

BROOKMAN'S PARK—THE NEXT STEP (See Page 831)

Popular Wireless

Every Thursday
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INCORPORATING "WIRELESS"

December 21st, 1929.

In this Issue
**THE
"MAGIC"
H.F. UNIT**



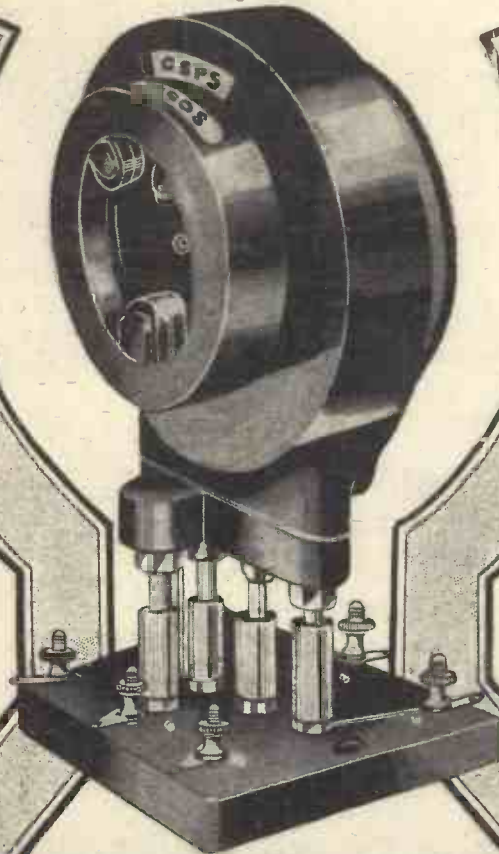
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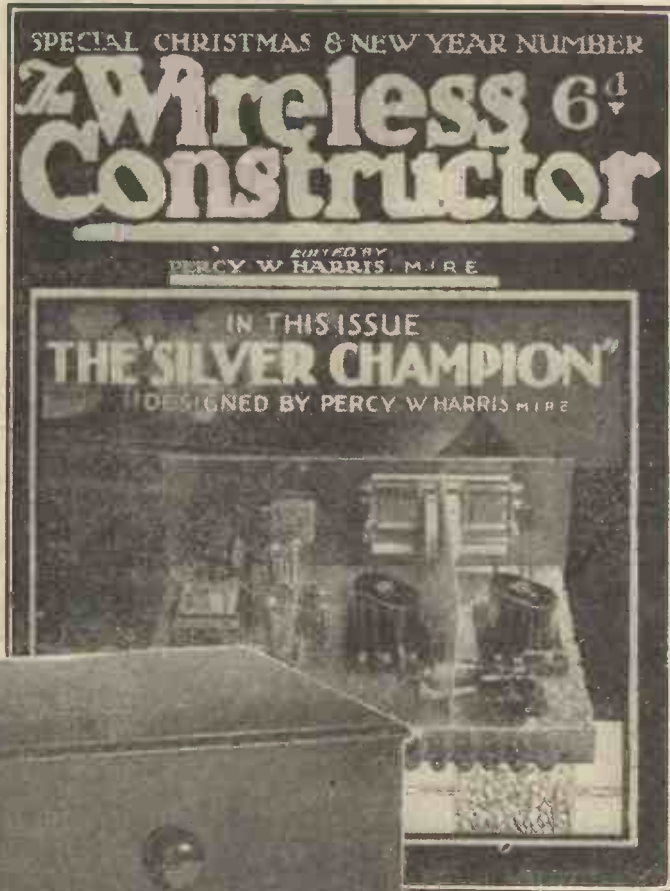
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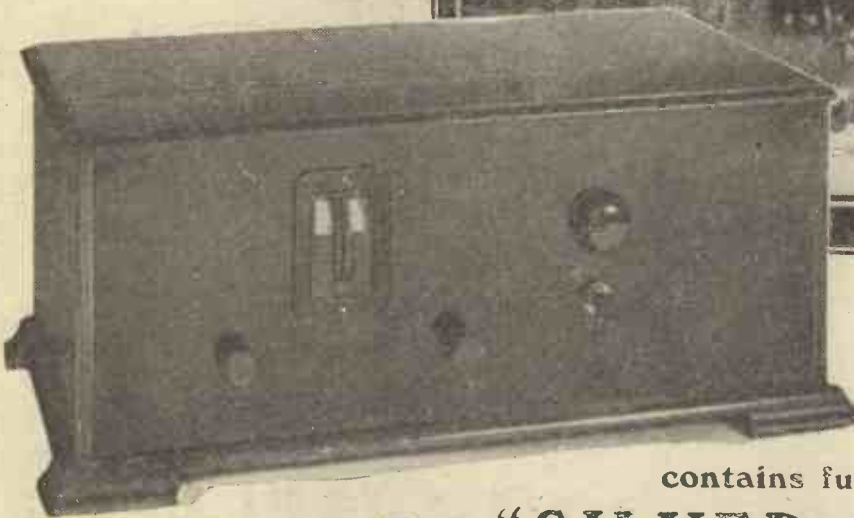
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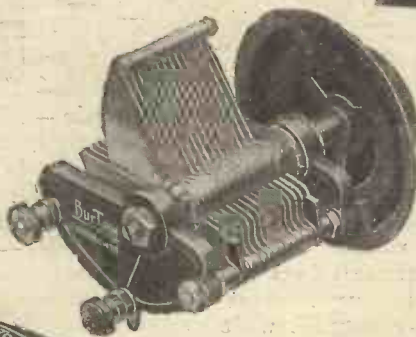
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**"ARIEL'S" CHRISTMAS.
 NEWS FROM FRANCE.
 A SUPER-SELECTOR ?
 MAINLY ON MAINS.**

RADIO NOTES & NEWS

**THE EX-SCEPTIC.
 WATCH THE LUGS.
 V.C. AND THE VALVES.
 WHAT IS L.S. STRENGTH?**

My Christmas.

ONE of my greatest pleasures at this time of the year is the batch of letters I receive from "wireless" friends abroad, engineers on the big stations, and so on, and the surprise visits from similar exiles who are lucky enough to collar some Christmas leave. They growl at the heat, or the cold, or the natives; they fulminate against local politics; they tell sad stories of wicked typhoons, and speak of six months' incessant rain—or drought. One will hunt lions on Boxing Day; another a defect in the machinery. One, whom I met by chance a few days ago, back from Siam, opened the ball with: "I say, where do you get that baccy you told me about in 1925?"

News from France.

I HEAR that there is the father and mother of a fine row on in France over that unlucky broadcast by Radio-Paris of the false news of the death of King George. The Public Prosecutor is on the warpath and has visions of an arrest. Meantime, it looks as if the broadcasting news in France will be subjected to a very strict supervision. Another minor sensation is the recent speech of the French Postmaster-General, which amounted to the repudiation of State control of broadcasting.

Gold Medal Award.

THE news that Professor R. A. Fessenden has been awarded the Scientific American Gold Medal for promoting safety at sea takes one back a good many years to when the Fessenden system of wireless telegraphy was better known than it is now. Fessenden was one of Edison's early associates. He won this medal from eighty competitors representing sixteen countries.

Epistolary Gem.

HERE is one of those gleams which occasionally shine upon the path of a "weakly ricordist." "Sir, the undersigned, which is private and not for publicity, often appreciates, in Eree Library, commentations of your weakly ricordist though remarks not sometimes obvious to self as living so remmote. Begging for some patience to you to listen to insignivigant reader asking news of —, went Europe six months since for become studious lawyer, and yet owing lots money everywhere. Prabably he is London so please

send address or publish secretly." This is a case for Scotland Yard.

The Super-Selector ?

FULLER details and news about the "Stenode Radiostat," the invention of Dr. James Robinson, are awaited with the utmost interest by all wireless men. If it's as selective as stated and the receiver is a stable, commercial proposition, then Dr. Robinson is a benefactor of humanity, for he will have enlarged the ether enormously.

Tune, Sir ?

I BELIEVE that the idea of fitting a taxi with a receiver and loud speaker was born with the seeds of mortality

Eckersley is fully described in this issue, and the blue print is presented free. It is superfluous to point out that such a set is a "dead cert." Sir O. Lodge and Sir Ambrose Fleming contribute fascinating articles, and Captain Eckersley pours out some of his personality in a characteristic review of "Seven Radio Christmases."

Latest Gramophone News.

THE grammy has put the radio set's nose out of joint for the time being, and our talk has become tinged with a new jargon. Severe competition with the loudest of our Symphonies is being experienced as a result of next-door's new baby beginning to train for grand opera. Our kitchen fairy is alleged to have remarked:

THE BISHOP AND BROADCASTING.



The Bishop of London recently visited some newly-erected flats at Parson's Green, and heard one of the tenants tune-in 2 L O.

within it. However, its fond father, a Parisian cab proprietor, has introduced it into society. I should say that the item with which he would seek to divert a furious Frenchman caught in a traffic hold-up would require to be selected with the most penetrating discrimination.

A Word to the Wise.

NO home will be complete this Christmas without a copy of the Christmas Number of "Modern Wireless." A receiver which has been specially designed and built for presentation to Captain P. P.

"That there portable 'baby grand' of Mrs. —'s wants a noo needle."

Mainly About Mains.

A LETTER from C. W. H. (West Ealing) is typical of a number recently received dealing with various requests for "mains" sets, and asking me to set the "technical hounds" to worry the subject. Far from being chief kennelman, I timidly approached them, and with a unanimous bark they assured me that "mains" will be dealt with in a very

(Continued on next page.)

NOTES AND NEWS.

(Continued from previous page.)

special series of articles. By the way, kind inquirers about Mr. Dowding's "home talkies" will be interested to know that the invention is now undergoing that long and painful but essential operation called "development."

An Ex-Sceptic's Troubles.

T. F. H. (Sussex), who scrapped his "Titan" Three, is feeling a little Laodicean, if not exactly sceptical, because his results seem no more than moderate. He refers twice to "luck," but this is a factor which exists only as a minute trace in the prescription for radio success. However, he seems to be an industrious "fan," and probably used the word in a Pickwickian sense. My advice is that he should overhaul earth and aerial, have the valves tested, and then re-build the set with great care. That should fix it. But if some local peculiarity is against him his is a case where a Radio Club could help.

Another Picture.

BUT here is a different story. F. S. A. (Birmingham) came across the "P.W." Four in the course of business, and was so pleased with it that he built himself one. He is kind enough to say that in eleven years' experience he has never before found a set which so well combined "punch, selectivity and fidelity." He has realised his ideal of reproduction. This is good news indeed, and we are happy to know that our friend will gladly show his set to anyone interested. Address: 110, Ivor Road, Sparkhill, Birmingham.

Can Radio Kill Music?

IT is freely reported that a German singer, Louis Graveure, is panicking for a method of secret wireless by means of which exclusive programmes can be purveyed to exclusive subscribers. His reason is that radio is killing music. Radio is no more killing music than railways are killing cattle. It has saved the Queen's Hall and packed it to the roof; it has called for innumerable orchestras and for many singers. It has done the gramophone record trade a world of good and must have sold myriads of copies of songs and music. Finally, it has introduced large numbers of people to a world of music previously unknown to them.

My Great Discovery.

MY own debt to broadcasting is great, and quite recently was overloaded by my discovery of Brahms' Symphony No. 1. It is a tonic. Its tremendous vitality, its sense of ill-suppressed power, and its stirring movement make it, in my opinion, a masterpiece. I think that Brahms must have got out of bed one morning "on the wrong side," and said: "If I don't knock the stuffing out of some band to-day my name's Clarence." He then wrote this piece which, but for radio, I might never have heard, and so would have been the poorer.

Amongst the Experts.

APROPOS secret wireless, somebody has committed the "Birmingham Gazette and Express" to the following revelation. "At present even a wave-

length turned upside down is decipherable if corresponding measures are taken by the receiver." I presume that an upside-down receiver recognises the unfortunate length by the size of its feet. Someone needs "Pentode's" article badly. The "Bradford Telegraph and Argus" "expert" has been in hot water for referring to a "potential difference" as a "load," and puts up that common form of defence, the ignorance of his readers and the bad taste of his critic, who was not "Ariel."

A Great Radio Day.

DECEMBER 20th is a day to note down to be kept open for listening. Two fine items are to be offered. First, a Symphony Concert conducted by Malko, the conductor of the Leningrad Philharmonic; the soloist, a soprano, is to be Tatiana Makushina. Next, Anthony Hope's ever-popular "Prisoner of Zenda" is to

SHORT WAVES.

"Can I put a DYNAMO speaker in series with an ordinary cone?" asks a correspondent in the "New York Times." Well, you can . . .

OVERHEARD.

Mrs. A.: "D'you 'ave the wireless at 'ome?"

Mrs. B.: "No. We got a set, but my 'usband's alwis himprovin' of it."

Mrs. A.: "No more do we. We got a set, too, but me 'usband's alwis looking fer summink in H'America, so 'e ain't found London yet!"

Application for vacancy: "I wish to apply for the position as timber salesman. I am fully experienced, having been engaged for some time on the job of selling Radio Logs."

"Radio cures laziness," we read in a contemporary.

It certainly does in our Query Department.

We understand that a well-known Scotsman has recently given up wireless because he lost his crystal.

"Why shouldn't Jane and Mary Ann wash the breakfast dishes to wireless? Of course, we should have to be careful of our programmes. Some of our popular songs are totally unsuitable. For instance: 'Break, break, break' is simply asking for things to come away in their hands, and Tosti's 'Good-bye' is bound to put ideas in their heads. And those hearty drinking songs would be a fatal temptation to a butler who had the keys of the cellar. 'Let me like a Soldier' Fall' would be dangerous for window cleaners. But 'Sirs, your Toast,' would be just the song to hustle forward the breakfast."—London Opinion.

I. T. (Clapham).—Am sorry to hear that you have passed 150 volts through the filament of your 2-volt valves—to correct this, pass the same voltage through once more, but in the reverse direction.—"Mullard Mag."

be broadcast in dramatic form. It is of interest to know that some organ music incidental to this item is to be relayed from St. Mary-le-Bow in the City. Real "Bow Bells"!

Watch Those Lugs.

IN view of the report that an accumulator blew up last month at St. Helens, whilst being charged, it is worth while issuing a warning that you should keep the terminals of your battery as clean as possible. The explosion of the gas in the container through being ignited by a spark between lug and plate is an exceedingly rare occurrence and there is no need for

alarm. Keep all accumulator terminals free from corrosion and the kids will wait in vain for the big bang.

Listening "By Order."

CERTAIN authorities in Switzerland have ordered that apprentices who live beyond a specified distance from a technical school shall take courses of instruction by radio. The Government will provide the receivers and it is to be hoped that they will function more efficiently than our Post Office pens and postage-stamp machines.

There seems to me to be just a mild Prussian flavour about this regulation, but ever since a Swiss official steered me away from a proscribed path with the aid of a rifle, during a "foot and mouth" epidemic, I have felt that there is a Prussian tendency in some parts of the country.

In Happy France.

IF I am correctly informed, the law in France governing wireless licences is about as nice as it could possibly be made. You simply register your set at the local post office by filling up a form stamped to the value of the equivalent of sixpence, and there is an end of it; you have paid your tax. On the other hand, the most patriotic Frenchman could not in truth say that French broadcasting is well organised.

The V.C. and the Valves.

BEING rather "up in the air" through reading the stories of the V.C.'s I received a reminder that even V.C.'s come in time to the necessity of earning a living in a more prosaic manner than they earned the Cross. Messrs. J. J. Inglis & Co., of Glasgow, who are, I believe, the sole Scottish agents for Tungsram Valves, wrote to the effect that Sergeant J. B. Hamilton, V.C. (Glasgow Highlanders), has joined their staff, and will, in due course, make himself known to the "trade." Good luck, Sergeant!

L.S. Strength.

K. C. (Newcastle-upon-Tyne) is seeking a definition of "good loud-speaker strength," a phrase which is so common that one does not stop to analyse it. Once a thing is defined it is limited—and who can limit good L.S. strength which ranges from easy hearing anywhere in a room of average size, to the elephantine trumpetings of a Public Address System and the titanic booming of freaks which can be heard for miles (in America)?

How Many Stages?

K. C.'s query arises, however, from the fact that whereas he is getting large volume with one stage of Res. Coupling he has seen it stated that for really good signals one stage of Transformer Coupling and one of Res. C., or alternatively not less than three of R.C. should be used.

There is no "hard and fast" rule about this which will cover all possible cases, and one has to advise the public in such a way as to be reasonably sure that whatever the circumstances may be the desired results will be secured. No doubt K.C.'s set and all and everything connected with it are as efficient as possible and all other factors are favourable. L.S. results on two ordinary valves are quite common.

ARIEL.



ALTHOUGH there are still inevitably some quite understandable complaints of the effect of the new London station, people seem to have adapted themselves to new conditions quite nicely. But we have another dislocation.

Brookman's Park is testing with a second programme on a second wave. Can it do this itself? When it finally sends out two programmes what will be the effect upon that non-existent entity, "the average receiver"?

The Twin-Wave System.

I can assure my readers on fairly good authority that its capability of radiating two programmes on two different wavelengths cannot be questioned, firstly because it was designed just to do this; secondly, and perhaps more convincingly, because it has been tested and found to perform exactly as it was intended to.

When I first revealed to an astonished technical world that we were to face the terrific problem of sending out two programmes from one station, I was amused to find that grave heads were shaken and previous remarkable failures cited. Of course, it is not all just as easy as making a speech; there are plenty of precautions to be foreseen.

In general one's idea is to go back to that very profound but simple dictum of the great Michael Faraday, "There is no force within a closed conductor," and so, carefully shield one system from the other, so that they may not even whisper to one another. Solitary confinement is the rule at Brookman's Park, each closed circuit incarcerated in each aluminium cell, each unit shielded, each control-room made with copper gauze woven into the floor, the walls, and the ceiling.

The Question of Selectivity.

The only possible danger will be if the lines conducting the programmes from Savoy Hill cause "cross talk." One may be humming to the vibrations of a Queen's Hall Wagner concert, while the other is picking up a nightingale 800 yards from the microphone, the bird in the depths of a thicket living very much up to its name. (The thicket, not the bird.)

But we are off the beaten track, and while you, as reader, may have an academic interest in the problems of transmission,

Experimental alternative programme transmissions are being broadcast from Brookman's Park, so that readers will greatly appreciate this special article from our Chief Radio Consultant. It will not be long before we have the two programmes "going strong," but between now and then many minor adjustments in our tuning circuits may be necessary, as this timely article points out.

By CAPT. P. P. ECKERSLEY,
M.I.E.E.

you have a very vital feeling about your problems of reception. Can it be done? Is it possible for a valve receiver to select between two equal strength (or, say, at most two to one in favour of the longer wave) transmissions, with a separation of 200 kilocycles?

Honestly, now, if that were all the

*
SOLVING THE INTERFERENCE PROBLEM.
*



Capt. P. P. Eckersley examining the "Brookman's" Rejector, which he discusses in this article.

problem, it would not be worth discussing. And pamphlets are written and wave-traps discussed, and selectivity is splashed as a great message to our younger designers across the front page of wireless gossip. Can it be done? Whispers, frowns, thought.

Shorten the Aerial.

People devoid of any but rule-of-thumb knowledge wrinkle those broad foreheads behind which lies so much of experience learnt so practically and understood not at all, and explain to one how it can't be done. But if that were all the problem, you as technical readers know that any valve set is capable of selecting between two equal strength transmissions, and that all we have to do is to shorten the aerial until we arrive at the proper conditions of selectivity. That, literally, is all. I do not know for certain, but, so far as I can judge, most sets will not notice any real diminution of local signal strength with a reduced aerial.

But that is not all the problem, of course. *The nearer people find themselves to the new station, the more they will have to shorten their aerial, and therefore the less sensitive will the set become when faced with the problem of receiving foreign stations.*

The Brookman's Rejector.

Of course, if the user desired to use a Rejector circuit, there is no necessity to shorten the aerial, and for those who wish to search for foreign programmes and adapt their sets for rejector working, such articles are available, either to purchase or to make.

For instance, in POPULAR WIRELESS has been given an account of what is called The "Brookman's" Rejector, which is satisfactory for cutting out the local station without shortening the aerial.

Of course, rejector circuits are closed circuits placed in series with an aerial or in parallel with the set. In the former case they present an enormous impedance to the strong, unwanted transmission, and in the latter case an

(Continued on next page.)

BROOKMAN'S PARK— THE NEXT STEP.

(Continued from previous page.)

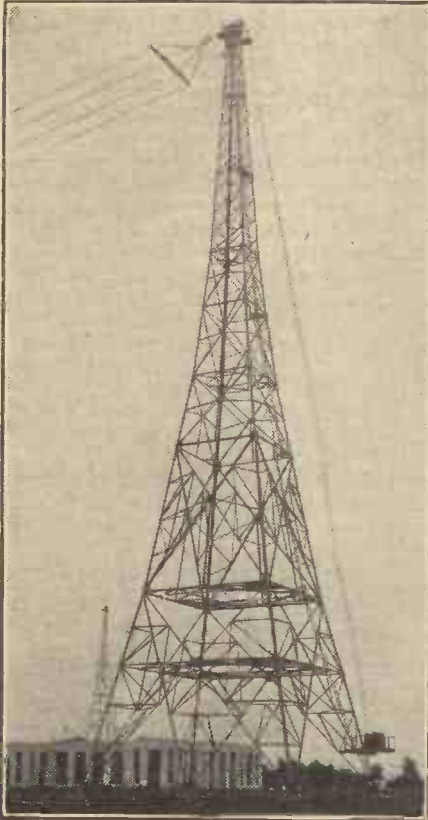
enormous acceptance to the frequencies of the unwanted station. In both cases these rejector circuits (and, after all, a rejector circuit in series, or an acceptor circuit in parallel, are the same thing) are suitable for rejecting the transmissions from only one station.

Frees a Wide Wave-Band.

The would-be distant listener can thus achieve such a circuit to cut out, shall we say, the lower frequency of Brookman's Park (i.e. the upper wave-length), but still would be embarrassed if he wished to receive stations close to the lower wave-length or the higher frequency emanating from Brookman's Park.

Nevertheless, a rejector—which again I define as a parallel acceptor—is of great

THE NEW 2 L O.



Two of the masts of the Brookman's Park twin-wave broadcasting station.

importance, because it frees a very large wave-band, particularly for the London listener, which would not be free were such a circuit not used.

Without the rejector, one might find that the first tunable station was 5 G B, and Langenberg, if you can separate it from 5 G B, Budapest and Vienna are the only reasonable stations. With a rejector circuit one might easily find Toulouse; one might find one or two Czecho-Slovakian stations, so that the rejector circuit is indeed of value to the reacher out.

Fundamentally, of course, the shorter aerial is of great advantage. The shorter aerial and more valves may constitute an ideal in the future, because the shorter aerial and more valves and a rejector circuit should, even to the Golder's Green listener, free the ether almost completely as it affects stations above 400 metres.

Within a Few Miles.

I was particularly struck with the ingenious design of the "Brookman's" rejector circuit, because this method does appear to give the most efficient performance I have ever come across.

I know that ten miles from the station (Golder's Green way) it is possible, with both programmes going and using a three-valve set marketed, complete, at £13 odd, to receive Daventry 5 G B, Vienna, Budapest, Kalundborg, Hilversum, Zeesen, and Radio Paris without interference from Brookman's Park.

