

ANOTHER FINE "TITAN" SET

Popular Wireless

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No. 350. Vol. XIV.

INCORPORATING "WIRELESS"

February 16th, 1929.

In this issue
THE "TITAN" TWO



VALVES FOR H.F.
IMPEDANCE COUPLING
BASS FROM THE B.B.C.

WHITE PRINT No. 11

VANISHING VOLTS
SHORT-WAVE NOTES
REACTION REMINDERS

METROVICATION FOR ALL-ELECTRIC WIRELESS OPERATION

THE ALL ELECTRIC VALVE

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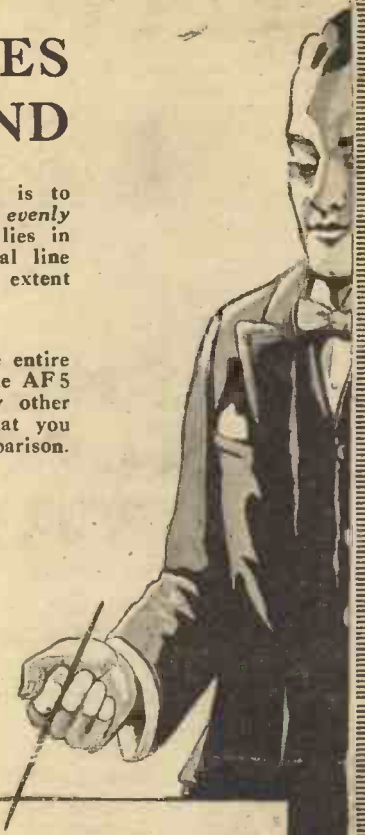
To begin with, you will notice that the chart is drawn to a musical scale, and that the easily-recognised notes are then transferred into terms of "Frequency in cycles per second." Nothing intricate or-misleading about that!

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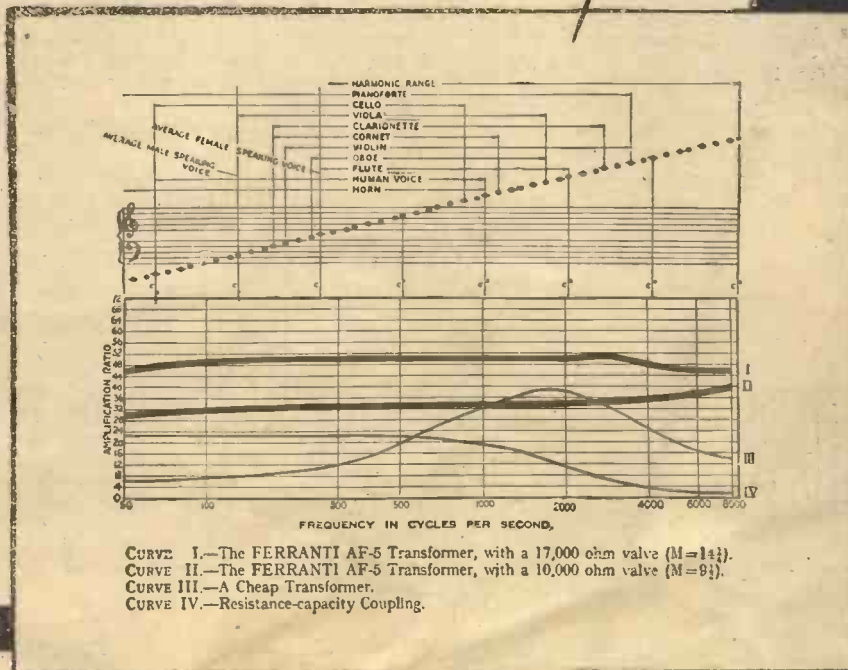
As the duty of the Transformer is to amplify signals not only strongly but *evenly* it will be realised that perfection lies in the direction of a straight, horizontal line on the chart; and that to some extent "curve" is a misnomer.

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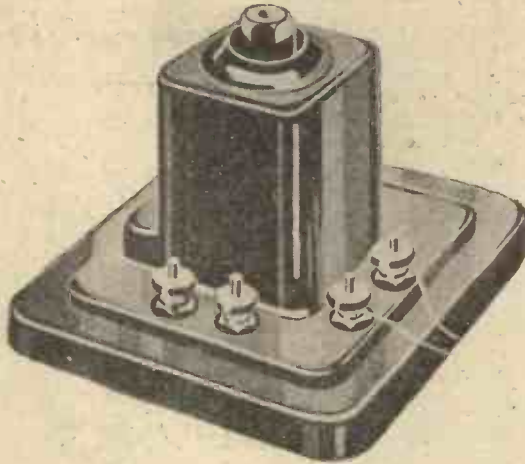
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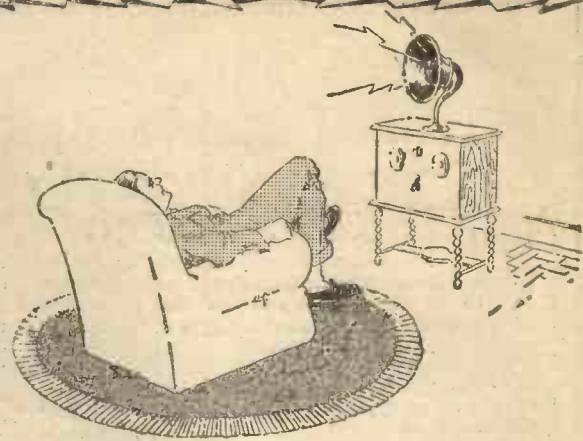
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Made by the makers of Lotus Buoyancy Valve Holders, Coil Holders, Vernier Dials, Variable Condensers, Jacks, Switches, Plugs, etc.

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All waiting for their birthdays

WHAT a look of expectancy on the youngsters' faces—the rapt attention as some thrilling story is told—the shouts of delight as Molly is wished 'A Happy Birthday' by the Wicked Uncle.

It's been a time of real excitement for the whole family. They have had wireless as never before.

The PHILIPS 2-Valve All-Electric Receiver, together with a PHILIPS Loudspeaker, have revealed to them the wonders of perfect radio.

It's all so simple—no batteries or accumulators—plug straight in to your electric mains—that's all! Get the Ideal Radio Combination to-day.

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Send at once for this wonderful Cossor Broadcasting Map. It gives the positions and wavelengths of over 200 European stations. It tells you how to identify those puzzling foreigners — how this station plays a chime of bells—how another uses a gong during the intervals. Besides a Map it is a veritable mine of information on Continental Broadcasting.

Every user of the famous Cossor Melody Maker needs this Map. It is an absolute necessity if you want to get full advantage of the amazing power of this wonderful Receiver. It tells you how to identify the stations which you can now receive and shows you "where" to search for the programmes you want to hear. Whatever type of Set you own you'll get more enjoyment from it with this new Cossor Map. It contains information that is of enormous value to every Wireless User. No one with a Radio Set can afford to be without it.

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To A. C. Cossor Ltd., Melody House, Highbury Grove, London, N. 5. Please send me your Broadcasting Map for which I enclose 2d. stamp to cover cost of postage, etc. Mark envelope "MAP" in top left-hand corner.

Name.....

Address.....

P.W. 16/2/29

Please write in Capital Letters

Popular Wireless



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RADIO NOTES AND NEWS.

Radio Makes Flying Safer—John and Sam to Exchange Programmes?—Abyssinia Awakes—B.B.C.'s Technical Triumph—Baby Telephones 8,000 Miles—The Gleeful Missionary—A Missing Knight.

The Way the Money Goes.

THE commercial accounts of the Post Office, issued last month, reveal that the B.B.C. received no less than £824,237 for the year. This, added to the profits on its publishing business makes a revenue which will need a lot of explaining away. What on earth do they do with it? They cannot use it all for listeners.

Antarctic Up to Date.

COMMANDER BYRD'S aeroplane has been in radiotelegraphic touch direct with New York whilst flying 3,000 ft. over the Bay of Whales. That is wonderful enough, but it is worth while casting back almost exactly 21 years, when Shackleton in the "Nimrod" was dodging the ice off the Great Ice Barrier. He found and named the Bay of Whales, and although he had a motor-car he had no radio. Just think of the tremendous foot-slogging he and poor Scott did—and then this aeroplane! Think of the two years' silence after they left civilisation! And then this radio!

Radio Makes Flying Safer.

THE trailing antennae of aircraft have always been a weak spot in the equipment, because they have to be reeled in at low altitudes and cannot be used on the ground. Now, as a result of considerable research, a suitable aerial on the wings has been designed and is to be adopted by Imperial Airways on their London-Paris route. By means of this improved aerial the air-liners can be guided in foggy weather right on to the aerodrome by directional radio methods.

John and Sam to Exchange Programmes?

MUCH experimental work has been done of late months with the object of diminishing "fading" on transatlantic broadcast reception. On this side 5 S W has been the transmitter used, while the special B.B.C. receiving post is at Tarring, Essex. It is on the cards that the B.B.C. are aiming at an exchange of programmes with the U.S.A., a departure which will no doubt be applauded by listeners in both continents, though I should like to see more attention paid to the claims of the Empire overseas.

"Some" Transformers.

IF you have ever wound a transformer during a nightmare it must have been one something like those Ferranti's are to make for the Central Electricity Board, which are the largest ever ordered for use in this country. Think of a component rated at 60,000 K.V.A.! Fancy it burning out during the "Children's Hour!" There must be something good about this firm's transformer design which collars an order like this—a total capacity of 1,100,000 K.V.A.

Abyssinia Awakes.

THAT queer kingdom of Africa, whose monarch claims direct kinship with King David, has not hitherto joined the ethereal concert of nations, owing, I

understand, to a strong conservatism on the part of certain powerful natives. But an awakening has come and they are now calling for tenders for a transmitting station of 25 kw., capable of communicating with Europe on 10 to 50 metres, and for five minor stations. This is going "all out," no mistake, but maybe it will not be long before our readers begin to report "Abyssinia on L.S." Morse, of course.

Technical Triumph of B.B.C.

WHATEVER one is induced to think and say about the B.B.C.'s programmes one's praise for the work of its engineering staff can conscientiously be unstinted, for, apart from the fine
(Continued on next page)

"YOU'RE IN MY HEART BUT NEVER IN MY ARMS."



The song named above was the subject of the first music photograph to be radioed across the Atlantic. Fred Elizalde (left) and Marinus B. Winter, of Dance-band fame, are shown with Miss Ellaline Nacey and Miss Ivy St. Helier, waiting the reception from America at Radio House, London.

NOTES AND NEWS.

(Continued from previous page.)

quality of the transmission, setting aside the question of "control," we have to consider that the breakdowns are negligible. During last year the average breakdown per station, calculated on the total scheduled transmission time, was 0.03 per cent, not including 5 G B which confesses to 0.54 per cent. Swansea gets the top marks with 0.01 per cent, and Glasgow goes to the bottom of the class with 0.11 per cent.

An Excellent Suggestion.

A CORRESPONDENT writing to a contemporary makes the suggestion that a suitable name for the projected new headquarters of the B.B.C. would be "Fleming House," because, he says, "without Professor Fleming's invention of the valve the house would not have been required." This idea has much to commend it. Firstly, any old name would be better than "Broadcasting House." Secondly, there is a lot of truth in the notion that the thermionic valve made "broadcasting" possible. Thirdly, on general principles the idea of thus prominently perpetuating in public the work of a British scientist is good, though Sir O. Lodge might have an equally sound claim to the honour.

The Lost Spectacles.

I HAVE just seen a story of a breakdown in the telephone service from a farm in Western New York which was caused by a pair of steel-framed spectacles having been placed across the terminals of the instrument by the farmer's wife. By this I am reminded of a zealous but not very knowledgeable assistant of mine who, years ago, came to me in a state of excitement saying that he had found the perfect "atmospheric" eliminator. Our receiver was a "magnetic detector." "When I put this pair of scissors across these terminals," he said, "there is a complete wipe-out of x's." By gum! there was. He was shorting the telephones! (A true story.)

Baby Telephones 8,000 Miles.

ONE of the minor romances of radio is that Princess Astrid of Belgium whilst in Java during the Christmas holidays was able to relieve her mind of anxiety concerning the welfare of her baby daughter, who was staying in Sweden. Telephoning by direct radio to Amsterdam, a distance of 7,452 miles, and from thence to Fridhem, Sweden, by cable under the Baltic (931 miles) the Princess got into touch with Queen Baby, and although the conversation was perhaps rather one-sided the fifteen-months' old infant succeeded in convincing mamma that she was "going strong" and that the milk was O.K. in Sweden.

A Bumper S.B.

WHEN Sir Harry Thornton broadcast a New Year's message from C.N.R.M. (Montreal) over the system of the Canadian National Railways it was relayed by wire to fifteen towns, at least 15,000 miles of land-line being employed. All the eleven stations of the company took part as well as four private stations, the most westerly and easterly being 3,000 miles apart. Something like an S.B., eh? I am rather glad that my grandmother could

not know about it. She would have deemed it almost wicked. "Shouting about all over the world" etc., etc.

"A Brown Study."

S. G. BROWN'S have won in the action brought against them by the Lektophone Corporation of Jersey City, U.S.A., for alleged infringement of a patent. Dr. Eccles' evidence was most interesting. But that's all in the way of business. Brown's have favoured me with another copy of "The Brown Budget," a "house organ" which steadily grows more and more interesting. The January number contains an interesting article about the use made by "Lyons" of the Brown "Electro-Megaphone." A delightful picture of

SHORT WAVES.

Broadcasting is said to have a strange effect on birds, especially doves—who are in some way prevented from finding their way home when there are wireless stations in the line of flight. They should, of course, take out licences (immediately and erect direction-finders.

Bride (proudly): "I got this recipe for the pudding over the radio."

Hubby: "There must have been a lot of static about, my love."

A correspondent from Streatham writes to say that he recently purchased a screened-grid valve and, although it works quite well, it has a curious whistle with it. He asks whether he should return the valve to the dealer.

Good gracious, no! Just take the whistle out and give it to the baby to play with.

SCIENCE IN 2929.

Archaeologist: "This is the skull of a man of the Old Radio Age. We can date it within twenty years."

Visitor: "For heaven's sake, how?"
Archaeologist: "Look at the evidence of wear around the ears. He used to wear headphones."—"Radio News."

"Every little helps," said the H.T. as it jumped across the filament.

Why did the valve howl?
Because an electron passed round the plate, and found it 2 M.T.

NOT A "SOFT" ONE, EITHER.

First Radio Fan: "What sort of a chap is he?"

Second R. F.: "Well, if he had a filament, grid and plate in his head it would make a good vacuum tube."—"Radio News."

"We've had radio for breakfast,
Radio for lunch,
Radio for supper,
And I've a kind of hunch
We'd be rocked to sleep by radio
If it wasn't for the fact
That we've sold our bloomers' bedspring
For some wave-lengths and a tack."
—"Dundee Advertiser."

"Nippy" is included. (Does anyone know where the original of the "Nippy" photo works? If I can spot that teashop I shall forsake my present haunt forthwith.)

Portables.

AFTER a discouraging start, portable receivers seem to be winning popularity. The valve power has reached equilibrium at five—at least, that is the most popular figure. But the strange thing is that whereas portables have been advertised for use in the "great open air, where men are men," the majority of people—so far as I have observed—favour them because they can lug them from room to room, thus avoiding the wiring necessary for plugging into non-portable sets. Therefore it seems to me that there would be a big market for an "all-mains, portable set."

The Gleeful Missionary.

A VERY snappy letter from S. G., who I take to be a ship's wireless operator, is brimful of enthusiasm for "P.W." and "M.W.," and tells me that he has increased our circulation in the Argentine. He ought to be promoted to Shore Inspector for that. He admires the cover of the Christmas "P.W." and asks who is the lady? Sir, I expect it is our Mr. Rogers clad in his sister's—or his cousin's—or his aunt's dress, and a wig made in the office.

Biographical.

MR. ALBERT COATES, the conductor of the great B.B.C. symphony concert at Queen's Hall, was born in Russia, and after receiving his general education in Liverpool, studied music in Leipzig. During the Great War he stayed in Petrograd, and after the revolution of 1917 was placed in entire charge of the Opera. It is a curious sidelight on the Russians to note that the Bolsheviks, anti-British as they are, confirmed his appointment.

A Missing Knight.

IF this should catch the eye of a correspondent who signed his letter "Grand Knight of the Whisker," he can earn the gratitude of some of our readers and us by writing again giving further details of the subject of his first letter. He gave us no address; hence this S.O.S.

"Rhythm" of Morse.

I CONTINUE to receive emphatic but pleasant letters from telegraphists, insisting that I was wrong in guffawing at the statement that an operator can sometimes be identified by the "rhythm" of his Morse. One and all they miss the point and tell me they can recognise senders by their style—a very different matter. Very few send Morse accurately as to time; it is like handwriting in a way, and each man develops certain characteristics by which, I agree, he can sometimes be identified. But rhythm? As space is precious I can only point to the dictionary.

I Wish

THE valve has often been called "the modern Aladdin's Lamp," and so I rub a pentode heartily and wish that makers of tapped grid and H.T. batteries would make the sockets less apt to pull out if the wander-plug is a little tight, and make them less slippery and more tenacious. I wish that when a screw in the set has to be in a position which can be reached only by a long screwdriver the makers would tell us how to replace it; it is very clever at falling upside down or full length but won't stay point downwards in the hole long enough for the driver to reach the slot.

I Go On Wishing

THAT transformers and certain other components could be standardised just enough to provide that if one has in an emergency to be replaced by another make, the screw-holes already in the panel or baseboard will coincide with those of the new component. That valve sockets might be made more get-at-able and not put where one is forced to insert the valve-pins by sleight-of-hand rather than by the aid of sight. That accumulator terminals were made non-corrodable. That the average wander plug had a better grip on the wire. That ebonite were transparent, chemically inert, and unbreakable.

ARIEL.



THE B.B.C. has been under heavy fire recently. I understand that one of the reasons is because of a move by certain powerful financial interests to have it taken out of the Government's hands again and made into a private company, as in the United States of America. However this may be, the searchlight of criticism has been turned particularly on to the B.B.C. programmes. And as nothing is perfect in this world, such criticism will do good.

P.O. Profits.

We have heard much of the £1,000,000 income of the B.B.C., but the facts are, of course, that its income is only about £800,000. No less than 7s. in the pound of the revenue from licences is retained by the Government. The Post Office keeps 12½ per cent for the cost of the collection and administration of the licences, which, of course, is far too high and on which a considerable profit is made; but an additional sum is retained by the Treasury which last year was estimated to have been £269,410. For this year, the licences were expected to increase in number to 3,000,000, paying revenue of £1,500,000, of which the B.B.C. would only retain £896,875, the Post Office taking £187,500 and the Treasury no less a sum than £415,625!

If there is little justification for the Post Office taking such a substantial amount of money, there is far less for the Treasury raiding the B.B.C. henroosts; while the amount that Mr. Churchill expects to take in 1931, if he is still in a position to get it after the coming General Election is over, is half a million pounds.

So it is hardly true to represent the B.B.C. as rolling in money. Nevertheless, it has an assured income, no competition, and, in fact, I believe it is fair to say, speaking generally, that their programmes are the best in Europe and probably in the world.

An outspoken article in which is embodied much criticism of a thoroughly constructive nature. While the Editor of "P.W." does not necessarily agree with all the opinions expressed, he is sure that every "P.W." reader will be interested in many of the statements made.

And we may as well admit, for a start, that it would be quite impossible to please everyone all the time, whatever programmes were arranged.

Nevertheless, I consider there is room for immediate improvement. I meet all sorts and conditions of men, women and children, and I always try and steer the conversation round to "wireless" in order to get their views. I think some opportunities have been lost.

An Opportunity Lost.

Wireless could be made to enter more into the day-to-day life of the people far more than at present. Take, for example, the long-drawn-out illness of His Majesty the King, which has thrown a gloom over the whole nation. I don't know if the proposal was made and, if it was, why it was not adopted; but many people would have liked the B.B.C. to conduct an Intercession Service and mobilise the whole of the people's faith and sympathy for the

recovery of their Sovereign. There would be nothing irreverent about this any more than there was anything irreverent in the broadcasting of the Armistice Day's Service at the Cenotaph. This latter, it will be remembered, was only allowed in the teeth of considerable opposition.

The News Bulletins.

The News Bulletins could do with improvement. There is some absence of news sense in whoever it is who prepares them. There is not enough British news and too much of comparatively minor events in remote quarters of the globe.

Now that the ban on controversy has at last been raised, I believe opportunities are being missed of really excellent debates between recognised political leaders and well-known controversialists. I know that the Central Offices of the three recognised Parties have been at loggerheads on this matter, the Government wanting to have a right to reply to both Liberal and Labour speeches.

But this isn't exactly what I have in mind. One of the many troubles about having three political parties is that any debate in which all three take part must be, more or less, a farce. Whoever has heard of a good debate with three sides? I was horrified at the idea of seventy minutes broadcast on the De-Rating Bill with a speech by a Conservative Minister followed by a speech by a prominent Labour politician, and then the same points gone over again by the Liberal opponent, with a final wind-up by the Government spokesman.

Politics.

This was to have had on one night a Conservative Minister describing the Bill and then a Labour politician attacking it and the night after the duel between Liberal and Conservative.

The Debates we ought to have, and I (Continued on next page.)



Jack Payne's Broadcasting Band, which surely must be one of the most widely-known and listened-to in the whole world. Lieut.-Commander Kenworthy says: "If the B.B.C. will give us plenty of orchestral music, followed by dance music later in the evenings, it cannot go far wrong."

"PROGRAMMES."

(Continued from previous page.)

believe they would be very popular on the wireless, would be between two, and no more than two, prominent politicians of opposing points of view on any subject they please.

Imagine Baldwin and Lloyd George going for each other; or Winston Churchill debating with Philip Snowden, or Ramsay MacDonald and Austen Chamberlain arguing on the wireless!

