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3D

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All About Outdoor Radio

ROUND *the* WORLD *of* WIRELESS

Chasing the Nightingale

THE annual B.B.C. hunt for the Nightingale will take place during the period May 22nd to 27th, in the intervals of the late dance music transmission, when an attempt will be made to relay his song for the benefit of listeners. The engineers consider theirs a thankless job as, although a microphone is placed near a bush which has been located for several nights as one of the bird's favourite spots, when the time comes for him to go on the air he either refuses to sing or it is discovered that he has flown elsewhere. However, stand by for the usual annual thrill, comparable only to the first call of the cuckoo in spring!

Belgian Colonial Transmitter

THE Belgian Posts and Telegraphs have installed a short-wave transmitter, in the neighbourhood of Brussels, for the broadcast of news bulletins and wireless entertainments to the Congo. The station may be heard working in the early evening hours on 30 metres. The broadcasts are picked up at Leopoldville where, later, a station to work on a medium wavelength is to be installed.

Germany's Listening Concessions

THE latest statistics show that the Reichsfunk has granted free licences to no less than 555,125 listeners who come under the heading of unemployed, blind or war invalids; these figures represent twelve per cent. of the total number of licences in force at that date, namely, 4,532,862.

Spring-cleaning the Czech Rooster

LISTENERS may have noticed that the crowing of the cockerel, which opens the early morning Prague broadcasts, has lately taken on a more youthful tone. It is, in fact, a different bird. A record of the newcomer's greeting to the rising sun was recently made on a farm in the neighbourhood of the capital. Several competitors were tested until the engineers were satisfied that they had, at long last, discovered an ideal cock-crow for their purpose.

The Dublin Relay Station

AS reception of the more powerful Athlone broadcasts in the environs of Dublin is not entirely satisfactory to the users of old crystal sets, the Free State authorities may shortly bring the old 1 kilowatt transmitter into operation as a relay for listeners in the capital.

An Island in the Pacific Ocean

A GROUP of some two hundred members of the Hungarian professional classes who, owing to present economic conditions, are unable to earn a living in their native land, have approached the authorities to secure from some foreign country, preferably Great Britain, the loan or lease of an island in the Pacific Ocean where a new colony could be established. The settlers, it is stated, would remain in touch with the Mother Country by means of wireless; the installation of the necessary apparatus would be carried out by members of the party.

Italian Broadcasts for Albania

IN view of the fact that attempts to establish a broadcasting system in Albania have not met with success, and that transmissions from the Bari studio are well heard in Durazzo, the Italian authorities propose to devote certain hours of the weekly programmes to special entertainments in the Albanian language.

Radio-Normandie's Carillon Concerts

THE Fécamp studio proposes to carry out regular relays of carillon and choral concerts from the Rouen Cathedral, of which the belfry contains twenty-nine bells. The first of these attempts may have already been heard by readers, as it was proposed to inaugurate this feature on Saturday, April 29th. They will take place at 8.30 p.m. B.S.T.

Broadcasts on 38,710 Kilocycles

THE B.B.C. short-wave transmitter which has been operating experimentally on 7.75 metres (38,710 kc/s), is situated at the top of Broadcasting House; its power is roughly 250 watts. The transmissions are carried out by means of an aerial suspended from masts 35 feet above the roof of the building. Tests show that excellent reception of the broadcasts can be secured within a radius of about fifteen miles. Similar experiments on ultra-short-waves are regularly made in Germany by the Witzleben Telefunken station near Berlin. In this case the broadcasts, on 7 metres, are put out with a power of 4 kilowatts. It is the most powerful ultra-short-wave transmitter in the world.

ROUND *the* WORLD *of* WIRELESS *(Continued)*

Bach Between Items

TO commemorate the death of Johann Sebastian Bach at Leipzig, both this and the Dresden broadcasting stations have adopted as an interval signal a short four-note theme composed of the notes, B flat, A, C, B, which, when translated into German musical notation, spell BACH. The signal has a sound reminiscent of a vibraphone, and is produced by small hammers striking metal rods. At the conclusion of the day's programme the *Nazi Horst Wessel* song is played, followed by the German National Anthem (*Deutschland über Alles*).

Choosing an Interval Signal

MOST European broadcasting studios at some time or other have appealed to their listeners for suggestions regarding a characteristic interval signal capable of identifying the station to foreign listeners, but it has been left to the Poste Parisien (Paris) to offer a prize of five-hundred francs for an original idea. As a result of a recent competition in which hundreds of suggestions were put forward, the station has finally adopted the first six notes of a well-known melody of Charpentier's Opera, *Louise*. The electrical device for reproducing these sounds will be built at once and listeners will shortly hear Poste Parisien's new mechanical call.

Russia's Heavily Taxed Listeners

THE Soviet authorities have decided to construct twenty 200 kilowatt transmitters during the next two years. To pay for these new stations, since the beginning of April, they have considerably increased the cost of listening licences which are now issued in six different categories. The owner of a simple crystal receiver is now taxed three roubles per annum or, roughly, 8s. 3d., but if a valve set is used, the cost yearly is *fifty* roubles (£6 17s. 6d.). Rates have been specially fixed for subscribers to the wired wireless distributing centres and for members of collective clubs. A large revenue is anticipated from these latter organisations which in future will be made to pay as much as *five hundred* roubles a year! In cities such as Moscow, Leningrad, Kiev and so on it has been the custom for families to be grouped in listening centres termed House Radio Clubs. According to the number of members in these small associations so the tax is fixed by the authorities, but in view of the new law, wireless entertainments will become a costly if not prohibitive pastime, as most of these groups will fall into a class rated at two hundred roubles or roughly £55 per annum.

Another Interval Signal

GRADUALLY, the ticking metronome, so long used by foreign studios to denote an interval in the programmes is being replaced by more and more melodious sounds. *Radio Beograd* (Belgrad, Yugoslavia) is the latest station to adopt a tune on a musical box to be switched on during pauses in the broadcast programmes. The theme chosen consists of the four first bars of an old Serbian folk song. As most of these short note combinations are easy to memorise, it will soon be possible to identify most transmitters by their individual signals in cases where no call is picked up.

INTERESTING and TOPICAL PARAGRAPHS

Radio Lisbon

ALTHOUGH but little has been heard of Portugal's forthcoming broadcasting system, work on the 20 kilowatt Lisbon transmitter has been progressing satisfactorily. The channel allotted to this station is 283.6 m. (1,058 kc/s), a wavelength already used for some time by CT1AA for its Amateur broadcasts. Although the erection of the plant is well on the way, it is not expected that it will be ready to test before the autumn. Portugal already possesses a number of listeners to foreign stations, but up to the present, apart from a mere formal registration with the Post Office authorities, owners of wireless apparatus have not been compelled to pay any tax.

THE NEW WASHFORD STATION.

A close-up view of the building of the new B.B.C. station at Washford Cross, Watchett, Somerset. This station will have a radius of 70 miles, and two programmes will be radiated simultaneously.

The New French Wireless Tax

ACCORDING to the new law French listeners will be compelled to pay a radio tax every first of January, if they possess a wireless receiver on that date. On simple crystal sets, fifteen francs (roughly 3s. 4d.); fifty francs for any multivalve set privately owned or double that amount if used for public auditions in cafés or restaurants, etc. No tax will be payable in the case of hospitals, schools, philanthropic institutions, or where sets are used by blind persons or war invalids. The revenue obtained will be used for the development of the French State broadcasting system, and for the operation and maintenance of existing stations and of those in course of construction.

Vienna Launches Out

WITH the advent of the new high-power Vienna (Bisamberg) transmitter listeners may expect better programmes from the Austrian capital. Twice daily a new station orchestra of thirty-two musicians will broadcast special concerts, and in general, more wireless entertainments are to be given. In addition, during the latter half of May and throughout June, a number of relays are to be carried out from the Vienna Opera House as well as a series of outside broadcasts to celebrate the Austrian musical festival weeks. Arrangements are also being made for a number of entertainments to be broadcast to the United States *via* the Königs Wusterhausen short-wave transmitter. These will take place at 2.0 a.m. B.S.T. Definite dates have not yet been fixed.

Another High Power Station

THE Turkish Government has decided to erect a super-power transmitter at Ankara; it is to be a copy of the 500 kilowatt station the Soviet authorities are completing at Noghinsk, near Moscow.

The Westinghouse Brake and Saxby Signal Company

WE understand that since the 18th of April the offices of the above company have changed over to the automatic telephone system, and in consequence their telephone exchange and numbers are altered to Terminus 6432 (6 lines).

Gramophone Societies

IT has been decided by the Public Performance Committee of the British Phonographic Industry that, despite the prohibition at present in force for the use of gramophone records for giving public performances, bona fide Gramophone Societies may continue their present activities on the understanding that permission to do so is revocable at any time after the members of the industry have definitely formulated their policy.

SOLVE THIS!

Problem No. 34.

Robinson had a normal four-valve set, fitted with an output-filter circuit and complete with decoupling arrangements in each stage. After building a televisor, he connected the neon lamp in place of the loud-speaker, but found that the lamp only gave sporadic flashes and the received image was not at all clear. After some experimenting he found the cause of this. To what do you attribute it? Three books will be awarded to the first three solutions opened which correspond with the solution which will be published next week. Address your solution to The Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, London, W.C.2, and post to reach us not later than May 15th. Mark your envelopes Problem No. 34.

SOLUTION TO PROBLEM No. 33.

Robins had forgotten that the rectifying valve required a larger input to deliver the 500 volts, and therefore a new mains transformer was needed to get the benefit from his change-over.

The following three readers received books in connection with Problem No. 32:—

H. F. Leslie, 76, Holly Road, Aldershot, Hants. H. Fraser, 68, St. Johns Road, Waterloo, Liverpool, 22. D. V. Braund, 80, Knollys Road, S.W.16.

All About OUTDOOR RADIO

How to Obtain the Best Results from Summer-time Radio in the Open Air

By H. J. BARTON CHAPPLE,

Wh.Sch., B.Sc. (Hons.), A.C.G.I., D.I.C., A.M.I.E.E.

DURING the long winter evenings, and at week ends, the fireside has been the usual gathering place of the household, and the radio programmes have, no doubt, formed one of the principal sources of entertainment. Possibly, also, the radio fan of the family has exercised his ingenuity and spent his spare cash on the construction of a new receiver, so that, for the time, at any rate, the home equipment is considered perfectly satisfactory.

With the coming of spring, however, the fireside has become more and more deserted. Evenings will be spent in the garden before very long, while country excursions and picnics will be arranged. Many listeners, therefore, are asking themselves to what extent radio can play a part in the open-air life of spring and summer, and what must be done by way of special arrangements in order to derive the maximum enjoyment from " al fresco " radio.

Two Main Divisions

To begin with, outdoor radio falls into two main divisions. To the hiker, motorist, picnicker and the river man it means a complete portable receiver which can be taken far afield, while to the home keeper and garden lover it means, generally, an extension line from the house receiver into the garden. The special needs and problems of successful outdoor radio are not identical for both classes of installation. They have many points in common, of course, but there are also individual problems peculiar to each type of equipment, so perhaps it will be best to deal with each separately. As the pukka portable set represents the requirements of a large number of open-air listeners, we will discuss this aspect first.

It is scarcely necessary to state that a portable receiver is a complete wireless equipment, consisting of a compact receiver, the necessary low tension, high tension, and grid bias batteries, a built-in loud-speaker and a frame aerial, all accommodated in a reasonably compact case, the total weight of the whole being kept down to a figure representing a not over burdensome load for an active outdoor man.

In technical design and mechanical construction, the portable wireless receiver of to-day is a vast improvement on earlier types, and its performance is correspondingly better. In fact, it is not too much to say that a high-class modern portable will give a performance, both as regards sensitivity and selectivity, which rivals that of the average household set. Indeed, in a great many homes, a portable set is employed for everyday indoor use. Many of the latest types use one or more screened-grid high frequency stages, although there are a number of excellent sets in which the H.F. stages are of the aperiodic type with triode valves. Since the introduction of special low consumption pentode valves, these have been adopted as output valves in many leading makes of portable sets, and recently portables with a pair of small pentodes in quiescent push-pull have appeared on the market.

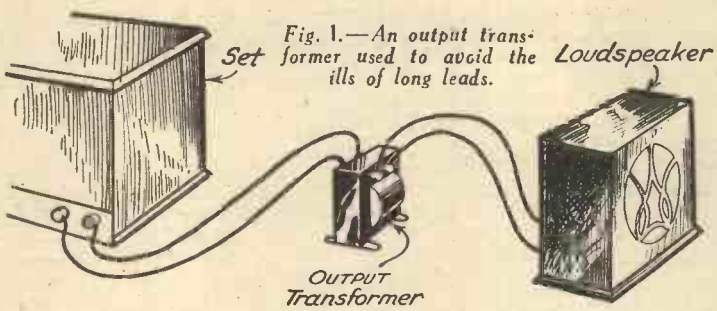

Fig. 1.—An output transformer used to avoid the ills of long leads.

Limitations

From a good portable set, therefore, the listener should expect to obtain with ease a choice of programmes including the alternative B.B.C. stations, and a goodly array of foreigners, anywhere within the British Isles, and even a very ordinary equipment should provide at least a round half-dozen programmes at good strength. At the same time, the limitations of all portable equipment must be recognised. In the first place, considerations of space and weight usually restrict the high tension battery to a small capacity unit and a maximum of 100 volts. This at once imposes some limitation on the efficiency of the high frequency valves, and also upon the total output of the power stage so that, although valve designers have spared no effort to improve the efficiency of two volt battery valves to the end that they should give the very best performance possible under " portable " conditions, the listener must not expect quite the power and volume which he obtains at home with a set having, perhaps, one or two fewer valves, but possessing the great advantages of an ample high tension supply and an outdoor aerial.

Again, the very fact that the portable set must use a small frame aerial means that the incoming impulses are very weak; moreover, the general absence of the successive tuned couplings normally available in a home set further cut down the effectiveness of high frequency amplification, already restricted by the small H.T. battery, so that, on an average, two high frequency stages in a portable must be considered as equivalent in value to about one in a " cabinet " set.

Apparent Loss of Volume

Another point at which the portable set is at a disadvantage is that, in addition to restricted power output, which, of course, means less actual volume of sound for a given signal, the *apparent* volume is further cut down simply because the set is working in the open air. In a room, much of the sound travels to the walls and ceiling, and, although a proportion of it is there absorbed, much is reflected back into the room. Out of doors, however, the sound travels outwards from the loud-speaker, and is not reflected back, hence all that affects the ear of the listener is the direct sound waves he or she intercepts. For this reason, some listeners feel that the volume from their portable is somewhat thin and weak under

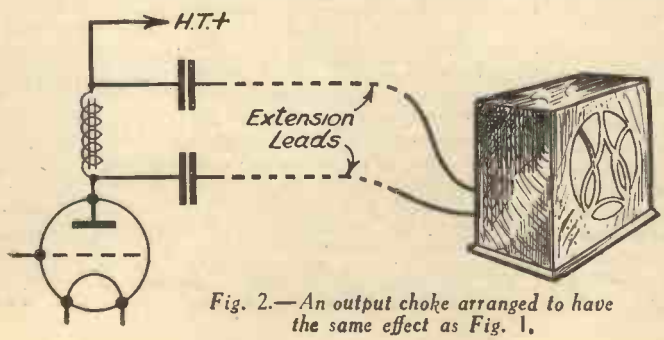

Fig. 2.—An output choke arranged to have the same effect as Fig. 1.

these conditions. However, there is usually enough for real enjoyment and, from personal experience, much greater volume would not greatly add to the owner's pleasure, and might considerably mar that of neighbouring parties.

The owner of a motor-car can, of course, by reason of the special transport facilities at his disposal, make use of a more powerful equipment if he so desires. Larger accumulators and high-tension batteries, carried independently of the receiver, a set approximating in design to a household receiver, and a portable aerial, should enable him to obtain most encouraging results.

Mention of the motor-car reminds me of some interesting television tests in the open air when the transmission of signals took place in the mornings.

I remember very well one of these instances, a portable "Televisor" being accommodated on the running board, while an enthusiast intently watched the images in the small aperture. Of course, now that the television transmissions are sent out by the B.B.C. late at night this is impossible, but with the hoped-for extension of facilities this kind of thing will be a future feature of outdoor radio.

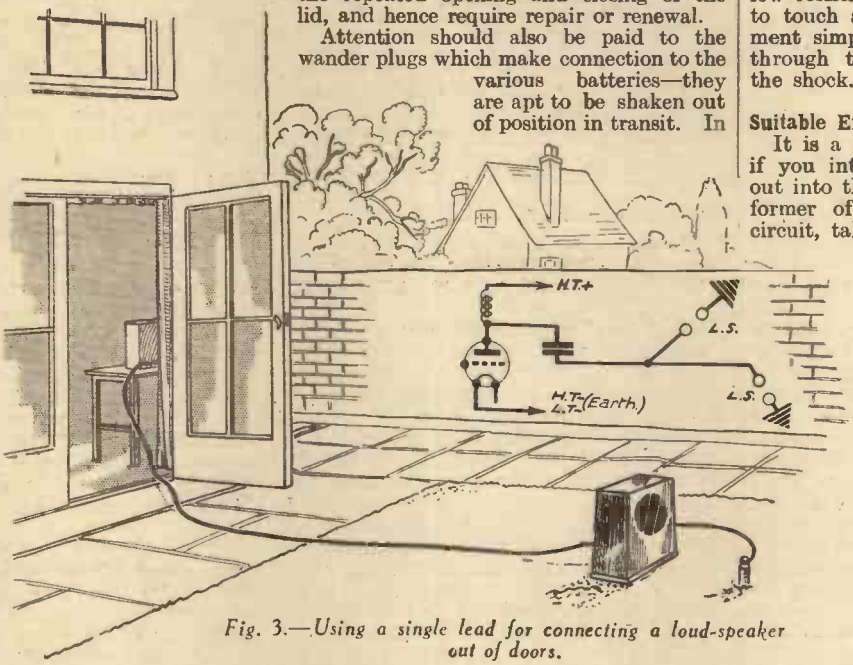

Fig. 3.—Using a single lead for connecting a loud-speaker out of doors.

Overhaul

In preparing for open-air radio, many listeners will now be overhauling their own particular portable equipment. If the set has been put aside since last summer, a considerable amount of attention must be paid to it. It is to be hoped that the accumulator was treated properly before being laid up, and not stored in a partially uncharged condition with the acid in it. At all events, the battery should be cleaned up and sent to be charged, after which it will be as well to put the set into service at home for a week to see if the accumulator is in good condition and will retain its charge.

