THIS WEEK—MORE ABOUT THE S.T.500

Radio Step-by-Step

Popular Wireless

No. 596.
Vol. XXIV.
November 4th,
1933.

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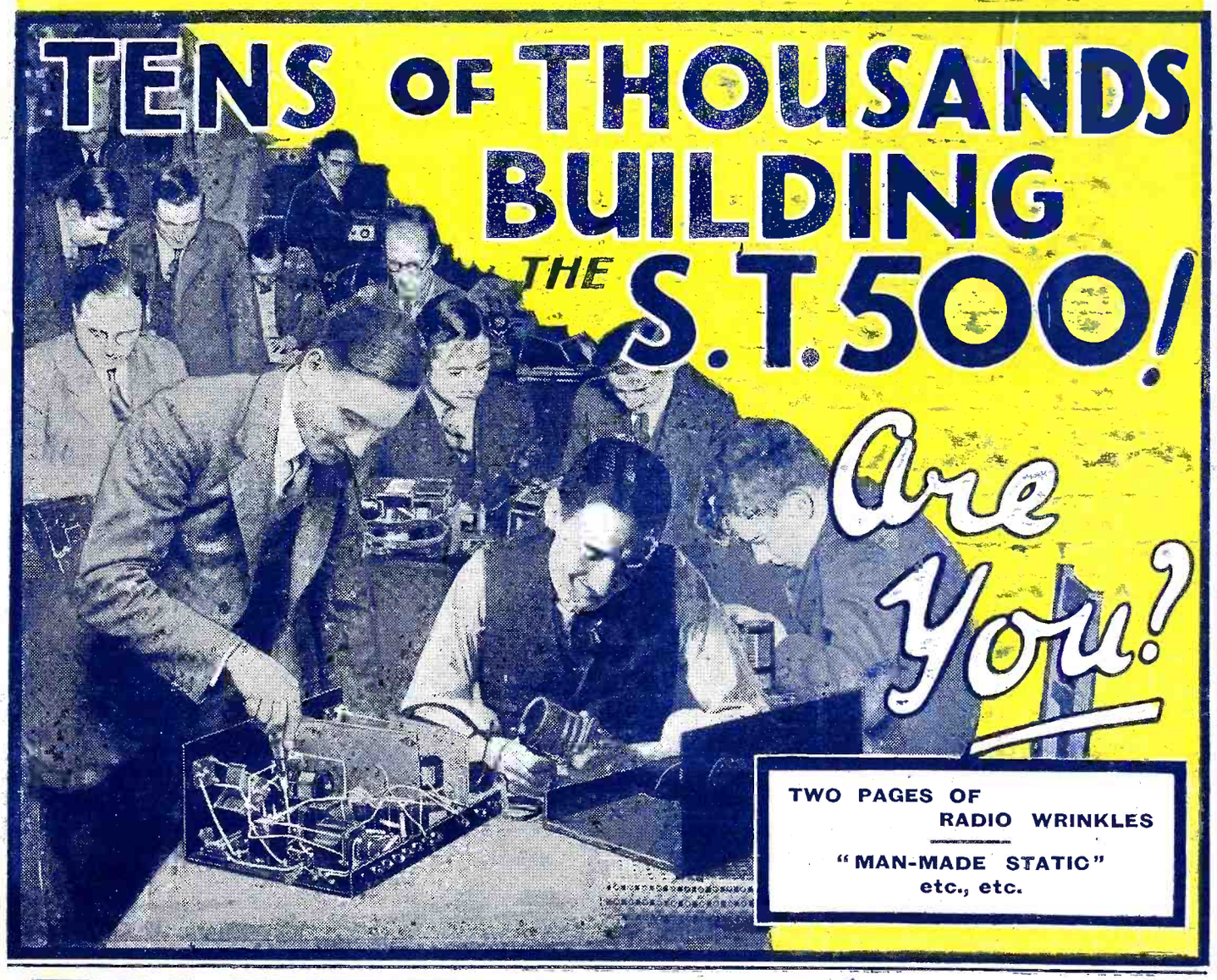

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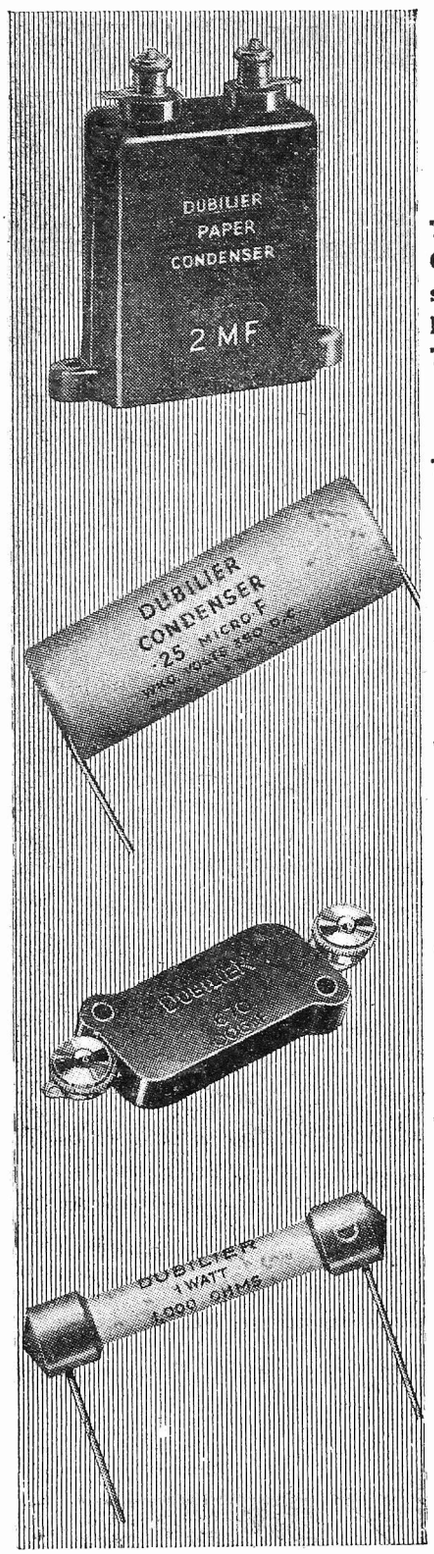

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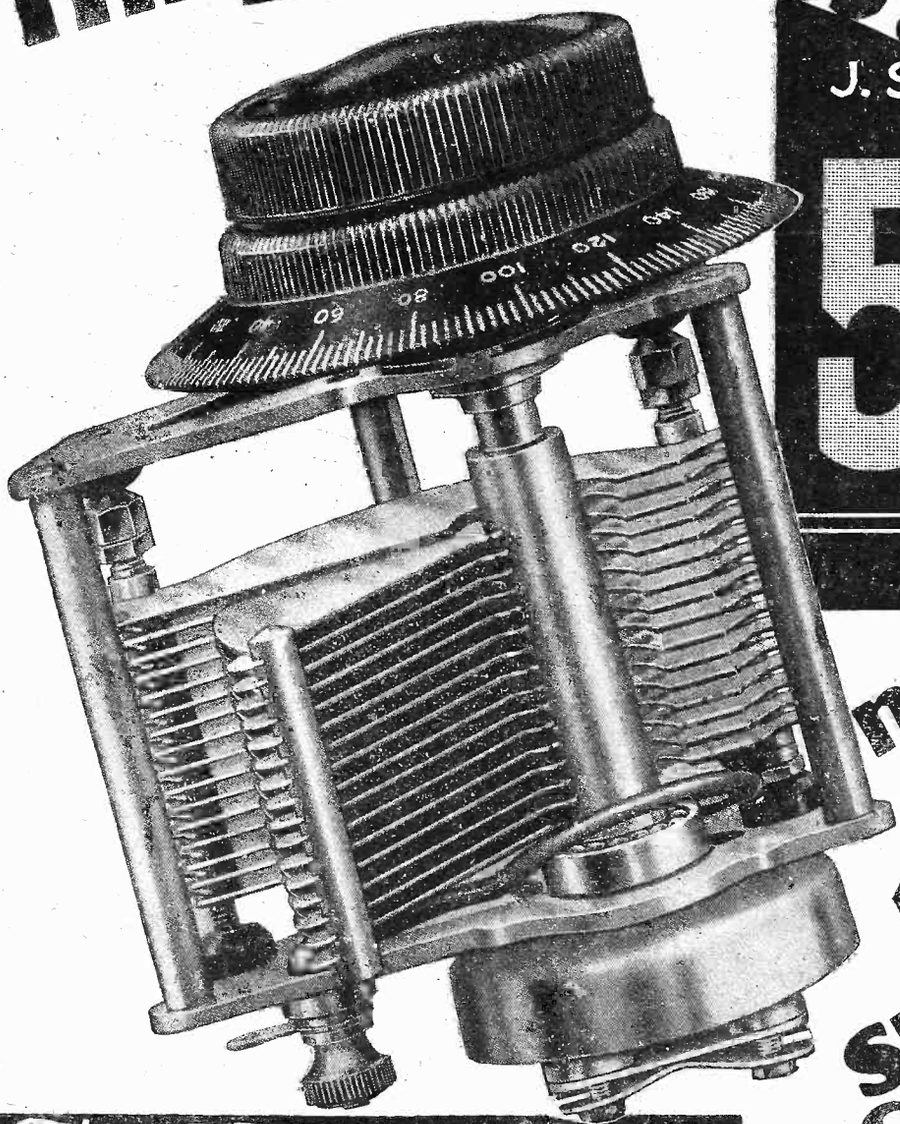
J. SCOTT-TAGGART'S S.T. 500



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Look carefully at the two forms on this page. First of all you must write your name and address on Form 1, which is just an ordinary label, on which you must stick a ½d. stamp. Then fill in Form 2, which is your reservation form. Then send these two forms to POPULAR WIRELESS. When they are received in our office, you will be sent a Gift Voucher on which to qualify for your "Manual of Modern Radio."

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Apply for your copy of "THE MANUAL OF MODERN RADIO" while there is STILL time. The demand is tremendous, and our great presentation offer must be withdrawn after this week. Don't miss this FINAL OPPORTUNITY.

Every radio enthusiast needs this book; it is a sure guide to knowledge and success in everything connected with the technical side of wireless, written by a man whose qualifications are unrivalled, the greatest living expert in set designing to-day.

It is seven years since Mr. John Scott-Taggart has found time to write a wireless book. His "Manual of Modern Radio" is a monumental work—a landmark in the literature of wireless technique. Within its pages he has brought the whole art of radio reception and the use of valves.

The Manual is "red hot" as regards recent developments. If you are interested in such things as H.F. Pentodes, Iron-Core Coils, the Double-Diode Pentode, Cathode-Injector systems, Metal Detectors, Class B Amplification, the Capehart Circuit, Metal Valves, Quiet Automatic Volume Control, the Pentagrid—here in this book will you find all you want to know.

But if, on the other hand, you are a novice who would like to know a little about "how the wheels go round," here again is the book for you. Scores of circuit diagrams are duplicated in pictorial form to help the beginner, and it has been assumed that the reader knows nothing whatever about electricity or science. All one needs is the ability to read.

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THE FIRST AND FOREMOST RADIO WEEKLY FOR THE CONSTRUCTOR & AMATEUR EXPERIMENTER

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AN APPEAL FOR SPEAKERS
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BLIZZARDS AND PENGUINS

RADIO NOTES & NEWS

THE NEW NO. 10
PRESERVING BEAUTY
ELASTIC AERIAL LEADS
HUNTING THE PIRATES

Old Loudspeaker Wanted.

OUR Mr. F. Briggs, who has lent the Science Museum a complete amateur transmitting station, has been asked by the Museum whether he can give or lend to it one of the original "Brown" loudspeakers.

He is unable to meet this request, and would be grateful if some kind reader who owns one of these speakers, *in working order*, would send it to him at Tallis House for presentation or loan to the Museum, which is trying to arrange a demonstration of the early types. Gentlemen, I thank you.

That Copyright Case.

ALTHOUGH the Court of Appeal has decided that to reproduce broadcast music in public constitutes an infringement of the copyright, the Performing Right Society has intimated that it does not intend to concern itself with such reproduction in instances when it is done by traders solely for the purpose of selling radio apparatus.

There is a wide difference between such performances and the use of wireless merely as an additional attraction in an hotel or restaurant, and the announcement of the P.R.S. must come as a great relief to wireless traders.

The Wireless League.

I HAVE received for review the Handbook of the Wireless League, price sixpence. The League, which was founded in 1925, has most desirable and praiseworthy aims and a distinguished backing, its chairman being the Hon. Sir Arthur Stanley, C.B.E., C.B., M.V.O.

The Handbook of thirty-six pages explains those aims and includes much other information pertinent to the keen listener and radio enthusiast. Very substantial, practical benefits are offered to members, either "Full" or "Associate." For details apply to 12, Grosvenor Crescent, London, S.W.1.

East Writes to West.

SIR OLIVER LODGE has received a letter from a Mr. Abdelnoor, of Cairo, who claims to have written the first book on radio in the Arabic language. In asking Sir Oliver for a photograph of himself he says: "I have very quickly, not only felt acquainted with the scientists who have contributed to the subject of wireless, but have accumulated an inner admiration and friendship towards them.

"This sensation of love and respect has made me venture to write and request to be honoured by a signed photograph of your honour." Yes, that's all right, but what puzzles me is why our appreciative friend's first name is "Edmund."

"P.W." LEADS!

As we go to Press with this issue we are informed by our Publisher that the circulation of "Popular Wireless" for week ending October 21st exceeded

242,500

Economy Note.

I FORGOT to mention that in this month's "Wireless Constructor" there are two especially noteworthy economy articles, and as economy is still the order of the day I shall do you a service by inviting your attention to them.

Firstly, Victor King has a lot to say, in relatively few words, about "The New Economy Circuits"—a provocative article which is well worth a radio club's time as the subject of a debate. You, in private, can chew it over and get all the "goodness" for yourself.

Next, you have a working article on the "Constructor's" Two, a model of inexpensive efficiency which incorporates one of the new iron-powder-cored inductance coils—the article tells you why.

Evidence of Recovery.

AT a jolly luncheon given by Exide's in connection with the Motor Show I was much cheered by a couple of glasses of—that is, I mean to say by the remarks of Mr. D. P. Dunne, the managing director, who stated that the mighty Exide works at Clifton Junction were fully occupied in spite of the number of cheap batteries available.

He added that the condition of their export trade indicated a very definite trend towards trade recovery. Unless Ruritania goes to war with Mars—I use these names at random—I think that Britain, having already regained its position as the world's financial centre, will be predominant in trade in five years.

"P.W." Slips Up.

SACKCLOTH and ashes! We beat our bosoms and scrape ourselves with potsherds! We nuzzle the dust! All because A. G. A. (Pembroke Dock) has convinced us that we have omitted to publish details of a most important circuit. He observed a "set," called the "Human Analyser," which for the sum of one penny would read the character of the penny-giver "in a hoarse voice." Inside the set he saw some "P.W." dual-range coils.

Hence he demands: "Why was the circuit not published in 'P.W.'?" A fair cop, guv'nor! But perhaps our Mr. Dowding will vindicate us by designing a character-teller which will deliver its verdict in his best valvonium tones.

(N.B.—Oh, A. G. A., I agree with you about the B.B.C., but if it's not the B.B.C. then it's earache or taxes or gas-bills!)

Broadcasts from the Antarctic.

THE Byrd Antarctic Expedition, which has recently sailed, proposes to try to link up with the Columbia Broadcasting Company and so broadcast voices of its members all over America. Hot stuff! If this project is successful it will be a triumph of radio engineering, for the power available at the start will be only 1 kw., plus blizzards and penguins.

The first step is one of 4,000 miles, to Buenos Aires. There the output will be stepped up and retransmitted to New York, whence the broadcast will be delivered.

(*Continued on page* 423.)

TENS OF THOUSANDS

LAST week I was discussing the reason why I did not use the latest types of coil in the "S.T.500."

The factory type of set has recently been helped by the introduction of iron-cored coils, which are very useful, but only, in my opinion, in certain directions.

Better than the Best

I tried out very fully the use of iron-cored coils. Probably many of you who are reading this article on the "S.T.500" expected an up-to-the-minute set to embody the latest type of coil. In the search for simplicity I even ordered a special coil to be made which was unsuitable for ganging owing to its high efficiency, but gives good results when tuned by a separate condenser. The results obtained, however, were totally inadequate. The ordinary air-inductance coil with reaction applied in the manner adopted in the "S.T.500" gave an efficiency 5,000 per cent better than the best iron-cored coil.

This improvement is terrific. The use of multiple reaction was first proposed in my British Patent 232,659, and the improvement in H.F. amplification technique has at last enabled the advantages from it to be fully obtained. Two stages of reaction were employed in my last set, the "S.T. 400," and the selectivity thus obtainable has been tried by constructors all over the country.

Where Losses Occur.

The results, however, are even more striking, both from the point of view of selectivity and signal strength, when the reaction is applied in the manner of the "S.T.500" circuit, where the reaction is not distributed between the two circuits, but is individually applied to each. Actually this makes for very much greater simplicity of operation and the reaction is smoother.

Since reaction on the anode coil was capable of producing all the efficiency there desired, my concern as regards iron-cored coils was simply for the aerial circuit. The greatest losses in the whole set occur at this point, and I proposed to try an iron-cored coil to see if this would remedy matters. The improvement obtained by the use of an iron-cored coil was small.

It may be pointed out that I was using a comparatively large unscreened aerial coil and the iron-cored coil, of course, shows up to its best advantage when compared with the small screened type of coil, essentially inefficient, which is favoured by most set designers both for commercial sets and for constructors' receivers.

EXPLODING A FALLACY

The S.T.500 is unique in its ability to combine high sensitivity with a large reserve of selectivity. Previously, designers have accepted as an inviolable law that selectivity can only be gained at the expense of sensitivity. Mr. Scott-Taggart has proved the fallacy of this contention, and explains to "P.W." readers the new revolution in radio and its application to the S.T.500. He tells you all about it here.

When I applied reaction to an ordinary air-cored coil the improvement was amazing. No one who has never tried out such a test with double reaction can appreciate the extraordinary increase in volume accompanied by amazing selectivity. No one who has tried the experiment would consider for a second the use of an iron-cored coil. To do so would simply be playing with the problem instead of solving it.

No one would use a putty knife to cut a thin slice of bacon, yet this is exactly what one does with an iron-cored coil. I readily admit that such coils, in circuits where no reaction is applied, are definitely better than the usual comparatively inefficient air-cored coils, but the overwhelming superiority of a coil with reaction applied to it is startling.

All of you know how on a det. and L.F. receiver signals and selectivity are enormously increased by the application of reaction. (The effect on such a set is more noticeable than when an H.F. stage is employed, because in the latter case some inherent reaction is probably already there.) It is just that improvement which is obtained in the

BUILDING THE S.T.500!

"S.T.500" on *the aerial circuit*, and also on the output side of the H.F. valve. The benefits of reaction are repeated. Is it any wonder that the "S.T.500" gives such highly selective and sensitive results?

Such results are only obtainable by the use of an extra reaction control. It is the simplest thing in the world to adjust it. It is done in exactly the same way as the ordinary reaction control, and anyone who can work this can adjust the aerial reaction when it is needed.

To obtain all the benefits of reaction twice over must, and actually does, give such vastly superior results that the little extra trouble in tuning is well worth while, and it is here that the home constructor can gain hand over fist over the factory-built set of the same general type.

But if you do not wish to use this control, no one on earth can make you do so! The mere sight of the knob on the panel is not going to disturb your equilibrium so much that you will be incapable of operating the essential controls, namely the tuning dial and the anode-reaction knob. A bicycle with a Sturmey-Archer gear is no worse and no more difficult to ride than an ordinary bicycle, even if the gears are not fully used. The full benefit of the gears will not be noticed perhaps until a hill is reached. There are plenty of hills to climb in radio.

I have spent thousands of words in explaining why different conditions require additional controls, and why new technical inventions can be employed when one departs from the simplicity frame of mind.

But I have said little as regards the need for reserves of selectivity. The invariable rule in radio receivers, except in so far as reaction is employed, is that as the selectivity is increased the volume is reduced. This unfortunate see-saw results in the design of sets so as to give a fair proportion of selectivity and a fair proportion of sensitivity. You can only increase one at the expense of the other. In the "S.T. 500" you can control both.

When Sensitivity is Needed.

The conditions which require sensitivity are:

(1) Poor aerial of small size.
(2) Daylight reception.
(3) Reception in remote districts.
(4) Reception in districts notorious for bad reception.
(5) Where the receiver is stationed a considerable distance from a B.B.C. station.
(6) When the foreign station to be received is on a part of the dial which is not subject to heavy interference from the B.B.C.
(7) Where a foreign station is flanked by comparatively weak neighbours.

In all these circumstances you can "let the set out" without any reaction at all; you can increase signal strength by turning aerial and anode couplers more to the right.

Baffled Set Designers.

This autumn you will have offered to you by the various wireless papers a variety of set designs each clamouring for your patronage. Some of these sets have already appeared. And I do not fancy the task of the average constructor in choosing his set. Although I have had a wider experience probably than any other designer in this particular field, I cannot claim to say what the average constructor regards as a desirable set.

Set designers themselves are baffled by the public's attitude. A designer once popular may suddenly find himself eclipsed, and his set a damp squib. If such a state has not befallen me, I think it is because I am not pre-occupied with wondering whether the set will be a success or a failure and whether the public will like or dislike it.

WRITE TO ME!

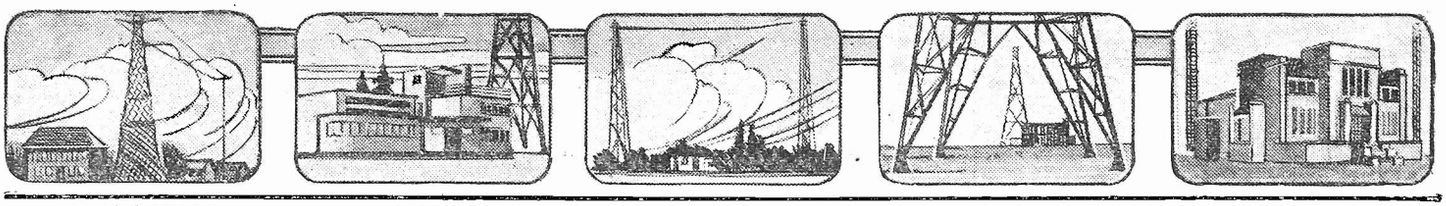
I am not simply describing the S.T.500 and leaving it at that. I want you to have very real service and to have the confidence that "Popular Wireless" will help you to the utmost to get the very best out of your S.T.500.

Owing to the great volume of correspondence I may not be able to deal with every letter personally, but I am in the closest contact with the "P.W." Service and Query department.

Write to me of your successes, I shall be as glad to hear of them as I have been to help you to achieve them.

JOHN SCOTT-TAGGART.

SENSITIVITY

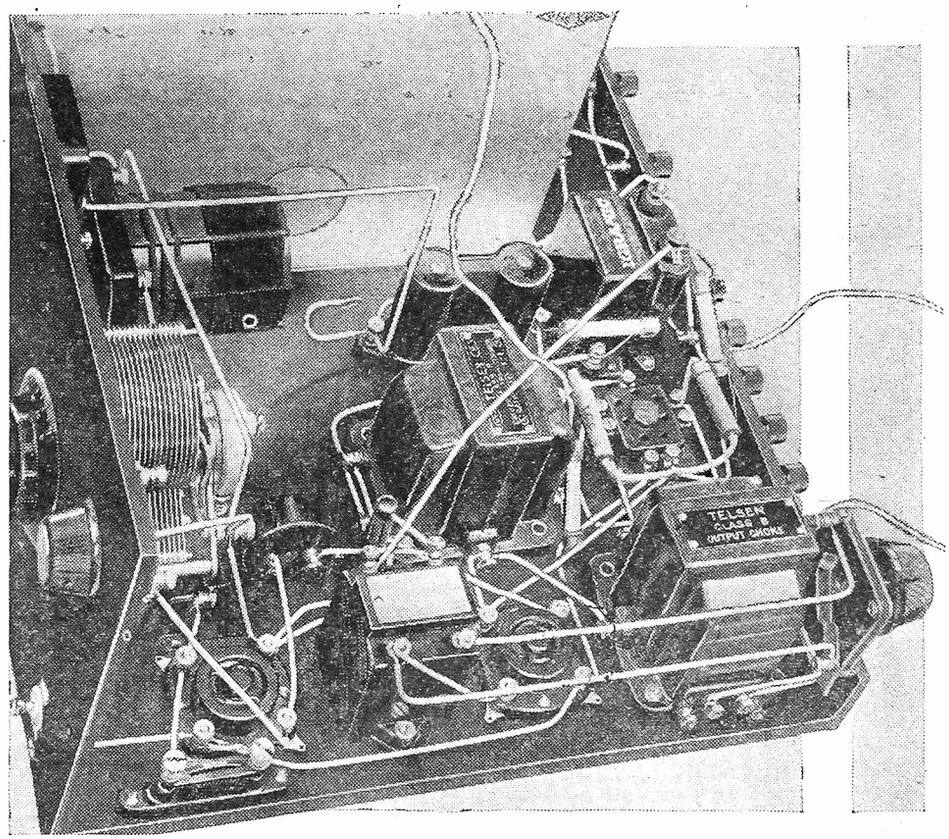


The designer who panders to what he imagines is public taste will find that the wireless constructing public will most ungratefully throw him over unless he can continue to deliver the goods.

This may seem like erratic and capricious behaviour, but actually the wireless public, as far as home constructors are concerned, is hard headed and will not tolerate a failure.

As soon as one begins wondering whether the public will like or dislike one's set, it is inevitable that sacrifices will be made in order to conform to what one thinks the public wants. Every now and again the wireless constructing public will turn and follow false gods. The designer who brings them back to a true, even though somewhat different faith, has the opportunity of achieving a great success.

ASTOUNDING VOLUME DUE TO PERFECTED CLASS B



An outstanding feature of the "S.T.500" is that it can deliver glorious volume without a trace of distortion. Perfected Class B and a good layout of the L.F. stages are the secret.

The "S.T.100."

My own experience is that wireless constructors will always consider a closely-reasoned proposition, even though it may fly in the face of all their existing ideas of what is right and proper in a set. Those of you who have known my set designs since 1923, and the many circuits I published long before that date, will find no real link between the different phases, and current practice.

In February, 1919, I published in the "Electrical Review" the tuned-anode-with-reaction circuit which was to sweep the country in later years. It was several years before its time, but it brought alive an extremely useful arrangement in the face of a whole multitude of possible circuits. Certainly no commercial receiver or Service set embodied the circuit, simple as it was. Curious as it appears now, the aperiodic H.F. amplifier was then the vogue.

In 1923, the "S.T.100" was the first of the nationally-built broadcast receivers for home construction. It was built in such huge numbers that it must have been of considerable influence in popularising broadcasting. The circuit arrangement was of the reflex type, a circuit quite unlike what everyone who had a wireless set was using.

In 1925 and 1926 was perfected the Neutrodyne circuit which was embodied in two famous receivers, the "Elstree 6" and the "Solodyne," which were first developed by my Elstree Laboratories. The one-knob vogue dates from the introduction of the "Solodyne." When, on January 15th, 1932, I introduced the "S.T.300" after a long absence from radio journalism, everyone was astonished to find that I, who had been the high priest, so to speak, of simplified control, should go to the other extreme and produce a multi-knob receiver. Those who saw the set before publication shook their heads.

"You'll never get the public to take to the idea of a lot of knobs. They will be scared stiff of them. What the public wants is something to work and easy to look at."