The opener should speak for twelve minutes, his opponent for twelve, and each should be allowed five minutes to reply to the other. That would be a little over half an hour, and would be a first-rate entertainment and very enlightening for the new voters. These leaders debate in Parliament, and much publicity is given to their speeches in the Press—why in the name of goodness shouldn't it be done on the wireless?

Parliamentary Broadcasts.

And yet another proposal I would make for political talks would be a weekly speech of ten minutes by prominent politicians of all three parties in turn and on any subject they like to choose. Everyone would like to hear Mr. Neville Chamberlain or Mr. J. H. Thomas on their pet subjects; and anyone who couldn't say all he wanted to in ten or fifteen minutes at the outside had better be barred from the microphone.

I admit we mustn't have too much of politics; but this year will be a political year and the months before the General Election might well be utilised to let the electors hear the most prominent political leaders on the microphone. I understand that the debate between "Jimmy" Maxton

the fault of the B.B.C. that this hasn't been done. For a start, the Budget statement, at any rate, should be broadcast. The taxpayer has a right to know his fate at the earliest possible moment.

Objections Against "Uplift."

Then as to the programmes generally. The majority of people object to being "educated" on the wireless. I know this is an unreasonable attitude, but we are a funny people. The average man or woman coming home from work does not want "uplift" or schooling.

Yet education by wireless can, and does, play a great part; but I suggest it should always take place before 7 p.m.

Without a doubt, the most popular part of the programmes are the musical items, and if the B.B.C. will give us plenty of orchestral music followed by dance music later in the evenings, it cannot go far wrong.

Plays, no. They need too much concentrated attention if the eye cannot help; and if the listener has to miss five minutes of a play the whole performance is spoilt for him. When television comes it will be another story; but in the meantime the number of plays had better be kept down to the very lowest limits.

Most criticism is fastened on the Children's Hour. I think the B.B.C. has been unfortunate here through those who have arranged the hour not understanding the childish mind.

Light banter between "Uncles" and "Aunties" only annoys the children. Good stories they like, especially of the adventure kind, with plenty of fairy princes for the girls and pirates and bandits for the boys.

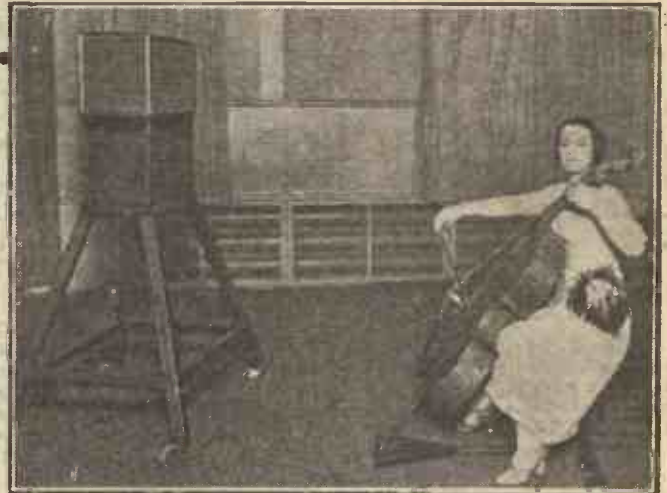
Hampering Difficulties.

All young children hate to be treated as children. Why they like pantomimes is because they really cater for the fathers, grandfathers and uncles, and not for the young relatives they take there.

Yet the B.B.C. is not without enterprise, and we must all recognise that it is working under hampering difficulties, financial and bureaucratic. As one who opposed the annexation of it by a Government department, I have only the poor satisfaction of finding my prophecies fulfilled, at any rate in part.

SET-BUILDING SUGGESTIONS.

For control of H.F. or detector grid potential a potentiometer of 300 or 400-ohms resistance may be employed, but for volume control the resistance value should be really high—half a megohm or so.



Madame Suggia, the famous "colliet," broadcasting from London. Our distinguished contributor suggests that the most popular part of the programmes are the musical items.

The little wooden "stiffening" rods supplied with Glazite make excellent spacers for winding primary coils over secondaries, etc.

When using a flux which "splutters," press a piece of stiff paper or blotting-paper over terminals, etc., and the acid will be prevented from spraying the panel.

If solder fails to "take" on a tag or other surface, do not try to affix a second bead of solder until the surface has been cleaned thoroughly.

When using a potentiometer it is advisable to place a fixed condenser (.001 or so) across the slider and "filament end" of the instrument.

The advantage of using a high-resistance potentiometer for volume control is that this method is practically distortionless.

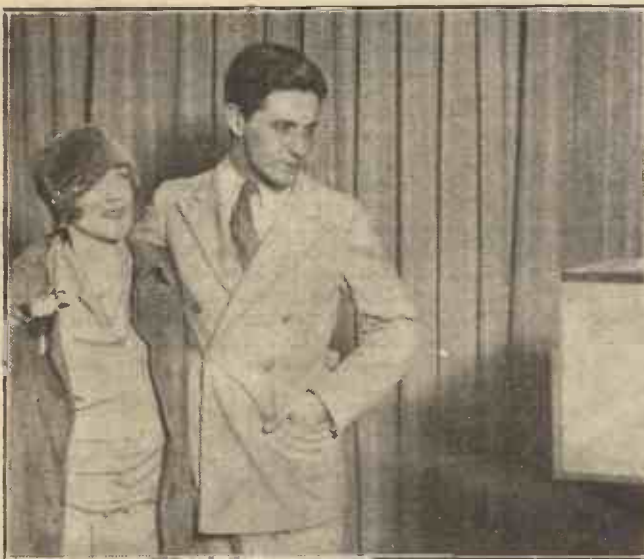
A "soft" valve uses more H.T. current than it should, so it is not usually economical in use.

The inductance value of an L.F. choke is partly dependent upon the amount of current passing through it.

It is a good rule never to take current from the mains for a loud-speaker field, or similar purpose, without inserting a fuse in the leads from the mains.

Don't trust to an ordinary switch being "off" when making adjustments to an H.T. mains unit. Always take the connecting plug right out of its socket.

Twelve months is about the longest life one can expect from flex leads—if yours have been in use for this length of time they require an overhaul if you are to be free from "crackling," etc.



Miss Phyllis Monkman and Ivor Novello, two popular artistes who recently broadcast a scene from a play in which they have been appearing.

and Sir Ernest Benn was very successful, and I have good reports of the debate on Capital Punishment by Miss Fry and Captain Evans M.P.

Before I leave politics, I must again suggest that the experiment at least be tried of broadcasting important debates in the House of Commons. I know it is not

VANISHING VOLTS.

A brief review of some of the commoner causes of failure with the high-tension supply.

By P. R. BIRD.

DO you find your high tension a nuisance? If the answer is "No" you are lucky, but if the answer is "Yes" the following hints may be of service in indicating where the trouble lies and how you may cure it.

Ever since wireless listeners became critical of quality and expected their reproduction to be at least as good as the very best gramophone procurable, there has been trouble over the high-tension supply. The reason for this is that in order to get good quality and real volume quite an appreciable current must be drawn from a high-tension battery. Unfortunately, a great many listeners confine their attention to the voltage of the high-tension battery, and not to the current it furnishes.

Calculating Current.

The most common H.T. fault of all is the use of a battery or a mains unit which is incapable of supplying sufficient current at the required voltage. Choose a battery or a mains unit which can supply enough current at the required voltage and most H.T. troubles are at an end, except, of course, for renewals in the case of the battery. (These renewals will be few and far between if the battery is able easily to supply the current drawn from it.)

The reason that so many batteries give faulty service is that they are really incapable of supplying the current required of them, and, consequently they are always overworked, and rapidly run down. The correct way to go about choosing a battery is to ascertain how many milliamps your set will take in high-tension current, and then choose a battery or eliminator which is able economically to stand up to such a drain upon it.

You can measure the H.T. consumption when the set is connected up to a new battery, for if a milliammeter is connected in the H.T.

negative lead it will show how many milliamps the current of the whole set amounts to. If you have not a milliammeter you can easily calculate what the current will be from the valve makers' curves.

Inspect the grid-volts-anode-current curve and you will see the line corresponding with the high-tension voltage you are going to apply. Along the bottom line is shown the correct negative grid bias (if any) which is necessary to bring the working point to the required point on the curve, and opposite to this point the anode current in milliamps for that particular valve.

Add the milliamps required by all the other valves, and you have the total milli-

amp consumption of your set. If this total exceeds 6 milliamps, then the ordinary small type of H.T. battery or dry-cell assembly is inadequate and you will require a double-capacity battery. If, on the other hand, the consumption is more than ten milliamps, you will require a battery of at least triple capacity.

Two Batteries to One Set.

If a mains unit is to be employed you must make sure that it is capable of supplying these currents at the requisite voltages before securing the instrument. It is failure to watch these questions of current supply that is responsible for most of the high-tension troubles that arise.

An economical method of using dry batteries as long as possible is to employ different batteries for different H.T. positive terminals. For instance, if your set is a Det., 2 L.F. it is probable that the last valve is a power valve, and takes more current than the other two valves put together. If, therefore, the 1st and 2nd

"DON'T DO IT."



Never connect up a new H.T. battery in series with your old one, this being a very common cause of howling and poor results.

valves are fed from a common H.T. terminal, whilst the power valve has a terminal of its own, it is possible to use two different H.T. batteries, with their negatives connected together. Then when one battery gives out only half the H.T. supply need be replaced.

It is much better to underwork a battery than to overwork it, for when excess current is demanded the effort to give more current than it is intended to supply shortens the life of the battery considerably. Suppose an H.T. battery capable of giving only, say, 4 milliamps for three months on end is attached to a set requiring 8 milliamps. It would not be capable of giving double current for half the time because this

excessive discharge definitely ruins the battery, whereas if worked well within its limits it "recovers" when not in use, and often surprises its owner by retaining its vigour for much longer than expected.

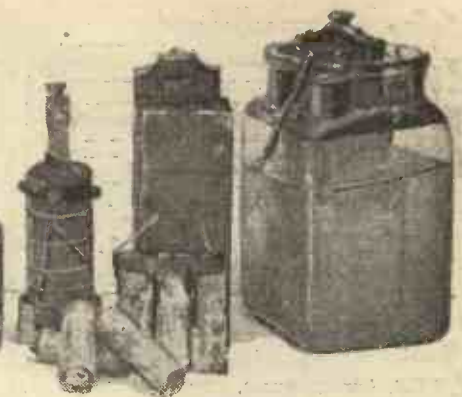
When an H.T. battery is running down, not only does its voltage drop, but its internal resistance goes up. Both of these symptoms are fatal to good quality so that distortion is inevitable, and very often there is a great tendency to howling as well. This latter is caused by the coupling effect due to the common resistance of the battery in circuit with all the valves, and no anti-motor-boating device can satisfactorily overcome it if the fundamental cause, i.e. the high resistance of the battery, is allowed to remain.

To Short, or not to Short?

There is much difference of opinion as to the advisability of shorting out a cell in a high-tension battery when this particular cell is known to be defective. One often hears it stated that even a dud cell should not be shorted, because of the effect upon surrounding cells. But this argument hardly seems adequate, for, unless the cell is shorted the battery is ruined, anyway, and consequently most users will prefer to get the last ounce out of the surrounding cells by bridging across the faulty one!

Finally, remember that the nearer you can get to the maximum high tension recommended by the makers of the valve the better for reproduction, provided always, of course, that you are careful about your grid bias, the voltage and the effect of which are curiously interlinked with the high-tension voltage and effect.

It should be remembered, too, that individual valves and individual sets vary a good deal with regard to their H.T. requirements, and often high-frequency and detector valves will work well upon a very much lower voltage than would be supposed from an inspection of their characteristic curves. But do not forget, in an endeavour to get H.T. voltages right, that the H.T. plug of a power valve or, indeed, of any valve should not be re-adjusted while the filaments are on. If this is done or if a high negative grid bias is suddenly removed by the removal of the H.T. negative plug there is a sudden rush of H.T. current which is not merely bad for the battery but extremely hard upon the delicate filament of the valve.



LATEST BROADCASTING NEWS.

B.B.C. ANNOUNCEMENT.

TONI FARRELL FOR 5 G B
—TELEVISION MOVES—SIR
HENRY WOOD—"TESS" ON
THE AIR—WHO IS A. J.
ALAN?

B.B.C. Announcement.

THE B.B.C. announces that a scheme of national lectures has been instituted, under which, three times a year, a formal lecture of nearly an hour's duration will be broadcast by an eminent authority on physical or natural science, philosophy, literature, exploration, music, art, or medicine.

Lectures equal in importance to the Romanes Lectures at Oxford, or the Rede Lectures at Cambridge, are in mind. The scheme is receiving the cordial approval and support of the following distinguished authorities: Lord Balfour, Lord Crawford, Mr. H. A. L. Fisher, Sir William Hardy, Sir Frederick Kenyon, Sir Donald Macalister, Lord Ronaldshay, Sir J. J. Thomson, Sir William Bragg, Lord Crewe, Sir Israel Gollancz, Sir James Jeans, Sir Oliver Lodge, Sir Henry Newbolt, Sir Ernest Rutherford and Dr. T. F. Tout.

The above advisory panel will give the B.B.C. the benefit of their guidance in the choice of subjects and lecturers, and have already recommended that the first of the national lectures should be delivered by Mr. Robert Bridges, the Poet Laureate, whose subject will be "Poetry." This will be on February 28th, at 9.20 p.m., for all stations except 5 G B. The second lecture is to be delivered on April 15th, by Dr. A. S. Eddington, the noted Cambridge astronomer.

Toni Farrell for 5 G B.

Toni Farrell, the composer and pianist whose name frequently appears in the broadcast programmes (it is down again for 5 G B on Wednesday, February 27th), has had many experiences which must make the ordeal of singing and playing before the microphone, so fearsome a task to some artistes, a tame affair of the "nth" degree.

Besides being attacked by a gang of roughs in a native bazaar, she has been boycotted by a Chinese secret society, and at one time lived in the heart of the Malayan jungle among the wriggly snakes, chattering monkeys, and stealthy tigers. Ugh!

Television Moves.

The lobby of the House of Commons is still a fruitful source of rumours about television. The latest is that following the ratification of a scheme to merge Fultograph in Television the B.B.C. has accepted

the Postmaster-General's proposal to have a "secret" test of television by a panel of inexpert but eminent judges.

There is some reason to believe that this will take place before the end of February. The result of this test is now the subject of eager discussion. Odds are lengthening that the verdict will be sufficiently favourable to make it imperative for the B.B.C. to do the same kind of public tests of television as it has done for Fultograph. These may be in place of Fultograph or additional to them.

Sir Henry Wood.

On Friday, March 1st, two days before he celebrates his sixtieth birthday, Sir Henry Wood is paying another visit to Belfast to conduct the Belfast Symphony Orchestra in a concert at the local studio. The vocalist will be Eleanor Toye (soprano). By the way, considerable excitement has been occasioned in music circles recently by the rumour that Sir Thomas Beecham is

to conduct next season's promenade concerts at the Queen's Hall.

There is, of course, no truth in the statement. The next season is Sir Henry's thirty-fifth in succession, and the B.B.C. are known to be giving him carte blanche to make it really worthy of his great traditions.

"Tess" on the Air.

The first broadcast performance of "Tess," an opera in four acts, the libretto of which is based on Thomas Hardy's "Tess of the d'Urbervilles," by Luigi Illica, with English translation by Alfred Kalisch and music by Frederick d'Erlanger, will be given from the Birmingham studio for 5 G B listeners on Saturday, March 2nd.

The artistes will include Keith Falkner, Dorothy D'Orsay, Frank Titterton, Stiles Allen, Gertrude Johnson, Odette de Foras, and Eric Greene, while the Birmingham Studio Chorus and Symphony Orchestra will be under the conductorship of Mr. Joseph Lewis. The production of the work will be under the personal supervision of the composer.

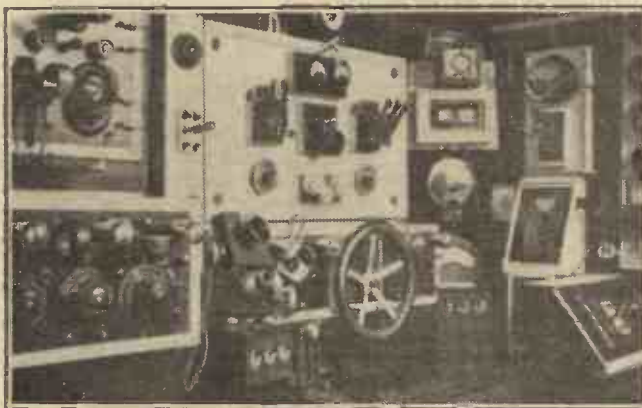
Who is A. J. Alan?

Another story by A. J. Alan will be broadcast from London and other stations on Tuesday evening, March 5th. As Mr. Alan has recently returned from a cruise to the West Indies his next yarn should be hot!

By the way, who is A. J. Alan? The most extraordinary rumours of his identity are in circulation. One thing seems certain, and that is that he is *not* A. J. Alan.

The third of the series of lectures on "How it Strikes Me" will be given from 5 G B by Miss Sybil Thorndike at the Royal College of Dramatic Art on Friday, February 22nd.

HANDSWORTH HAM'S HANDIWORK.



This handsome experimental station, built by a Handsworth reader of "P.W.," took no less than nine years to build.

TECHNICAL NOTES.

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

AN INTERESTING "SPEAKER"

A WELL-KNOWN PRINCIPLE—SOURCE OF ELECTRONS—ETC., ETC.

An Interesting "Speaker."

YOU will probably have noticed in "Modern Wireless" a description of a moving-plate loud speaker which is of German origin, having been developed by Hans Vogt, a well-known radio engineer. This speaker was submitted to me about twelve or eighteen months ago and I made a good many experiments with it at the time. It is based upon a very interesting principle, and one which has not received the attention it deserves—the electrostatic principle. It does not contain any magnets or windings and has only one moving part, the diaphragm. This diaphragm is made from a very thin sheet of aluminium alloy.

A Well-known Principle.

The electrostatic principle as applied to telephone receivers and transmitters is too well known to need any lengthy description, and I would merely remark that the action of the speaker depends upon electrostatic attraction and repulsion.

As is explained by the writer of the article mentioned above, I also found that this loud speaker was capable of excellent reproduction although, owing to its special character, it was essential to use a real y efficient amplifier, as free as possible from distortion.

In view of the fact that fairly high values of H.T. are now quite common, one of the apparent disadvantages of this type of speaker no longer exists, and I have no doubt that much more will be heard of it—and from it—in the near future.

Source of Electrons.

In the case of the modern dull-emitter filament, in which an increased emission is obtained by means of oxides of calcium, barium and strontium, the question has never been satisfactorily settled as to whether the extra-emissive substances have the effect in some peculiar way of enabling the free-moving electrons to escape more

(Continued on page 1218.)



THE MYSTERY OF THE B.B.C.

By THE EDITOR.

ALL things considered, it is not very surprising that a good many people these days are beginning to regard the B.B.C. organisation as something originally conceived by Mr. Edgar Wallace. The trouble is, of course, that there's far too much mystery about the B.B.C.'s organisation.

The other day the Earl of Clarendon, in the House of Lords, quoted speeches by the Prime Minister and the Postmaster-General to the effect that the Governors of the B.B.C. were absolute masters in their own house. And then his lordship went on to expiate at some length on the allegation that the B.B.C. was a super-department of the Post Office.

Which is Correct?

According to Lord Clarendon, the B.B.C. is nothing of the sort. Well, what are we to believe?—for Lord Clarendon's statement is at variance with the terms of the B.B.C.'s charter. The latter shows, quite clearly, that there is hardly a single matter of general policy which may be decided by the B.B.C. executive chiefs without first obtaining the permission of the Postmaster-General.

The objects of the Corporation are also clearly set forth in the Charter, which are "to carry on broadcasting as a public utility service and to exploit the said broadcasting service and any other licences as aforesaid in any such other direction, and by any such other means as may from time to time be permitted by Our Postmaster-General and from time to time to obtain or agree to a renewal or extension of or any modifications of the terms and conditions contained in any such licence as aforesaid as Our Postmaster-General may from time to time be willing to grant or agree to."

The Television Business.

That seems clear enough, and yet Lord Clarendon says that the B.B.C. is not by any means a super-department of the Post Office, and that the Governors of the B.B.C. are their own masters. As a matter of fact, the real position is that the Chairman of the B.B.C. and the Governors of the B.B.C. are tied down pretty firmly by this Charter, and the Postmaster-General permits them to do this, that or the other as he pleases.

If the B.B.C. gets unruly and doesn't fall into line, there is trouble. Witness the television controversy. Although the Postmaster-General has not definitely ordered

"The trouble is, of course, that there's far too much mystery about the B.B.C.'s organisation."

the B.B.C.—at least, not as far as we know—to give the Baird system a trial, he pretty well intimated that he *thought* the B.B.C. should.

The B.B.C., however, backed by its technical chief, Captain Eckersley, had the pluck to stand out against this "suggestion" for some time because, from the technical point of view, Captain Eckersley was not satisfied, nor were his assistants, that television had reached a stage which would warrant a public service.

Our readers have all heard now of the new B.B.C. lectures, which are to be similar in style and length to the Romanes lectures at Oxford. That knowledgeable gentleman who writes in the "Evening Standard" under the title of "Londoner" recently suggested that Professor Eddington, who is to deliver the second lecture, might chat about his new theory of the electron, which fogged the Royal Society the other day, and it would be good fun if Professor Einstein could be induced to explain his recent paper on electro-magnetic fields! He also suggests that there are certain problems of Roman Law on which the public is "burning to be informed," and no doubt a short account of the marriage customs of the Aztecs would interest all listeners!

RADIO IN SCULPTURE.



The latest work of the Russian sculptor, Zukoff, is a radio subject. His speciality is the depicting of human expressions on animal faces.