If it runs down immediately, the advice of the service man should be sought so as to ascertain if the battery can be reconditioned or whether a new one is necessary. The week of test will serve also to show whether the high-tension battery requires renewal (and do not forget the grid-bias battery at the same time) and if the valves and the circuit generally are in good order. The symptoms, of trouble are identical with those in any other wireless set, so there is no need further to discuss this point. Mention may be made, however, of a few specially vulnerable spots in a portable set.

Vulnerable Points

Owing to the rather strenuous conditions of service by way of transportation and so forth, it is possible that the cone of the loud-speaker may need adjustment. Failure to operate may be due to broken connections in the wiring—accidents which are not very likely to happen in a set which is never moved. In many portables there are flexible connections between the frame aerial and the receiver proper, and these connections may be strained or broken by the repeated opening and closing of the lid, and hence require repair or renewal.

Attention should also be paid to the wander plugs which make connection to the various batteries—they are apt to be shaken out of position in transit. In order to reduce weight to a minimum, many portable receivers are arranged for resistance capacity coupling between the various amplifying stages. Breakdown of the anode resistances is another likely cause of poor performance.

Garden Extensions

We must now turn our attention to the listener who requires simply an extension of his radio to the garden. In principle, this involves nothing more than is required for an extension loud-speaker in another room in the same house, but there are one or two precautions which should be observed. In the first place, it must be remembered that leads taken out into the garden are far more liable to mechanical damage, and to the effects of moisture, than those between two indoor rooms. It is advisable, therefore, that stout, well insulated leads should be used. "Tough rubber" or cab-tyre flexible, is very suitable for this job, but a length of lead-covered single or twin cable is even better, and could, if desired, be made a permanent fixture by running it along the fence to some convenient spot where it may be terminated in a weather-proof plug and socket, or in a water-tight junction box.

Another point to bear in mind is that where a loud-speaker is connected directly in the anode circuit of the output valve, as unfortunately so often happens, the speaker terminals are charged to the full high-tension voltage of the set—indeed, in the case of a pentode valve output stage the peak voltage on the loud-speaker terminals may be considerably greater than the maximum voltage of the battery. Not only would an earth on the speaker leads, whether due to injury or to moisture, cause a serious short circuit of the H.T. supply, but anyone accidentally touching any live part of the loud-speaker or its circuit would receive a most unpleasant shock. Indoors, standing on a dry floor or carpet, folk are well insulated from earth, and can touch a single high-tension terminal almost with impunity—not that anyone is recommended to try. But in the garden, especially if the grass or ground is moist, people are in excellent low resistance connection with earth, and to touch any charged part of the equipment simply means a good leakage path through the body to earth—and hence the shock.

Suitable Extension Arrangements

It is a very wise precaution, therefore, if you intend to take your loud-speaker out into the garden, to fit an output transformer of suitable ratio in the output circuit, taking the speaker leads from the secondary winding of this transformer, and thus isolating the loud-speaker circuit from the high-tension supply as is shown in Fig. 1. Another method is to use a choke capacity output filter with high insulation condensers of, say, 2 mfd. capacity, in both speaker leads, as indicated in Fig. 2.

Where it can be arranged conveniently, however, I think the simplest scheme for garden extension wiring is to use the standard choke capacity output filter, as then only one extension lead is necessary. This is demonstrated clearly in Fig. 3. The usual output choke is included in the anode circuit of the last valve, while a 2 mfd. condenser is joined on one side to the valve anode, and on the other to the single extension lead. One or more loud-speakers can then be connected to this lead, the remaining terminal of the "reproducer of sound" being connected to earth through the medium of, say, a meat skewer, penknife blade, copper rod, and so on. The earth itself then acts as the return medium to the set when, of course, the negative of the high tension is earthed.

Finally, although this is not a technical point, it is to be hoped that those readers who do indulge in garden radio will be considerate to their neighbours by limiting volume to reasonable proportions and confining their listening to reasonable hours. It is not fair to have your loud-speaker blaring at full volume from early afternoon until midnight in the garden. Some people like to have a nap in the afternoon and many go to bed long before midnight. Besides, other people like to hear their own sets sometimes. No ordinarily reasonable neighbour objects to a little music in the next-door garden on occasion, provided quality is tolerably good, but not mere noise, and that continuously in season and out of season. Besides, in many districts objectionable garden radio is an offence against the local by-laws and carries a stiff fine. It is a very simple matter to add a volume control "at your elbow" to save constant walks to the set itself in order to make adjustments, and this should be adopted if felt desirable.

Q.P.-P. — OR — CLASS "B"?

A Discussion in Regard to the Relative Merits of the Two Systems.

By FRANK PRESTON, F.R.A.

IN a way it is rather unfortunate that two similar systems of L.F. amplification should have made their appearance at almost the same time, for the prospective constructor is liable to be left rather in a quandary as to which he should use. The position is still further complicated by the fact that both Quiescent Push-pull and Class "B" amplification are intended for one and the same purpose, namely, to provide a large, undistorted loud-speaker output from a battery-operated receiver. One can justly be excused for asking, "Which is the better system to adopt in my own case?" Rather than answer this question directly I propose to set out the merits and demerits of each method from the practical point of view, so that the reader may finally decide the issue for himself.

The Circuit Arrangements

To make matters clear I have sketched out in Fig. 1 the wiring plan and circuit diagram for a Q.P.-P. amplifier, and in Fig. 2, for a Class "B" amplifier. It will be seen in each case that some of the components are shown as "ghosts"; these are the ones that are normally incorporated in the receiver proper, whatever its type may be. The other parts, indicated in full lines, are additional ones required, and which are of special types designed particularly for the new L.F. amplifying systems.

From Fig. 1 we observe that the Q.P.-P. portion follows directly after the detector valve, no intermediate stage being required to supply ample signal voltages to the grids of the pentodes. This is because the input transformer has a high step-up ratio, generally in the region of 1 : 10. In Class "B," however, we are obliged to use a step-down transformer in order to make the secondary of low resistance and to match the grid-filament circuits of the output valve to the anode circuit of the preceding one. In consequence of this it is essential to include one L.F. stage between the detector and Class "B" valves. The intermediate amplifier is known as a "driver" due to the fact that it "drives," or supplies power to, the secondary winding of the transformer following it. I do not think any further explanation need be given here since the theory of both methods of amplification has been adequately dealt with in previous issues of PRACTICAL WIRELESS. Let us, therefore, proceed with an analysis of the more practical aspects of the little problem we set out to discuss.

Power and Quality

First of all it should be mentioned that the actual power output is approximately the same in each case if we assume the use of a similar H.T. voltage—preferably from 120 to 150. As a matter of fact, the output from Class "B" is slightly higher, but not greatly so; the difference in this respect is certainly not so great that it could easily be detected under normal circumstances. Furthermore, both systems are equally good as regards the quality of reproduction which they afford.

Current Consumption

The mean anode current of two high-efficiency pentodes connected in Q.P.-P. approximates to 6 milliamps when using a 120-volt high-tension battery, whilst that of Class "B" is a little higher—about 8 milliamperes. But we have seen that the latter valve requires a "driver" valve for its correct functioning, and this takes a further 2 milliamps or so, and thus brings the total current consumption up to 10 milliamps. As to L.T. current: the two pentodes in Q.P.-P. take .4 amp. between them, whilst the single Class "B" valve consumes the same amount. Again, however, we must add to this the .15 amp. or so required by the "driver," with a result that the total filament current is just over half an ampere.

Cost of Components

And what about the cost of the components in each case? We must first base this on the assumption that a separate amplifier is being made to follow directly after the detector valve in a normal receiver. For Q.P.-P. we shall require (1) one special Q.P.-P. input transformer—average cost, 15s.; (2) one tapped output choke or transformer—say, 16s. 6d.; (3) two 5-pin valve-holders, 2s.; (4) one G.B. de-coupling resistance—1s.; (5) one shunt resistance for connecting in parallel with primary of input transformer—1s.; (6) two pentodes—35s. We can see from our list that the total cost works out at about £3 10s.

And now let us see how this price compares with that for a complete Class "B" amplifier, including, of course, the "driver" valve and the L.F. transformer which feeds it. The necessary components and their average prices are: (1) one small L.F. transformer—7s. 6d.; (2) one 4-pin valve-holder—10d.; (3) one Class "B" "driver" transformer—10s. 6d.; (4) one 7-pin valve-holder—1s.; (5) one tapped output choke or transformer—16s. 6d.; (6) one small power ("Driver") valve—8s. 9d.; (7) one class "B" valve—14s. The inclusive cost in this case is seen to be approximately £3 and thus the Class "B" shows a slight advantage in the way of initial expense.

In both of the above examples I have purposely left out the resistance and condenser generally required for reducing excessive high-note response, but as these components are used in either type of amplifier, they will not affect the comparative price. In so far as we have already considered the question, we reach the conclusion that for a similar signal output the Q.P.-P. amplifier is rather more expensive in first cost, but since its L.T. and H.T. consumption is smaller, it will be cheaper to run; Class "B" scores in regard to "replacement" expenses, because both of its valves are cheaper than pentodes.

Converting an Existing Receiver

The figures we have obtained above apply only when a complete and separate amplifier is to be made, and they will be modified considerably

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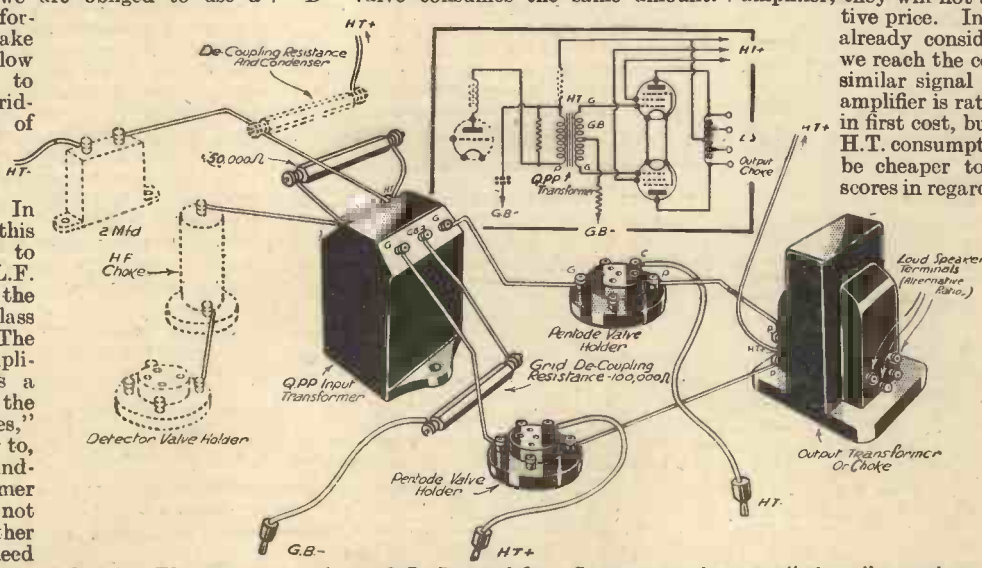


Fig. 1.—The connections for a Q.P.-P. amplifier. Components shown as "ghosts" are those normally included in the receiver proper. L.T. wiring is omitted for the sake of simplicity.

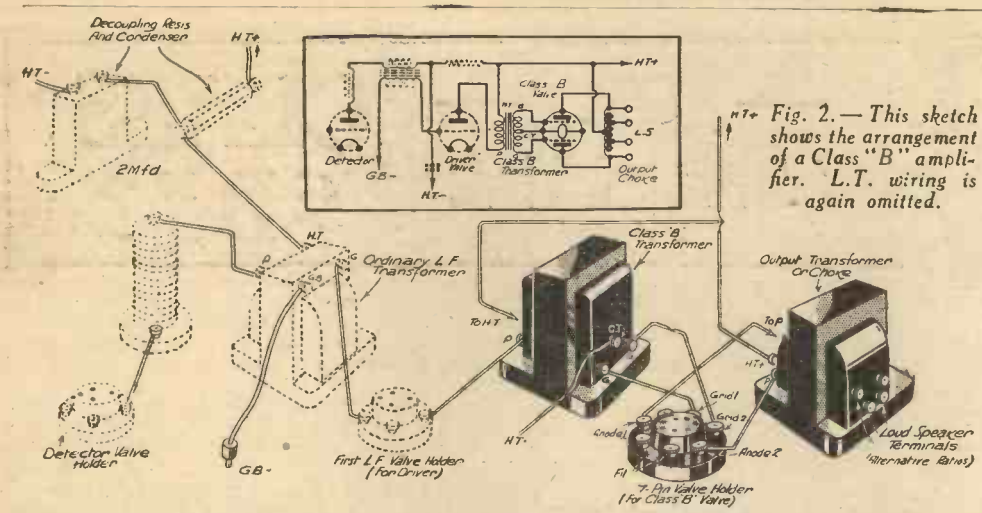


Fig. 2.—This sketch shows the arrangement of a Class "B" amplifier. L.T. wiring is again omitted.

(*Continued from page 289.*)

when it is required to convert the L.F. portion of an existing set to one of the new systems of amplification. For example, if the set is a three-valver having S.G., detector, and power valves, the cost of the "small L.F. transformer" "4-pin valve-holder" and "small power valve" can be deleted from the estimated price of a Class "B" amplifier, but all the listed components will be required for a Q.P.-P. conversion. Moreover, we shall be left with a spare transformer and power valve in the latter case.

But if our present set uses a pentode output valve the position will be rather different, because we shall only require one additional pentode with the other components listed above to convert the set to Q.P.-P. This will bring down the price to about £2 12s. 6d. In converting the same set for Class "B" a small power valve would be required in place of the pentode (which would then be "spare"), but the ordinary L.F. transformer could be retained. In other words, the cost of conversion would be almost exactly the same as for Q.P.-P. And since Q.P.-P. is more economical of current we should decide in favour of this system. When the receiver which is to be modified contains two low-frequency valves, Class "B" would be our undoubted choice, because the first L.F. stage could remain unaltered to serve the function of "driver." The only extra components then required would be the "driver" transformer, Class "B" valve, 7-pin valve-holder, and output choke, so that the cost would work out at something like two guineas.

Operation of Class "B" and Q.P.-P.

There is yet another side to the question—that of adjusting and operating our amplifier. Class "B" is most certainly to be preferred on this account because it does not require the rather delicate "balancing" of anode current, nor the correct setting of grid-bias voltage that quiescent push-pull does. In fact, no balancing of any kind is required, because all this is done by the valve-makers, and since the special Class "B" valve does not require any grid-bias, G.B. voltage adjustments are not called for as the high-tension battery gradually runs down. At least, this is so in regard to the output valve, but a slight adjustment to the "driver's" G.B. will probably be required at intervals. This might not always be necessary, because the working characteristics of the latter valve are by no means critical.

From the above brief summary we can deduce that when modifying an existing set to include either Q.P.-P. or Class "B" our decision as to the better system will principally be governed by the circuit arrangement of our present receiver; if it has a pentode output stage, Q.P.-P. will be favoured, but if the last valve is of the small-power type, or if the set has two L.F. stages, Class "B" will be somewhat more economical and convenient.

Economy in H.T. Current

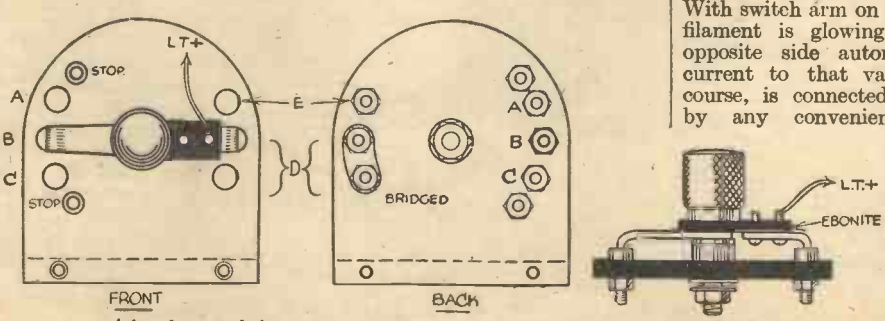
For most "domestic" requirements it will be found that the maximum possible output of signal current is scarcely ever required from either of the amplifying systems under discussion. When this is the case a distinct economy in running costs can be effected by reducing the H.T. voltage, or better still, by cutting down the signal input to the amplifier by means of a volume control. (The average anode current of either a Class "B" valve, or two pentodes in Q.P.-P., is proportional to the volume they are required to supply.) In some instances the reaction condenser, variable-mu potentiometer, or series aerial condenser, will serve the latter purpose, but with Class "B" a better method is to connect a potentiometer across the secondary of the transformer preceding the "driver" valve. A suitable value is 250,000 ohms, and the method of connection is indicated in Fig. 3.

Fig. 3.—A volume control can be used to cut down the H.T. current consumption of a Q.P.-P. of Class "B" amplifier. This sketch shows the simplest way of fitting a volume control to a Class "B" amplifier.

When full volume is never required the simplest thing is to replace the small power valve used as "driver" by one of the ordinary L.F. type. This will slightly reduce the consumption of low-tension current, as well as that of high-tension, and will not have any ill effect on the quality of reproduction.

A SWITCH DODGE

A SWITCH for cutting out series aerial condenser, also H.F. stage and H.F. valve filament, can be made as follows: Cut a piece of ebonite to shape, as Fig., and arrange three contact studs on each side, the left side to have stops at each end. Drill a hole to take switch-arm spindle in the ordinary manner. The double arm must be arranged so as to insulate the filament part, and this is done by fixing switch arm to spindle with a piece of ⅛in. thick ebonite of required length. This is clamped under the switch knob in line with aerial switch part which is fixed as in ordinary practice. Attached to small ebonite strip is the end cut off from a spare switch arm, and this is drilled to take two small screws, one of which is used to take a flexible lead to the L.T. positive terminal. The two studs at D are bridged underneath with a piece of copper foil and stud E is left blank. Stud A goes to first terminal of series aerial condenser, B goes to second terminal of S.A. condenser, and C goes to top of detector coil. Studs D go to the filament terminal of the H.F. valve-holder. With switch arm on A or B the H.F. valve filament is glowing, but when on C the opposite side automatically cuts off the current to that valve. The aerial, of course, is connected to the centre spindle by any convenient method and the completed switch is screwed to the back of the baseboard alongside the earth terminal, or the earth terminal could be mounted on the same piece of ebonite as the switch.



A handy switch for cutting out the series aerial condenser, and H.F. stage.

—C. E. HOLDUP (Finchley).

Some Mysteries I have Solved!