I was not intimidated. I was aware, of course, before I designed the "S.T.300" that there was a section of the public who wanted simplicity at all costs and a set at no cost. How else could one explain the enormous popularity of cheap, simple reaction receivers of the kind which were regarded by me as so definitely obsolete that I was prepared to lose large sums in support of my principles?

The extraordinary success of the "S.T.300" is common knowledge, while the "S.T.400" enjoyed an even greater success. This receiver was taken by me on a tour of Great Britain, during which I visited the whole country from Land's End to John o' Groats. Probably many of you have read about it in the "Wireless Constructor." The set was tested in different zones round the B.B.C. stations, and you are —in the "S.T.500"— profiting from the experience gained in constructors' own homes.

Double Reaction.

The keystone to the "S.T.500" as regards its selectivity is double reaction. A master patent for this invention was taken out by me on February, 1923, at a time when there was comparatively little interference and when the underlying idea could not be carried out to the best advantage because screened-grid valves were not introduced. Later the popularity of one-knob control and so-called simplified sets ruled out immediately the possibility of introducing reaction into more than one circuit.

During the last eighteen months, I have concentrated on the development of my original invention and by up-to-the-minute modifications have developed it out

The S.T.500 Defies the Coming Ether Chaos

of all recognition. Reaction has probably proved a greater friend to the wireless constructor than almost any other invention in connection with the valve. Stations which normally are inaudible can be built up to great strength by applying reaction, the principle being that the incoming oscillations are amplified, the amplified oscillations being then fed back on to the original ones in such a way as to strengthen them. The new strengthened oscillations are then amplified and again strengthened, and the process is repeated until very strong signals indeed are produced; the effect is actually practically instantaneous.

Building Up Signal Strength.

If the reaction is increased too far, the circuit will oscillate of its own accord independently of any incoming signals. "Oscillation" represents the extreme point of reaction and the efficiency of the adjustment depends on how near one can get to oscillation without oscillation actually taking place. Smooth reaction is therefore essential to the obtaining of the maximum benefit, but even under the most crude conditions of operation, reaction will increase signal strength of weak signals several hundred times.

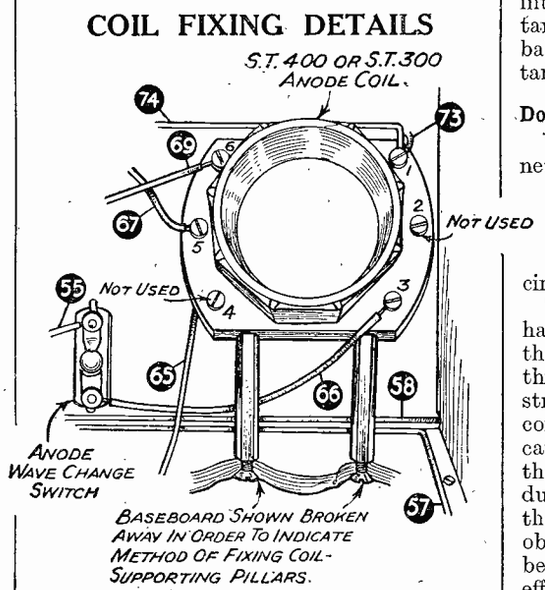
The benefits of reaction, however, are not limited to the building-up of signal strength. An even greater advantage is that selectivity is improved. In all tuned circuits there are losses in the inductance and in the condenser, particularly in the former. A resistance of 10 ohms, representing the high-frequency losses, will cause a big reduction in signal strength and selectivity.

Increasing Coil Efficiency.

The electric currents swing backwards and forwards in a tuned circuit in much the same way as the pendulum of a clock or the balance wheel of a watch. The effect of a rusted suspension may well be imagined. If we could mount a pendulum so that there were no losses, if a tap were given to it, it would go on swinging for ever. We cannot do this, but we provide a pivot with as little friction as possible, and we can lubricate it. Since, however, a pendulum would very soon come to rest, we have to keep it moving by giving it regular little taps and this is done by means of the mechanism of the clock or watch.

In a wireless tuned circuit we can increase the selectivity and signal strength to some extent by increasing the efficiency of the coil; we can increase the surface area of the wire, space the wires, use a low-loss former, and make the coil of generous size.

More recently, we have wound the coil on a core of powdered iron which enables



The anode coil is supported by pillars, which are fixed by screws passing through the baseboard.

us to use a smaller amount of wire, although losses are increased in other directions, but not to the same extent as the improvement. Iron-cored coils are about half as efficient again as air-cored coils of about the same size, but are little better than the best air-cored inductances.

Before reaction was invented, the design of efficient coils was of paramount importance, but the most elaborate struggles to increase the efficiency of a coil pale into insignificance when compared to the vastly greater effectiveness resulting from the application of even a small amount of reaction.

Improving the coil is like oiling the pivot of a pendulum, while reaction is like giving a knock now and again to the pendulum to keep it swinging. Since one is going to keep the pendulum swinging by applying energy from a local source there is little point in taking elaborate precautions to reduce losses in the pendulum; it is so easy to balance them out.

Where no reaction is employed, as in the case of most band-pass tuners, the iron-cored coil possesses distinct merit, but when reaction is applied resistance losses tend to disappear altogether. Reaction introduces what is known as negative resistance into a circuit, and may be made to balance out the positive or ordinary resistance of the circuit.

Don't Be Caught By a Catchword.

When the resistance is completely neutralised, the valve will oscillate, so that in the state immediately preceding oscillation the resistance of the circuit has been kept down to an extremely small fraction of an ohm and the circuit has become highly selective.

The manufacturers of iron-dust coils have, on the whole, been quite moderate in their claims and have made no attempt to throw some of the dust in the eyes of constructors. Although the words "iron core" are going to constitute the new catchword in radio, it is to be hoped that their readers will not be caught. The introduction of an iron-core is merely a drop in the ocean compared to the benefits to be obtained from reaction, even if the reaction be applied in the clumsiest and most ineffective manner.

Since reaction is only applied on one circuit in the usual set, there is plenty of scope for the most efficient types of iron-cored coils. A hundredth part of a loaf is better than no bread. Since I am giving you the whole loaf in the "S.T.500," the *relatively* insignificant advantages of iron-cored coils are comparable to holding up a candle to the sun.

Discrediting a Useful Invention.

Using iron-cored coils in the "S.T.500" would have been like giving a ham sandwich to an alderman ten minutes before a banquet at the Mansion House.

If you like, you can use iron-cored coils in the "S.T.500," but if you do I shall regard you as the type of person who would push behind a steam roller in order to help it along.

Some astonishing claims have been made for simple reaction sets using the iron-cored

A Signal-building Scheme that Improves Selectivity!

coils. I am very much afraid that those who encourage such a fallacy will bring discredit on quite a useful invention. Meanwhile, what coil manufacturer has thought it possible to leave off a reaction winding on an iron-cored coil? The use of an iron-core may necessitate a slight decrease in the amount of reaction used, but reaction currents are cheap enough in all conscience. They are normally a waste product.

Double Reaction's Double Benefits.

The extraordinary benefits of reaction are frequently under-estimated in the case of sets using a stage of H.F. amplification. This is because there is always some inherent or latent reaction effects which result in there being considerable reaction even with the knob intentionally at zero; under these circumstances, there is less scope for improvement when the reaction is increased. The best type of set in which to prove the benefits of reaction is the simple detector and reaction valve, followed by one or more stage of L.F. amplification.

Reaction is nearly always applied by the detector valve in a modern set to the tuned circuit preceding the detector. The multiple reaction system, however, applies all the benefits of reaction, not only to one tuned circuit, but to the others as well.

In a two-circuit receiver, it is customary to find that the aerial circuit tuning is flat, while the anode circuit can be made comparatively sharp by the aid of reaction. This is because circuit losses in the aerial circuit are left to do their worst, while in the anode circuit they are greatly reduced by reaction.

S.T.500 ACCESSORIES

LOUDSPEAKERS.—Blue Spot, W.B., Rola, R. & A., Epoch, Celestion, G.E.C., Atlas, Marconiphone, H.M.V., Ferranti, Ormond, Magnavox, Amplion. All above should be models suitable for Class B output valve used. In this case no output choke is needed in the set. Speakers only suitable for triode output necessitate the output choke in the set.

BATTERIES.—H.T.: Lissen, Ediswan, G.E.C., Ever Ready, Siemens, Pertrix, Marconiphone, Drydex, Hellesens, or Block H.T. accumulators.
G.B.: Ediswan, Siemens, Ever Ready, Lissen, Pertrix, Marconiphone, Drydex.
L.T.: Block, Lissen, Ediswan, Pertrix, Exide, Oldham.

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

This flat tuning is also experienced on all double circuit arrangements where reaction is applied to the second circuit. One designer even justified this flat tuning in the aerial circuit by saying that it assisted the search for foreign stations!

This is, indeed, making a virtue of necessity. It is actually possible to design a set without tuning at all! It is extremely simple to operate. No fiddling knobs, no adjustments to make, no reaction. It has only one disadvantage: all stations come in at the same time.

The overall selectivity of a receiver is due to the cumulative effect of the various tuned circuits. One can only use a large number of tuned circuits of ordinary selectivity or a very few with very high selectivity. The latter type of circuit possesses very many advantages as far as the home constructor is concerned. Hitherto, with the exception of my own receiver, the "S.T.400," a very mediocre amount of selectivity on the aerial circuit has been attained.

Converting the Sceptic.

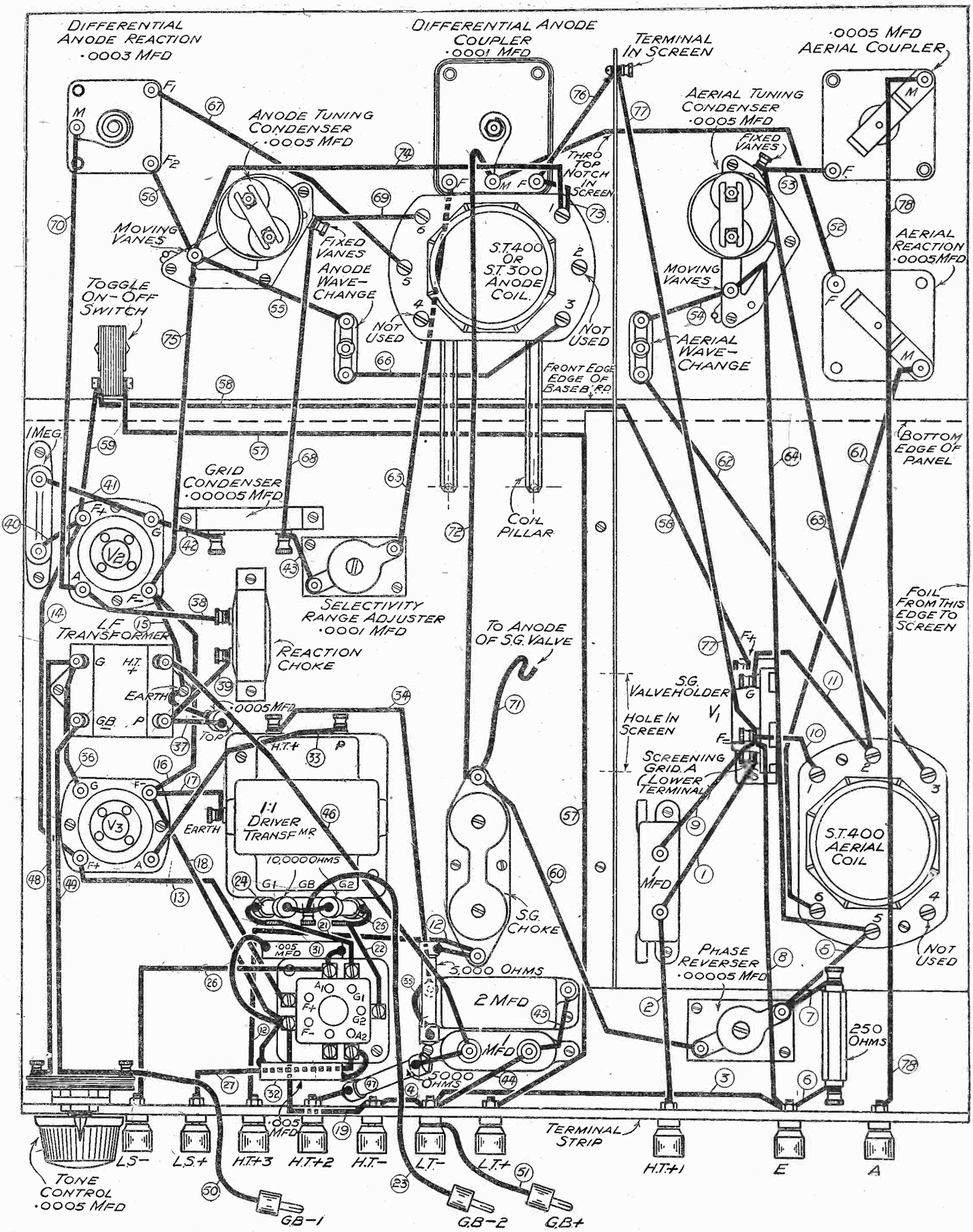
The merits of applying reaction to the aerial circuit are so easily demonstrated on both the medium and long-wave bands that no one who has seen the effect would hesitate a second before fitting the extra control necessary. The most hardened sceptic will be the most enthusiastic user of this control on the "S.T.500."

The ability to improve selectivity at will *while actually enhancing sensitivity* is bound to appeal to every class of listener.

J.S.-T.

COMPONENTS AND ALTERNATIVES AS OFFICIALLY APPROVED BY MR. JOHN SCOTT-TAGGART

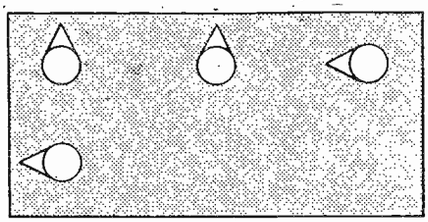
Component	Makes used by Designer	Alternative makes of suitable specification recommended by Designer
2 S.T. 500 coils (same as S.T. 400 coils)	Colvern	Telsen, Wearite, Ready Radio, Lewcos, Sovereign, Goltone
2 ·0005-mfd. tuning condensers	Ormond, type R.493	Graham Farish, Polar, J.B., Utility, British Radiogram, Telsen, British Radiophone
3 ·0005 solid dielectric (preferably log mid line) variable condensers	Graham Farish "Litlos" log mid line	Polar, Telsen, Ready Radio
1 ·0001-mfd. differential reaction condenser	Telsen, type W.353	Graham Farish, British Radiogram, J.B., Polar, Igranic, Ready Radio
1 ·0003-mfd. differential reaction condenser	Polar	Graham Farish, British Radiogram, Telsen, J.B., Ready Radio
1 baseboard preset, ·0001 mfd.	J.B., type 1088	Graham Farish
1 baseboard preset, ·00005 mfd.	J.B., type 1087	Graham Farish
1 Class B driver transformer	Telsen, ratio 1 : 1	R.I., Lissen, Ferranti, Varley, Benjamin, Wearite
1 Class B output choke	Telson	Ferranti, R.I., Lissen, Varley, Wearite, Multitone
1 L.F. transformer	Varley "Niclet," type D.P.21	Lissen "Hypernik," Ferranti, Telsen, Lewcos, L.F.T.6A, R.I. "Hypermite," Tunewell, Igranic, Multitone
1 S.G. choke	Telsen, type W 74	Graham Farish, Wearite, Lewcos, R.I. "Dual Astatic," Ready Radio, Bulgin S.5, Sovereign Super Amplion binocular
2 4-pin valve holders	Benjamin "Vibrolder"	Graham Farish, W.B., Telsen, Lissen
1 5-pin valve holder	W.B. "Universal"	Graham Farish, Lissen
1 7-pin valve holder	Graham Farish	Ferranti, Wearite, W.B., Benjamin
1 H.F. choke	Lissen, disc type L.N.5092	Graham Farish, Lewcos, Igranic, Telsen, Wearite, Amplion
1 1-megohm grid leak	Ferranti, synthetic type S.	Graham Farish, Dubilier, Erie, Ready Radio, "Thermion"
1 holder for same	Ferranti	—
2 5,000-ohms resistances	Dubilier 1-watt metallised	Graham Farish, Erie
2 10,000-ohms resistances	Dubilier 1-watt metallised	Graham Farish, Erie
1 250-ohms resistance	Graham Farish "Ohmite"	Dubilier, Erie
1 2-mfd. fixed condenser	Igranic	Graham Farish, T.C.C., Dubilier, Telsen, British Radiogram
1 1-mfd. fixed condenser	T.C.C., type 50	Graham Farish, Dubilier, Telsen, Igranic, British Radiogram, Ferranti
1 1-mfd. fixed condenser	Dubilier, type BB	Graham Farish, T.C.C., Telsen, Igranic, Ferranti
2 ·005-mfd. tubular condensers	T.C.C., type 300	Graham Farish, Telsen, Dubilier
1 ·0005-mfd. tubular condenser	Graham Farish	Telsen, T.C.C., Dubilier, Igranic
1 ·00005 mica condenser	Lissen	Graham Farish, Dubilier, T.C.C.
2 push-pull on-off switches	Lissen, type L.N.5070	Telsen, British Radiogram, Benjamin, Wearite, Tunewell, Bulgin, W.B., Ormond, Sovereign, Ready Radio
1 toggle on-off switch	Bulgin S.80	—
1-ply baseboard (16 in. × 12 in.) with Metaplex section	Peto-Scott	—
1 panel, 16 in. × 7 in. × ⅛ in.	Peto-Scott	Permcol, Goltone
1 S.T.500 screen	Peto-Scott	Magnum
1 terminal strip	Peto-Scott	—
1 bracket for ·0005-mfd. variable condenser (tone control)	British Radiogram	—
10 terminals	Belling-Lee, type R	Igranic, Clix, Bulgin
3 wander-plugs (G.B.)	Clix	Igranic, Belling-Lee, Eelex
4 wander-plugs (H.T.)	Belling-Lee	Clix, Eelex, Igranic
2 spade terminals	Clix	Belling-Lee, Eelex, Igranic
Connecting wire (glazite 20 S.W.G.)	Lewcos	—
Flex, screws, etc.	Peto-Scott	—
1 anode connector	Belling-Lee	—
Special cabinet	Peto-Scott	—



Constructors who build the "S.T.500," and decide, at the same time, to equip themselves with a new loudspeaker, should purchase a special Class B type. It is then unnecessary to include in the set itself the output choke shown in the original blueprint. To make absolutely clear the alterations required when omitting the choke, this black and white reproduction of the original blueprint is given. It differs from the blueprint only in regard to the omitted choke. On page 437 you will find the necessary alterations to the Rapid Construction Guide (published in the October 21st number) when the design is to be modified in this way.

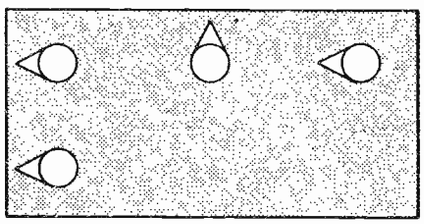
THE AMAZING FLEXIBILITY OF THE S.T.500 SIMPLY EXPLAINED

★ Aerial Coupler. ★ Anode Coupler. ★ Anode Reaction. ★ Aerial Reaction.

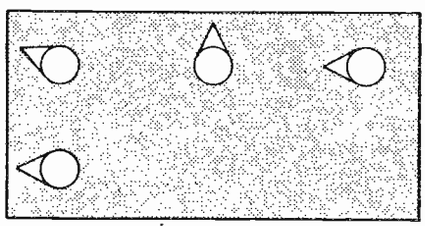


(1) All knobs at "normal." Loud signals; selectivity medium. Suitable for first tests, "local" reception and totally inexperienced users. Both reactions are at zero.

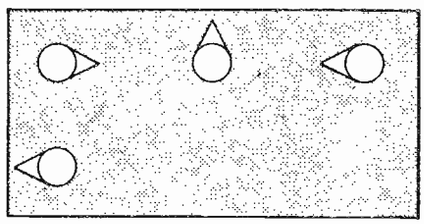
On the opposite side of this page are shown the names given to the controls. Wave-change switches are not given; they are pushed in for "Long" and pulled out for "Medium."



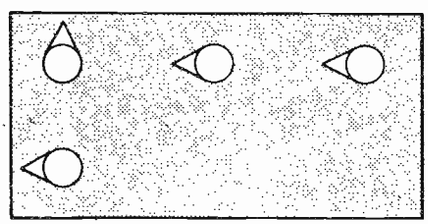
(2) Aerial selectivity is high, anode circuit selectivity medium. Signals weak. Aerial coupler has reduced volume. Both reactions are at zero.



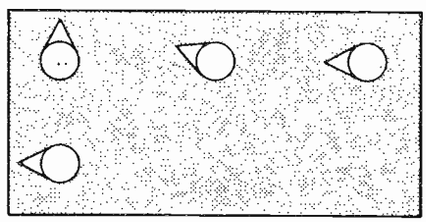
(3) As (2), but signal strength is greater because aerial coupler is increased; selectivity of aerial circuit slightly lower. Reactions still at zero.



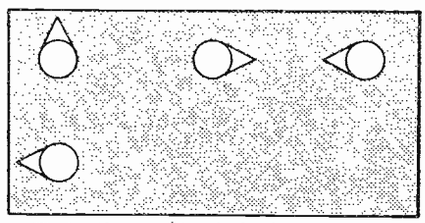
(4) Stronger signals than (3). Aerial selectivity poor. Suitable for daylight reception or very poor aerials. Reactions still at zero.



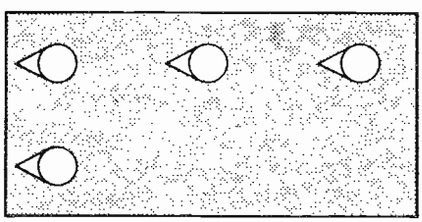
(5) Anode circuit selectivity good, but signals weak because anode coupler at zero. Rarely used. Extremely stable. No reaction used.



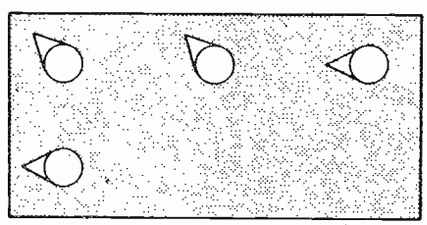
(6) As (5), but signals louder but anode selectivity rather less. Very useful for preliminary tests, local reception and totally inexperienced users.



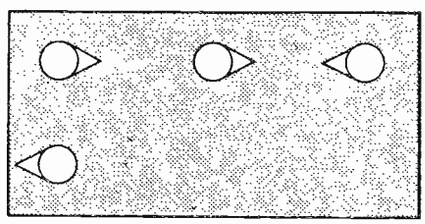
(7) As (6), but signals louder and anode selectivity at its worst. Set may be unstable with anode coupler at maximum. (Selectivity range adjuster may be reduced.)



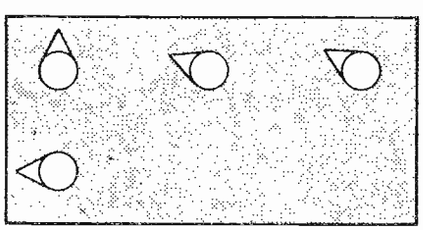
(8) Maximum selectivity (without reaction) and minimum signal strength.



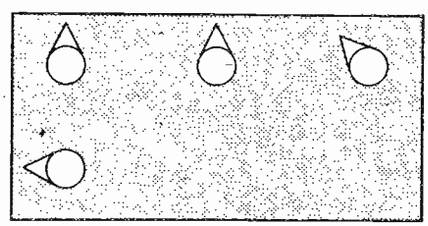
(9) Probably most usual best position of controls before applying reaction. Gives good selectivity and signal strength.



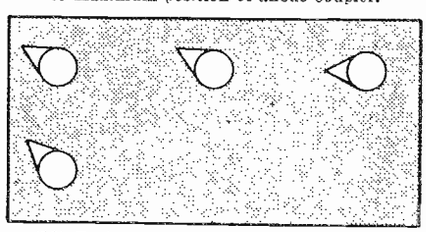
(10) Maximum signal strength before using reaction. Suitable for daylight reception, receiving long waves when little interference, poor aerials, etc. Set may be unstable owing to maximum position of anode coupler.



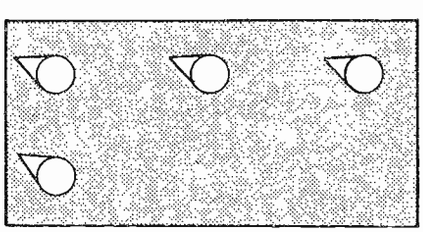
(11) Best arrangement for all-round work. High selectivity and signal strength. Anode reaction is in use. Control volume by aerial coupler.



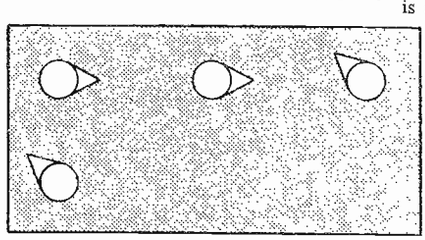
(12) As (11), but louder signals with slight reduction of anode selectivity.



(13) Best arrangement for demonstrating amazing effect on selectivity and signal strength of aerial reaction. Both couplers are kept partly to the left. Anode reaction is at zero.



(14) "S.T.500" operating to give superlative results as regards signals and selectivity. Double reaction is in use. Coupler positions may be tried a little more to right. In daylight, aerial coupler may be full right.



(15) Theoretical maximum signal strength obtainable with set. Anode coupler too far to right may, in some cases, impair smoothness of reaction.

82 STATIONS RECEIVED ON THE S.T.500

Below Mr. Scott-Taggart gives the dial readings of the aerial tuning condenser on the S.T. 500 for 82 long- and medium -wave stations. The wavelengths and kilocycles quoted were those actually in use at the time the dial readings were noted.

LONG WAVES

Wave-length	Kilo-cycles	Name of Station	Aerial Dial	Wave-length	Kilo-cycles	Name of Station	Aerial Dial
1875	160	Huizen	144	1411	212·5	Warsaw	94
1725	174	Radio-Paris	130	1354·4	221·5	Motala	86
1635	183·5	Deutschlandsender	121	1191	252	Luxembourg	60
1554·4	193	Daventry National	112	1153·8	260	Kalundborg	53
1481	205·5	Moscow	101	1083	277	Oslo	40
1445·7	207·5	Eiffel Tower	98	1000	300	Moscow (T.U.)	23

MEDIUM WAVES

Wave-length	Kilo-cycles	Name of Station	Aerial Dial	Wave-length	Kilo-cycles	Name of Station	Aerial Dial
574·7	522	Ljubljana	173	325	923	Breslau	88
550·5	545	Budapest	168	322	932	Göteborg	87
542	554	Sundsvall	165	312·8	959	Genoa	82
533	563	Munich	163	309·9	968	West Regional	80
525	572	Riga	161	304	986	Bordeaux-Lafayette	78
517	581	Vienna	158	301·5	995	North National	76
509	590	Brussels No. 1	156	296·1	1013	Hilversum	72
500·8	599	Florence	153	288·5	1040	Scottish National	68
488·6	614	Prague	150	281	1067	Copenhagen	64
480	625	North Regional	147·5	279	1076	Bratislava	63
473	635	Langenberg	145	276·5	1085	Heilsberg	61
465·8	644	Lyons (La Doua)	142	273·7	1096	Turin	59
459	653	Beromunster	141	272	1103	Rennes	58
441	680	Rome	134·5	269·8	1112	Bari	57
436	689	Stockholm	133	267·6	1121	Valencia	55
424·3	707	Madrid	128	265·4	1130	Lille	54
413	725	Athlone	125	263·8	1137	Moravská Ostrava	53
408	734	Katowice	123·5	261·6	1147	London (Western) Nat.	51
403	743	Radio-Suisse Romande	121	259·3	1157	Frankfurt	50
398·9	752	Midland Regional	119	257	1166	Horby	48
389·6	769·9	Leipzig	116	255	1175	Toulouse P.T.T.	47
385	779	Toulouse	115	253	1184	Gleiwitz	45
381	788	Lwów	112	252	1193	Barcelona (Ass. Nat.)	44
376·4	797	Scottish Regional	111	249	1205	Juan-les-Pins	42·5
372	806	Hamburg	109	247·7	1211	Trieste	41·5
368·1	815	Seville	107	242·3	1238	Belfast	38
364	824	Algiers	105	240	1250	Radio Beziers	36
360·5	832	Stuttgart (Mühlacker)	104	239	1256	Nurnberg	35
356	843	London Regional	102	237·2	1265	Bordeaux-Sud-Ouest	34
348·8	860	Barcelona	99	235·5	1274	Christiansand	33
345	869	Strasbourg	97·5	227·4	1319	Flensburg	26
342	878	Brno	95·5	225·9	1328	Fécamp	25
338·2	887	Brussels No. 2	94	217	1382	Königsberg	17
331·5	905	Milan	91	214·3	1400	Aberdeen	15
328·2	914	Poste-Parisien	89	211·3	1420	Newcastle	12

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

MR. LLOYD GEORGE TO BROADCAST

Mr. Churchill's grievance—A new attitude with talks—Vernon Bartlett's talk—Selling programmes to advertisers.