So the user will have, in this locality, a choice of two local, one more distant British, and five European stations, a total of eight programmes to choose from. Is it not enough? Does one normally, if given the choice of eight theatres, find boredom in every one?

Closer in to Brookman's Park still—say, Barnet way—I should think the choice would narrow to three or four programmes, but three or four is good enough, surely. The great majority of Londoners have eight or more, and those in South London (quite a few people) are unaffected.

"Portable" Problems.

But I am concerned with two problems—the very old crystal set and the portable set—the one far away and the other near to the station. I "doctored" a crystal set, and for an expenditure of three shillings, I think, made it sufficiently selective for the conditions of the Regional Scheme.

But you can't cut down the size of aerial on a portable, except, of course, by turning it round so that the frame is just at right-angles to the line joining the portable and the station. And there are a terrible lot of portables about.

It is quite a problem to expect people to turn a portable just exactly "so"; not insoluble, of course, but it seems—to me, at any rate—that that is where the greatest complaints will come from. I shall have more to say about this when I have had an opportunity of studying the problem more in detail.

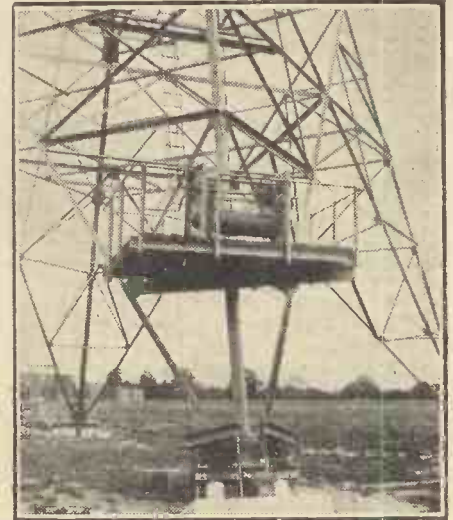
USING FIXED CONDENSERS.

THE fixed condenser—one of the smallest though most important components in the radio set—has been rather neglected of late, and there are one or two hints about its construction and uses which are well worth bearing in mind.

In the first place, the condenser itself is capable of wide variation in construction. There are the paper dielectric, mica dielectric, and electrolytic varieties; the first, of

ordinary construction, though efficient enough for the less important positions (across 'phones in crystal sets, and so on), cannot be used where extreme accuracy is required, or where the condenser is to withstand a heavy voltage load; the mica dielectric type can be used in every position in the average set.

One of the uses of the condenser (and one which is sometimes neglected) is that of



This photo shows the winding gear for one of the Brookman's Park aeriels.

putting one of, say, 2 mfd. in the earth lead, as a safety measure when using D.C. mains.

The condenser (this time a .0001) may be used also in the aerial lead. In this position it will sometimes serve to give an adequate degree of selectivity to sets which are inclined to be on the "flat" side as regards tuning. It must be borne in mind, however, that this will affect the tuning of the set, as it will alter the capacity of the aerial circuit, and will consequently raise the reading of the aerial tuning condenser. Incidentally, this effect is often useful if you wish to get a station right at the top of the condenser scale, but it must be remembered that volume may be very slightly decreased, and the set will usually become more "lively."

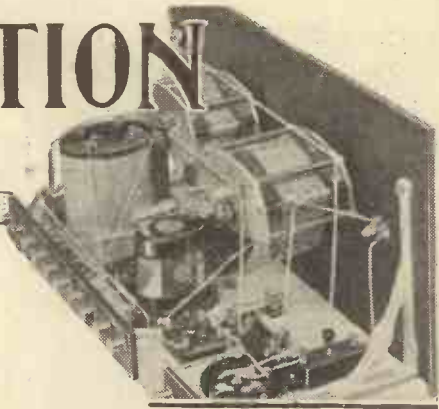
The next hint, though not strictly in accordance with radio custom, is often quite effective. If you are having trouble with low notes, try the effect of replacing your grid condenser with one of high value, say 2 mfd. This will have to be done with care, for if you overdo it woolliness of tone will result. Carried out with care, however, the idea is sometimes useful.

Parallel Capacities.

Finally, the use of fixed condensers to increase capacities is always worth keeping in mind. Besides their inclusion in the aerial circuit as already mentioned, one can always be put in series or parallel with a fixed or variable condenser in order to gain any desired increase or decrease in capacity (you increase the capacity by placing the condensers in parallel).

Many other uses of a similar nature will readily occur to those of an experimental turn of mind, while those already indicated may prove of some use to readers of this journal.

RESISTANCE REACTION CIRCUITS



Here are some schemes that should appeal to the experimenting constructor who is searching for an ideal regeneration control.
By J. ENGLISH.

IN receivers having provision for reaction a variable condenser is almost invariably used as the reaction control. There are, however, other methods of controlling reaction, and one which is very popular in America, especially for short-wave receivers, is resistance control.

The advantage of this form of control is that it has less effect upon tuning than the condenser control, while it is possible to obtain a very smooth transition through the threshold of oscillation which is essential for short-wave reception. In certain cases it is also possible to obtain a constant reaction effect. We are always striving after the perfect control which should have no effect on tuning, be reasonably constant and give perfect smoothness in passing into oscillation.

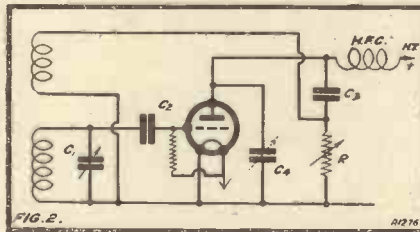
While not possessing all these desirable features, resistance control is nevertheless very satisfactory, and well worth more attention on the part of the discerning amateur.

Many Methods Available.

There are quite a large number of ways of using a variable resistance in a regenerative receiver for controlling reaction, and I could give you at least twenty diagrams of different circuit arrangements, some of them, of course, being more satisfactory than others. In general, all resistance reaction circuits are so arranged that they oscillate continuously, and then the superfluous reaction feed-back is got rid of by introducing losses by means of a variable resistance.

For example, we might connect a variable high resistance in parallel with the tuning condenser. This would introduce an H.F. loss, increasing as the resistance was reduced so that any required degree of reaction could be obtained. This we might call an H.F. control. Another type of circuit varies the anode voltage by means of a variable series resistance or a potentiometer feed system, reaction increasing as the anode voltage is increased. In this type of circuit we might call the resistance an L.F. control.

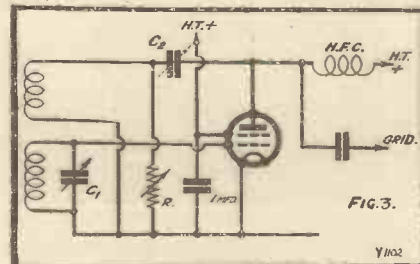
It is now generally agreed that the L.F. resistance control is more satisfactory as regards smoothness of control and the avoidance of detuning. The circuit of Fig. 1 is particularly useful as the potentiometer control, R, gives a very fine adjustment of anode voltage. The only serious fault with



this type of circuit is that the usual run of variable resistances and potentiometers are noisy, especially when the circuit is on the verge of oscillating.

The noise produced when adjusting the detector to its most sensitive state for short-wave reception is even more pronounced than in a receiver working on medium or long waves, while the circuit of Fig. 1 has not that constant reaction effect that is so very desirable.

There is a variation of the H.F. control method which uses an H.F. potentiometer to control the amount of energy fed into the



reaction coil. This is shown in Fig 2, where the fixed condenser C_3 and the variable resistance R can be regarded as a single resistance as far as H.F. currents are concerned.

Silent and Smooth.

The lead to the reaction coil is taken from the junction of C_3 and R, so that decreasing R is roughly equivalent to moving the reaction coil lead down the imaginary single resistance as you would the slider of a potentiometer. The effect of reducing the resistance of R is to decrease reaction, as a smaller H.F. voltage is then applied to the reaction coil. Increasing R increases reaction in a corresponding manner.

In practice the circuit is quite effective, control being smooth and noiseless with hardly any effect on tuning, and without any undesirable hand-capacity troubles. The variable resistance should not have a maximum greater than 100,000 ohms, its working value being round about 20-25,000 ohms. With a semi-variable type condenser of .00015 maximum for C_3 a near approach to a constant reaction control can be obtained by juggling a little with the setting of C_3 and R.

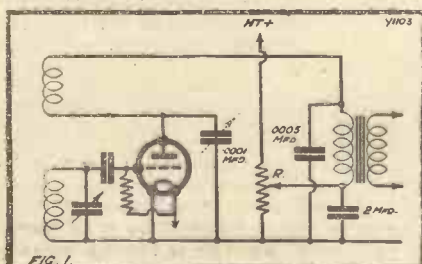
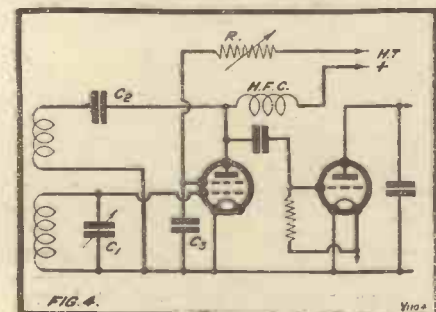
Increasing the capacity of C_3 tends to reduce the regeneration on the lower part of the condenser scale, and to increase it on the upper. This constant reaction effect is partly due to the position of R, which is actually in parallel with the reaction coil. With this circuit it is easy to obtain an adjustment whereby medium-wave stations come in as a series of bumps as the condenser dial is quickly rotated from zero to maximum. The constancy of reaction is also fairly good on short waves, and quite good on long waves.

Using an S.G. Valve.

A simple S.G. circuit which is very popular for fixed and portable receivers uses choke-coupling between the screened-grid valve and the detector with capacity reaction from the S.G. anode into the input circuit. Resistance control can be applied to this arrangement with very promising results, the necessary modifications being indicated in Fig. 3.

Here we have the method of Fig. 2 applied to the reaction coil, the feed condenser C_2 being a variable or compression type condenser of .0001 mfd. maximum capacity. With this arrangement reaction is fairly constant if the capacity of C_2 is kept rather low, about .00005 mfd. Control is quite smooth on both wave-bands, and on the whole operation is very pleasing.

Another method of control of the L.F. type which is particularly suitable for this circuit is shown in Fig. 4, where the screening grid is fed through a variable high resistance.



THE FIRST TEST TRANSMISSIONS

Some notes on the new service from Brookman's Park, the world's first twin-wave high-power broadcasting station.

By THE EDITOR.

THE first series of dual transmissions from Brookman's Park seems, on the whole, to have been successful.

Listening to the transmissions some fourteen miles from London, on a fairly ordinary three-valve set, very little indication of interference between the two transmissions was noted—and certainly what little there was could quite easily be eliminated by the use of a simple wave-trap.

Using a very poor set—selectivity almost nil—interference was, of course, pronounced; but here the value of the Brookman's Rejector was made very obvious. Using it, the two transmissions were easily separated, and either received without any interference at all.

A Good Start.

In short, the dual test transmissions started auspiciously, and we hope that we shall hear from readers to the effect that they found little to worry about in connection with the tests.

A good deal of "sane" criticism has appeared in the Press about this dual transmission scheme, but now that we have actually experienced it, it does not seem to be by any means the bogey some alarmists have made it out to be.

In any case, Brookman's Park is unique in the respect that it is the first twin-wave station in the world, the two separate aerials being energised from a single main source of power.

It is expected that a national service programme will be radiated on the Brookman's Park short wave (261 metres) and also on the long wave Daventry 5 X X transmitter. Temporarily 5 G B and the Brookman's Park 356-metres transmitter will radiate the same Regional programme. The B.B.C. intends to design programmes in future on the assumption that both the national programme and the Regional programme from one or other of the stations named can be received at will.

Reducing Your Wave-length.

As a single-wave transmitter the new Regional station has realised the expectations of the B.B.C. engineering staff, for reports have been received from all parts of the country stating that both volume and clarity are good. Within the service area, of course, there have been no signs of fading. When the transmitter first began operations it was anticipated that reception would be impaired in some quarters, but there appears to have been only a small amount of inconvenience to listeners.

In the London area it has been unnecessary for receivers hitherto to tune down to 261 metres, but the adapting of sets to the new wave-length should not cause a great deal of alteration in most cases. The wave-length of a wireless receiver is governed

by the value of its capacity and inductance. The increase of one or both of these factors brings about an increase in wave-length. It is only necessary, therefore, to decrease one or both of these values to bring about a reduction in wave-length.

The simplest method to reduce the wave-length of the aerial is the introduction of a small condenser in series with the aerial. The value of the condenser should be in the region of '0001 mfd.; shortening of the aerial wire may also answer in many cases.

Where it is found impossible to reach down to the lower wave-length without internal alteration, the necessary adjustments can be made by employing coils with a smaller number of turns. In most cases, however, interchangeable coils will effect any desired alteration in tuning.

TESTING AND TRAVELLING.



This picture shows wireless picture apparatus being tried on the famous "Flying Scotsman."

RADIO WRINKLES AND REMINDERS.

Although a 2-megohm leak may be ideal for ordinary reception, on short-waves this resistance value is generally too low, and 4, 5, 6, 7, or even 8 megohms may be tried to increase sensitivity.

Powerful local station signals will come in on almost any type of aerial, but it takes a really efficient aerial and earth to bring in DX (long-distance) signals properly.

At the annual banquet of the Radio Manufacturers' Association the other day, Mr. Kellaway, the chairman of Marconi's, had a few words to say about the vexed problem of patent royalties. "I think we understand each other," said Mr. Kellaway, significantly alluding to the fact that it was better for manufacturers to pay Marconi's a royalty rather than face unrestricted competition from America.

Captain Barber, who brought the test action against Marconi's to reduce royalty fees, won it, and then lost on appeal, was also present, but his views could not be clearly ascertained.

Beam Beginnings.

Marconi's, according to Mr. Kellaway, have hitherto kept down American competition in this country, to the benefit of British manufacturers. It would be interesting to know on what facts Mr. Kellaway bases this claim.

Apart from the royalty question, Mr. Kellaway made another interesting statement about beam wireless.

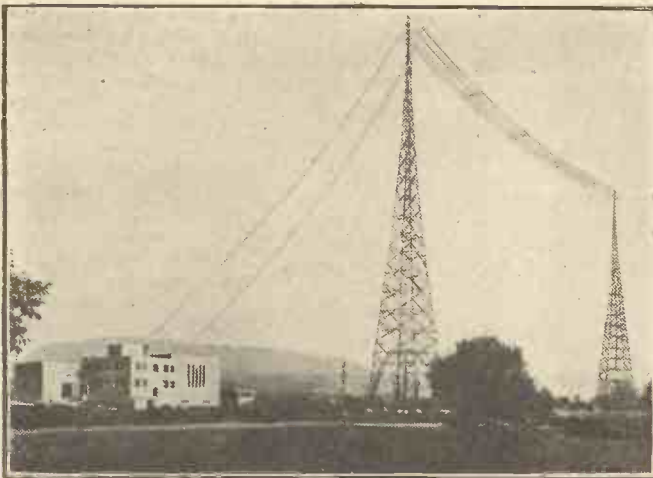
He said that when Senator Marconi first suggested the possibilities of beam wireless he was pooh-poohed by experts and politicians alike. The only two politicians who had taken a serious interest in the idea from the first, he revealed, were Mr. Philip Snowden and Mr. J. H. Thomas.

But what about the amateur pioneers?

It is a good plan never to mount spring switches, potentiometers, or rheostats with spring adjustments until the constructor has made sure that the tension on these is sufficient to afford good, strong positive contact.

When using a voltmeter or milliammeter be sure to connect it in circuit the right way round, as marked on its terminals.

Various wave-lengths have recently been classified by the International Consultative Committee. The term long-wave is now used to mean 3,000 metres and upwards. Medium waves are those between 200 and 3,000 metres. Wave-lengths between 50 and 200 metres are now termed intermediate wave-lengths. Short waves are those between 10 and 50 metres. Wave-lengths below 10 metres are now designated ultra-short wave-lengths.



This view shows the League of Nations' special short-wave station.

A NEW SHORT-WAVE SCHEME.

Another chapter in the history of short-wave communication is ending with the completion of a new series of stations for linking Britain and America.

From A SPECIAL CORRESPONDENT.

BEFORE the end of the present year the British Post Office will have established a second complete two-way short-wave channel for transatlantic traffic, and by February next a service to South America is expected to be in full operation. This will mark another chapter in a romance more fascinating and more marvellous than even the wonders of aviation.

A Romance of Research.

In half a decade, two years' previous experimentation in short waves has culminated in short-wave radio telephony being used to commercially link up two continents widely removed. The development and installation of the United States terminals for the four new trans-oceanic wireless telephones is a superb example of intelligent co-operation both in research and engineering. Two stations in America, at Lawrenceville and Netcong, with their counterparts in England at New Southgate and Deal, will complete the stage which marks the most profitable as well as the most interesting in the history of short-wave investigation.

It would take too long to tell the story of the progressive steps which have been made since only a few years ago, the study of methods of generating and receiving radio signals with high frequencies, and of measuring the intensities of their fields, was begun. Nevertheless, that seems a long way off to-day.

The gradual adoption of power-amplifiers and of high-frequency oscillators, the adding of crystal control to the generating and modulating circuits, the tests on varying wave-lengths on ever-increasing distances, the simultaneous survey of field-strengths over wide areas made in England by Post Office and other engineers, and by the Bell Telephone Laboratories and the American Telephone and Telegraph Company in America—all this is a record of scientific research as fruitfully prolific as it has been patient and sustained.

The Alternative Hazards.

It was only two years ago since the Deal transmitter was associated with the New Southgate receiver as an east-bound short-wave experimental channel, auxiliary to the long-wave system, which at that time was in commercial operation. The tests which were made during the summer of that year in combination with the

Of the two hazards to good radio transmission—static and magnetic "storms"—the long-wave system proved adversely affected by the former and comparatively little affected by the latter, whereas the short-wave system showed the reverse properties. The use of the transatlantic service increased so rapidly that it was found that more channels and facilities than those afforded by Deal would be necessary to handle the traffic. Thus the new transmitting station at Lawrenceville was called into being.

The selection of transmitting frequencies,

long-wave west-bound channel, clearly demonstrated the complementary properties of the two systems.

have directional characteristics which necessitate placing them broadside to the direction in which transmission is desired. Since it was not considered advisable to place obstructions directly in front of any aerial, straight-line formations were selected. With this arrangement an extremely long line of towers results when several channels transmit in the same direction. This is the case at Lawrenceville, where three of the four transmitters work to England.

Aerials in Line.

The space requirements for a single aerial were arrived at on the basis of a fixed linear distance between towers which would most satisfactorily accommodate any one of the three aerials. This was done so that all tower spacings would be uniform, and flexibility obtained for shifting groups or interchanging the aerials in a group in case it was later found desirable to make such changes.

In order to avoid undue loss in the transmission lines feeding these aerials, each transmitter should be located as nearly central to its three aerials as possible. It was therefore decided to separate the four transmitters and install not more than two in a single building. Accordingly two-storey buildings identical in layout in so far as the transmitter installations are concerned were erected.

On the ground floor of each building, occupying the entire width at the rear, are

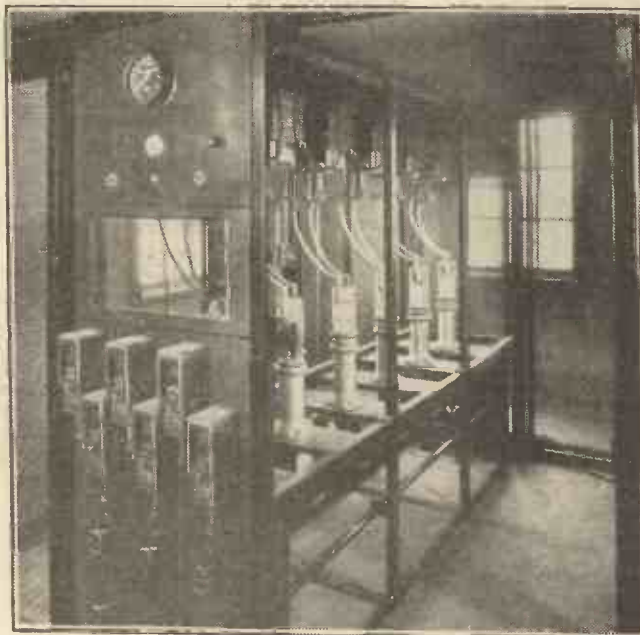


Fig. 1. One of the two six-phase high-voltage rectifiers for supplying D.C. to the transmitters.

circuits, and aerials to be used was based upon experience with the installation at Deal, and the development work conducted at that station during the previous two years.

Due to the particular type of aerial selected, and the fact that each transmitter was to operate on any one of three assigned frequencies, a total of twelve independent aerials for the four channels was necessary, each requiring a linear distance of 500 ft. for its structure. These aerials

transformer vaults and rooms for water-cooling units. Directly in front of these, and also extending the full width of the building, is the power-room.

As a precaution against vibration in the building, all rotating machinery was mounted on concrete piers which rest on cork mats several feet below the power-room floor. Cork linings surround these piers where they pass through the floor.

Directly over the power-room, and of

(Continued on next page.)

A NEW SHORT-WAVE SCHEME.

(Continued from previous page.)

equal floor area, is the transmitter-room. Here are located two transmitters, in line, on one side of the room, and two power-control boards, in line, on the other.

Associated with each transmitter is an audio-frequency control turret, located on a desk which stands in this aisle near the centre of the room. The radio operator, in this position, can communicate directly with the New York control operator and monitor the input and output of the radio transmitter.

An Automatic Alarm.

Extending back over the top of the middle transformer vault from the centre of the room, and at a slightly higher floor level, is a room containing two six-phase high-voltage rectifiers (Fig. 1) for supplying direct current to their respective transmitters. Beneath the rectifiers, on each side of the middle transformer vault, is a high-voltage switch chamber.

The power-control board (Fig. 3) consists of motor-generator control-panels and distribution panels, nine in all, equipped

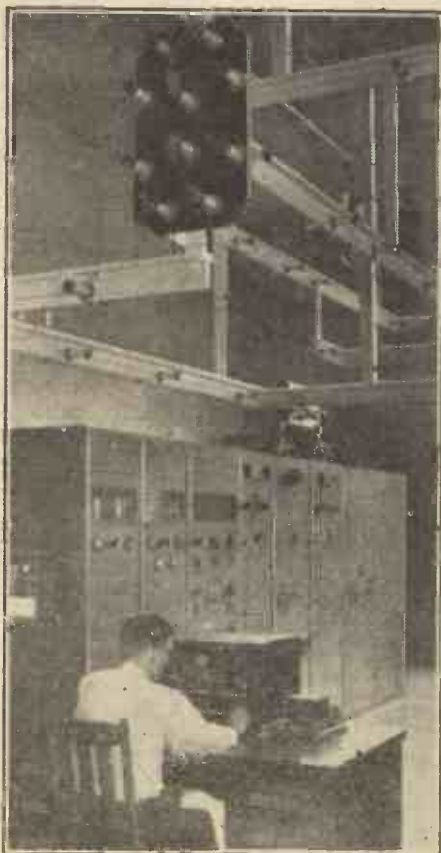


Fig. 2. The new station that will be in direct communication with the British Isles.

with the necessary apparatus for controlling and applying power to the associated transmitter. All apparatus is remotely controlled from this point. Independent control of the various motor-generator sets may be had from their respective panels,

and power applied to the transmitter by working in the proper sequence.