An Interesting Account of Some Elusive Faults and How They Were Traced

By A RADIO ENGINEER

IT is a favourite theory of mine that, because all faults in radio equipment are due to definite electrical or mechanical causes, it is only a matter of systematic and careful testing to discover the nature and location of any defect. In nine hundred and ninety-nine cases out of a thousand this theory works perfectly. Watch an experienced service engineer examining a faulty set. First, an apparently casual, but actually very searching glance to try and detect obvious disconnections or broken contacts; then, rapidly, a dozen simple tests are applied. Often the trouble is spotted right away in the first five minutes, for the skilled tester has a rare acumen for locating likely faults. If the obvious initial tests do not bring the trouble to light, however, each portion of the apparatus in turn is gone over systematically, and by a process of elimination the defect is tracked down, first to a particular stage, then to one component, and finally to a particular point in that component.

Many amateurs have also acquired a high degree of skill in adopting similar methods, and usually have no very great difficulty in putting matters to right. Very occasionally, however, a fault is encountered which eludes all attempts at discovery, and baffles even experienced engineers. I have collected a few notes concerning some of these, and the following selection refers to cases which, at the time, seemed very mysterious, but were afterwards found to have quite simple explanations.

Most Annoying

A most annoying type of fault is that in which a set behaves perfectly on the test bench, but as soon as it is replaced in its cabinet, immediately shows signs of the same trouble. My most recent experience of this kind was with a home-built set of the metal chassis type, which was subject to almost continual cracklings. On removing the chassis to a table and connecting it up, no amount of maltreatment would induce the least amount of noise—the performance of the set was normal and perfect. Then, as soon as the chassis was put back into its cabinet, on came the crashes and crackles.

After two or three repetitions of this, having already tested-out every connection and component and found nothing wrong, I was about to give up for the evening, when I stumbled upon the solution quite by accident. The chassis was standing on the table at the time, and in order to give it one final scrutiny at close quarters I pulled it towards me along the table. Immediately came a fearful crash. After switching off, I turned the chassis on end and examined the underneath again—and discovered the trouble. There were several metallized resistors included in the circuit, and these were accommodated with some other small components under the chassis. Owing to the sagging of some of the connecting wires, one of these resistances just touched the surface of the table, and as I dragged the chassis along this resistance caught the roughness of the table, causing the connecting wire to bend sufficiently to allow the end cap of the resistor to touch lightly against a terminal (Fig. 1). The resultant intermittent short circuit was the cause of the crashes and cracklings. The same state of affairs occurred when the set was pushed into the cabinet, but when the chassis was withdrawn the springiness of the wires allowed the resistance to fly back into position. Judicious bending of the wire and the use of an inch or so of insulating tape completely cured the trouble.

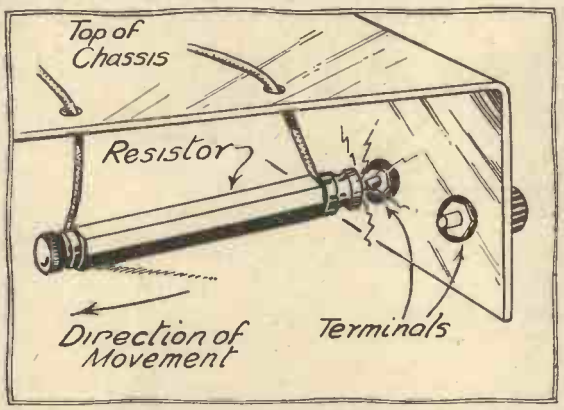


Fig. 1.—Slack leads allowing a resistor to short circuit against a metal chassis.

Wire Continuity

One lesson which I learned early from experience, was never to trust a first test on the continuity of a wire. This point was driven home with considerable force on an occasion when I was endeavouring to cure bad crackle in a set. Everything pointed to a loose contact, but for the life of me I could not discover where it was. Every lead and wire had been separately tested for continuity, including the wire connecting the aerial terminal of the set to the lead-in tube. This was, as a matter of fact, insulated with particularly thick and stiff rubber, and it tested out perfectly O.K. With the set connected up again, all went well for a time, but soon the crackling recommenced.

I switched off to re-test, found nothing wrong, and connected up again; reception was now quite normal. Then, while fumbling absent-mindedly with the wires, on came the crackling. Quickly I looked to see what I was touching; it was the aerial connection, and as I wobbled it about the grating crashes increased in intensity. To put in a new wire was but the work of a moment, and the trouble was cured. On conducting an autopsy on the discarded wire I discovered a break just inside the insulation (Fig. 2). The stiffness of the rubber kept the broken ends sufficiently in contact to pass test while the wire was lying quietly on the table, but when connected to the set the wire was slightly bent, causing a rubbing, intermittent contact. Ever since, when testing wires for continuity, I always twist them about so that any fault which exists is exaggerated and more easily detected.

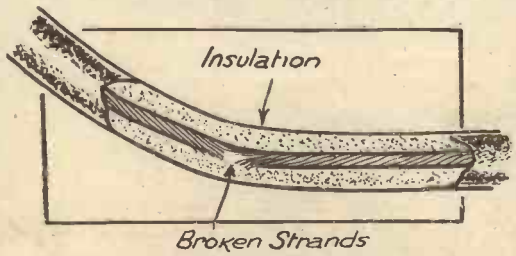


Fig. 2.—Flexible wire fractured inside the rubber covering.

Heating Effects

When a fault occurs only after the set has been switched on for a certain time, always suspect some effect of heating, such as expansion. Metals expand when heated, and both shorts and partial open circuits can be caused in this way. There was the case of a set which always started crackling and other noises about a quarter of an hour after it had been switched on. When I was asked to look at the receiver, I switched on and waited for the fault to develop, which it did in due time, and I then switched off and began my search for the trouble. The usual continuity tests were applied to all the various components, and the anode resistance of a resistance - capacity - coupled low-frequency stage came under special scrutiny, because such spots are always likely places to find a break. The fault, however, could not be traced.

The set was reconnected and switched on again, and sure enough, in about ten minutes or so, the crackle recommenced. I still suspected the anode

(Continued on page 294.)

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(*Continued from page 291.*)

resistance, so switching off the set once more, I removed the resistance and tested it again—and found an internal disconnection, or rather intermittent connection. A new resistance was soon obtained, and after fixing it in place of the old resistance, the set functioned perfectly. Out of curiosity I then took another test on the discarded resistance, but now no sign of bad contact was to be discovered. It was not until I had opened it up for examination that I found the reason. The end of the resistance wire had become unsoldered from the terminal, but was resting against it, making a light contact. Undoubtedly, when the resistance wire had warmed up owing to the heat generated in high-resistance contact, the end of the wire expanded and moved away from the terminal, thus breaking the contact.

"Dry" Joints

The "dry joint" type of fault is sometimes very difficult to trace, especially if it occurs in a manufactured component usually considered quite above suspicion. On one occasion an A.C. mains set started to suffer from a most mysterious defect. As soon as anyone walking across the room passed a certain spot, the most alarming crashes would occur in the set. At other times the receiver gave no signs of trouble. Now I knew that there was a loose board in the floor at the critical spot, and immediately connected the trouble with vibration set up by this board. Everything pointed to a loose contact which was jerked by the movement of the board. But the most stringent tests failed to reveal any bad contact, and it was only after I had gone over every joint, both likely and unlikely, that I found the offender. It was one of the filament pins of the rectifier valve. A "dry" soldered joint between the leading-in wire and the valve pin had worked loose. The wire was long enough to touch the bottom of the pin, and the contact was sufficient to allow the filament current to pass. When the table on which the set stood was shaken by someone walking over the loose floor board (Fig. 3), however, the loose leading-in wire vibrated in sympathy and the contact was rapidly made and broken. A few minutes with a soldering iron resulted in a perfect repair, and the valve is still in service and doing good work.

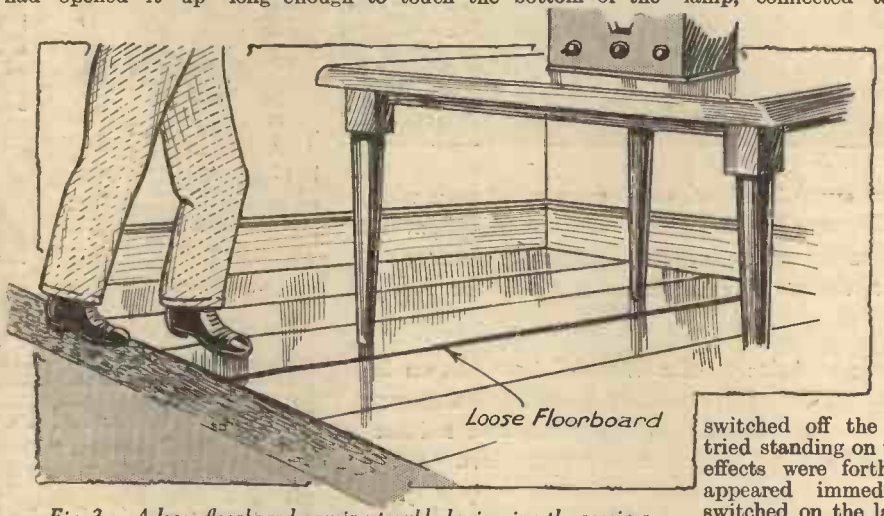

Fig. 3.—A loose floorboard causing trouble by jarring the receiver.

Floorboard Incident

Another floorboard incident was still more mysterious, because the noise did not always occur when the loose board was stepped on. I was told that it never occurred during the day; I noticed it only in the evenings—and only sometimes then. A clue presented itself one evening when the set had been working quite satisfactorily for some hours. I went across the room and switched on a table lamp, connected to a wall plug. As I walked back to my chair I stepped on the fatal board, and at once deafening crashes came from the set. Looking round, I observed for the first time that the loose board was in a direct line between the wall plug feeding the table lamp and the wall plug feeding the set; in fact it was now clear that this was the board which the electrician had removed when he wired the plugs. I next switched off the lamp, and once more tried standing on the loose board. No ill effects were forthcoming, but they reappeared immediately I once more switched on the lamp.

Finally, I switched off the lamp and took up the board. As I had guessed, the electric wiring—lead-covered wire—ran immediately below the board, notches having been cut in the bearers to accommodate it. Examining more closely the connections to the lamp plug, I found that a very poor contact was made between one of the lead-covered wires and the screw terminal of the plug. When the wire was shaken, even quite gently, the contact resistance varied.

A NOVEL METHOD OF DIAL ILLUMINATION.

THE majority of sets have the long-wave and the medium-wave stations inscribed on the same dial, and frequently one has to glance at the wave-change switch in order to ascertain which waveband one is working on. This is entirely obviated by the method described, as the station names of the waveband *not* in use are, though still in sight, are rendered invisible.

First of all, the pilot light must be replaced by *two*, side by side, as close together as possible. One way of doing this is by fixing two batten holders side by side.

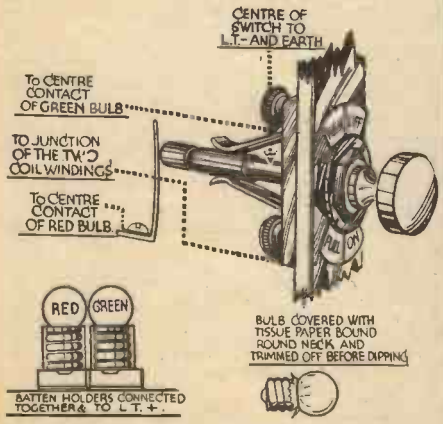

Fig. 1.—A switching arrangement for controlling dial lights.

These should be connected together. The two bulbs occupying these holders, must be made to give red and green lights respectively. This may be done by dipping them in suitably coloured ink several times, allowing them to dry between each dipping. A little gum mixed with the inks is very helpful.

Alternatively, each bulb may be covered with the thinnest tissue paper (tied round the base of the bulb and trimmed away, as shown in Fig. 1) before the bulbs are dipped.

The wiring connections are shown in Fig. 2. The only other addition is a strip of springy brass screwed to the baseboard close enough to the wave-change switch to make contact with the plunger when it is pushed in for the long waveband.

One other alteration remains. A strip of stout white paper, or better still, white celluloid, is fastened on to the dial over the existing station readings. If in your case the light shines *through* the dial, the original list of dial readings must be removed and replaced with a piece of white celluloid the same size and shape.

Now neatly print in the names of the stations on the new strip. Medium-wave stations must be printed in RED ink. Long-wave stations in GREEN.

When the set is switched on, only the station names of the waveband to which the set is switched will be visible. If the medium waveband is in use, the light on the dial will be green. The station names printed in red ink will stand out as though in black. The names printed in green under the green light will be invisible.

When the wave change switch is pushed in for long waves, the light on the dial will change to red. The medium-wave stations printed in Red will now become invisible, and the Green long-wave printings will appear. The effect is very pleasing.—E. H. OLIVER (Oxford).

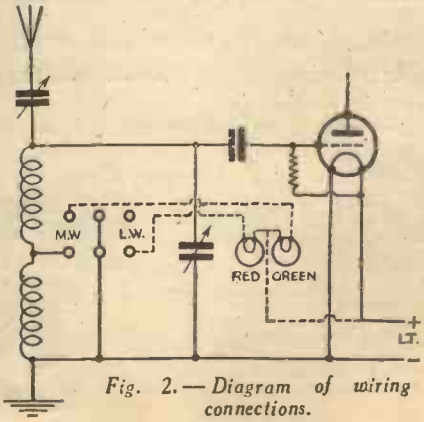

Fig. 2.—Diagram of wiring connections.

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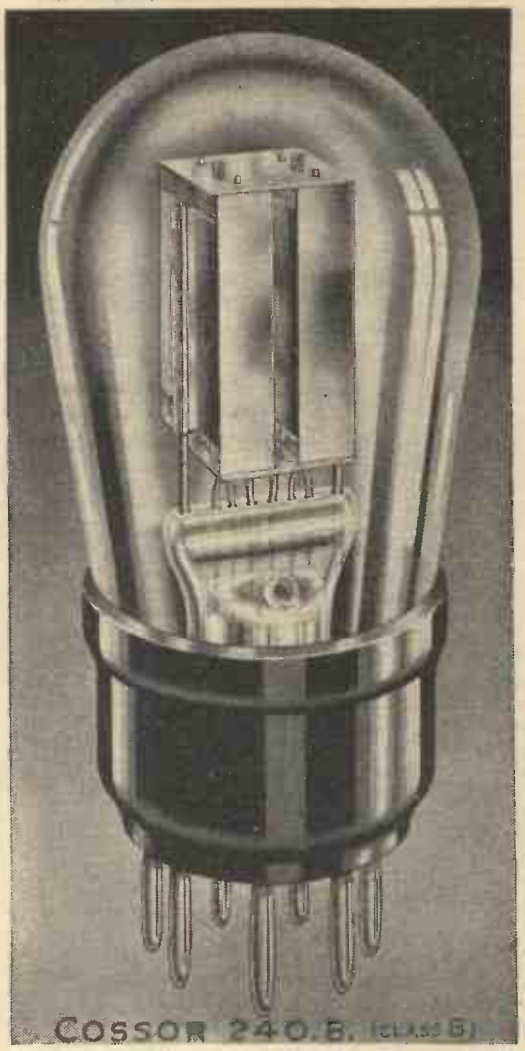

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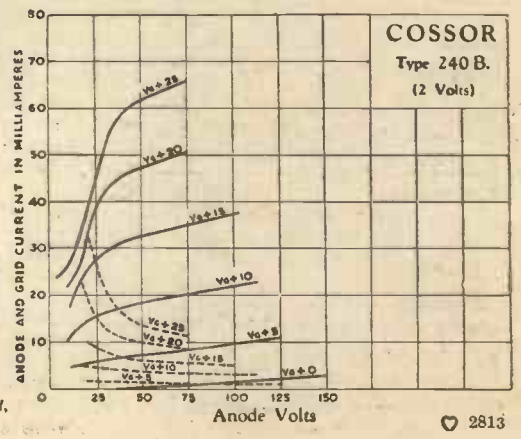

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A HOME-CONSTRUCTED MICROPHONE

A Simple but Efficient Instrument for the Experimenter.

By G. L. GRISDALE

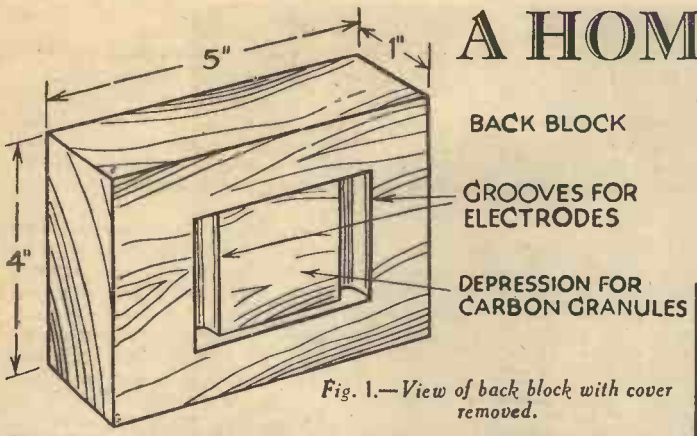


Fig. 1.—View of back block with cover removed.

THE radio experimenter will find many uses for a good microphone, and although there must be many who would like to possess such an instrument they generally regard it either as too expensive, or beyond their ability to construct one for themselves. Many who live in or near London, that paradise of junk shops and stalls, will have gone so far as to purchase one of the ex-G.P.O. or service speech transmitters which are so often to be found laying about in the aforementioned places. But in nearly all cases the results from these solid back types of instrument will be disappointing, because the transmitter is not intended to give good reproduction but only intelligible speech. Only in the very early days of programme transmission were these types of microphone used, as they were quickly replaced by more modern types. There is one advantage which the old type of transmitter has over any more modern type, and that is in the matter of sensitivity. It is often possible to overload a super power valve in the last stage of a two-stage amplifier by speaking close up to one of these microphones, but the quality, if it can be called such, is beyond description.

The home-constructed microphone here described, and illustrated in Fig. 1, is certainly not good in the question of sensitivity; the output from the microphone circuit to the grid of the first valve is of the order of 0.1 volt, or about one-tenth of the output of the average pick-up. This may not sound too encouraging, but it must be remembered that the commercial high quality microphones give about the same output, and that the condenser type of microphone, which is used extensively in talking picture recording, is considerably less sensitive.

The microphone is of the carbon type, working on the transverse current principle, that is to say, the current flows across the microphone between two electrodes, no current passing through the diaphragm. Thus the conducting diaphragm usually employed in microphones may be omitted, and a substance with more favourable acoustic properties may be used. The granules are enclosed between the diaphragm which is set into vibration by the sound waves, and a very stable surface which does not vibrate with the sound waves. Thus the granules of carbon are compressed by the sound and their resistance alters in sympathy with the impressed sound. The current flowing across the layer of granules between the electrodes is also varied in sympathy with the sound.