MR. LLOYD GEORGE has promised to broadcast on behalf of the "Wireless for the Blind" Fund from Churt on Christmas Day. It will be interesting to see if Mr. Lloyd George can bring in more money for this cause than Mr. Winston Churchill or Lord Snowden did on similar occasions.

Mr. Churchill's Anger.

I hear that Mr. Churchill is so annoyed at not being included in the special five minutes' disarmament series that he has told the B.B.C. that he will not accept any invitation to appear in debates on India and other subjects which Broadcasting House have been planning. It looks as if the B.B.C. has made a permanent enemy of Mr. Winston Churchill.

Adjusting the B.B.C.

The process continues of dividing the staff of the B.B.C. between "creators" and "executives." It is not as easy as it seemed on paper, the chief reason being the very human one that people who originate ideas do not lose interest in their application or the desire to be given credit for the ideas. I think we shall see before long a considerable revision of the new organisation at Broadcasting House. The alternative, of course, is that the B.B.C. will become enmeshed in the toils of a bureaucracy to which there is no parallel in any Government department.

Humanising the Talks.

I was gratified and not a little surprised to hear on good authority the other day that the whole system of B.B.C. talks is likely to be recast with a view to making it more human and full-blooded. It was interesting to know that Mr. Tom Clarke, ex-editor of the "News-Chronicle," may be given the task of overhauling the whole of the spoken word of broadcasting. I hope to hear this confirmed because there is no one else better qualified than Mr. Clarke for this great work. Incidentally, it is high time that a professional editorial mind was brought to play on programme building.

The Vernon Bartlett Talk.

No event since the episode of Poland has caused so much discussion in broadcasting circles as Mr. Vernon Bartlett's comment on the withdrawal of Germany from the League of Nations and the Disarmament Conference. The man on the spot who arranged the talk at very short notice was Mr. Lionel Fielden, the originator of the "News Reel" feature.

B.B.C. Recorded Programmes.

The B.B.C. has sanctioned an important departure from policy in order to try to get a sale for its recorded programmes overseas. In the past these recorded programmes were not allowed to be associated with commercial transmissions.

They are now thrown open to sponsors—that is, in other countries. It will be interesting to see whether the American advertiser, for instance, will care to take up the B.B.C. programmes to push his wares and services.

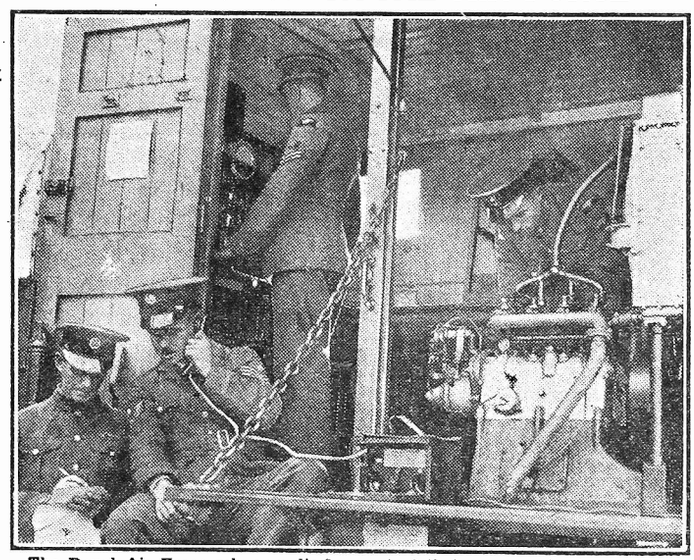
A Talk on St. Kilda.

The lonely island of St. Kilda, which was evacuated some time ago because the few inhabitants of this rock in the Atlantic found it impossible to endure the hardships and privations, or even to support themselves, is to be the subject of an interesting discussion between Mr. Colin G. Hamilton and Mr. Neil Gillies before the Scottish Regional microphone.

Mr. Gillies was an original inhabitant of St. Kilda, and this summer held the post of bird watcher on the island for the Earl of Dumfries.

Mr. Hamilton joined him for a few weeks, and together they lived alone, meeting with some interesting adventures and experiences, some of which they will recount for listeners under the title of "The Last Men to Leave St. Kilda."

RADIO IN THE ROYAL AIR FORCE



The Royal Air Force rely on radio for most of their communications. Not only are all 'planes fitted with suitable equipment, but they have a fleet of "radio lorries" which are used for emergency ground stations. It is one of these that you see above.

Organ Recital by Dr. Lowery.

Nothing but the works of northern composers will be played by Dr. H. Lowery, the organist at the Manchester College of Technology, in his broadcast recital for North Regional listeners on Wednesday, November 8th.

Some of these composers are no longer alive, but of those who are there will be works by Mr. T. W. Hanforth, organist of the Cathedral and City Hall, Sheffield; Sir Edward Bairstow, organist of York Minster; Mr. F. Wood, organist of the Parish Church, Blackpool; and Norman Cocker, sub-organist of the Manchester Cathedral.

Those dead include Charles Avison, a native of Newcastle-on-Tyne and an eighteenth century organist of repute; W. T. Best, who was born at Carlisle and spent most of his life as organist at St. George's Hall, Liverpool; and A. L. Pearce, who succeeded him in that position. Another Liverpool organist whose work will also be included is William Faulkes, who died only this year.

There is much to be said for linking programmes with personalities in this way.

(*Continued on page* 433.)

THE LISTENER'S NOTEBOOK

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

A CORRESPONDENT writing to "The Times," tells an amusing story of an attempt some years ago, during a plague in India, to broadcast by distribution (for it was before the days of broadcasting) a certain professor's address on the efficacy of inoculation. The address was translated into 40 different dialects, and "plague officers" were requested to distribute these in the several districts of the affected provinces. An immense labour! But all they got from the inhabitants for their pains was the derisive remark, "We don't believe it!"

* * *

I feel, somehow, that we may be prompted to say the same to Mr. Howard Marshall if he exposes many more stretches of country similar to the Bournemouth-Portsmouth stretch. I know this stretch well. It has often given me a pain. Otherwise I might suspect a little exaggeration on Mr. Marshall's part. It is magnificent (and depressing) work Mr. Marshall is doing. Good luck to him and to vanishing England!

* * *

The crisis in Germany provided some momentous speeches before the mike; in one case with commendable promptness. It is when the B.B.C. acts in this way that it proves itself a really vital institution possessing both courage and imagination. Mr. Bartlett's talk must have been heard with universal interest. It was, as usual, a very lucid talk.

* * *

I am a little surprised at the opposition that has been raised to it. Every one knows Mr. Vernon Bartlett and whom he represents (or does *not* represent). If listeners choose to associate him with anyone but himself they have only themselves to blame if they are misled. Mr. Bartlett's comments on world affairs ought to be quite understood as being his own by now.

* * *

Mr. Bartlett never approaches the mike with the same purpose as Herr Hitler, for instance. He never appears in the rôle of a dictator, but rather as an ordinary citizen with the extraordinary gift (this is my estimate of him) of being able to present a vivid picture of world affairs as seen through his eyes. In this unofficial capacity he is probably doing as much as anyone to cause listeners to view world affairs with an understanding that is free from bias and prejudice.

* * *

The part broadcasting played during the German crisis brought home to everyone the enormous power of this new weapon—a power for evil, if abused: for good, if used aright.

* * *

Mr. S. P. B. Mais' second talk, although not entirely free from atmospheric disturbances, wasn't as interfered with as his first was. But interference or no interference, nothing could seem to damp Mr. Mais' enthusiasm or *joie de vivre*. When so many talks nowadays demand such serious concentration, it is refreshing to be able to relax a little and listen to something

(*Continued on page* 434.)

All the interesting news and views of current short-wave practice.

THE new receiver has been well and truly "run in" during the week. After one or two small adjustments had been made I was completely satisfied, and it is now used for the mere purpose of *listening!* I have sworn a solemn vow that this state of affairs shall continue, and that any experimental work that I want to do shall be carried out on other sets.

The present line that interests me most is the use of an ordinary output pentode as detector, resistance-coupled to an L.F. stage. So great is the signal strength that there is no need for the latter; but it is so difficult to match impedance when using a pair of headphones with a pentode.

Pentode Detectors.

Readers will probably remember that I rather decried the idea of pentode detectors a little while back, when "A. B. T." wrote to me on the subject from West Africa. At the special request of several readers I have taken the subject up again, and the result will, I hope, be a two-valver that is something out of the ordinary.

A set of this type, using two pentodes, would make quite a good loudspeaker receiver. Possibly a third pentode, used as an H.F. stage, would liven things up a bit. But where are all our triodes going?

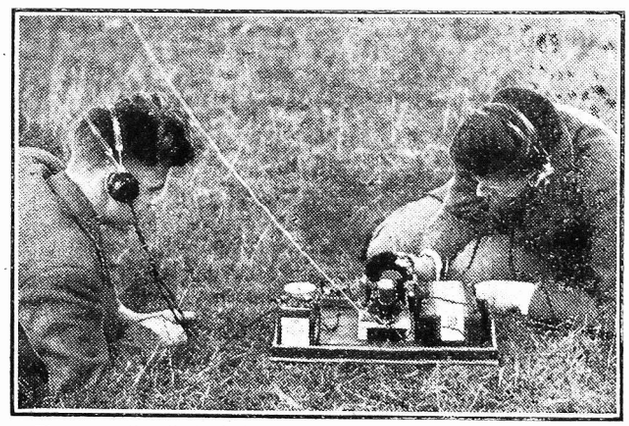
A long and interesting letter from "G. S. C." (C. for Canada!) has reached me from South Africa. G. S. C. uses tapped coils, with stud-switches both for grid and reaction coils, and appears to be very pleased with the arrangement. The chief merit of G. S. C.'s arrangement is that the two coils are compact and mounted in such a position that leads are quite short.

To be exact, the coils are mounted on the back of the front panel, just above the tuning condensers—an excellent arrangement. I can't say that I am particularly enamoured of the general principle of tapped coils for short waves, but I certainly admire G. S. C.'s way of doing the job.

The Upper Bands.

Being rather old-fashioned and conservative by nature (?), I don't trust dead-ends very far. But we mustn't turn anything down without trying it, and G. S. C., who is apparently quite a critical man, appears to like it very much.

GETTING DOWN TO FIVE METRES



The accusation that wireless as a hobby keeps its devotees indoors does not apply to 5 metres, which offers large scope for such "field" work as our picture illustrates. The two amateurs are operating their home-built portable 5-metre receiver.

One or two readers, notably "J. W.," of Edgware, send in logs of amateur transmissions on the 160-metre and 80-metre bands. The latter, by the way, is quite interesting nowadays. There has been a sort of swing of the pendulum in the amateur world.

For Local Work.

"Hams" in this country who have suffered from a surfeit of long-distance work on 20 and 40 metres have found themselves getting out of touch with their own neighbours, so to speak. The result is that the British amateurs use 80 metres largely as a rendezvous for meeting "locals."

I had hoped that the 5-metre band would eventually be "tamed" sufficiently to be used for this purpose, but we seem to have a lot more work to do yet.

The whole trouble with 5 metres at the moment seems to be location. If a couple of stations are favourably situated it is comparatively easy to work over a distance of 20 miles or more; but if screening is bad and the transmitters are working under unfavourable conditions, nothing on this earth will make communication possible.

This, at least, is the position as we know it to-day. What to-morrow will bring nobody really can tell.

A Good Station.

Returning to the world of broadcasting, there is not much to say except that W 2 X A D (19·56 metres) still holds his position as the "brightest star." In the early evenings he is usually exceptionally good, and his programmes are sometimes quite entertaining, if a little incomprehensible. Next to him the best station is certainly W 8 X K on 25·27 metres.

The Europeans continue to be so loud as to be a bit of a nuisance sometimes, but we can't have it both ways.

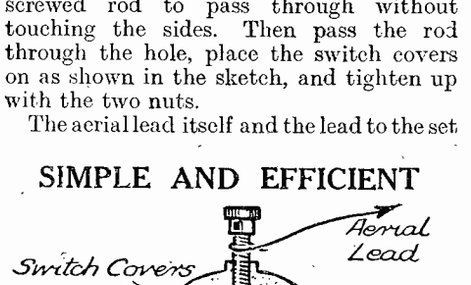
A WATERPROOF LEAD-IN.

AN exceedingly efficient waterproof lead-in can be very simply contrived from two covers from bakelite lighting switches. All that is required, in addition, is a length of screwed rod, two nuts and a couple of terminal heads.

A hole is drilled through the wall or roof of sufficiently large diameter to allow the screwed rod to pass through without touching the sides. Then pass the rod through the hole, place the switch covers on as shown in the sketch, and tighten up with the two nuts.

The aerial lead itself and the lead to the set are then clamped under the terminal heads on their respective sides of the lead-in.

SIMPLE AND EFFICIENT



The simple materials required to make an efficient lead-in are to be found in most experimenters' "junk" boxes.

THREE TIPS FOR CONSTRUCTORS

Leading in the aerial—Ensuring good connection—A drilling hint.

POINTS ON CHASSIS CONNECTION.

WHEN using metal chassis finished with cellulose enamel great care should be taken to clean the cellulose off at any point where a connection is made to the chassis. If this precaution is not taken results may be very seriously affected.

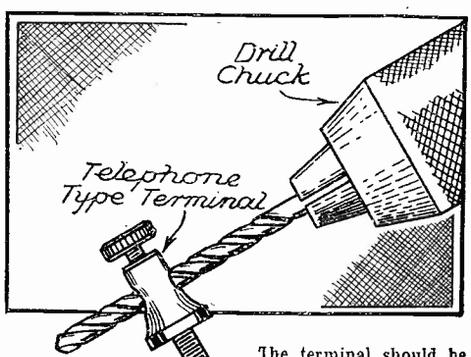
This point is also of importance when using other components, such as coil units or gang condensers which are cellulosed. For instance, the base of a coil unit should have the cellulose removed where it touches a metal chassis.

A USEFUL DRILL STOP.

A PROBLEM which often confronts the home constructor is to drill a hole *into* (as distinct from through) a piece of material. If an attempt is made to stop "just in time," the almost invariable result is that the drill goes right through owing to misjudgment of the depth to which the drill enters with each turn of the brace.

A method of preventing this is to employ a "telephone-type" terminal fixed on the drill as shown in the accompanying sketch. It will then be found impossible to drill a hole deeper than the length of the drill below the terminal. Such length should, of course, be the depth of the hole it is desired to drill.

PREVENTS DRILLING ERRORS



The terminal should be fixed so that the length of drill below the terminal corresponds to the depth of the required hole.

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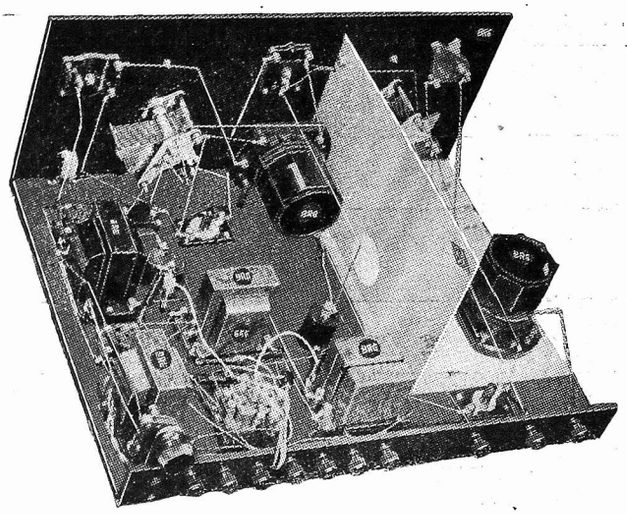

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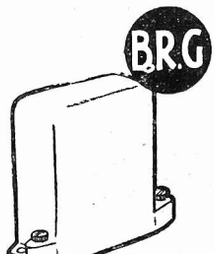

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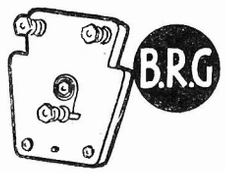
2-mfd. (29/1) 2/6

Type No. 25 Slow-Motion Condenser.
·0005-mfd. - 6/6



Differential Reaction Condensers.
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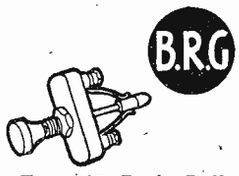
·0001-mfd - 2/6



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ECKERSLEY EXPLAINS-

Many people are inclined to think that broadcasting must necessarily be carried out by "wireless"; but, as Eckersley explains, the use of wire to link listeners' homes with the studio is gradually becoming complementary to the radio method.

THE Dutch are very enterprising people. Certainly, if they were not *the* first, they were among the first to do broadcasting. Chelmsford was working in 1919, and the American adventure at Pittsburg was almost contemporaneous; but P C G G was, if my memory serves me, almost certainly transmitting before that time.

M. Braillard tells me he had a telephony station in Brussels or Liége or Paris (I forget which) before the war. I heard speech coming over the air in 1906—before the days of the valve. It was done by means of spark. But P C G G was really the first regular broadcasting station in Europe.

And now, in Holland, they are pioneering another new development—what I have called "Rediffusion," and many call "radio relay," and what other Europeans call "Centrales."

Making a Start.

Ten years ago a very young man, A. V. Bauling, got an amplifier, a receiver and some pieces of wire, and he wired up a few subscribers in a town just outside Amsterdam (I can't pronounce the name of the town, much less can I spell it!). From that small beginning has sprung a big industry.

There are 7,000,000 people in Holland. There are 600,000 people who listen to radio (estimated). Of these 300,000, or 50 per cent, get their radio via a wire from a central amplifier; they do not use sets.

A typical town has x houses, and of these half are wired for rediffusion—that is, 50 per cent of the houses. Fairly remarkable, I think.

I went to Deventer recently for an official "opening." It is "Mr. Bauling's town." He has the concession to operate rediffusion in that town. There are 4,000 houses wired, and the listener has a choice of *five programmes*.

All the main-feeder wiring is underground. The cable contains not only rediffusion conductors, but conductors for interconnecting sub-stations and for fire-brigade alarm purposes.

Their Own Studio.

In Holland people are allowed, with reservations, to initiate their own programmes. Thus gramophone concerts are given. Also, Mr. Bauling has a good-sized studio at his headquarters. The local unemployment committee were proposing to raise funds by giving a concert over the Deventer Centrale network.

The amplifier and feeder-board system was very interesting and beautifully "presented"—that is to say, it was nice to look at and, incidentally, very impressive. A total low-frequency power of over a kilowatt will be eventually legislated for, meaning that if every subscriber came on at once their loudspeakers would each have a power of 300 milliwatts available from the supply.

The B.B.C.'s Attitude.

Of course, rediffusion has not developed anything like so much here as in Holland. Firstly, it started later; but, secondly and more importantly, it has had most people's hands against it. The B.B.C. have said definitely that they are not in favour of the idea unless they control it, and I can perfectly sympathise with their point of view, given their job, outlook, etc.

Nor, probably, are you, as a wireless experimenter, particularly in favour of a system which does not depend upon wireless. Of course, I do not think that in England at the moment the wireless interest need fear the wire development terribly. Wireless must hold the whole field for a long time and a part of it always.

Britain has actually the biggest single unit of rediffusion in the world at Hull. There are more subscribers in Amsterdam than in Hull; but there are over 100 different companies in Amsterdam, while only one company in Hull is responsible for a service for, I think, about 13,000 people.

It is, I think, very interesting. I thought as "wireless" enthusiasts you would like to know something of how the art of broadcasting is developing. In any case, I do not think there is any necessity for people to make such a fuss about the terrible rivalry between rediffusion and the wireless set.

A Legitimate Field.

There is, obviously, as has been proved in Holland, a legitimate field of expansion for rediffusion; but, on the other hand, a competent authority told me that he thought that rediffusion probably reached its saturation when 50 per cent of the houses in a town were wired. Rediffusion in its present form, at any rate, cannot have much application in country districts.

So it seems as if, as usual, wire and wireless each have their separate functions and should be allowed to develop so that each of them serves the community in the way best suited to that community's needs.

The present chaos in the ether, which, so far from becoming better, looks like becoming much worse, is brought about because politicians, not technicians, are trying to force "technics" to give results which, in the nature of things, they cannot give. If a wide recognition of the facts about wire broadcasting took place officially as well as unofficially, there would be a new light brought to bear upon the at present unsolvable problem of wavelength allocation.

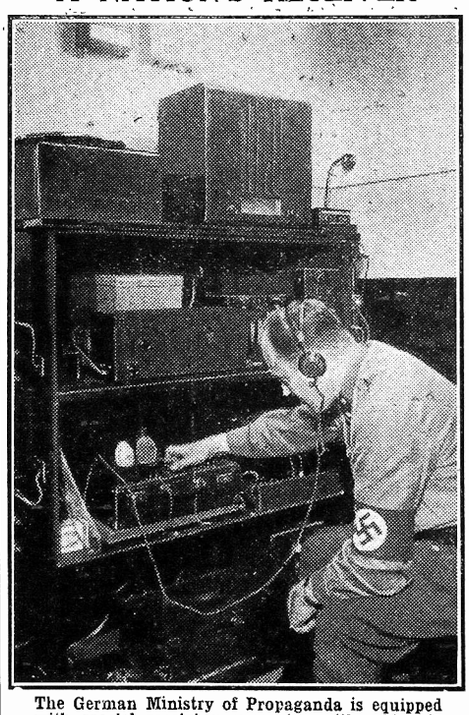
Looking Ahead.

I imagine a sane future in which wireless broadcasting is achieved by a relatively few high-powered long-wave stations separated in frequency by 20 kilocycles at least; while the urban districts are given the facility of choice between many really first-class-quality programmes in terms of the wire.

As I am continually emphasising, the long waves are greatly superior to the medium waves for consistent reception at a distance. Fading, the bugbear of long-distance medium-wave reception, would be eliminated, and the minimum station separation of 20 kcs. would ensure A1 quality.

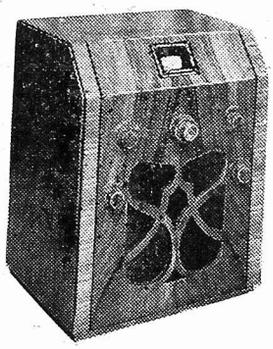
Those listeners living in or near towns would have the programmes at their disposal, via rediffusion, without the bother of having to instal and maintain a radio receiver

A NATION'S RECEIVER



The German Ministry of Propaganda is equipped with special receiving apparatus with which it keeps a watch on the ether so that anti-German broadcasts may be answered without loss of time.

RECEIVERS of RENOWN



THE TELSEN "464" RECEIVER FOR A.C. MAINS.

A REALLY good mains receiver for less than ten pounds. Not an unreasonable request in these days, but, nevertheless, one which is not too readily granted. But no radio enthusiast, constructor or listener has ever looked in vain to the Telsen Electric Company; so that it is not surprising, though none the less gratifying, that the "less-than-ten-pounds" request has been met this season by the provision of a new receiver, designed in accordance with the most recent developments, and called the Telsen "464" Receiver.

Built to Give Service.

Here is a set which has been built for a purpose. One might talk a great deal about "built up to a standard, not down to a price," or "quality comes before cost," or other such well-used phrases. But it is far more satisfactory to say that the Telsen "464" is the result of designing for the man who can afford a battery receiver, an all-mains instrument which is more than adequate for modern stringent conditions. The manufacturers make no extravagant claims for this new model. Some of their claims, in actual fact, are too modest, as we found when we tested the receiver. They put it forward as a thoroughly good set, and it is backed with a thoroughly reliable name. Its own merits act as its best publicity agent.

The Telsen "464" is a three-valve receiver, of the table type, for A.C. mains. Its indirectly-heated valves comprise an H.F. pentode, a detector and an output pentode, with, of course, a rectifier. The circuit includes a tuned H.F. transformer with reaction and a parallel-fed L.F. transformer coupled to the pentode which drives a powerful moving-coil speaker. It is interesting—and important—to note that iron-cored coils are used throughout.

Single-control ganged tuning operates an illuminated dial calibrated in wavelengths, about which we have more to say later. There is a selectivity control, a volume control and a tone control, the wavechange switch being the other control on the front of the set. The mains switch is at the back.

An Outstanding Set.

Those are the bare facts about which one can hardly sound enthusiastic. A very different state of affairs accompanies the performance of the "464."

We have no hesitation in saying that we know of no other receiver of this type, selling at less than ten pounds, which achieves such remarkable selectivity or boasts such extreme sensitivity. This we say as the direct result of exhaustive tests under actual working conditions. On an ordinary evening we found that no less than twenty stations (often more than this) could be depended upon for real programmes. And the joy of it is that the calibrated wavelengths on the dial correspond *absolutely* with the wavelengths of the stations. While testing many sets in this way we have had to make use of a wavemeter. The "464" was not the slightest trouble, and it was possible to check even the German relay stations.

The wavelength range seems to be extremely wide. On the long waves, for instance, Croydon can be received with quite a bit of the dial to spare, while the range goes well up above 2,000 metres.

The principal features of the "464"—for in these sophisticated days provision for extra speaker, pick-up terminals, trimmer and selectivity controls are taken as a matter of course, and are naturally incorporated—are the tone control and the design of the cabinet. The tone control has very wide limits and cuts off sufficiently to eliminate any heterodyne interference. The quality of the set—which is, quite frankly, above what one might reasonably expect—can be toned to any individual requirement.

Unique Cabinet Design.

As for the design of the cabinet, this is both æsthetically and practically as perfect as it could be for a set of this type. The sloping front, which enables the dial readings to be seen with unusual and most commendable ease, is a new departure which might well become standard on table-model instruments. The walnut finish, lined in black, makes the "464" a worthy addition to the designs of 1934.

The question of hum in a mains set is one which has, without doubt, given rise to some qualms in the minds of prospective purchasers whose previous experience has been confined to battery sets. Consequently, in the "464" what is known as a "hum adjuster" has been provided. This is rather a "hum minimiser," and in certain cases would prove most useful. In our own tests, however, we never found the least need to use this refinement. Although the set was tested on mains which have proved troublesome in other cases, there was never the least trace of hum.

Provision for Mains Aerial.