The final step is the application of high voltage to the plates of the power-amplifier tubes, which is possible only when conditions are such that it will cause no damage. The fulfilment of these conditions is ensured through the agency of an alarm and protective circuit, which is also effective in turning off the high voltage should trouble develop while the transmitter is in operation.

Each channel is provided with its own water-circulating system for cooling the anodes of the rectifier and power-amplifier tubes. At the present one, and eventually two three-phase power-transmission lines, from the public electricity service, supply the power to the wireless station. Each building has its own sub-station, where the voltage is stepped down from 4,000 to 2,300 volts, and whence four 2,300-volt cables supply all power for the building.

Two of these cables, each of which supplies one transmitter, terminate in the power-transformer vaults of their respective transmitters. A bank of step-down transformers in each vault supplies all auxiliary power requirements for one transmitter at 220 volts.

The other two 2,300-volt cables, one of which is a spare, provide for the building's light and power requirements. They terminate in a vault in another section of the building which is independent of the transmitter layouts.

A WONDERFUL SYSTEM.

A friendly commentary on Dr. Robinson's new invention.

"By PENTODE."

RIGHT in the middle of my series of little articles on Radio comes news of a radio invention, discovery or theory (call it what you will) that has shaken our fundamentals to the roots. Fortunately, my articles remain unscathed, for it so happens that in traversing the wide plains of wireless, I have kept to those well-beaten tracks that have been trodden to a concrete hardness by the feet of practical scientists.

Dr. Robinson, one time head of Radio Research for the R.A.F., has, among other things, propounded a new theory of wireless, and has attempted to prove it practically with certain apparatus. It is not a completely new theory of radio; rather, a series of explanations, of certain phenomena, that differ from those that hitherto have universally been accepted.

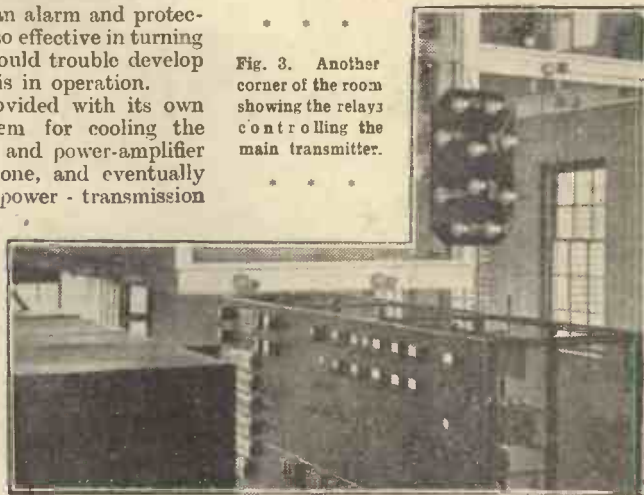
We would have been inclined summarily to dismiss the whole business had it emanated from a man of unknown technical capabilities, but in that its expounder is Dr. Robinson we are forced to give it our closest attention, even if we are not bound to accept it in its entirety without question.

A complete disclosure of Dr. Robinson's

scheme has yet to be made and, so far, we have had to be content with a brief outline of his main claims and a demonstration that was necessarily incomplete.

Briefly, Dr. Robinson claims that the so-called "clipping of side bands" that is

Fig. 3. Another corner of the room showing the relays controlling the main transmitter.



said to occur in highly selective, resonant circuits, is really an over-accentuation of the bass rather than a loss of high notes.

With his apparatus he deliberately narrows the wave-band entry of a receiver and makes this responsive to a frequency band of but a few hundred cycles (he can arrange this width to his liking). I believe he claims that quality is retained by preserving proportional amplitude variations.

Frequency and Amplitude.

Obviously, if the Robinson scheme is effective, you can crowd hundreds of ordinary stations in an otherwise very restricted wave area, although Robinson receivers would be needed to sort out the various individual transmitters.

Dr. Robinson may have a great deal up his sleeve; I, for one, hope he has, and I am anxiously awaiting the full details of his discovery and an account of scientific tests of his apparatus.

For one thing, he has to show us a "dissection" of transmitted radio energy. As you know (some time ago I explained this in full) it is extremely difficult to amplitude modulate without an incidental frequency modulation, just as it is mighty hard to frequency modulate without there being an accompanying amplitude modulation to some slight degree.

The Whole Story.

The Robinson theory may or may not depend upon a disassociation of the one from the other. Actually, it is too early to raise any criticism at all, and the worthy Doctor may laugh like anything when he reads this, my humble contribution.

Anyway I, for one, take off my hat to Dr. Robinson for, if he never does anything more, he will have achieved something really worth while. He has given us furiously to think.

And when he tells his whole story, who is there to say that he might not make us all turn on our venerable lexicons and rend them as deceivers?

In the meantime, I will continue my little articles in POPULAR WIRELESS, but with one eye very wide open as to this devastating possibility.

LIFE STORIES OF FAMOUS BROADCAST STARS N° 6

"When I First Had MICROPHONE FRIGHT"

by TEDDY BROWN



The famous dance band leader and xylophonist contributes an exclusive article to a popular "P.W." series.

by taking things into my own hands in rather unorthodox fashion. I commenced, not as a violinist or a pianist, but as a self-taught drummer.

In those early days the drums had a strange fascination over my youthful spirit. For hours on end I would watch my father's drummer at work. I started to practise on my own account, and for my age developed a remarkably strong pair of wrists. When I was six, I was given a small drummer's outfit for my own use.

At seven, I became a member of the band, and gave special ten-minute feature performances on my own drums. But for a ruling of the Children's Aid Society of America, which said that an infant of my tender years could not be paid for performing in public, I should have been the youngest professional musician in the world.

Although I always had a good reception in the various towns we visited, I began to tire of the drums simply because it was impossible to produce a melody from them. Father accordingly arranged that I should learn the piano. Incidentally, this is the

only instrument for which I have received tuition.

My lessons enabled me to obtain a good knowledge of the theoretical side of music. As this knowledge increased, I tried my hand at every instrument in the band, and what is more, I mastered them all.

Starring at Thirteen.

I found, however, that I had a natural preference for the mallet instruments, such as the tubular bells, the glockenspiel, the chimes, and last but not least, the xylophone, which I liked best of all. No doubt it was my early experience as a drummer which led me in this direction, for a drum-stick and a mallet are closely related.

I practised hard and often, and eventually came to be regarded as something of an artist, especially on the xylophone. I played frequently at picture houses, which, at that time were just becoming popular. At the age of thirteen, I found myself a star item in the bill of one of New York's finest houses—the Jefferson Theatre.

(Continued on next page.)

I HAVE heard it said that music, like writing and painting, runs in the blood.

It seems to in my case. My mother and father, my grandfather, my great-grandfather, and my great-great-grandfather were all good musicians.

I have not looked up my family records beyond that point, but I should think it extremely likely that a Brown was the ship's musician on board the "Mayflower" when that good ship brought the first English settlers to America. So, if tradition counts for anything, I had a good start in life.

How I Started.

I was born in New York, and my earliest recollections take me back to the days when my father toured the leading towns of the United States as a trumpeter in a band. I suppose I was more or less destined to take up music as a career, but I startled my father



Here is the genial Teddy Brown with his band. His wonderful dexterity with the xylophone, his favourite instrument, is the admiration of all who listen to him. He can also play all the other instruments in the orchestra, although he prefers those of a percussion type. He started as a self-taught drummer, and gave public performances at the age of seven.

"WHEN I FIRST HAD 'MICROPHONE FRIGHT.'"

(Continued from previous page.)

I made gramophone records in plenty for, owing to the absence of "echo," the xylophone was regarded as one of the finest instruments for gramophone recording. It was not until some years later that wireless broadcasting became established, but there is no doubt that the experience gained in playing before the gramophone-recording machine stood me in good stead in later times before the microphone.

My First Dance Band.

The classical side of my musical education was not forgotten, and I played the kettle drums in the band of the Metropolitan Opera House, New York, under the direction of Toscanini. I also played xylophone

The free and easy American methods of broadcasting have been severely criticised from time to time. I have nothing but praise for them. Indeed, I would like to see some of the American methods in use over here. My band was allowed to introduce a little impromptu "patter" between the dance items, and we found the relaxation helpful.

"Microphone Fright."

Even at its best, a microphone can never radiate the same friendly atmosphere as an audience, and it is for this reason that the B.B.C. decided to introduce small audiences in their studios. American broadcasting intrigued me to such an extent that after I had finished my work at two in the morning, I habitually tuned in my set to the Chicago programmes which often lasted until six a.m.

Curiously enough, it was not until I had done more than a year's broadcasting work that I had my first experience of 'microphone fright.' One evening, as I was about to announce the name of a dance item, I

band through the twelve hundred miles railway journey to our destination.

This took twenty three hours. The following day we returned to Montreal, after having played from ten at night until six in the morning. I should imagine that a journey of nearly 2,500 miles to play for one evening at a dance is something of a record.

At the dance the Prince of Wales asked me why I had never visited England. I replied that if there was any possibility of London people thinking my band good enough, I would gladly cross the Atlantic. The following month I received an offer to play at the Café de Paris, London. I accepted, and have never returned to America. From the Café de Paris I went to the famous Kit Kat Club, and from thence to my present headquarters, Ciro's Club.

The English Temperament.

I have had much experience of English broadcasting, and as I have said, I find it very different from the American method. It did not take me long to settle down to the English ideas, and I have played before the B.B.C. microphones, both as a dance band leader and a solo xylophonist.

English dancers, too, are different from their American cousins, although they are just as clever, and just as appreciative of good music. But English people show their appreciation in a different way. Over here, for instance, there is very little clapping after each dance item, and this is apt to be a little discouraging to the band, unless one fully understands the English temperament.

In New York the dancers will clap until their hands ache, and I remember one occasion when the applause was so deafening that it actually made me sick and dizzy. The English lady or gentleman prefers to give you a kindly smile, and a very honest "Thank you, Teddy!" when leaving the ballroom.

Did You Hear It?

Broadcasting life is not without its ups and downs, as I once discovered—in a very literal sense! I was making my way carefully up the stairs of Savoy Hill, carrying my xylophone in front of me. At that moment, a lady happened to be singing a very moving song in the studio. I picked my steps with care, for, as anyone who has visited a wireless studio will tell you, it is necessary for strict silence to be observed whilst the broadcast is proceeding.

Suddenly my foot slipped, and down the stairs I went—xylophone and all. In the stillness of the building it sounded like a dozen earthquakes. What the listeners must have thought, goodness alone knows!

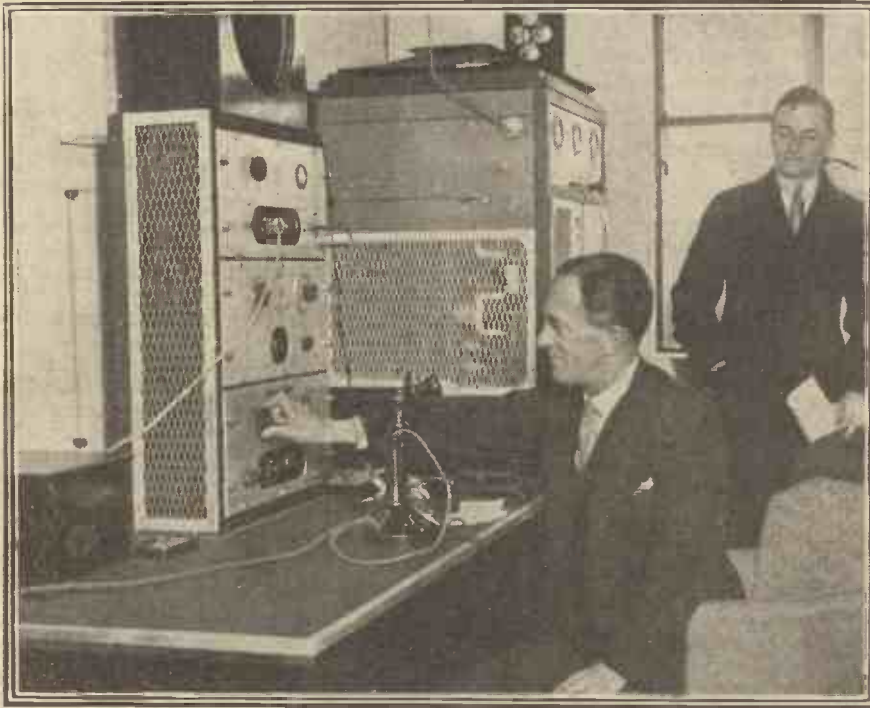
NOTEBOOK JOTTINGS.

The best arrangement for earthing an aerial is one which completely disconnects the receiver at the same time.

In the absence of a crocodile clip quite a good variable contact may be made with little "bulldog" clips (supplied by stationers), or by small paper clips.

An easy way of shorting out a fixed condenser in the aerial is to fit a 3-in. length of flex with a crocodile clip, shorting across the two terminals on the fixed condenser when necessary.

TEACHING FLYING BY RADIO.



This is the Heston Air Park School wireless installation. The Moth aeroplanes used for training are fitted with simple receiving sets, and via these the pupils receive verbal instructions from the ground.

solos at the Philharmonic Symphony Concerts.

All this, in its way, was excellent experience, but I found it too monotonous, and hankered after something different. In 1921, I decided to form a dance band, and thus was the first man to introduce the xylophone into a dance orchestra.

For taking this step, I was accused of going from the sublime to the ridiculous, but I contend that dance music is good music, and is more closely allied to classical music than most people imagine.

After a lengthy engagement in New York, I took my band to Montreal, and it was here that I had my first experience of broadcasting. This was in 1923, and I found that playing before the microphone was indeed a fascinating business.

happened to see a well-known figure amongst the dancers. It was none other than the Prince of Wales!

This unexpected sight so unnerved me, that I stood for half a minute, gasping mutely at the "mike." And even when I found the courage to speak, I got myself so thoroughly muddled that I announced the tunes in the wrong order, saying we were about to play a fox-trot when we struck up a waltz!

I Come to England.

The Prince, however, spoke very kindly to me, and soon put me at my ease. Shortly afterwards I received a telegram from Long Island, asking me to play at a dance that was being given there in the Prince's honour. I readily agreed, and rushed my

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60 volt (reads 66)	7/11	100 volt (super power)	22/-
100 volt (reads 108)	12/11	9 volt Grid Bias	1/6
120 volt	15/10	4½ volt Pocket Battery, 5d. each (4/6 a doz.)	4d.
36 volt	4/6	Single Cell Torch Battery ..	4d.
60 volt (super power)	13/6		

THE SECRET PROCESS THAT PUTS POWER INTO YOUR SET

LATEST BROADCASTING NEWS.

RINGING IN 1930.

THE B.B.C. MUSIC DIRECTOR
MYSTERY—NEW YEAR IN
SCOTTISH RADIO.

THE Programme Department at Savoy Hill can always be relied upon to give listeners an interesting and, more often than not, a really good programme on New Year's Eve, but should their plans to mark the passing of 1929 and the birth of 1930 materialise we shall go to bed with something out of the ordinary in broadcasting to think about.

The earlier part of the evening's programme can be mentioned with little or no comment. There will be a vaudeville entertainment between 7.30 and 9 p.m., after which comes the news and the cheery voice of Sir Walford Davies who, much to the regret of thousands of those who have heard him so regularly and for so long past, will be giving his final evening talk in that wonderful series on "Music and the Ordinary Listener."

It was hoped to broadcast the Ceremony of the Keys from the Tower of London at 9.45 p.m., a project originally arranged for Christmas night, but having to be postponed, and, now, unfortunately, once again this relay is "off." Instead, listeners will hear a pianoforte recital by Beno Moiseiwitsch at 9.40 p.m., and this will be followed at 10.15 with a Surprise Item, no doubt appropriate to the occasion.

Chasing the Witching Hour.

The real excitement of the evening begins about 10.30 p.m., after which no one knows quite what will happen. The plans of the B.B.C. provide for a series of relays from Continental broadcasting stations beginning at about 10.40 with preliminary canters and eventually, at about 10.50, going over to Cologne by land-line for the Old and New Year programme of the Rhine city.

It should be explained that 11 p.m. Greenwich time will be midnight in Germany and other countries which have mid-European time, so that listeners in this country will be able to hear 1930 ushered in an hour before it comes to England.

After Cologne, visits will be paid, via the B.B.C. receiving post at Tatsfield, to seven or eight other European stations. No details are available at the moment, as negotiations between the B.B.C. and Continental broadcasting authorities are still proceeding with a view to the arrangement of special items suitable for re-broadcasting. But it is hoped that the "run round" will include Budapest, Vienna, Frankfurt, Milan, and Turin, whose programmes will be interspersed with odd bits of dance music from the London Studio.

At 11.35 an effort will be made to relay a programme from Hilversum. Holland has a time of its own which is neither Greenwich time nor mid-European time and which is about twenty minutes ahead of our own. The passing of the Old Year and the coming of 1930 should, therefore, be heard for the second time.

After this there will be a return to the Studio for the B.B.C.'s own New Year Programme, which will take the usual form of suitable music by the Wireless Singers, a short religious address, and the striking of Big Ben.

Immediately following comes a relay, also via Tatsfield, from Radio-Paris, where France, conforming to Greenwich time, will also be having its New Year celebrations.

Later still, it is hoped to re-broadcast a programme from New York, where it will still be about 7 p.m. on New Year's Eve. Should this be possible it will be done via the B.B.C. special non-fading short-wave experimental receiving station at Terling, near Chelmsford.

What promises to be a memorable night will then conclude with one of those fascinatingly elaborate "Good Night's" by Mr. J. C. Stobart.

The Music Director Mystery.

The formal announcement by the B.B.C. that Mr. Adrian Boulton will take up the post of

Music Director on May 15th does not entirely clear away the atmosphere of mystery in which this affair has been developed.

For instance, it is by no means certain that Mr. Percy Pitt has recognised the right of the B.B.C. to terminate his tenure of this post in January. Then again it is common knowledge that Mr. Boulton is in fact taking a very active and responsible part already in musical administration at Savoy Hill. Then why May 15th as the official date of starting?

New Year in Scottish Radio.

New Year's Day is a holiday in Scotland. For those who remain at home there is a band concert by the Bonnybridge Band, with May Lymburn (soprano) as singer, and an eye-witness account of a football match between the Celtic and Rangers. We don't suppose that English listeners would get very excited about any of these items, but then they are characteristically Scottish, which is what listeners over the Border always profess to want.

ACHTUNG! ACHTUNG! HIER AUGSBURG!



The aerial of Augsburg, one of the German relay stations that transmit the Munich programmes. Its wave-length is 560 metres.

TECHNICAL NOTES.

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

LOUD SPEAKERS FOR "TALKIES."

A FIELD FOR THE AMATEUR?—OUR TECHNICAL EDITOR'S
SUGGESTION, ETC.

MY remarks recently on the question of loud-speaker reproduction, particularly as used in the "talkies," have brought me a number of letters from readers in which various ingenious suggestions are made.

In passing, I should remark that the advent of the talking pictures has opened up a totally new and tremendously increased field for the loud speaker and its associated equipment and there is an excellent opportunity here for the radio experimenter to pursue his investigations with a view to improved loud-speaker technique for this purpose.

I think anyone who has heard the talkies—and who has not?—would agree that there is room for improvement in the sound reproduction, notwithstanding the immense resources of the companies who are at present responsible for the apparatus used.

In the development of radio, many of the most important inventions and improvements have been made by experimenters,

and even by amateurs, and it is quite possible, if not indeed probable, that equally important contributions will be made to the science of "talking movies" by the same class of investigator.

So put your thinking-cap on and see whether you cannot make any suggestion for improvement or development in loud-speaker technique as applied to the talking film.

Direction of Sound.

This, however, is all by the way; I started these remarks with the intention of referring to the placing of the loud speaker in association with the screen.

As you know, in order to create the illusion of the sound coming from the speaker on the screen it is necessary that the loud speaker be placed in a position in close relationship to the screen.

It is a common practice to place a loud speaker (sometimes several loud speakers) behind the screen. This seems simple

(Continued on page 864.)

The Transformer that NEVER BREAKS DOWN



The transformer you can use for every published circuit

8/6

Turns Ratio 3-1
Resistance Ratio 4-1

In a single season the Lissen 8/6 Transformer gained fame and an overwhelming popularity with builders of radio receivers. It has been used in every type of circuit to replace far more expensive specified transformers, tested under all conditions, its results compared and its price considered—over half a million Lissen 8/6 Transformers are proving now that all the claims made for this transformer are thoroughly well founded.

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LISSEN

TRANSFORMER

If your chosen circuit calls for a Super Transformer use a Lissen Super Transformer. You cannot get a better one. PRICE 19/-

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*A new valve for
any set with one
stage only of L.F.*

**YOUR PRESENT BATTERIES WILL DRIVE THIS
POWER PENTODE
AND GIVE YOU DOUBLE VOLUME**



Any two-valve set becomes at once a fine loud-speaker set when you put this new Lissen Power Pentode into it. You can use this Power Pentode Valve in any set with one stage only of L.F. amplification, and you will get full loud-speaker volume on stations previously weak.

And you do not need to make a single other change in your set—you do not need more H.T. current—as long as you have at least 100 volts available—nor does this extra volume that you get cost you any more in running expenses. Because Lissen have produced at last a Power Pentode that is battery driven—the only Power Pentode of its kind on the market, the only Power Pentode Valve that you can economically run off ordinary H.T. batteries.

If you have a set with one L.F. stage from which you want more power get a Lissen Power Pentode Valve P.T. 225.

17/6

(2 Volt-Consumption only 7 M.A.)

LISSEN
NEW PROCESS
VALVES

If you are wanting a lively detector valve, get the Lissen Valve H.L. 210.
PRICE **10/6**

OTHER TYPES AND PRICES: H.210 R.C. and H.F., 10/6. L.210 L.F. Amplifier, 1st Stage, 10/6. P.220 Power Valve, 12/6. All other types available shortly.

LISSEN LTD., Worples Road, Isleworth, Middlesex.
(Managing Director: T. N. COLE.)

Factories also at Richmond (Surrey) and Edmonton.



Screening Binocular Coils.

W. R. H. (Berwick-on-Tweed).—"If binocular coils really have no external field, why is it necessary to use metal screens between stages?"

The metal screens make the screened stages "binocular" too! I mean, if binocular means absolutely no external fields, then the definition must be bound up with the metal screens. Then, after all, other components do couple as well—electrostatically and electromagnetically. In an H.F. amplifier you can't overdo screening (in all its senses).

The Shape of a Cone.

R. A. D. (Wentworth).—"Does the depth (or diameter) of the cone employed in a cone loud speaker have any bearing on the actual rendering of the high notes?"

It does and it doesn't. The design of a cone loud speaker is a design bound up with suiting the movement to the cone, the electromagnetic drive to the curvature, the attachment to the degree of displacement, and so on.

Does the weight of an engine have any bearing upon the speed of a car? Yes, and no, but no car is designed by considering these things separately, as it were.

Ganging Condensers.