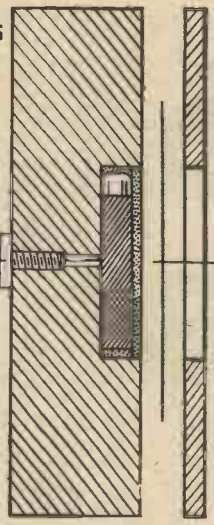


Fig. 2.—Sectional view.

Details of Construction

Now regarding the construction of the microphone. The body of it must be heavy so that it will not vibrate and cause resonance. If it is of wood it will be quite good as far as sound properties go, and, in addition, it will be easy to work. So we start with a block of wood measuring about 4in. x 5in. x 1in. The dimensions do not matter much so long as it is heavy. The next job is to cut a shallow depression to hold the granules. Mark out a rectangle about 2in. x 1½in., and carefully cut a depression with a chisel about 1/16in. deep; if it is more than this the microphone may be insensitive, and, in addition, take more granules to fill it. In one of my own microphones I used a plywood block and made the depression just one-ply thickness deep.

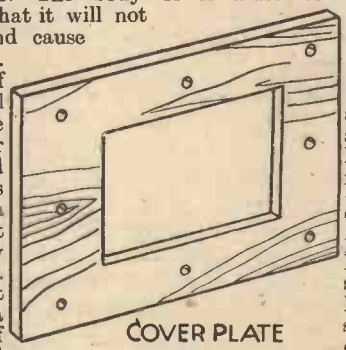


Fig. 3.—Cover plate of microphone.

Having cut and sandpapered the depression, the electrodes must be fitted. These are best made of carbon rods from torch batteries as I have found that metal electrodes are apt to cause crackles when the microphone is in use. If torch battery carbons are used they should be carefully scraped before use. The end with the small brass cap on it should be carefully retained, and any shortening necessary done from the other end. Two electrodes are necessary, and a wire should be soldered to the end of each; the wire should be thin and flexible, and a few strands from a piece of flex is suitable. Now take the block again and drill a hole through at each end of the depression and fit two terminals into these holes from the back of the block, each with a wire attached. The terminal must be threaded into the wood with the wire attached to the end and pushed through the hole, and this will be quite easily done if too much solder has not been used. With a chisel make a recess at each end of the rectangular depression to hold the rod. Solder each terminal lead to a carbon rod lead or direct on to the cap on the rod, as in Fig. 2, and tuck the spare wire away under the rod. Push the rod down flush with the bottom of the depression, and fix it there with strong adhesive or sealing wax. But scrape the wax or glue off in front of the rod so that there is good contact for the granules. It may be remarked here that the terminals should be short, or trouble will be caused when the rod is pushed into the groove which has been cut for it.

Fitting the Diaphragm

This finishes the body of the microphone, and the diaphragm has now to be fitted, and the granules put in. The diaphragm lays flat across the front of the block, but it must first be fixed to the front piece of wood which is screwed on to the back. This front piece consists of a thin piece of plywood of the same size as the back, but having a hole cut through it of the same size as the depression. About eight small holes are drilled round the edge to take the screws. It is best to fix the front down once before the granules are put in, to make the screw holes in the back piece. If this is not done the granules may be shaken about where they are not wanted in the final assembly. Having made the screw

(Continued on page 316.)

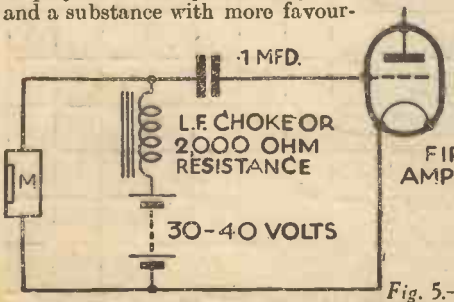


Fig. 5.—How the microphone should be connected in the grid circuit.

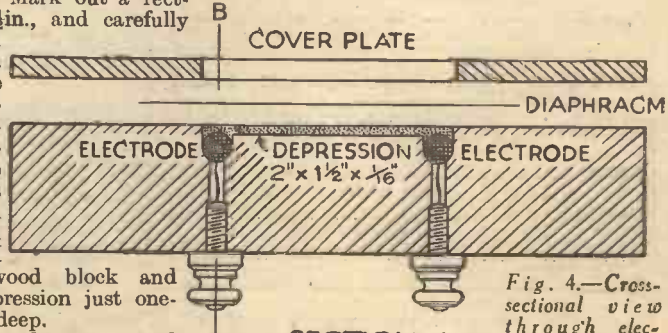


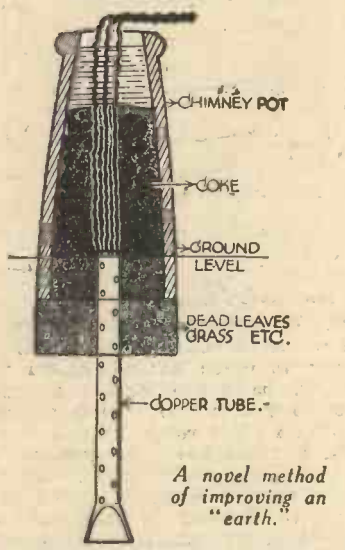
Fig. 4.—Cross-sectional view through electrodes.

THE HALF-GUINEA PAGE

Radio Wrinkles FROM READERS

An Improved Earth

THE accompanying sketch illustrates how I utilized a disused chimney-pot to improve my earth, which is extremely dry in its natural state. The device holds



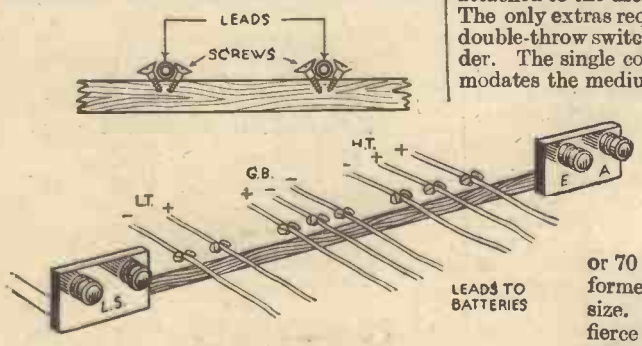
A novel method of improving an "earth."

about two gallons of water, which is slowly fed to the surrounding soil, after percolating through the coke, grass, etc.—H. IGGALDEN (Birmingham).

Fixing Battery Leads

IT is a good plan for experimenters to keep the battery leads separate—that is to say, H.T. from G.B. and G.B. from L.T., and so on, because in a set where all the leads are in one cord it is very easy to make a mistake, which would result in the destruction of all the valves. Besides, it is much more convenient for those who are always altering their lay-out. Here is a method of doing this. Obtain a quantity of twisted rubber-covered flex, one strand red and the other black. The quantity, of course, is proportionate to the number of batteries. Also obtain a number of small wood screws with bevelled heads. The number is double that of the leads. Now, on the back edge take, say, the L.T.— lead, and at the output end of the receiver, near the speaker terminals, secure it as shown in the accompanying diagrams.

Screw the screws down tight and the lead is secured. Now secure all the leads in the



A neat method of fixing battery leads.

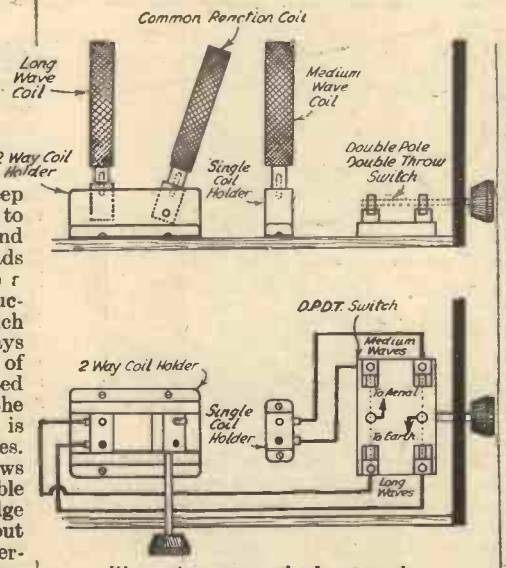
THAT DODGE OF YOURS!

Every reader of "PRACTICAL WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us, addressed to the Editor, "PRACTICAL WIRELESS," George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be *original*. Mark envelopes "Radio Wrinkles." Do NOT enclose Queries with your Wrinkle.

same manner. Of course, the number of leads vary with the type of set. Now twist your L.T. leads together and join up the battery. Do the same with the G.B. and H.T. leads. The twist can be secured by bands of thread at intervals of four inches.—G. D. BRUCE (Edinburgh).

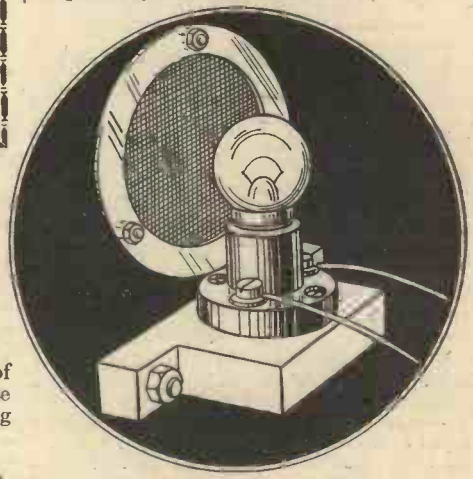
Wave Changing When Using Plug-in Coils

THE accompanying diagram may be of interest to those readers who use plug-in coils of the basket type. By using



Wave changing with plug-in coils.

the method illustrated the only drawback attached to the use of these coils is removed. The only extras required are a double-pole double-throw switch, and a single coil holder. The single coil holder (which accommodates the medium-wave coil) is screwed to the baseboard about 3in. from the common reaction coil. The size of the reaction coil is best found by experiment, but one equivalent to 60 or 70 turns on a 4in. slotted former is about the best size. If the reaction is too fierce on the medium-wave band the single coil holder can be moved farther from the reaction coil and screwed down again, or the reaction can be reduced in size. In case of non-oscillation on either waveband, the connections to the coil must be reversed. The master-points on the d.p.d.t. switch are connected to the usual aerial and earth respectively.—S. COLLINS (Cowes, I.W.).



Fitting a pilot lamp and window.

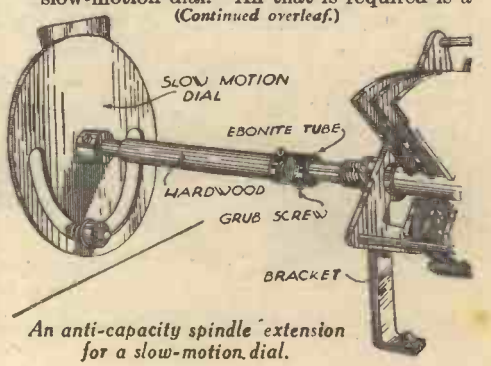
A Novel Indication Lamp

MANY constructors have in their junk boxes an old valve window used in the days of bright emitter valves. These can be utilized in a simple way, in conjunction with a small lamp, to show whether the set is on or off. Firstly, decide upon the position of the lamp, and then cut a neat round hole to accommodate the valve window. Fix the latter into the hole and fasten securely. Then procure a piece of wood about 2ins. by 1½ins. and cut it into the shape shown in sketch. An ordinary fuse-holder is then obtained and fixed on the piece of wood, which in turn is screwed on the cabinet side, just underneath the valve window. The two leads from the holder are then taken to their appropriate positions on the set, the bulb is screwed into its socket, and the gadget is completed.—A. SMETHURST (Manchester).

Reducing Hand-capacity Effects

THE accompanying sketch illustrates an easily-made and efficient extension handle for a short-wave set which can be adapted for use with practically any slow-motion dial. All that is required is a

(*Continued overleaf.*)

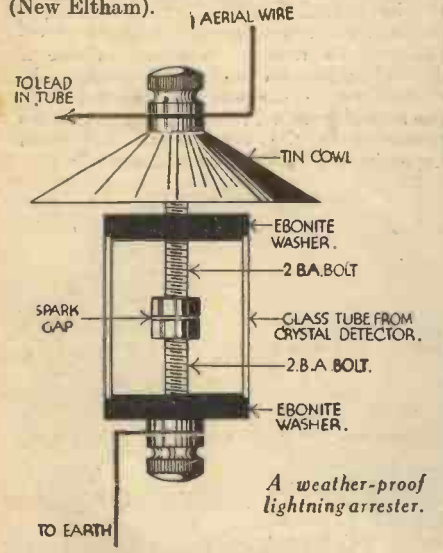


An anti-capacity spindle extension for a slow-motion dial.

RADIO WRINKLES

(*Continued from previous page.*)

length of hard wood in the shape of a pencil for the extension handle, a piece of ebonite tube about 2ins. long, which will fit tightly over the condenser spindle, and a bracket which can be made from any stout piece of metal. A metal screen may be placed at the back of the panel and earthed, if desired.—E. J. CHAPMAN (New Eltham).



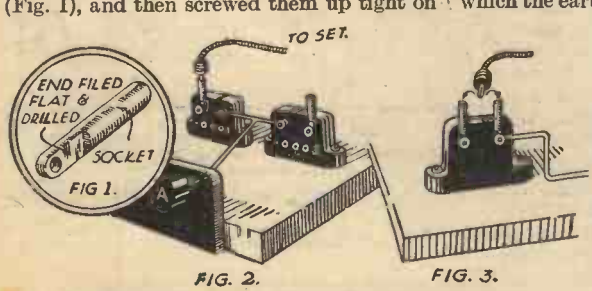
A weather-proof lightning arrester.

Weather-proof Lightning Arrester

THE accompanying sketch gives details of an arrester which is sure in action and needs no switching in or out. It is always in set, should there be a storm. The components can be obtained from the junk box—the main parts are the two ebonite washers to fit the glass tube, which should make a tight fit and be drilled and tapped perfectly straight for the 2 B.A. bolts. The small tin cowl keeps the top dry, and is made from a small circle of tin, as if making a cone for a speaker. Solder the joint, and paint it to prevent rust. Adjust the gap between bolts as fine as possible, then shellac or glue well around washer and bolt. Insert arrester in aerial lead near window and connect earth terminal to earth outside the house. This arrester can be seen working in the dark, if there is bad static about, showing that it does its work. —E. THOMAS (Swansea).

Handy Change-over Sockets

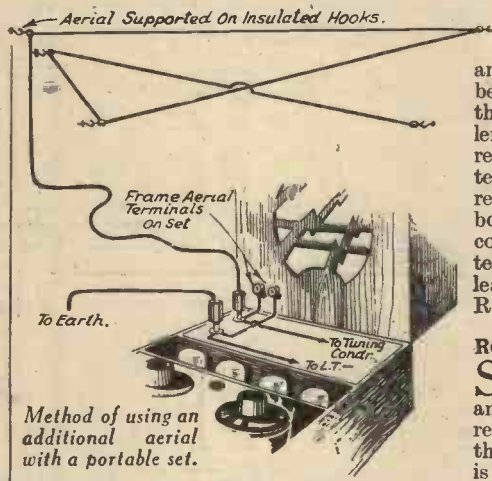
HAVING found out that a fixed condenser in the aerial circuit brought about a certain amount of selectivity, and in the course of experimenting that a .0001 condenser served medium waves, and a .0003 condenser long waves best, I adopted the following method to facilitate changing condensers. From some old type plug-in coils I took out the metal plugs and sockets. On the sockets I filed a flat on each side (Fig. 1), and then screwed them up tight on the condensers. The plug was then soldered to a short length of flex (the tapped hole in the end of the plug makes this easy by first threading the flex through it). The other end of the flex is then fastened to the coils. The condensers are wired to the aerial terminal as shown in Fig. 2. This idea can also be used for cutting out a condenser in any part of the circuit, as in Fig. 3.—A. GIBSON (Brotton, Yorks).



Using plugs and sockets for changing condensers.

Improving Your Portable Set

FOR those whose portable sets are not fitted with turntables, or who cannot go to the trouble of fitting a turntable, the following idea is suggested. I have carried this out in practice for several months with success, using an indoor aerial and an earth. The set is placed near a window and the earth wire is taken to a buried earth immediately below the window, in the garden (a pipe earth would serve the same purpose). The aerial, of single stranded cotton or silk-covered wire, is plugged into the set with an ordinary plug-socket fitting and taken round the room as illustrated, being kept clear of walls as far as possible. Hooks screwed into picture rails fitted with a short length of insulated cord, will ensure the necessary clearance of walls. It will be seen from the sketch that the aerial is pointing in four different directions, which obviates the necessity for turning the set, as signals from nearly all directions will be brought in by this type of aerial. For those sets not already fitted for use with aerial and earth, this can easily be carried out by

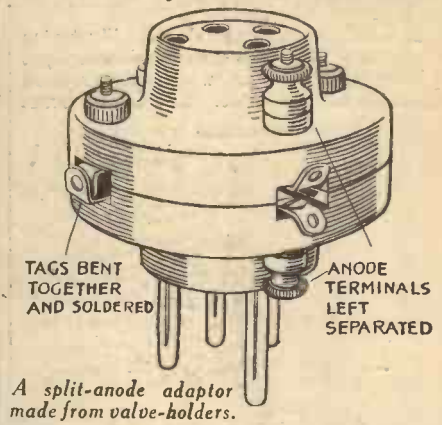


Method of using an additional aerial with a portable set.

drilling two holes through the back of case, as shown, and fitting two eye-sockets, the aerial and earth plugging into them from the outside. The lead from tuning condenser to frame aerial must be connected to this aerial socket, so that when the indoor aerial is plugged in it connects in circuit with the frame aerial. The other *end* of the frame coil and lead to negative filament battery must be brought to the *bottom* eye-socket, to which the earth is plugged in. More stations, and with greater volume, will be brought in without moving the set. The tuning will naturally be slightly different, as this alteration really amounts to increasing the inductance, consequently one will require less condenser reading on your dials than hitherto, for any given station. When desiring to move set to another room or locality, the aerial and earth can be disconnected, and the set then functions exactly as before conversion.—F. J. ARNOLD (Gillingham).

A Home-made "Split Anode" Adaptor

FOR this simple device two valve-holders are required, and four or five valve legs, according to the type of holder used. The valve legs are inserted, threaded end first, into one of the holders, and retained by a blob of solder underneath. If necessary, strip the thread with pliers. Insert the other ends temporarily into the second holder while soldering, to ensure correct alignment. Place the holders base to base, as shown, and clamp them together by two bolts passed through the holes normally intended for fixing down. Complete the adaptor by joining the adjacent pairs of filament and grid terminals by any method. Personally, I found it easy to bend the tags one over the other and solder them together, but other ways, such as short lengths of "glazite," are obvious. A refinement would be to remove the three terminal screws from each holder, and replace them by bolts passing through both, with a brass distance-piece to ensure contact on the lugs. With the anode terminals left for the attachment of meter leads the adaptor is thus ready for use.—R. JAMES (Harrow).