Finally, the mains aerial must have a word to itself. The utility of a mains aerial lies chiefly in its convenience in circumstances where an external aerial cannot be used or when it is desired to use the set in different rooms. It is not intended as a substitute for a proper aerial under ordinary conditions. At the same time, we found that it could be used to bring in almost all the British National and Regional transmitters, as well as several programmes from the Continent.

In a year when the whole trend of design has been revolutionised it takes no little courage for a manufacturer to stake his reputation upon one single new model, and that a model which depends for its success not upon spectacular novelties but upon the inherent quality of its design. But Telsen have had the courage of their convictions and have produced an instrument which is worthy of all the traditions of a famous firm.

The price of the Telsen "464" is £9 9s. As value for money it is unexcelled. But, in addition, it is a receiver which follows modern practice both in design and in its suitability for the all-exacting requirements of the listening conditions of to-day.

TECHNICAL SPECIFICATION OF THE TELSEN "464."

All-Electric Table-Model Receiver for A.C. Mains, 200/250 volts, 40/100 cycles. Consumption 48 watts. Four indirectly-heated valves: H.F. Pentode, Detector, L.F. Pentode and Rectifier.

CIRCUIT.—Loosely coupled Aerial with selectivity adjustment. Tuned H.F. Transformer with reaction. Parallel-fed L.F. Transformer coupled to a Pentode Output Valve operating a powerful built-in Moving-Coil Speaker of the energised-field type. Iron-Cored Screened Coils used throughout.

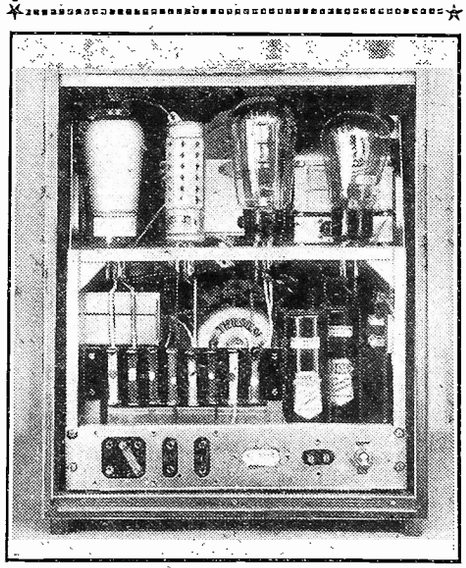
CONTROLS.—Single-Control Ganged Tuning with Trimmer, operating an Illuminated Dial calibrated in wavelengths. Selectivity or "Separator" Control. Volume Control, Tone Control, Wavechange Switch. Mains Switch at back.

AERIAL.—Indoor, Outdoor or Mains.

OUTPUT.—2·5 watts (undistorted). Provision for extra Loudspeaker and Gramophone Pick-up.

CABINET.—Table Model, finished walnut, lined in black, with sloping top for ease of tuning.

PRICE.—£9 9s. complete.



The features to notice in this back view of the "464" are (1) the Catkin valve, second from the left at the top; (2) the arrangement of the resistances below; and (3) the mains aerial switch and pick-up and additional speaker sockets at the bottom left-hand side.

"MAN-MADE STATIC"

With the rapid growth of the grid system of distributing electricity throughout the country, more and more listeners are experiencing interference from electric fans, motors and so forth. Unfortunately it is not always possible to tackle the trouble at its source, but much can be done at the receiving end as explained below.

By L. H. THOMAS.

OF all the blessings conferred upon mankind since the introduction of radio it is hard to find one more universally agreed upon than the extension of A.C. lighting and power mains to every corner of the country. The famous "grid" scheme is now practially complete, and before long it will probably be difficult to find a village without electric light.

For every good thing, unfortunately, we have to pay in some way or other, and the mains have brought along their little trials and tribulations with them. Quiet little backwaters that used to be ideal for radio reception owing to the quiet background and complete absence of "man-made static" now make their own little welkin ring in no uncertain fashion with vacuum cleaners, electric fans and (horrid thought!) dirty-switch contacts.

A Noisy Fan.

In many of these cases the harassed owner of a receiver is quite helpless, unless he happens to be a philanthropist, until the G.P.O. takes the matter up. By this I mean that he can't cure the trouble at *his* end, but has to go round to the owners of the offending pieces of apparatus and fit them (the pieces of apparatus, not the owners) with "silencers."

My own eyes were opened in this way when I listened one morning quite recently and heard a most horrible racket. Nothing below 50 metres could be heard through it; it was a continuous scrape-cum-buzz, with a slight rhythmical tendency, obviously produced by a very sick electric motor.

I lost no time in rigging up my receiver in the car, complete with "fishing-rod" aerial as used for five-metre work, and trying to locate it. After driving up and down the road several times I could tell that it was louder at the "south" end.

Going into the road that runs at right angles to my own at the south end, I repeated the procedure. To cut a long story short, by the "getting-warmer" method I eventually traced it to a block of shops *half a mile from home*. After interviewing several shopkeepers, I found on the counter of a grocer's store a small electric fan running suspiciously slowly.

The Use of "Suppressors."

A loose brush was the trouble, and the consequent sparking was what was playing havoc with the short-wave ether in my neighbourhood.

Now there is an excellent object-lesson for you. A small fan at half a mile, if undetected, would have been the end of my short-wave career! It was out of order, it is true, but a fan at a tenth of that distance and working properly may have its effect upon the quietness of the background.

As I have often said, a law compelling the use of "suppressors" on electrical apparatus that is capable of radiation is long overdue. Till it arrives, what can we do? First and foremost, we must see that our own end—the receiver—is above reproach.

This is particularly the case when it is run from the mains. Fig. 1 shows a filter circuit that is more than sufficiently good to look after things. Two H.F. chokes in series with the mains, and two by-pass condensers in series, with the centre-point earthed, are used.

Making the Chokes.

It is *important* to see that the chokes are wound with wire of a gauge sufficient to carry the full current taken by the eliminator in use, and that the condensers are of a reputable make capable of working at about 150 volts A.C. With two in series this gives a reasonable margin of safety.

I have always found chokes of the long, thin variety most efficient. Wind them on a length of wooden dowel, about 1 in. in diameter, or, if possible, a cardboard former with a diameter of 1 in. or 1¼ in. The usual small receiver and power supply will generally consume something of the order of 30 watts at the very most, so that the current we have to allow for is only of the order of ·15 amp.

If we wind our chokes with No. 20 or No. 22 enamelled wire we have allowed a good margin of safety, and we shall not have dropped the voltage to a measurable extent, because, fortunately, the turn numbers need not be very high.

Don't Take Liberties!

Two chokes of 50 turns each on a 1-in. former are, I find, excellent for the job. The whole filter should be neatly made and wired up with insulated wire or stiff wire covered with sleeving. Don't take liberties or be untidy when dealing with the mains! Mount it somewhere out of the way, where screwdrivers and other instruments can't fall across the terminals!

Remember that the purpose of the filter is not to stop H.F. from the set from going down the mains, but to stop H.F. in the form of "man-made static," which is travelling along the mains, from finding its way into the set.

Battery-set users in general will find less trouble from "man-made static," but they, too, can take certain elementary precautions against it. For broadcast receivers the screened lead-in is, of course, a very valuable asset. For sets of all kinds a good, direct earth lead with a business-like connection at the far end is essential.

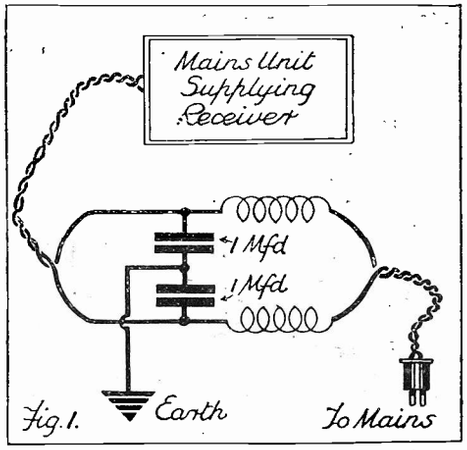
Unfortunately for short-wave listeners, the screened aerial lead-in is not often a success, as much of the "mush" that they receive is actually picked up on the top part of the aerial, and it doesn't matter much whether the lead-in and the set itself are screened or not.

Remember that "man-made static" can be divided into two very definite categories: that which is really radiated into the ether, and will, therefore, be picked up on the aerial, however high and clear that aerial may be; and the more insidious kind that does a kind of "wired-wireless" performance along the mains. Even a battery set may be affected by that kind, if the mains are in the house.

Tests for its presence may easily be made by switching off at the mains. This, too, will show up any dirty contacts or "power leaks" in the house wiring.

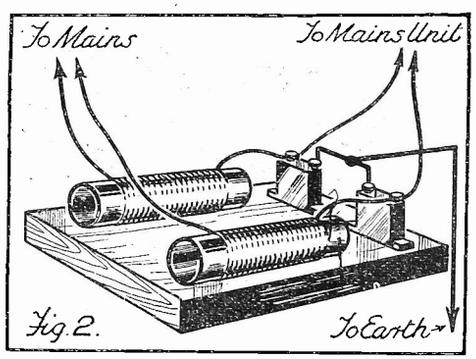
Interference that cannot be improved, whatever one does to the receiver, aerial or earth systems, however, is by no means rare, and this must be tackled at the "transmitting" end. How it is done I hope to show in a future issue.

AN H.F. MAINS FILTER



If troubled with noisy reception when drawing power from the mains, relief may often be obtained by "filtering" the mains supply.

WIRING THE CHOKES



In setting up a mains filter, long, thin chokes are generally most satisfactory.

TELSEN
BINOCULAR H·F CHOKE
Specified by Mr. JOHN SCOTT-TAGGART
for the P.W.
"S.T. 500"

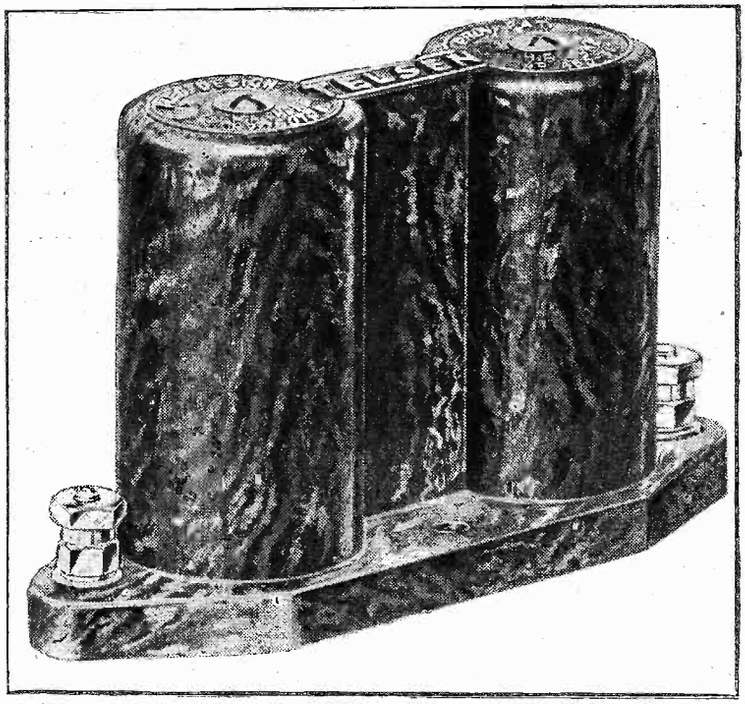
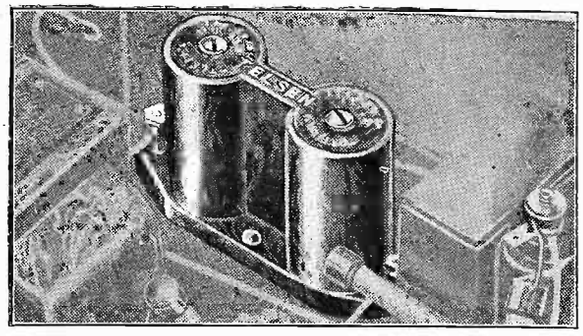
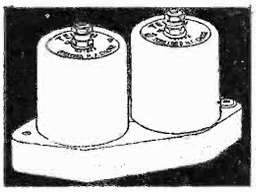


Illustration below shows the position occupied by the Telsen Binocular H.F. Choke in the built-up 'S.T. 500.

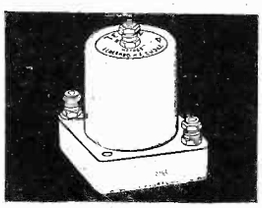


EXPERT designer and home constructor alike concur in their choice of the Telsen Binocular Choke where lasting efficiency at low cost is the first requirement. Its external field is negligible, with a very low self-capacity, while its inductance is as high as 180,000 micro-henries - - - - - - - - **3/6**

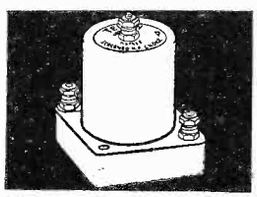
TELSEN COVER EVERY H.F. CHOKE REQUIREMENT



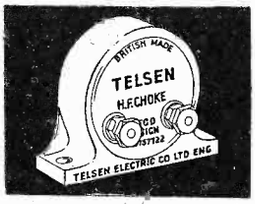
TELSEN ALL-WAVE SCREENED H.F. CHOKE - - - - 4/6



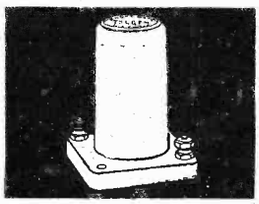
TELSEN STANDARD SCREENED H.F. CHOKE - - - - 2/6



TELSEN SHORT WAVE SCREENED H.F. CHOKE - - - - 3/-



TELSEN STANDARD H.F. CHOKE - - 1/6



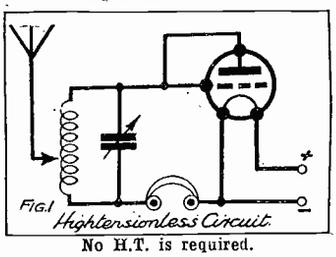
TELSEN SHORT WAVE H.F. CHOKE - - 2/6

TELSEN FOR EVERYTHING IN RADIO

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

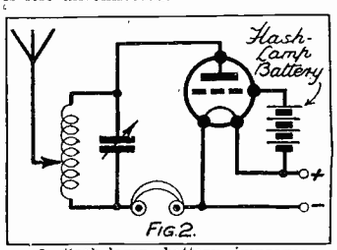
IMPROVING A CRYSTAL SET

THE crystal set is more or less a bother to use owing to the frequent adjustment of the crystal. In place of the crystal a valve can be used in the following manner :



No H.T. is required.

The valve is inserted between the top of the tuning-coil and the phones in the same way as a crystal. The electrons from the filament serve to rectify the oscillating current set up in the coil. The plate and grid can be joined together as shown, but little difference will be observed if the plate is left unconnected.

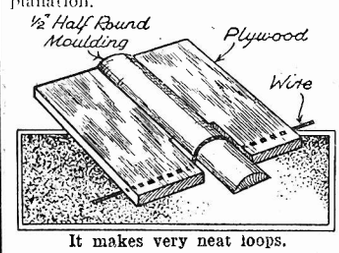


A flash-lamp battery improves results.

Any valve seems to serve if it has a fairly high impedance. A ·06-amp. detector gives economy of filament consumption. Using a rheostat and running the valve at ·05 amp., a 20-amp. accumulator will last a long time. *No H.T. is used* and the strength obtained is crystal strength. To get greater power, obtain a flash-lamp battery and put the positive terminal to the grid, the top of the tuning-coil to plate, as in Fig. 2.

NEAT BENDS.

HERE is a rough drawing of a little gadget I made for looping wire when it has to cross another lead. It is made of plywood and a piece of half-inch, half-round moulding; it is quite simple and needs no explanation.



It makes very neat loops.

The wire is looped over the projecting end of the moulding, then passed along into the slots and bent up under the base, giving a very neat loop.

RECORD REPRODUCTION WITHOUT VALVES.

THIS wrinkle is intended primarily for those readers who possess a battery radiogram and, in addition, a pair of headphones. It occasionally happens that one's L.T. battery will give out unexpectedly and a fresh one is not available. There is no need to be without music, however.

The simple expedient of connecting a pair of headphones in parallel with the pick-up leads will, provided the phones and pick-up are reasonably sensitive, provide excellent reproduction of gramophone records in the headphones.

Perhaps the best method is to equip the 'phone leads with crocodile clips so that they can be clipped on to the pick-up leads quite easily.

If the pick-up is provided with a built-in volume control, the latter should be turned to the position which gives maximum volume.

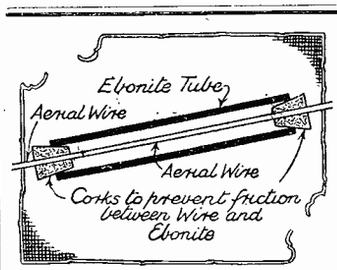
AN IMPROVED LEAD-IN.

A VERY useful little dodge for an aerial lead-in can be rigged up simply in the following manner :

Instead of the usual ebonite lead-in tube complete with brass rod, with the connecting nuts at the end, I use only the ebonite tube in conjunction with two corks.

The sketch shows roughly the idea of things—the point being that the two corks stop all friction between the wire, or in some cases, the wire's insulation, and the ebonite. In my own case, I have heavily taped over the two joints, and on top of that there is a nice heavy layer of battery pitch.

The beauty of this idea is that one is able to have a really efficient *unbroken* lead-in.



An unbroken lead-in is provided.

FITTING KNOBS.

PRACTICALLY every radio experimenter has at some time found himself faced with the problem of fitting a knob having a ¼-in. hole on the shaft of a component whose size is ¼ in. If a split metal liner is available of the correct size, the fitting of the knob becomes child's play.

When, however, it is necessary to pack the knob with tinfoil, the result is usually a knob which operates eccentrically or which is not true with respect to the panel.

This can usually be overcome by wrapping round the shaft a length of copper wire of correct size.

In most cases it will be found that No. 28 S.W.G. will serve the purpose, and this should be wound tightly round the spindle and the ends cut off neatly.

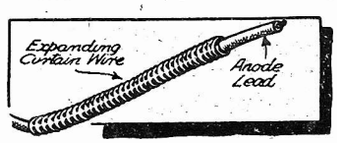
It will be found that the grub-screw, especially if it is pointed, will force its way between the turns of wire and grip on the component shaft, whilst the wire will serve to hold the knob in a central position.

If desired, bare wire can be used, which can be tinned after shaping it round the shaft, forming an excellent liner.

SCREENED ANODE LEADS.

WHEN making up a screened-grid three I experienced great difficulty in obtaining a screened anode lead of sufficient length, so I bought a small expanding curtain wire which I found ideal for the purpose.

I used an ordinary piece of connecting



The screening is made from curtain wire.

ONE GUINEA FOR THE BEST WRINKLE !

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

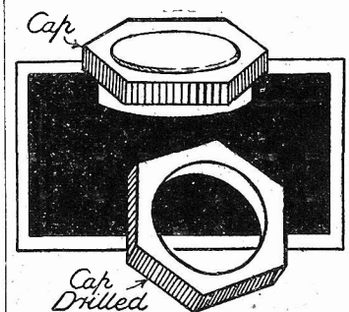
Each hint must be on a separate sheet of paper, written on one side of the page only. Address your hints to the Technical Editor, "Popular Wireless," Tallis House, Tallis Street, E.C.4, marking the envelope "Recommended Wrinkles."

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

The best Wrinkle last week was sent by Mr. F. N. Bedwell, Rosemont, Evesham Road, Stratford-upon-Avon.

NOVEL BUSHES.

IT is not commonly realised that the bakelite or composition caps from various makes of tooth-paste and shaving-cream tubes make excellent insulating bushes if carefully drilled with a hole the proper size.



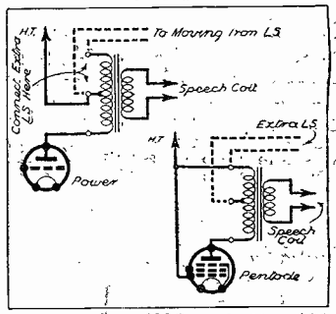
Made from tooth-paste tube caps !

The two sketches make the method quite clear. One shows the type of cap and the other the cap drilled.

The panel should be drilled so that the narrow portion of the cap will just slip into the hole.

THAT EXTRA LOUD-SPEAKER.

IF one possesses a receiver of the console type, employing a moving-coil loudspeaker, it is sometimes desirous to run a moving-iron speaker externally. If this is connected either in series or parallel with the primary of the moving-coil loudspeaker, a drop in quality is generally experienced.



A simple method of adding an extra loudspeaker.

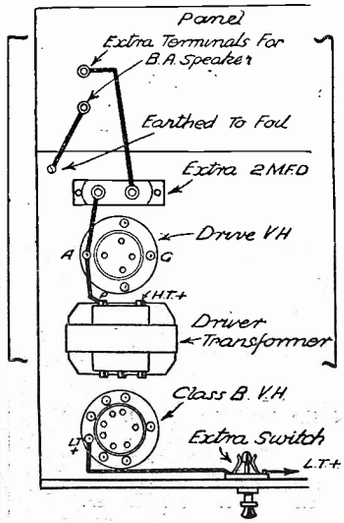
This can very easily be overcome, if the moving-coil transformer has a primary split for power or pentode, by connecting as shown in the diagram. I have employed this circuit and have never noticed any change in volume or quality of reproduction from the moving coil.

SWITCHING OUT CLASS B.

HERE is an idea I use which works well with the Class B Four. Perhaps many readers (like myself) do not always require the very great volume this set gives and would at certain times like to switch out the Class B valve and use a balanced-armature speaker.

The sketch shows the very simple extra wiring and parts required, which are : one 2-mfd. fixed condenser, two terminals, and one L.T. switch, and one screw for earthing a terminal to the foil.

To switch out Class B valve and use B.A. speaker, push in switch on terminal strip and connect B.A. speaker tags to terminals on panel. To switch in and use Class B, pull out switch and disconnect *both* L.S. tags from terminals on panel.



The Class B valve is switched out when not required.

The driver valve becomes an ordinary output valve to which the B.A. speaker is choke-filter coupled, the transformer primary being the "choke."

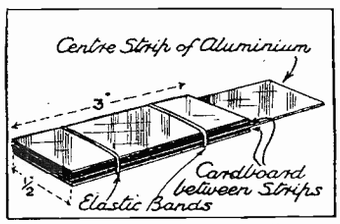
(*Continued on next page.*)

RECOMMENDED WRINKLES

(*Continued from previous page.*)

A SELECTIVITY DEVICE.

ALL that is required are three pieces of aluminium, 3-in. long and ½-in. broad; 2 pieces of cardboard, 3-in. long, and ½-in. broad; two elastic bands.



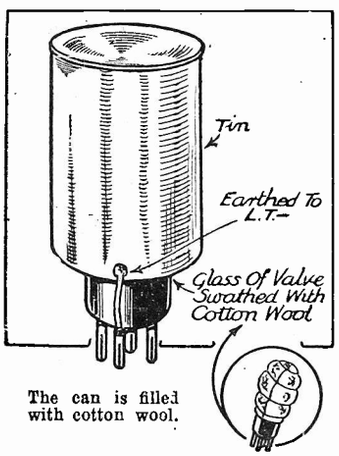
For improved station separation.

Place cardboard between strips of aluminium and bind with elastic. Pull out centre strip of aluminium and connect to aerial lead (which is disconnected from set for the purpose). The two outside strips of aluminium are connected to aerial terminal on set. When set is switched on selectivity is varied by pulling out or pushing in the centre strip.

AVOIDING MICROPHONY.

THE following is a good cure for microphonic valves:

Wrap the glass part of the valve in cotton wool and bind with cotton or

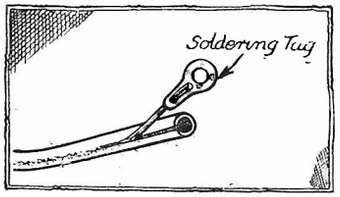


The can is filled with cotton wool.

something similar to keep the wool on. Then place over this an empty cocoa tin. Earth this in the usual manner, viz. to valve's negative pin.

STRONGER JOINTS.

TO avoid breaks between flex and soldering tags the following scheme is useful: Instead of cutting



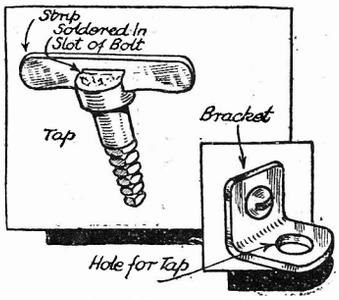
When finished bind with insulating tape.

off the insulation, slit it about the length of the tag shank, solder wire and tag, replace joint in insulation, tape tightly, leaving only ring showing. This method receives the benefit of the strength of the insulation.

THOSE PANEL TAPS.

PANEL taps, made from brass or steel bolts which are to be found in many radio constructors' tool kits, can be made much nicer to handle by the fitting of short strips (metal) to the bolt heads, soldering being best, as is illustrated.

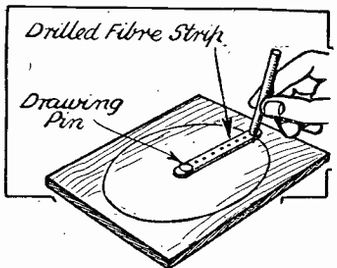
To carry these taps in the tool cabinet small brackets can be made.



A useful tap handle.

FOR LARGE CIRCLES.

ENTHUSIASTS who make their own plywood loudspeaker frets, and who do not have a pair of compasses with extension leg handy for marking out circles of large radius, will find an efficient substitute can be made from a strip of fibre, drawing pin, pencil and ⅛-in. drill. Along the fibre strip, which should preferably be ⅛-in. thick by 9-in. long by ½-in. wide, is drawn a centre line, and at



As good as compasses!

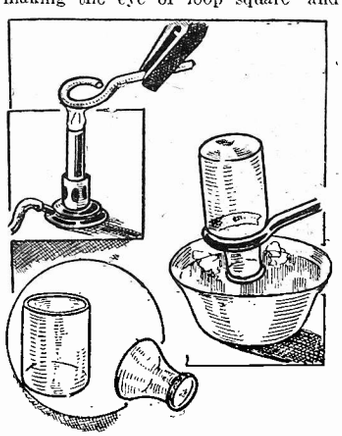
½ in. from one end of the strip on this line is drilled a ⅛-in. hole; this forms the "centre" hole. At distances 2 in., 2½ in., 2⅞ in., etc., from this hole other holes ⅛ in. are drilled along the line, increasing by increments of ¼ in.

The strip is placed over the plywood to be marked and a drawing pin inserted in the "centre" hole of it and pressed into the wood, the strip being free to rotate. The point of the pencil is inserted in the hole of required radius from the pin, and on the simultaneous pressing of the pencil and rotation of the strip the required circle results.

HOME-MADE H.T.'s.

WET H.T. batteries may be made up cheaply if a number of small bottles are treated in the following manner to remove the tops cleanly:

Make up an eyepiece from three-eighths iron to suit the top of the bottle. Make it red hot and place it in the position shown on the bottle. Leave it for a minute or so, and then plunge the bottle into cold water top downwards. Square-shaped bottles can be treated in the same manner by making the eye or loop square and

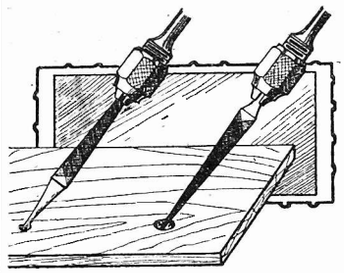


This scheme ensures a clean fracture.

using in the same way. This provides a use for small bottles which could not be disposed of otherwise, and reduces the cost of making up the battery.

MAKESHIFT DRILLING.