This judgment was passed after seeing a special test at the Baird laboratories; but political pressure has since been brought to bear, and we now hear a good deal of talk about a "secret test," a merging of interests with the Fultograph, and the inevitable conclusion we must come to is that the B.B.C. have decided that the Postmaster-General's "wishes" cannot be flouted too much, and that, at any rate, they must make some showing of considering television, although Captain Eckersley is still of the opinion that its technical degree of efficiency is not such as would warrant a public utility service, nor the alliance of television with the B.B.C.

him for an hour is a heavy price to pay for it. "With broadcasting there is not even this—only the consolation that it requires less moral courage to turn off a loud speaker than to walk out of a hall when one is bored."

Pretty good, this; and it is a point the B.B.C. might bear in mind. If the B.B.C. is going to start copying Oxford and lading out long and erudite lectures the crisis will certainly soon be reached.

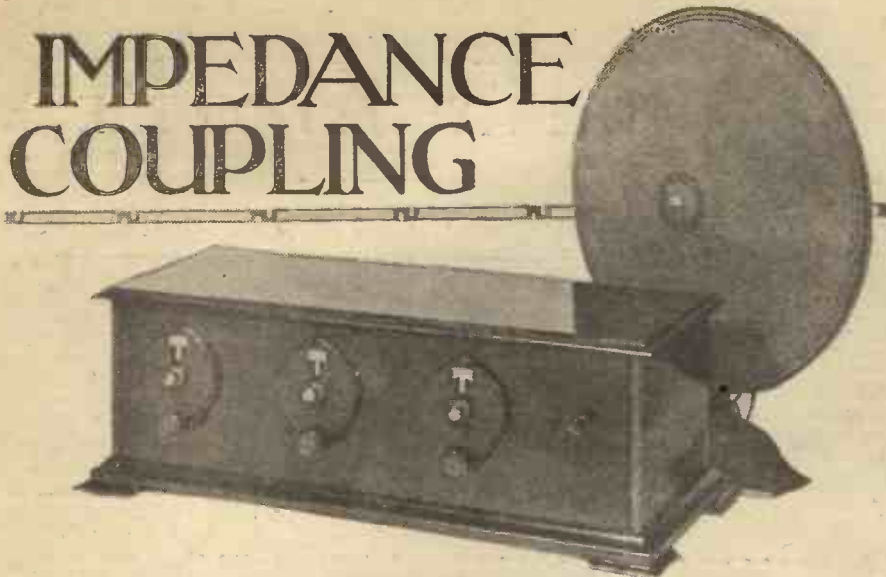
Surely it would be worth while the B.B.C.'s engaging, say, Mr. P. G. Wodehouse, or Mr. W. W. Jacobs, to give a lecture on humour in literature, or Mr. Edgar Wallace to give a talk on crime in literature?

A Crisis?

This is pretty good satire, and one can't help agreeing with the writer when he says that for his part he can't imagine why anyone ever wants to hear a lecture. If a man has anything to say he can communicate it much better in writing.

There is sometimes the attraction of seeing a remarkable man in the flesh (as the writer in the "Evening Standard" points out); but often listening to

IMPEDANCE COUPLING



The description of an exceptionally interesting circuit.
By F. E. COX, B.Sc.

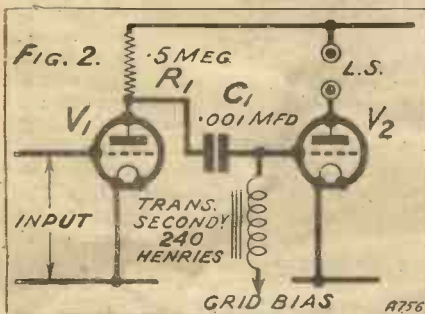
READERS who take a keen interest in the design of L.F. amplifiers with a view to securing pure production must often have been surprised to find fashion in circuits undergoing continual change. Transformers, chokes, resistance-capacity, have each had their day.

Most of us now know that each method has advantages and drawbacks, most of which can be expressed in mathematics. The writer in discussing yet another type of coupling little used realises that he must produce sound arguments before even enthusiasts will seriously consider changing from methods which give them no small measure of success. No attempt is here made to make novelty the outstanding reason.

A Curious Effect.

When resistance-capacity coupling first became popular with experimenters the writer was using the circuit of Fig. 1, the components having values there given.

An effect was noticed which was indirectly the cause of this article. Although satisfactory so far as audible results were concerned the circuit suffered from the defect that change of grid bias to V_2 produced no appreciable effect, particularly so whenever the set was dusty.

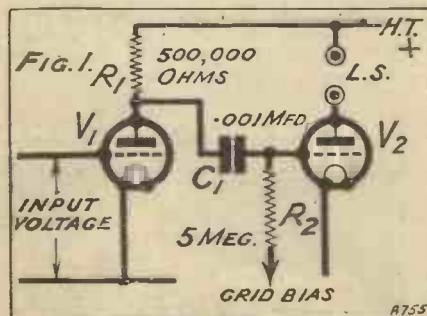


Even with components of highest quality and carefully cleaned the effect was there. It was put down to insulation leakage in condenser C_1 or the resistance panel.

To check this theory the writer removed the grid resistance R_2 , and replaced it by the secondary winding of a transformer.

It was expected that the full effect of grid bias would now be apparent as, owing to lowered D.C. grid to filament resistance, insulation leakage would have negligible effect. This proved to be the case, response to grid bias being all it should be.

But here is the surprising point! The bass register was audibly strengthened instead of disappearing. Now the transformer



To-day this well-known circuit differs by having resistances R_1 and R_2 of lower values, and C_1 is generally larger to suit.

secondary as a choke had replaced a 5-megohms metallised leak.

It could not be supposed that the impedance of the choke at low frequencies would approach this high figure. The particular transformer had a primary of perhaps 15 henries and a ratio of 4:1. Thus, the secondary would have an impedance of 15×4^2 henries = 240 henries. This would give approximately 150,000 ohms at 100 cycles—only a small fraction of 5 megohms—yet the bass notes were there and enhanced too.

The solution lay in the resonance of the electrical circuit of coupling condenser C_1 and grid choke (Fig. 2) in series.

Occurrence of Resonance.

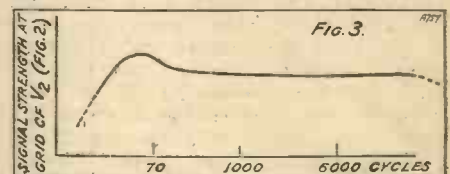
Resonance occurs at a frequency which depends on the electrical values of both capacity and inductance. Therefore, the signal voltage applied to grid of V_2 will tend to rise above that passed to it by anode resistance R_1 . In Fig 3, the hump in the response curve (grid-volt-frequency curve) is the result of the resonance.

At middle frequencies the plain choke impedance rises to a high value, and replaces the high leak value R_2 . (Fig 1). Thus, at middle frequencies signal strength is maintained.

At the highest frequencies another resonance takes place. The self-capacity of the choke together with the latter's inductance produce it. Normally with the resistance-capacity circuit (Fig. 1) a droop in the curve is noticeable at about 6,000 cycles. As a result of resonance the choke gives a level curve well on to 10,000 cycles, but a hump is not produced.

Subduing High Notes.

Thus, a transformer, useless according to modern practice because of its low primary inductance, can be of service in producing strengthened high notes and low notes. Since even to-day many loud speakers are deficient in both these this feature of the circuit makes it valuable.



Gramophone enthusiasts who use the pick-up and wireless amplifier will be able, by using this circuit, to restore the upper and lower register which is admittedly difficult to record at normal strength on the disc. Of course, should high notes be over-accentuated in a given loud speaker they can always be subdued by a capacity in parallel with the speaker.

Using Two Chokes.

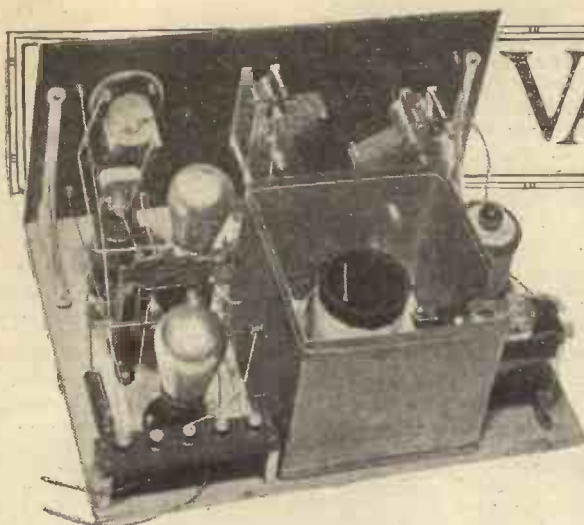
The anode resistance R_1 may be replaced by an anode choke if preferred. The position of the resonance hump can be shifted by increasing the capacity C_1 . Values between .005 mfd. and .05 mfd. are suggested as useful trial values in conjunction with a choke of 150 henries or more.

The effect of variation in type of valve V_1 is negligible on the characteristic curve, though over-all amplification depends on suitable choice in V_1 . It is possible to purchase from at least two firms the impedance coupler in a complete and compact form.



This component embodies the necessary items for one stage of dual-impedance coupling—viz., two L.F. chokes and a coupling condenser.

VALVES for H.F.



Good high-frequency amplification is not hard to obtain provided care is taken in the choice and arrangement of the circuit and components. The modern H.F. valve is a hard worker, and if you give it half a chance will more than repay the time and trouble of adding that "pre-detector" stage. But because a valve is labelled "H.F." it does not mean it is useless elsewhere, as this article will show.

By G. W. EVANS.

OF all the various types of valves available to the home constructor, probably none is quite so useful as that generally labelled H.F. In the first place an H.F. valve, as its name suggests, is for use mainly in H.F. circuits, but at the same time its characteristics make it useful as a detector and for L.F. stages where high magnification is required and no great input is available.



A vertical type screened-grid H.F. valve capable of providing enormous amplification, provided suitable circuits are used.

For instance, in the case of a first stage L.F. resistance-capacity - coupled amplifier, an H.F. valve very often is ideal and will carry a bigger input without distortion than will the R.C. valve, which, in spite of its name, has a limited application even where R.C. circuits are concerned.

The H.F. valve has characteristics which usually include impedances of 15,000 to 30,000 ohms and magnification factors of somewhere about 15 to 30. Above the 30 the valves can

usually be placed among the resistance-capacity types, though in some cases they may still be named by the makers "H.F." Below a magnification of 15 the valves are usually labelled L.F. or general purpose, and are not so suitable for H.F. circuits.

Of Universal Use.

It is, therefore, of valves having impedances between 15,000 and 30,000 ohms (and incidentally of screened-grid valves) that I would speak, and give one or two hints as to the methods of obtaining the best results.

A medium H.F. valve (having an impedance of somewhere about 20,000 ohms) will be suitable for use in practically every H.F. circuit, except, of course, in circuits specially designed for screened-grid valves, though even here one can often adapt the circuit without much trouble so that it will be quite suitable for the average H.F. valve.

There is really little that need be said

about the ordinary 20,000-ohm type of valve, as it is so foolproof in its use that you can rest assured that any circuit requiring an H.F. valve having that value and characteristics, and in many cases where an R.C. valve might be used, the H.F. will do its work reliably and well.

It must not be forgotten, however, that the average H.F. valve usually requires neutralising by one or other of the methods which are generally found to be satisfactory, and, unlike the screened-grid valve, may cause trouble from oscillation, if this and a certain amount of screening are not carried out.

Different Characteristics.

The screened-grid valve is essentially an H.F. valve, though its characteristics are vastly different from those of the average valve. It cannot be used as a detector or L.F. in any satisfactory way. The S.G. valve requires a specially efficient type of circuit in order that it may operate to the best advantage, one of the essentials being a high impedance in the plate circuit, such as a tuned anode if capacity coupling be used, or specially designed H.F. transformers if transformer coupling is used.

Another plan which is very successful is

to choke couple the valve direct to the detector valve, no tuned circuit being used in the grid circuit of the detector, and by this means very simple tuning control over the receiver can be obtained, while the set is remarkably stable.

Not Interchangeable.

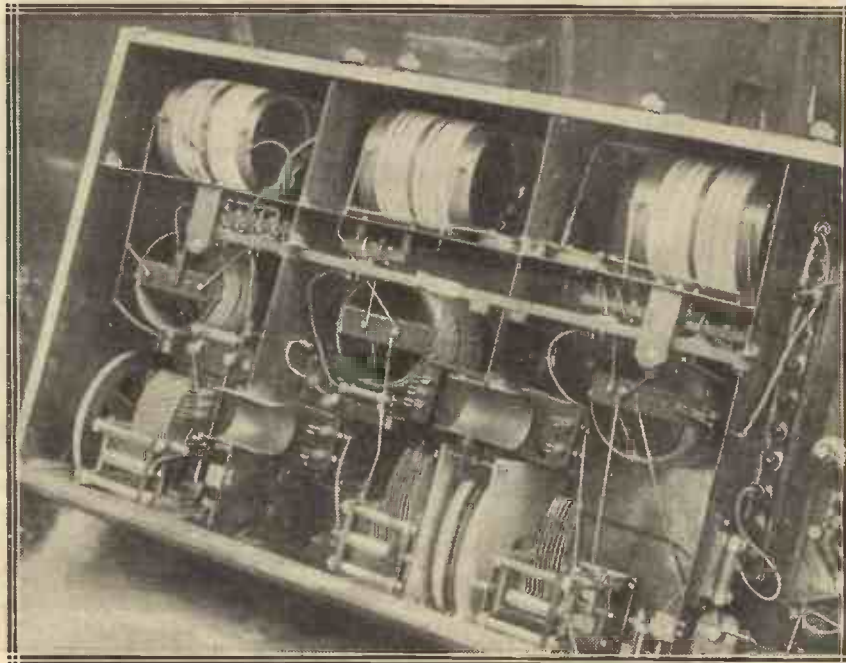
The one drawback, as in most of the screened-grid circuits, is that the selectivity is not so great as that associated with the ordinary type of H.F. valve. For short-wave H.F. amplification, of course, the screened-grid valve is ideal.

It must be remembered, however, that the screened-grid valve is useless in any other position than the H.F. position, while the ordinary H.F. valve can be used in other positions besides the true H.F. stage.

For instance, it makes an excellent grid leak and anode bend detector, where in the former case it can be transformer or resistance-coupled to the next stage, and in the latter case it should be resistance coupled.

For anode-bend detection, perhaps the valve having 30,000 ohms impedance and a mag. of somewhere about 30 is the most popular, while with a grid leak a 20,000-ohm valve is extremely good. The main thing is to pick a valve which has a sharp bend in its curve if it is to be used

(Continued on next page.)



The H.F. end of a screened-grid valve (horizontal type) receiver. The holders for the valves are seen in the foreground.

VALVES FOR H.F.

(Continued from previous page.)

for anode bend purposes, or an average good H.F. if it is to be used as a detector. There are, of course, special detector valves on the market, but these we are not concerned with at the moment.

As an L.F. valve the H.F. valve makes a very good showing, especially as remarked before, in the first stage of a resistance-coupled amplifier. It should be remembered, however, that whereas the H.F. valve is interchangeable with detectors and, in some cases, with L.F. valves, these latter are not necessarily interchangeable as substitutes for H.F. valves.

In the majority of circuits, the result of a low-impedance valve in an H.F. stage is completely to spoil reception, for signal strength will drop off so much that the receiver will be practically useless, or at any rate the H.F. stage will not be worth having.

Keep to Specification.

It is best, therefore, to use an H.F. valve having an impedance of from 17,000 to 30,000 ohms and a magnification factor as near 30 as you can get, for this will give the highest magnification unless, of course, you are specially advised to use an R.C. valve (in the event of using the tuned anode coupling). Here, again, it is a matter of opinion as to whether the R.C. or the H.F. valve is the better, and the writer prefers the H.F. even when the set is tuned anode coupled, for he is of the opinion that better all-round results are gained by this means than by using the valve with higher magnification and higher impedance factors.

Furthermore, do not forget that it pays to

neutralise very carefully, as there is very little that comes up to the sheer joy of tuning a well-neutralised receiver, also if you are advised to use certain types of H.F. coils use them, as the coils have an extremely marked influence on the general operation of the set, an influence which is so far greater than many people imagine that it hardly ever pays to use a substitute for any particular coil specified by the designer of the set in question.

New S.G. Valves.

And especially is the coil design important where screened-grid valve circuits are concerned. Follow the designer's instructions to the letter, and choose good valves and results will more than come up to your expectations.

Recently further advances in the design of the screened-grid valve have been made, and it is now possible to obtain this type of valve with the indirectly-heated cathode, for use on A.C.

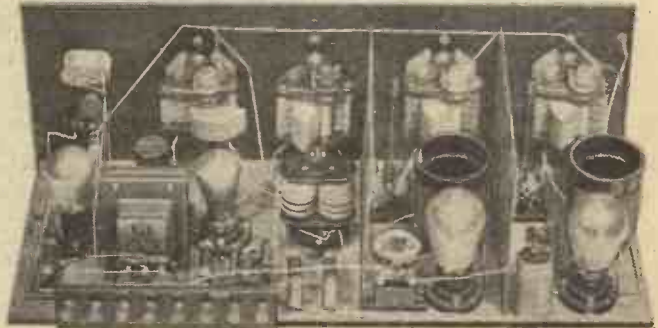
The valve in this case is of the short-path construction favoured by Metro-Vick Supplies, Ltd., and has an impedance of somewhere round 800,000 ohms and a magnification factor of about 1,200. Unfortunately with a magnification of this description very careful screening has to be carried out, while it is not easy to design tuned circuits that have low enough losses to enable one to take advantage of the tremendous magnification powers to anything like the full extent. For a high impedance means very

high efficiency in the anode circuit if a large percentage of the magnification power is to be utilised.

The average home constructor has, however, the choice of a screened-grid or the ordinary H.F. valve and has the means at his disposal of making his set really efficient on the H.F. side.

A good example of modern H.F. design is to be found in the "Titan" Three, a description of which was published in "P.W." of February 2nd, and which employs the S.G. valve *choke coupled* to the detector, only one tuned circuit being used in the whole set.

Wonderful selectivity and ease of control are obtained by this means, for a specially



Two neutralised stages of H.F. amplification with six-pin coils are employed in this four-valver.

designed grid circuit gives the selectivity in spite of the tendency to broadness of tuning that would be expected by the use of the only one tuning condenser and the S.G. valve.

Many constructors are afraid, or at any rate doubtful, of adding H.F. to their receivers, but the troubles that used to be associated with H.F. amplification no longer need be encountered. Neutralising and the screened-grid valve have laid the bogey of instability, while improved circuits and ganged control have got rid of the trouble of tricky tuning.

It is no longer necessary to spend five or ten minutes to find even a distant and weak station, for modern H.F. valves and modern H.F. tuning circuits have made DX really simple and completely worth while.

PRACTICAL POINTERS.

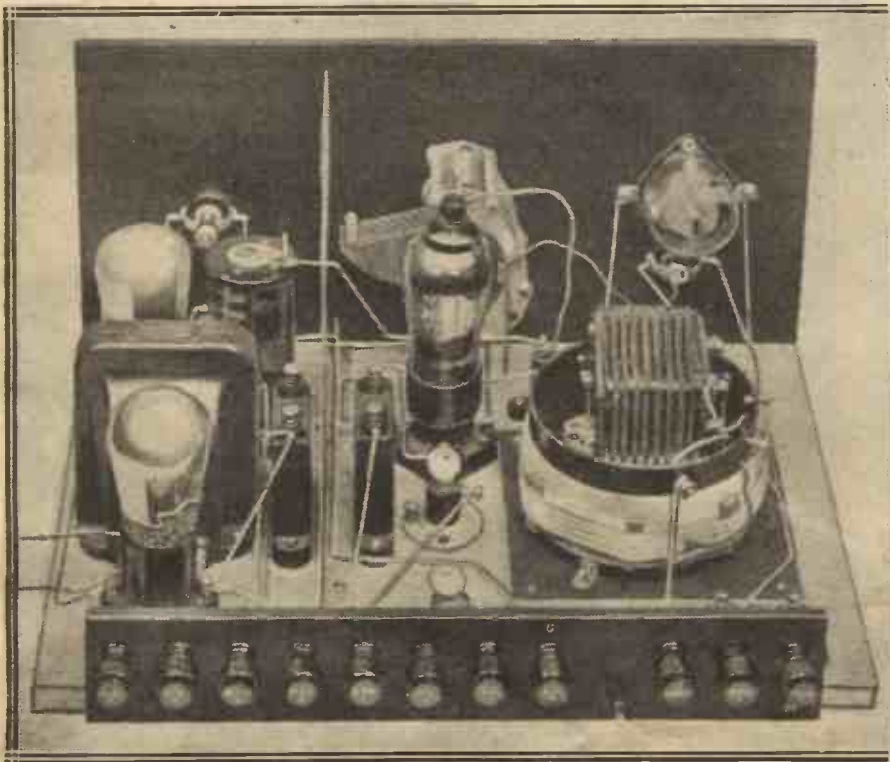
An old shaving brush kept on hand when drilling, filing, etc., is done, will be found almost invaluable for "clearing up" as one goes along.

Never file terminals on a panel on which variable condensers are mounted unless great care is taken to prevent dust from getting on to the vanes of the variable condensers.

When wiring up a multi-valve set, it is a good plan to check valve holders, etc., for continuity before mounting them in place, as the little time lost is more than justified when it is remembered how long such a small fault may take to remedy in a completely-built set.

As soon as a joint has been soldered, and whilst it is still hot it should be wiped over with a clean duster and all superfluous flux removed?

The best time to learn how to control oscillation is to choose a period outside broadcasting hours when the ether is quiet.



The now famous "Titan" Three, described in "P.W." of February 2nd, employs a special circuit for the screened-grid valve, which enables its selectivity and sensitivity to be obtained with a minimum of tuning. Only one tuning control is needed on this set.