F. G. (Leicester).—"In these days of high selectivity sets, there is a tendency towards increasing the number of tuning controls. For instance, with three tuned circuits three separate condensers are frequently employed. What is the 'snag' in 'ganging' these controls and only having one dial tuning? I have heard that the aerial circuit is usually the difficulty."

"Ganging" is "all the go" in advanced design to-day. There are problems, of course, but they are more bound up in mechanics than electrics.

The aerial can always be forgotten by using aperiodic coupling, but the slightest

* * * * *

Under the above title, week by week, Captain P. P. Eckersley, M.I.E.E., late Chief Engineer of the B.B.C., and now "P.W.'s" Chief Radio Consultant, will comment upon radio queries submitted by "P.W." readers. But don't address your queries to Captain Eckersley. A selection of those received by the Query Department in the ordinary way will be dealt with by him.

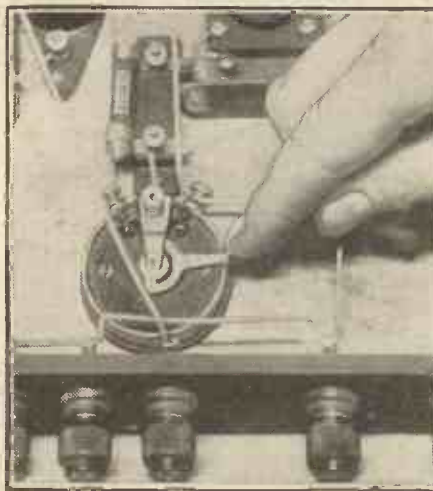
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mal-fitting of condensers or poor matching of inductances throws out the whole scheme. It is not easy for amateurs to build a proper ganged control set. It is essentially a job for mass production.

Lengthening H.T.B. Life.

T. H. W. (Norwich).—"Is it really

CURING CRACKLING.



A frequent cause of "crackling" is a loose spring contact. So all potentiometers, resistance-sliders, etc., should be adjusted to give strong contact before being mounted in position.

possible by baking, or by any other means, to increase the life of a dry H.T. battery?"

If anyone could find a means of increasing the life of a dry battery by baking it I'd invest in ovens! Keep a battery reasonably cool and dry, and don't discharge it above its rated capacity, and it will last as long as it will last in the present state of our knowledge!

Size of Coupling Capacity.

I. A. D. (Yeovil).—"A learned friend of mine tells me that the coupling condensers in my R.C. amplifiers are too small to reproduce anything below 100 cycles. Does this really matter for gramophone work?"

It's so small a matter to increase the size of the condensers that it's worth so doing. There is plenty of bass in a gramophone record—far more than a lot of people realise—and it is best to do everything we can to let it through. Besides, one never knows, you might want to use the amplifier for wireless one day.

Using a Pentode.

H. J. D. (Holt).—" (a) In the case of a pentode valve, does it matter which filament pin is connected to L.T. neg. ? (b) Also, can I use a pentode valve with a choke filter output instead of a transformer?"

(a) Not essentially, if you really mean filament pin. But look up the standard connections of a pentode, which explains itself. (b) Certainly, you can use a choke filter output, but remember the impedance of the choke must be very high—as high as the impedance of the valve. This "matched impedance" must be calculated for the lowest frequency you wish to use. A rough rule is to multiply the inductance of the choke in henries by six times the lowest frequency in periods per second, when the answer should equal the impedance of the valve.

THE "MAGIC" THREE.

The Editor, POPULAR WIRELESS.

Dear Sir,—It might interest you to know that I have constructed the "Magic" Three, and having purchased a set of short-wave coils, I tuned-in on Saturday morning between the hours of 12.30 and 2 a.m. the American station Westinghouse Electric K D K A, Pittsburg, U.S.A.

I had two sets of headphones on the set, and it was very loud and distinct. I have taken note of the various items in the programme to prove that I received the station. I may also say that on the broadcasting wave I can pick up all British stations and about 18 foreign stations on loud-speaker strength, as for a volume control it is not a luxury, but a necessity on this set.

I have also constructed the "Magic" Four for a friend, and it does all that you claim, and more.

We have a great difficulty in Edinburgh to get the components, as I think all Edinburgh must be on the "Magic" list at present. My aerial is 80 feet outside, but pretty well screened with high buildings, so it is not a bad performance. I am also quite a beginner in wireless.

With all good wishes and more power to "P.W."

Yours faithfully,
Leith, Scotland. WILLIAM MCKENZIE.

The Editor, POPULAR WIRELESS.

Dear Sir,—I must confess to having been a little sceptical when I read the glowing accounts of the "Magic" Three, although at the same time I knew better than to think that "P.W." would introduce a dud. Anyway, I have since made two editions of this set and given it a good trial, and it is certainly amazing what an ordinary detector can be made to do. Over twenty stations were received, when conditions were favourable, on the L.S. with the usual five or six long-wave stations; also several short-waves, this being my first try for the latter.

I may mention that each of these sets was constructed with parts of different make, but the results in each case were as above.

Yours faithfully,
OLD READER.

Co. Wicklow.

A "MAGIC" CONVERSION.

The Editor, POPULAR WIRELESS.

Dear Sir,—Of all the hobbies provocative of vocal eruptions commend me to Wireless! The torments of Tantalus were as nothing compared with those of the wireless fan who finds that a new circuit he is trying out is within an ace of his ideal, but which nevertheless refused to come up to it after much expenditure of energy and bad language. All this apropos of my first experiment with your "Magic" Three. When this receiver first appeared in "P.W." I was at once attracted to it for many reasons, but as I have a perfectly good three-valver of the Reinartz type based on White Print No. 4, and which was giving me about thirty stations on the L.S., I was reluctant to change it; but in view of the enthusiastic reports from readers about the M.T., I finally decided not to scrap it, but to alter the detector circuit of the set to conform with that of the new receiver, and see what happened. All I required was a differential condenser, and this I got. I already possessed the necessary coils and potentiometer. The alterations were soon effected, and

CORRESPONDENCE.

THE "MAGIC" THREE.

A "MAGIC" CONVERSION—"PENTODE'S" ARTICLES—COUNTERPOISE EARTHS.

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

results on two valves were excellent, both for volume and quality. But when the third valve was switched in for distance, results were not so satisfactory. Reaction was either too fierce, or not strong enough, and I could strike no intermediate point, no matter how I wangled the knobs of the two condensers, or the arm of the potmeter. It was here where the bad language originated, for the set was so good on two valves that I was anxious to hear it to equal perfection on three, but I had come up against a snag. Where was it?

Looking again at the photos of the M.T. I saw that the coils were practically touching one another. Thinking that possibly my trouble lay here (for mine were about three-eighths of an inch apart) I brought them closer together, but this only made matters worse. Anyhow, it gave me an idea, for I can take a hint even from wireless mechanism! Going to what seemed the opposite extreme I separated them, so that they were now nearly an inch apart. Imagine my satisfaction and delight when I found that this had done the trick! Stations come in all round the dial with wonderful clearness and strength, and reaction was quite O.K. Evidently the aerial coil had been getting an overdose of magic—I mean magnetic—flux from the reaction coil, even with only a No. 35 in this position.

Now there are probably many like myself who would like to try out this excellent set without too much trouble, so perhaps the following hints may be useful. If their valve holders, like mine, are all arranged in one direction, i.e. with their plate terminals to the left as viewed from behind the set, there is no need to reverse the position of the detector to agree with the Blue Print, an arrangement designed, I fancy, to take the shortest possible lead from the reaction condenser to the valve plate and reaction coil. This is all right, of course, but in my opinion it involves rather a roundabout way of wiring up the filament circuit to this valve. As all my valves faced one way, and I was not anxious to disturb them, I left them as they were, reversed the position of the differential, bringing its "arm" to the top and so nearer to the moving vanes terminal of the tuning condenser, and then wired them together and to L.T.—. This is a shorter cut than first

taking the "arm" to the neg. fil. of the valve, and then to the potmeter, before reaching the tuning condenser and L.T.—. The remainder of the wiring is as per Blue Print. The leads to the valve plate and reaction coil are a little longer, but this does not affect the efficient working of the set. The arrangement, in fact, is very similar to that of the "Magic" Two.

In conclusion I would like to say that this is the best three-valver I have ever made, and I have made many during the last four years. What I might call the stereoscopic clearness of all signals is remarkable, and its volume is beyond cavil. I can get more stations in one evening than I care to listen to. No one need be afraid to venture on this new receiver.

Yours truly,
A. J. WOOD.

Manchester.

"PENTODE'S" ARTICLES.

The Editor, POPULAR WIRELESS.

Dear Sir,—Wanting to know something about wireless, I chose the "P.W." from among the many available radio journals, and luckily started just as "Pentode" commenced his series.

That alone has made me a permanent and satisfied reader, regardless of the other interesting and helpful information to be had in a very cheap twopence worth.

Even in this short time I am beginning to understand what before was unintelligible.

Regarding the mathematics I think that most people can more satisfactorily grasp anything if they have something at which they can actually work (if it needs it), and most people with experience are generously minded enough to pass over what they know uncomplainingly and, recognising that it is necessary, leave it to the beginners.

So use a little space on problems, please. Thanking you for a fine magazine and Pentode for a very interesting and helpful guide.

I remain,
Yours sincerely,
MAX PAYNE.

Fulham.

COUNTERPOISE EARTHS.

The Editor, POPULAR WIRELESS.

Dear Sir,—I am writing a few lines to you regarding Counterpoise Earths, by Mr. C. Radford, POPULAR WIRELESS issue, October 19th, 1929. I have had good results with the bedstead, also 100 ft. of aerial wire stretched under the carpet, either will work separately, but when I soldered the two together the results were exceptionally good. I was glad to try something else as my earth was on the ventilation pipe of the drainage, and while I have had good results from London, from Brookman's Park they were weaker. I might mention I have only a home-made crystal set, with a one-valver. My set contains two home-made coils, one variometer, two fixed condensers, one Formodensor, one '0005 variable condenser.

Thanking Mr. Radford for his useful article on Counterpoise Earths.

Yours respectfully,
Wm. SMITH.

P.S.—I almost forgot to mention I have an indoor aerial.

London, N.W.1.

A CORRESPONDENT from Oxford asks if I can identify a transmission that he logged on November 17th, at 19.20 G.M.T., on about 25 metres. When he first picked up the carrier-wave he heard bugles blowing the "Last Post," followed by an order in English, after which the band struck up a "well-worn musical switch of war-time songs," finishing up with the Reveille, followed by a complete fade-out.

I myself have no ideas on the subject; did any other readers hear this transmission, and can they enlighten me at all? It does not seem impossible that it was a gramophone record. The same reader logged the Siamese station on 16 metres at midday, with a very bad echo.

An Interesting Letter.

The short-wave receiver ballot is still going strong, and at present the leader is the detector and note-mag., with, surprisingly I think, the S.G., detector, and note-mag. only just behind. There are far more using S.G.'s on short waves than I ever imagined.

At least one reader, by the way, is using a "Filadlyne" circuit for short-wave work.

I have been taken to task by R. W. S. (Little Wakering), who points out that he

SHORT-WAVE NOTES.

By W. L. S.

received the Manila station in July, and that it was duly reported in "P.W." at that time. This naturally annuls my statement that F. N. H., of Dursley, was the first and only reader of "P.W." to report this station. My apologies to both parties!

I have to acknowledge a most interesting letter from a regular reader in Nice. His first receiver was a British "S.G., det., and pentode" type, which was very consistent and good, but was changed for an American S.G., det., and 2 L.F. The latter, he says, was also good, but required a lot of handling. His present receiver, which he considers better than either of its forerunners, is a home-built detector and 2 L.F., which is easier to handle and more silent in operation.

He says that short-wave reception has been marvellous in Nice through all the

summer. It certainly appears to have been an abnormally good year almost everywhere for short-wave work; I myself can't remember a better.

Even in Nice, though, they have interference troubles, such as the stream of motor traffic past the hotel, and the hotel life, which apparently is worse than my pet ticking noise. This reader ends up with one good word for 5SW: "After listening to some of the horrible modulation from Continental stations (Germans excepted) it is a joy to hear 5SW, with its silent carrier and good modulation."

Reception in India.

Certainly 5SW cannot be criticised upon the score of quality, but some of the readers in the Far East appear to think that the quantity is negligible or little better. I should very much like to take a trip round the south of India and find out whether matters are as bad as some listeners make out, for the only man from India that I personally have ever known to be interested in short-wave work said that there was nothing wrong with 5SW or general reception conditions, and he always used to receive my own 10-watt station on 21 metres without the slightest difficulty.

LISSEN ACCUMULATOR



Free
**CARRIER
SUPPLIED**

One more triumph of Lissen organisation—one more example of Lissen value for money—the Lissen L.T. accumulator. Here is a complete range of highly efficient accumulators, sturdily built to give absolute satisfaction in use and long life. These accumulators are designed to give absolutely trouble-free service. The plates are all very thick, the containers are strongly made, and the general appearance and finish of the Lissen accumulators is far in advance of usual standards.

All the Lissen accumulators listed below are supplied with strong carrier, free.

PRICES BULL EMITTER (Type G.M.)

L.N.503 2-volt, 20 amp. hours **4/6**

L.N.504 2-volt, 20 amp. hours ... **8/6**

Multiple plate type, glass containers.

L.N.500 2-volt, 20 actual amp. hours, **9/6**

L.N.502 2-volt, 45 actual amp. hours, **13/6**

L.N.560 2-volt 60 actual amp. hours, **17/6**

EXTRA CAPACITY

L.N.555 2-volt, 24 actual amp. hours **10/6**

L.N.557 2-volt, 48 actual amp. hours, **14/6**

L.N.559 2-volt 72 actual amp. hours, **18/6**



H.T. ELIMINATORS YOU CAN USE WITH YOUR SET LIKE A BATTERY

The current you get from Lissen Batteries is the purest power you can get for radio. But if you want to use an eliminator, use a Lissen Eliminator. You'll then get H.T. current from your mains smoother, steadier, better than before.

There are 4 types of Lissen Eliminator: one of them will almost certainly be just right for your set. Tell your dealer what voltage your mains supply is and whether it is A.C. or D.C.; tell him what output you require, or what valves you are using, and he will show you the Lissen Eliminator to suit your needs.

Then you only have to take your battery out and put the Lissen Eliminator in its place. No need for special wiring. These Lissen Eliminators are cased in insulating material and the lead is heavily insulated cable flex.

TYPES AND PRICES.
D.C. MODEL "A" Employs 3 H.T.+ tap-
pings: H.T.+1 giving 80 volts for S.G. valves; H.T.+2 giving 60 volts at approx. 2 m/A for detector valves; H.T.+3 giving 120/150 volts at 12 m/A for power valves.
PRICE ... 27/6
D.C. MODEL "B" Employs 3 H.T.+ tap-
pings: H.T.+1 and H.T.+2 are con-
tinuously variable (by means of two control knobs) and capable of giving any desired voltage up to 120/150 volts at approx. 2 m/A; H.T.+3 giving 120/150 volts at 12 m/A for power valves.
PRICE ... 39/6

Models working on 100/110 Mains Voltage give output voltages of approximately 60 per cent of above values.

A.C. MODEL "A"
Tappings as in D.C. Model "A"
LN 576 for A.C. Mains voltage ... 200-210
" 577 " " " " ... 220-230
" 578 " " " " ... 240-250
" 639 " " " " ... 100-110
PRICE ... £3:0:0

A.C. MODEL "B"
Tappings as in D.C. Model "B"
LN 579 for A.C. Mains voltage ... 200-210
" 580 " " " " ... 220-230
" 581 " " " " ... 240-250
" 640 " " " " ... 100-110
PRICE ... £3:15:0

LISSEN ELIMINATORS

LISSEN LTD., Worple Road, ISLEWORTH, Middlesex.
(Managing Director: T. N. COLE)



12/6

BUYS YOU

The **LISSEN**
FOUR-POLE

ADJUSTABLE BALANCED ARMATURE UNIT

The Lissen 4-Pole Balanced Armature Unit brings something approaching loud-speaker perfection within the reach of everybody who owns a radio set. You can build any type of cone loud-speaker with it; you can use it with a big baffle board, or put it in a cabinet. You can build a linen diaphragm loud-speaker with it, or you can buy it completely assembled and ready to connect up to your set. It has a fine adjustment, and you therefore get the utmost volume from it without chatter.

In brown moulded case with attachment for fitting to any type of cone
PRICE 12/6

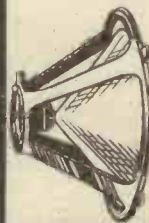
Cast aluminium Chassis, specially designed to give the best results from the Unit
PRICE 7/6
13-in. cone for use with the above **2/6**

COMPLETE ASSEMBLY

with which you get the nearest possible approach to moving-coil tone and fine full volume without chatter.

Ready for use or to mount in a cabinet. Price

22/6



THE "Magic" Four has completed and brought to a close our series of special "Magic" receivers, and in this now famous range you have the choice of one-, two-, three- and four-valve designs. Now what about trying to add a touch of "Magic" to your existing receiver?

We imagine that there must be a certain proportion of our readers who have looked longingly at the "Magic" series and decided regretfully that for one reason or another the time for building a new set had not yet arrived. Well, it is by no means impossible or even difficult to incorporate many of the special features of the "Magic" series in an existing set. No doubt the more experienced reader will have realised that it is comparatively simple to modify the detector circuit to incorporate the special scheme of reaction control, potentiometer adjustment for the detector valve, and so on.

Increasing Range and Selectivity.

Such conversions as this, of course, are very much a matter for the more experienced constructor, as we have hinted, and we could not hope to give sufficiently detailed instructions for the guidance of the comparative novice. Sets differ too much in their arrangement for this to be possible.

What we mean by "adding a touch of 'Magic'" to an existing receiver is rather the

construction of a unit which you can connect up to your present set, and so ginger up its results to something like the level of one of the "Magic" series. This is quite possible, and it can be done by even a novice, because we can give you a complete fully worked-out design for such a unit.

What we have in mind is an H.F. unit which can be added to any existing detector or L.F. type of set, and which will then confer upon that set some of the extraordinary power and sensitivity of the "Magic" Four. Such an instrument is the "Magic" H.F. Unit, which you will probably be able to see is very much like just the H.F. section of the "Magic" Four, with certain minor modifications to make it suitable for working with almost any type of standard detector and L.F. receiver.

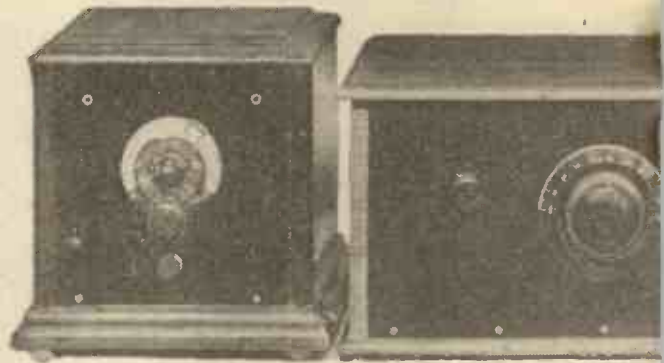
Keeping Down H.T. Consumption.

It has in addition certain special features of its own which you will understand in a few moments when we explain its general arrangement. In the main it has just the same arrangement of a tuned grid circuit composed of an X coil with its two tappings for the aerial, giving two different degrees of selectivity, and "parallel-feed" coupling to the succeeding detector valve, this latter being located, of course, in your present set. Just as before, there is an H.F. choke in the anode circuit of the screened-grid valve, and a "feed lead" goes off from the anode end of this through a fixed condenser to the grid circuit of the detector valve.

Now about those special features. In the first place, provision is made for using a little negative grid bias on the screened-grid valve, which economises H.T. consumption considerably in the case of this season's screened-grid valves.

Grid bias is obtained from a single dry cell placed upon the baseboard, and you will find that two flex leads are provided for this in the wiring. If you find difficulty in obtaining a small

THE "MAGIC"



single dry cell, by the by, you can use an ordinary 4½-volt grid-bias unit and tap out just 1½ volts from it.

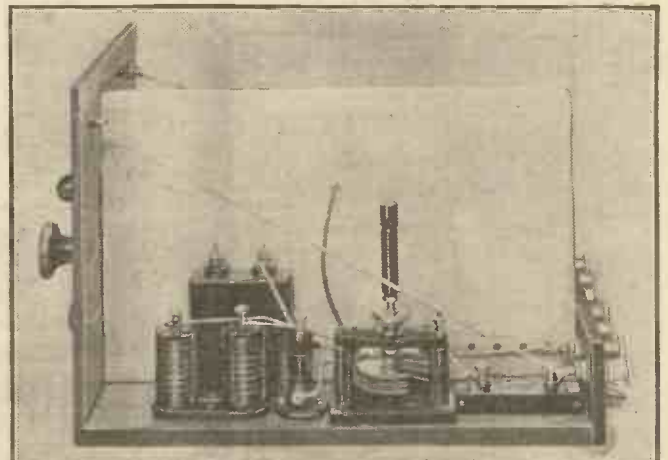
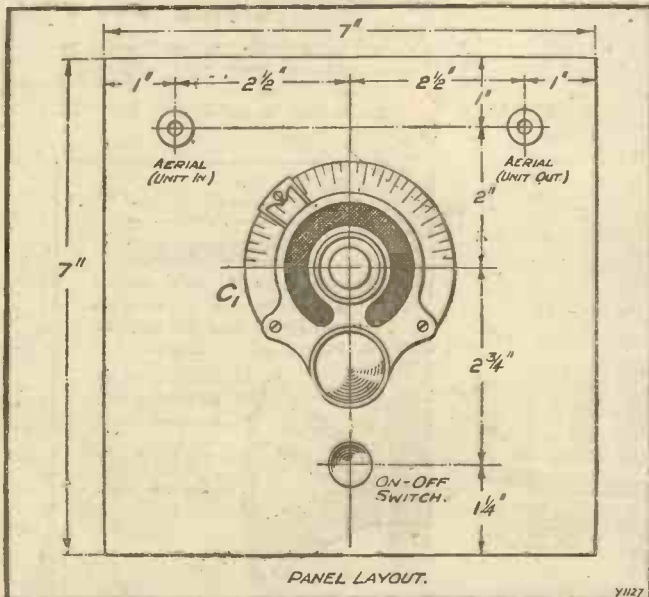
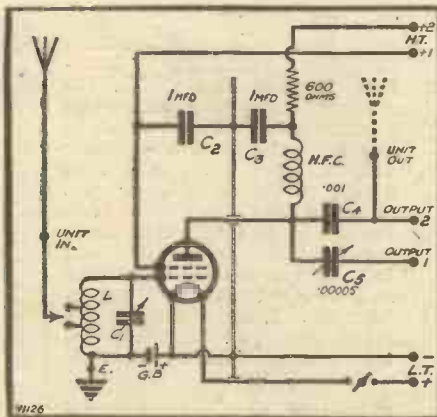
A special feature of considerable convenience is one we have provided for cutting the unit out of circuit when it is not required, for example, when the local station is being received. This device is exceedingly simple and takes the form of two sockets on the front panel of the unit, the idea being to furnish your aerial lead with a plug upon its end and insert this in one or other of the sockets.

Cutting Out the H.F. Stage.