AN easy and quick way of drilling and enlarging holes in ebonite and wood panels, without a drill, is to get an 8-in. three-corner taper or half-round taper file and a carpenter's brace.



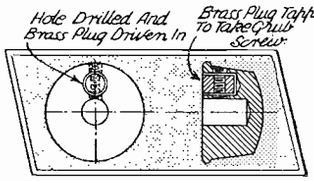
If you want to make a hole in a hurry, try this idea.

Start by putting the taper end of file into the chuck of the brace (after sharpening the point of the tang of file) and drill hole with the tang of file. When through up to the end of the tang of file, pull out and reverse the file by putting the tang of the file into the chuck.

Then you will be able to make a ⅝-in. hole very easily. Do not put too much pressure, as it cuts very quickly. Remove rough edges with sandpaper. It can also be used for enlarging holes in copper sheet and cast iron. Larger holes can be made by using larger files.

REFIXING GRUB SCREWS.

THE attached sketch shows a method of securing a grub screw in a bakelite knob in which the thread



The plug holds the screw in position.

has been stripped. It consists in drilling a hole parallel to the spindle hole and inserting a brass plug which is afterwards drilled and tapped in position to take grub screw. The sketch is self-explanatory.

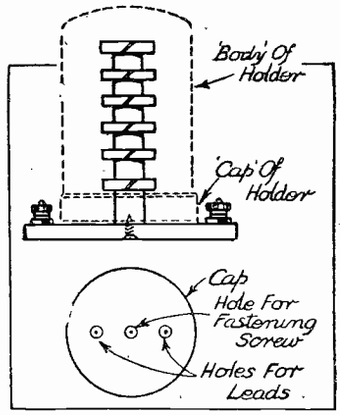
ANOTHER USE FOR CHATTERTON'S.

THIS very simple dodge will be found very useful when inserting screws in awkward positions: Heat a small piece of Chatterton's Compound in a match flame and place on the tip of the screwdriver blade. When tacky insert the blade in the slot of the screw and the two will adhere quite firmly. The screw can now be inserted in any position required. Chatterton's Compound is useful for a variety of purposes, such as filling in holes in ebonite panels, and can be obtained at any electrician's.

SCREENING AN H.F. CHOKE.

AT the present time many readers will be wondering whether a screened H.F. choke will improve their sets. Here is an idea which will enable them to find out without spending any unnecessary money, providing they already have a choke of the type shown in the diagram. The idea consists in enclosing the choke in an aluminium shaving-stick holder, which the majority of readers will have lying about.

First take the "cap" of the holder and drill three holes in it; the centre hole to take the screw which fastens the cap and choke to the ebonite base and the remaining two holes to pass the leads from the choke through the base to the terminals. With the cap

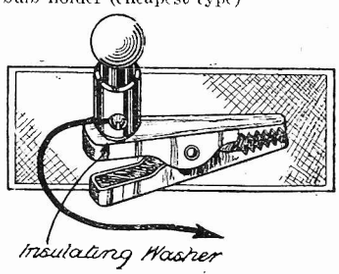


Screened with a shaving-stick tin.

fastened between the base and choke it only remains to push the body of the holder into the cap and you have an efficient screened choke.

A CLIP-ON LAMP.

THE accompanying sketch shows a crocodile clip with the connecting screw replaced by a slightly longer one passing through the base of a bulb holder (cheapest type)



Always ready when needed.

From the side of the holder a flex lead goes to the L.T. terminal that is *not* earthed. Then by clipping on to any earth wire you get a light; you can thus test any earth lead for continuity (providing the L.T. is connected to the set).

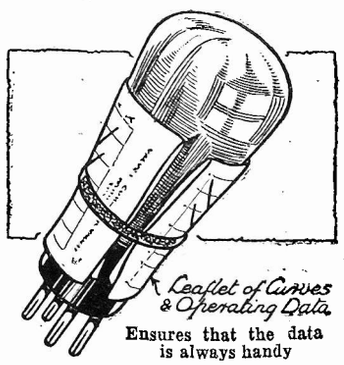
Also it makes a useful little lamp for use inside the set while working. Painted in black wax, there is no danger of a short with any other wire.

KEEP THOSE CURVES.

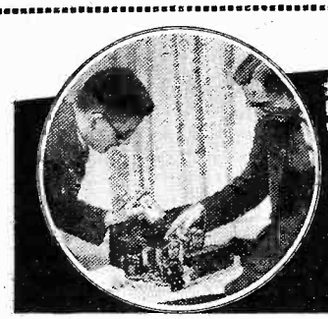
IT is generally conceded that a receiver is built around its valves and that the most efficient set is only that which utilises their properties to the fullest extent, yet in *operation* valves are rarely treated fairly.

Every valve which leaves its factory is accompanied by a leaflet of curves and operating data, such as voltages and currents necessary, anode load, etc., and for the best results such instructions must be closely followed. Despite this, most curve leaflets soon reach their ultimate destination, the wastepaper basket—which is hardly surprising, for it *is* difficult to find a safe and yet convenient place to keep them, isn't it?

A very simple and practical solution is to just fold the curve leaflet around its valve, slip on an elastic band—and they are inseparable companions this time.



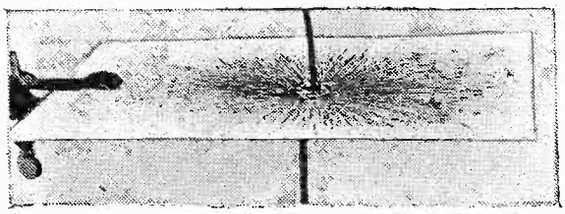
Ensures that the data is always handy



RADIO STEP-BY-STEP

OUR SPECIAL SUPPLEMENT for BEGINNERS

MYSTERIES OF MAGNETISM



Some important processes fascinatingly described.

MAGNETISM is a force which plays a very important part in radio and in electricity generally.

Practically everybody has handled the familiar horseshoe magnet so beloved of the schoolboy. How many listeners are there who haven't, at some time or another, used one of these small toy-shop magnets for picking up steel articles such as needles, screws or tacks?

An Interesting Experiment.

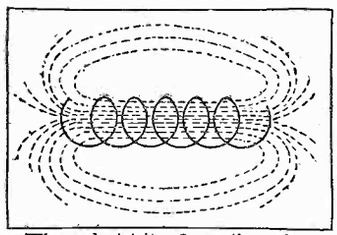
What is it that causes the magnet to pick up pieces of steel? Undoubtedly some force must be exerted across the space separating the magnet and the article it picks up. Otherwise why does the said article (incidentally it must be made of iron or steel) suddenly decide to move towards the magnet and adhere to it.

An interesting experiment is to take a bar magnet (a straight magnet as opposed to the type shaped like a horseshoe) and a compass. Not an expensive compass, but one you can buy for a few pence.

Slowly bring one end of the bar magnet nearer to the compass needle. You will notice that the needle swings on its pivot, perhaps moving towards the magnet, possibly away from it, as if repelled.

The fact that the needle moves proves that some force must be present to produce the movement.

LINES OF FORCE



When electricity flows through a length of wire a magnetic field is created which consists of lines of force spreading out in all directions.

Exerting a Force.

Another experiment can be carried out with the help of a quantity of iron filings. These filings can easily be "manufactured" by the industrious amateur from a lump of iron and a fairly coarse file.

Take a piece of thin cardboard and place it on one end of the magnet. Then scatter some of the filings over the surface of the cardboard. Tap the cardboard gently until the filings take up a fixed position, when you will notice that they follow a well-defined pattern.

If you look at them closely you will see that they have arranged themselves in radial lines converging on a common centre, viz. the magnet.

Now, we know that a magnet exerts a force, which force could, if necessary, be measured and translated into fractions of a pound or ounce, pull or push.

Field of Influence.

But we are not concerned with the magnitude of the force. It doesn't matter from the radio point of view whether the magnet will lift a ton or a thousandth of an ounce.

All that concerns us is the fact that a force is radiated from the magnet so that it affects neighbouring steel objects.

The iron-filing experiment proves that the magnet has the power to make the filings take up a definite position. An inspection shows us that the filings tend to arrange themselves along lines which converge towards a certain point, viz. the magnet pole or poles.

These lines are called *lines of force*. When an object is brought within the influence of the lines of force it is said to be within the *magnetic field*.

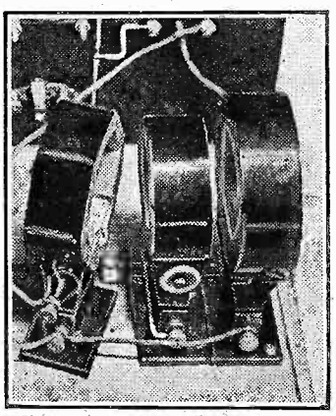
The number of lines of force in a given area is called the *flux density*, magnetic flux being another way of saying magnetic field.

So far we have only mentioned the simple bar and horseshoe magnet. These are known as permanent magnets.

There is another form known as an electro-magnet. This is a bar of iron (not necessarily solid; it may consist of a number of strips or sections called laminations) surrounded by a coil of wire.

Making a Magnet.

If the two ends of the coil are joined to a battery or other source of electrical power the iron bar or core will become a magnet, and will exhibit all the properties of a permanent magnet.



If two or more coils are placed together, as shown above, it is possible to transfer energy from one to the other by taking advantage of the properties of magnetic fields.

If the core is of steel it will, in fact, remain a permanent magnet and retain its magnetism when the source of electrical power (in our case a battery) is removed.

If, on the other hand, a *soft* iron core is employed the magnetism will cease to exist when the battery is removed.

In practice a permanent magnet is one which exerts a force and possesses a magnetic field without the assistance of a battery or other external source of power.

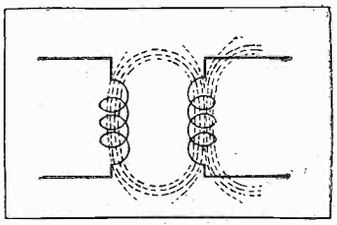
Permanent-magnet loudspeakers, for example, do not have to be connected to the mains before they will work; but loudspeakers of the energised type employ electro-magnets, and will only work when joined up to a source of power such as the mains.

Dispensing With Iron.

Does the existence of a magnetic field and of magnetic lines of force depend upon the presence of iron or steel? The answer is *no!* Any electrical conductor (a length of copper wire) can be made to produce a magnetic field if it is joined to a battery. The flow of electricity from one end of the wire to the other produces a magnetic field, and this field is similar in its characteristics to that produced by the permanent or electro-magnet.

The flow of electricity along the wire will affect a compass needle and cause it to move just as the magnet does.

MAGNETIC INDUCTION



The magnetic field set up by a coil of wire can generate a flow of electricity in a second coil.

But it is interesting to note that lines of force are set up much more readily in iron than in air; and if a length of wire is wound round a piece of iron the lines of force will tend to concentrate themselves in the iron, because it offers an easier path for them than the air.

Meaning of Permeability.

This conducting or carrying power of the iron is called its *permeability*, which is described as the ratio of the flux density of the iron to that of air.

The permeability of a metal is given as a number. Air is one, while iron may be a thousand.

(*Continued on next page.*)

MYSTERIES OF MAGNETISM.

(*Continued from previous page.*)

In other words, if one line of force passes through one square centimetre of air a thousand (or more) lines will pass through the same area of iron.

The question of permeability is of great importance in the design of certain radio components, because it enables the full use to be made of the lines of force set up by the flow of electricity round a coil of wire. Later on in the series we shall deal with this point more thoroughly.

Generating Electricity.

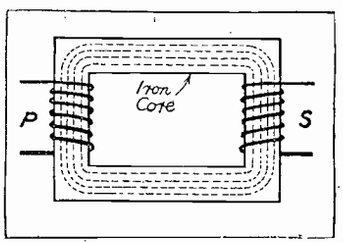
Now, a magnetic field, due to a magnet or a length of wire, has the power of affecting other things apart from iron filings, compass needles or steel articles.

If we take a second length of wire, wind it into a coil (a coil is not essential, by the way) and then place it in a magnetic field a flow of electricity will be induced in the coil.

We can generate electricity in a length of wire simply by moving it across a magnetic field. This is the principle of the dynamo.

But electricity will only be generated in the wire when the wire is moved at an angle to the lines of force.

USING A CORE



When two coils are wound upon an iron core the lines of force flow through the iron. Any lines due to the coil P will act on the coil S.

Suppose we took two bar magnets and placed them on supports so that their north and south poles were an inch or so apart. Lines of force would fill the gap between the two poles, because in magnetism unlike poles attract and like poles (south to south or north to north) repel each other. Magnets are usually marked so that the north pole can be distinguished from the south.

If we joined a loop of wire to a sensitive measuring instrument such as a galvanometer (to detect the flow of electricity) we should notice that the needle moved as the wire passed through the gap between the magnet poles.

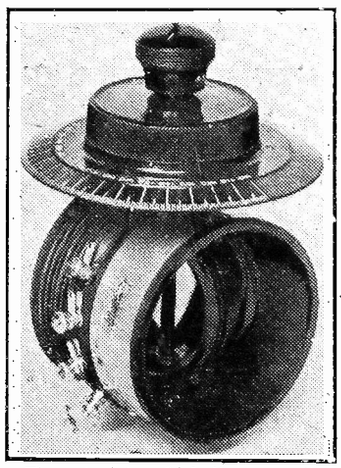
Reversing Polarity.

If, on the other hand, we moved our loop of wire from one pole to the other so that the wire was always parallel to the lines of force and never permitted to cut across them, there would be no flow of electricity around the loop and no indication on the measuring instrument.

Incidentally, we would mention that when a magnet is used to pick up a steel object the effect of the magnetic field is to make the object into a magnet of opposite polarity. The north pole of a magnet, if placed near a needle, would cause the needle to behave as a south pole and so attract it.

If the needle was already a north pole of similar strength to the bar magnet one would repel the other and the magnet would not pick the needle up. But a strong north (or south) pole could overcome a weak north (or south) pole, reverse its magnetism (polarity) and so make it a south (or north) pole and thus attract it. In radio, however, we have to consider the magnetic fields—that is, the lines of force—set up by coils of wire rather than those due to magnets.

ROTATING COILS



The extent to which the magnetic field set up by one coil can affect another depends upon the relative positions of the coils. By arranging for one coil to rotate within the other the effect of the field can be infinitely varied.

Transferring Energy.

One of the most important factors is that a coil of wire carrying electricity can, by reason of its magnetic field, produce a flow of electricity in a neighbouring coil.

The magnetic field carries electricity through space, but its effect is much greater when the two coils are close than when they are well separated.

When air is the conducting medium or carrier for the lines of force they tend to spread out, and only a few have any effect upon the coil into which they are inducing a flow of electricity.

Electricity which is generated in this way is said to be produced by *induction*, because it is induced by the magnetic field or flux of the first coil.

If we want to get the maximum effect from the lines of force we use a carrier having a higher permeability than air.

For instance, if we wind the two coils on a core of iron we find that a much greater quantity of electricity is generated in the second coil than is the case when air is the carrier. This, of course, is assuming that the amount of electricity in the first coil is the same in both cases and that the two coils are the same distance apart.

Avoiding Waste.

The high permeability of the iron provides an easy path for the lines of force, and nearly all of them pass through the second coil. With air, the lines which spread out and fail to pass through the second coil are wasted.

At this stage we would point out that electricity is only generated in the second coil when the number of lines which pass through it are varying.

This means that the flow of electricity only occurs when the magnetic field is formed or when it collapses. The field, is formed when the battery or source of power is connected to the first coil, and it ceases to exist when the source of power is removed.

Alternatively the magnetic field may be kept constant and the second coil moved to and fro so as to cut the lines of force at right angles. This is what happens in a dynamo.

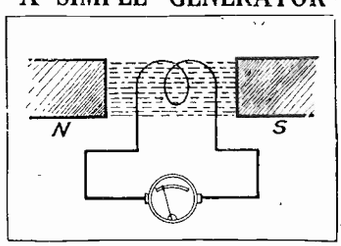
How It Works.

A coil (or number of coils) of wire called the armature rotates in a strong magnetic field, and all the while the armature is rotating electricity is generated in the wire. Directly the armature stops the flow of electricity ceases.

In a practical dynamo the magnets which produce the lines of force for the armature to cut are not of the ordinary permanent type. They are energised magnets which possess sufficient residual magnetism to start a flow of electricity through the armature.

In other words, they have just enough permanent magnetism

A SIMPLE GENERATOR



One method of generating electricity is to move a length of wire across the gap between two magnet poles. This is the principle of the dynamo.

to cause some lines of force to cut the armature winding. This is enough to start a flow of electricity when the armature is just rotated.

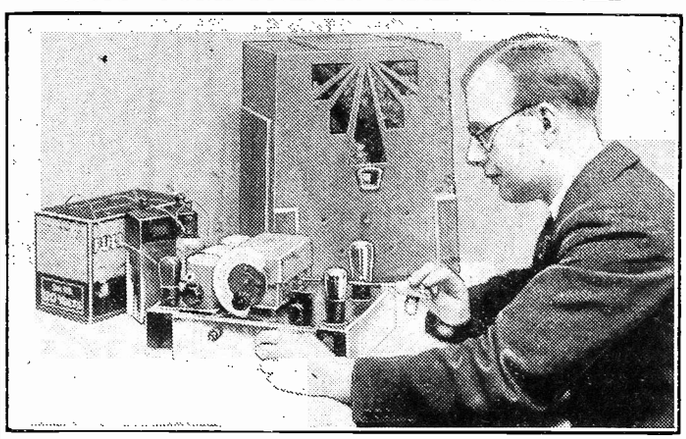
After this, part of the electricity flowing in the armature is diverted through the magnet windings (called the field windings), thus strengthening the magnetic field and so increasing the amount of electrical energy in the armature winding.

Hence once the dynamo is running it creates its own magnetic field; but if it wasn't for the existence of a small degree of permanency in the magnets the dynamo would not work, because there would be no lines of force for the armature to cut during its first few revolutions.

Ensuring Efficiency

The armature is wound on an iron core, and the gap between the armature winding and the magnet poles is kept small—just sufficient for the armature to revolve freely. This ensures that the maximum number of lines of force cut the armature winding, since they naturally take the easy path through the iron core.

WHY COMPONENTS ARE SCREENED



Metal screens are often employed in modern receivers. This is to prevent the magnetic fields set up by the different components from affecting others near by. The particular receiver shown above is an example of very thorough screening.

S.T.500

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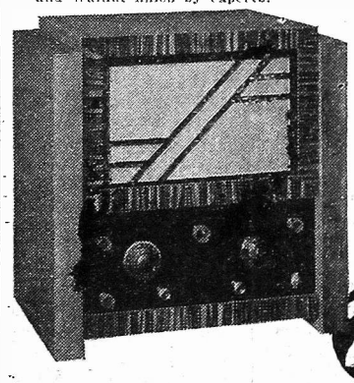

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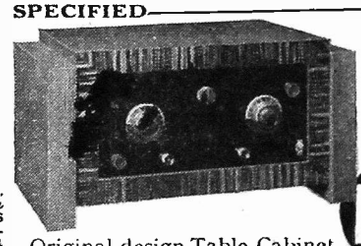

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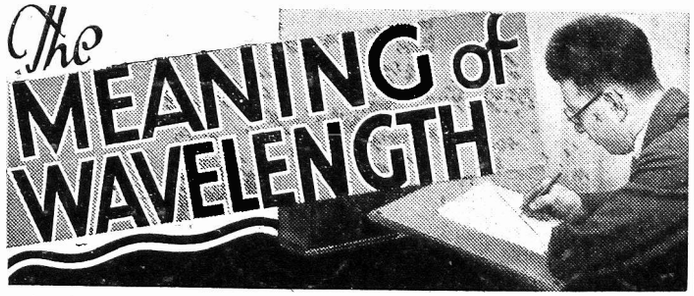
Special Beginners' Supplement—Page 3.

The MEANING of WAVELENGTH



WHEN, for example, a broadcasting station is said to be using "a wavelength of 300 metres" it means exactly what those words say. The station is creating waves in the ether of 300 metres in length. (That is, about 325 yards.)

A complete wave consists of a trough (condition of pressure) and a crest (the equivalent of the lumping up in a water wave).

Later on we shall tell you how the wireless wave is formed in the ether, but first we must discuss the relation between Wavelength and Frequency.

Easy to Understand.

These related terms are very widely used in radio, and it is essential that they should be understood before the beginner tackles tuning and other things.

It should not be hard to grasp the fact that a wave has a definite length. (See Fig 1.)

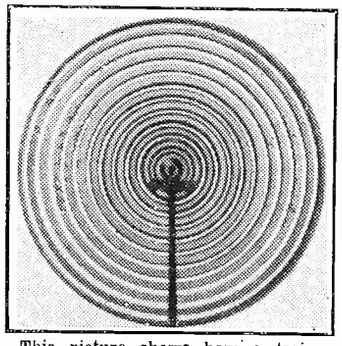
The next fact to remember is that ether waves, whether of light or radio, are always radiated at a constant speed or Velocity. This is 300,000,000 metres per second (approximately 186,000 miles).

It doesn't matter where the radio station is when it transmits or what power or wavelength it employs: the Velocity of the waves radiated from its aerial remains the same—300,000,000 metres per second.

A Fixed Factor.

As this factor is absolutely fixed it follows that there must be a definite relation between the length of the waves and the number of waves that are created in a given time.

TRAINS OF WAVES



This picture shows how a train of waves is set up by a central source of disturbance.

This last is known as the Frequency, and the unit of Frequency is the Cycle—one complete operation, as it were. In this case each radio wave is a "cycle."

A succession of waves, such as ripples outwards through the ether from a broadcasting station, is styled a Train of Waves. Actually, of course, as you will appreciate, there couldn't be just one wave: there must always be a series of them.

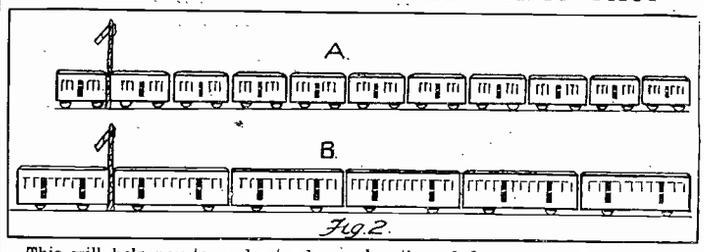
As the waves radiate through space at 300,000,000 metres per second the number which pass a given point in the same time (one second) tells you the length of the wave.

A simple analogy will make this point clear.

Supposing railway trains always travelled at exactly the same speed (Velocity). Let us say 50 metres per second, to use units which are similar to those employed in radio.

If ten carriages passed a signal-post in one second, what would be the length of each carriage, providing they were all of the same length and were very closely coupled? (See Fig 2.)

SIMPLIFYING A FUNDAMENTAL RADIO FACT



This will help you to understand wavelength and frequency. Both trains proceed at the same speed. A larger number of coaches will pass the signal-post in a second in the case of A, as A's coaches are shorter than B's.

Obviously, 5 metres. The train travels 50 metres in a second; ten carriages whip by in that amount of time; each must clearly occupy a length of 5 metres.

Let us look at it from another viewpoint. We know the length of the carriage. Call it 10 metres. How many will pass in one second? In other words, what is the Frequency?

Something to Memorise.

The Velocity is 50 metres per second; the length is 10 metres. There will be a Frequency of 5 per second. That should be plane-sailing. Now think of the string of railway carriages as a train of radio waves (which maintain the fixed velocity of 300,000,000 metres per second) and the analogy is complete.

In the form of an equation the relationship between Wavelength and Frequency is:

Velocity = Wavelength × Frequency.

To discover the Wavelength when the Frequency is known you merely divide the Frequency into 300,000,000. Alternatively, knowing the Wavelength, the Frequency can be discovered by dividing the Wavelength into 300,000,000.

The Frequency of a transmission on a wavelength of 300 metres is 1,000,000 cycles. The Wavelength of a station transmitting with a Frequency of 1,500,000 is 200 metres.

Numbers having lots of noughts are clumsy to handle, and so usually the Frequencies of radio stations are given in Kilocycles. A Kilocycle is a thousand cycles. Thus we can more conveniently refer to 1,000 kilocycles than to 1,000,000 cycles or 500 kilocycles than to 500,000 cycles, and so on.

Kilocycles Preferred.

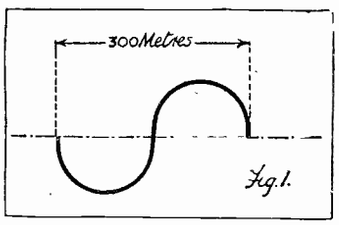
But calculations must be made in cycles, for that is the unit. To reduce Kilocycles to Cycles all that has to be done is to multiply by 1,000, and, as we have seen, Kilocycles are obtained by dividing the figures in cycles by one thousand.

Perhaps some of you are wondering why it is necessary to use that term "Cycle" and why Wave cannot be employed instead.

The reason is that Frequency applies to other things than ether waves, and, therefore, its unit must be more widely applicable.

It might be very convenient to have "glass" or "cup" as a unit of liquid measurement in a refreshment establishment; but it would hardly apply to calculations of swimming-bath or petroleum-tank capacities. The pint and gallon are clearly superior.

A COMPLETE CYCLE



A complete wave consists of a trough and a crest, the distance from the beginning of one to the end of the other being the wavelength.

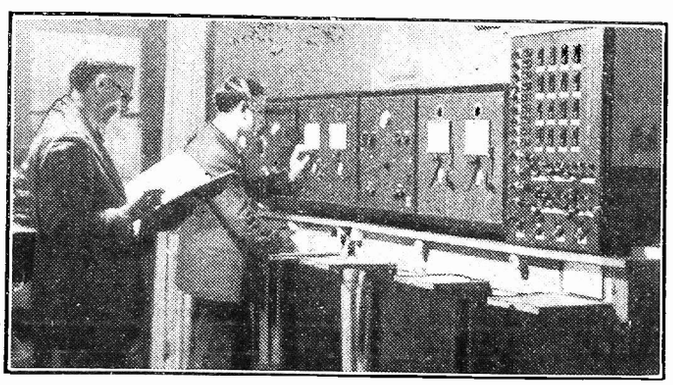
This is perhaps going rather far afield for a simile, but it does, we hope, convey the idea.

Anyway, Frequency, as with Capacity, is applied to various things. But you need not fear that it changes its character. It always is used to indicate the number of repetitions of operations or events occurring in a certain time. (One second is employed as the unit of time in electricity)

In the transmission of radio energy a wave is a Cycle, and, when you come to think of it, this is perfectly descriptive.

There is a compression in the ether followed by a rarefaction, then another compression followed by another rarefaction, and so on. There is a repetition of a CYCLE of events. The term, you see, is perfectly logical, though we fear that cannot be said of all terms used in wireless!

THE POLICEMAN OF THE ETHER



Transmitting stations are allowed to disturb the ether at certain specified frequencies only. The lengths of the waves they create are checked by the authorities at a listening post in Brussels.