Like a bugle call in the dead of night

AS the challenging call of the bugle pierces the stillness upon the background in which it is amplified by a Lissen Transformer; there is silence before each note, dead silence after. And this background of silence enables your loud-speaker to reveal new beauties in the music—a more mellow tone in the deep bass notes, an unfaltering truth and clearness in the high notes. That is why everybody agrees that a Lissen Transformer in ANY circuit inevitably improves reproduction. Put Lissen Transformers in each stage of your next amplifier—you can use them in every circuit, no matter what else is specified.



The Lissen Super Transformer

This Super LISSEN Transformer is made in two ratios, $3\frac{1}{2}$ to 1 and also $2\frac{1}{2}$ to 1. The $3\frac{1}{2}$ to 1 is suitable for use in either the first or the second stage of an L.F. amplifier, or can be used in cascade for both stages, and with practically any valve. The $2\frac{1}{2}$ to 1 transformer is suitable for use after a high-impedance rectifier valve without fear of distortion or loss of high notes and overtones. The price is the same for both ratios **19/-**

The Famous 8/6 Lissen Transformer

This famous 8/6 Lissen Transformer has won for itself the reputation of "the transformer that will never break down." Suitable for all ordinary purposes. Turns ratio 3 to 1. Resistance ratio 4 to 1. **8/6**

Obtainable of all Radio Dealers.

Lissen Limited

8-16, Friars Lane, Richmond, Surrey.

(Managing Director: Thos. N. Cole)

FROM THE TECHNICAL EDITOR'S NOTE BOOK



A MOVING-COIL LOUD SPEAKER.

ALTHOUGH it is an indisputable fact that there are now quite a number of very excellent cone loud speakers available, and that some of these approach very closely to moving-coil speakers in regard to performance, the moving-coil still holds its own.

It seems impossible to get the "depth" with any other type. I do not mean that moving-coil speakers are deep-pitched or that they can handle the bass better (which, generally speaking, they can), but that their reproduction holds more natural continuance or reverberation although their "entry" remains just as sharp.

The ordinary very-good cone can reproduce speech and music very brightly, but it seems to get its notes off from the surface of its diaphragm. You find that the sounds are very much localised.

But with a good moving-coil speaker you have the illusion of broader projection, the sounds seem to emanate from a studio or concert room with the speaker acting as a fairly widely open door.

And so with the Brown "Cubist," which I have just tested, the reproduction has "depth." There is, also, plenty of brightness, and this is no doubt due to the employment of a large metal flare which is a feature of the instrument. This speaker is of the permanent magnet variety and incorporates a transformer so that it is all ready for attaching to any set.

It is sensitive for its class, and it has ample bass. It is built into a fine cabinet and is of handsome appearance.

Another distinctive feature is that it employs a moving-coil of hexagonal shape



This is the Brown "Cubist" Moving-coil Loud Speaker.

and on it are concentrated the poles of six strong magnets.

Altogether, it is an excellent proposition and those "P.W." readers aspiring to this ambitious class of accessory should bear it in mind when the time comes to choose one particular make from the several available.

J. B. DRUM DRIVE.

Drum drive is becoming more and more popular in this country, and there are very few commercial sets produced these days with circular dial controls. And there is good reason for it in that drum drive gives a neat appearance as well as making it easy to obtain very close tuning adjustments.



The J. B. Drum Drive is "an excellent piece of precision engineering."

Bros. costs 10s. 6d., without condensers, but complete with an attractive panel plate and dial. It is an excellent piece of precision engineering and is of both novel and sound design. By placing the control knob immediately below the scale, DX work is facilitated and, moreover, made, if possible, even more pleasurable.

FRELAT VALVES.

We recently received a set of 2-volt valves made by Messrs. Frelat, of Amsterdam. These are, of course, sold in this country and are readily obtainable. The type 207R.H. is a resistance-coupling valve taking .07 amp. The general-purpose type 207G. has the same consumption. These two valves retail at 6s. 6d. each. The type 210N.P. is a power valve which consumes .1 amp. filament current and the retail price of this valve is also 6s. 6d.

It will be noticed that the type figures indicate the filament characteristics of the valves and the letters their purposes. We have carefully tested these three valves and find they operate well. If we prefer one

above the others it is the general-purpose type, which makes an excellent detector preceding transformer coupling. In a straightforward three-valve set good results were given, using the Frelats throughout. Undoubtedly the Dutch are well versed in the art of valve-making!

TANNOY MAINS UNITS.

We have had submitted to us a sample of the well-known Tannoy low-tension trickle-charger. This is designed for charging 2-, 4-, or 6-volt accumulators at a charging current of approximately $\frac{1}{2}$ ampere.

Traders and manufacturers are invited to submit radio sets, components and accessories to the "P.W." Technical Department for test. All tests are carried out with strict impartiality, under the personal supervision of the Technical Editor, and readers are asked to note that this weekly feature is intended as a reliable and unbiased guide as to what to buy and what to avoid.

It incorporates a Westinghouse metal rectifier and small step-down transformer, the model sent to us being also equipped with an ammeter reading up to 1 amp. This has a central zero, and shows the current both on charge and discharge of the battery.

We have tested this trickle-charger very considerably during some two or three months past, and have found it to be an excellent device entirely free from trouble of any kind.

We also received from Messrs. Tulsemere Manufacturing Company a sample of their H.T. eliminator. This device, which is very small and compact compared with most H.T. eliminators, incorporates a series of small electrolytic rectifiers, and provides a number of output D.C. voltages by means of taps. On test we have found the device to work very well, provided, of course, the load thrown upon the output side does not exceed that specified by the makers. The electrolytic rectifiers require an amount of attention which is so small as to be almost entirely negligible.

For those who do not require a very heavy H.T. output, this Tannoy H.T. eliminator should prove an excellent investment in view of its performance and comparatively low cost.



Interior view of the Brown "Cubist" showing the transformer which is incorporated.

TUNE WITHOUT LOSS

The new Lissen Variable Condenser enables you to enjoy a new standard of tuning—a new sense of smooth control—a new ease in separating stations close together—*simply because there is no condenser loss, and incoming signals are retained at full strength.*

See the unshakeable rigidity of its construction; see the long bearing, and the extended spindle for ganging purposes. Notice that there is no end pressure, no tendency to distortion of the vanes. The fixed vane terminal is in a new and convenient position well away from the end plates. There are feet for baseboard mounting, or standard one-hole-fixing for panel mounting.

LISSEN LOW-LOSS VARIABLE CONDENSER

·0001 mfd. capacity	5/9
·0002 " " " " " " " "	6/-
·0003 " " " " " " " "	6/-
·00035 " " " " " " " "	6/3
·0005 " " " " " " " "	6/6



**LISSEN
REACTION
CONDENSER**
Embodies many of the exclusive features of the big Lissen Condenser, including no end pressure on any end plate to distort frame or vanes.

"A" Type 4/-
"B" TYPE, with insulated bushes for mounting on panel. Price 4/6



**EXTRA
QUALITY
WITHOUT
EXTRA COST**

**"TENACIOUS
COATING"**

**THESE FOUR POINTS
ARE WORTH HAVING
AT NO EXTRA COST**

1. Altogether purer tone.
2. A more abundant volume with no distortion.
3. "Background noises" will have ceased.
4. Foreign stations will be more easily tuned in.

**Osram
valves**
with the
"TENACIOUS COATING"

MADE IN ENGLAND.
Sold by all Wireless Dealers

OSRAM VALVES are the valves with "Tenacious Coating," the secret of purity and maximum power throughout an abnormally long life.

Advt. of The General Electric Co. Ltd., Magnet House, Kingsway, London, W.C. 2

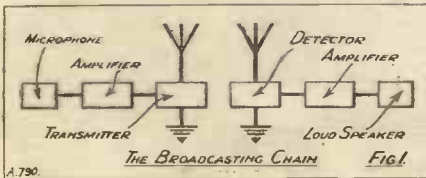
EVERYBODY seems to be keen on bass nowadays; I refer in particular to the lower musical register and not to the beverage! Radio reproduction could never be said to have been realistic until the introduction of the super-cone and moving-coil loud speakers, the first instruments which adequately reproduced the bass frequencies.

The importance of these lower frequencies may be gauged by the fact that about seventy-five per cent of the "horse power" of an orchestra is dissipated on fundamental notes and harmonics of the order of 50 to 250 cycles per second. The frequencies above 250 are important, too, but their function is largely to give the lower notes the "character" which enables us to differentiate between instruments.

Our Ears.

If an amplifier is arranged so that it will not pass any notes above 250 cycles, all the voices reproduced will sound alike. If the amplifier is altered to reproduce notes above 250 cycles only, the voices reproduced on the loud speaker will still be unnatural, but may be recognisable. In short, the body's in the bass and the character's in the treble!

You may ask: "Why is it that so much more 'horse power' is expended on the low notes?" Well, an orchestra is designed to give a fairly even sound, from extreme bass to top notes, and the human ear is very much less sensitive to the extreme low frequencies. Consequently, much more power has to be put into the lower notes in order to make them heard at all.



If our ears were equally sensitive to all notes from 50 to 10,000 cycles, the lightest traffic noises would sound like a colossal bombardment and the squeak of a bat would be as loud as a cornet! Ear sensitivity differs greatly, some people being able to hear notes as low as 16 cycles per second, while others cannot hear below 75 or even 100 cycles. Animals are sensitive to notes that we cannot hear. Parrots, for instance, can hear extreme low notes very well, and dogs are able to hear frequencies well above 10,000 cycles.

Power and Quality.

The correct transmission of the bass notes has been a difficult problem for broadcasting engineers. The links in the broadcasting chain are, roughly speaking, six in number. The three links at the broadcasting station are the microphone, the amplifiers and the transmitter.

At the receiving end, there are the detector, the amplifier and the loud-speaker links.



By BAYNHAM HONRI.

If equal air pressures are applied to the microphone, and the electrical impulses are correctly passed on by the amplifiers, transmitter, and so on, to the receiving loud speaker, corresponding air pressures should be "generated" by the diaphragm of the loud speaker.

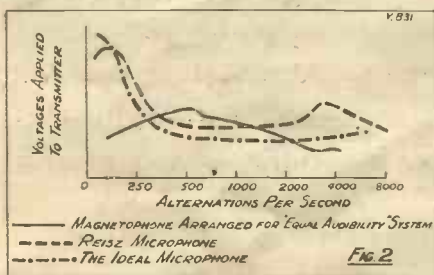
But, as I pointed out in my first paragraph, seventy-five per cent of the power of sound is in the low frequencies, particularly in the extremely low frequencies. Much higher voltages will be set up in the microphone circuits by the low notes than the high notes, and the broadcasting engineer finds that he has to have a much bigger transmitter simply in order to accommodate the low notes.

A 3-kilowatt broadcasting station with good bass notes will only just make as much noise in the ether as a 1-kilowatt station without bass.

The Equal Audibility System.

A much more economic system of broadcast transmission would be one in which the bass was almost suppressed and the high notes emphasised. At the receiving end, the high notes could be cut down to their correct level in relation to the bass, so that the reproduction was natural.

If the "corrector," which suppressed the high notes on the receiving set, were placed



between the amplifier and the loud speaker, quite ordinary valves would be capable of performing work now done by power valves. Such a system would only be possible, however, if the radio-set manufacturers and home constructors included correctors as specified by the broadcasting authority, and such sets would then give distortion on foreign stations which had not adopted the same system.

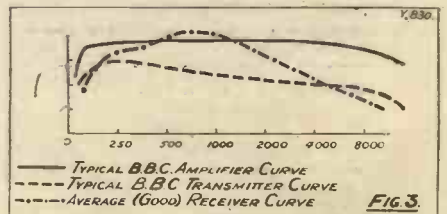
As a matter of fact, the B.B.C. did use this system in the early days. The microphones and amplifiers were so arranged that each note of a piano set up approximately the same voltages on the transmitter. It was known as the "Equal Audibility" system, because sounds of various frequencies which were of equal intensity to the human ear produced equal voltages in the microphone circuits.

B.B.C. Quality.

The lack of bass did not matter, for there were no receivers or loud speakers which were capable of dealing with the bass even if it were there! The B.B.C. used this arrangement up to 1925 in

London and to 1926 in most provincial stations. There were three very good reasons why the B.B.C. used this system:

- (1) The magnetophone microphone had a very boomy "near bass"—i.e. a resonance on about 120-150 cycles;
- (2) Modulation could be much higher without "blasting";



(3) A comparatively small transmitter could cover a larger area and be heard at greater distances.

In 1925, however, cone loud speakers and exponential horns made their appearance, and the desired bass in the transmissions was missing. Something had to be done about it, especially as the B.B.C. had achieved a reputation for fine quality transmissions.

The Ideal Pick-up.

In the first instance, the "correction" circuits used in connection with the magnetophones were altered. The microphone circuits were made fairly sensitive to the bass, but, at the same time, care was taken to suppress the annoying boomy resonance of the microphone. A much better alternative soon appeared, however, in the shape of a good quality carbon microphone, the Reisz.

The Reisz microphone had a rubber diaphragm stretched across the front of a

(Continued on next page.)

BASS FROM THE B.B.C.

(Continued from previous page.)

marble block. Behind the diaphragm a very fine carbon powder was packed, and at each side was a carbon electrode. An improved type of Reisz microphone had a mica diaphragm, and this type is still being used by the B.B.C. Correctors were now unnecessary, the characteristic of the new microphone being very close to the ideal "pick-up," which would give equal voltages for equal air pressures.

I have hardly mentioned the amplifiers and transmitter, the other links in the broadcasting chain. Hitherto, these links had been very good compared with the end ones, the microphone and the loud speaker. But with the great improvement in microphone and loud speaker, the slight distortions they introduced began to matter a great deal.

A Regional Improvement.

Curves were taken of various transmitters and amplifiers, and by divers methods, the same curves were flattened out. The least success was obtained with the transmitter, which slightly cut down the extreme high frequencies, owing to certain deficiencies in the "choke-control" system used.

The straight "choke-control" transmitter circuit has now been abandoned by the B.B.C., and a new system which has overcome the very slight defects of the old one will be used at the regional stations. I doubt if listeners will be able to note any improvement in the quality of transmissions; nevertheless, the improvement will be there, and it will put the B.B.C. further in the lead in the great race for quality.

THE PURITY OF SOLDER.

SOLDERS, as the amateur will most probably be aware, are made in different grades for different purposes. For instance, there are hard solders which are used for heavy plumbing work, medium-hard solders, soft solders, fusible alloys, and various other forms of metallic soldering alloys, all of which are manufactured for some definite purpose or other.

The solder used in wireless constructional work is almost always of the "soft" variety. That is to say, its melting point is not very high, being well below 400 deg. Centigrade.

Soft solder contains, or *should* contain, at any rate, a large proportion of tin. But tin is not a really cheap metal and, on this account, some of the so-called "soft" varieties of solder often contain very much less tin than they should do. Consequently, the use of these adulterated soft solders makes wireless soldering operations much more difficult.

An expert can tell at a glance if a sample of a soft solder for wireless constructional work is up to the standard or not. The genuine article has a peculiar bright bluish

appearance about it, its surface being quite unlike the dull, dead-looking aspect of a hard solder.

Probably, however, the best test for the amateur to apply to a stick of solder is to hold a thin strip of the material close to the ear, and to bend it gently. During this bending process a crackling noise should be heard. This crackling noise is a well-known characteristic of pure tin, and if the solder evinces the noise, also, the material may definitely be relied upon to contain a sufficient proportion of tin, which is vitally necessary to the convenience and success of radio soldering.

EARTHING THE AERIAL.

OBTAIN a double-pole change-over switch (the porcelain-base type can be purchased quite cheaply). Connect the aerial to one of the centre poles and the earth to the other. The right-hand pair of terminals may be connected to earth and aerial on your set, and the opposite poles may be short-circuited by joining them together with a short lead. When the set is not in use, throw the switch arms over to the short-circuited side.



The Marconi 12 kw. broadcasting transmitter at the London Station. There are six panels, and from left to right they are: Two rectifier panels, one independent drive panel (centre), one main oscillator panel, and two modulator panels.

REACTION COILS.

THERE is no fixed value for reaction with a given tuning coil, and the best size must be determined by experiment. If the reaction coil is too large, oscillation will commence with a loud click, and signals may be weak. On the other hand, if the reaction coil is too small it may not be possible to induce the circuit to oscillate even if the coils are placed very close together.

One very satisfactory way of determining the correct value of reaction is to wind a coil slightly larger than the tuning coil and reduce the size gradually by removing one or two turns at a time until oscillation commences gently with a slight breathing sound.

HINTS FOR THE HANDYMAN

One of the best arrangements for an indoor aerial is to have the separate wires as long as possible, well spaced from each other, and all connected at one end to the set.

Probably the best place in most houses for an indoor aerial is under the roof, but in some cases great care must be taken with the lead-in wire which comes to the set, as if this be placed too close to metal piping or similar object, much of the energy collected by the aerial will be lost on its journey to the set.

Probably the most important factor in long-distance reception is the proper control of reaction.

Too much reaction is worse than none at all, for it is impossible to hear long-distance or good-quality signals if your set is oscillating?

So great are the losses in high-frequency circuits, due to switching, that for a long time it was the practice to dispense with switching altogether in these circuits. Now that better switching methods have been devised it is becoming easy to switch out tuning coils, etc., that are not wanted, but the switching out of complete high-frequency stages is still taboo.

Where a high quality three or four valve set is employed a voltmeter is really essential.

Even with a small valve set a good voltmeter to check up the voltages of the batteries is a great convenience, as it enables them to be run economically, and indicates when renewal or recharge is necessary.

When mounting components upon a panel a good plan is to mount all the terminals first and to file their ends ready for soldering before any other components are mounted.

All the filing of terminals, tags, etc., should be carried out before any of the soldering is done, so that there is no risk of the specks falling upon flux or adhering to the panel.

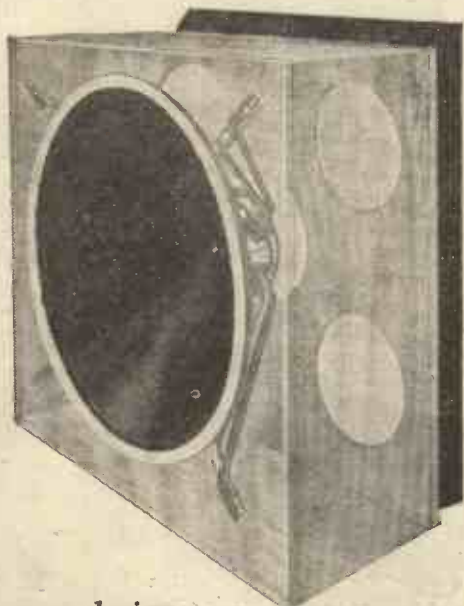
If the panel is held upright when terminals, etc., are filed, the filings will fall off on to the floor or bench, and thus trouble due to specks of brass, filings, etc., will be prevented.

YOU CAN BUY WHAT THE CRITICS CALL "the finest speaker" FOR A PRICE AS LOW AS £6

You buy performance when you buy an Amplion Chassis. You get no cabinet — but what you do get is the essential Amplion works, a full-size Amplion Lion Speaker ready for immediate connection with your set. You house the instrument according to your taste.

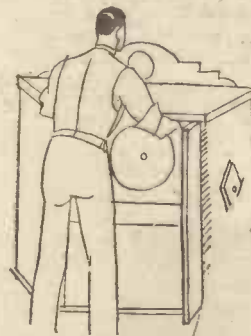
You can place it, for instance, in an existing piece of furniture. Or make a cabinet of your own design— or have one made for you exclusively. Or, for that matter, leave the chassis as it is—for looks are really nothing compared with the wonderful reproduction that the *New Amplion* assures. A plain Speaker—in both senses of the phrase—for the *New Amplion* 'Lion' reproduces with almost startling clarity, distinctness and fidelity, the original performance

★ ★ ★ ★
The Amplion 'Lion' Speaker in Cabinets of Oak or Mahogany, £9 10s. to £42. Amplion Standard and Junior Speakers, 35/- to £5.



The Amplion Standard Chassis (L. 14), 17½" x 17½" x 8½" (14 inch cone) £6

The Amplion Power Chassis (L. 18P), 21½" x 21½" x 10½" (18 inch cone) £8



The Critics say: "Astounding results," wrote Mr. Ernest Newman, the famous music critic, in the *Sunday Times*. "Vivid... natural," says Miss Carrie Tubb, the well-known singer. "Not a subtle tone in the voice is missed by the New Amplion Speaker." "It is a revelation in reproduction," writes Capt. Andrew Harris, Director of Music, Welsh Guards. "Your New Amplion reproduction of the Military Band is perfect... The tone colour of each group of instruments is clearly cut... In fact, the New Amplion gives me the real Military Band." "I, as a musician," says Mr. Sinclair Logan, the popular baritone, "have nothing but the most unqualified praise for the Amplion 'Lion' Speaker."

AMPLION LION CHASSIS

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MR. DICKENS DID NOT WRITE PLAYS!



CHARLES DICKENS was a specialist. He devoted his life to one thing—writing. Even in the use of words he specialised, and, as a result, he is universally acknowledged as the greatest novelist of all time. Like the creator of the immortal Pickwick, we are specialists. For nearly a quarter of a century we have made nothing but

condensers. And because we have never deviated from our task—never expended our energy in the making of other components—the name T.C.C. on a condenser is accepted throughout the world as the undisputed hall-mark of accuracy and dependability. Take no risks: use T.C.C. Condensers in your next Set.



Above: T.C.C. .0003 Mfd. Flat Type Mica Condenser, Price 1/10.
Left: T.C.C. 2,000 Mfds. Electrolytic Condenser. Price 15/-.

T.C.C. .0003 Mfd. Upright Mica Condenser. Price 1/10.

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SEND COUPON FOR FREE BOOK!

I enclose 1d. stamp for your free book which shows me how to build an L.T. or H.T. Eliminator.

Name

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P.W. 16/2/29.

POSITIVE AND NEGATIVE.

The Editor, POPULAR WIRELESS.