When you insert the aerial plug in the left-hand socket (looking at the unit from the front) and switch on the filament of the screened-grid valve the H.F. unit is working, and will give you the remarkable extra power and selectivity to be expected from a well-designed H.F. stage. Then when you desire to receive the local station you just transfer the aerial plug to the right-hand socket and switch off the filament of the screened-grid valve, and so get your local station in just the old way, saving the H.T. and L.T. consumption of the H.F. valve.

Here is just the little "Magic" touch to rebuilding it. An extra selectivity you get all the difference to

Designed and "P.W." R



The "Magic" H.F. unit is remarkably simple to make, and there are only four parts on the panel, as you will see from the drawing on the left. Next to the sketch is a photograph of the unit, showing the particular needs, and finally a complete plan view which will help you to clear up any constructional detail.



unit you want to add the
our existing set without
instrument which will give
and power, and make
our long-distance work.

Described by the
SEARCH DEPT.

Another special feature concerns the use of the unit on short waves. Just as in the case of all the other "Magic" receivers, this instrument will work well on short waves by inserting a suitable coil in the socket and corresponding sizes in your receiver. (Naturally, you cannot

work on short waves unless your receiver is suitable for the purpose.)

The special scheme in this case lies in the parallel-feed arrangement which connects the H.F. unit to your receiver. You will see that there are two terminals on the H.F. unit and the one marked Output 2 is the one for all normal use. With some receivers on short waves, however, it is advisable to use a much smaller fixed condenser in the parallel-feed lead, and you can get this desirable arrangement by connecting the appropriate lead to the Output 1 terminal instead.

Reducing Atmospherics.

You then have the neutralising-type condenser in the parallel-feed circuit, and by setting this to various values you will quite possibly find one which will give better results with your particular set. This scheme was not needed in the "Magic"

Four, but it is a desirable arrangement where an H.F. unit is to work with all sorts of receiving sets. In particular, you may find it preferable when atmospherics are a nuisance on short waves.

Another device included in this H.F. unit which was not found necessary in the "Magic" Four you will see in the H.T. + 2 lead, which supplies the voltage for the anode of the screened-grid valve. To make the unit as "safe" as possible with all sorts of different receiving sets, we have included here what is called an "anti-coupling" filter.

This consists of a small resistance of a type produced by various firms for this purpose and a 1-mfd. condenser, C₃. The resistance in this case is actually of 600 ohms but the other conventional value of 500 ohms can also be used equally successfully.

Before we leave the general design of the unit there is one more point we should like to explain about short-wave work. You will observe that an ordinary .0005-mfd. tuning condenser is fitted, and you may wonder why we have omitted the usual fixed condenser to place in series with it for short-wave work.

Practical Pointers.

The fact is, that when an H.F. unit is used on short waves, the tuning of the grid circuit (the condenser C₁) is very much less sharp in proportion than it is on the broadcast band, and so it is quite feasible to use one of .0005 mfd. here, so long as you have a fairly good slow-motion dial to adjust it with.

Constructionally there is very little to be said about this unit, because it is a very straightforward and easy job with the aid of the clear photographs and wiring diagram which you will find accompanying this article. Just one word, and that is to remind you that it is

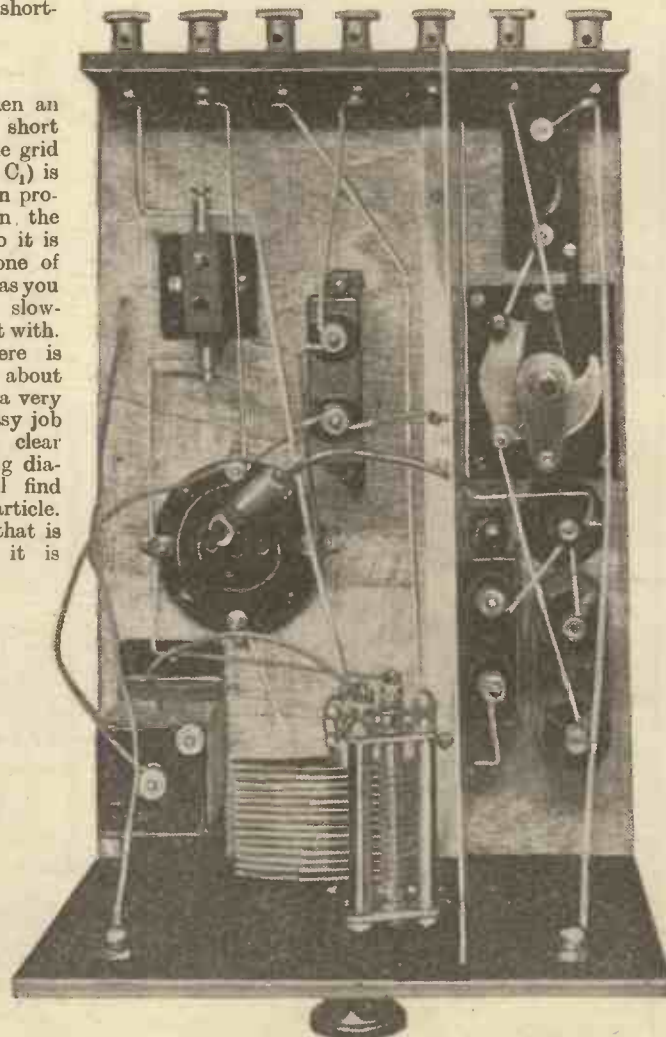
advisable to use covered wire such as Glazite or bare wire and sleeving for this unit, just as it is in the case of all instruments containing metal screening with the consequent risk of wires touching the screen. Otherwise, we can leave you to carry on in the usual way with drilling the panel, mounting up the parts, etc.

Before we go on to the next point, by the way, we should just like to give you a warning concerning something which is not strictly a constructional point, but which, nevertheless, may well be dealt with at this point. Just note that the coil holder must be connected up the right way round. Place it upon the baseboard with the pin of the holder towards the back of the unit, that is to say, nearest to the terminal strip.

Connections to the Set.

Now about the connections of the unit, a very important point which we must explain carefully. The arrangement of the aerial we have already explained, and you will understand that the aerial lead must be furnished with a plug to fit the two sockets on the front of the panel. The earth lead should be connected to the earth terminal on the back strip, and not to the earth terminal on your receiver.

(Continued on next page.)



Owing to the special "output" arrangements, then a view in which attention is drawn to the tapping device on the aerial coil which enables you to adjust the selectivity to suit your own which you may need assistance. Note particularly the placing of the various components in relation to the screen.

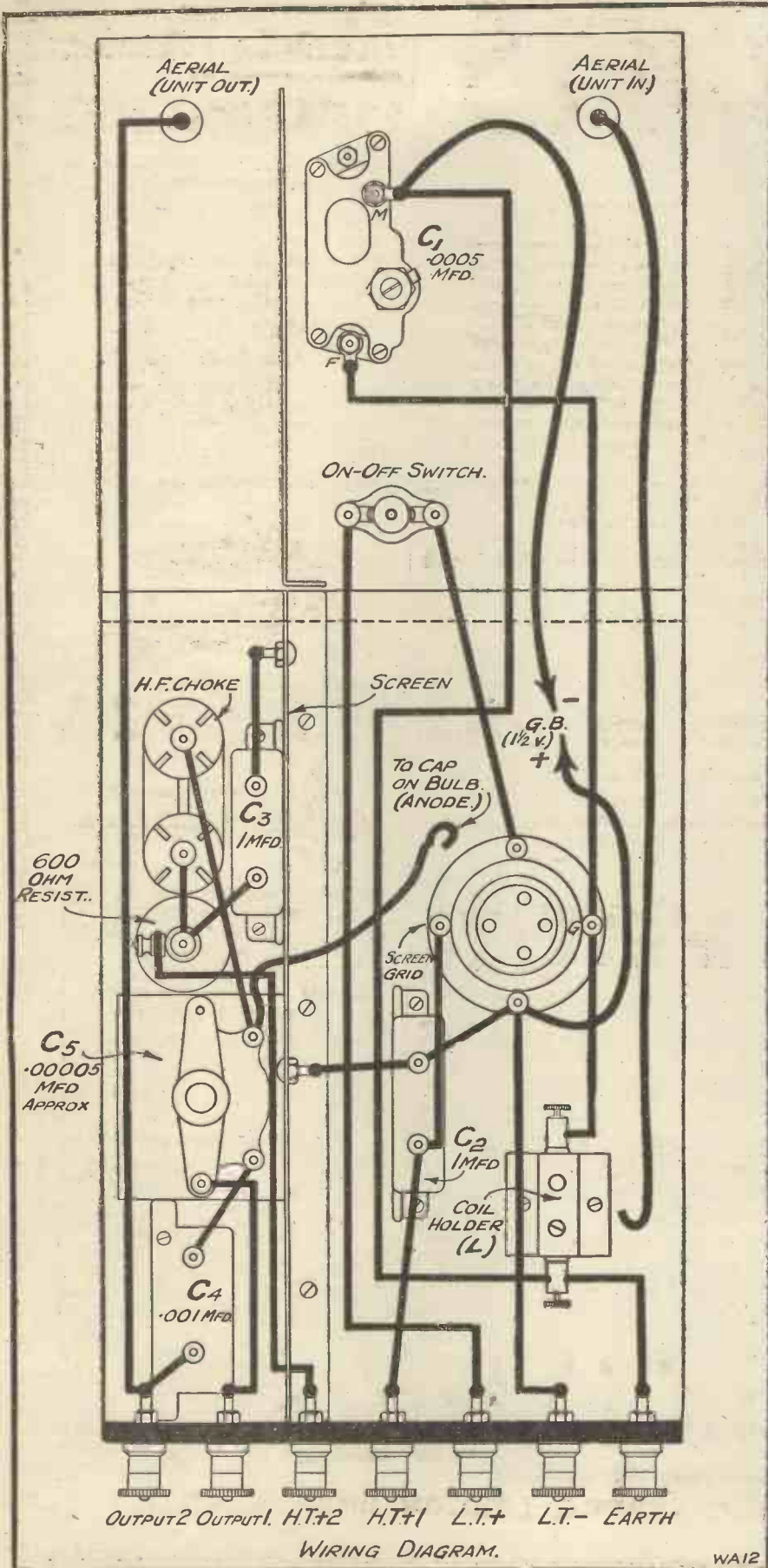
THE "MAGIC" H.F. UNIT.

(Continued from previous page.)

Now about the battery connections. There are two terminals in just the usual way for connection to the L.T. battery, and it is assumed that you will use the same one as that which supplies your receiving set. There is no H.T. — terminal on the unit, and we mention this in order that we may explain that its absence does not result from forgetfulness on our part!

LIST OF COMPONENTS.

- 1 Panel, 7 in. × 7 in. (Keystone, Kay Ray, Becol, Resiston, Paxolin, Ripault, etc.).
 - 1 Cabinet to fit, and baseboard 10 in. deep (Cameco, Osborn, Raymond, etc.).
 - 1 .0005-mfd. variable condenser (Cyl-don, Lissen, J.B., Lotus, Igranic, Gecophone, Ormond, Dubilier, Bur-ton, Bowyer-Lowe, Polar, Utility, etc.).
 - 1 Slow-motion dial, if condenser is of plain type (Lotus, Lissen, Igranic, J.B., Ormond, etc.).
 - 1 L.T. on-off switch (Lissen, Igranic, Lotus, Benjamin, Raymond, Ormond, Magnum, Wearite, Bulgin, etc.).
 - 2 Small panel-mounting sockets (Ealex Clix, etc.).
 - 1 .001-mfd. fixed condenser (Lissen, Dubilier, Mullard, Clarke, Goltone, T.C.C., etc.).
 - 1 Sprung valve holder (Lotus, Lissen, W.B., Benjamin, Dario, Igranic, Wearite, Marconiphone, Precision, B.T.H., Magnum, etc.).
 - 1 Standard "P.W." screen, 10 in. × 6 in. (Ready Radio, Paroussi, Mag-num, Keystone, Wearite, etc.).
 - 1 Baseboard-mounting single-coil socket (Lissen, Ready Radio, Lotus, Mag-num, Wearite, Igranic, Raymond, etc.).
 - 1 H.F. choke, universal type if unit is to be used on short waves. Any ordinary standard type if unit is to be used only on broadcast and long waves (Raymond, Ready Radio, Climax, Lissen, R.I., Igranic, Lotus, Varley, Wearite, Keystone, Magnum, Col-vern, Dubilier, etc.).
 - 1 Baseboard-mounting neutralising type condenser, capacity about .00005 mfd. (Keystone, Lissen, J.B., Bowyer-Lowe, Magnum, etc.).
 - 2 1-mfd. condensers (T.C.C., Lissen, Dubilier, Hydra, Mullard, Ferranti, etc.).
 - 1 600- or 500-ohm decoupling resistance (Bulgin, Ready Radio, Wearite, etc.).
 - 1 Terminal strip, 7 in. × 2 in.
 - 7 Terminals (Ealex, Igranic, Belling & Lee, Clix, Burton, etc.).
- Wire, screws, tapping clip for coil, flex, G.B. plugs, etc.

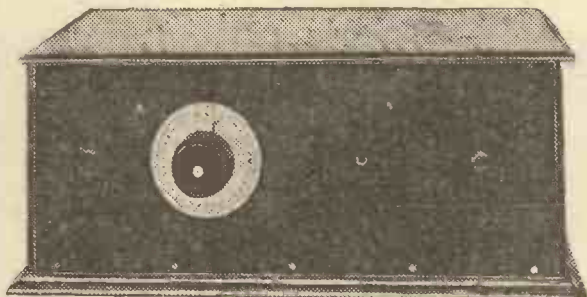


It is not required on an H.F. unit which is to be run from the same batteries as the receiving set, and is better omitted in order to avoid possible short circuits if the unit is employed with a receiving set in which H.T. — is connected to L.T. + instead of the more usual scheme of to L.T. —. When there is no H.T. — terminal on the unit, it does not matter which connection

(Continued on page 860.)

The MAGIC 3

Cheap & Easy to Build



ALL KITS ARE OFFICIALLY APPROVED

By "POPULAR WIRELESS"

READY FOR IMMEDIATE DESPATCH

KIT A	less valves and cabinet	£6 : 13 : 0
KIT B	with valves less cabinet	£8 : 6 : 6
KIT C	with valves and cabinet	£9 : 16 : 6

Deduct 10/6 from each kit, if Short-Wave Coils not required. All kits include special Ready Radio connecting links, and with "Magic" 3 kits the official Blue Print and full wiring and operating instructions are included.

NO SOLDERING REQUIRED

MAGIC FOUR

KIT A	less valves and cabinet	£9 : 19 : 6
KIT B	with valves less cabinet	£12 : 15 : 6
KIT C	with valves and cabinet	£14 : 8 : 0

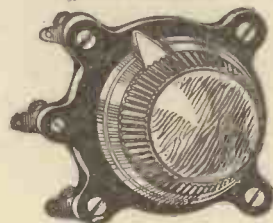
Short-Wave Coils (20-50 metres) can be supplied separately if desired. Price 7/10.

For full list of approved components see issue dated November 30th. All kits include special Ready Radio connecting links.

NO SOLDERING REQUIRED!

Ready Radio COMPONENTS

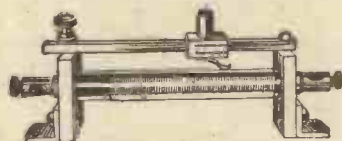
SPECIALLY DESIGNED FOR MAGIC CIRCUITS & OFFICIALLY APPROVED



'00015 DIFFERENTIAL REACTION CONDENSER **5/-**



25,000-ohm ANODE FEED RESISTOR (WIRE WOUND) Complete with holder. **2/5**



Baseboard-mounting 400-ohm SLIDE POTENTIOMETER (Essential for Short-Wave Work) **2/9**

READY RADIO IMMEDIATE DESPATCH SERVICE

When you buy radio parts you naturally want them quickly. You also would be happier with the knowledge that in the event of subsequent difficulties you can obtain technical advice without trouble.

TO HOME CUSTOMERS

Your goods are despatched post free in sealed cartons or carriage paid by rail. Note.—You can if you desire avail yourself of the C.O.D. system.

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All your goods are very carefully packed for export and insured, all charges forward.

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Ready Radio

Telegrams: Ready Hop 5555 London.

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FROM THE TECHNICAL EDITOR'S NOTE BOOK.

Tested and Found-?



A PICKETT CABINET.

MESSRS. PICKETT'S Wireless Cabinets have as their ideal the development of radio furniture. They regard the radio receiver as an instrument for home entertainment that is becoming of even more importance than the piano. They have no time for gadgets and exposed dust collecting parts, and this is the reason why they are concentrating on the production of cabinets, as opposed to mere cases or boxes.

Their "Radiola" series will probably be well known to all readers, for they have proved extremely popular lines. They now have a model which retails at 75s. It is undoubtedly excellent value for money.

£3 15s. 0d. for a full-sized cabinet is a remarkably small sum, and for this you do

not get a shoddy erection of gummed-together parts sprayed with glossy varnish. Indeed, the cabinet is given a proper hand french-polishing, a silky, glittering, enduring surface that can hardly fail to extract admiration from the most critical.

The "Radiola" range of cabinets is a very comprehensive one and includes everything from the simplest layout

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

to elaborate affairs that will accomodate the most ambitious of radio-gramophones. I have recently had the opportunity of exam-

ining two or three different models situated at the extreme ends of the price scale, and, as far as I can see, the Pickett people can completely satisfy any taste and any pocket.

MARCONI VALVES.

The "Marconi Valves for All Receivers" book, is a new 82-page catalogue giving full particulars of all types of Marconi valves and is a publication that should be in the hands of all amateurs.

BELLING-LEE RADIO LEGS.

The Belling & Lee Radio Legs enable you to convert a table model radio set into a cabinet model. The Radio Legs can be equally well used for cabinet loud speakers or portable gramophones. The article is a sort of collapsible table, without the top, and, in fact, it can be used to grip a tray or any such object, in order to form a temporary table. In this way, a portable wireless set can be accommodated without sacrificing the usefulness of its turntable.

Although the Radio Legs are essentially collapsible, and fold up into a very compact form, their design is such that when they are opened out and a set mounted on them the whole becomes an extremely rigid assembly. The following is an extract from the instructions regarding the use of the device.

"The legs are first pulled out to the width of the set and locked at this width by tightening the four milled nuts. The cross legs are then opened out to slightly more than the depth of the set, and the nearest link of the chain hooked on to the slotted bolt.

(Continued on page 852.)

Referee, pleadingly:

"Now . . . just a minute . . ."

Player's Please



A few words on Transformers of high ratio

There is no difficulty in making a high ratio Transformer. A ratio of 1/7 in a Transformer means simply that the secondary has seven times as many turns as the primary. Any manufacturer can do that and sell you a high ratio transformer.

But high ratio in itself is of little value. We knew that when we fixed the ratio of the AF3 at $1/3\frac{1}{2}$. We knew that any higher ratio was attained only with some sacrifice of quality. And we all agree that anything that impairs quality is a retrograde step.

There is no magic in this. It is simply the observance of well-known fundamental laws with which expert transformer designers are acquainted; the principal law being that the inductance of the primary must be relatively high if uniformity of L.F. amplification is to be obtained. Other considerations enter into the matter, of course, but the above will suffice to show that it is not merely a question of winding so many turns on the primary and seven times as many on the secondary.

This problem of getting a high ratio and maintaining high inductance was not a simple one and involved much research and the application of highly specialised knowledge of transformer characteristics, which very few other firms possess. That we have achieved a considerable measure of success is shown by comparison of the inductance figures.

The FERRANTI High Ratio Transformer, the AF6, has an inductance of 70 henries when a current of 2 m/a is flowing in the primary. So far as we know, no other, under similar conditions, reaches 20 henries.

That fact alone is convincing evidence that the FERRANTI AF6 Transformer is supreme in its class.

The price of the AF6 is 30/-.

TESTED AND FOUND?

(Continued from page 850.)

The set or other instrument is then placed on the floor and the two milled nuts are



This is the Pickett "Radiola" Cabinet.

tightened up until the chains are quite taut, whereupon it will be found that the

set is rigidly held and can be carried about complete with its legs."

Thus, you will see that they are both simple and effective in use. Additionally, they are comely in appearance. The price is 15s. 6d. in oak or mahogany finish.

THE I.D.S. REGIONAL STATION ELIMINATOR.

This device, which is produced by Ideas Developments Syndicate, Ltd., is a moderately large cylindrical-shaped object having two terminals on its side and an adjustment knob at the top. The following is claimed for the device:

1. Cuts out Regional or local stations.
2. Reduces the damping and wipe-out effect of the Regional or local station.
3. Increases the sensitivity of the receiver.
4. Increases the strength at which distant stations are received.

The price of the I.D.S. Regional station eliminator is 10s. 6d. Actually, it is an absorption wave-trap. In the body of the device is a small cardboard former on which two tightly-coupled coils are wound. The one coil is brought in series with the aerial circuit of the set and the other coil is tuned by a small variable condenser to the wave-length of the interfering station. I find on test that the I.D.S. Regional station eliminator is a good wave-trap, but I am afraid that I cannot say I share the enthusiasm of the manufacturers

in regard to all of the above four points.

FOR RADIOGRAM ENTHUSIASTS.

A book that will prove of interest and real use to radio-gram enthusiasts is "Gramophone Adjustment and Repairs" (price 1s., Percival Marshall & Co., Ltd.). It deals solely with the gramophone, and is a practical guide to its mechanical repairs and replacements written by a man who undoubtedly knows his job.

A SHORT-WAVE ROMANCE.

"P.C.J. Short Waves and Long Distances, a Tale of Ingenuity and Science," is the attractive title of a book that is being distributed by Philips Radio, Ltd. There are many pictures and much useful and interesting information regarding the famous Dutch short-wave station.



Besides making parts for your set, the Ferranti people build colossal electrical gear, such as the transformers seen above, which are installed in the Birmingham Corporation's new generating station. They handle up to 33,000 volts.



*They all place **Polar** behind their panels*

When it is a question of efficiency and economy there is no condenser more worthy of being placed behind your panel than the Polar No. 3.

Prices:
 .0005 5/9
 .0035 5/7
 .0003 5/6
 without dial

It is highly efficient on normal and ultra short-wave reception. It is low in price and it economises on space because its overall size is only 3½ in. wide when fully open and 2½ in. deep behind panel. One-hole fixing.

Constructed entirely of chemically cleaned hard brass. Perfect electrical contact at all points. Smooth yet precise action. Robustly built throughout.

Note: Dial as illustrated which matches that used on Polar "Ideal," 1/- extra.

YOU WILL BE PLEASED WITH POLAR BEHIND YOUR PANEL

WINGROVE & ROGERS, Ltd., 188-9, Strand, London, W.C.2

Polar Works: **MILL LANE, OLD SWAN, LIVERPOOL.**

Polar No. 3

Get a copy of the Polar Catalogue (P).

EVERYTHING **The G.E.C.** ELECTRICAL
your guarantee

**"The
Christmas
Spirit"**



**Treat
yourself
and
your
friends
to a
set of**

MADE IN ENGLAND
Sold by all Wireless Dealers.

**Osram
Valves**



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

QUESTIONS AND ANSWERS.

ANODE RESISTANCE AND GRID-LEAK VALUES.

E. R. F. (Mansfield).—"To get maximum amplification from the detector I thought of using a 1-megohm anode resistance followed by a 10-megohm leak. Would this be satisfactory with a very high impedance detector?"