TELSEN

'S.T. 500' COILS

for Mr. John Scott-Taggart's

P.W. 'S.T. 500'

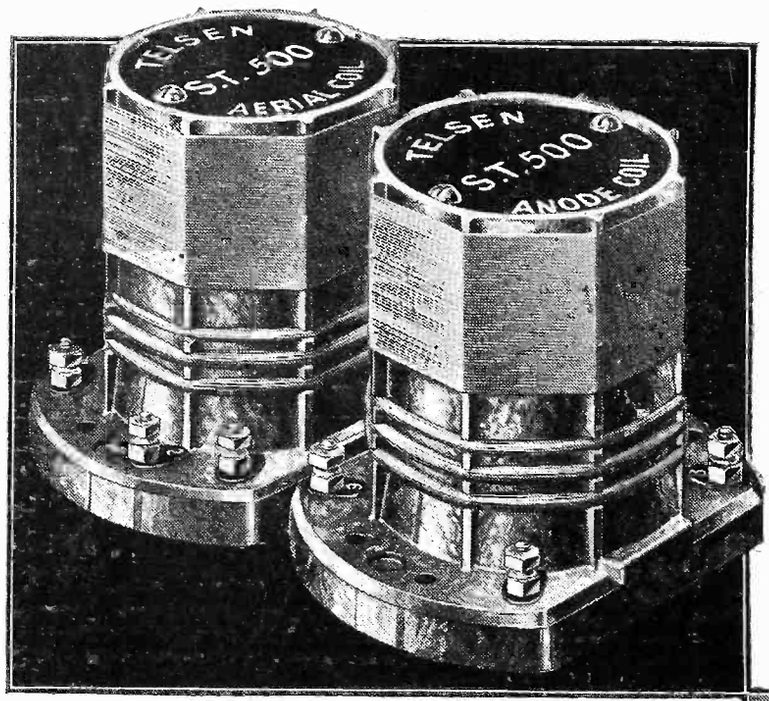
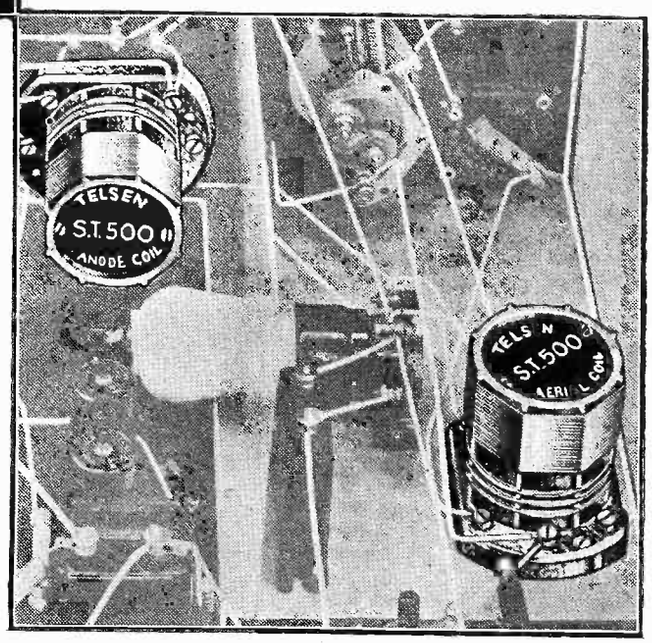


Illustration below shows the position occupied by the Telsen 'S.T. 500' Coils in a built-up 'S.T. 500' Receiver.

RECOMMENDED for use in the S.T. 500 by Mr. John Scott-Taggart, the Telsen S.T. 500 Coils have been specially designed for their purpose, to ensure immaculate performance with enduring efficiency. The Aerial Coil consists of plain long and medium wave windings connected in series, with a separate reaction winding, the Anode Coil having a larger reaction winding connected to the earth end of the main winding. The Anode Coil is supplied complete with two brackets and the necessary screws for mounting.

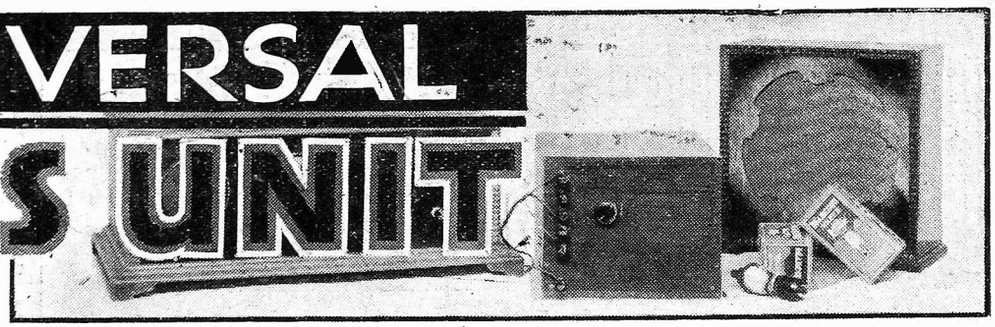
Price per pair **8/-**



TELSEN FOR EVERYTHING IN RADIO

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

A UNIVERSAL MAINS UNIT



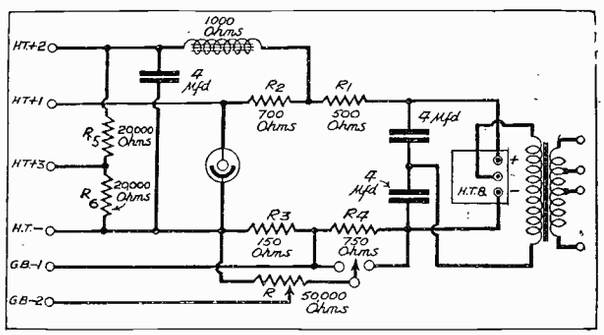
By KRYPTON

Greater flexibility in the design of mains units is the plea put forward by our contributor. He discusses in detail all the factors which a satisfactory arrangement should incorporate, and combines his conclusions in an interesting and practical specification which constructors can build for themselves. It has tappings suitable for all types of output valves, and also provides automatic grid bias.

DON'T you think it is about time we developed some new ideas in mains-unit design? The average eliminator is becoming rather too "stodgy", an affair for those of you who experiment with modern circuits, while it is incapable of supplying the widely fluctuating anode current of Class B and Q.P.P. stages at the constant voltage so necessary for the best results.

There are, of course, special Class B eliminators now available, but these, in my opinion, are hardly flexible enough for all your requirements. What we really need is a new type of unit, a universal design, capable of meeting the power-supply requirements of the various types of modern receivers and of receivers of the near future.

FLEXIBLE AND STABLE



Provision is made for a stable voltage supply to the output stage, and unstabilised outputs are available for other stages. Variable grid bias is also a feature.

We may not all agree about the design of a universally useful mains-unit, but I don't think you would be disappointed in the following general specification: A compact unit, metal rectifier, and inexpensive smoothing equipment.

It has a special power supply suitable for Class B, Q.P.P. or ordinary output stages at a *constant* H.T. potential of some 125 volts; a second power supply at 150 volts for other valve stages; a tapping at 70 volts or so for screen potentials or detector; and last, but not least, as many fixed or variable-grid bias voltages as you require.

You might imagine that all this would lead to a rather complicated circuit arrangement, but in actual practice the design can be worked out on quite simple lines.

By No Means Complicated.

The accompanying diagram, which introduces my idea of a universal unit, is by no means complicated. On the right we have the usual mains transformer and rectifier; either metal oxide or valve rectifiers can be used equally well. Next follows the neon stabiliser circuit, which provides such remarkable voltage regulation that the voltage at H.T.+1 remains almost constant whether the load is 40 ma. or zero.

The series resistance required for the neon tube is distributed round the circuit in such a way that it performs three functions at the same time—the section R_1 R_2 provides a higher voltage at H.T. + 2, the section R_3 R_4 free grid bias, and both together the current limitation for the stabiliser circuit.

The Smoothing.

You may wonder what has happened to the normal smoothing equipment for the H.T. + 1 feed. There isn't any, for the simple reason that the neon tube and associated resistors give you all the smoothing you want with Class B, Q.P.P., push-pull and ordinary amplifiers, no hum at all being audible.

This, of course, is a real economy, as the smoothing choke and condenser for the secondary H.T. feed are relatively inexpensive components. Incidentally, this secondary feed is designed to give up to 10 ma. at 150 volts, which should be ample for the earlier stages of the receiver. Any desired subsidiary voltage at H.T.3 can be obtained by choosing appropriate resistors for R_5 R_6. Another point of interest is that, except for the voltage-doubler circuit of the metal rectifier, high-voltage test condensers are unnecessary, as the neon tube itself prevents an excessive voltage rise on switching on the unit.

Free G.B. Supply.

One of the most convenient features of this unit is the adaptability of the free grid-bias supply, as up to 45 volts negative is available. In the diagram you get 7½ volts bias at G.B.1 and either 0–7½ or 0–45 variable bias at G.B.2, according to the connection of the potentiometer R.

Any other fixed voltage required can be got by including more or less resistance between H.T. — and the grid-bias tap, remembering that the value of this resistance is obtained here by multiplying the desired bias volts by 20. Thus, for 15 volts fixed bias, the required resistance is 300 ohms. Of this R_3 provides 150 ohms, so that R_4 must be tapped or divided into 150- and 600-ohm resistors, the desired 15 volts being picked up where the two latter are joined together.

It should not be forgotten that some decoupling of these grid-bias feeds will, in nearly every case, be required. This is not shown in the eliminator diagram, as such decoupling is more conveniently incorporated in the receiver itself.

High Maximum Voltage.

The grid-bias arrangements should be sufficient for all present and future requirements in view of the high maximum voltage available and the ease with which different bias volts can be got. The variable bias at G.B.2 can be altered to control a short-base or a normal variable-mu valve.

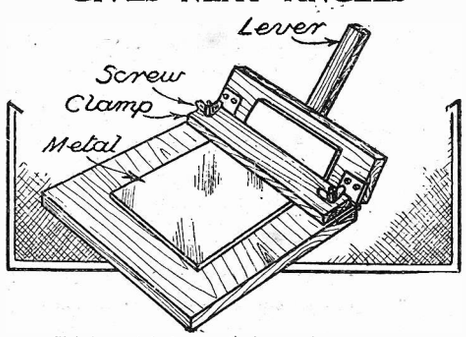
In conclusion, I would suggest the provision of a 4-volt secondary on the mains transformer.

BENDING SHEET METAL

A neat arrangement which overcomes the bending difficulties met with in making metal chassis.

ALUMINIUM is ideal material for small boxes for mains units or for the chassis-built type of receivers. But it is sometimes difficult to bend the metal quite accurately and neatly.

GIVES NEAT ANGLES



Sheet metal is easily bent to any angle.

A very simple device, however, can be made up from odd pieces of wood in a few minutes, which will prove very satisfactory for obtaining neat angles. The scheme is shown in the sketch.

AN A.V.C. UNIT

MANY constructors seem unable to understand why it is that automatic volume control does not upset the balance of a musical item. They argue that if the control keeps loud transmissions down to a certain fixed-volume level, then, surely, there will be a tendency for the varying volume levels of any one given programme to be tampered with.

For instance, the loud passages of an orchestral item subdued, the beating of a drum made to sound like fairy footsteps, and so on.

But A.V.C. does not fall down on so elementary a snag as that. Let me try, in a few words, to convince you of this.

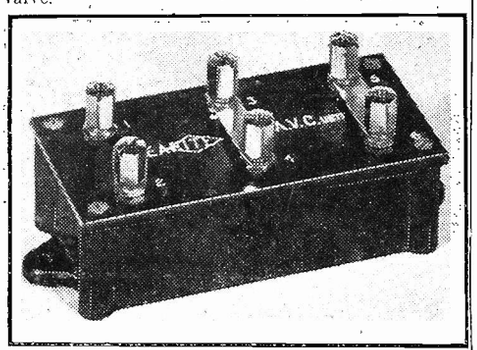
You know that the prime essential for good-quality reproduction from an ordinary stage of L.F. amplification is that the H.T. current should retain a constant level.

A milliammeter is used to check this. It shows a steady reading. On loud passages, on quiet passages that needle should not move.

In much the same way the D.C. output of a detector valve maintains a steady average value, but in this case this steady average value differs with different stations in accordance with their strength.

In fact, it is the carrier-wave of the station and not the modulation of the carrier by speech and music which determines that average D.C. output. And it is this last which can be applied to A.V.C.

A comparatively simple and perfectly satisfactory method of applying it is to use a Westector "cold valve."



The Wearite "Auto'rol," a useful little unit for providing automatic volume control using a Westinghouse metal rectifier.

This ingenious and highly useful device forms the basis of the Wearite "Autotrol" unit, which incorporates a Westector and the necessary condensers and resistances.

The "Autotrol" enables A.V.C. easily to be added to an existing set of a suitable type, and it is also a conveniently compact assembly of the required parts for a new set.

The price of the "Autotrol" is only 10s. 6d., and I doubt if the separate components in it could be bought as cheaply.

Inasmuch as its connections and the methods of application advised for it are based upon perfectly standard and straightforward practice its effectiveness can be taken for granted. But, of course, we tested it and, as anticipated, it worked decisively and without trouble.

A USEFUL GANG

A two-gang condenser, complete with a slow-motion drive, panel fittings and scale light, for 10s. 6d. is what Messrs. Burne-Jones are able to offer.

The condensers are of the solid dielectric type, and the whole affair is very compact. Nevertheless, it cannot be dismissed as anything but a component which deserves the closest attention of constructors.

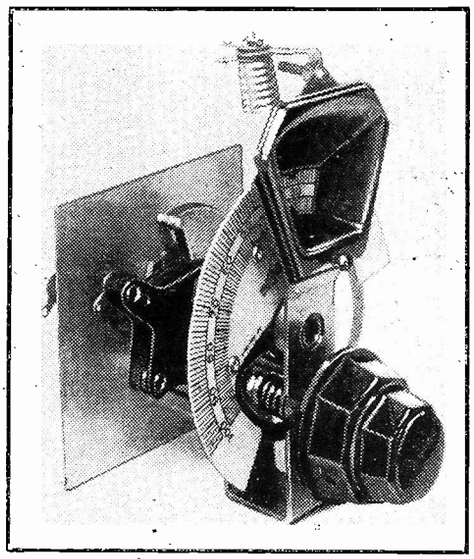
For compact band-pass sets of many types it is a serious alternative to the higher-priced air dielectrics. How can the sections possibly be accurately matched? I can hear many asking.

This is satisfactorily accomplished by providing a vane-rocking adjustment for the one section. This is a liberal adjustment, and is controlled by a small knob concentrically arranged on the main tuning knob. No trimming is necessary; that is, trimming of the ordinary kind. This subsidiary panel control is really a trimmer.

And while it is rather subversive to the one-knob tuning ideal it allows closer matching to be obtained than with the majority of expensive precision gangs.

This, obviously, may largely offset the losses occasioned by the introduction of solid dielectric, so on balance the Burne-Jones gang emerges, as I have said, as a component meriting commendation on all counts.

It is very well made, and its drive is beautifully smooth.



Priced at 10s. 6d., this Magnum double-gang solid-dielectric condenser, made by Messrs. Burne-Jones, Ltd., represents excellent value for money.

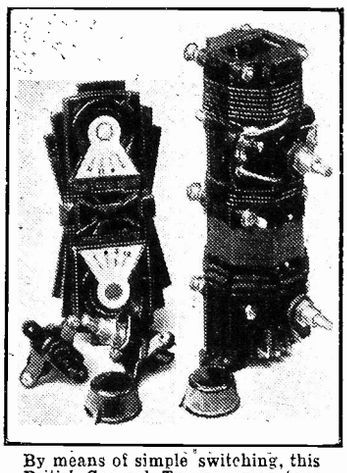
AN ALL-WAVE TUNER

It is a long jump from the separate plug-in coils of, say, the famous "P.W." "Magic" set to an "all-wave" tuner. Long in a technical sense, that is, but not in time.

Actually it is not so very long ago, even, that the idea of combining short and long wavebands in the one set was first introduced. The above-mentioned "old Magic," as it is affectionately termed by hosts of constructors, was instrumental in bringing short waves and "ordinary" broadcasting together.

And now "all-wave" tuners are as freely obtainable as "dual-banders"! There is, for example, the British General unit, which covers no less than four wavebands.

This is a particularly compact component, and its wave ranges are controlled by two switches set in an artistic panel escutcheon.



By means of simple switching, this British General Tuner covers four bands of wavelengths and tunes down as low as 12 metres.

One of these switches adjusts the aerial coupling in accordance with the frequency, and is a refinement which contributes considerably to the successful operation of the device.

With this tuner you can roam from 12 to over 2,000 metres with no other switching than with the switches I have just referred to.

You would not expect colossal selectivity with any det. L.F. or det. 2 L.F. type of set, but with this B.G. tuner a very good performance indeed is achieved, and the short-waves are free from flat spots and other such blemishes.

It is certainly an attractive proposition, particularly at the very reasonable price of 9s. 6d., which, is less than the price of some dual-wave coils.

On test I found it quite free from the usual faults encountered in many of the ambitious tuning units that from time to time are offered to the public.

For example, there isn't an overwhelming break-through of the medium waves into the territory of the long-wave stations.

A very common fault, that, and yet I cannot remember having received much correspondence from constructors on the subject.

I wonder if "break-through" is accepted as inevitable by most of them? It should not occur in a serious manner if the tuner is properly designed.

Weekly jottings of interest to buyers

A PARTICULARLY gratifying aspect of the new season's tendencies is the amount of attention that is now being given by the commercial set manufacturers to battery-operated receivers.

For long enough I have stressed in my notes the inadequate number of models available, bearing in mind that well over half of the total number of homes in this country are still unwired for electricity. But now the manufacturers have really got down to it, and a survey of the market shows that the proportion of battery to mains models is much more in keeping with the potential demand.

One particularly outstanding model which I have had an opportunity of testing is the new Ekco Model B.74.

For those who are interested I am able to pass on the news that a complete report of this particular instrument is to appear in an early issue of "P.W." Meanwhile, from my own personal experiments I have no hesitation in saying that I consider it to be one of the leading battery designs of the present season. It worthily upholds the traditions of a famous name.

Please, Mr. X.!

I have an uneasy feeling that before very long a certain "P.W." reader living in Northampton will be writing to me to complain that, despite the fact that he enclosed a 2d. stamp, he has not received literature Nos. 51, 53 and 54. If "Mr. X., Northampton," is an adequate address, then I take back my remark. If not,

(Continued on page 434.)

The recent introduction of valves having as many as seven electrodes has created a need for multiple-socket valve holders, and our contributor follows up his previous article on valve connections by explaining how the new holders are employed.

DEVELOPMENTS in valve design, particularly as regards the multiple types, have been so rapid that many are still regarded as something of a curiosity.

Such valves, however, are being employed with increasing frequency in commercial and home-constructed designs. The multi-electrode type, too, are becoming more and more popular, and there is more than an indication, in fact, that the simple three- and four-electrode valves may be entirely displaced in time.

It is as well, therefore, to be conversant with the purposes for which the more common are intended, as well as with the actual connections of the electrodes of these valves to their base pins.

A Popular Type.

In what may be termed the multiple type the Class B valve will be by far the best known to our readers, as this extremely useful valve has been incorporated in quite a number of our battery designs recently.

This valve consists really of two triodes mounted in the same bulb, operated usually

THE DOUBLE-DIODE TRIODE

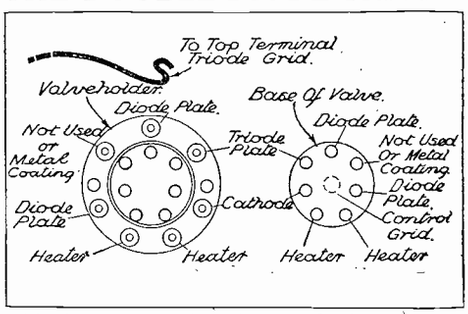


Fig. 2. With a mains-driven double-diode triode the terminals of its holder assume the functions indicated in the sketch.

with zero bias, although in some cases a small negative bias is required.

It affords exceptionally large volume for low-power consumption, a maximum of about 2 watts being available with suitable operation from standard H.T. batteries.

Almost every manufacturer is now listing a Class B valve. As these vary in the maximum power output permissible and current requirements, suitable types are available for practically all needs. The connections for the Class B valve are shown in Fig. 1.

It Provides A.V.C.

Next is the double-diode triode, the chief purpose of which is to provide combined rectification, automatic volume control and L.F. amplification simply and inexpensively.

As the name implies, the valve consists actually of two diodes and a triode section in the same bulb. Many variations in the circuit arrangements are possible with this multiple valve, but the usual is for one diode to be used as a simple detector, the second diode for providing a rectified voltage for biasing previous multi-mu H.F. stages, and the triode section as a first-stage L.F. amplifier.

The elements of the A.C. model are connected to the base pins as shown in Fig. 2.

FOR CLASS B

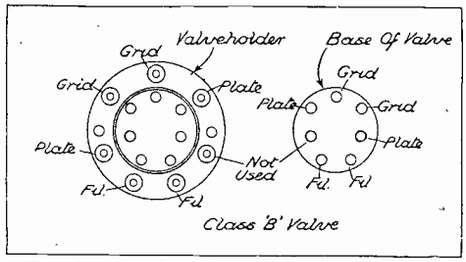


Fig. 1. The disposition of the terminals on a seven-pin valve holder when a Class B valve is used is clearly shown above.

It should be observed that the triode control grid is taken to the terminal in the top of the bulb.

The double-diode multi-mu pentode is somewhat similar to the above valve in its purpose, but the pentode section enables post-detector as well as pre-detector automatic volume control to be obtained. In this valve the top terminal is connected internally to the pentode anode.

High-Frequency Pentodes.

In the new class of multi-electrode valves the H.F. pentode is probably most familiar. This is quite similar to the ordinary S.G. valve, but an additional element is included.

It is claimed that this type of valve has greatly increased voltage-handling capabilities and high voltage amplification. These valves are available both for mains and battery operation in multi-mu and ordinary type.

We have here shown the connections for a mains H.F. pentode of the type having a

H.F. PENTODES FOR MAINS

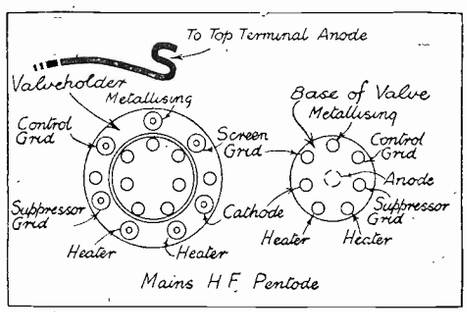


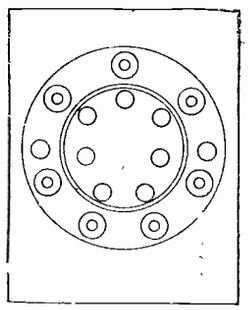
Fig. 3. Mains H.F. pentodes require to be connected into circuit in the manner shown by the terminal indications of this diagram.

★ ★ ★

STANDARDISED

The new seven-pin valve holder is standardised to take various types of multi-electrode valve and its termina's are not marked, as their purpose varies with each different valve.

★ ★ ★



seven-pin base. The connections of the battery H.F. pentode are similar, but the cathode terminal is not used.

In addition to those mentioned, a valve which has no less than seven electrodes has recently been developed primarily for superheterodyne receivers.

It will be noticed in one or two cases that all seven pins are not employed. The seven-pin holder, however, has been accepted as standard for all the valves mentioned, since it would be pointless to necessitate more than one new holder.

The New Holder.

The terminals of the valve holder may appear a trifle confusing at first glance, since there is no very clearly defined disposition of sockets as with the more usual type. Unfortunately, also, the terminals cannot be definitely marked, in view of the variety of connections called for.

In practically all diagrams of reference, however, the holder is regarded as held in such a position that a line from the viewer through the centre of the holder bisects it

USING A D.-D. PEN.

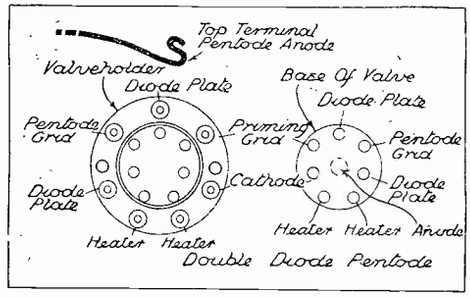


Fig. 5. The connections to be made to the various valve-holder terminals for a mains double-diode pentode can be ascertained from this diagram.

into two symmetrical halves, as shown in fig. 4. The filament terminals are then always the two at the bottom.

The valves dealt with here cover practically all those most commonly used in modern circuits, and it is interesting to note the manner in which valve design has developed.

Two quite distinct directions are clear: (a) the use of an increasing number of electrodes applied to the fundamental and simple triode valve; (b) the incorporation of two or more complete valve units in a single bulb. These are exemplified in the H.F. pentode, and the double-diode triode respectively.

In the case of the valve in which additional elements are used, the purpose is usually to modify the valve's characteristics in such a manner as to permit higher amplification or greater voltage-handling ability. The multiple type of valve provides a means for utilising multi-valve circuit arrangements in the simplest way possible.

THIS "TIDINESS" COMPLEX

Some useful hints for all radio enthusiasts.

By W. L. S.

Lack of time, or an eagerness to try out a new circuit are among the many things that sometimes make us neglectful of the appearance of our wireless gear. But does it pay? To this, our popular short-wave expert answers an emphatic NO, and points out how greater efficiency can invariably be expected as the reward of tidiness.

EVERYONE who dabbled in radio in the pre-B.B.C. days must have heard of the old saying that "the more untidy a thing was, the better it worked." Some folk, to judge by the nasty messes one sometimes sees nowadays, believe in it still.

But it isn't true, now, any more than it was then, except in one or two particular ways. Believe me, the "untidy" gentleman pays out more for accidentally burned-out valves and similar calamities than he saves on anything else.

The Amateur Transmitter.

Take our old friend, the amateur transmitter. His gear used to spread in a nonchalant fashion from one end of a bench to the other. My own, in 1922, had to be seen to be believed.

Water grid leaks in jam-jars of revolting appearance; "scrambled" coils suspended by bits of string from the window-frame; condensers like bird-cages; all lashed up by old bits of wire with twisted joints at intervals of a foot or so. I confess, most humbly, that *that* was what my "station" looked like.

Experimental Rigs.

Now there is some excuse for this sort of thing when a job is still in the very earliest of the experimental stages. Before one quite knows what form the final arrangement is going to take, there is no objection to spreading things about a bit. But when one has decided on the constants and the circuit arrangement, it is a most slovenly habit to fall into. Make the thing up properly, and it will work just as well, or better, and will not fall to pieces every time the window is opened!

This applies just as much to the simplest short-wave receiver as it does to the more ambitious gear of the transmitter. The 1933 listener's motto ought to be "If a thing is worth doing, it's worth doing well."

Two Good Examples.

The two photographs on this page might be taken as the two extremes. The American owner of the untidy gear will, I am sure, forgive me for reproducing it, as he describes it himself as "the junk-heap." The model of tidiness is the station of G 6 F N in Scotland, and the results obtained are good enough to squash the old adage about the advantages of untidiness for ever.

How can we tidy up our receivers? Quite a lot of them seem to leave no room for improvement in this respect; but what about the "extras"? Under this heading come such things as accumulators, H.T. batteries and power packs, to mention a few.

How often does one see a neat receiver rigged up on a bench and surrounded by straggly leads, dirty accumulators with mouldy terminals, H.T. batteries oozing "juice," and the other undesirable oddments?

Why not clear the place up and give the receiver a treat? L.T. batteries, in particular, too often receive a shabby deal by being placed a long way from the set and connected up with antique flex of doubtful reputation. Use good thick wire, preferably rubber-covered single flex, and place the L.T. supply as near to the set as possible, and directly underneath it, if it can be managed.

Aerial lead-in methods, too, leave a lot to be desired. Remember that your lead-in is probably the weakest link in the whole aerial, and treat it with as much care as you do the insulation of the far end.

Those "Fading Signals."

Then bring your wire straight to the set, keeping it off the wall as far as possible, and *do* provide for keeping it rigid. Half these tales of "fading signals" that one hears are accounted for by something inside the house.

As far as the set itself goes there is not very much to be said. At least, there *shouldn't* be! But the wise words so often uttered by the sages who write in "P.W." seem to need a sledge hammer to drive them home.