Dear Sir,—Regarding article "Positive and Negative" on page 1,007, may I give the following hint as an aid to memory?

In "long" and "negative" the letter "N" but not in "short" or "positive."

In "short and positive" the letter "S" but not in "long" or "negative."

With many thanks for all the help you have given me,
Yours faithfully,
J. W. ANDERSON.

Banchory, N.B.

"EVERYBODY'S" THREE.

The Editor, POPULAR WIRELESS.

Dear Sir,—Your correspondent whose letter you published in January 19th issue regarding "Everybody's" Three evidently appreciates a good thing when he meets it. The set is all you claim for it—and then some. The results, using two cheap but very reliable transformers—to the initiated the price, 17s. the two, will be a sufficient indication—are surprising for clarity and freedom from distortion, even on the verge of oscillation.

May I suggest that a variable anode resistance—50,000 to 250,000 ohms—would possibly form a useful exchange for the fixed resistance suggested in your article, and provide for the varying sensitivity of detection valves in regard to oscillation. A governing rheostat to tone down the "fresh" accumulator would be useful also; and finally a three-point switch similar to the wave-change switch on the L.T. side would allow of complete disconnection of H.T. battery when set is switched off.

The "P.W." Research Department have done it again, and if we poor "experimenters" and "constructors" do not always write to express our appreciation it is because we are too busy trying to keep pace with the good things which are placed before us.

Congratulations from one who has taken "P.W." from the start of its most entertaining and instructive career.

Sincerely yours,
H. V. FIELD.

Hornchurch.

OUR FREE BOOK.

The Editor, POPULAR WIRELESS.

Dear Sir,—Many congratulations on the Free Gift. If you want to pull the Technical Department's leg, tell them that it hurts to see that they have omitted "Kilohertz" from the Dictionary.

What will Ecko say?
Yours faithfully,
W. E. GIBSON.

Harrow.

THE "BIRTHDAY" FOUR.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have had the pleasure of making up on about a dozen occasions, for myself and friends, that very excellent portable receiver, the "Birth-

CORRESPONDENCE.

POSITIVE AND NEGATIVE.

"EVERYBODY'S" THREE—OUR FREE BOOK—THE "BIRTHDAY" FOUR, etc.

Letters from readers discussing interesting and topical wireless events or recording unusual experiences, are always welcomed; but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents and we cannot accept any responsibility for information given.—EDITOR.

day" Four, which your splendid journal gave us last summer.

I found in each case the circuit gave results far in advance of the claims you made for it. I myself am using one at the moment, and find no difficulty in tuning in almost any evening half a dozen or so foreigners at good strength, using it as a portable, of course.

As a general-purpose set using a fair aerial and earth I don't know of any set to beat it on all-round work, and find it a comparatively easy matter to get a couple of stations or so over the water. Usually WY G and K D K A. I had already installed in each set that little anti-motor-boating device you discussed in last week's issue of the journal; I mean the resistance and condenser in the detector lead, with the loose end connected to L.T.—

I certainly had had a little trouble when the H.T. was running down, and possibly other readers have also had a little difficulty in the same direction; but the above is a certain cure in the case of the "Birthday" Four.

Please allow me to thank you for the many excellent circuits POPULAR WIRELESS has given us. I hook up nearly every one, and I still have my old Slider set you gave in No. 1. If might interest you to know that I have only one arm, but manage to do all my own cabinet and constructional work and generally wind my own coils.

Again thanking you,
Yours faithfully,
C. R.

S.W.9.

SHOULD EXECUTIONS BE BROADCAST?

The Editor, POPULAR WIRELESS:

Dear Sir,—I read Lt.-Com. Kenworthy's article in to-day's "P.W.", "Should Executions be Broad-

cast?" with astonishment, and wonder to what extent "P.W.'s" readers are having their legs pulled, or if the Hon. Commander is really as serious as his article leads us to believe.

The idea of such a broadcast, apart from being ghastly, gruesome, and awe-inspiring, would surely be degrading to the minds, and an insult to the intelligence, of a people already overfed on sensationalism.

If listeners have a right to hear executions broadcast, they have an equal right to hear sordid divorce cases, and it is not possible, according to the Hon. J. M. K.'s theory, that every listener would at once be in favour of the abolishment of not only divorce but marriage as well, neither of which I should like to see abolished.

Of course, if the hon. gentleman is certain that listeners do want sensationalism, go right ahead, let us have broadcasts of operations from hospitals, street brawls in Limehouse, debates on Birth Control, etc.

Yours faithfully,
C. J. BANNISTER.

Hants.

THE "SYDNEY" TWO.

The Editor, POPULAR WIRELESS.

Dear Sir,—As I am writing (or trying to) this letter, the loud speaker is pouring forth some music from Munich, one of the twenty stations I receive on my 0-7-2.

The set is the modified "Sydney" Two with an extra valve. "P.W." certainly can supply the "goods" in the way of short-wave sets. Since Christmas I have logged W 8 X K, 3 X L on the loud speaker, Nairobi, 7 L O, fairly good 'phone strength at times, P C J on the L S, 2 X A F (this station comes over so loud on Saturday nights that we have a job to "keep the paper on the walls," and the tone is simply wonderful, even though the loud speaker is only of the "horn" type), 2 X A L comes over fairly well at times on the loud speaker. I have had Sydney (2 F C) at good loud speaker strength, but it fades badly. On the 'phones I have logged the following: W B Z, 70-2, 2 X B A, 65-18, Motala (Sweden), 41-45, 2 X A G, 26-9, 2 X E, 22-1, A N H (Java) 17 metres. Well, not a bad effort for three valves! It is really wonderful the way I get the transatlantic telephone transmission. I get some of the talks at full loud-speaker strength.

On the 200 to 500 wave-band I get on a good night about 20 stations, loud speaker, but on the long waves three is the most. Why, I do not know. Perhaps it is my aerial, which is 25 feet long, 30 feet high, with a long lead-in.

Just before writing this letter I was listening to 3 L O (Melbourne), but conditions were so bad that I just got scraps of him; still, I got some news that may be of interest to "P.W." readers, the wavelength of 3 L O is changing to 43 metres from next month onwards.

Wishing "P.W." all success, and more power to your elbow,
Newcastle-on-Tyne. E. M. HETHERINGTON.

5 S W S shift from 24 metres to 25.3 metres does not seem particularly popular, judging by the opinions that I have received recently. Two or three readers from this country have written to tell me that he is not received so well as before, while I have received a report by radio from South Africa that 5 SW is nothing like his normal self since the shift. Perhaps the B.B.C. engineers have not yet got the aerial system into proper working order for the new wave-length.

I am able to include with this week's notes a very complete list of new nationality prefixes. As far as I know, the only countries that do not appear in the list are Chile, Argentina, Greece, Turkey, Mexico and China. In each case I know of three or four alternatives for the country in question, but it is useless to give them until we know which the country will adopt. I should be glad to hear from readers who know of any prefixes in official use other than those in the list.

This week I was sorely puzzled for an hour or so by the apparent hopeless inefficiency of a receiver that has been a trusted friend for quite a long time. I had restored it to the place of honour after an absence of some months, and, though results left nothing to be desired on the 40-metre band, signals on 20 metres were abnormally weak and made me think that something was seriously wrong. After much aimless looking round for a likely cause, I discovered that signals

SHORT-WAVE NOTES.

By W. L. S.

did not change in the slightest degree if I removed the aerial altogether.

Naturally, I went for the aerial coil, expecting to find a break in the winding, but it was quite blameless. Eventually, by substituting another with one turn fewer, the receiver was restored to its old lusty performance. The cause of the trouble was apparently that this particular aerial coil, although it was perfectly suited to the 23-metre wave in use some months back, was, in conjunction with my aerial, quite hopeless for 20-metre work. Either by the substitution of a smaller coil or by capacity-coupling the aerial the set was made perfectly healthy again.

I have also come across the case of a faulty valve in the L.F. stage causing the most puzzling noises, which one would ordinarily put down to a dud grid-leak or something of the kind. An incessant rattle reminiscent of an undercurrent of strong "keyclicks" from a nearby station was inseparable from this particular specimen. Substitution, of course, both found the trouble and cured it.

New Nationality Prefixes.

CR Azores	ON Belgium
CM Cuba	OZ Denmark
CT Portugal	PA Holland
CN Morocco	PK Dutch East Indies
CV Roumania	PY Brazil
CP Bolivia	RA U.S.S.R.
CW Uruguay	RV Persia
CZ Monaco	RX Panama
D Germany	RY Lithuania
EA Spain	SM Sweden
EI Irish Free State	SP Poland
EL Liberia	SU Egypt
ES Esthonia	TF Iceland
ET Ethiopia	TS Saare
F France and Colonies	UL Luxemburg
G Great Britain	UN Jugoslavia
HA Hungary	UO Austria
HB Switzerland	VE Canada
HC Ecuador	VK Australia
HH Hayti	VO Newfoundland
HR Honduras	VP-VS Colonies
HS Siam	VU India
I Italy and Colonies	W U.S.A.
J Japan	YI Iraq
KI Philippines	YL Latvia
K4 Porto Rico	YM Danzig
K6 Hawaii	YN Nicaragua
K7 Alaska	YS Salvador
LA Norway	YV Venezuela
LZ Bulgaria	ZA Albania
OH Finland	ZL New Zealand
OK Czecho-Slovakia	ZP Paraguay
	ZS South Africa

THE "Titan" Three has now been presented to our readers in the confident belief that they will find it very near indeed to their ideal of a really powerful and sensitive set with a minimum number of valves. Next we come to the needs of the constructor who does not want to go so far as to use a screened-grid valve, but who naturally would like to obtain as many of the benefits of the "Titan" design as he can.

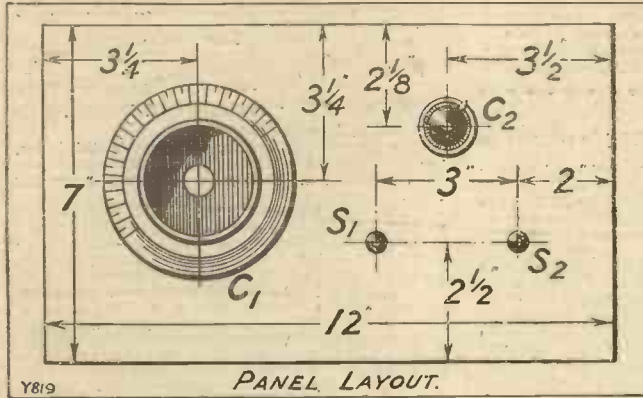
To meet his needs we have therefore produced the "Titan" Two, which again is

unit), gives you long or ordinary waves at the touch of a switch, has a perfectly simple but highly effective independent adjustment of selectivity on both wavebands, and is very easy to work.

Nothing Critical!

Better still, it is absolutely free from any critical features, and you can use up practically any components you may have in stock, provided they are of reasonably good quality. The only essential part is the "Titan" coil, and all the rest may be any odd materials you have at hand.

Consequently, this design is an ideal one for the man who has a small or medium sized set and feels that he would like to make up something more modern, yet keeping as many of his old components as possible. He can build the "Titan" Two in the comfortable assurance that it is right up to date, and is sure to stay so for some considerable time to come, while if he wants to



something of a super set in its class. It is only a "Det. and L.F." combination, yet its high-efficiency tuning and reaction circuits give it powers of long-distance reception which almost suggest the work of an H.F. stage. Its special feature, of course, is the use of one of the new "Titan" wave-change coil units, and it is to the high efficiency of this that it owes most of its sensitivity and selectivity.

With the aid of this unit you have a set which is exceptionally easy to build (a lot of the wiring is ready done for you in the coil

make it ultra-modern he can use a Pentode valve in the L.F. stage, whereupon it becomes equal in power and sensitivity to practically any three-valve of the "Det. and two L.F." type. (Probably the only three of this type which could then beat it would be "Everybody's" Threc.)

A Flexible Circuit.

The circuit is the improved form of the Reinartz, with slight differences in detail in the long- and medium-wave arrangements to produce the most efficient system of switching. On the medium waves there is a separate "aperiodic" aerial winding, which has tappings to enable different degrees of selectivity to be obtained and different aerials to be suited. On the long-wave adjustment a portion of the loading coil is tapped off to form an extra aerial coupling and reaction winding.

This is all done by the special new "Titan" coil unit, which also, of course, provides the necessary tuned secondary and separate reaction winding for the ordinary wave-lengths. If you find any difficulty in following all this on the circuit diagram, don't worry, just mount up the coil unit in the set and adjust the tappings according to the operating notes given later, and you will get the results all right.

The unit is perfectly simple to build into the set, because it is fitted with marked terminals, and all you



have to do is to wire it up according to the wiring diagram, without worrying about what all the various windings do. It makes it more interesting if you can follow out from the circuit diagram just how the unit works, but you can still make perfectly effective use of it without doing anything of the sort.

The L.F. stage is just the usual transformer coupled affair, and there is nothing out of the way here, so we can go straight on to "how-to-make-it" matters. Now, this is a specially easy set to build, just as was the "Titan Three," partly as a natural result of pains spent on its design, but chiefly because we have used once more the special new combined-wave coil unit which simplifies both assembly and wiring so greatly.

With this new "Titan" unit all you have to do is screw down the one part, instead of a number of coils, as in earlier schemes, and the whole wiring of the tuning and reaction circuits is just a matter of connecting up the various terminals on the unit to the appropriate points on the other components.

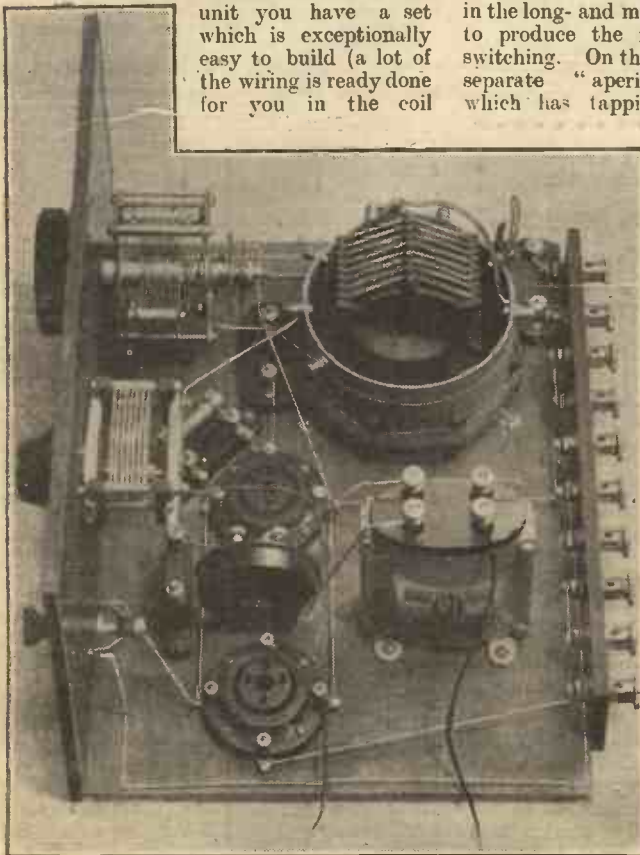
The "Titan" Two is yet another outstanding product of the "P.W." Research Dept. It is intended to bring the advantages of the new coil unit within the reach of the constructor who only wants a small set, and gives really super results.

This may not seem such a very great point on paper, but you will find that it really is a considerable saving of time and trouble when it actually comes to building the set.

How It Works.

The L.F. part of the receiver is perfectly standard, of course, but a few minutes spent going over the detector portion will probably be helpful in giving the intending constructor an idea of how it all works. Also, it will enable him to see just what the new coil unit does.

Well, the circuit is, roughly speaking, a Reinartz, with a slight difference between the long and ordinary wave arrangements. The change from one to the other is made



A neat and carefully planned lay out helps to make the set unusually easy to wire up. Note the number of short, direct leads.



automatically, of course, in switching over from one wave-band to the other, so there is no need to worry oneself over this detail unduly.

The main 4-in. diameter former of the "Titan" coil unit carries the three windings necessary to form the circuit on the ordinary wave-lengths, and these are arranged as follows. First, there is a plain single-layer winding of No. 24 D.C.C. (40 turns) which forms the tuned secondary, then over this at the bottom end is a tapped aerial (primary) winding of the same wire, of 16 turns with tappings at 5, 8 and 12 turns.

A flex lead from the "A" (aerial) terminal on the coil unit carries a tapping clip (or plug in some makes) upon its end, and so you are able to use varying amounts (or the whole) of the primary winding at will. This, of course, is the selectivity adjustment for the ordinary broadcast wave-length, and requires setting to suit your own conditions (a very simple matter). The primary, by the way, is supported over the secondary in the usual way with a series of small wooden or ebonite spacing pieces (about 10 in number).

The new combined-wave coil unit makes the "Titan" Two another specially "easy-to-make" set, and gives it very special merits of selectivity, sensitivity and adaptability to varying conditions. It is not expensive to make, either.

Against the lower edge of the secondary, and with a small space between (not critical; about $\frac{1}{8}$ or $\frac{1}{4}$ in.), is the reaction winding. This consists of 20 turns in the same direction as the secondary, and is wound with a fairly fine gauge of wire, such as No. 32 D.S.C., and serves for the lower wave-band.

The Loading Scheme.

On pushing in the wave-change switch, the standard loading coil on the unit comes into circuit (it was previously "shorted" out), and this has the effect of loading up the secondary circuit to the 5 X X band of wave-lengths. Also, by virtue of the tapping lead on the loading coil you now have the effect of an extra primary-coupling winding

in the aerial circuit, which further acts as an extra reaction winding to complete the arrangements necessary for successful operation on the long waves.

This, then, is the slight difference between the long and ordinary wave circuits: On the lower band there are separate aerial and reaction windings, but on long waves a combined extra primary and reaction winding is brought into action. Notice, too, that on long waves the ordinary wave coils remain in circuit, the extra loading windings being brought in in series with them. This has much to do with the high efficiency obtained, since so long as windings are kept in circuit, losses will not occur if they are properly arranged.

On the lower wave-band, on the other hand, the extra windings are completely short-circuited, and since, they are carefully placed at right angles to the low-wave ones, and also lifted above them, they do not produce losses which can be detected by even quite delicate tests. Hence, the efficiency of the unit is high on both wave-bands, which is distinctly unusual in combined-wave coils.

Long-Wave Adjustments.

On long waves, by the way, there is again an adjustment of aerial coupling to give different degrees of selectivity, suit different sizes of aerial, and so on. This is done by means of another flex lead which can be attached to any one of the tapping terminals on the loading coil. These are marked 25, 60, and 80, and one of the last two will usually be correct for this set.

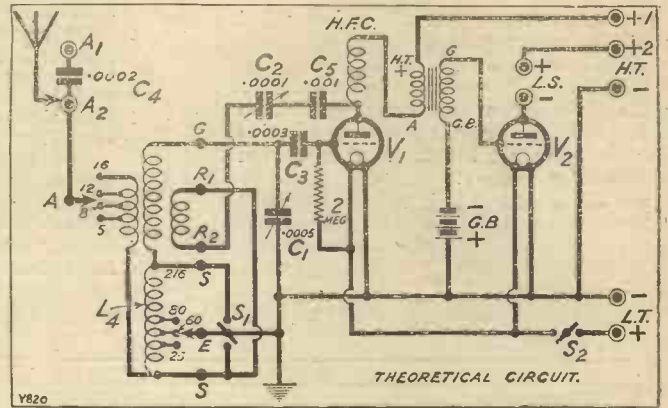
On the constructional side there is only one point which we need mention, since the set, as a whole, is so extremely simple to make. The type of wave-change switch required is the standard 3-point on-off variety used in practically all "P.W." wave-change sets. This can be an L.T. on-off switch of certain makes having the necessary features, which are these: Two separate side-spring contacts and a central metal plunger to which a third (flex) lead can be attached.

This third lead can be attached in a variety of ways, according to the particular make of switch. In some, for example, it must be soldered to the tip of the plunger; in others, the tip can be unscrewed a little and then tightened up again to grip the bared end of the flex. Again, in the "Magnum" form you will

find a small screw and washer provided on the end of the plunger, which is intended to take this extra lead.

The Wave-Change Switch.

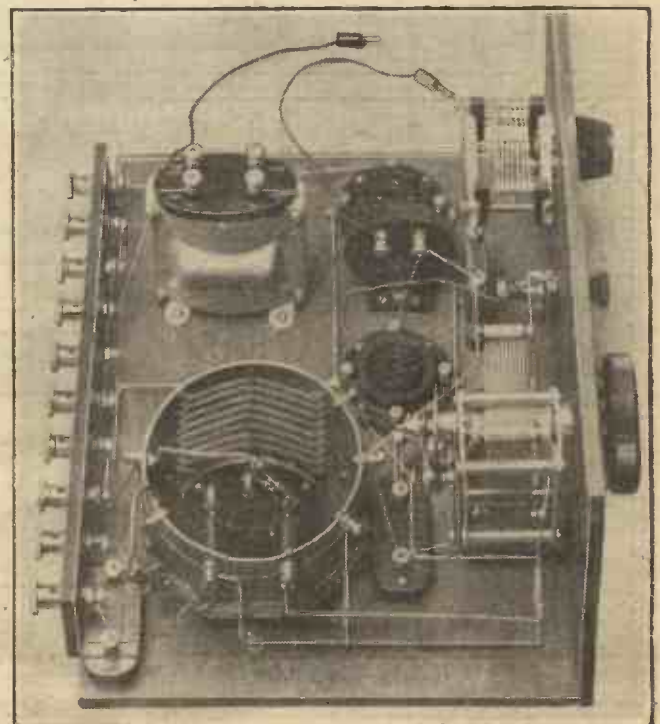
Alternatively, you can use one of the special three-spring switches which have been produced by a number of firms expressly for use in circuits of this type. These have the usual metal plunger, and three side spring contacts instead of two. The three leads to the switch are then taken to the three springs (in any order), instead



of one going to the plunger itself, and since there is no need for one of them to be of flex, the result is perhaps slightly neater. (Examples of this type of switch are the Wearite, Bulgin, and Pioneer.)