The values named are both too high for satisfactory reception under ordinary conditions, and the circuit

would need a tremendous amount of adjustment and "wangling" if the reproduction is to be of the high quality for which you hope. Honestly, we think you would do better not to attempt to get full amplification from a valve of this type, but to use an anode resistance of about 100,000 ohms and a grid leak of about one-quarter of a megohm.

HEARING THE DOOR BELL.

M. J. (Nr. Crumbleton, Cheshire).—"Was it in your paper some time ago that I saw particulars of a method whereby a ring at the front door bell (electric) could be made audible in the loud speaker as a buzz, so that even when the loud speaker was on and the door bell was inaudible in the ordinary way,

it could be heard as a warning buzz? If so, what was the method of connection?"

The method was described in "P.W." by a correspondent. The easiest way is to connect the nearest point of the bell wiring to some part of the input side of the wireless set through a fixed condenser.

A .001-mfd. condenser is a suitable size, or other values will do, depending upon the strength of the signal required and the wiring system, bell battery, etc. The simplest way to try it out would be to have a .001 fixed condenser connected to the aerial circuit. The other side of the condenser can be taken to the nearest point on the bell wiring system by means of a well-spaced wire.

If the ringing of the bell does not give the necessary indication in the loud speaker, the wire to the bell wire system can be transferred to some other point on this, preferably near the buzzer. If it is too loud when connected to the bell wiring system, the other end of the connecting lead may be moved away from the aerial terminal and taken to the grid of the first or the second L.F. valve, according to the strength of interruption which is required.

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

BROADCASTING FROM ONE ROOM TO ANOTHER.

"BILLIKIN" (Sheffield).—"Is it a fact that an ordinary low-frequency amplifier can be used to broadcast a programme, speech, music, etc., from one room to another? If so, what are the connections?"

The method has often been described in "P.W." In addition to the amplifier and batteries, with its loud speaker, all you require is some form of microphone, for the input.

Failling a real microphone, which usually requires an L.T. battery to work in conjunction with it, you can use a small horn loud speaker or one of a pair of telephones. This is quite satisfactory, and though not so sensitive as the microphone, it has the advantage that no battery is required with it.

Simply join the two terminals of the 'phones or speaker to the respective input terminals on the amplifier. The output or loud-speaker leads from this amplifier should be taken to the different room,

(Continued on page 856.)

WHY PAY more than 5/6 FOR A UNIVERSAL VALVE

DARIO VALVES MAKE IDEAL GIFTS FOR CHRISTMAS

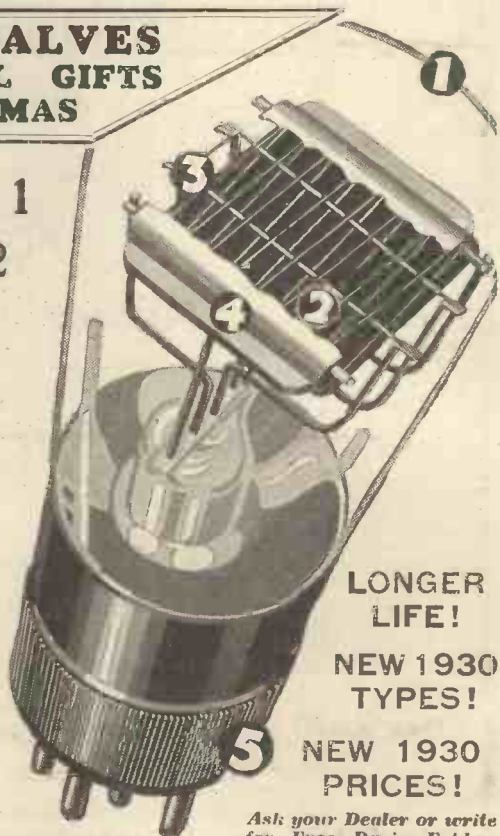
New Glass Bulb. 1
Finer yet Tougher.

New Super Strength Grid. 2

New Non-microphonic Filament with Special Coating 3

New Large Size Anode. Easier Flow of Electrons. 4

Dario Milled Base for Easier Handling. 5



LONGER LIFE!

NEW 1930 TYPES!

NEW 1930 PRICES!

Ask your Dealer or write for Free Dario Folder.

TWO VOLT		
Universal	1 amp.	5/6
Resistron	1 amp.	5/6
Super H.F.	15 amp.	5/6
Super Power .. .	18 amp.	7/6
Hyper Power .. .	3 amp.	9/6
Pentodion	3 amp.	18/6
FOUR VOLT		
Universal075 amp	5/6
Resistron075 amp.	5/6
Super H.F.075 amp.	5/6
Super Power .. .	1 amp.	7/6
Hyper Power .. .	15 amp.	9/6
Pentodion	15 amp.	18/6



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Unparalleled

SHORT NOTICE, MID-SEASON

Achievement

300% Production Increase

in three weeks to meet

AN UNPRECEDENTED

DEMAND FOR THE

“FORMO-DENSOR G”

used and Definitely Specified

by the Designer

of

“BROOKMAN’S”

REJECTOR

We tender sincere apologies to the many thousands of constructors for the delay and disappointment experienced in the procurement of the two “FORMO-DENSORS G” (Price 2/- each) specified in this Circuit and offer our assurance that no effort has or will be spared to satisfy requirements.

LEAVE A DEFINITE ORDER

with the nearest REPUTABLE WIRELESS DEALER



BE WISE!

Use only Components specified by the Designer.

The FORMO Co., Crown Works **Cricklewood Lane,**
London, N.W.2.



With Indicating Floats

P.G.F.5.
20 a.h. 2 v. 11/9
(as illustrated.)
P.G.F.7.
30 a.h. 2 v. 13/9
P.G.F.9.
40 a.h. 2 v. 15/9

Non-Indicating

P.G.5
20 a.h. 2 v. 9.-
P.G.7.
30 a.h. 2 v. 11/-
P.G.9.
40 a.h. 2 v. 13/-
P.G.11.
50 a.h. 2 v. 15/-

Oh for an L.T. I can depend upon!

You need never again experience the disappointment of missing part or all of a much-looked-forward-to programme through your L.T. suddenly giving out.

Get a Peto & Radford P.G.F. accumulator which gives you warning that its energy is low.

The P.G.F.'s indicating floats ensure that you always have a sufficiency of current to carry you through the programme. A single glance at these tells you whether the accumulator is

charged, half-charged, or running out

It embodies these further special features. The plates are sturdy. Paste is held by interlocking grids. The lid is of crack-proof, acid-proof Dagenite, hermetically sealed at the edges. Terminals have acid-proof glands, and, because of their different diameters, they cannot be reversed. There is ample acid-room, and plates are held in place by glass key-ways in the box.

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ACCUMULATORS

The beginning and the end in

POWER

W.R.3

This announcement is issued by
THE NATIONAL ACCUMULATOR CO., LTD

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 854.)

where they can operate the loud speaker, and it will be found that speech can be reproduced quite easily by these means.

WET-WEATHER WEAKNESS.

L. M. (Calne, Wilts).—"Most people say that the weather does not affect wireless at all, or else that reception is better during the wet; but for some time I have noticed that my strength seems to fall off any time there is any rain or any mist or fog. What would be the cause?"

Generally when signals fall off in wet weather it will be found that the aerial insulators are either inadequate in size or number, and the rain is forming a conductive path across them from the aerial to earth. When such a path exists the effect naturally is to leak a certain proportion of the signals away, but the provision of more insulators or of those which remain dry during adverse weather conditions, will generally completely remove the trouble.

H.F. INTERFERENCE FROM D.C. MAINS.

S. A. W. (Warwickshire).—"The peculiar nature of the hum and of the slight distortion seems to point to H.F. interference from the mains. What is the best method of overcoming this trouble?"

In many cases of such interference it is quite sufficient merely to insert an ordinary H.F. choke in series with the negative main between the H.T. lead and the mains. To try this, just break one of the main leads to the unit and insert a high-frequency choke, and see what happens.

If things do not seem much better take out the choke and put it in the other lead. One position or the other is pretty sure to make an improvement if H.F. currents are your trouble. This simple test, although it may not provide a complete cure, will in many cases put you on the right track, and if the improvement is insufficient, the next step is to try two H.F. chokes.

One choke is placed in each lead, that is to say, in series with each lead from the mains to the set.

In bad cases yet another cure is possible, this needing two Mansbridge type condensers of the usual high quality and high working voltage, as required for mains working.

Connect these in series with each other and shunt them across the mains after passing through the chokes, that is to say, on the mains unit side of the two chokes and not on the mains side. Now try connecting the centre point of the two condensers straight to earth, and you will probably find that the last trace of hum disappears.

In most cases a perfectly normal kind of H.F. choke is quite satisfactory for an ordinary H.T. unit, but for use on sets of the "all-mains" type with the filament circuit running off the mains, as well as the anode circuit, the special heavy-duty type of choke is required.

WHEN NEXT DOOR SWITCHES ON.

R. J. A. (Erdington).—"Is there any simple remedy which will get over the fading and distortion which my neighbour causes when he switches on? Until he gets home at seven o'clock at night everything is fine and dandy, but the moment he puts his switch in my quality goes all to pieces."

Cases of this kind cannot generally be cured by one party only, but the cooperation of both parties concerned is desirable. Usually the trouble arises in a serious degree only when the sets concerned (one or both) are employing a large amount of reaction, or, in other words, are insufficient to give the necessary loudness of programmes without forcing and distortion. The only certain cure is to space the aerial systems as far apart as possible, and, if necessary, for both parties to build larger sets, such as employ neutralised high-frequency stages; but sometimes a cure can be effected by making sure that a different earth is used by each receiver.

The use of a small condenser in series with each earth lead might improve matters in some cases, and a more careful use of reaction on both sides of the fence should go a long way towards overcoming the trouble. It is advisable also to write to the B.B.C., and state the whole circumstances.

As the fundamental cause of the trouble is the fact that your aerial, earth lead, etc., are too close to his, it follows that the greatest possible space should be placed between the two aerials, and on no account should they run parallel for any greater distance than is essential, for the closer the wires are together the worse will be the interaction between the sets.

Where the gardens are both narrow, and consequently the masts must of necessity be fairly close

to one another, it is a good plan to have one high mast and one low, so that the separation between the wires is as great as possible.

AVERAGE INDUCTANCES.

"STUDENT" (Brixton, London, S.W.).—"I was interested in the recent statement that the average capacity of an outdoor aerial of approximately 100 ft. in length was about

"P.W." TECHNICAL QUERY DEPARTMENT

Is Your Set "Going Good"?

Perhaps some mysterious noise has appeared, and is spoiling your radio reception?—Or one of the batteries seems to run down much faster than formerly?—Or you want a Blue Print?

Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers an *unrivalled* service.

Full details, including scale of charges, can be obtained direct from the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do. On receipt of this an Application Form will be sent to you free and post free immediately. This application will place you under no obligation whatever, but having the form you will know exactly what information we require to have before us in order to solve your problems.

LONDON READERS PLEASE NOTE: Inquiries should NOT be made in person at Fleetway House or Tallis House.

.00025 mfd. For some reason the various capacities in a wireless set are generally mentioned—a .0002 grid condenser, 2 mfd. output condenser, .01 coupling condensers, etc.—but I have never yet seen the statement of average inductive values in this way.

(Continued on page 858.)

WONDERFUL RESULTS

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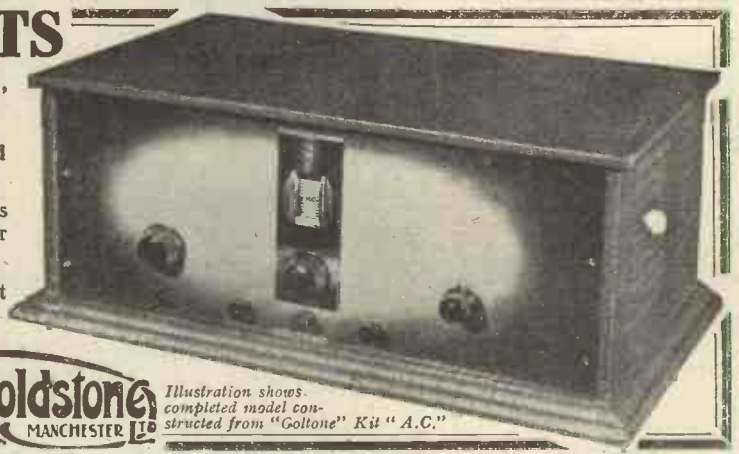
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Illustration shows completed model constructed from "Goltone" Kit "A.C."



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A great show—every dancer in step—magnificent to watch.

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Valves, Batteries and Royalties extra.

ALL MAINS MODEL

(self-contained)

Price of Set - - - - £11 : 5 : 0

Price of Valves (Mullard A.C.)- £3 : 10 : 0

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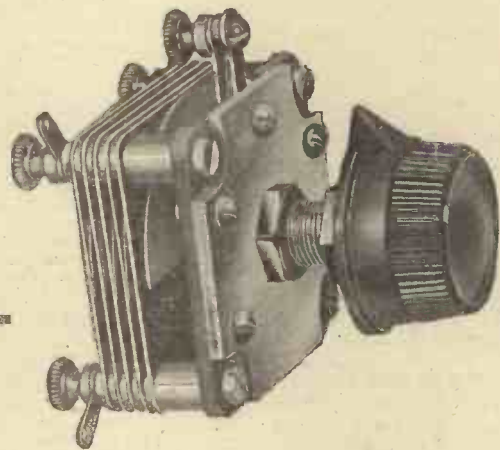
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The Condenser is reproduced here in actual size. It has two sets of fixed and one set of moving vanes, interleaved with bakelite discs of the highest possible dielectric qualities. All-brass parts are chemically treated.

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GARNETT, WHITELEY & CO., LTD., LIVERPOOL

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 856.)

"About how many microhenries inductance would the aerial be for instance? And an ordinary tuning coil, H.F. choke, and L.F. output choke?"

The L.F. choke should be about 20 henries, while 80,000 microhenries is a representative value for an H.F. choke.

Some of the tuning-coil makers give the inductance in microhenries of the various coils on the coil itself, or the literature supplied with it, an average ordinary-wave grid coil value being 200 microhenries. Similarly the average 100 ft. aerial inductive value is about 16 microhenries.

SWITCH FOR "THE WAVE-CHANGE BROOKMAN'S."

"THE BOYS" (Hendon Hill).—"Are we going to build the 'Brookmans Wave-Change Rejector'?" Answer (all together) WE ARE! But as spokesman of the party I am being asked a lot about the switch, and I should like to know exactly what kind is wanted, as it's not given in the 'Components' list?"

The correct type of switch required is the single-pole change-over variety, with a push-pull action. The one actually used was of Bulgin make, and the position of the contacts shown in the diagram applies to this form.

THE ORIGINAL "BROOKMAN'S" REJECTOR.

S. C. A. (Barking, Essex).—"I heard such good reports of it that I asked my news-agent to get me a copy of 'P.W.' with it in; but he said he couldn't get it, so I went to your offices in Farringdon Street specially for it.

And they told me it was out of print, although it was only published on the 14th.

I simply must have the details after what I have heard of the way it puts the lid on Brookman's, so will you please give me enough details to build it?"

You will have seen that in last week's "P.W." we gave another version of the "Brookman's" Rejector, this time in wave-change form. But if it is the original type that you still wish to build, the following brief details will enable you to make it, and thus completely cut out the interference.

The parts required are: 1 single coil-holder (Lotus, Ready Radio, Raymond, Keystone, Wearite, etc.); 2 .001-mfd. compression type condensers (Formo type G); 1 base-board, 4 in. x 4 in.; 1 ebonite strip, 4 in. x 2 in. x 1/4 in.; 2 terminals; 1 plug-in coil (see below); a few inches of wire.

The connections should be made as shown in the accompanying diagram.

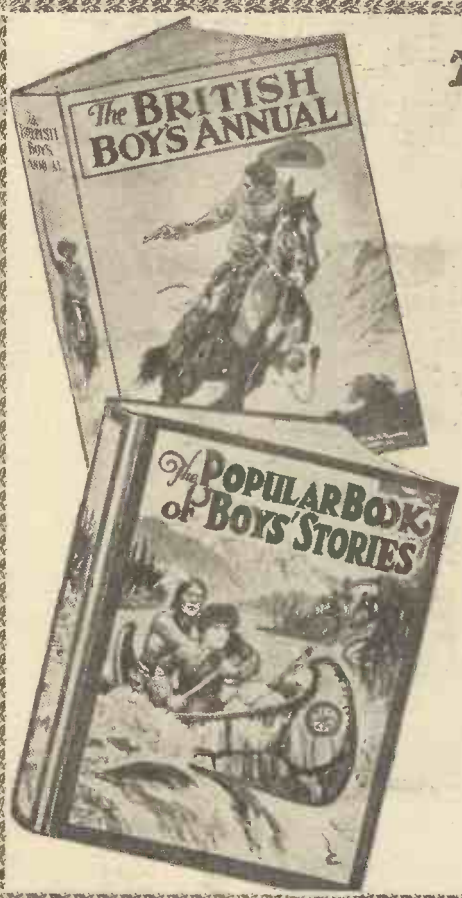
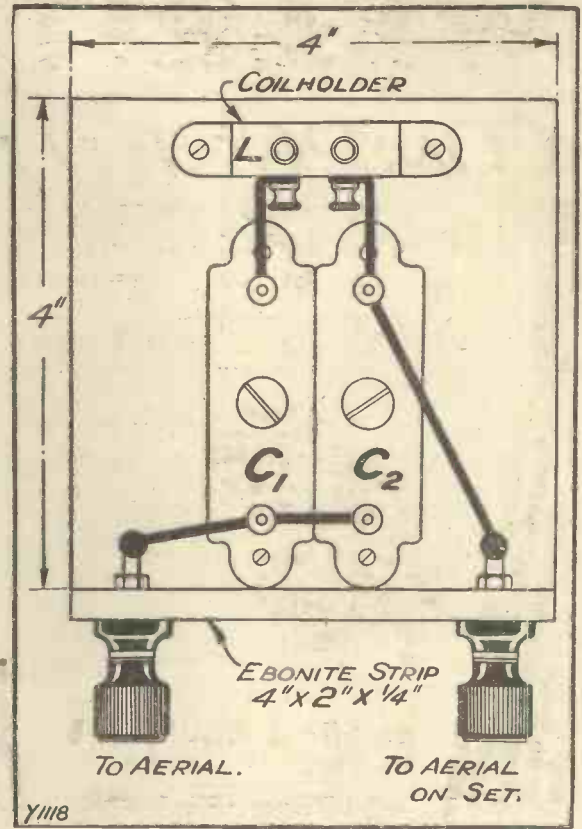
The coil should be a No. 50 for cutting out 2 L.O. or any station of wave-length from 250 to 400 metres.

Connect the aerial to the left-hand terminal of the rejector, and wire the right-hand one to the aerial terminal on your set. Now set the left-hand "Formodensor" (C₁) to nearly its maximum adjustment (knob nearly fully screwed down). Next, start with the knob of C₂ (right-hand Formodensor) fully unscrewed, and turn it slowly down towards maximum.

Presently you will locate the "rejection" point, and the local will suddenly go down to inaudibility. On either side of this point it will reappear. Try to locate the point as accurately as possible, and when you have got it we think you will begin to understand our enthusiasm for this remarkable rejector. (While you are making this adjustment, by the way, it is best to have your set a trifle detuned from the true setting for the local station.)

Just one other hint: When you

want to receive the local station in the normal way, there is a simple scheme for putting the trap out of action. Just pull the ping-in coil out of its socket. That's all!



Two Splendid Christmas Gifts!

Bumper Books for Boys!

Here is a book for the boy who likes thrilling stories—a wonder budget of exciting tales of school life, sport, mystery and adventure that will delight every boy. It is lavishly illustrated with clever black-and-white drawings, and also contains several beautiful coloured plates. The boy who has the BRITISH BOY'S ANNUAL will have a book that he will want to read over and over again. Girls who like boys' stories will also enjoy this jolly story book.

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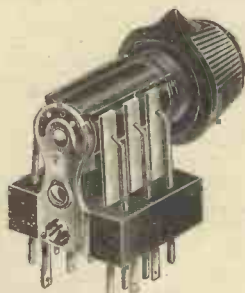
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4/6

The New "MICRO-FICIENT" Condenser, a brass-vaned log-mid-line variable condenser using Bakelite as a dielectric. Robust in construction, and ideal for portable sets. Can be mounted for either drum or ordinary dial control.
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.0015 4/3.



5/- each.

The "MULTIWAVE" H.F. CHOKE designed for modern valves. By employing solenoid winding followed by sectional windings, high impedance is obtained with low D.C. resistance. Also very effective for use in H.F. stopper or filter circuits. With Base.

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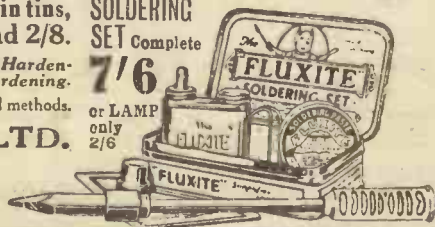
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MAINS UNITS. The DIX D.C. No live Terminals. Humless Filter, 3 taps, 30/-. De Luxe Model with Meter, 40/-. A.C. Unit with Control and 3 taps, Two Valves and Special Filter, £4 10s.

CHARGING DYNAMOS. L. and R. new 6 to 12 volt, 8 amp. shunt ball bearings, enclosed with pulley, 50/-. 20 volts, 5 amps., 35/-. 12 volts, 40 amps., £5 10s. 22 volts, 12 amps., £5 10s. Crompton, 30 volts, 15 amps., with pulley, £6. Panel for same, fitted ammeter and voltmeter, £2. Switches, Boards, and Resistances. All Sizes in Stock.

A.C. to D.C. BATTERY CHARGERS. Work off lampholder and charge a 2-, 4-, or 6-volt battery up to 6 amps. max. Sale at half-price, £2 10s. Larger type for 12-volt Car Cells, £4. Both fitted plug, cord and C.Z. Ammeter. Limited number of these bargain sets available.



ELECTRIC. Electric Blowers, 30/-. Flat Irons, 10/-. Electric Two-Plate Cooker, 12/-. Single Hotplates, 7/6. Immersion Heaters for 3/6, 5/6, and 30/-. with plugs and cord. Electric Soldering Irons, all sizes, from 7/6. Glass Boring Outfits for lead-in holes in window, 10/6.

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218, UPPER THAMES STREET, E.C.4.

'Phone: City 0191.

MAGIC H.F. UNIT

(Continued from page 848.)

is used in your receiver. The unit will work with either.

There are two H.T. positive terminals and H.T. + 1 supplies the screening electrode of the screened-grid valve, and requires somewhere about 60 to 80 volts, the best value being determined by test to suit any particular screened-grid valve. The other terminal (H.T. + 2) requires the usual 120 to 130 volts, and this should just be connected up to the maximum voltage point on the H.T. battery.

A very important lead in joining up the H.F. unit to your set is that from the output terminal (whichever one is used) to the old aerial terminal on your receiver. This lead must be kept short and direct and well away from all others, and more particularly it should be kept well away from the battery leads and from the aerial lead.

Voltage Adjustments.