One sees, almost daily, sets on which no single component is held down by more than one screw (and many are not held at all), wired up in the crudest fashion with thin D.C.C. wire and twisted joints. The marvel to me is that some of 'em work at all, unless their owners possess the power of hypnotism.

Soldered Joints Best.

If you can't solder, I should advise you to do one of two things; (a) learn to do it; (b) learn to make tight joints without solder, and use a pair of pliers.

I think an instrument for measuring the total unnecessary resistance of all the connections in a set would give some of us a fright, but it would be very useful. I have known cases of L.T. voltage being 4 at the accumulator terminals and 3·2 at the valve-legs, thanks to bad leads, dirty connections, a poor L.T. switch, and still more bad leads!

Look after details like this, and you will, in nine cases out of ten, be more than surprised at the all-round improvement in the performance of your set, whether you be a short-wave expert, or a "local-station enthusiast."

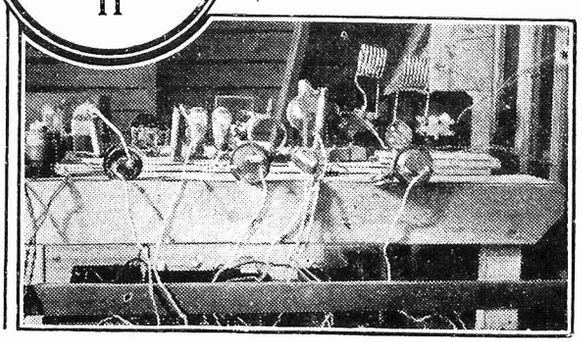
A Real Test.

I am going to make two sets to the same design one of these days. I shall make one of them as well as I know how (and perhaps that's not saying much), and the other to an imitation of some of these Heath-Robinson contraptions. Probably, in the long run, I shall only find that the untidy set works better than the other one, but that's hardly the point! If that is the case, it will only be that something unforeseen has cropped up.

Let it be a matter of pride with you that your set, and all its associated gear, is tidy enough to stand in the drawing-room, even if it is going to be tucked out of sight in your own little private "shack," and I think you will find yourself amply repaid. If it does not work any better, you will at least have a set that is good to look upon.

THE WAY IT SHOULD BE DONE

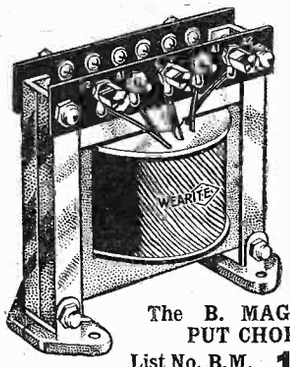
HOW NOT TO DO IT



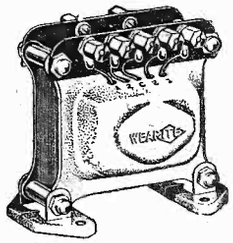
To prove his contention that the owner of a "tidiness" complex can expect adequate recompense for his efforts, W. L. S. gives these two photographs as examples. The picture above shows the arrangement of the gear at station G 6 F N, and even if W. L. S.'s assurance of the excellence of the results which are obtained were not true, it can be well imagined that such exemplary neatness must accord G 6 F N immense personal satisfaction and certainly should provide for efficiency.

The American owner of the subject of the lower picture himself refers to his station affectionately as "the junk-heap." But is affection sufficient recompense for a risk of bad results?

'CLASS B' at its best in the S.T.500 means



The B. MAG OUTPUT CHOKE.
List No. B.M. Price **11/-**



The B. MAG Driver Transformer.
List No. B.J. or B.J. 21. (See note in List of Components.) **8/6** Either type

Regd. Trade Mark

WEARITE "B. MAG" COMPONENTS

'Class B' is essentially a stage demanding a perfect team of components. Driver Transformer and Output Choke must work together as one. Wearite were of the first to produce such a team. Realising that valves and speaker were subject to substitution special tappings have been incorporated on both the B. Mag Driver and Output Choke. Use any of the suitable valves—employ what speaker you will—the Wearite B. Mag teamtakes care of these points. Insist on Wearite B. Mag Components for your S.T.500.

The Complete List of WEARITE Components for Your S.T.500

	s.	d.
1 pair Wearite S.T.500 Coils (or, separately: Aerial coil 4/-, anode coil 4/3)	8	3
1 Wearite B. Mag. driver transformer, type B.J., for use with Cossor, Mullard or Mazda valves Type B.J.21, for use with Marconi or Osram B.21 valves	8	6 Either Type
1 Wearite B. Mag. output choke (B.M.)	11	0
1 Wearite H.F.P. H.F. choke (or H.F.P.A. with screened pigtail connection 4/-).	3	6
1 Wearite H.F.P.J. H.F. choke	2	0
2 Wearite G.S.P. switches (each)	1	0
1 Wearite 7-pin valve holder (S.3)	1	9

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Band Pass Tuning
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Please send me a copy of full size blue print and constructional details showing how to build the WEARITE TEAMSTER. Also your booklet P.12 together with literature on "Class B."

NAME .....

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P.W.4/11/33 Please write in block letters.

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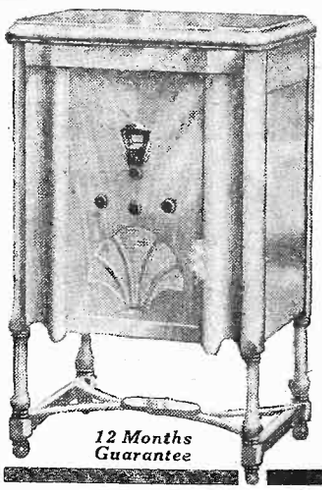

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A.C. All Mains. Variable-mu screened-grid valve, power grid detection and corrected Pentode output, and Mazda Valve rectification. Receives signals 200–2,000 metres. Magnetically coupled band-pass tuning with illuminated calibrated dial. B.T.H. Mains-excited Moving-coil Speaker. Line Voltage Regulator with safety fuse incorporated. Garrard Electric Motor, Automatic stop. B.T.H. pick-up. Special gramophone tone corrector. Walnut cabinet. Triple gang condenser controlled by single knob. The finest value in the world. Honestly worth double. (Also D.C Model, 16 gns.) Write immediately for illustrated booklet, and particulars of 3 days trial.

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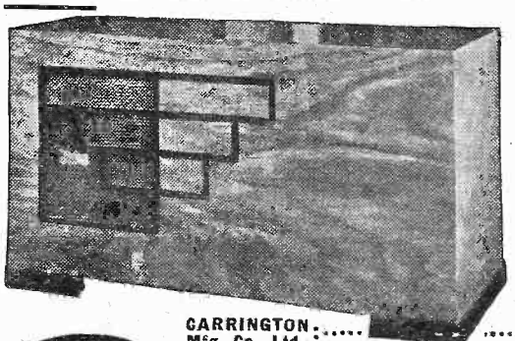

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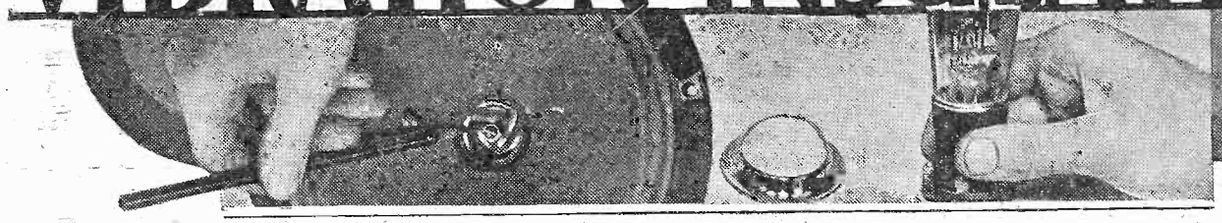
VIBRATION INSULATION



At times a shortcoming of the all-in type of receiver is the risk of a noisy background being caused by the close proximity of the loudspeaker to certain parts of the set. There are, however, simple remedies to overcome this trouble, and they are described below.

By V. A. GILLIAN.

WITH the coming of the compact, self-contained type of receiver some year or two ago the wireless amateur and manufacturer alike found in this new principle of construction many problems confronting them from which the older type of receiver had been comparatively free.

Tracing the Trouble.

Now, when a wireless set and its attendant loudspeaker find themselves in a cabinet they seldom succeed in working amicably together. What invariably happens is that the purely mechanical vibration set up by the loudspeaker and baffleboard finds its way to delicate parts of the receiver.

A background of noises caused by vibration varies in intensity from a slightly woolly interpretation of some sounds to a din of whistles and hootings that would do an election meeting justice.

Therefore we will view the elimination of microphonic effects and other troubles having their root in vibration from the position of the home constructor, and consider the means available for the suppression of this form of interference.

The Loudspeaker to Blame.

The root of the trouble, then, seems to be the loudspeaker, so it will be well to start at its attachment to the baffleboard and to try to insert some form of vibration-smoothing material here. This may be carried out in various ways, two of which are given here.

One method is to cut a ring of felt of diameter slightly larger than the loudspeaker chassis, which can be inserted between the chassis and baffleboard, as shown in Fig. 1.

An alternative method is to make a number of washers in felt or rubber which may be threaded on to the screws securing the loudspeaker chassis to the baffleboard, so that when the loudspeaker is attached the washers come between the speaker chassis and baffleboard. The sketch in Fig. 2 will make this clear.

If anti-microphonic valve holders are not at hand the rigid type may be mounted on felt or rubber rings, the method being shown in Fig. 3.

Next in importance to valve holders come the valves themselves.

A Simple Cure.

Fortunately, modern valves are seldom troubled in this manner, being designed with a view to avoiding microphonic effects. In spite of this, however, you do come across a microphonic valve sometimes, and the trouble can often be cured, or at least alleviated, by putting a wrapping of felt round the offending valve or valves and securing the same with thread, as is also shown in Fig. 3.

Another frequent source of trouble from vibration effects can often be traced to the moving vanes of variable condensers, especially if the condensers are mounted on to the same board as the loudspeaker.

The trouble arises through the moving vanes of the condenser having only one rigid support, namely the spindle, and the unsupported extremities of the vanes vibrating in accordance with any other vibration that may be present.

There is an effective cure for this which can be easily carried out. The method is to solder a piece of stiff wire across the edges of the condenser's moving vanes; this is not very difficult, as Fig. 4 will show.

In conclusion I may say that vibration is frequently the cause of noises in reproduction for which atmospherics and man-made static often receive the blame.

DEALING WITH THE SPEAKER

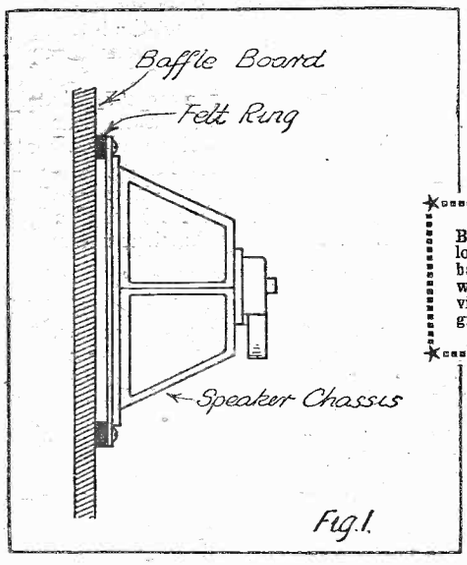


Fig. 1.

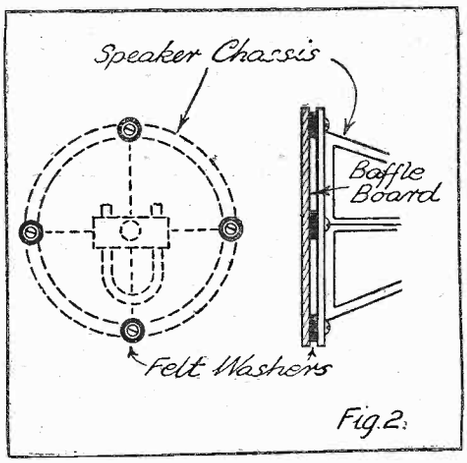


Fig. 2.

By interposing a felt ring, or several felt washers, between the loudspeaker and the baffle, as in Figs. 1 and 2, vibration of the baffle is prevented. Mounting a valve holder on a felt disc and wrapping the valve in felt is a good way of suppressing valve vibration (Fig. 3), and the expedient shown in Fig. 4 imparts greater rigidity to the moving vanes of a variable condenser.

PREVENTS MICROPHONIC HOWL

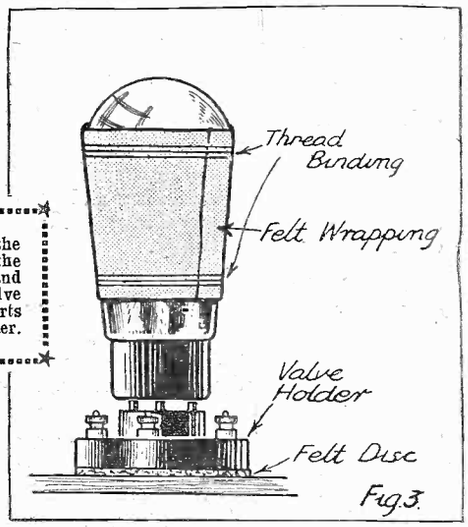


Fig. 3.

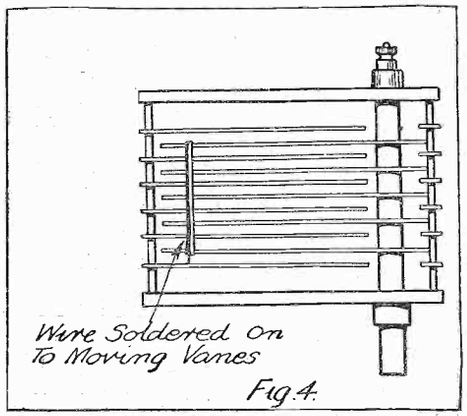


Fig. 4.

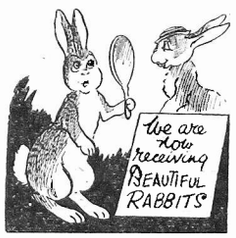
ARIEL CONTINUES HIS RUNNING COMMENTARY ON RADIO

(*Continued from page* 391)

That practical dreamer, Marconi, has pronounced the transmission to be feasible, so that readers who specialise on U.S.A. stations may hear the attempts.

Let the World Know !

THE proprietor of a local shop, who appears to be a wireless enthusiast, put this notice outside his door the other day: "We are receiving beautiful rabbits!" Well, it is a relief to know that the rabbits he receives are distinguished by their pulchritude, and it might be a better world if this inspired us to keep folk in general similarly advised.



For example: "We are getting beautiful signals from Barcelona," or "We are now enjoying Konigswusterhausen." After all, if you receive a beautiful rabbit, why keep the fact locked in your bosom? Goodness knows how many men with lovely rabbits are sneaking about, chortling in secret!

The Champion Key-Pounder.

APROPOS my report about the Morse sending record of 57·3 words a minute which was set up by Mr. W. J. Chaplin, R. W. (Worksop) suggests that I might point out that the feat was not accomplished with the ordinary straightforward type of Morse key, but with what they call in America a "side-swiper" or "bug."

I do not know what type was used, but in any case the speed attained indicates superb manipulation. R. W. apparently has a poor opinion of our amateurs' sending and of our ship operators' also, and blames bad Morse keys. I myself always thought our English keys too heavy.

Egypt is Coming On.

TO the horror of King Tut, the Sphinx, etc., there is the distinct possibility that express trains in Egypt may be equipped with broadcasting receivers. Nay, it is even mooted that trains de luxe will be fitted with telegraph offices. That's a nasty one for Isis, Osiris & Co. Worse follows!

There is a proposal on foot to link up Egyptian villages with radio-telephone services. Some people have no respect for mummies! What would the Sacred Cat of Thotmes say? I know! "Not quite so much of 'The Book of the Dead,' there, and a little more cat's-meat!"

Lost Spirits.

SPIRITS used to materialise at the bidding of those super-tricksters, the Maskelynes, at St. George's Hall. But that is all over now, for the B.B.C. is to take over the hall in order to replace the studio in the river warehouse, which is to be demolished.

The lease of the hall is said to cover a licence for the sale of drinks, and Sir J. Reith is said to have fainted twice and then transferred the licence to the Queen's Hall. So "spirits" will *not* materialise in St. George's!

You must be content with sucking peppermints—a form of "debauchery" which, according to Sir James Barrie, is carried on in kirks by Scottish folk.

The New York Radio Show.

AFTER all, they had a ten-day Radio-Electrical Exposition in New York this year, and report sayeth that the business done was worth $1,500,000. The total attendance was over 200,000. The "trade" predicts a successful selling season; I sincerely hope they may get it.

SHORT WAVES

The pronunciation of "margarine" with a soft "g" is advocated by the B.B.C.

Perhaps it would be fairer to have it soft in summer and hard in winter.—"Punch."

* * *

"What's the scandal at the broadcasting studio?"

"The whispering tenor wants more hush-money."

* * *

Newspapers may make readers' eyes start from their sockets, but the dear B.B.C. cannot allow its listeners' tender ears to burn.—"Newspaper World."

* * *

A MODERN ELEGY.

... Now all the world to busy life awakes,
The village street is filled with petrol fumes,
A bus blares by, a lumbering lorry shakes
The roofs, and reaches me among the tombs!

A distant driver harshly grinds his gear;
A motor-bike appals the countryside;
While from each cottage casement I can hear
The nasal tones of wireless—amplified!

'Tis more than human fortitude can bear,
And now at last I wish that I could creep
Beneath those rugged elms—or anywhere
The rude forefathers of the hamlet sleep!

These mute, inglorious Miltons never quake
At motor-cars, no Hampden knows the thrill
Of radio—but were they to awake
The rude forefathers might be ruder still!

"Daily Mirror."

Cheerfulness At All Costs.

RED-HOT report from San Diego (Cal.) to the effect that a firm of morticians (undertakers!) have contracted for a year with KFSD for a weekly series of programmes, musical and poetic.

In all conscience, it is ghoulish enough when firms of this calling use radio for advertising; but when I recall how common the practice of *embalming* is in America I reel mentally and shrink a little physically to read that this series is entitled, "Beauty that Endures"!

Muddy Methods.

ACCORDING to Sir J. Reith, if an applicant for a job with the B.B.C. cannot say that he would rather join the B.B.C. at £500 per annum than go elsewhere for a larger salary, that applicant's chances of being appointed are doubtful. Singular lack of worldliness on the part of "the first Director-General"!

Again, Sir John is reported to have said that he asks the applicant: "Why do you want to come to the B.B.C.?" Of course, the reason couldn't possibly be that the poor fellow had failed to get a job anywhere else!

New Menace to Radio.

THIS floor-polishing is a curse. It has long been a blight because it causes the mat to slide under the foot of the unwary; but when it arouses zeal in the bosom of the "domestic" it is—what I said.

Last night my set was dumb, and investigation showed that the aerial and earth leads had been wrenched from their terminals. The housemaid, anxious to polish that part of the floor on which the set stood, had just shoved the obstruction aside. Probably she thought that the leads were elastic.

I have, therefore, invented a lead which has a section which is made of wire coiled like a spring, covered with a strong rubber tube which will stretch.

Steady March of Radio.

DEPRESSION, heat-wave, the "pips," the "doomp." Dinwiddies, Dawnays and lady announcers combined fail to stem the steady flow of licences. It really is amazing. During August the total issued licences in Great Britain mounted up to 5,654,400.

It might have been more than that but for the Jolly Rogers who, during the same month, had 219 of their crew prosecuted and fined in all £198. So profitable and exciting does the Post Office find this hunting that there are rumours of a great Drive. What a pity that it is necessary!

More Faith Wanted.

WHAT we lose for lack of a little faith! Years ago I could have bought a real golden quid on London Bridge for a shilling, but I was too wide-oh! This is rubbed in by the news that a Salford radio dealer put in his window a ticket for the Manchester United–Burnley League football match, with the following notice: "It's yours for the asking."

Hundreds of passers-by looked, read—but did not ask, and eventually the office boy got it. I hope that this story will not make you rush to buy the next gold brick which is offered to you.

Electronic Music.

A new radio musical instrument, working on a hand-capacity principal, is being played for H.M.V. recording It is called the Electronde.

ARIEL.

RADIOTORIAL

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

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

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

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

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

QUESTIONS AND ANSWERS

WHEN THE PROGRAMME SUDDENLY DROPS TO A WHISPER.

R. V. M. (Billingshurst).—"I cannot understand what is the matter with my set (three valves, H.F., detector and low-frequency). It will be playing splendidly, and then all of a sudden drop almost to a whisper.

"After a few seconds, sometimes longer, it will burst forth into full volume again. What is the reason?"

You don't give us much assistance in the way of information about the set, do you, R. V. M.? To be able to help you in detail we should like to know a lot more about it, and also about the fault.

For instance, has the trouble been there ever since the set was put into action, or has it appeared after a period of good working?

Did you alter any of the wiring or leads just before the fault was noticed? And does this sudden silence occur when everything in the room is still, or only when somebody is walking about or moving near the set? Any little points about *how* and *when* the trouble appears would help us in diagnosing it.

Failing that, and any information about the receiver itself, we can only say in a general way that this type of fault is nearly always due to a faulty contact somewhere—possibly in the set, but may be in the battery, aerial, earth or loudspeaker lead.

To test, you must make a systematic examination. Start with the loudspeaker, and look carefully at its terminals to see that they are making firm connection. If there seems nothing wrong with the instrument itself, have a good, leisurely look along the leads which run to it.

Don't hurry over the job. Take a foot or so of the wire in your hands and examine its insulation, and then bend and wriggle it about a bit to see if moving that particular section seems to have any effect upon reception. If not, pass along to the next section of the wire, examine that with similar care, and so on.

Then examine the battery leads in the same careful fashion. Don't be satisfied because a wire *looks* all right at first glance, but test it. Insulation can cover a multitude of sins.

And when you arrive at the battery itself, examine that with equal suspicion. If it is the L.T., make sure that the spade tags or other connectors are tightly gripped by the terminals.

Undo the terminals and look at the hidden surface which actually makes contact with the connector. Is it clean and bright, or would a good rub-down with sandpaper or emery cloth improve it?

Remember that if the battery consists of separate 2-volt units the connecting bars between these must be as firm and as clean as any other part of the equipment. If not, they may give rise to exactly the kind of intermittent contact which is causing your trouble.

Go for the H.T., G.B. and aerial earth leads in the same thorough manner, keeping the set switched on all the time, and noting if any movement of yours seems to affect the fault.

If you cannot find anything wrong outside the set, open the lid and very carefully investigate the internals with a wooden penholder or some such convenient non-conductive prod. (Don't use metal, or you may make an accidental connection somewhere and cause a burn-out or no end of trouble.)

Look with especial care at all flex leads, such as those which go to coil tappings. Sometimes nearly every flexible strand gets broken through, and thus contact becomes very "chancy"; so moving the

(*Continued on next page.*)

DO YOU KNOW—

the Answers to the following Questions?

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

(1) Which of the big B.B.C. stations is to be replaced by improved equipment of greatly increased power?

* * *

(2) How does the B.B.C. use the Blattnerphone apart from the re-broadcasting of past items?

* * *

(3) What great change in European broadcasting is due to take place early in 1934?

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

lead will cause the reception to come and go, as you describe.

Then gently prod the valves and the components one by one. By proceeding slowly and methodically in this way you are fairly sure to come across a valve, or a grid leak, or a lead (for every wire should be gently investigated) that is causing the trouble. And once you know where the trouble lies you can put it right by improving the contact at that point.

Notice, too, whether all the wires which are supposed to be apart are really well apart or nearly touching. Because if something which is supposed to be insulated is sometimes actually touching another piece of metal it may be shorting all your results away. (The aerial lead touching against the gutter-pipe or other earthed conductor was often the cause of this when simple sets were all the go, but nowadays the fault is generally a little more subtle.)

Be specially careful to test the switches as thoroughly as possible; they often develop poor contact after they have been in use, especially if they are not well made and soundly designed. And don't trust loose plugs. Open them out so that they fit firmly into their sockets.

By overhauling everything in this way you are fairly sure to find the fault. But if you do not you will at least have the satisfaction of knowing that it is not the wiring, etc., but one of the components that is letting you down.

DOING WITHOUT DECOUPLING.

D. K. (Tunbridge Wells).—"I am not sure if I am doing right, but after a lot of trouble I have got the set going, and I am perfectly satisfied with it, if you are. But this is what I want to ask about.

"When first connected up to the batteries I got no programme at all, and spent a long time trying to make out what was wrong. Finally, I happened to touch the decoupling resistance and heard music.

"This put me on the track, and in the end I got everything going perfectly—reaction strong, volume control perfect, etc.—but *with no decoupling resistance*, only a piece of wire across the terminals of its holder. Do I need to do anything about it, or shall I carry on like that?"

Your decoupling resistance was a dud, and the correct thing to do is to get another one which is O.K. and use that in the holder.

It is, however, quite possible to carry on as you are, because if there is no instability you do not need the decoupling.

But remember that when the H.T. battery begins to age it may cause instability to develop, and in that case, you will find that decoupling is a very valuable feature, if only because it soon pays for itself in the increased battery life which it enables the set to achieve before distortion shows itself.

CONNECTING THE EARTH MAKES NO DIFFERENCE.

F. T. T. (Acocks Green, Birmingham).—"Perhaps you can tell me the cause of a curious fault which has been puzzling me ever since I found it a fortnight ago.

"There is no difficulty with reception or anything like that, but just a failure of the earth connection to make any difference whatever to the set. It goes at exactly the same strength, whether the earth witing is attached to the earth terminal or not.

"I have tried it on distant stations, and actually got Riga on it one night last week. Before the programme started to fade I was able to try both with and without the earth lead several times, and it makes absolutely no difference to tuning or to strength.

("I believe Riga is about a thousand miles away, and not a high-power station, so this was a thorough test of the set's pulling powers, with and without earth.)

"As you can guess, I am very pleased with the set, which I consider is a wonder for two valves (detector and pentode). But I am puzzled about this earth business, because of my experience last year, when I wrote to you about the "Apex."

"In your reply at that time you suggested that my trouble was likely to be the poor earth I had then, and on your recommendation I went to a good bit of trouble to remedy that, with the result that I proved you were right, and the set went fine as soon as the earth was O.K.

"That being so, why is it that now I have gone over to an all-mains set, with only two valves, using *same aerial and earth*, I can take the earth right off without making any difference?

("By the way, I know the earth is all right, as I had it up and examined it when digging near last month, and I have tested the lead, and will swear that it is as near perfection as can be.)"

We must admit, F. T. T., that we should have been very puzzled to account for your results if you had not disclosed one very important difference between the set you were using before and the set which is

(Continued on next page.)

"P.W." PANELS, No. 142.—POSTE-PARISIEN.

This is one of the finest stations on the Continent, and is very strongly received in this country.

The distance from London is a few miles over two hundred, the station being erected well outside Paris itself, for the same reason that our own Regional stations are outside London, Manchester, etc.—i.e. better radiation.

Poste-Parisien works on 328·2 metres, with a power of 60 kilowatts. Announces "Poste Parisien."

A feature of this station's programmes is the music of an "electric organ"—one which uses oscillating valves instead of organ pipes.

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from previous page.*)

now in use—we refer to your statement that you have now "gone over to an all-mains set."

On the face of it that may not appear to have very much to do with the earthing efficiency. But if you think it over, you will see that it is possible for the peculiar symptoms you describe to be due to the fact that the set is now well and truly earthed *through the mains.*

It does not always happen that a mains supply provides efficient earthing. But sometimes it does, and apparently that is what is happening in your case.