So far as operating the set is concerned you have already gained an idea of the main points to which you must attend, i.e. the selectivity adjustments on long and ordinary wave-lengths. On the lower wave-band you will find that placing the aerial clip on tapping "8" or "12" will suit most

(Continued on next page.)



The only special point in construction is to see that the coil unit is put down in the correct position, and this view will help you to locate it.

THE "TITAN" TWO.
(Continued from previous page.)

conditions. On "8" selectivity is highest, but on "12" signal strength is usually better, so you should try both to see which meets your requirements best.

Suiting The Aerial.

On small aerials you will probably find that it pays to use the whole of the primary (16 turns) to get the loudest possible signals. On such aerials, of course, the selectivity will still be good on this higher tap, because if the aerial capacity is small the effective coupling does not become very tight even with a large primary.

On bigger aerials it is usually necessary to use one of the lower taps when high selectivity is needed; but, of course, signals will even then probably be stronger than on a small aerial. The higher tap should always be used when possible, i.e. when

COMPONENTS.

- 1 Panel, 12 in. x 7 in. (or 8 in.) x $\frac{1}{8}$ in. or $\frac{1}{4}$ in. (Becol, Resiston, "Kay Ray," Trolite, etc.).
- 1 Cabinet to fit, with baseboard 9 in. deep (Areraft, Pickett, Raymond, Lock, Bond, Gilbert, Cameco).
- 1 .0005 mfd. variable condenser, slow-motion type, or with vernier dial (G.E.C., Lissen, J.B., Lotus, Ormond, Dubilier, Utility, Igranic, Cyldon, Pye, Burton, Raymond, Colvern, etc.).
- 1 .0001 or .00015 reaction condenser (Bowler-Lowe, J.B., Cyldon, Burton, Utility, Peto-Scott, Igranic, Dubilier, etc.).
- 1 Wave-change switch (either an ordinary L.T. on-off switch of the following types: Lissen, Lotus, Burne-Jones, Burton, Pioneer, etc., or a special 3-spring type, such as the Wearite, Bulgin, Pioneer, etc.). (See text.)
- 1 "Titan" coil unit (Burne-Jones, Ready Radio, Paroussi, Wearite, etc.).
- 2 Sprung valve holders (Lotus, Burton, W.B., Pye, Igranic, Formo, Burne-Jones, Wearite, B.T.H., Benjamin, Ashley, etc.).
- 1 L.F. transformer of low ratio (R.I.-Varley, Ferranti, Igranic, Lissen, Phillips, Brown, Mullard, Marconi-Phone, etc.).
- 1 H.F. choke (Igranic, Lissen, Cosmos, Burne-Jones, Lewcos, Bowyer-Lowe, Climax, Colvern, Wearite, R.I.-Varley, Dubilier, etc.).
- 1 Fixed condenser of .0002 mfd. (Dubilier, T.C.C., Lissen, Mullard, Clarke, Igranic, Goltone, Burne-Jones, etc.).
- 1 Fixed condenser of .0003 mfd.
- 1 Fixed condenser of .001 mfd.
- 1 2-meg. grid leak and holder (Dubilier, Lissen, Mullard, Ediswan, Pye, Igranic, etc.).
- 1 On-off switch.
- 1 Terminal strip, 10 in. x 2 in., and 10 terminals (Ealex, Belling & Lee, Burton, Igranic, etc.).

only a moderate degree of selectivity is needed.

On the long waves you have the choice of tappings "60" and "80" on the loading coil, and these behave very similarly again. On "60," selectivity is best; but signals are generally louder on "80." On small aerials, as before, the higher tap may still give quite sufficient selectivity.

In situations where interference from the local is particularly bad, try connecting your aerial lead to A₁ on the terminal strip instead of to A₂, and so bring in the series condenser C₄. In the real "agony area," within a few miles of the local, of course, you must expect to use a wave-trap, even with a selective set like this.

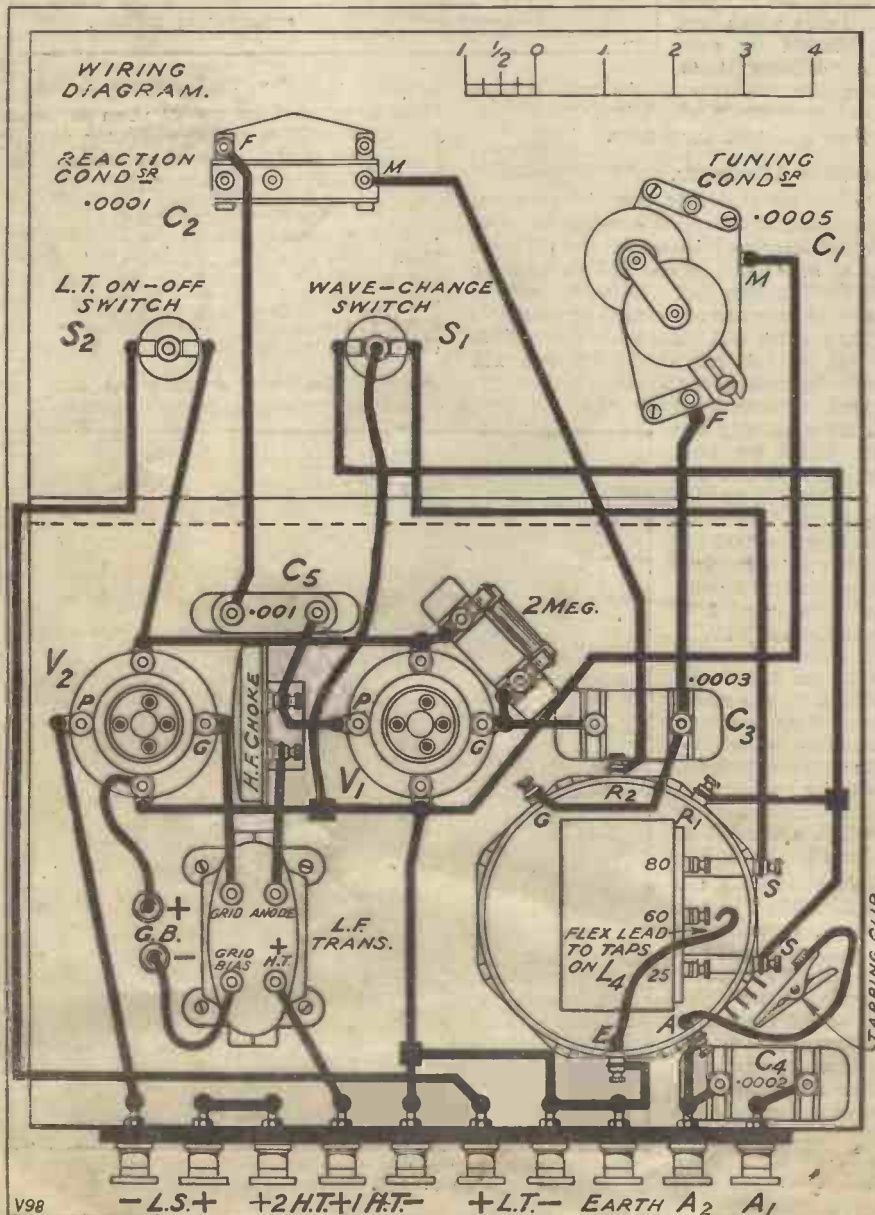
Why Not Use a Trap?

This is a point we should like to emphasise. We find from correspondence that many readers apparently do not realise that a trap of the improved modern type is a simple and perfect cure for the problem of interference by a very near-by local station, and are perturbed when they find that sets of the simpler type are "swamped out."

The plain fact is that within a radius of perhaps five or six miles from a main station an absolutely super-selective set is needed to cut it out at all easily. Such sets as are normally described as "highly selective" can only be expected to cut it out in favour of a station fairly well separated in wave-length, e.g. 5 GB in the London area.

To cut the local out really sharply and get other stations on near-by wave-lengths even quite a good set needs a little assistance in these difficult locations, and the standard "P.W." wave-trap gives just what is wanted. With its aid you will find that the local goes in and out almost as sharply as a distant station, and leaves the rest of the dial quite clear. Truly, a great boon!

Finally, about valves and voltages. Just the standard arrangements should be made here, i.e. first valve, H.F. type, second valve, power or super-power (latter if close to local), H.T. on detector, 40 to 60 volts, H.T. on L.F., 100 to 120 volts.



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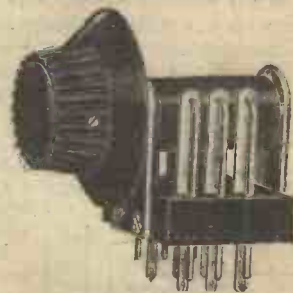


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AMONGST the many variations of the well-known "Reinartz" system of reaction, the most popular one is undoubtedly that in which the reaction condenser is placed between the reaction coil and the earthed end of the grid tuning coil, as shown in Fig. 1.

By this method it will be seen that the moving plates of both tuning and reaction condensers are at earth potential, thus eliminating that once-prevalent trouble, "hand capacity." Even very weak distant stations may be tuned in to the very edge of oscillation without the risk of losing them as soon as the hand is moved away from the reaction condenser.

It is the practice nowadays to insert, in series with the reaction condenser, a fixed condenser for the purpose of preventing a short circuit of the high-tension battery in case the plates of the reaction condenser should touch.

This method is quite satisfactory when the grid and reaction windings are wound together on one former and perfectly insulated from one another. When plug-in coils are used, however, it is almost useless to place

this fixed condenser in the position shown at X in Fig. 2.

A Better Position.

It will readily be seen that if one is using, say, bare wire coils, or coils in which the ends of the winding are connected to metal plates on the sides of the coil plug, there is a risk of the grid and reaction coils coming into metallic and electrical contact.

This means at least a short-circuited high-tension battery. The moral is—always place the blocking condenser between the plate of the valve and the reaction coil, as shown in Fig. 3, thus isolating it from the H.T. voltage.

It sometimes occurs that reaction suddenly becomes very fierce at some point on the reaction condenser often below the normal setting for any particular adjustment of the tuning condenser. This trouble is usually attributed to a defective H.F.



REACTION REMINDERS

essential to avoid the introduction of twists which may give rise to kinks, and in any case will not permit of the wire hanging in a perfectly straight fashion. While paying out the coil should either be revolved or held in the hand, and three loops released from either side in turn, reversing the coil to do so.

Some interesting and useful details concerning a very important subject.
By H. L. HANDLEY.

choke, but there is often another less obvious reason for this occurrence.

As it is customary to use a fairly large blocking condenser so as not to reduce unduly the value of the reaction condenser, it is evident that if the plates of the latter touch at any point the actual reaction capacity in series with the coil is suddenly increased to the maximum value of the blocking condenser.

A Peculiar Phenomenon.

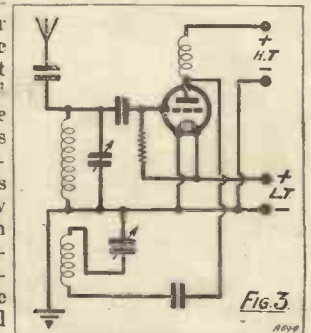
In illustration of this point, the writer came across a case in which a receiver oscillated violently just as the reaction condenser approached zero.

It appeared, on investigation, that the plates of the reaction condenser scraped together at this point, with the result that the value of the reaction capacity was actually increased "at one hit" to .006 mfd., which was the capacity of the blocking condenser in this case. The writer is of the opinion that a thorough examination of the reaction condenser may prove many so called "dud" H.F. chokes to be quite blameless after all.

The tuning coils of crystal and single-valve receivers can be wound with No. 24 S.W.G. No. 26 S.W.G. is also convenient for some sets, and it is durable and permits of tappings being made with little danger of breakage.

In sets where it is necessary to include a large number of turns in a limited space, use No. 30 S.W.G. The sizes 24 and 26 can be double-cotton-covered, and No. 30 double silk.

When wiring a receiver care must be taken that the "loop" end of wire that goes round a terminal follows the screw thread. With few exceptions, all terminals are threaded with a right-hand thread; therefore the nuts are tightened to the right, or clockwise. It is a good idea when making a loop in the end of a wire which is to be placed on a terminal or a screw, to bend the loop in a clockwise direction, or to the right, so that the wire will not be twisted out from under the nut when it is tightened. Always make the loop in the same direction that the nut tightens.



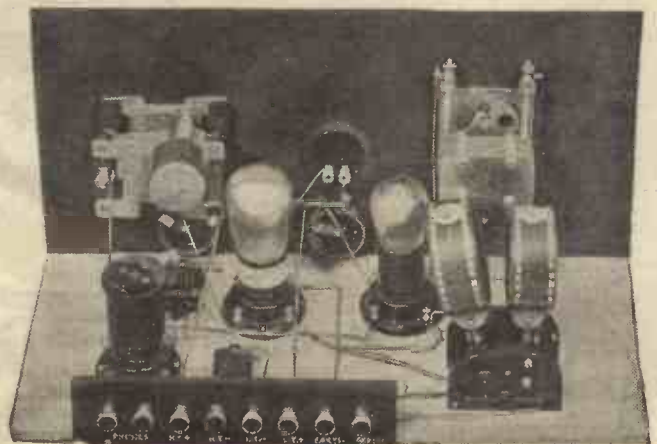
SOME CONSTRUCTIONAL HINTS.

OWING to the very small space allowed between the springs in "key" switches, these are not to be recommended for use in high-frequency circuits. The contact springs really form the plates of condensers of very small capacity, which are quite sufficient to by-pass high-frequency oscillations, and to divert them from the paths which they are supposed to travel.

When unwinding aerial wire from a hank it is

Don't forget when soldering fine wires or small tags that these, owing to their small size, heat much more rapidly than larger objects.

For soldering very fine wires it is essential to use a solder of low-melting point.



A set in which throttle reaction control assists the rougher "flip-flop" method.

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this. Does not this strong preference for Exide Batteries, which has lasted since the first days of broadcasting, show that they must have proved themselves, under the test of time, to be the most reliable and the best?

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RADIOTORIAL

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

The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts and photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4. The constructional articles which appear from time to time in this Journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless receivers. 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 specialities described may be the subject 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.

ADDING AN H.F. STAGE.

W. G. (High Wycombe, Bucks).—"At present I use a home-made coil for the aerial, having a number of taps on to which I connect the aerial lead according to the degree of selectivity required. (I have always been keen on trying to get long distance.)

"I was told it would be quite an easy matter to put an H.F. choke stage in front of this and so bring up the distant stations, so I should be glad if you could tell me exactly what components are required and how they should be connected?"

In addition to the new valve holder you will require a .0002 mfd. fixed condenser, an aerial coil with coil holder (single coil type will do), a good H.F. choke and a tuning condenser (for the aerial stage) of .0005 mfd. variable capacity.

It will be necessary to arrange the valve holder on the baseboard in such a way that filament leads from its filament terminals can easily be carried to the L.T. positive and L.T. negative wires. Then screw down into position the holder of the aerial coil and the H.F. choke, making sure that these are spaced well away from each other and also from the original coil.

Remember that the aerial coil should be placed as close as possible to the aerial tuning condenser, so as to keep the leads conveniently short, and that the grid terminal on the valve should also be placed relatively close to these so that the wiring can be as short as possible.

If you have any doubt as to the best arrangement, or if you find that when connected up the set is not as stable as it should be, it will be necessary to send us a sketch of your arrangements so that we can make some suggestion for improving the layout or shortening the wires.

The actual connections are few in number and quite simple to make. One filament socket on the valve holder is connected to the earth wire on the set and another earth terminal is added to this lead if required. From the other filament terminal on the new valve holder a lead is taken to the corresponding lead to the other valve holder, thus placing the two filaments in parallel with one another.

That lead which was previously earthed should now be connected also to one side of the aerial coil holder and to the moving plates of the variable condenser. The remaining side of this coil holder and the remaining side of the condenser (fixed plates) are connected together and to the grid socket on the new valve holder.

The plate socket of this valve holder is then joined to one side of the high-frequency choke and to one side of the .0002 mfd. fixed condenser. The other side of this new .0002 mfd. condenser carries a flexible lead which is clipped on to one of the tappings on the old coil (which was previously the aerial coil and is now the detector grid coil).

Finally, the remaining side of the high-frequency choke is connected to the new H.T. positive terminal from which a plug is taken and plugged into the H.T. battery at the appropriate voltage. A centre-tapped coil can be used for the aerial coil holder, the aerial lead coming to the centre tap in the usual way.

Do not forget that all the wires should be spaced well apart, particularly those to the grid of the H.F. valve, and that all the leads should be as short and direct as possible with the coils spaced well apart from each other and from adjacent wiring.

"MAKING A NICE JOB OF IT."

G. C. F. (Hyde, Cheshire).—"In all the sets I have made I have had the same trouble, namely, flux and greasy marks remaining on the back of the panel, in inaccessible places, spoiling the look of the finished job. I notice that in properly manufactured sets the wiring is as clean as though flux had not been used at all. Can you tell me what flux they use, or what is the secret of making a nice job of it?"

The secret of clean soldering is nothing more than an ordinary common old duster or piece of cloth, used at the correct time. It is no good trying to remove flux after it has cooled down, and the correct procedure is to use as little flux as possible and wipe it off with a duster whilst the metal joint is still hot.

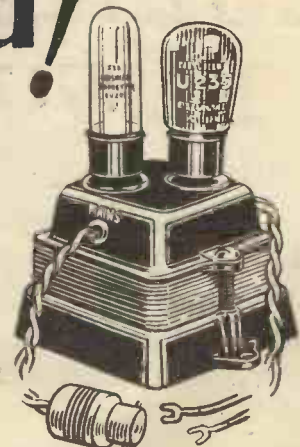
(Continued on page 1212.)

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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1210.)

At this stage the flux is in a liquid state, but if the wiping is not done immediately the flux will get cool, after which it sticks and becomes a permanent nuisance. Try wiping over every joint the instant it is made. You will be surprised how easy it is to remember to do this when the habit is formed, and how much it improves the appearance of the completed wiring.

CONNECTIONS TO AN AMPLIFIER.

COALMAN (Cambridge).—"The amplifier has always given good results when used with a crystal set, so I thought it would be all right to boost up a one-valve set. But when it was connected up there was a smell like burning and I noticed that one of the wires seemed to be a bit hot, so I disconnected it all quickly as possible and since then have been afraid to use it.

"Is it possible to run the amplifier, using the same batteries as those on the valve set?"

You are experiencing quite a common fault which fortunately is very easily remedied.

What has happened is this. In either the amplifier or the set, the H.T. negative terminal is joined to L.T. negative; but in the other instrument (either the set or the amplifier) the H.T. negative goes to L.T. positive. This means that if you connect up all the terminals in the way indicated, the L.T. battery will be shorted and consequently it will be damaged. But you will find that there is no earthly need to connect up all the terminals.

Try connecting up again, to all the terminals as marked on the one-valver, but be sure not to connect a wire to the H.T. negative terminal on the amplifier. Ignore that terminal altogether and leave it without any connection externally, but join up H.T. positive, etc., as marked. In all probability you will find that the amplifier then works in a perfectly satisfactory manner.

A LITZ WOUND WAVE-TRAP.

I. F. A. (Chepstow, Notts).—"I am going to make a tapped wave-trap like the 'P.W.'"

standard wave-trap, but I wish to use Litz instead of ordinary wire for this. Would this be satisfactory, and if so how can the tappings be made on a coil which is made of Litz?"

In the case of a Litz wound coil somewhat elaborate methods of winding must be adopted, since it must

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A postcard will do: On receipt of this an Application Form will be sent to you free and 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.

be remembered that in making connections to this coil at any point it is essential that a good soldered joint be made to every strand of the wire.

In the case of a tapped wave-trap made of Litz wire the simplest way is to regard each tapping as a finishing point for the coil, cutting the wires and passing the ends through two small holes in the former, to fix them. When this has been done

securely, drill two small holes a little further round the tube and secure the end as before, carrying on the winding until the next-tapping point is reached, when the process should be repeated.

At each tapping point therefore the coil will be broken and the two ends will be left sticking out. The ends of the strands should then be bared at these points and all carefully soldered together, the two ends next being soldered to each other and then to the connecting wire.

Remember that a really perfect joint to each strand is absolutely vital for success and if you feel the least doubt about it, it is better to use a solid wire and be sure of a coil which is at least reasonably good instead of running the risk of making a coil which is definitely bad, as may easily be the result of an unskilful attempt to use Litz wire.

It might be as well to point out that as the real difficulty of using Litz is simply that of properly baring, cleaning, and soldering each strand of the wire, this will be made a much easier process if the type of Litz chosen is that which is silk-covered only, without an enamel covering on each strand. With this type of Litz it is fairly easy to get the silk off by gently singeing with a match and then a little careful scraping of each strand will make it quite bright and fit for soldering.

COMPACT COUPLING OF AERIAL.

F. P. D. (Aberdeen).—"I was interested recently in the answer you gave in your book to a correspondent who wanted to know how to fit inductive coupling instead of fitting his aerial direct to the coil. I should like to try this myself, but unfortunately my set is a small one in a small cabinet and there is no room to put in the extra coil which you recommend.

"Is there any way of overcoming the difficulty in such a case? If so I should be very glad to hear of it, but unfortunately there is not room for a second coil, but I certainly would like to be able to improve the selectivity so that I can reach out a bit when the local station is broadcasting."

The feasibility of making a good inductively-coupled aerial circuit will depend largely upon the exact type of coil in your aerial coil holder. There is no reason why you should not try to adapt your

(Continued on page 1214.)