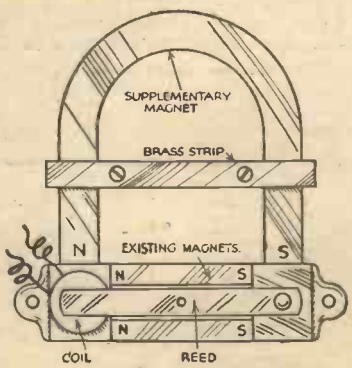


A split-anode adaptor made from valve-holders.

Rejuvenating Loud-speaker Units

SOME time ago I experienced trouble with a speaker unit losing its magnetism, and there are probably a number of other readers who have experienced the same thing. The way in which I cured my trouble is as follows:—

I placed a horse-shoe magnet (taken from an old unit) against the magnet of the unit, as shown in sketch, and the speaker was nearly twice as loud as before. Any U-shaped magnet will do.—L. LAWSON-DURHAM (Holt, Norfolk).



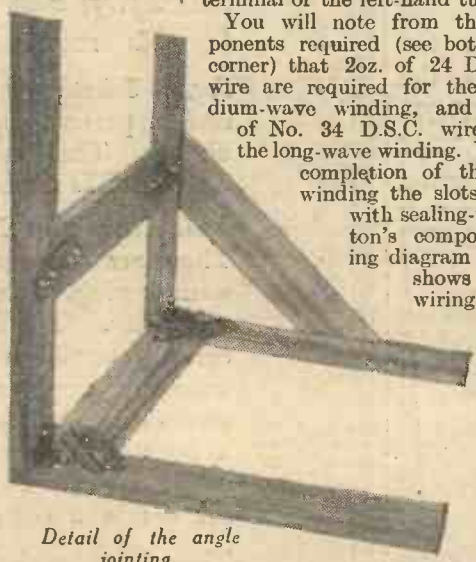
Method of rejuvenating loud-speaker magnets.

Rear view of the Featherweight Portable Four.

STILL LEADING—AND

Portable Set ever placed before the Home Constructor, Serving our Readers. Every Possible Requirement of The Featherweight Portable Four is covered by

THE remaining illustrations of the Lightweight Portable Four given in these pages show all of the construction necessary to complete it. They also illustrate perhaps in a more detailed form than last week the originality of the design, and the fact that I have made a genuine attempt (I believe a successful attempt) to get out of the rut into which home-constructed sets have fallen in the past ten years. I hope (as has been the case with so many PRACTICAL WIRELESS features!) that it will start a fashion. I endeavour to originate them, with the needs of the amateur whose purse is limited but who requires first-class performance, well in mind.



Detail of the angle jointing.

I had no space last week with which to deal with the frame aerial. This is wound into the comb-like slots of the Bulgin Frame Aerial Spacers which are screwed diagonally at each corner of the swinging front. These spacers have the slots inclined so that when the wire is placed in them there is no possibility of them slipping out. The spacers should therefore be fixed with the inclined slots directed *outwards*.

Frame Aerial Winding Details

Solder one end of the 24-gauge wire to the upper right-hand contact of the tuning condenser, and take the wire across to the upper slot of the nearest spacer. Run the wire across to the left, through the upper slot on the left-hand spacer and down to the lower spacer, across the lower edge, and so continue to the slot where you commenced. Carry the wire through this slot again, and make a further turn, repeating the process so that there are three turns in the first slot. Pass to the second slot, and wind three turns in this, after which two turns only are wound in each remaining slot until eight slots have been used. There now remains the two wide slots. The end of the 24-gauge wire must be cut, and it should be soldered, together with the beginning of the 34-gauge wire, to the upper terminal of the three-point switch. The long-wave winding consists of twenty-three turns in each slot, and the finish of the winding is joined to the lower terminal of the left-hand tuning condenser.

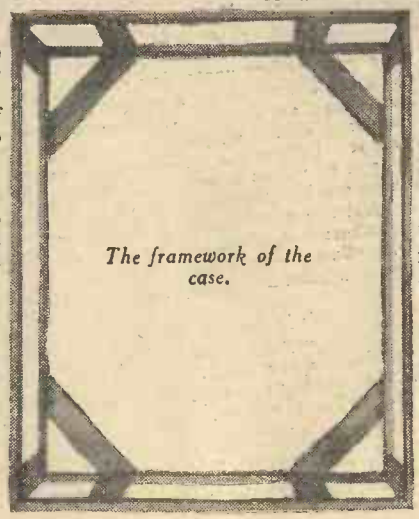
You will note from the list of components required (see bottom right-hand corner) that 2oz. of 24 D.C.C. wire are required for the medium-wave winding, and 2oz. of No. 34 D.S.C. wire for the long-wave winding. Upon completion of the frame aerial winding the slots may be sealed with sealing-wax or Chatterton's compound. The wiring diagram given last week shows how simple the wiring up really is, and how few wires are really used. Notice that low-tension negative and high-tension negative leads are connected to the three-point wave-change switch, and that H.T. positive is connected to the centre tapping of the speaker transformer; the L.T. positive lead, of course, goes direct to the on-off switch.

The Carrying Handle

Carrying handles may be purchased quite cheaply from most leather stores, although the one I used was taken from an old attache case and re-covered in the same material as was used to cover the case.

ORIGINALITY!

Two metal strips will be required to pass through the swivels of the handle. Two clamping plates will be required as well, one to go beneath, and one on top. The handle itself spans the two cross struts interposed between the front and back top rails, and the clamping plates (one above and one below) are bolted over these. This makes a very rigid form of attachment, and there is no risk of the handle breaking adrift.



The framework of the case.

The Batteries

The Ediswan high-tension battery is snugly accommodated in the bottom of

IDEAL FOR THE RIVER—

SHOWING THE WAY!

erweight" rtable four

by F.J.CAMM

uctions for Completing the Splendid Lightweight ver's full size Blueprint of which was given last week's issue. This is probably the Lightest and bears Further Tribute to our Policy of a Portable Here Combined in One Receiver! My Personal Free Advice Guarantee.

e, and on this stands the accumu- d the grid-bias battery. The leads to l-bias battery are taken direct to the

e completed receiver.

nts, namely, the transformer and l condenser.

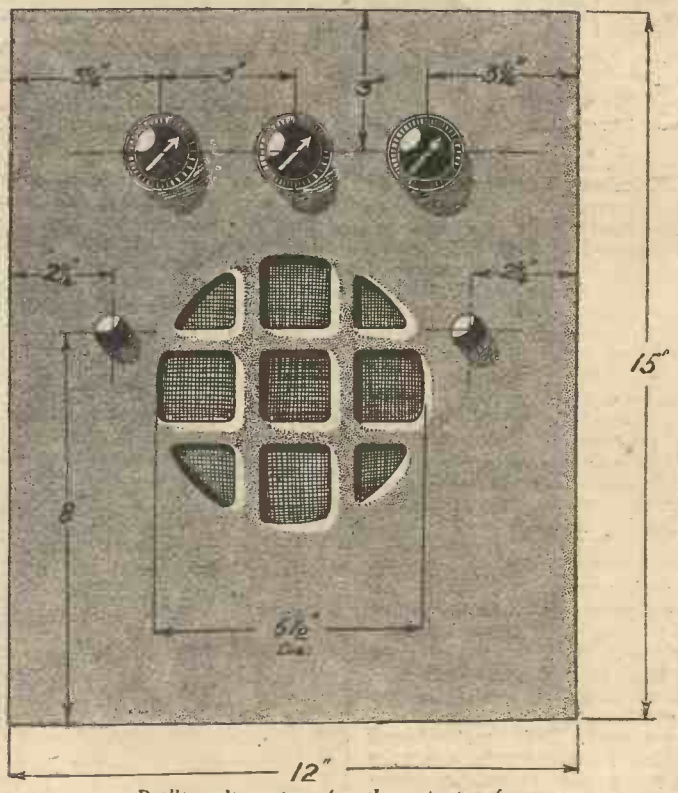
g Instructions

ittle need be said about operation.

The two extreme knobs at the top control the tuning, and they should be both moved to zero position to start with. Slowly rotate them, keeping them approximately in step until signals are heard, when final adjustment to their positions can be made. The reaction condenser can be used to build up volume, but for preliminary tuning it should be set to its minimum position. About 4½ volts grid bias should be used, and, of course, the full 120 volts from the high-tension battery. It is in the adjustment of the Featherweight Portable Four that you will realise the great convenience of the design. The swing hook at the top is merely released when the whole receiver front can be swung outwards and is immediately accessible. Considerations of design led me to use the flat form of frame aerial, and I naturally expected a loss of efficiency as a result. I have not experienced it, for the number of stations received, the volume, and the quality of this production equal the best portable on the market, and it is with every confidence that it will satisfy readers that I place it before them backed with my personal guarantee of free advice until it functions in the same manner as mine. A final note—do not forget to orientate the receiver to make full use of the directional properties of the frame aerial.

OUT OF THE ORDINARY!

A REALLY FIRST-CLASS PERFORMER.



Drilling dimensions for the swinging front.

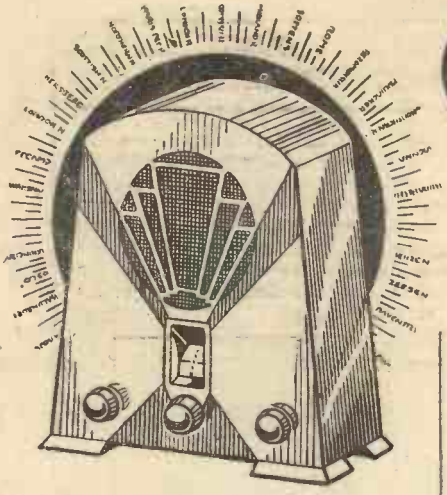
SPECIFICATION OF FEATHERWEIGHT PORTABLE

Two Utility Bakelite Condensers, .0005 Type W. 297.
One Wearite H.F. Choke, Type H.F.P.A.
One Lissen Dual Range Shielded Coil.
One Graham Farish Lillos Condenser, .0003.
One Graham Farish Ohmite Spaghetti Resistance, 10,000 ohms.
One Graham Farish Ohmite Spaghetti Resistance, 50,000 ohms.
One Graham Farish Ohmite Spaghetti Resistance, 100,000 ohms.
Three Clix 4-pin Chassis Type Valve-holders.
One Clix 7-pin Chassis Type Valve-holder.
One Bulgin On/Off Switch, Type S. 38.
One Bulgin Wave-Change Switch, Type S. 36.
Four Bulgin Frame Aerial Spacers, Type I.12.
One Bulgin Senator Transformer, Type L.F. 12.
One Lissen Class B Driver Transformer.
One 2 megohm Grid Leak, with wire ends, Lissen.
One T.C.C. .01 mfd. Fixed Condenser, Type M.
One T.C.C. .0002 mfd. Fixed Condenser, Type M.
One T.C.C. .002 mfd. Fixed Condenser, Type M.
One T.C.C. .1 mfd. Fixed Condenser, Type 50.
One T.C.C. 1 mfd. Fixed Condenser, Type 50.
One T.C.C. .001 mfd. Fixed Condenser, Type M.
One Cossor 220 S.G. (Metallised) Valve.
One Cossor 210 H.F. (Metallised) Valve.
One Cossor 215 P. Valve.
One Cossor 240 B Valve.
One Rola Loud-speaker, Type F.5-PM-1-Class B.
2 ozs. 24 D.C.C. wire and 2 ozs. 34 D.S.C. wire for frame.
One Ediswan 120 volt H.T. Battery, ref. 60706.
One Ediswan 9 volt Grid Bias Battery, ref. 60807.
One Ediswan 2 volt accumulator, E.L.M.2.
Four Wander Plugs (H.T.+, H.T.—, G.B.+ and G.B.—).
Two Spades (L.T.+ and L.T.—).
One coil Glazite, flex, screws, wood for case, carrying handle, etc.

Light enough for ladies to carry.

'HE GARDEN—

—OR THE PICNIC



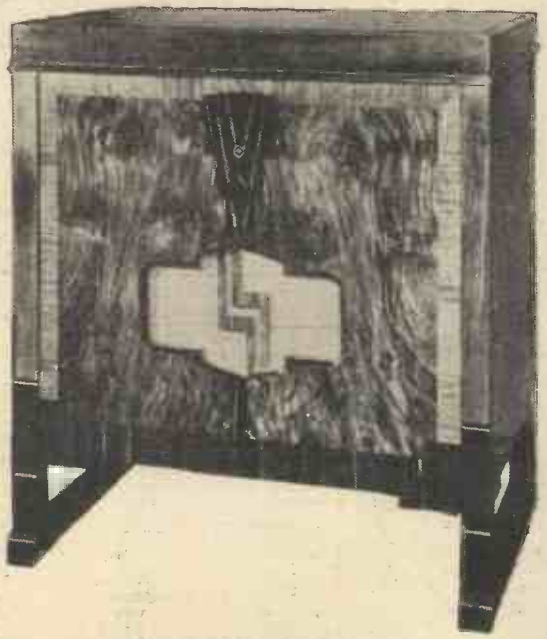
OUR VIEWS ON RECEIVERS

H.M.V. AUTORADIOGRAM SEVEN, MODEL 524.

MUSIC lovers will be very interested in this receiver which is produced by His Master's Voice Company, and which is designed to enable the very best to be obtained in music from either gramophone records or by radio broadcast. Leaving out the question of the cabinet, which has been designed to harmonize with practically any furnishings and which is acoustically sound in every way, the apparatus is a most interesting piece of work and is described by the makers as a "3-in-1" instrument. These three are, in order, (1) a seven-valve super-heterodyne broadcast receiver; (2) an electrical gramophone, and (3) an automatic record-changing device.

Controls

The complete apparatus is divided up to form the most convenient assembly from the point of view of manufacture and operation. Inside the cabinet, the wireless receiver is fitted to the left-hand side of the cabinet and is held in a vertical position, with the valves horizontally arranged. To the motor-board are attached three controls, the main tuning knob, a tone controlling device and a three position switch, providing long waves, medium waves and gramophone points. Two tuning dials are visible through small windows and these are calibrated in wavelengths. To the left of these controls are arranged the pick-up, turntable and automatic record device. On the front of the cabinet is a volume-control which operates on either radio or gramophone reproduction, and just above this is a small push button which is employed to reject a record should it be desired not to listen to that particular item. More will be said of this later. At the bottom of the cabinet stands an electro-magnetic moving-coil loud-speaker. The tuning arrangements for the super-heterodyne receiver are very simple, but slightly different from the usual practice. In place of the customary screened coils, the inductances in this receiver are unscreened, but are so arranged that there is no interaction between them. A four-gang condenser is employed for tuning, and the range covered is from 200 to 550 metres, and from 900 to 2,000 metres. The aerial input is of the band-pass type, coupled to a variable-mu H.F. valve. This is choke-capacity coupled to the first detector (a three-electrode valve) which operates on the anode-bend principle. The oscillator follows, and this has a tuned-grid circuit, magnetically coupled to the grid circuit of the first detector. The I.F. amplifier is also of the variable-mu type, and this is coupled to the second detector (also a triode), which employs the same method of detection as the first detector. The automatic bias resistance in the cathode lead of this valve is "split," and a portion is short-circuited when the receiver is switched over to "gramophone," so obtaining the correct bias for this valve when employed as an L.F. amplifier. The output valve, which is supplied by means of a resistance-fed L.F. transformer, is a PX.4, giving an output of 2¼ watts.



The H.M.V. Autoradiogram.

Tone Control

In order that the tone, on either broadcast or gramophone, may be adjusted to suit the acoustics of the room, or personal tastes, a 600,000 ohm resistance is joined from the grid of the output valve to earth, via a 2,000 mmf. condenser. This enables the reproduction to be modified to give brilliance to the top notes or to reduce the amount of top-note response and give that "mellow" tone which is favoured by so many listeners.

Automatic Record Changing

The mechanism to hold the records may be adjusted to take 10in. or 12in. records, and a large knob at the rear of the turntable is suitably engraved for this purpose. The records are held in a pile (eight records) over the turntable, and the spindle is specially extended to accommodate this number. When the control is adjusted to provide automatic playing, the elaborate mechanism which is installed permits the first record to drop to the turntable (a distance of only a few inches), lowers the needle to the surface of the record, and when the end of the track has been reached, the pick-up is raised, carried back to the outside of the turntable, and the second record descends on to the first. The pick-up then comes to the first groove, the needle is lowered, and the second record is played. A slight interval must, of course, elapse between each record, so that it cannot be used for non-stop dancing, but with the apparatus as adjusted, the total playing time is half-an-hour or so, which provides a splendid dance programme for the home, and which may be extended by using 12in. records. The reproduction is, of course, remarkably good, and the response is splendidly balanced. No trace of boom can be heard, and the tone adjuster enables the records to be played without undue surface noise. One interesting feature of the H.M.V. pick-up is, of course, that owing to its freedom it gives off almost as much sound as the ordinary acoustic gramophone, and this is held by many to be a fault. Naturally, where the needle is arranged to have perfect freedom to follow faithfully the sound track on the record, it must in itself act as a small "sound-box," and this is a sign that it is of good design, not bad. However, the makers of this Autoradiogram have taken steps to avoid any unpleasant effects from this source, and to this end the entire lid is lined with felt. Furthermore, a notice is printed on the rear of the lid (inside) instructing the user to close the lid whilst playing records, and under these conditions no trace of needle chatter can be heard even when the volume is reduced to such a level that it offers no entertainment value.

Price

It might be expected that an elaborate piece of apparatus such as this would cost a fabulous sum, but actually it may be obtained, for either A.C. or D.C., for only 55 guineas, which, when it is remembered that the apparatus is scientifically balanced, is a very small sum indeed. There was a time when such a receiver could not be purchased for four times this amount, and it is therefore a real step towards better musical reproduction, which is within the reach of everyone.

The BEGINNER'S SUPPLEMENT

THE EASY ROAD TO RADIO

Conducted by F.J. CAMM

Daylight Effect

AN expression used in reference to the difference noticed between the reception of wireless signals during the day as compared with that at night. It is a well-known fact that on the medium and long wavelengths reception after dark is considerably better than in daylight. Reception over the greatest distance is obtained when the whole distance between the transmitter and receiver is in darkness. This accounts for the fact that the most favourable time for reception of American stations in this country is in the small hours. It is then night over the whole distance between the two countries.

Curiously enough, at short wavelengths the daylight effect seems to diminish and it is possible in some cases to communicate over long distances equally well in daytime as at night. However, there are certain peculiarities regarding the daylight effect at short waves, such as a kind of reversal of the effect at certain distances. For example, a station will become inaudible when darkness falls, but will be easily picked up hundreds of miles farther away. Also, effects are different at 20 metres to what they are at 45 metres, and vary still again on the ultra-short waves.