Now just a brief word or two about operating adjustments. Battery voltages we have already dealt with, and you will realise that when you use a screened-grid valve you must have available at least the full 120 volts to get the proper results. The valve will presumably be a 2-volter, or one of whatever filament voltage you use for your receiving set. Do not forget that you require a screened-grid valve of the VERTICAL type, with a terminal on top of the bulb.

The coils for use in the socket marked L should be a No. 60X type for the ordinary broadcast band, and a No. 250X for the long waves. Remember to try the flex lead from the aerial socket on each of the tapping points up the X coil in turn, and see which suits your particular aerial and selectivity requirements.

The operation of tuning in will become just a little bit more difficult with the H.F. unit at work, because you will have to learn to run the dial on the unit in step with the tuning of your receiver. The trick of it is easily learned, and once you have got it we think you will be surprised at the extraordinary number of new stations you will be able to bring in and the much greater ease with which you will be able to cut out the local station by virtue of the greater selectivity now at your disposal.

Try Varying the Coupling.

Just one final point about getting the best results from the unit. If you have any form of adjustment for what was the aerial coupling in your set, try varying it when the H.F. unit is added and see whether you cannot find a better arrangement than the one which you employed when it was actually serving to couple the aerial into your receiver. It now serves, of course, as a coupling between the H.F. valve and the detector.

For short-wave work, by the way, you should use one of the standard bare wire short-wave coils in the coil holder, and the flex lead from the aerial socket should be now provided with a tapping clip and tried on various turns. As a rule you will find you will get satisfactory results by placing the clip somewhere near the middle of the coil. For the 20- to 40-metre wave-band you will require a No. 4 coil and a No. 6 for the other interesting band from 40 to 60 metres or thereabouts.

JUNIT specified again and again

"Popular Wireless"

Wavechange Brookman's Rejector
(described last week).

Mullard "Orgola" Receivers
Manchester Evening Chronicle 3

"Help Yourself 3"
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The "POPULAR WIRELESS"

BLUE PRINTS of TESTED CIRCUITS

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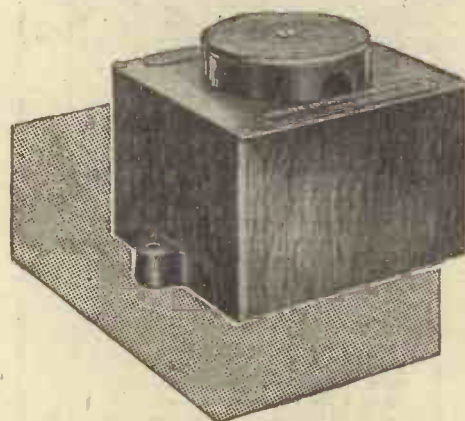
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1. DETECTOR VALVE WITH REACTION.
 2. OUT OF PRINT.
 3. 1-VALVE I.F. AMPLIFIER.
 4. CRYSTAL DETECTOR WITH L.F. AMPLIFIER.
 5. H.F. (Tuned Anode) AND CRYSTAL WITH REACTION.
 6. H.F. AND CRYSTAL (Transformer Coupled, without Reaction).
 7. 1-VALVE REFLEX AND CRYSTAL DETECTOR (Tuned Anode).
 8. 1-VALVE REFLEX AND CRYSTAL DETECTOR (Employing H.F. Transformer, without Reaction).
 9. H.F. AND DETECTOR (Tuned Anode Coupling, with Reaction on Anode).
 10. OUT OF PRINT.
 11. OUT OF PRINT.
 12. OUT OF PRINT.
 13. 2-VALVE REFLEX (Employing Valve Detector).
 14. OUT OF PRINT.
 15. OUT OF PRINT.
 16. H.F. (Tuned Anode), CRYSTAL DETECTOR AND L.F. (With Switch for Last Valve).
 17. CRYSTAL DETECTOR WITH TWO L.F. AMPLIFIERS (With Switching).
 18. 1-VALVE REFLEX AND CRYSTAL DETECTOR, with 1-VALVE L.F. AMPLIFIER, Controlled by Switch.
 19. OUT OF PRINT.
 20. OUT OF PRINT.
 21. THE 2-VALVE LODGE "N."
 22. "THE GUARANTEED REFLEX."
 23. THE 1-VALVE "CHITOS."
 24. THE "SPANSACE THREE." Three-Valve Receiver employing 1 Neutralised H.F. Valve, Detector with Non-Radiating Reaction Control, and 1 L.F. Valve.
 25. OUT OF PRINT.
 26. A "STRAIGHT" 4-VALVER (H.F., Det. and 2 L.F. with Switching).
 27. OUT OF PRINT.
 28. A "MODERN WIRELESS" 5-VALVER (H.F., Det. and 3 L.F.).
 29. AN H.T. UNIT FOR DIRECT CURRENT MAINS.
 30. A REINARTZ ONE-VALVER.
 31. OUT OF PRINT.
 32. THE "CUBE SCREEN" THREE (H.F., Det. and L.F.).
 33. A "KNIFE EDGE" CRYSTAL SET.
 34. AN H.F. AND DETECTOR TWO-VALVER.
 35. THE "UNIVERSAL THREE" (Det. and 2 L.F. stages resistance-coupled).
 36. THE "SPANSACE FOUR" (H.F., Det. and 2 L.F.).
 37. THE "LONG SHORT" CRYSTAL SET.
 38. A TWO-VALVE L.F. AMPLIFIER.
 39. THE "SYDNEY" TWO.
 40. THE "SUPER SCREEN" THREE.
 41. THIS YEAR'S "CHITOS" ONE-VALVER.
 42. THE "Q AND A" THREE. A simple set (Det. and 2 L.F.).
 43. THE "INEXPENSIVE FOUR."
 44. THE "ECONOMY FIVE." For long-range loud-speaker work.
 45. A SIMPLE A.C. H.T. UNIT.
 46. THE "REGIONAL" THREE.
 47. THE "WAVE-CHANGE" ONE.
 48. THE "REGIONAL" CRYSTAL SET.
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ALL "POPULAR WIRELESS"
BLUE PRINTS——6d. EACH

All orders for these Blue Prints should be sent direct to the "Popular Wireless" Queries Department, Fleetway House, Farringdon Street, London, E.C.4, enclosing a stamped addressed envelope and a postal order for 6d. for each Blue Print ordered.

CUT OUT 2LO at will—

and get better
reception from
other stations



By fitting two Dubilier Wave Traps to your Set, even if it's only a simple receiver, you will be able to get good reception from other stations without the slightest interference from either of the two 2LO transmissions—as effectively as if you fitted high-frequency valves costing several pounds.

Available in two models for the two wave-lengths of the London Regional Transmitter.

If, however, you merely desire to receive one or other of the two transmissions from the London Regional Stations at Brookman's Park, you will only require one Wave Trap, and in that case, unless your Set is already fairly selective, it is extremely unlikely that you will be able to receive any other than one of the two transmissions from Brookman's Park when they are broadcast simultaneously.

Type BR 1 for 356.3 metres.

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The Dubilier Wave Trap has only to be connected between your aerial and your set—that's all. It's ready tuned when you buy it, so there are no adjustments to make.

PRICE
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If your dealer is unable to supply, please write to us giving his name and address.

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Dubilier Condenser Co. (1925) Ltd., Ducon Works, Victoria Road, N. Acton, London, W.3.

The Easu Way TO PERFECT RADIO

In addition to their own extensive range PETO SCOTT offer YOU every known RADIO Receiver or Component on

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4, Manchester Street, Liverpool.
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Mains Unit Components, KITS OF PARTS FOR:

H.T. A.C. Unit, SG60, SG80, Det. 60, 150 max. £1 18 6

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Battery Charger, complete with valves, charging current 2 amps. £1 15 6

Wiring Diagrams Free. State A.C. or D.C.

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We SPECIALISE in the supply of all Good Quality Radio Sets, Components and accessories on Easy Terms. We will give you efficient service. Send us your list of requirements and a quotation will be sent by return.

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11, Oat Lane, Noble St., London, E.C.2
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Westminster Radio

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BATE'S MILLION 1/6 EA. A REAL EARTH TUBE 24" LONG X 1" DIA. ALL DEALERS SUPPLY.

JABEZ BATE & CO
VERONA WORKS BIRMINGHAM

PLEASE MENTION "POPULAR WIRELESS" WHEN REPLYING TO ADVERTISEMENTS

SEVEN RADIO CHRISTMASSES.

CHRISTMAS, 1923! Christmas, 1929!—six years while one has seen broadcasting grow from an impetuous youth to what one might describe as an old young man of the world, well-dressed, gentlemanly, formula-seeking, self-assured, and, at times, a little irritatingly patronising towards enthusiasm.

I liked broadcasting better, I must confess, when it had all the crudities of enthusiasm, when a thousand letters poured in to praise or blame an innovation. Many disagree with me, believing that such is the responsibility of the broadcasting authority that it must never commit the *faux pas* of seeming to want to indicate a definite line of thought, and must never descend to the vulgarities of publicity, drum beating, and an expressed desire to please.

The Good Old Days.

Perhaps then I shall be blamed in raking up a past best left to be covered by the oblivion of the crowded years that separate

NEXT WEEK

A special article entitled

YOUR "MAGIC" SETS

forms one of the many attractions in next week's

POPULAR WIRELESS

Make Sure of Your Copy

On Sale Dec. 24th. Obtainable Everywhere.

now and then. Perhaps it is mere hedonism that drives me all to recapture the fever that possessed us all in those days; but maybe there are some who in the leisure and goodwill of Christmas will like to read of Christmas, 1924, as I remember it.

It all centred round what we called American relays. In those days "short" waves were astonishing all but the pioneers in their ability to penetrate to every part of the globe and give signals of amazing clarity considering the long leagues they had to travel. KDKA, an American station worked by the research engineers of the Westinghouse Company in Pittsburg, was using a wave-length of the order of 60 metres, and, at times, and with luck, could be heard in this country.

So writes Capt. P. P. Eckersley in the December Special Christmas Double Number of "Modern Wireless" concerning the life and progress of the B.B.C. He brings to light many intimate facts about the "good old days," and gives a remarkable insight into the technical side of the B.B.C.

As Capt. Eckersley points out, many things have happened since then, and, as he says, it's a far cry from Christmas, 1923, when we first relayed America, to the Christmas of 1929. We have now a far

(Continued on next page.)

CLIMAX RADIO EARTH

DEFINITELY IMPROVES SELECTIVITY on the NEW REGIONAL STATIONS

DEFINITELY HELPS TO ELIMINATE MAINS HUM on All-Electric Receivers

Insist on the genuine Climax. See the name on the cap. From all radio dealers.

CLIMAX COPPER EARTH for the Commisour 5/-
CLIMAX GALLOP EARTH for the Economist 2/6



Good Reception!
Well Housed!

RADIO FURNITURE OF QUALITY!

The sort that people desire to possess and keep. Graceful design—sound construction—hand finished (piano finish), snug, compact, adding to the life of your set.

Over 3,000 delighted clients. (Used by Radio Press—by W. James, Percy Harris, etc.)

For your OWN set!

"Radiola" deluxe, from £5 5 0 to £11 11 0

"Popular" Oak Model, from £3 15 0

Cash or easy payments.

ORDER IMMEDIATELY for XMAS. If you wish to part with it we will willingly refund FULL MONEY.

Telephone: Boxleyhead 194. LIST FREE.

PICKETT'S, RADIO FURNITURE MAKERS.

"P.W." WORKS, BEXLEY HEATH, KENT. Established since the beginning of Broadcasting.

HEADPHONES REPAIRED 4/-

Transformers 5/-. Loudspeakers 4/-. All repairs re-magnetised free. Tested, guaranteed and ready for delivery in 24 hours.

Discount for Trade. Clerkenwell 9069.

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WET H.T. BATTERIES

Solves all H.T. Troubles.

SELF-CHARGING, SILENT, ECONOMICAL

JARS, (waxed) 2 1/2" X 1 1/2" size, 1/3 doz.

ZINCS, new type 10d doz SACS 1/2 doz.

Sample doz. (18 volts), complete with bands and electrolyte, 4/3, post, 9d.

Sample unit, 6d, illus. booklet free.

Bargain list free.

AMPLIFIERS, 30/-, 3-VALVE SET, £5.

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PLEASE MENTION "POPULAR WIRELESS" WHEN REPLYING TO ADVERTISEMENTS

SEVEN RADIO CHRISTMASSES.

(Continued from previous page.)

greater possibility of hearing. Might we perhaps not once more capture the old spirit of enthusiasm, and in doing so remake for the first time in 2,000 years the true spirit of Christmas "Peace on earth, good will towards men"? It only requires a voice to articulate what all believe that peace must endure or civilisation perish.

"CALLED-UP."

THERE has recently been so much wide-spread discussion regarding war plays and stories that the following letter from reader should prove of exceptional interest.

Have you any good yarns about wireless in the war? If so, send them along and those printed will be paid for at our usual rates.—EDITOR.

A DEEP SEA DRAMA.

The Editor.

Dear Sir,—I wonder how many readers of "P.W." could be persuaded to tell stirring or amusing tales of radio in the Great War? My own experience must be typical of the many radio dramas enacted.

It was in mid-Atlantic during the intensive submarine campaign, and I was wireless operator on board a Canadian Pacific liner. Scores of exciting messages about submarines had been received in the few days we had been at sea, but I always vividly remember the radioed account of a fight between an old sailing ship and a submarine.

It was reported in brief Morse messages from a tramp steamer that—liable to be attacked herself—hung on to the edge of the fight to report it by radio to all allied warships.

Nothing was to be seen—only the vivid messages coming through at intervals:

6.40—"Sub. now firing heavily and sailing ship replying with its one gun."

6.52—"Sailing ship still afloat but one mast gone. Still firing."

And so on at intervals for several hours until—apparently at the order of a warship—the accounts suddenly ceased. I never knew how that fight finished, but if ever there was a thrilling broadcast that was IT.

Yours faithfully,

Bradford.

S. W. C.

DOES THE B.B.C. HELP SHEET MUSIC TRADE?

WHATEVER criticisms are levelled at the B.B.C. programmes, one certain fact emerges. It is that they have helped to revive the popularity of the best of the old songs and ballads. The Publishers of that fortnightly part work, FAMOUS SONGS OLD AND NEW, which is having such a large sale at 1s. 3d. per part, state that since publication started a few weeks ago, a surprising number of applications for copies of the old famous songs contained therein have been received, while broadcast, recording and music-hall artistes are applying for copies of these songs to use in their respective callings. In this particular way the B.B.C. certainly have benefited the music trade, and it is only due to them that they should be credited with this good work.

THE "PERMACORE" TRANSFORMER—



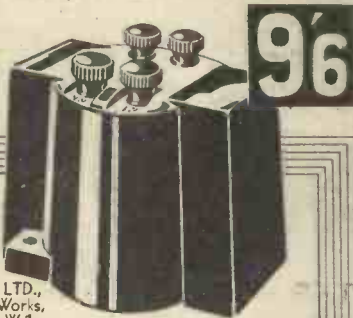
You can take it from us—secure in the knowledge that you get a good job for your money. It's compact. That means simplified assembly and wiring. It's efficient. It does its work properly because of its special core, the silver wire of the primary, and the nickel-wound secondary.

Hear its performance and you'll remember its name—the Mullard PERMACORE L.F. Transformer. It has a step-up ratio of 3 : 1.

Mullard MASTER · RADIO

'POPULAR' TRANSFORMER

Make your new set a better set with the Brownie POPULAR Transformer. Although it costs only 9/6, its purity of amplification gives a more vivid clarity of reproduction throughout the musical scale, while its sturdy British build ensures that once it is fitted the words "transformer troubles" can be eliminated from your list of worries.



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BROWNIE WIRELESS

THE LITTLE CELLS THAT SATISFY

Leyton Primary H.T. Battery, Pl Porous Pot Cells S1 & S2 Sac Cells. All complete for assembly.

1-cell.	6-cell.	12-cell.	30-cell.
P1 6/d.	3/3	5/9	14/-
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"Easeful" Filler, 1/2 pint 1/-, pint 1/6. Post Free 3d. ex. Send 1d. stamp for booklet giving full particulars to

THE LEYTON BATTERY CO.,
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Popular Components for the "Eckersley Three"

described in Modern Wireless

THE Sovereign H.F. Choke is a great favourite of set designers. It is efficient, effective over a very wide frequency band, slot wound, minimum capacity, low-loss Bakelite former, terminals and tags. Follow the set designer — he knows!

THE Sovereign 400-ohm Potentiometer, a popular component, smooth action, Bakelite former, terminal connections, baseboard mounting. For the "Magic Three." Favoured by many set designers. **2/-**

The Sovereign range, stocked by all dealers, includes Six-pin Base, also suitable for the "Eckersley Three," Plug-in Coils, X-coils, Rheostat and Speaker Kit. Write direct if unable to obtain in your district.



Produced by J.R. WIRELESS CO.
6-8, Rosebery Avenue, London, E.C.1.

Baldry Ad. J. R. 5.

PLEASE be sure to mention "POPULAR WIRELESS" when communicating with Advertisers. THANKS!

TECHNICAL NOTES.

(Continued from page 840.)

enough in itself, but it at once introduces a certain drawback in that the screen itself acts as an obstacle to the sound and tends to make it muffled.

Screen Radiator.

Attempts have been made to get over this difficulty by isolating a portion of the screen and making this portion act as a diaphragm or sound-radiator of the loud speaker, the portion in question being, of course, flush with the rest of the screen and indistinguishable from it, so far as appearance goes.

This very simple arrangement is not, however, very easy to carry out in practice. Where a comparatively small screen is used it is possible to make the screen itself of fairly rigid material, such as millboard, and to affix a loud-speaker unit directly to the back of the screen, the screen then acting itself as the sound radiator. Both these methods have actually been used in practice with varying degrees of success.

In the Photophone film the sound record (which is in optical form, of course) is on the edge of the ordinary film, and so does not encroach upon the part which is devoted to the pictures. This system gives very good reproduction, perhaps a little "thin" in the upper register, but much better than some of the reproduction which I have heard upon other kinds of apparatus.

Following the Speaker.

I understand that in the Photophone outfit eight moving-coil loud speakers are used, these being at different positions in relation to the screen. In this way it is believed that a more natural effect is obtained than if the speakers are simply placed behind the screen in the ordinary way.

I believe a suggestion was made some little time ago by Mr. G. V. Dowding, the Technical Editor of this Journal, which seems to me to be an ingenious and valuable one, according to which the several loud speakers are used at different positions, either behind or around the screen, and the operator is able to switch into operation any one of these loud speakers according to the position of the actor on the screen.

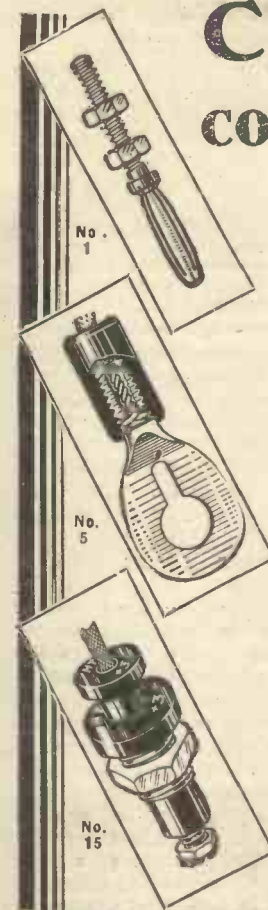
In this way the loud speaker, as it were, follows the figure on the screen as he moves about from one part to another, and a more natural effect should be obtainable. Whether this system is in actual use at the present time, I am not able to say, but it has the merit of being simple to operate, whilst anything which makes for greater naturalness is evidently very important.

Canned Pictures.

Another point on which from time to time I receive enquiries is the recording of the impulses which are transmitted in picture-transmission and television systems. As you know, the transmission in these cases is essentially similar to that used in ordinary broadcast sound transmission and, in fact, the impulses which are received and fed into the television receiver or the picture receiver, as the case may be, can actually be converted into sound or noise. These sounds, of course, have no intelligible meaning and can only be interpreted when

(Continued on next page.)

CLIX for CONTACT



No. 1. **COIL PIN**
A boon to home constructors **2d.**

No. 5. **RING TERMINAL**
An ideal fitment for permanent contact. Red and black **2d.**

No. 15. **ALL-IN PLUG AND SOCKET TERMINAL**
Will give you safer, speedier and better contact. Price complete **8d.**
Panel portion **4d.**
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(Supplies immediately obtainable through all Dealers.)
Write for the **Clix Folder.**

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KAY'S CABINETS
This Cabinet soundly constructed of Oak and equipped with Baseboard Runners. Full Front, Hinged Top, Polished rich Jacobean, 36" high. For panels 45"-up to 18" wide. Also made to accommodate any Popular Sec. Greatest Range of Wireless Cabinets. Illustrated Lists Free.

H. KAY, Cabinet Manufacturer
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EASY PAYMENTS

The first firm to supply Wireless parts on easy payments. Five years advertiser in "Popular Wireless." Thousands of satisfied customers. Send us a list of the parts you require, and the payments that will suit your convenience, and we will send you a definite quotation. Anything wireless, H. W. HOLMES, 29, FOLEY STREET
Phone: Museum 1414. Qt. Portland St., W.1

THE PICTURE PAPER WITH THE MOST NEWS

SUNDAY GRAPHIC

TRY OMA LEVER SELF-FILLING SAFETY
for smooth writing **5/-**

Points to suit all writers.
Fitted with 14-carat Gold Nib, Iridium-tipped Every Pen Guaranteed.
Of Stationers or Sole Makers—
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TECHNICAL NOTES.

(Continued from previous page.)

the impulses to which they correspond are allowed to operate the television or picture receiver.

Inasmuch as the impulses can be transformed into sounds, it is obviously possible to record them upon a gramophone record in exactly the same way as any other sounds. If this record is then "played," the sounds will be reproduced from it and if these are converted back into electrical impulses and then fed into the television or picture receiver the result will be more or less the same as if the impulses were actually being received by radio.

A Scientific Toy.

All this sounds very simple and so it is in principle; but in actual practice there are all kinds of serious difficulties, and for this and other reasons it is very doubtful, in my opinion, whether such a system would have any value or interest beyond that of scientific novelty.

If such a record could be perfected, and if the apparatus necessary for reproducing the picture were sufficiently simple and inexpensive, then this method might provide us with a system of talking pictures in which both the sound and the picture would be recorded upon a record similar to an ordinary gramophone record.



The new Lissenola Cabinet Cone Loud Speaker is fitted with an entirely new type of cone movement. The case is designed to act as a baffle and eliminate drumming effects.

Personally, as I say, it seems to me that there are very much simpler and more reliable ways of accomplishing the same result, but in these days of scientific progress one can never be sure that any discovery may not suddenly prove to have great possibilities.

Short-Wave Peculiarities.

Following my remarks recently about the use of short waves for beam transmission, the question has been raised as to the use of radio beams for determining the position of distant reflecting objects.

As you know, the so-called Heaviside Layer is believed to reflect radio waves, and investigations have been made upon the location and properties of the Heaviside Layer as, naturally, the information has an important bearing upon long-distance transmission.