Naturally, if you have a good earth through the mains wiring, your outside earth is going to make very little difference to results, whether it is connected or left undone. Whereas, on a battery-driven set, it might be absolutely essential to have a good earth connection in order to get good long-distance results. Incidentally, we should like to congratulate you on getting Riga on two valves. He uses only fifteen kilowatts, and is quite a thousand miles from your aerial, so that was "good going"!

PLUGS AND SOCKETS FOR LOUDSPEAKER EXTENSION WIRING.

We should like to thank F. M. T. (of Radley College), who has written to warn fellow-readers of "P.W." of a little snag which is sometimes met with in connection with the wiring of loudspeaker extension points.

The snag is that if you use the ordinary household type of 5-amp. plugs and sockets for joining up the loudspeaker, and if these sockets happen to be placed near others which are used for lamp or electric-iron connections, some careless or lighthearted soul may all unwittingly push the *loudspeaker* plug into the *mains* socket! And that certainly won't do the loudspeaker any good!

Obviously, in any case where such confusion of sockets might arise, it would be far better to have a different type of plug and socket for the loudspeaker leads, so that the plug which belongs to these cannot possibly be inserted in the mains wiring socket. (Some of the miniature plugs sold specially for loudspeaker wiring are very cheap, inconspicuous and ideal for the job.)

We should like also to say, whilst on the subject of readers' experiences, how greatly we value the friendly spirit of co-operation and helpfulness which is exemplified by F. M. T.'s letter, and which exists amongst "P.W." readers all over the country—in fact, all over the world!

THOSE WEAK SHORT-WAVE CARRIERS.

D. W. T. (Luton).—"Like one of your other readers, I have been trying my hand at short-wave reception for the first time. And I am a bit puzzled about the results obtained.

"I get plenty of chirps and whistles, but they are mostly very *weak*, as compared with tuning-in on the medium or long waveband. (At least, the programme-giving stations are. Some of the Morse is anything but weak!)

"Is this usual?"

Generally speaking, the carrier-wave chirp of a short-wave broadcasting station is not at all promising; but very often what sounds at first like a "weak carrier" will prove to be capable of providing a fine loudspeaker programme, so the short-wave enthusiast never neglects a transmission because at first it sounds weak.

The golden rule, as W. L. S. has pointed out in "Short-Wave Notes," is to investigate everything you tune in.

The set should be gently oscillating when the carrier-wave is tuned in, and in order to "resolve" the programme the reaction must be very gently slackened off, so that the set is nearly, but not quite, oscillating, whilst the tuning is very slightly re-adjusted to "hold the station."

This final tuning is a bit critical, so the dials must be rotated slowly and carefully, but there is really very little more difficulty than in tuning on ordinary waves. Once you realise that when reaction has been slightly altered it may be necessary to compensate by retuning very slightly also, the resolving of weak carrier-waves into strong programmes is quite easy.

HOW TO OBTAIN BACK NUMBERS OF "P.W."

C. W. (Leiston).—"I want the number of 'P.W.' in which the 'Class B Mains Unit' was described. Please say if this is still obtainable, and how much."

The "Class B Mains Unit" was described in "P.W." No. 590, dated September 23rd, 1933. This, and any other numbers of "P.W." which are still in print can be obtained through a newsagent's order, or direct from the Amalgamated Press Ltd., Back Number Dept., Bear Alley, Farringdon St., E.C.4. Price 4d. per copy.

THE "S.T.500."

The tremendous interest created by this set has made it impossible to despatch individual replies to queries with our usual promptness.

We hope, therefore, that readers who raise other than definite technical queries will excuse the unavoidable delay in replying to their letters.

THE ANSWERS

TO THE QUESTIONS GIVEN ON PAGE 430 ARE GIVEN BELOW.

(1) Daventry 5 X X. A modernised long-wave station is now being erected near Droitwich.

(2) The Blattnerphone is constantly used to improve the standard of talks, etc. It enables broadcasters to hear their own voices at rehearsals, and many faults of speech, etc., are thus corrected before the broadcast takes place.

* * *

(3) On January 15th the Lucerne Wavelength Plan is due to come into force, and many stations will then alter their wave-lengths.

DID YOU KNOW THEM ALL?

THE MIRROR OF THE B.B.C.

(Continued from page 400.)

A Symphony Concert.

The Merseyside Symphony Orchestra, conducted by Louis Cohen, the well-known violinist, who founded it about a year ago, will be heard by North Regional listeners during the evening programme on Sunday, November 5th. The soloist will be Douglas Miller, who, with the orchestra, will play the Concerto in C Sharp Minor, Rimsky-Korsakov's only work for piano and orchestra.

The short history of the Merseyside Symphony Orchestra has proved that Liverpool has a great appreciation of its concerts which are given on Sunday evenings at the St. George's Hall. Among the guest conductors who will direct it during the coming season are Sir Hamilton Harty, Dr. Adrian Boult and Dr. J. E. Wallace.

From the Midland Regional.

Midland Regional's series of County Week programmes have almost run their course. Only one or two still remain to be given, among them being a week devoted to Shropshire, which is to begin on Monday, November 6th, with an introductory talk by the Chairman of the County Council, Mr. T. Ward Green.

Martyn Webster, the young producer whose early service with the B.B.C. was performed in Scotland before he was transferred to Broadcasting House, from where he was recently moved to take the place of Charles Brewer at the Birmingham station, is to produce the Shropshire Pageant, which follows Mr. T. Ward Green's introductory talk.

The Pageant has been written by Mr. A. D. C. Anderson, one of the masters at Shropshire School, a fantasy upon which is included in the last of its eight scenes.

Noises of the Hunting Field.

Industry has not spoiled Shropshire, and has left unscathed its beautiful hills—the Clees, the Long Mynd, the Quorndons, Breidden, the Wrekin and the Long Mountain—which, in their variety, are the most distinctive features of the county.

Shropshire has its sheep and its hunting, and a talk on the latter will be given on Wednesday, November 8th, by Major A. C. Bovill, master of the North Shropshire Hounds. Typical noises of the hunting field will be introduced from the kennels at Lee Bridge, near Wem.

Appropriate Musical Items.

On the musical side of the programmes, what could be more appropriate than that composers of such national fame and Shropshire birth as Sir Walford Davies and Sir Edward German should be represented in two of the midland composers' series of concerts that week?

Sir Walford Davies, who was born at Oswestry, will be represented on Thursday, November 9th, by eight of his part-songs, including three from his cantata "England's Pleasant Land," which are to be sung by the Midland Studio Chorus.

Sir Edward German is a Whitchurch man, and the concert of his music will be heard on Friday, November 10th. It will be given by the Studio Orchestra, directed by Frank Cantell.

THE LISTENER'S NOTEBOOK

(*Continued from page* 400.)

so brimful of sunshine, jollity and interest as this Florida talk was.

* * *

It is such talks as these that lessen our tendency to take everything, including broadcasting, for granted. By which I mean that, to my mind, there was something of the wonderful in this broadcast, although the transmission fell far short of perfection. Well, that was how it struck me.

* * *

I don't think the six telephone conversations that introduced the principals of "Pursuit" should be regarded as the solution to the identification problem in radio plays. But they went a long way towards achieving that end. The fact is, radio drama will always have this problem, and the real solution rests with listeners themselves and the skill they display in spotting.

* * *

At the worst, all that's necessary, I suppose, is a little patience on our part. All the same, it is up to authors and producers to simplify things as much as possible. I can recall plays when no sort of attempt was made by them to avoid initial complications. Such a play should never pass the plays' director, whatever the merits of the play.

* * *

I liked "Pursuit" because it was full of incident, and the dialogue was lively. Again, the cast was excellent. We've come to expect this always now, but the two players who took my fancy most were Miss Gwendoline Evans as the abducted girl and Mr. Phillip Wade as a taxi-driver.

* * *

Emerich Kalman's was a real Continental programme of music, though with the B.B.C.'s distinctive touch. I can't remember a programme of this type that I enjoyed better. It would be futile to try to distinguish between numbers that were all so uniformly excellent, but the two songs from "Countess Maritza" pleased me immensely.

Thea Phillips and John Hendrik were at their best, though it is true that Kalman had provided them with some jolly songs to sing. A very enjoyable hour, because one felt one was listening to gay and sentimental music that was pleasing and by no means lowbrow.

* * *

Professor Watson's second talk on "Rural England" confirms the opinion I formed of him after his first talk that he is something of a find as a broadcaster. He enters straightway into the ranks of radio's big guns.

* * *

Charlie Buchan, on international matches, stated his case very clearly, I thought, and conversation among "Soccer" fans could not have been wanting for the rest of that Saturday evening. If not altogether controversial, the issue at stake might be described as debatable. Good fare for a Saturday night for thousands—that's more than I can say for the Welsh interlude that followed Buchan's talk.

THE LINK BETWEEN

(*Continued from page* 420.)

will "Mr. X" please communicate his name and address to me immediately.

By the way, will everyone who applies for literature please note that any slight delay which may occur is due to the tremendous number of applications we have to deal with and not to the fact that they have been forgotten!

Cabinets for Constructors.

The high standard of cabinet craftsmanship displayed in the majority of modern commercial receivers was perhaps the most outstanding "first impression" of the recent radio exhibitions.

But this welcome tendency is by no means restricted to sets of the commercially built type. Several of the cabinet manufacturers are now producing for home-constructed sets models which are both elegant and distinctive. In this connection I want particularly to call attention to the range of cabinets that is now being produced by Peto-Scott. For considerations of space I am afraid I cannot describe each and every one, but take my advice and obtain a copy of their catalogue. It is available under "P.W.'s" postcard literature scheme. **(No. 61)**

OUR POSTCARD SERVICE

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

Making Bad Mains!

I wonder how many readers are aware of the meticulous care that is taken by commercial set manufacturers these days to ensure that not a single instrument leaves the works until it is in perfect order, irrespective almost of the conditions under which it may ultimately be used.

A typical instance has just come to hand from Marconiphone, and because I regard it as a matter of more than usual interest I think it is well worth passing on.

For obvious reasons, the power-supply mains in the testing laboratories of the Marconiphone factory at Hayes are steady and accurate and free from interference.

But, unfortunately, that is more than can be said of all the various sources of mains supplies in the country. In some districts the supply mains are notoriously "dirty," and consequently a set which may be quite up to standard on the "clean mains" of the Marconiphone Factory may not always be completely immune from interference when used elsewhere.

To obviate this difficulty, and to ensure that sets leaving the Hayes factory are suitable for all types of mains, the Marconiphone engineers have now isolated a section of the mains circuit, and have purposely made them "dirty" by feeding in from an oscillator interference of a particularly obnoxious kind with a heavy second harmonic.

If a set will work perfectly under these exacting conditions, it's a safe conjecture that it will work anywhere. Good scheme, Marconiphone!

H.T. ECONOMY

How to make a unit employing the latest H.T. reduction circuit.

ONE of the most ingenious adjuncts to the modern battery receiver is undoubtedly the H.T. economiser: that small group of resistances and condensers, plus a dry rectifier, that enables its user to save something like 40 or 50 per cent in H.T. consumption in the operation of his set.

How it works and what it is, have been described often enough in these columns, but owing to its popularity the question sometimes arises as to how and where to *get* it.

Our latest use of the economiser circuit was in the modernisation of the famous "Comet" (POPULAR WIRELESS, October 7th), when a commercial economising unit was employed. Since then some difficulty has been experienced in certain quarters in obtaining specimens, and we have been asked whether the unit described in POPULAR WIRELESS (September 16th) could be employed instead.

A Single G.B. Battery.

The unit in question incorporated a simple economising circuit which is very successful, but although it could be used in the "Comet" provided separate bias batteries were employed for the two L.F. valves in the set. a later development of the circuit obviates this disadvantage, and enables a single bias battery to be employed.

That circuit we reproduce on the next page, and for clarity we have marked the connections so that they agree with those on the "Comet" diagram.

The circuit can obviously be made up in compact unit form, or it can be built up on the baseboard of the set as desired.

Those who refer back to the unit we published in September will notice where the circuits differ, and how, in the present one, we have obtained the undeniable advantage of the retention of a common bias battery for the set, though in other

(*Continued on next page.*)

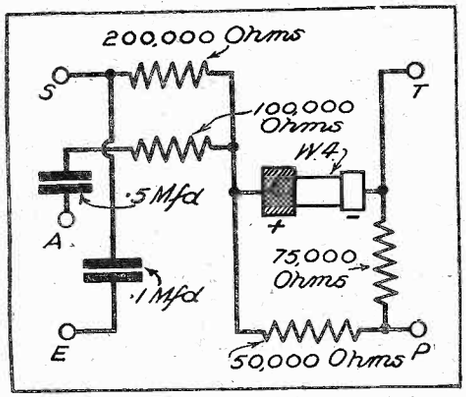
H.T. ECONOMISERS

(Continued from previous page.)

respects the operations of the two economiser circuits are identical.

Natnrally, if desired, the two resistances across the Westinghouse rectifier can be substituted by a single resistance, the value being chosen to suit the output valve with which the economiser is to be employed. For a large pentode the value need be some 50,000 ohms only, but for a

SAVES HIGH TENSION



The connections and suggested arrangement of a simple home-made economiser unit.

triode the value is preferably between twice and three times that figure—say 125,000 ohms.

In the "Comet" modernisation we catered for the use of a triode output valve, and so terminal "T" was used on the economiser unit. This, as shown in our diagram, meant that a resistance of the order of 125,000 ohms was being used across the rectifier. With T and P joined together, the value of the resistance is reduced to 50,000, and the unit is suitable for a large pentode valve.

ROUND THE RECORDS

A review of some of the more outstanding of the recently released records, of special interest to all users of radiograms or pick-ups.

ONE of the finest set of recordings ever published is the H.M.V. album of Beethoven's Concerto in C Minor, No. 3, for pianoforte and orchestra. The pianist is Artur Schnabel, and he is finely supported by the London Philharmonic Orchestra under the baton of Dr. Malcolm Sargent.

There are five twelve-inch discs, the Beethoven Concerto taking up nine sides and the remaining side being filled with the same composer's Rondo in C Major, Op. 51, No. 1. The discs number from DB1940 to DB1944 inclusive, and can be obtained either for "straight" playing or for automatic record changers.

A single disc that deserves high praise for both its recording and its conception is the Columbia "The Floral Dance," a descriptive ballad of the famous Helston Furry, with the immortal song theme running through it. The soloist is Raymond

(Continued on next page.)

40 MILLION POPPIES READY FOR SALE ON REMEMBRANCE DAY NOVEMBER ELEVENTH

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BRITISH LEGION WORK, made possible by Poppy Day, includes the relief of distress, finding employment, sanatorium for tuberculous, help for the blind, workshops and homes for the disabled, pensions for the prematurely aged, etc.

YOU HAVE A SHARE IN THIS GREAT WORK because you buy Poppies on November 11th.

PLEASE HELP MAKE IT A GREATER WORK by paying a little more for your Poppy than you did last year and, if you are able, send a donation to EARL HAIG'S BRITISH LEGION APPEAL, Haig House, 26, Eccleston Square, S.W.1.

ROUND THE RECORDS

(Continued from previous page.)

Newell, while others taking part include Charles Wreford, Franklyn Bellamy and Mrs. Charles Wreford (DX520).

The new Concise Grand Operas, also by Columbia, should meet with a ready sale, for they provide the best out of two of the most tuneful and popular operas, though widely contrasted in style. The operas chosen are "Madam Butterfly" and "Aïda," and run on records Nos. DX500-505 for the former and DX506-511 for the latter.

Terence O'Brien, the famous Irish tenor, records for the first time on Regal-Zonophone MR1018. He has chosen two of the most tuneful Irish ballads, "Mother Machree" and "A Little Bit of Heaven," which he sings with great effect.

Dance and Comedy Numbers.

Jack Jackson and his Orchestra are to be welcomed on H.M.V., one of their best recordings being B6392, "I'm Gettin' Sentimental Over You," while "hot" fans will be pleased to have another Louis Armstrong disc, B6387, where the famous trumpet player lets himself go in "Mississippi Basin" and "Dusky Stevedore."

A comedy number worth hearing, though somewhat over-exaggerated in theme, is "Taking Possession," by Those Four Chaps (Claude Hulbert, Bobbie Comber, Paul England and Max Kester). It is recorded on H.M.V. B8003, and portrays the troubles of Claude on his purchase of a new house.

"The Invalid" is a comedy sketch that is well done and quite unusual in type. I shall not give any idea here of its theme, for that would spoil the surprise, but I advise you all to hear it. Columbia DB1179.

The Radiolympia record of Henry Hall (Columbia CB660) is novel, but as entertainment to others than were present during one of his shows there it must fall a little short in entertainment value. It shows, however, that advances have been made in recording, for the plaudits of the audience are excellently portrayed.

"C. B. Cochran Presents."

Another fine Columbia release is the topical "C. B. Cochran Presents," which was brought out coincident with the famous producer's sixtieth birthday and the special broadcast programme arranged to celebrate the event.

It is a twelve-inch disc, and contains a number of the big hits of Cochran shows over the last ten or twelve years. The orchestral parts are provided by Henry Hall and the B.B.C. Dance Orchestra, while artistes "appearing" in their original numbers include Delysia, Peggy Wood, Noel Coward and Mary Ellis. The whole is compèred by the inimitable Christopher Stone.

The record is the excellent result of a fine idea, and should prove extremely popular not only with those to whom the Cochran shows are familiar, but to the whole radio and gramophone public. It is good entertainment.

Fans of Val Rosing, one-time Henry Hall's vocalist, will like to follow his recording career on Rex records. I have had several of these, and they form some of the best shillingsworth I have ever had. The latest is "Let's Call it a Day" and "Don't Blame Me" (8023). And, talking

(Continued on next page.)

ROUND THE RECORDS

(Continued from previous page.)

about Rex records, let me put right a slight slip made in the last "Round the Records" when I was discussing the products of the Crystalate Record Mfg. Co. It was stated that they were the manufacturers of the "Four-in-One" records. This should have been "Four-Tune," of course.

Another old favourite has been resurrected, a number that is said by "those who should know" to be the best dance number ever composed—"Avalon." It is re-recorded by Billy Cotton, and is coupled with his rendering of Duke Ellington's "Sophisticated Lady" (MR1035).

And here's the story of another Billy Cotton release, the tale of a song which its composers wanted to sell for £5, but which actually, through the astuteness of its "discoverer," will net probably thousands of pounds,

The manager of the Regal-Zonophone Company was asked over the telephone recently if he would consider a new song that had just been written. The reply was a polite refusal. The composer then happened to mention that what had been written was a "rhymes" song, and although discouraged, the young man persisted, and was invited to bring his effort along.

The sequel came when the members of a vaudeville act—The Three Blue Boys—rpesented themselves and handed over the MS. of a song entitled, "Sunday School Stories." The Regal-Zonophone official, struck by its originality and humour, arranged with two representatives of the publishers to advance a far better remuneration, with the result that we now have an excellent recording.

K.D.R.

FOR CLASS B SPEAKER USERS

Below we give the alterations to the S.T.500 Rapid Construction Guide which are necessary in the case of those constructors who have loudspeakers already provided with a Class B transformer.

(20) Not now in the set. Tighten the H.T.+3 terminal on strip.

(21) Driver-transformer terminal G1 to 7-pin valve holder V4 grid terminal (tighten) G1.

(22) Driver-transformer terminal G2 to 7-pin valve holder V4 grid terminal (tighten) G2.

(23) Driver-transformer terminal G.B. via 12-in. length of flex to G.B. — 2 plug (tighten).

(24) Driver-transformer G.B. via 10,000-ohm resistor to driver-transformer terminal (tighten) G1.

(25) Driver-transformer terminal (tighten) G.B. via 10,000-ohm resistor to driver-transformer terminal (tighten) G2.

(26) L.S. — terminal (tighten) on strip to 7-pin valve holder V4 anode terminal A1.

(27) L.S.+ terminal (tighten) on strip to 7-pin valve holder V4 anode terminal A2.

(28) Not now in the set.

(29) Not now in the set.

(30) Not now in the set.

PASTE ABOVE over third column of page 289 of "Popular Wireless," dated October 21st, 1933. The numbers before (20) and after (30) remain the same, and the Rapid Guide remains identical except for the above.

PLEASE be sure to mention "Popular Wireless" when communicating with Advertisers. Thanks!

Advertisements

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

TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio.

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

Radio Relays.

THE radio relay movement seems to be catching on, and I have met quite a number of people who are enthusiastic about it. I must say that when it was first talked about, I suppose some two or three years ago now, I personally did not think much of the idea, and I never thought it would become popular. You know what it is—a "central" receiving set which receives a choice of just a few programmes and redistributes these to loudspeakers in the houses of the subscribers to the "system."

In principle it is not unlike a local telephone exchange, where incoming calls are distributed to subscribers who have telephone instruments. With such a variety of regular receiving sets at popular prices I should have thought that everyone would have been fully catered for by a set of his own; but the extraordinary thing is that, so I am told, practically all the subscribers to the "local-relay" system have their own radio sets as well!

Some Output.

There are, of course, variations in the actual output, but, briefly, the distributing station is fitted with one or more receivers of a specially powerful type which can be tuned to receive a few special programmes—generally not more than four or six. A set of powerful amplifiers, usually on the push-pull system, are employed, the number and power of the amplifiers depending on the total number of subscribers to be served, and you can guess that a pretty heavy output is delivered. In some cases the actual output may be between 100 and 200 watts, whilst the high-tension current may reach as much as one ampere at its maximum value.

Dual Speakers.

Some little time ago one of the well-known loudspeaker manufacturers sent me one of their dual instruments for test. I had not had an opportunity of trying this out until a day or two ago, when I made a series of pretty exhaustive trials.

This idea of balancing the tone by means of two or more instruments is not new—it has been tried out at various times during the past few years. Hitherto, or until recently, it never seemed to me to meet with a very great deal of success, possibly because the different component parts did not really bring out their assigned portions of the audio range.

You Should Try This.

However, I must say that the tests I have made with this instrument have convinced me that there is a great deal to be said for using two speakers together in this way. One of the units is specially designed for favouring the higher register, whilst the other one brings out the bass, and in that way you get a result which it would be

(*Continued on next page.*)

TECHNICAL NOTES

(Continued from previous page.)

much more difficult to obtain from a single instrument. Naturally, it costs more to produce what is, in effect, a *pair* of loudspeakers, than a single one, but on the other hand each of the two separate units is simpler, since there is no need to make it cover more than one particular range.

Then Stop and Buy One.

If you have not tried this scheme it is worth looking into, and you can make your first tests, without actually buying a new instrument, by means of a couple of loudspeakers which you may have on hand or which you can borrow, one with a high-pitched note and the other a low pitch.

Having satisfied yourself that there is really something in this scheme, you can then consider going in for one of the excellent dual-compensated speakers which are now on the market.

Condenser Values.

With the very large number of different types of condensers which are now available the ordinary man gets rather confused on the question of capacity values, and unless you are continually handling condensers for different purposes you are liable to go wrong on a decimal point, which means multiplying or dividing by 10, and makes a lot of difference!

I have often been asked questions on this matter, and it might perhaps be useful to some of you if I just mention the purpose for which different capacities of condensers are generally used. For instance, the very small capacities, say 0·00005 up to about 0·0005, are generally used for aerial tuning, the smallest values being for aerial selectivity adjustments. Values ranging from ·0003 to ·0005, are also used for tuned anode, and for high-frequency transformer tuning, whilst fixed condensers having values of about 0·0001 to 0·0003, are often used for high-frequency coupling, detector anode bypass and power-grid detectors.

For Resistance Capacity.

Coming to higher values, resistance-capacity coupling takes 0·001 up to many times this value, even as high as 0·1, whilst this latter value is also useful for high-frequency bypassing. With parallel-feed transformers you can use from 0·05-microfarad right up to 1 microfarad or even up to 2 microfarads. For low-frequency decoupling, condensers of 1 or 2 microfarads may be used, whilst for smoothing circuits, as in a mains-supply unit, you can use 2 or 4 microfarads and, in fact, go to electrolytic condensers with very much higher capacities.

Decoupling.

Talking about decoupling, by the way, reminds me that many of my readers seem to be a bit hazy about what decoupling

(Continued on next page.)

TECHNICAL NOTES

(Continued from previous page.)

means; it is continually mentioned in technical articles and is one of the most important of the many dodges used in a radio receiving circuit. Decoupling, as its name implies, is the separation of two circuits, or rather of two *parts* of the circuit, in such a way that unwanted interaction between them is got rid of.

Motor-boating.

If you have an ordinary receiving circuit without special decoupling devices you will often get interaction between different parts of the circuit which will cause instability, howling and motor-boating. There are certain interaction effects between different stages which are definitely required for the proper operation of the circuit as a whole, but these unwanted or, as we may perhaps call them, parasitic effects only cause trouble, and therefore we have to keep them out.

It would take too long to give you all the various causes of unwanted coupling and the different places in the circuit in which decoupling should be used, but I can illustrate the general principle by referring to the commonest of all causes of unwanted coupling, and that is the high-resistance H.T. battery.

I dare say you know that if an H.T. dry battery is getting a bit ancient and dried up its internal resistance increases very much, and then it will cause howling and motor-boating and all sorts of troubles, quite apart from the fact that its voltage is running down. Well, this is due to the resistance of the battery causing a coupling between one valve stage and the next.

High-Frequency Stopper.

If the battery has a *low* resistance the high-frequency currents will get through and go straight to earth; but if the resistance of the battery is unduly *high*, the high-frequency currents, not finding an easy path to earth through the battery, will go off to the anode of the succeeding valve and cause oscillation trouble. If, however, a suitable resistance is introduced into the anode lead of the first valve, this will act as a stopper to the high-frequency currents, so that they will not be able to pass into the H.T. battery.

Alternative Path.

If, in addition to this, the anode of the valve in question is connected to earth *via* a fixed condenser of suitable value, not only will the H.F. currents find themselves stopped from going on to the H.T. battery, owing to the resistance referred to above, but they will find an easy alternative path offered them to earth. They will thus be faced with an opposition on the one hand, whilst on the other they will have a strong inducement to go in another direction. This resistance is known as a decoupling resistance and will render the circuit stable.

This is a very good example of what is meant by decoupling, and, as I say, decoupling has to be done in different parts of the circuit. The principle, however, is the same as that described above.

Non-Inductive Components.

You are continually reading that this or that component to be used in a circuit should be "non-inductive," and inasmuch as some of the components, such as transformers, chokes and so on, have a definite and necessary inductance, readers sometimes wonder why it should be so important whilst specifying inductance in one place to prohibit it in another.

As you no doubt know, inductance and capacity together comprise the makings of a tuned or resonant circuit, and whilst you want such resonant circuits in some parts of the set you don't want any tuning effect at other parts, or else you will get things all mixed up. For instance, in a band-pass circuit you use a bypass resistance and a coupling condenser, but these must be non-inductive, otherwise you would get what are known as "resonance peaks."

In the Grid Lead.

In the grid lead of a low-frequency valve you sometimes introduce a stopping resistance so that high-frequency currents will not get into the low-frequency amplifier—as I have mentioned earlier in these Notes—and this resistance must be of the "non-inductive" type, so that it will not discriminate between one frequency and another; if it were an *inductive* resistance it would single out certain frequencies and treat them differently from others, and you would get distortion troubles. Another case is where a bypass condenser is placed between the screening grid of a screen-grid valve and the earth; this condenser must be as far as possible non-inductive.

Never Actually Zero.

Of course, in practice the most we can do is to make the component of as low an inductance as possible, but we can never reduce its inductance to zero. Even a piece of straight wire carrying current has a certain inductance. When current flows it creates a magnetic field, and there you have the elements of inductance; but if the current is caused to flow in certain special ways (for example, in a coil of wire) the inductance is greatly increased.

NEXT WEEK

Another Long Article by

JOHN SCOTT-TAGGART

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also

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