D.C.

Abbreviation for *direct current*.

D.C.C.

This means *Double Cotton Covered* and refers to a well-known type of insulated copper wire. The bare wire is covered in two layers of cotton thread, the first being wound in one direction round the wire and the second in the opposite direction. When used in a dry atmosphere cotton-covered wire has very good insulating properties and is quite suitable for winding wireless coils. If the atmosphere is damp, however, the cotton absorbs moisture from the air and loses its good insulation to a considerable extent. Under these circumstances the more expensive silk-covered wire is superior. Good enamelled wire is probably better than either.

THE BEGINNER'S A B C OF WIRELESS TERMS
Continued from page 272, May 6th issue.

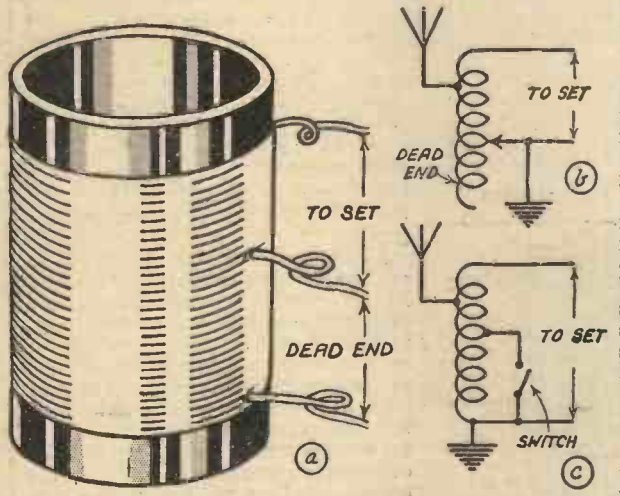


Fig. 1.—(a) and (b) show the meaning of "dead end," while (c) shows a method of overcoming the effect.

Dead Beat

This term is used in reference to certain measuring instruments in which the pointer or indicating needle comes to rest very quickly. This desirable feature is obtained by what is known as *damping* (see under that heading) and is to be found in the majority of voltmeters and ammeters used for wireless purposes. Without damping of some sort or other the pointer of the meter would keep on swinging backwards and forwards for a considerable time before taking up its final position. This would be most noticeable with the better-class instrument, as the bearings are here made to be practically frictionless.

Dead-end Effect

In the early days of wireless it was quite common to make one large tuning coil serve the purpose of several. This was done by taking tappings so that when tuning to the lower wavelengths a considerable portion of the coil was just "dead end." The dead end of the coil had a deleterious effect on the efficiency of the portion being used. Unwanted currents were induced in the unused portion due to its close proximity to the rest of the coil. These currents in turn reacted on the active turns and impaired their efficiency. Sometimes matters were improved by short-circuiting the unused turns, but later on it became customary to use plug-in coils. In this case there was no dead-end loss because there was no need to "short" any turns, a separate coil being used for each wave-band.

Nowadays it is usual to provide at least two separate windings on each coil—one for the medium waves and one for the long waves. The dead-end effect is overcome by short-circuiting the long-wave portion with a switch when the medium waves are being received. Fig. 1 shows the difference between dead-end and shorted turns: (*a*) shows a simple coil. If the upper turns only were connected in circuit and the lower end left free, then the lower turns would constitute a dead end. This is also represented diagrammatically at (*b*), while (*c*) shows how the dead end can be eliminated by means of a shorting switch.

Decibel

Unit used in the measurement of the strength of sound. One decibel is the measure of a sound just audible to the human ear.

Decoupling

Every wireless set using valves has to be supplied with high-tension current. This may be derived from a battery or

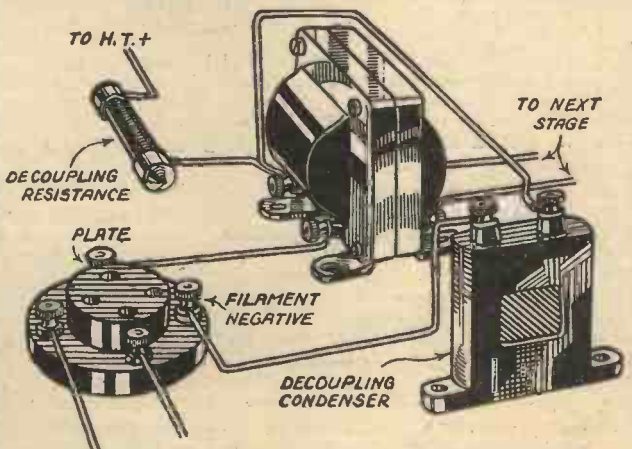


Fig. 2.—How a decoupling condenser and resistance may be fitted in the anode circuit of a valve.

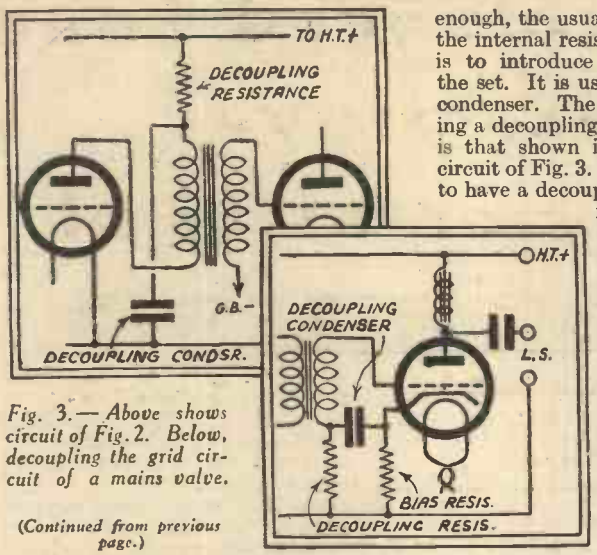


Fig. 3.— Above shows circuit of Fig. 2. Below, decoupling the grid circuit of a mains valve.

(Continued from previous page.)

from the electric light mains, but whatever the source it has a certain resistance. This resistance is usually higher in the case of mains supply than with a battery, although when an H.T. battery gets old its resistance may be very high. The effect of this resistance is often to produce howling in the receiver. It does this because the resistance being common to the anode circuits of all the valves tends to couple them together, so that energy from the later circuits is fed back to the earlier ones. It is perhaps rather difficult to understand this, but the effect is something like that obtained when the earpiece of the telephone is held near the mouthpiece. Anyone who has tried this will know that a horrible howl is produced. What happens is that any little sound made when placing the transmitter and receiver together is magnified by the mouthpiece, and travelling through the system emerges from the earpiece. This being so close to the mouthpiece sends the magnified sound into it so that it goes round again. This keeps on until the sound builds up into a howl. In our wireless set energy from the last valve gets led back to the first one, so that currents are sent through the set. These become magnified in their journey until they arrive at the last valve again, when part of them is once more fed back to the first valve. The result of this "perpetual motion" is to seriously interfere with the legitimate signals and to produce a howl.

Decoupling is, as its name suggests, a means of preventing this. Curiously enough, the usual method used to combat the internal resistance of the H.T. supply is to introduce another resistance into the set. It is used in conjunction with a condenser. The usual method of arranging a decoupling resistance and condenser is that shown in Fig. 2 and the upper circuit of Fig. 3. It is sometimes necessary to have a decoupling device of this nature fitted to every valve in the set. In the lower sketch, in Fig. 3, an example is shown of a decoupling device being used in the grid circuit as well as the anode circuit of a valve. This is because the valve is a mains valve and gets its grid-bias from the same source as its anode current —namely, from the mains. The decoupling used in the anode circuit is provided by a choke and a condenser instead of a resistance and condenser. This is because the valve happens to be the last one in the set and the choke is used to feed the loud-speaker.

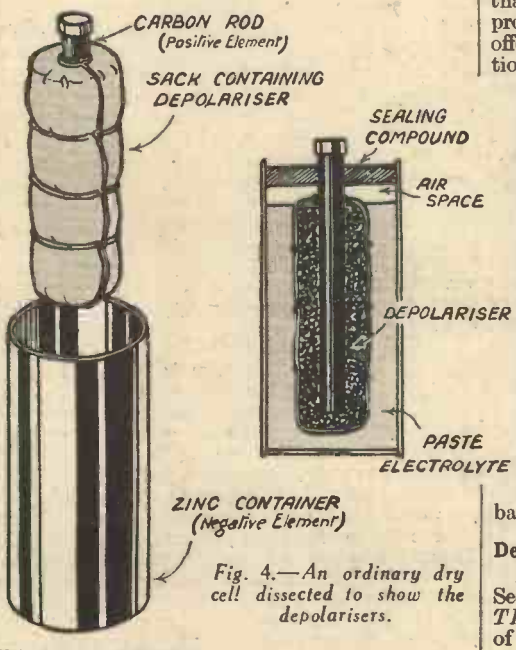


Fig. 4.—An ordinary dry cell dissected to show the depolarisers.

Demodulation

Most wireless sets exhibit to some extent or other a peculiar property. This is noted when a comparatively weak station is broadcasting on a wavelength near that of a powerful one. Owing to the closeness of the wavelengths and the slight flatness of tuning of even the best receivers both stations should be audible at once. However, the powerful station seems to affect the weaker one and to cut it out. This must not be confused with "drowning" it out, since the weak station cannot be heard between pauses in the programme of the other. However, if the other station shuts down, then up will come the weak one! This *demodulation effect*, as it is called, is due to the detector of the receiver. It does not occur with two stations of equal strength, but only when one is much louder than the other.

Depolariser

A substance, usually a chemical, which is used inside a battery to prevent its internal resistance rising as current is taken from it. Nearly all primary cells, unless provided with a depolariser, would only work for a few seconds without the current dropping to practically nothing. This is because such cells function by reason of chemical action. This action commences as soon as the battery is connected up and one of the results is that tiny bubbles of hydrogen gas are produced inside the cell. These bubbles offer a very high resistance or opposition to the passage of the current. To overcome this trouble some substance called the *depolariser* is put in the cell to dissolve or combine with the hydrogen and so remove it as formed.

Fig. 4 shows the construction of one of the cells of an ordinary dry battery. In this type the active elements consist of a centre rod of carbon suspended in a zinc container. The space between is filled with a paste corresponding to the liquid electrolyte of a wet battery. If there were nothing more than this the battery would work well only for a short period because the bubbles of hydrogen would collect all over the carbon rod. This rod is therefore surrounded by a mixture of small chippings of carbon and manganese dioxide. This mixture is the depolariser and is contained in a little cloth bag to keep it in position. See also *CELL*.

Detector

A device for rectifying wireless waves. See also *RECTIFIER, CRYSTAL DETECTOR, VALVE, etc.* Several examples of detectors are shown in Figs. 5 and 6.

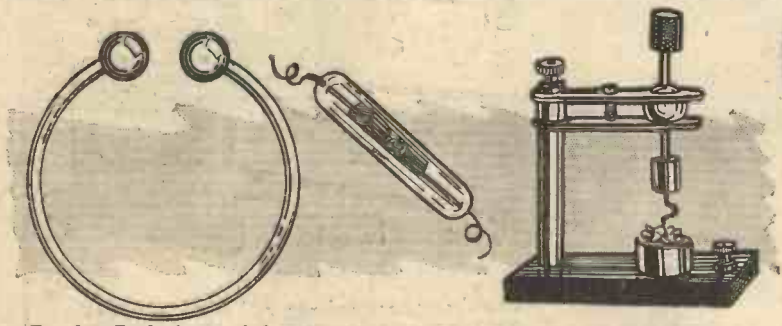


Fig. 5.—Early forms of detector—the cymoscope, coherer, and crystal detector.

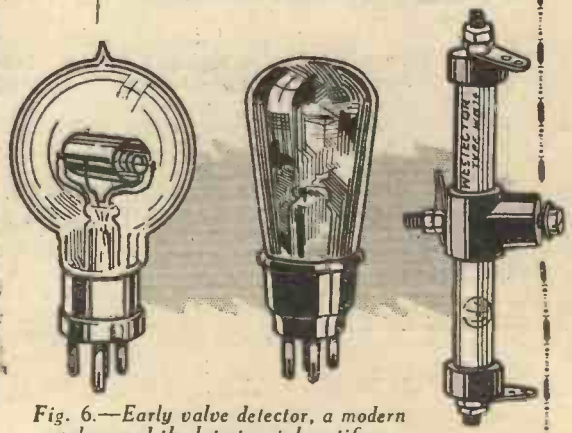


Fig. 6.—Early valve detector, a modern valve, and the latest metal rectifier.

ULTRA SHORT-WAVE RECEPTION

Some Hints for Improving Reception Below 10 Metres.

By ERIC JOHNSON

INTEREST is very rapidly increasing in reception on waves of the order of 10 metres and less. Although the ordinary type of short-wave receiver can give a very good performance on these high frequencies, nevertheless, better and more reliable working can be guaranteed if the set be designed with this special end in view.

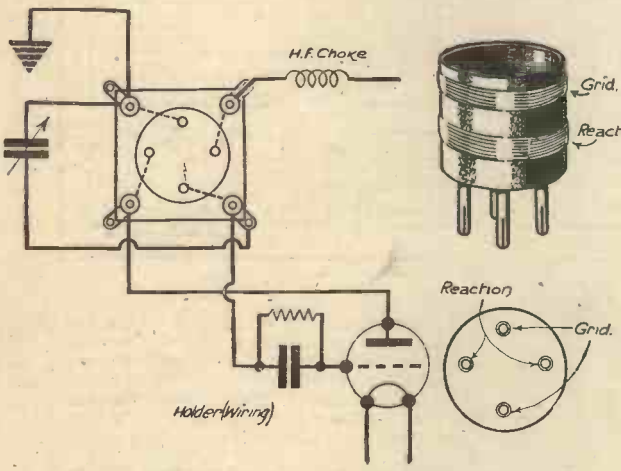


Fig. 1.—A valve base used as a short-wave coil former.

One would not expect the ordinary broadcast receiver to function as satisfactorily on, say, 30 metres as 300 metres; firstly, the tuning condenser would be hopelessly large, and doubtlessly other components would not have the optimum values; secondly, probably only the average amount of care would have been expended on layout and general construction. In the same way reception on 5 metres is vastly different from reception on 50 metres. As much extra care will be needed here as in the first example.

Careful Layout Necessary

It is quite superfluous to point out that only the most careful layout and meticulous construction will achieve reliability. As in all short-wave receivers the L.F. department may be trusted to look after itself, so long as the average amount of trouble is taken; the detector stage is the all-important one. In the first case the tuning condensers must be of a reasonable size. Anything larger than .00005 mfd. is ridiculous, and, in fact, the latter size makes for difficult tuning unless a really good high-ratio slow-motion dial be used. An excellent tuning condenser may be made from the old multi-plate neutralising condensers. All except two plates should be removed, and for really easy tuning these may be double spaced. Generally, these condensers are fitted with some form of extension handle, which is all to the good. Most are without pigtail connections, however, and this deficiency should be remedied before fitting in the set. The coil problem is an important one. It has been the practice until quite recently to make these of bare, spaced wire of fairly large diameter. As a consequence, it was found that it was extremely difficult to coax the set down to 10 metres even, the reason being that one found oneself trying to work on fractions of a turn of wire. Under these conditions obtaining sufficient feed-back for reaction was something of a problem. As the success of all short-wave sets hinges on this, the ordinary amateur did not progress far. It was then that the amateur transmitting fraternity popularised the valve-base coil. These are constructed of quite thin d.c.c. wire wound around the base, the ends being brought through suitable holes and soldered to the valve legs. Although this seemed to violate all good principles of short-wave reception, the results surpassed anticipation. Owing to the small diameter, coils of a comparatively large number of turns could be made having the same inductance as one or two turns of the customary large size. Reaction coupling was simplified, and the receiver went much lower down in wavelength; furthermore, the external field was reduced, another favourable point. The ordinary valve-holder of the low capacity type is, of course, used as a coil-holder.

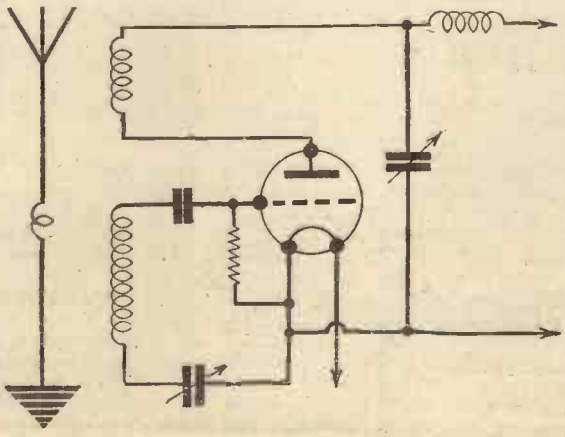


Fig. 2.—An alternative position for the tuning condenser.

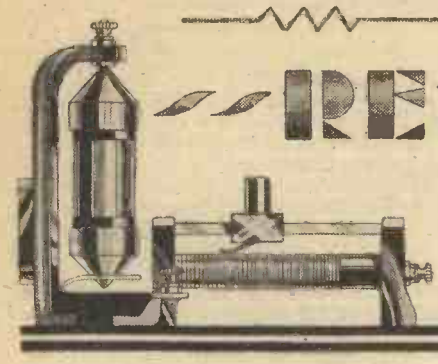
Making S.W. Coils

A word or two about the actual construction of these coils. The general idea may be gleaned from Fig. 1. Most listeners have a few discarded valves in the junk box. The actual glass envelope may be removed by immersion in hot water or methylated spirit, when the fixative will dissolve allowing the glass to be pulled away from the case. By holding the latter in a small vice holes may be drilled adjacent to each valve leg. After winding on the requisite number of turns for reaction and grid coils the wire ends should be passed through the holes and soldered to the appropriate legs. Incidental and stray capacities in short-wave receivers play such an important part in determining the wavelength, that it is useless to give anything more than approximate sizes. However, it is best to start off with about six turns on the grid coil which should land one well down in the "'teens," and gradually remove turns until the wavelength is reduced to the required point.

Series Tuning

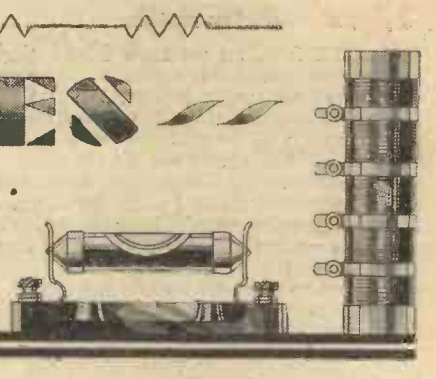
Although the tuning condenser is generally connected in parallel with the tuning coil, series tuning is by no means uncommon in ultra-short-wave sets. The circuit is shown in Fig. 2. Even when the condenser is at its maximum the total capacity across the tuning coil is always less than the incidental circuit capacity. As a result, it is possible to go down to a very low wavelength. One disadvantage, which is quite important at high frequencies, is that the grid-leak has to be returned direct to L.T. positive; its self-capacity is, therefore, added to that of the valve, which we have already probably endeavoured to reduce by employing a skeleton valve-holder. When connected across the grid condenser its capacity is added to the latter, but being such a minute proportion of the whole it has no appreciable effect; with the valve, however, it may well be compared with the grid-filament capacity.