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1 Lotus '0005 mfd. variable condenser	5	9	
1 Lotus S.M. dial	4	9	
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1 Wave-change switch	1	6	
1 Ready Radio "Titan" Coil Unit	15	0	
2 Lotus sprung valve holders	2	6	
1 R.I. Varley L.F. transformer	15	0	
1 Wearite H.F. choke	6	6	
1 Lissen '0002-mfd. fixed condenser	1	0	
1 Lissen '0003-mfd. fixed condenser	1	0	
1 Lissen '001-mfd. fixed condenser	1	0	
1 Lissen 2-meg. grid leak and holder	1	6	
1 Terminal strip, 10 x 2 in., and 10 Belling-Lee terminals	3	9	
2 Valves, as specified	1	3	0
Glazite, flex, screws, G.B. plugs, etc.	2	0	

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1 Lotus S.M. dial	4	9	
1 Litanic Micro Condenser	5	6	
1 L.T. switch	1	0	
1 Wave-change switch	1	6	
1 Ready Radio "P.W." Copper Screen	2	6	
1 Ready Radio "Titan" Coil Unit	15	0	
3 Sprung valve holders	3	9	
1 Lissen L.F. SUPER transformer	19	0	
1 Wearite H.F. choke	6	6	
1 Lissen '0002 condenser	1	0	
2 Lissen '0003 condensers	2	0	
2 Dubilier 1-mfd. Mansbridge condenser	5	0	
2 H.T. Fuses	3	0	
1 Lissen 2-meg. leak and holder	1	6	
1 Terminal strip with 11 Belling-Lee indicating terminals (mounted)	4	0	
3 Valves, as specified	2	5	6
Set of connecting links, flex, screws & G.B. plugs	2	3	

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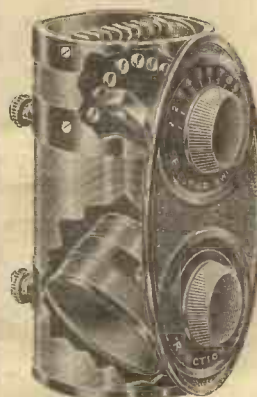
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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1212.)

present coil for it by winding a second coil actually upon the former of the original aerial coil. If it is one of the ordinary plug-in type, for instance, you might be able to arrange little wooden pegs upon it around which an extra winding of ten turns, twenty (or whatever the requisite number may be), can be affixed.

If the extra winding is wound round and round the outside of the coil close up to the internal winding, the coupling between the two will probably be quite effective, and any required degree of selectivity can be obtained by varying the number of added turns until a suitable size for the external coil has been decided upon. A convenient wire to use for the external coil is 20 or 22 or 24 D.C.C., and this may be affixed with silk or cotton. (Of course, no metal, or similar source of damping should be used to hold it in position.)

One end of the external coil is then joined to the aerial and the other end to earth, and it is quite likely that in this way you will find a complete and satisfactory solution to your selectivity problem.

A LEAD-IN QUESTION.

"DISAPPOINTED" (Ashford).—"I have had the set for over two years, but it has not been doing so well this winter as formerly, and I cannot make it out. I have read that it might be due to valve falling off, etc. So I got a friend of mine to bring round his valve, which is of a similar type, to try and remedy it, but it made no difference.

"We went over it together, and everything appears to be quite O.K., so he kindly suggested that he should bring his set round and try it on my aerial.

"When it was new we had compared it with mine as it had the same number of valves. That was at the beginning of last winter, so we remembered about what his set should do, and as it seemed to be a good idea I got him to do this.

"I quite expected to find that his set would be far better than mine, but curiously enough

it gave very disappointing results, and that made me think it might be something wrong with the aerial. So next day when it was light I inspected this, and although it has been up ever since I had the set it appears to be in quite good condition and I cannot see any dirt on the insulators or any other reason for the bad results.

"Do you think it might be the two lead-in tubes which I have to use because the outside aerial comes close to the conservatory and after running along a short lead through this

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it passes through another window into the house? I should be glad of any suggestions, for it seems a very puzzling fault that affects both his set and mine in the way without anything to show for it."

From your description it certainly looks like a fault in the aerial-earth system. By the way, please note this latter part of the sentence, for the earth is quite as important as the aerial, and it is possible that your earth wire has broken underground or that the contact is thoroughly bad at some point of the lead.

Examine the actual aerial wire itself and the cleanliness of the insulators. (It is important to watch the cleanliness of all the connections, especially those

at the lead-in tube.) We think that as you have two of these tubes in use it is very likely that your trouble lies there. We should certainly take down the tubes and have a good look at them.

Make sure the wire makes good contact with the tube, and generally see that there is a first-class connection at all points. Probably the best way to tackle the job would be to lower the aerial and inspect it foot by foot, watching for any breaks, dirty insulators, etc., which might account for the loss in signal strength.

A careful inspection of the wire right up to the lead-in tube only is not sufficient, for the tube itself must be dismantled and inspected to make sure that everything is in first-class working order. Be particularly sure to take nothing for granted, even the inside of the tube, and we feel sure that if you replace any parts that appear doubtful both in the aerial and in the earth system you will come across the source of the trouble.

By the way, do not forget that if the position of the lead has been altered so as to bring it near to a metal gutter pipe or anything of the kind, this alone is quite sufficient to account for the falling off in strength, it being essential to keep the aerial and lead-in wires spaced well away from all conductive objects, especially those which are earthed. For this reason the lead must not be run too close to walls, and both the aerial leads should be as short and direct as possible.

AN ELIMINATOR PRECAUTION.

"CAUTIOUS" (Southampton).—"To supply the H.T. to the eliminator and the current to the moving-coil loud speaker, I have to run a flexible lead from a point in the skirting board along the side of the room.

"As I am very careful and it is carefully handled at all times I do not think there is the slightest danger in this, but it occurred to me that it might be a good plan to put in a couple of ordinary flash-lamp bulbs to act as fuses so that should anything go wrong they would blow and thus cut off the supply at the switch. I thought of mounting the bulbs on the wooden switch as there is a convenient place to do this, provided you think that such a place is O.K."

It is certainly a good idea to put a couple of extra fuses in, in the way you suggest, and flash-lamp bulbs

(Continued on page 1216.)

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The Opinion of an Expert.
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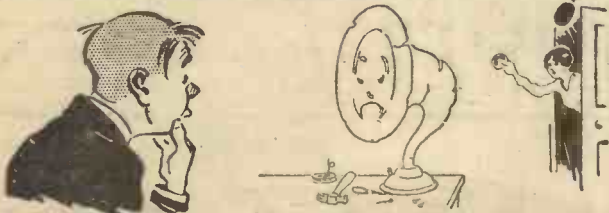
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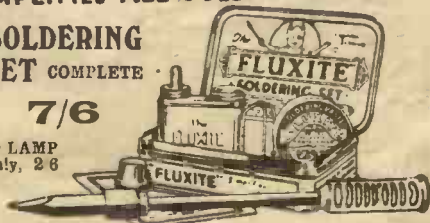
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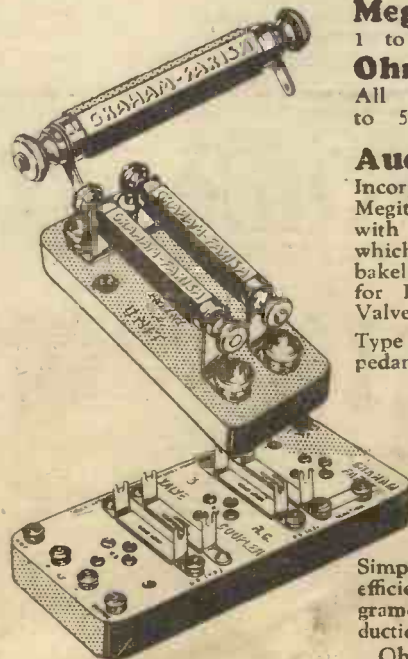
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MORNINGTON CRESCENT LONDON, N.W.1

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1214.)

will do quite well for the purpose. We should of course be very careful to see that the wiring to these is properly covered in every way and protected from accidental contacts or, of course, they will be more of a danger than a safeguard. Provided this precaution is adopted (we suggest a cover for the whole thing), the fact that the current supplied will come through the two flash-lamp bulbs ensures that in the event of anything going wrong in the set you will have an extremely safe and efficient cut-out in operation by the "blowing" of the flash-lamp bulbs.

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The easiest way is to connect the nearest point of the bell wiring to some part of the input side of the wireless set through a fixed condenser. A .001 mfd. condenser is a suitable size, though other values will do, depending upon the strength of the coupling required and the efficiency of the bell battery system, etc.

The simplest way to try it out would be to have a .001 fixed condenser connected to the aerial circuit. The other side of this condenser can be taken to the nearest point on the bell-wiring system by means of a well-spaced wire. If the ringing of the bell does not give the necessary indication in the loud speaker, the wire to the bell-wiring system can be transferred to some other point on this, preferably near the buzzer. It is too loud when connected to the bell wiring system the other end of the connecting lead may be

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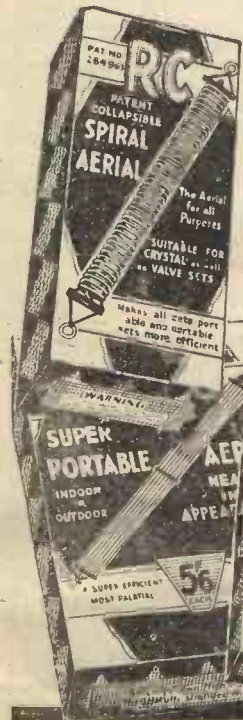
moved away from the aerial terminal and taken to the grid terminal of the first or of the second L.F. valve, according to the strength of interruption which is required.

Another method of varying the volume is to alter the size of the coupling condenser, but do not omit this altogether, especially if you are using a mains unit to supply the H.T. to the set, for it is important that there should be good insulation between the set and the bell-wiring system.

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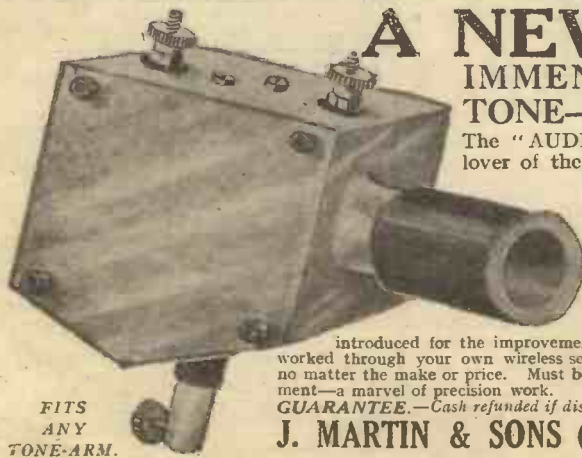
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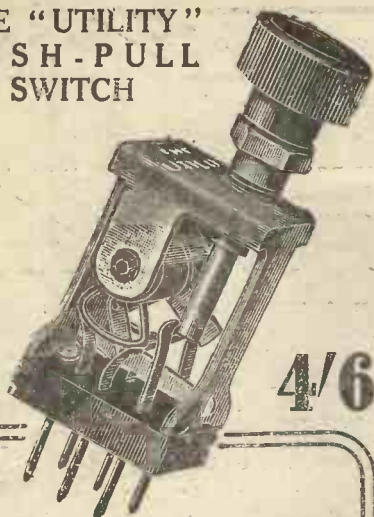
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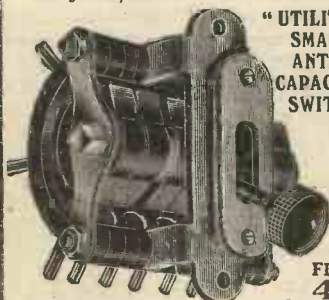
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TECHNICAL NOTES.

(Continued from page 1190.)

easily from the filament, or whether the extra emission is provided by the disruption or decomposition of the oxides themselves. Inasmuch as a dull-emitter filament of this kind generally loses its conductivity gradually, it would seem that the latter explanation was at any rate partly true, but, on the other hand, in control experiments in which the temperature of the filament is kept below a certain limit and great care taken therefore not to over-run the filament, extraordinarily long periods of activity have been recorded.

Further Improvements.

The question naturally arises as to the possibility of discovering an entirely cold valve. The recently developed copper-oxide rectifier has been described as a "cold valve" and, inasmuch as it acts as a rectifier simply and without the aid of any exterior source of energy, the description is no doubt

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quite correct. To that extent, whilst it has enormous uses for purely rectification purposes, it is comparable to the original 2-electrode rectifying valve, and might perhaps more correctly be described as a "cold rectifying valve."

If any method could be found whereby the copper-oxide rectifier (or any chemical or electrolytic rectifier for that matter) could also be satisfactorily employed for *amplification* purposes, in a way really to be compared for efficiency, convenience and sensitivity with the thermionic valve, then undoubtedly we should have the "cold valve" and something of immeasurable value.

Pick-up Troubles.

When using an electrical pick-up in connection with a gramophone record, you will sometimes find that there is overloading of the first amplifier (that is, what would be the detector of the radio set if the amplifier were used in that way).

It is sometimes rather difficult to correct this overloading, but if it is due to nothing more serious than too large a volume from the pick-up, this can easily be cured by shunting some of the speech currents from the pick-up by means of a potentiometer.

A potentiometer used in this way may be regarded as a volume control, but, of course, it means that you are cutting down the volume in order to make it suitable for

(Continued on page 1220.)

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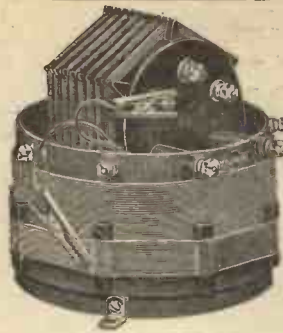
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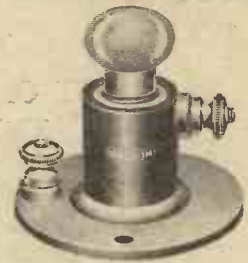
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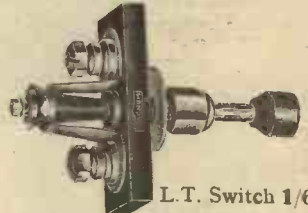
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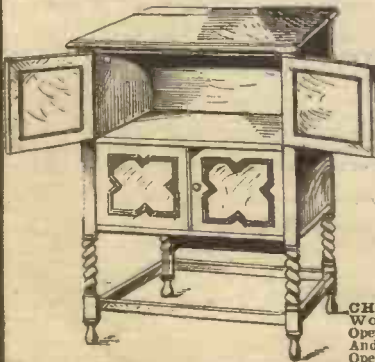


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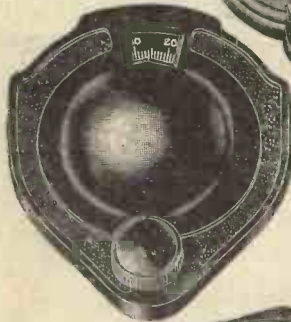
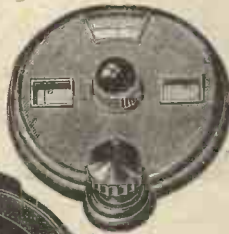
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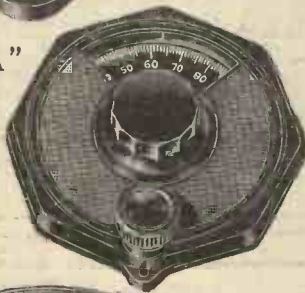
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TECHNICAL NOTES.

(Continued from page 1218.)

the first stage, whereas it would appear to be more reasonable to increase the power of the first stage so as to enable it to handle the full volume delivered by the pick-up.

Adjustments.

In addition to what I have just mentioned, there are the usual sources of distortion such as incorrect value of high-tension, and of grid-bias, and just as these require adjustment in the case of the ordinary radio receiver, so you will find it advantageous to give careful attention to your H.T. and G.B. voltages in connection with your pick-up amplifier. Often trouble is experienced owing to the fact that the H.T. voltage is too low.

Interference.

A further source of disturbance with the electrical pick-up arises from the fact that often rather long leads have to be brought from the pick-up to the amplifier or from the amplifier to the loud speaker, and naturally there is the possibility of mutual effects between these leads, which sometimes gives rise to howling.

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Care With Leads.

This arises in the old familiar way; the impulses from the loud-speaker leads are received by the pick-up leads and passed into the amplifier, where they are in due course amplified and passed into the loud-speaker leads, and so on. With the presence of an amplifying system in the circuit there is always a possibility of this howling, or low-frequency regeneration being set up, and with the electrical pick-up it is particularly important to keep the leads all in such positions as to avoid interaction of this kind.

Earthing.

Incidentally, it is generally a good plan to connect the mounting of the electrical pick-up to earth. If this is metallically connected to the gramophone tone-arm you will sometimes find it more convenient to make the earth connection to the large end of the tone-arm. If the gramophone has an electric-motor drive it is also important to earth the motor.

Loud and Soft Tone.

You will no doubt have noticed that what are commonly called "loud-tone" needles are thicker than "soft-tone" needles, or rather the thick part extends nearer to the pointed tip. Sometimes "soft-tone"

(Continued on page 1222)

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ADVERTISEMENTs have recently been issued featuring the Telegraph Condenser Company's Condensers with the special feature of the double mounting bracket as an innovation first evolved by us, but we find to our regret that this is incorrect.

This feature, for which originality was claimed by us, had already been previously registered by Mr. T. Graham Farish, of Graham-Farish Ltd., on the 16th day of

August, 1926, No. 723271, Class 3, and incorporated in their condensers since that date.

We wish to take this the first opportunity of publicly acknowledging the error, but are happy to announce that arrangements have been made which will enable this special double mounting feature to be continued in T.C.C. Condensers under licence from Mr. T. Graham Farish, the registered proprietor of the design.

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15/- as used and recommended by Technical Dept. of this Paper.

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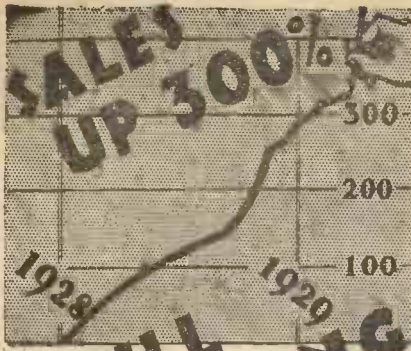
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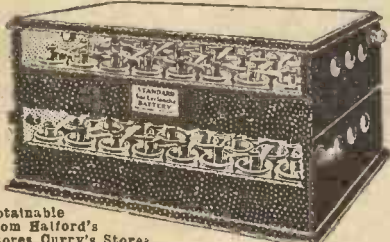
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TECHNICAL NOTES.

(Continued from page 1220.)

needles, in addition to being gradually tapered, are also rather longer than "loud-tone" needles.

Lost Motion.

If you think about this for a moment you will soon see the reason, since a long tapering needle will be more "elastic" than a shorter thick one, and consequently some of the vibratory motion imparted to the tip will be lost before it reaches the needle-holder (sometimes called the "chuck").

This will naturally have the same effect as though the vibrations of the needle point were weaker or of smaller amplitude. A shorter thick needle, on the other hand, will be more rigid, and consequently the actual vibratory motion of the tip of the needle will be more fully communicated to the needle holder and so to the diaphragm of the soundbox, or to the armature of the electrical pick-up, as the case may be.

Needle Adjustments.

If you have only one type of needle in stock you can sometimes vary the loudness quite appreciably by fixing the needle right up into the holder as far as it will go, or bringing it out as far as possible, in other words, making the vibratory member (of which the needle forms part) as short as possible or as long as possible.

It will be obvious that for a given amplitude of vibration in the track of the record, a long needle will vibrate through a smaller angle than a short one and, as the actual vibration of the diaphragm or armature depends directly upon the angle of vibration of the needle-holder, this means that the volume produced will be less with a long needle than with a short one, quite irrespective of the fact that the long needle will also be more elastic, as mentioned above.

Wear and Tear.

The subject of keeping records clean is one which periodically comes up for discussion. It is very advisable to keep your records constantly brushed with a fine soft brush or rubbed over with one of the pads or cloths which are sold for the purpose.

THE "TITAN" COIL.

Owing to the unprecedented demand for this "Popular Wireless" component, there may be delays in delivery. But the firms advertising the coil are working at high pressure to cope with the demand and hope shortly to be in a position to fill all orders with their usual expedition. Any reader unable to purchase the coil should write to the Editor, who will do his best to help him. Although it was anticipated that the "Titan" Three would prove a popular set, its instantaneous success is of an unparalleled magnitude. The aggregate orders for the vital components already run into tens of thousands.

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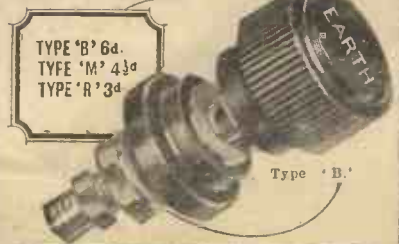
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ALTERATIONS AND IMPROVEMENTS.
A Word or Two of Warning.
From A CORRESPONDENT.

MOST real wireless enthusiasts, I suppose, are seldom content with their receiving sets for long. At intervals a new receiver is built on the lines indicated in POPULAR WIRELESS, "Modern Wireless," or the "Wireless Constructor," and for a time it seems to be the very last word in radio equipment; but before long one begins to wonder whether a switch could not with advantage be inserted here, or a variable instead of a fixed condenser there.

Added Refinements.

Possibly a change is made from grid-leak to anode-bend rectification, or *vice-versa*; it may be that a switching arrangement is incorporated so that either type of rectifier may be used at will. Quite likely certain changes are made as time goes on in the aerial coil, a tapping being arranged so that fewer turns may be taken in on the lowest part of the broadcast wave-band.

In the receiver which has swinging-coil reaction control a change may be made to some form of capacity-controlled reaction. Here, again, there is scope for much experiment and many alterations, since the circuits for capacity-controlled reaction are legion.

On the low-frequency side it may be found advantageous to be able to cut out a valve at will; a volume control may be incorporated, though there was none in the original design, an output filter may be added, or the last stage may be so arranged that a single valve or two in parallel may be used as required.