Recently, Professor Stormer, of Oslo, has obtained "echoes" of radio signals as much

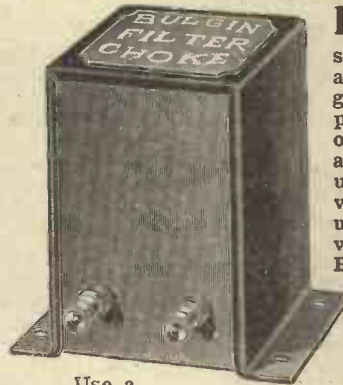
(Continued on next page.)



The Choice of Critics

BULGIN
RADIO PRODUCTS

SEND 2^d Stamps (Postage) FOR THIS BOOK



BULGIN FILTER OUTPUT CHOKES are substantially constructed and made on the modern gap principle. They will protect the delicate coils of your loud speaker against the high voltages used with modern power valves, and will carry up to 50 milliamps without saturation. Black crystalline finish.

PRICE 12/6 EACH
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FILTER OUTPUT CHOKES FOR PURITY!



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The plugs that sit firm in their sockets. Fitted with grub screw for holding the lead. All nickel-plated, with 6 different coloured sleeves. Standard size 2 D.W. or Midget, 2d. each.



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EUREKA

The L.F. Transformer that gives Really First Class Reproduction at a low cost.

Baby Grand 1st or 2nd stage ..	8s. 6d.
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Smoothing Chokes 20h.40m/a. ..	10s. 6d.

All Post Paid by return. Money refunded if not satisfied in 7 days.

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WIRELESS CONE KIT OF PARTS 2/6

for constructing an all steel Chassis double lined diaphragm Speaker with adjustable damping attachment. Size 20 ins. square x 8 ins. wide. Built in half-an-hour. Takes any popular movement.

GREEN & FAULCONBRIDGE, LTD.,
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Any make of L.F. Transformer, Loudspeaker or Headphones repaired and despatched within **48 HOURS—TWELVE MONTHS' GUARANTEE** with each repair. 4/- post free. Terms to Trade.

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RAYMOND'S

27 & 28a, LISLE ST., LONDON, W.C.2.
Come to LEICESTER SQUARE TUBE
This address is at the back of Daly's Theatre
Phones: Gerrard 4637 and 2821

HOURS OF BUSINESS EVERY DAY 9 to 8
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OPEN BOXING DAY 10^{to} 1 Afterwards as Usual

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RECEIVES LOCAL BROOKMAN'S PARK, NEW ALTERNATIVE, 5 G.B., AND MANY CONTINENTAL STATIONS.



NO COILS TO CHANGE. JUST SWITCH ON—THAT'S ALL.

MULLARD MASTER 3^{1/2} CIRCUIT
THE MOST WONDERFUL SET FOR DISTANCE, SPEECH AND MUSIC.

RECEIVER (as shown above) with 3 D.E. Valves (one Power), Dual Range Coil 200/2000, Battery Leads, and 9 volt Grid Bias. ALL PARTS ENCLOSED. **NETT. CASH 69/6**

Carr. and packing 5/-. NOT C.O.D.

OR

RECEIVER (above) with Valves, Coil, Leads and Grid Bias, and 100 volt H.T., 2 volt 40 L.T., Cone Speaker. Aerial Equipment. Carr. and packing 7/6. **NETT. CASH. £5.12.6**

NOT C.O.D.

MAGIC 3 OUR KIT OF PARTS OFFICIALLY APPROVED Editor "Popular Wireless"
KIT OF PARTS.—18 x 7 Panel, .0005 Variable, S.M. Dial, Reaction (Differential), L.T. Switch, 3 Spring V.H., 2 Coil Sockets, 400-ohm M.B. Potentiometer, Neutrodyne B.B., Lewcos H.F. Choke (or R.I. Dual), Hypermu and Ignitor, 3 J.L.F., .0005 Fixed 2 mfd., 2-meg. Leak and Holder, 25,000-ohm to 60,000-ohm Wire-wound, 16 x 2 Strip, 10 Terminals, Wire, Screws, Baseboard, Carriage and Packing. **79/6** 2/- (U.K.) Nett Cash

SET OF 4 COILS 40, 60X, 100, 250X
10/- POST FREE
3 TRIOTRON DARK EMITTER VALVES 18/6
3 MULLARD 33/6 set
3 DARIO 18/6
18x7" American Type CABINETS 17/6

THE MAGIC THREE NOT C.O.D. **SPECIAL! THE LOT** KIT OF PARTS ABOVE SET OF 4 COILS ABOVE 18 x 7 x 10 CABINET BY PASSENGER TRAIN - **95/-** £5

TRIOTRON VALVES New Dark Emitters. Power, 7/6; R.O., H.F., L.F., each 5/6. 2 volt. Post 3d. Latest TRIOTRON 4-pole Bal. Arm. Loud Speaker Unit **15/6**

TALISMAN 7/6 (Wearite) Magnetic Reaction
TUNEWELL 7/9 200/2000 Metres.

KITS OF PARTS of your own selection over 25/- in value quoted for at a special cash price where possible on receipt of detailed list.

MAGIC 2 PARTS Panel 14 x 7, .0005 S.M. Condenser, Differential Reaction, 0/6 Switch, 2 Spring V.H., 2 B.B. Coil Holders, H.F. Choke, Lotus or Telsen Radiogrand 12/6 (add balance any other make), 400-ohm B.B. Pot. Neutrodyne Condenser, .0005 and .0005 Fixed, 2-meg. and Holder Strip, 10 Terminals, Wire, Screws, Chips, Flex. Plugs. THE LOT **55/-** Post 1/- U.K. NOT C.O.D.

WE STOCK J.B. Condensers, R.I. Chokes, Transformers and all usual products, Levego Coils, Chokes, etc., Ekco Mains Units, Amplion Speakers, Brown Speakers, and all components, phones, etc., Ferranti L.E. Transformers, Chokes, Anode Resistances, Concor, Mullard, Osram, Ediswan, Marconi Valves, Various Chokes and Transformers; O r m o n d Condensers, Dials, etc.

TECHNICAL NOTES.

(Continued from previous page.)

as 15 seconds after the transmission of the signal. Stormer worked mostly on a wavelength of about 30 metres and his experiments seem to show that, in addition to the effect of the Heaviside Layer, there is also reflection from some electronic medium at a considerable distance beyond.

Supersonics.

Just as short radio waves can be concentrated into a beam, so short waves of any other type are more readily concentrated than long waves. A striking example of the application of this principle is the use of beams of actual sound-waves, of very high frequency, sometimes called "supersonic" waves, since the frequency is above the audible range.

Very short waves of this type can be sent more or less in a definite direction (by the use of suitable generating apparatus, of course), and do not spread out as ordinary audible sound waves do.

A beam of such sound waves is, therefore, convenient for detecting and locating a distant object, since the beam may be directed against the object and the reflected beam then detected by a suitable receiver. This system is now largely used in submarine work, and, in particular, it is becoming increasingly employed for what is called "acoustical depth-sounding."

Automatic Sounding.

A short sound-signal is produced underwater by a suitable oscillator, whilst close to the oscillator is a sound-receiver upon which the echo of the sound (reflected from the sea bottom) is received. In some cases the sound emitter is instantly converted after the emission of the signal, into a receiver and so is adapted to receive back the echo of the signal which it sent out.

Knowing the velocity of sound in seawater, and the time-interval between the emission of the signal and the reception of the echo, it is a very simple matter to calculate the depth at that point. In fact, the apparatus can be made entirely automatic, so that the depth is indicated from one moment to another.

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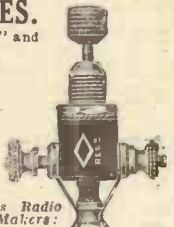


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for use with Super-Microphone as a HIGHLY EFFICIENT DEAF AID, or Detectaphone, etc., this 3ft. silk cord 6/- necking cord fitted Earpiece Fine Black Enamelled Full Directions for use of Super-Microphone for many purposes and Diagrams of connections free. **FREDK. ADOLPH, Actual Maker, Museum 27, Fitzroy Street, London, W.1.** RE829

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A RAPID GUIDE TO RADIO

A JUMPING-OFF SERIES FOR THE NEW AMATEUR

By "Pentode"



YOU won't go far wrong if you think of a loud speaker as a telephone receiver earpiece, having either a very large diaphragm or a horn stuck on it. The average loud speaker is a very straightforward proposition.

When you have a fair idea as to how telephone receivers operate, you will be able to understand the working of loud speakers.

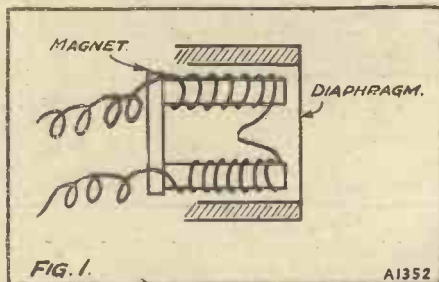
A pair of telephone receivers consists of two earpieces, each of which is a complete sound-producing instrument. If you unscrew the cap of one of them and slide away the metal diaphragm—you mustn't pull it away or you may bend it—you will see that there is nothing else inside except an electro-magnet.

When Diaphragms Move.

In fact, the whole "works" of the ear-piece can be shown in the simple form at Fig. 1. The diaphragm is close to the magnet but does not actually touch it.

The magnet is actually of the "electro-permanent" kind. That is to say, the core of the structure is a permanent magnet, and without any aid tends to attract the diaphragm.

But the core is wound with wire, and it



is through these windings that the current that operates the device passes. As the current passes through so it tends still further to attract the diaphragm.

And every time the diaphragm is moved so the air surrounding it is moved.

Now, the distance that the diaphragm moves will largely depend upon the variation in the magnetic pull on it. Remember, it is being attracted to some extent all the time.

In order to produce musical notes, the diaphragm has to vibrate at frequencies corresponding with the pitch of the various notes.

Making Sounds.

You could make the diaphragm vibrate 500 times per second and register a note of that pitch by sending 500 impulses of electricity per second through the magnet windings. The diaphragm would then be attracted nearer the magnet and released to its original position 500 times in the second.

A similar effect could be caused by passing an uninterrupted current through the

windings which varied in strength 500 times per second. Then you would have a magnetic pull on the metal diaphragm which fluctuated in accordance with the current fluctuations. That is fairly obvious, is it not?

The loudness of the sound caused will depend upon the intensity of the sound waves, and this, in its turn, will depend upon the displacement of the diaphragm. If the magnetic attractions are small the diaphragm

Although this series of "how it works" articles is in itself quite complete, readers will find it interesting and instructive to examine the "Close-ups for Constructors" feature overleaf after reading each week's instalment. Here they will see the various component parts referred to and may frequently trace their circuit-connections.

II.—HOW LOUD SPEAKERS WORK.

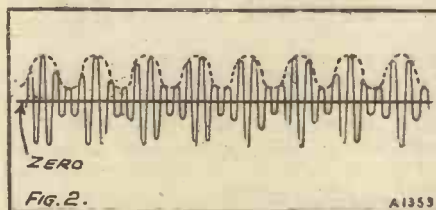
bends will be small, and the sound waves will be tiny ones that will get to your ears but softly.

It is not necessarily the largest current variation that shifts the diaphragm most; the strength of the pull of a magnet, you will remember, is gauged by "Ampere Turns." One turn of wire around the metal core carrying a current of 10 amperes will give you as much pull as 100 turns of wire carrying 1-10th ampere.

Resistance of 'Phones.

But as we must not expect to get much current in our 'phone earpiece or loud speaker, we take the Turns factor pretty well to its limit. We endeavour to get as many turns of wire on our magnet as possible.

This enables very small current fluctuations to have a considerable effect. But the use of a lot of thin wire means a high resistance. Thus you get telephone receivers having resistances as high as 4,000 ohms. Knowing your Ohm's Law (as I hope you now do) you will realise that this resistance is not a virtue. If the same number of turns of wire could be achieved at a lower resistance, the device would be much more efficient. Or, perhaps, I should say that if a greater number of turns could be wound on without increasing the resistance beyond



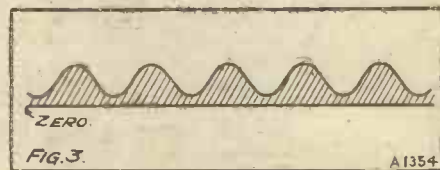
a certain point that would be so much gain. The current that is flowing in the aerial circuit that we have been discussing could

not operate our 'phone earpiece. This current is varying its direction hundreds of thousands of times per second. And even if the metal diaphragm could follow these variations, sound waves would not be caused because sound frequencies are below the 10,000 mark.

What Speakers Want.

The current we need for operating the 'phone earpiece or loud speaker is a current that flows in one direction only, and rises and falls in strength at audio frequencies.

The aerial current, the high-frequency current, carries intensity variations of audio (or low) frequency, but its rapidly



alternating character makes it completely unsuitable for the purpose.

Perhaps you will remember the brief reference I made to "Modulation"; Fig. 2 will help you to visualise this. You will see that the current is varying in strength in accordance with a definite pattern, as it were. Each successive cycle contributes to a gentle rise and fall which builds up a sequence of large wave-forms. These represent the audio-frequencies.

And for the operation of the loud speaker all we want is the wave pattern as it is applied to the current flowing in one direction, as at Fig. 3. Given this, we have the rise and fall of uni-directional current needed to vibrate the diaphragm.

An Important Point.

We can dispense entirely with the current flowing in the other direction. And one way of doing this is to use a rectifying device, such as that still very popular crystal detector.

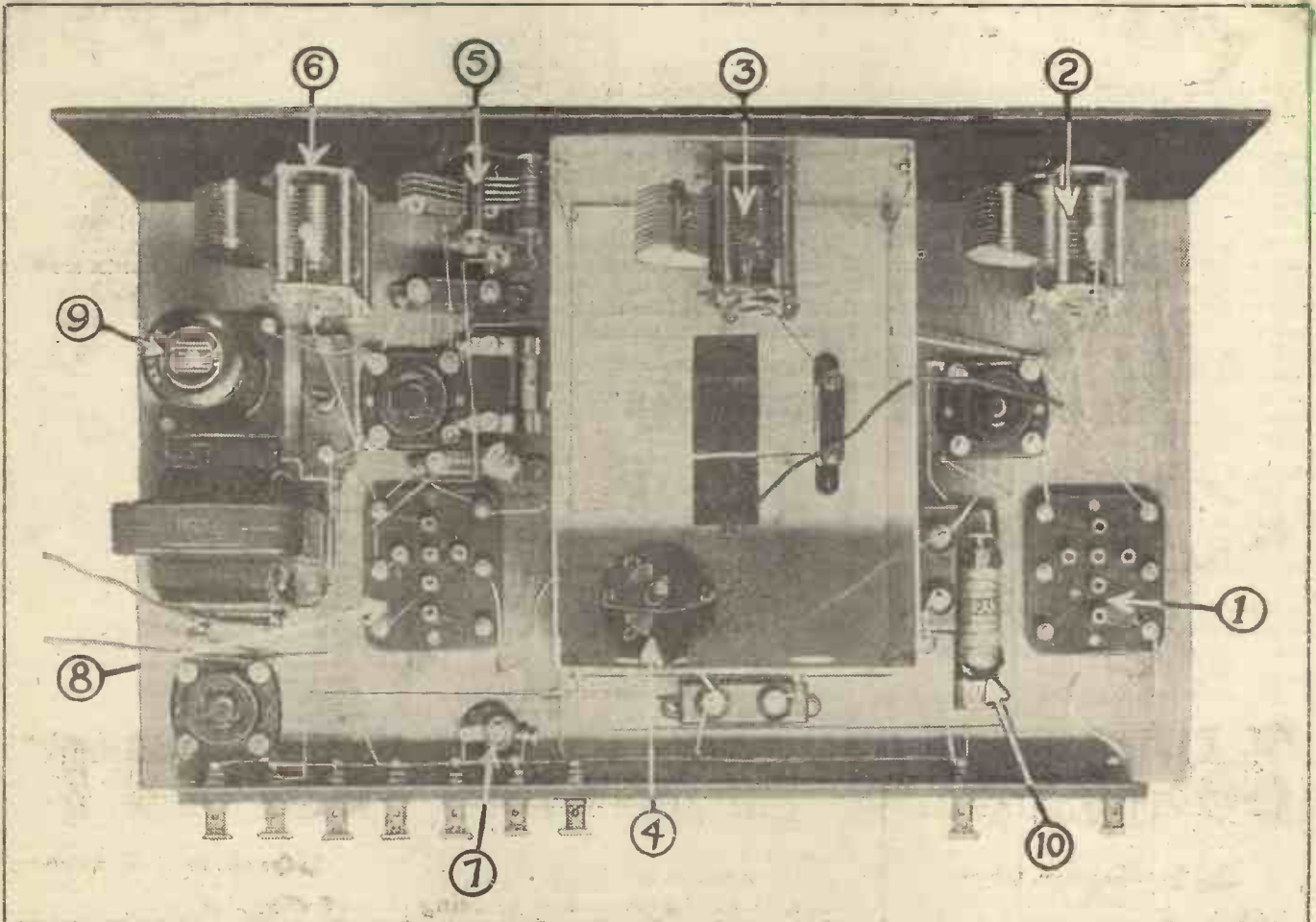
By the way, quite an important point occurs to me, and one that I should not have thought of had not an interested reader asked me a question regarding one of my earlier articles.

I have just used the word "rectifying," and without enlarging on its meaning in an electrical sense. If you were to look this word up in the dictionary you would find that its meaning is given as "correcting," or "refining by distillation."

So you see that it is moderately applicable although its dictionary definition is not such that you would be able to gather a single correct idea as to what is radio rectification. It is a point you, and particularly I, must bear well in mind.

CLOSE-UPS FOR CONSTRUCTORS.

NUMBER ELEVEN OF A PICTORIAL SERIES FOR SET BUILDERS.



THIS is a modern set possessing some unusually interesting features. It is an H.F. (screened-grid valve), detector, L.F. (transformer-coupled) three-valver.

What is known as a "band-pass" H.F. system is embodied in the circuit. The vital components concerned are grouped in the screening box. The purpose of this is to prevent unwanted coupling effects occurring between the various parts.

The "band-pass" filter adds another tuned circuit and the necessity for a further tuning control, but it enables a high degree of selectivity to be obtained without any sacrifice of reproduction quality.

Thus it is very useful for modern conditions such as are imposed by the twin high-power stations at Brookman's Park.

Indeed you get selectivity that is accompanied by an absence of high note loss.

This set makes use of six-pin coils, the holders for which are at (1) and (8).

Connecting Up Your Variables.

The variable condenser at (2) is mounted on the ebonite front panel, while that at (3) is fixed so that its spindle passes through the side of the screening box. In most cases, as we have previously pointed out, it does not matter at all if the one set of vanes of the variable condenser do come in contact with a metal panel or screen which may be earthed.

This is because the one set of vanes also is probably earthed. But note how important it is in such circumstances that you should connect up the variable condenser the right way round. The sole

objects of striving to "earth" the moving vanes of a fixed condenser are to achieve stability and reduce hand-capacity effects. The moving vanes of a modern variable condenser are connected to the metal framework.

Of course, in some circuits the variable condensers in no way go direct to the earthed portions of the set. Again, it very often happens that the reaction condenser should be well away from such points. Therefore, you should particularly watch the above details when metal panels and screens come into contact with parts of variable condensers.

The Easy Tuning Adjustments.

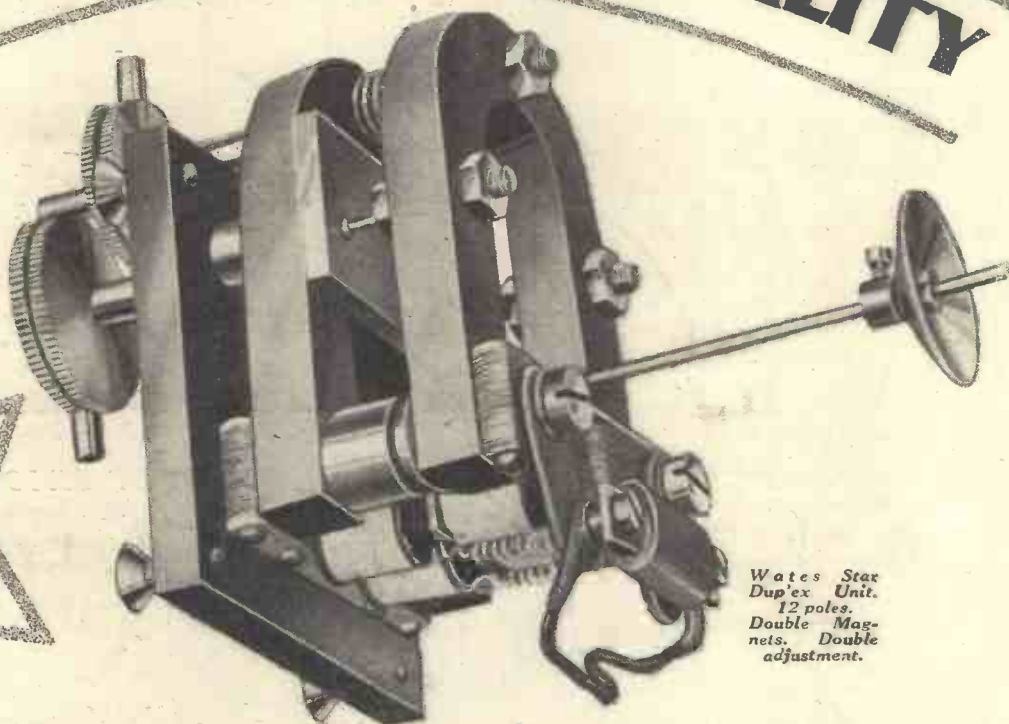
At (4) is a neutralising condenser which gives a variable coupling between the H.F. filter circuit and the subsequent stage of the set. You adjust this component to give you just the right degree of selectivity for your own individual conditions.

A neutralising condenser is used because it provides a very small capacity variation. The particular type has no special virtues, and there is no real difference between it and the large variables from an electrical point of view.

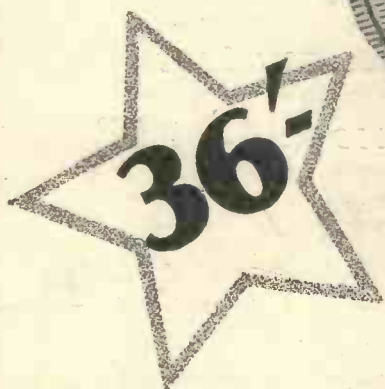
This set has four condenser dials requiring adjustment (we have not yet referred to (5) and (6), which are the reaction and another tuning variable). But the adjustment of these is not as difficult as you might think, because the selectivity is 'spread out' and there is no razor-sharpness at any one point. This is a condition that "band-pass" filters enable us to avoid.

(9) is the H.F. choke, (10) a wire-wound resistance, and (7) a fuse to protect the filaments of the valves and the H.T. supply.

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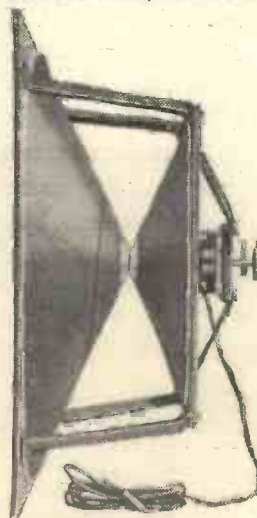
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