One final word about aerial coupling. Although coupling through a very small capacity to the tuning coil is very efficient and convenient, it must be remembered that the effect will be perhaps seriously to increase the minimum wavelength of the receiver, this being by reason of transference of a part, small it is true, of the aerial capacity. In that case, therefore, it may repay to experiment with a one turn aperiodic coil as in the diagram, *very* loosely coupled.



RESISTANCES

WHY AND HOW · THEY ARE USED.



By W. B. RICHARDSON.

Part II: Resistances in a Mains Receiver

IT is in the modern all-mains type of receiver that the greatest use is made of both fixed and variable resistances.

A glance at Fig. 1 reveals no less than ten different resistances in a three-valver of quite modest pretensions. There would, of course, be proportionately more in a four or five-valver. However, the three-valver will serve to furnish us with at least one example of most of the uses to which resistances are likely to be called in present-day receivers of the A.C. mains type.

For the purposes of this article I shall deal one by one with the resistances shown in the circuit diagram, Fig. 1. This circuit, with one or two slight modifications, is an A.C. version of the battery circuit given in Part 1. Naturally, any resistances which are identical in function with those in the battery circuit will be dealt with as summarily as possible, while those which are necessitated purely owing to the mains operation will receive most attention.

Before examining the resistances themselves it is just as well to remind ourselves of the value of the voltages which are handled in a set of this description. Instead of a mere 120 or 160 volts H.T., as is used in the average battery set, the mains receiver shown here employs a maximum voltage of 350. This is obtained by stepping up the voltage of the mains by means of a transformer.

Voltage Dropping and Decoupling

Now let us take the various resistances in numerical order. The first one, R1, serves two purposes. Primarily it is a voltage-dropping resistance, that is, it is used to reduce the voltage applied to anode of the screen-grid valve to a value which it will stand without harm. Its secondary use is for decoupling purposes. Consider first its function as a voltage-reducer. The H.T. voltage available after smoothing is about 250 volts, and the particular variable-mu valve shown requires a voltage of no more than 200. We, therefore, have to drop 50 volts. To arrive at the correct value for R1 to give this drop, we look up the anode current of the valve from the pamphlet issued by the makers. In this case this is nearly 8 milliamps. We know from Ohm's Law that resistance equals voltage divided by current $\left(R=\frac{E}{C}\right)$, therefore the resistance required equals $\frac{50}{.008}$=6,250 ohms, say, 6,000 ohms as a round figure.

For its decoupling function R1 is supplemented by the condenser C1. As R1 is of a fairly high value the condenser need be no larger than .01 mfd.

Before going further, I want you to understand that the values of the resistances I am giving here, although a useful guide to those employed in the average mains set are not hard and fast. Obviously, in a receiver employing a different circuit from the one shown here, and more particularly other valves the values might work out quite differently. However, my object is not to give values to suit all cases, but rather to explain to you the function of the various resistances and show how their values are arrived at.

After R1 we come to a network of resistances, R2, R3, R4, and R5. They certainly look rather formidable, but if we realise right away that they have only two main functions to perform between them their arrangement will not appear so complicated. The first function is to supply variable bias to the variable-mu valve, and the second is to give a suitable voltage to the screen of the same valve. The resistances looking after the bias are R2 and R3, while R4 and R5 are the chief controllers of the screen voltage.

For an understanding of the working of R2 and R3 we must know how grid-bias is applied in an all-mains set.

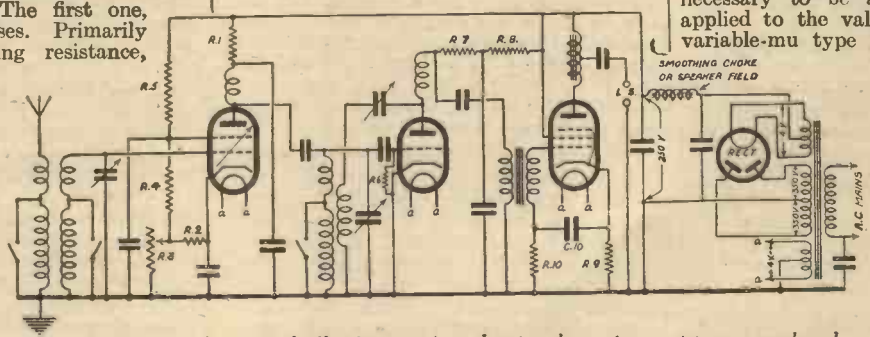


Fig. 1.—Circuit of a typical all-mains receiver showing the various resistances employed. The text deals with the function and value of each.

Getting Grid Bias from the H.T.

The most obvious way of making the grid of a valve negative in respect to its filament is to connect a battery (known as a grid bias battery) between the two. This is shown in Fig. 2, and is the method employed in a battery set. In this example a 4½-volt battery is shown.

Now there are two ways of looking at this biasing business—you can either take the filament as the zero point and say the grid is 4½ volts *negative* to it, or you may consider the grid as the starting-off point and say the filament is 4½ volts *positive* to the grid. With mains valves the *cathode* corresponds to the filament of a battery valve. The filament in a mains valve is merely used to heat the cathode. It is the latter which is the "business" element and gives off the electrons. Well, then to make the cathode *positive* in respect of the grid is the same thing as making the grid *negative* to the cathode. Now look at Fig. 3. Here you will see how a resistance R2 is used to obtain bias from the high-tension supply. The plate of the valve being connected to H.T. positive is at a high positive potential in respect to the grid, which is connected to H.T. Let us say for the sake of argument the difference is 100 volts. This drop in voltage will occur across the internal resistance of the valve denoted by the dotted resistance R1. If, however, a resistance R2 is included in series with R1, then the drop will be divided between them. Thus, for example, if R2 is the same value as R1 there would be 50 volts dropped across each. In other words, we should be getting 50 volts H.T. and 50 volts grid bias from the supply. If R2 were smaller than R1, then the voltage dropped across it would be proportionately smaller than that across R1. In practice, of course, R2 is made just sufficiently large to give the necessary few volts required for bias.

In the case under consideration it is necessary to be able to vary the bias applied to the valve, since this is of the variable-mu type in which the variation of bias forms the volume control of the receiver. To arrange this the two resistances R2 and R3 in Fig. 1, are used in place of the resistance R2 in Fig. 3. R3 is the bias resistor proper which can be varied from zero resistance to a fairly high figure. R2 is included in series with it so that there is always a slight bias even when R3 is at zero. This is necessary because the valve is designed to work with a small minimum bias.

Bias Resistor Values

Now as to the value of R2 and R3. The usual way to calculate these is to ascertain the current flowing through them. This divided into the bias voltage required gives the necessary resistance. It is simply a further application of Ohm's Law.

(*Continued overleaf.*)

(Continued from previous page.)

Taking R2 first, we see from Fig. 1 that it has the combined anode and screen currents of the valve flowing through it. The valve makers state that the maximum anode voltage of 200 (at which we are running the valve) the anode current is 8 milliamps. To this must be added the screen current of about 1 milliamp at optimum screen volts. Again, from the maker's pamphlet we find that the normal grid bias required by the valve is 1.5 volts. R2 will therefore have to be of such a value to provide this minimum bias when R3 is at zero. We can calculate this value from Ohm's Law thus:

$$R = \frac{E}{C} = \frac{1.5 \times 1,000}{9} = 166.6 \text{ ohms.}$$

The nearest obtainable value to this would be 150 ohms, although a 200 ohms resistance would perhaps be better in the interests of stability.

The value of R3 depends on what degree of volume control is desired. To give a fair range requires a variation of bias between 0 and about 40 volts; therefore to obtain this the resistance must drop 40 volts when "all in." The calculation is the same as for R2, namely, voltage required divided by current passed. However, in this case the current is more than that passing through the valve. There is also that passed by the screen potentiometer composed of R4 and R5. This latter is about 3 milliamps, so that the total current passing through R3 is about 9 mA. plus 3 mA. = 12 milliamps. To give a voltage drop of 40 the value of R3 must therefore be $40 \div .012 = 3333.3$ ohms. A suitable value would be 4,000 ohms.

Before dismissing R2 and R3 I must just say a word about their wattage dissipation. I think it is fairly obvious that R2 will not be overloaded even if of the smallest rating since it is not a very high resistance. Let us see how it works out. We know that wattage equals voltage multiplied by amperage, thus the wattage required for R2 is $\frac{1.5 \times 9}{1000} = .0135$ watts. Quite a modest dissipation and well within the capacity of the average metallized or spaghetti type of resistance. The wattage of R3 is worked out in a similar manner. The voltage in this case is 40, and the current 12 milliamps thus the power dissipation is $\frac{40 \times 12}{1000} = .48$ watts. Thus the average wire-wound potentiometer or volume control would be quite suitable, in fact most such components will stand 5 watts.

Now as regards the voltage on the screen of V1. This is regulated by the resistances R4 and R5 together with some part of R3 (the actual amount depending on the position of the slider). These three, as you see, form a potentiometer across the full H.T. supply.

The screen of the valve takes its voltage from the junction of R4 and R5. Naturally, the voltage applied to the screen will depend on the ratio of R5 to R4 and R3 together. If R5 is large compared with the other two, then most of the 200 volts from the H.T. supply will be dropped across it and the voltage on the screen will be low. If, on the other hand R4 and R3 together form a higher resistance than R5 then the greater drop will be across these and so the potential on the screen will be higher.

Actually there are three things which govern the values of R4 and R5. Firstly, there is the voltage required by the screen; secondly, the current it takes; and, thirdly, the amount of current which must pass

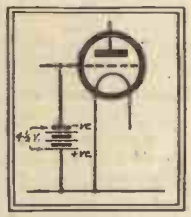


Fig. 2.—How grid bias is obtained in a battery set.

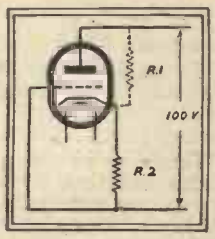


Fig. 3.—Showing how, in a mains set, the grid bias battery is replaced by a resistance.

through the resistances themselves. This last must be fairly large compared with the current taken by the screen in order to obtain a sufficiently steady voltage. It should be at least three times the screen current. In this case, therefore, the minimum figure is three amps.

In determining the values of R4 and R5 we shall ignore R3 for the moment by assuming it is set at zero. The correct voltage for the particular variable-mu valve we are using is 80 volts therefore to pass 3 milliamps at 80 volts R4 must be about 27,000 ohms. The nearest standard resistance to this is 25,000 ohms. Assuming we use this then it will pass $\frac{80}{25,000} = 3.2$ milliamps. Now, this current plus the screen current of 1 milliamp will have to flow through R5. To determine R5 we have to divide the voltage it has to drop, namely 250 less 80, by the current it has to pass, thus: $170 \div \frac{(3.2 + 1)}{1,000} =$ just over 40,000 ohms. A resistance of 40,000 ohms would therefore be used.

The reason for connecting the lower end of R4 to the slider of R3 instead of direct to H.T. may appear rather strange, especially as it amounts to the same thing when the volume control is set at zero. However, it is done to compensate for the drop in screen volts which naturally follows an increase in grid bias. For efficient working the voltage on the screen of a variable-mu valve must remain nearly constant whatever the position of the volume control.

As we have already seen, the grid-bias volts are obtained by taking them from the H.T. voltage. This deduction does not matter so much in the case of the plate voltage, but cannot be tolerated in the case of the screen voltage. Of course, a small proportionate reduction is quite in order but the connecting of R4 to H.T. would give the same reduction in screen volts as in plate volts, namely, 1 volt for each volt increase in bias. How the joining of R4 to the slider of R3 improves matters may be explained by the fact that R3 is in series with R4 and R5 across the full H.T. supply; therefore an increase in R3 from zero upwards means an increase in the proportion of the voltage dropped across R3 and R4 together, as compared with that dropped across R5. Since the voltage on the screen is dependent on the ratio of R3, R4 to R5 an increase in R3, R4 will give an increase in screen volts. This increase will partially compensate for the loss due to grid bias.

The next resistance in the set is the grid leak R6. A suitable value is ½ megohm. R7 is the feed resistance to the L.F. transformer and its value must be decided by the make and type of transformer employed. A usual figure is 30,000 ohms.

Resistance R8 is a decoupling resistance. Its value should be about the same as that of the corresponding resistance in the battery set described last week, namely, 20,000 or 30,000 ohms. Regarding the wattage of R7 and R8 one-watt types would be large enough since the anode current of the detector valve is only about 3 milliamps.

R9 is the grid bias resistor for the output valve. The grid bias required by this particular valve at 250 volts on the plate is 9 volts while the anode current is 30 milliamps, therefore, since the resistance has to pass 30 milliamps (the anode current passes through the bias resistor, of course) and gives a voltage drop of 9 volts its value must be:—$9 \div \frac{30}{1000} = 300$ ohms. 300 ohms, therefore, is the value chosen. As regards its current carrying capacity the use of a ½ watt type would provide an ample margin of safety. The actual wattage dissipation of R9 is clearly $\frac{30 \times 9}{1000} = .27$ watts.

The last resistance in our set is R10. This is used for decoupling purposes in conjunction with C10. Its object is to prevent any hum or ripple picked up by the bias resistance from manifesting itself on the grid of the pentode. A suitable value for the resistance is 50,000 ohms while the condenser should be about 1 or 2 mfd. As there is practically no current passing through R10 the question of wattage does not arise so a resistance of the lowest rating will suffice.

ROUND THE WORLD OF WIRELESS

(Continued from page 286.)

Buenos Aires Calling

TEST transmissions from the new "Radio Excelsior" broadcasting station at Buenos Aires, which has just been completed, have recently been received in England. The wavelength of the station is 361 metres and the power 20 kilowatts (unmodulated aerial carrier energy). The test programme, consisting of announcements in English and other languages, military and dance band items, English sea songs, and a pot-pourri of Irish songs, was clearly heard, particularly before sunrise, a frame aerial being used when atmospherics became troublesome and an ordinary "open" aerial at other times. The transmitter for the new "Radio Excelsior" station was designed and constructed in England, at the Marconi Works, Chelmsford, to replace an earlier installation of comparatively low power. Its modern features include low-power modulation, crystal frequency control, and careful provision for a frequency response substantially flat between 30 and 10,000 cycles, ensuring first-class quality of reproduction.

"Radio Excelsior" has one of the highest broadcasting aerials in the world, the horizontal aerial being suspended between two towers 700 ft. in height.

MOVIE MYSTERIES EXPLAINED

THE May issue of "Home Movies and Home Talkies" contains two pages of fascinating pictures showing how professional effects are obtained in the big Studios.

OTHER CONTENTS

Are you thinking of having a Cruising Holiday this year? If so, you should make a point of reading Adrian Brunel's article, "How to Take YOUR CRUISE FILM." Another illustrated article of special interest at this time of the year is "Making Movies at the Zoo"—that paradise of picture-makers. Also further information on Home Talkies, and particulars of TWO PRIZES of £10 and TWO of £5 offered to readers.

Obtainable at all Newsagents, Bookstalls and Dealers, or post free 7½d. (Subscription rates: Inland and Abroad 7s. 6d. per annum. Canada 7s. per annum) from George Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.

Geo. Newnes, Ltd.

WHY PAY EXORBITANT PRICES FOR VALVES?

Turn to page 244 of your "Practical Wireless" dated April 29th, and read what the Technical Staff of this journal say about BRITISH 362 VALVES. These wonderful valves bring you better radio at lower prices, and, despite the huge demand, we can give you DELIVERY BY RETURN OF POST.

SEND DIRECT TO THE MAKERS FOR

BRITISH 362 VALVES

THE NEW CLASS "B"

This new valve gives Mains Volume from a Battery Set at Negligible Current Drain. Immediate delivery with full instructions. 7-pin base as illustrated, or side terminal.

9/-

POST FREE

If you also require a "driver" valve, send for the British 362 Power Valve.

Compare the prices of British 362 Valves. They are FULLY GUARANTEED to have as high, or higher, characteristics as any valve (British or foreign). They are equal to any and better than most. Non-microphonic. Buying direct by post from the makers SAVES YOU 50%. Post your order to-day. Immediate delivery of all types.

R.C., H.F. L.F. & DETEC.	POWER	SUPER POWER	SCREENED-GRID or VAR-MU.	PENTODE TYPE
3/6	4/-	4/6	7/6	10/-

All Post Free. In 2v., 4v., or 6v. Metallised 3d. extra.

If valves of a certain make have been specified for your Set, send the name and type with your order and we will send you 362 Valves of similar characteristics. Cash with order. Cheques and P.O.'s must be crossed and made payable to :—

The 362 RADIO VALVE Co., Ltd. (Dept. W.8), 415, Mare St., Hackney, London, E.8.

Utility

For the wonderful little portable described in this week's issue the designer specifies two Utility Bakelite Condensers. Utility Bakelite Condensers are the finest of their type, they occupy a minimum of space and are accurately rated to the capacities stated.

From your dealer or post free from the makers.

WILKINS & WRIGHT LIMITED

Utility Works, Hollyhead Road, Birmingham

London Agent:

E. R. Morton, Ltd., 22, Bartlett's Buildings, Holborn Circus, E.C.4

TUNES THE "FEATHER-WEIGHT" PORTABLE

★

Utility W297 Bakelite Condensers, complete with knob - - - 2/- EACH

The Motor Cyclist's Enquire Within.

THIS is the only Reference Year Book covering every phase of Motor Cycling. Contains complete and comprehensive information with practical illustrations relating to all makes of machines and accessories, facts and figures regarding competitions, records, clubs, legal matters, overhauling and repairing, tuning, classified buyers' guide, etc.

The Motor Cyclist's Reference Year Book

Edited by F. J. CAMM.