Unless one has had both considerable practical experience in the use of receiving sets and a good deal of practice in constructional work, it is seldom wise to make alterations in published designs, particularly if these concern sensitive receiving sets.

A "Gat's-Cradle."

The beginner, therefore, will generally be well advised to go very warily in his "improvements"; certainly he should never attempt them without previously seeking the advice of a more experienced friend. Nothing, however, will deter the old hand from making frequent small additions and alterations.

It is easily understandable that he should take this line, for he naturally wants to keep his set right up to date and generally has not the time to indulge in complete rebuilding except at intervals of greater or less length.

There is usually a certain amount of difficulty in carrying out alterations, since little space is wasted in carefully thought out designs, and there is therefore not much room available for any fresh components that may be required. Ingenuity, however, enables the enthusiast to fit them in somehow.

When the first small change has been made the set may still retain something of its original neat aspect internally. As

(Continued on next page.)

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2-v. or 4-v. G.P. 5/6 H.P., Det., R.C., 5/2 each;
Super Power, 7/6 Super Power, 6/9, 2-v. or
Super H.F., 2-v. or 4-v., 7/6 4-v., Post 4d. (10/- Free)

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Lotus, Ormond or Polar, 0005 and S.M. Dial, Micro 00005, Lissen L.F. (8/6) (any other L.F. obtainable by adding balance). Wave-change Switch, H.T. do., the wonderful "Titan" Coil Unit, 3 Spring V.H. Lewcos or R.I. Varley, H.F. Choke, Burne Jones 0002, 0003 (2) fixed 2 meg. eak 2 Mans-bridge Condensers

BURNE-JONES ALL - WAVE COIL UNIT DESIGNED BY "P.W." USED IN ORIGINAL SET. 15/- in Parts. Handsome OAK POLISHED CABINET, hinged lid, 15/-, with parts. (17/6 without.)

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To induce you to BUILD this WONDERFUL SET PLEASE ADD 2/6
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"TITAN" COIL UNIT TOTAL 52/6 (Plus 2/6)
For cash with order only a Base-board, 12 x 9, Free.

COUPON. P.W. FEB. 16.
ONLY ONE COUPON ON ANYONE ORDER
If you spend 25/- or more you can buy for 3d. extra any one (only) of the following:
S.M. Dial, 100 ft 7/22 Copper Aerial, 12 yds. Lead-in, Fuse and Holder 12 Nickel Terminals, 60X Coil H.F. Choke Permanent Detector, Battery Switch, 0003 and 2 meg Leak 9-volt Grid Bias, Panel Brackets 6-pin Coil Base, 100 ft Insulated Aerial, Loud Speaker Silk Cord, 30 ft Covered Connecting Wire, Ebonite Panel, 9 x 6, 12 yds. Twin Flex, 100 ft. Indoor Aerial, Cycle Rear Reflector.



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ALTERATIONS AND IMPROVEMENTS.

(Continued from previous page.)

Time goes on, though, its baseboard becomes more and more crowded, its panel more and more bristling with knobs, and its wiring more and more of the cat's cradle order. There comes a time when something must be done to evolve order out of chaos.

In such cases complete rebuilding is naturally by far and away the best course, but many of us are loth to undertake it, especially if an old and tried friend still gives wonderfully good service. Clearly, however, a sorting out of some kind must take place.

Pruning the Improvements.

The first thing to do is to decide which of the hoped for improvements have been real improvements and which have not. Often it will be found that the provision of a tapping, a switch or of a variable instead of a fixed condenser, may be of no appreciable advantage.

A somewhat complicated circuit, again, which has been tried out, may be no better than something far simpler. Ruthless pruning must take place of all the components and the leads that are not pulling their weight in the receiving equipment.

Generally, a start may be made with the panel, which, after a certain length of time, may contain far more knobs than appeared in the original design. Which of them are of any real use? Probably quite a number can go without detriment to the set's performances. And with the knobs the corresponding components behind the panel disappear also.

What is to happen to the holes that have been made in the ebonite? If these are not very large they may be countersunk and filled with short, dummy screws of suitable size—4, 2, or even 0 B.A. Holes $\frac{1}{4}$ in. or $\frac{3}{8}$ in. in diameter are rather more of a problem to disguise neatly.

Filling Holes in Panel.

One good way of dealing with them is to obtain a piece of ebonite rod of appropriate diameter whose end is carefully squared off and polished, first with fine emery cloth and, finally, with knife powder and oil.

A short length of the rod is then cut off and inserted into the hole from the back of the panel, being pushed through until the polished end is just flush with the external surface.

If it is rather a loose fit the plug may be held in place by smearing it with a little melted Chatterton's compound. Another way is to prop the panel into a horizontal position, holding a piece of paper firmly against the underside, after which the hole is filled with black sealing wax, Glittervax, or Chatterton's compound.

(Continued on next page.)

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ALTERATIONS AND IMPROVEMENTS.

(Continued from previous page.)

The top of a plug of this kind can be smoothed off with the blade of a knife, previously well moistened, applied while the plugging material is still hot. A third way is to make use of a dummy knob of small size, secured by a screw or small piece of studding passed through the unwanted hole.

By the removal of all unnecessary components upon the panel a certain clearance will have been made, and the wiring of the set can be simplified to a by no means inconsiderable extent.

We come next to an examination of parts upon the baseboard. Can any of them be discarded without loss? If so, they must certainly be removed. Next see whether there is any undue crowding at certain points.

A Phantom Baseboard.

In most cases it will be found that though, say, the high-frequency end remains fairly well spaced, the neighbourhood of the detector valve is somewhat congested. Or there may be undesirable overcrowding towards the output end of the set. Intelligent rearrangement of the components is called for, and here one may give a tip that will be found exceedingly useful.

From any large stationer's shop squared paper may be obtained ruled off into large squares with 1 in. sides, which are sub-divided into smaller squares, each with $\frac{1}{4}$ in. sides. This is sold in sheets of various sizes.

Obtain a sheet big enough to contain a full-size layout of the baseboard. On it rule off a rectangle of the exact size of the baseboard, and cut out small cardboard models representing the space occupied by the various components.

These can be moved about on the phantom baseboard until the best position for each has been found—do not forget that the best position is that which gives the shortest leads combined with the minimum of crowding.

Keep Wiring Short.

A rearrangement of the actual components can now be made. The simplest way is to shift only one or two at a time.

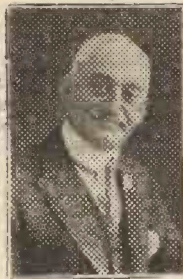
In this way the business is enormously simplified and a couple of hours spent on a set that has suffered many changes may result in a straightening out that has beneficial effects all round.

As regards the wiring be most careful to keep all your grid and plate connections as short as possible. A considerable improvement in this respect can often be made by raising the baseboard an inch or so and carrying the majority of the low-potential leads beneath it.

Fixed resistances and certain condensers may also find a place under instead of above the baseboard, all of which helps to avoid the crowding that is inimical to first-rate results.

YOU NEED HELP

It is very difficult to prosper in life without a little help.



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and I state most emphatically that there are thousands of men earning less than half of what they could earn simply because they do not know where the demand exceeds the supply. Thousands of people think they are in a rut simply because they cannot see the way to progress. This applies particularly to Clerks, Book-keepers, Engineers, Electricians, Builders, Joiners, etc. They do not realise that in these particular departments the demand for the well trained exceeds the supply. In Technical trades and in the professions employers are frequently asking us if we can put them in touch with well-trained men. Of course, we never act as an employment agency, but it shows us where the shortage is. In nearly every trade or profession there is some qualifying examination, some hall-mark of efficiency. If you have any desire to make progress to make a success of your career, my advice is free; simply tell me your age, your employment and what you are interested in, and I will advise you free of charge. If you do not wish to take that advice you are under no obligation whatever. We teach all the professions and trades by post in all parts of the World, and specialise in preparation for the examinations. Our fees are payable monthly. Write to me privately at this address, The Bennett College, Dept. 106, Sheffield.

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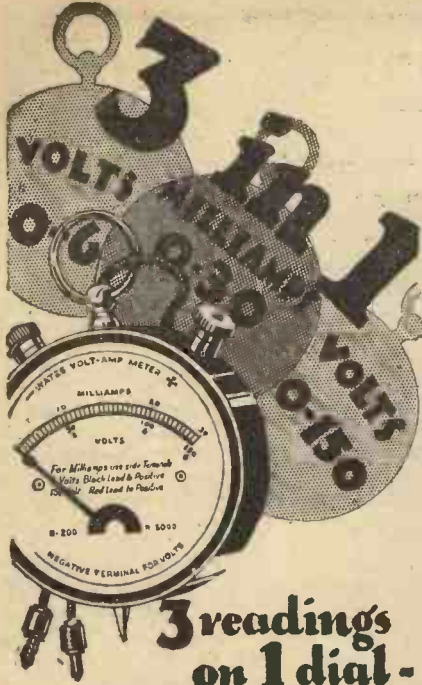
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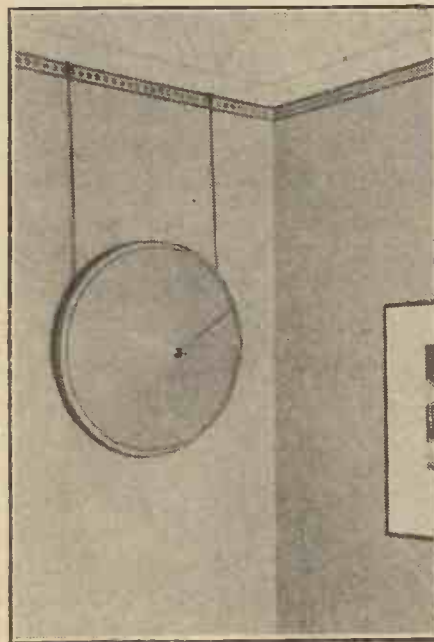
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A DECORATIVE LOUD SPEAKER.

THE accompanying photograph shows the result of a serious attempt to meet one "loud speaker's" objection to another loud speaker being introduced into the best room. The objection is usually a valid one, as wires trailing about a room can be very unsightly. When redecorating recently, advantage was taken of the opportunity to experiment.

The wall was pierced and leads introduced behind the picture rail, the ends being fastened to two small nickel hooks screwed into the rail from underneath. The speaker itself has a reed unit fastened by three "Meccano" strips to a white wood mirror frame.

A piece of the wall paper was firmly stuck to a foundation of stout parchment



The loud speaker looks very neat when arranged in the way suggested.

paper and, when dry, was made into a cone in the usual way. Two silk covered leads, attached at one end to small nickel screw eyes suspend it from the screw hooks, the other ends being screwed under the unit terminals. Small rubber buffers, on back of frame, keep it off the wall.

The method of suspension, though theoretically un-scientific, in practice works splendidly. The experiment has been most successful, and whilst the speaker is quite capable of making itself heard, it is very quiet and unobtrusive, and looks, as it really is, an integral part of the decoration creating a pleasing harmony delightful both to eye and ear.

G C. B.

Keep on Saying DARIO for Radio
See page 1213.



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PLEASE MENTION "POPULAR WIRELESS" WHEN REPLYING TO ADVERTISEMENTS

NO collection of favourite circuits would be incomplete without an example of that fascinating little scheme the Filadyne, and accordingly we are devoting this week's White Print to a good standard arrangement of one of its later forms.

The Filadyne proper is fundamentally a detector valve circuit, of course, but we have actually provided for a two-valve receiver in design by adding a single transformer-coupled L.F. stage.

Thus you will be able to work a loud-speaker on the stronger stations and be sure of really adequate strength on the 'phones from the others.

Transformer Ratio.

There is little out of the way in this L.F. stage, so we will clear it off first before we begin on the unconventional parts of the circuit. It is a standard transformer-coupled stage, except for one point of detail. This is that the transformer is a high-ratio one (about 6 to 1) instead of the usual low-ratio type commonly chosen to follow a detector valve.

The reason is to be found in the special connections of the detector valve, which cause it to function best with a high ratio of transformation, i.e., as though it were quite a low impedance valve. An ordinary low-ratio transformer could be used, but the volume would not be quite so great as with the recommended type.

The Filadyne circuit is a most interesting scheme, due to the Technical Editor, Mr. Dowding, and its exact mode of functioning has never been fully explained. This little element of mystery is one of its attractions, for in such cases there is always the possibility that experimenting will lead you to stumble upon a modification giving still better results even than the known forms of the circuit.

Remarkable Sensitivity.

Apart from this factor, however, it possesses very special merits of extraordinarily high sensitivity, besides the fascination of using a valve in a completely unconventional way.

Space will not permit us to go into its details at all fully here, but an examination of the circuit diagram will give you a general idea of the curious "upside down" way of using the detector valve, which is responsible for the remarkable properties of the circuit.

Instead of the signals being applied between grid and filament, as in normal detector circuits, they are applied, in effect, across filament and

THE "P.W." "WHITE PRINTS."

A NEW SERVICE FOR OUR READERS.

White Print No. 11. :: :: A Filadyne Two-Valver.

This week we publish the eleventh of our White Prints. This page may be easily and safely torn out—along the dotted line overleaf—and the White Print filed. In due course you will thus have available an encyclopaedic collection of the best circuits used in modern radio practice. A "White Print" will be published on the last page every week in "P.W." until further notice.—THE EDITOR.

plate. Further, the filament is the high-potential point, instead of being earthed, while the plate is the low-potential point so far as H.F. voltages are concerned.

To permit the filament to be kept "up in the air" in this fashion it is isolated by means of a special arrangement of the tuned circuit, which is placed in series in the filament leads, and acts as a choke in each. (Actual chokes were used in the earlier forms.)

is usually found that this potentiometer should be kept somewhere near the positive end, so the object should be to set the reaction coil so that the receiver just oscillates with the potentiometer thus placed; and make all further adjustments on the latter.

Adjust Filament Current Carefully.

Another peculiarity of the circuit is that the detector requires to be run at a much lower filament current than normal, and this point requires a good deal of testing to get things just right. H.T. adjustment on the detector is also important, and will generally be between 20 and 40 volts.

Coil details follow: L₁ and L₂ each have 50 turns of No. 24 D.C.C., and are wound in opposite directions with a space of 3/8-in. between on a tube 4 in. long and 4 in. diameter. L₁ has aerial tapplings at 5, 10, 15, and 20 turns. L₃ (reaction, sliding inside L₂) has 25 turns of No. 34 D.C.C. wire, in the opposite direction to L₂ on a short piece of 3 in. diameter tube.

Correct choice of the detector valve is absolutely essential in the Filadyne, since its requirements are peculiar, and it will only work at all well with certain special types. Originally, these varieties were found suitable: D.E.3, D.E.2 L.F., D.F.R., B5, D.R.2, etc., but these are now obsolete and not many constructors will have them.

Choosing a Valve.

Among modern types these examples have been found suitable: Cosmos "short-path" H.F. valve (2-volt) and Dario "super H.F." (2- and 4-volt). One of these, or something which you have found by test to function as well, should, therefore, be used.

For the L.F. stage just the usual type should, of course, be used, i.e. one of the L.F. or small power type, with 100 to 120 volts H.T. and correct grid bias.

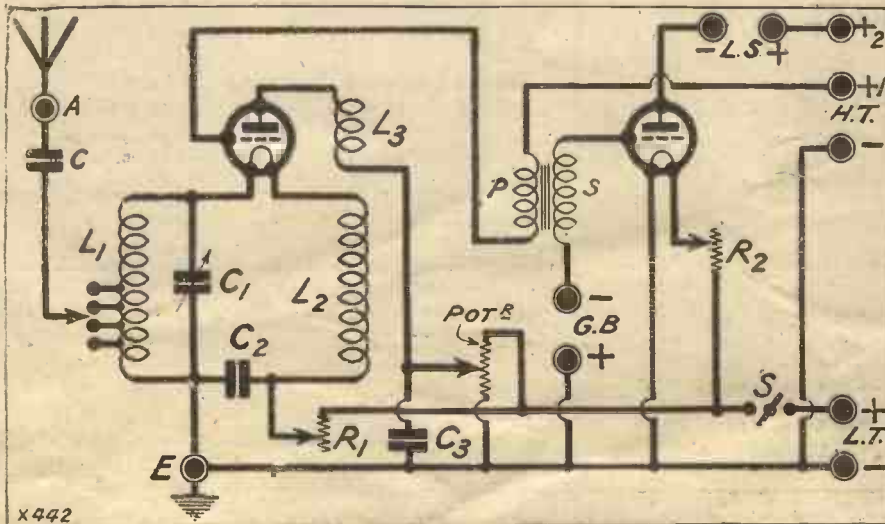
A point to be noted in making the operating adjustments on a Filadyne Receiver is that the settings of filament current, H.T. voltage and potentiometer are all related. Hence, when you alter one of these factors it is as well to re-adjust each of the others to match before deciding whether the new setting is an improvement or not. A small point, it may be, but an important one.

COMPONENTS.

- 1 Panel, 14 in. x 7 in. x 1/4 in. or 3/8 in.
- 1 Cabinet to fit, with baseboard 10 in. deep.
- 1 .0005-mfd. variable condenser.
- 1 On-off switch.
- 1 200- or 400-ohm panel-mounting potentiometer.
- 2 Spring valve holders.
- 1 L.F. transformer, ratio about 6 to 1.
- 2 Baseboard rheostats, 30 ohms.
- 1 .0002-mfd. fixed condenser (C₁) on diagrams.
- 2 .001-mfd. ditto (C₂ and C₃).
- 1 Terminal strip 12 in. x 2 in. x 1/4 in.
- 9 Terminals.
- G.B. plugs, flex, tapping clip, wire, screws, materials for coils, etc.

The grid of the valve is used as a plate (or more correctly, as an anode), while reaction is obtained in a special manner. It is found that a small positive bias on the true plate helps the valve to function more efficiently, and this means that a small current will flow here which can be used to produce reaction.

A reaction winding is accordingly in-

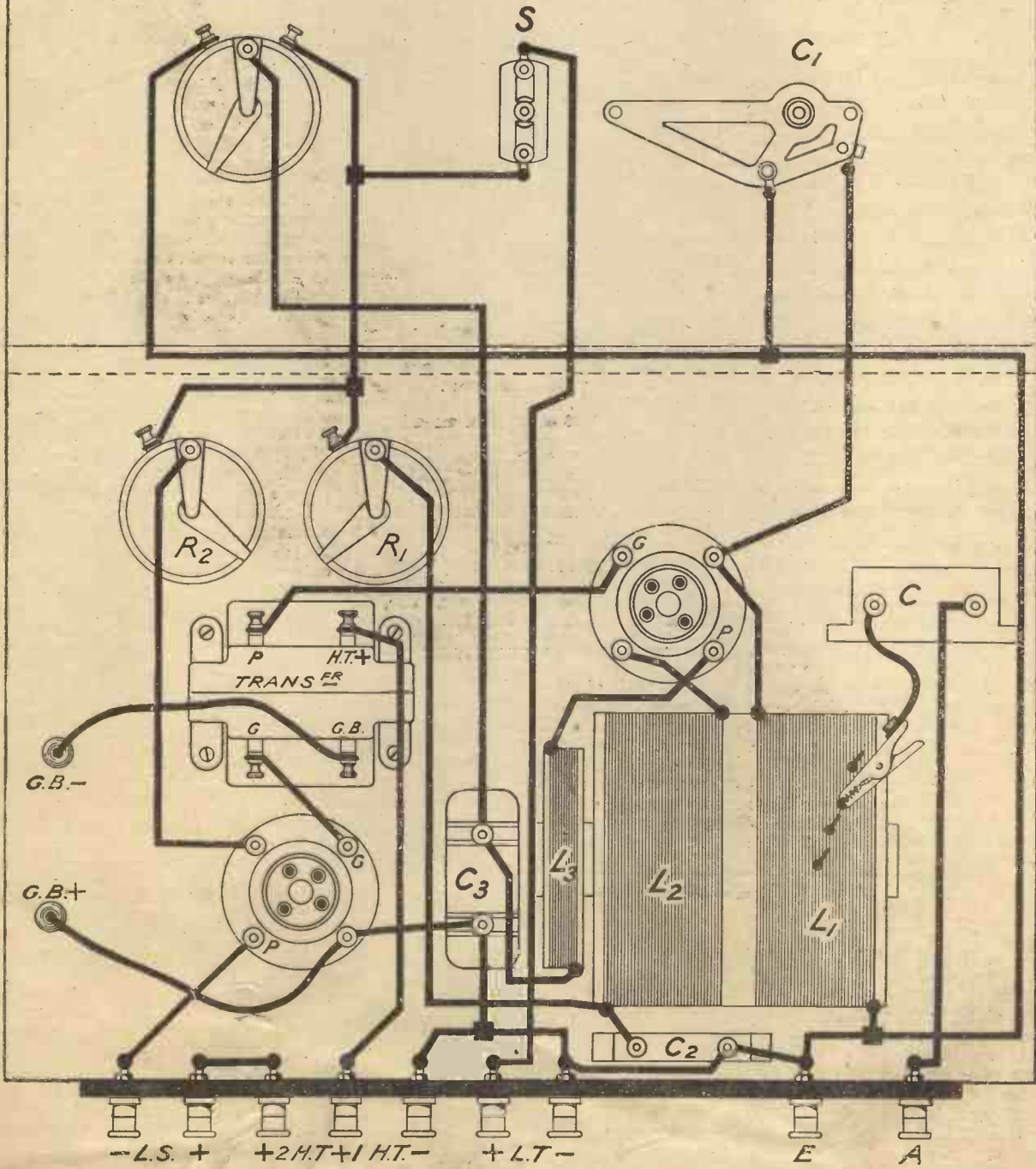


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PANEL 14"x7"

POTENTIOMETER



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The secret lies in the wonderful Mullard P.M. filament—the filament that is four years ahead in design and construction. It is the heart of hearts of your set, this wonder wire within every Mullard valve, and the difference it makes—well, buy a set of Mullard valves and hear for yourself.

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