1932—1933 EDITION

Obtainable at all Newsagents and Bookstalls, or post free 1/2 from George Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. **1/-**

Read this

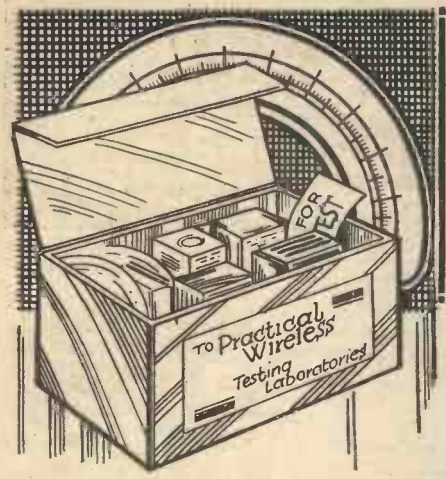
QUALITY Produces EFFICIENCY

TESTED BEFORE DESPATCH

The original BECOL ebonite low loss formers are thoroughly reliable. They are used in all parts of the world. Look for the BECOL trade mark. Ask your dealer. If unable to supply, write direct. SEND NOW, enclosing 6d. (post free) for up-to-date handbook of tuning coils for DUAL RANGE, BAND-PASS, and SUPER-HET. circuits. Fully illustrated with data. A very interesting handbook.

RODS, SHEET, TUBES, PANELS

The BRITISH EBONITE Co., Ltd., Hanwell, London, W.7.



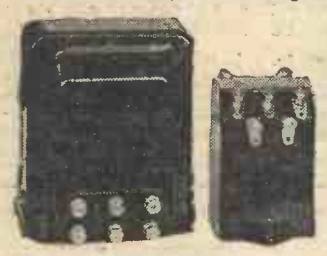
Facts and Figures

Components Tested in our Laboratory

BY THE PRACTICAL WIRELESS TECHNICAL STAFF

VARLEY CLASS B COMPONENTS

THE two transformers illustrated below are the new Class B couplers produced by Messrs. Varley, Ltd. On the left is the type DP.42 Output Choke, which is designed to couple any type of Class B valve to practically any existing type of loud-speaker having a high resistance. The inductance is 10 henries per half primary at the maximum current of 33 mA. The D.C. resistance is only 350 ohms, so that there is no serious voltage drop. The choke is tapped to provide three separate ratios, 1.5 to 1, 2 to 1, and 2.5 to 1. It is a most substantial component weighing very nearly 2lbs., and it gives splendid results. It costs 16s. 6d., including royalty. The smaller component is the Driver Transformer, and this weighs only 9ozs. It is designed to couple the Cossor or the Mullard type of Class B valve, and therefore has two sets of secondary terminals. The ratio provided on one set is 1 to 1, and on the other 1.5 to 1. The primary has an inductance of approximately 30 henries, and is designed to carry a current not exceeding 6 mA. The resistance of each half of the secondary is 100 ohms on the 1.5 to 1 ratio, and 150 ohms on the 1 to 1 ratio. The price of this transformer is 15s., inclusive of royalty.



Varley Class B transformer and output choke

LISSEN CLASS B HYPERNIK TRANSFORMER

TO the already extensive range of Lissen transformers, the Class B Driver, illustrated below, has now been added. This is a splendidly-designed component, and has the following electrical characteristics. The primary inductance is approximately 25 henries, and is designed to carry a maximum D.C. of 5 mA. The resistance of the primary is 500 ohms, so that the voltage drop at maximum current is only 2.5 volts. The secondary has a total resistance of approximately 400 ohms, giving a ratio of roughly 1 to 1. It is thus suitable for the Class B valves which are at present on the market, and no doubt a further model will become available when the new types of Class B valve make their appearance. For coupling the loud-speaker to the Class B valves the Lissen Centre-Tapped Output Feed Choke should be used. This has already been reported on under the heading of quiescent push-pull components, and the correct load is obtained with this particular component.

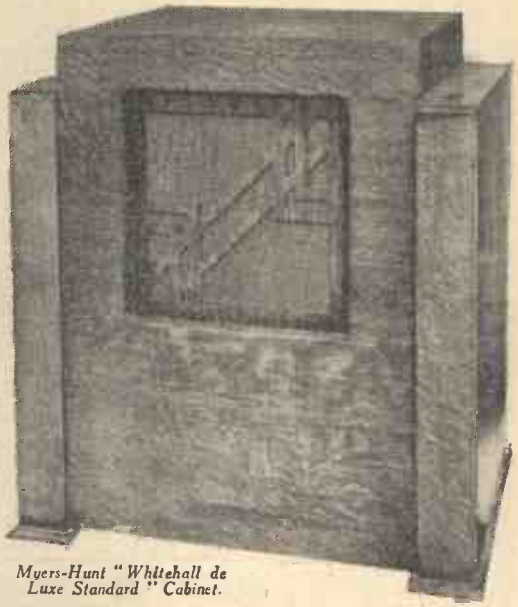
Lissen Hypernik Class B transformer.

RADIOPHONE SCREENED DOWN-LEAD

THE manufacturers of the British Radiophone condensers are now entering the market with other components, and one of the first additions to their range is a screened down-lead which is of most use in areas where what is known as "man-made static" is troublesome. As has already been stated in our pages, trolley-buses, flashing signs, and other such apparatus give rise to cracklings and other distressing noises in the loud-speaker, and in many cases completely prevents distant reception. It has been found that screening the leading-in wire assists greatly in reducing this form of interference, and the particular lead supplied by Messrs. The British Radiophone, Ltd., is made up from three rubber tubes of small diameter held inside a larger tube. This results in a solid rubber tube, having three equal-sized air channels running through its length. At the centre, the lead-in wire is held between the three tubes, and it is thus air-spaced. The exterior of the outer tube is covered with plaited wire, and this is joined at the end to a substantial wire for earthing purposes. It has been tested in some very severe cases and found to operate most effectively. In the PRACTICAL WIRELESS laboratory, a receiver was connected to the normal aerial and a large electric motor connected to the lathe was switched on. The noise from the speaker prevented the reception of even the London station, but when the screened lead was used, and the screening earthed, the noise from the motor was reduced to such a value that the programme could comfortably be listened to. In the case of outside interference the reduction is in most cases complete, and the strength of distant stations is not appreciably affected. The cost of this lead is 9d. per foot, and it will be found invaluable in areas where outside disturbances are severe.

"WHITEHALL" CABINET

A MOST attractive cabinet is illustrated on the right, and is a product of the Myers-Hunt Cabinet Co. Usually, the cabinets which are obtainable for the home-constructor are built to have a most pleasing appearance, but the requirements of a cabinet (from the radio point of view) are too often overlooked. In this case, however, the cabinet appears to have been designed with all its requirements in view. Firstly, the accommodation is ample for the ordinary home receiver *and* the loud-speaker. A shelf may easily be fitted to accommodate the batteries in the case of a battery-operated receiver. There is ample room for the 9in. type of speaker, and to enable this to occupy a good position at the rear without unduly increasing the size of the cabinet the simple "stepped" arrangement of the cabinet has been employed. This also adds to the appearance. The material from which the cabinet is made is not ply-wood, but most substantial oak, and in the cabinet illustrated this is ¾in. thick. The result of this, combined with the shape of the cabinet, is that resonance is avoided, and the reproduction is particularly pleasing and free from boom. The finish of the cabinet is very fine, and the workmanship is of a high order. In solid-figured oak, this cabinet costs 30s., and in walnut, 40s. The inside measurements are 16in. wide, 11in. deep, and 17½in. high.



Myers-Hunt "Whitehall de Luxe Standard" Cabinet.

LONG THROAT SWITCHES

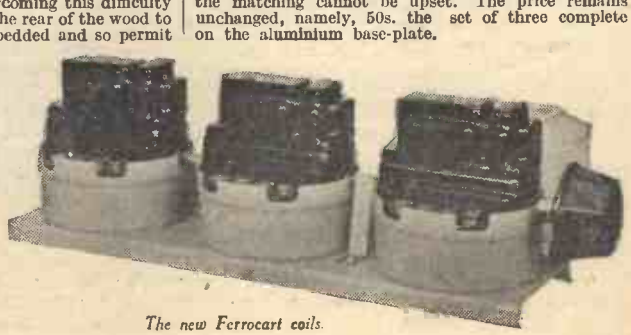
WHEN constructing a radio-gramophone it is often found necessary to mount one of the small Q.M.B. switches on the cabinet side, or on the motor board. When the cabinet has been designed on sound lines, the wood is often round about half an inch in thickness. Consequently, it is found extremely difficult to screw on the nut which holds the switch in place, owing to the shortness of the threaded portion of the switch. One way of overcoming this difficulty is to cut away a square piece at the rear of the wood to allow the switch to become embedded and so permit at least two turns to project. This is difficult and makes the attachment of the connection wires difficult. For such cases the Claude Lyons Long Throat Switch will be found particularly suitable. It is exactly the same as the standard Q.M.B. switch, except that the threaded portion—or throat—is nearly an inch long. It may thus be secured to the thickest cabinet or panel with ease and requires only the drilling of a three-eighths hole. It is supplied in a 3-amp., 250 volt rating, and costs only 1s. 9d.

BURNE-JONES SLOW-MOTION DIAL

A NEW Magnum product has come to hand in the form of a neat slow-motion dial. It can be used for either panel mounting, may be secured to a baseboard, or attached to the frame of a single or ganged condenser. A steel frame carries the whole assembly and the scale is mounted on a robust bush which will accommodate spindles up to ¼in. in diameter. A small steel grub screw serves to lock bush in position. A special slotted plate is fitted to anchor the fixed vanes of the condenser, and the drive is of the smooth, non-slipping type, having the spindle supported at both front and rear. A taper bearing obviates undesired movement. The escutcheon is of distinctive design, and an oxydized copper finish is provided. The dial supplied may be obtained calibrated in wavelengths against the standard Magnum Canned Coils, or with a plain scale marked 0/100. A lampholder is fitted to enable rear illumination to be provided. The cost of the complete assembly is 3s.

NEW FERROCART COILS

MESSRS. COLVERN, LTD. have submitted new models of the famous Ferrocart coil. The electrical characteristics remain unchanged, but in view of the awkward handling that might be given to these coils, not only in transit, but also by curious purchasers of the coils, it has been found desirable to completely enclose the coil in a moulding, as may be seen in the illustration In this way, no damage can be done to the coil, and the matching cannot be upset. The price remains unchanged, namely, 50s. the set of three complete on the aluminium base-plate.



The new Ferrocart coils.

IMPRESSIONS ON THE WAX

A REVIEW OF THE LATEST DISCS

By E. REID WARR

Recordings from the Programmes

Here are the best recorded versions of some recently broadcast items. The pieces have been carefully selected to give at least one to suit every individual taste.

Very English Music

Every composer's work bears traces of his nationality, and it would be difficult to find any music more typical of England than Eric Coates'. There was a programme of music a few weeks ago, and amongst the items was the suite *From Meadow to Mayfair*. Here is simple music which never bores one. There is a fine recording, done a few months ago. The two records are played by the London Symphony Orchestra on *H.M.V. C*2448-9 *at* 4*s. each.*

One for the Kiddies

Did you hear *Alec Shaw, the Scottish Bird Man*, in a Vaudeville hour recently? The hours he has spent with the songsters have given him a most uncanny power of imitating their song. You will find all of his "turn," with its little explanatory remarks, on *Columbia DB*936. This record is a very delightful half-crownsworth.

A Seventeenth Century Gem

One of the loveliest songs you will find in any language is *Plaisir D'Amour*. It was sung by Lucyenne Herval some time ago. There is a marvellous record of it made by Yvonne Printemps on *H.M.V. DB*1625. It is sung to a harpsichord accompaniment, and its plaintive air haunts one for days. Its companion song *Au Claire de la Lune* is extremely good also. It is a six-shilling record, but worth every penny.

Tauber and "The Merry Widow"

The famous *Vilja* (pronounced *Villia*) was sung in an afternoon programme recently. It is one of those songs which always seem welcome. Tauber has sung it, and splendidly, too, on a *Parlophone Odeon R.O.* 20188 (4*s.*). You can imagine that Tauber *would* sing this well!

A Very Tuneful Overture

—That from *Mignon*. Played very creditably by the Northern Studio Orchestra. It contains music of the kind which is called "nice"—"jolly"—pretty." There is an excellent performance of it by the *Orchestre Symphonique of Paris* on *Columbia DX*355 (4*s.*).

And Still Another

Offenbach's Orpheus in the Underworld. this is better than Thomas's "Mignon." A record everybody ought to have is that of the performance by the *Berlin State Opera Orchestra* on *H.M.V. D*1293. This is done in the grand manner with tremendous skill and power.

A "Best Seller" in Songs

Haydn Wood's *Brown Bird Singing* has had a tremendous run. It has been performed in every way imaginable (Reginald Dixon played it on the organ in a recent programme, which recalls the very delightful record *H.M.V. B*6184 (2*s.* 6*d.*), where it is played as a waltz by Ray Noble and the Mayfair Orchestra, and it is very appropriately backed by *Bird Songs at Eventide* in the same style.

A Schubert Song Worth Hearing Again

The *song's* the thing really, although *Am Meer* was played by an orchestra in a recent broadcast. There is a new *Decca Polydor* (*No. DE*7020, 2*s.* 6*d.*), on which the famous German bass, Schlusnus, sings it. He is quite in the front rank, and should be heard. The song on the other side, *By the Weser*, is very good, too. Both are, of course, in German.

An Operatic Star in a Popular Number

They are all doing it nowadays. That oft-played song, *Her Name is Mary* (and a very good little song, too), heard in tea-time music, has been most unaffectedly sung by that very good tenor, Kullman on *Columbia DB*1006 (2*s.* 6*d.*). He forgets that he is an opera star when he sings this—that's why it's so good.

A Spanish Triumph with Shakespeare

Some weeks ago *Should He Upbraid* was sung. It is strange that the most perfect singing of a song so essentially English should be by a Spaniard, but nobody can help but agree after hearing Conchita Supervia sing it on *Parlophone RO*20186 (4*s.*). Inflexion and understanding of Shakespeare's words are perfect, the accent well-nigh so. This record is of the highest possible merit, and Bishop's fine old song has been faithfully dealt with.

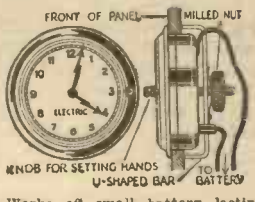
Some New Gems from the Classics

One or two delightful recent issues of Columbia and Parlophone which have just come to hand may be cordially recommended. The first is certain to be enjoyed by everybody—it belongs to that strangely named "popular classical" school. The titles are *Intermezzo—Cavalleria Rusticana* and the *Intermezzo—Pagliacci*. They have been done before, many times, of course, but here are singularly impressive performances by the Milan Symphony Orchestra. You will find these favourites on *Parlophone E*11339 (4s.).

Then to Wagner. The British Symphony Orchestra, under Bruno Walter, have done *Siegfried's Journey to the Rhine* from the *Götterdämmerung* on *Columbia LX*191 (6s). Again, a very luxurious rendering of well-known music.

Gounod and Bizet follow—the popular classic again. I like Charles Kullmann's singing (in English, mark you) of *All Hail, Thou Dwelling* and the *Flower Song—Carmen*, on *Columbia DX*442 (4s.). Both are sung without any tricks, cleanly and

(*Continued on page 314.*)



RADIO RAMBLINGS

By JACE

Jottings from my Notebook

Lectures on Television

A SPECIAL course of four lectures on Television will be given by H. J. Barton-Chapple, Wh.Sch., B.Sc., A.C.G.I., D.I.C., A.M.I.E.E., at The Polytechnic, Regent Street, on Wednesdays, commencing May 10th, 1933, from 6.30 to 8 p.m.

The syllabus for the complete course is as follows :—

May 10th.—Definition. Relationships and differences between television and photo-telegraphy. Analogies. Nature's television system. Importance of visual persistence. Illustration of principles of television.

May 17th.—Photo-electric cells. Spot light and flood light principles of working. Disc and mirror drum transmitters. Distortion at transmitting end.

May 24th.—Synchronizing. Image structure. Picture ratios. Transmission channels. Ultra-short-wave possibilities.

May 31st.—Different types of television receivers. Consideration of wireless receivers for television. Image distortion. General survey of modern practice with suggestions for future developments.

The course is intended for those who have attained a reasonable standard in electrical and high frequency technology.

Automatic Wireless Beacon.

WIRELESS is being used in many novel ways for the guidance of navigators both in the air and on the sea, and an automatic wireless beacon of particular interest is being installed in the Irish lightship *Comet*. The wireless beacon will have an energy in the aerial of 100 watts and will be operated in conjunction with a submarine sound signalling device to enable navigators to ascertain not only their position in respect to the lightship, but also their distance from it. During the transmission periods the wireless beacon will transmit a warning dash, followed by a series of dots at regular intervals. The submarine sound-signalling device will transmit a signal, the beginning of which will be synchronized with the end of the five seconds warning dash of the wireless. Wireless waves travel with the speed of light, and are therefore received practically without time lag by any receiving station within the service area of the beacon, while the sound waves emitted by the submarine signalling device travel through water at the rate of 4,800 feet per second. The signals will be arranged so that the number of dots received by wireless before the reception of the submarine signal will be equal to the number of miles the receiving ship is from the beacon. The navigator will thus be enabled to ascertain his distance from the beacon without computation. The lightship will have a distinctive signal which will be emitted before each transmission. A chain of twenty-three wireless beacons is in operation around the coasts of the British Isles for the safeguarding of shipping, and the Marconi Company have a contract in hand for two new beacons for the Chinese authorities to assist navigation on the important routes to Shanghai and the Yang-tse-Kiang.

New Use for Radio

TALKING of ships reminds me of a novel instrument that I inspected in a large factory devoted to the manufacture of nautical and other instruments for recording purposes. This particular instrument is called an echometer, and is being fitted to vessels in increasing numbers to obviate the need for "swinging the lead" in obtaining soundings as to the depth of water under the ship. Actually the instrument consists of a radio transmitter and receiver which sends out signals from the hull of the vessel and picks up the echo of these signals after it has travelled to the bottom of the sea and back. The difference in time between the sending of the signal and its subsequent reception is measured, and as the speed of wireless waves is known it is a fairly simple matter to calculate the distance the bottom of the ship is from the ocean bed.

What Will the Show Reveal?

THIS year's Radio Exhibition at Olympia, takes place from August 15th to August 24th. What with set manufacturers introducing new models in March, and the makers of accessories giving us new coils, valves and the "cold" detector so early in the year, I almost feel like asking if there *can* be any more new things in so short a time. In the way of components, I must confess that I can only think of permeability-tuning coils. As regards complete receivers, I imagine that we shall find that all the better quality ones are fitted with automatic-volume control, some system of automatic tone compensation and, in the case of battery sets, with either Class "B" or "Q.P.-P." output. But we must wait and see.

Parasitic Oscillation

A CURIOUS difficulty one sometimes meets when trying out a new set is that caused by what is referred to as parasitic oscillation. It is due to some part of the set oscillating at quite a different wavelength to that which the set is actually tuned to. Parasitic oscillation generally makes itself known by the fact that reaction control is not so effective as one would expect. When the knob is rotated, signal strength is not increased as it should be, and at a certain point a "click" is heard denoting that oscillation has actually set in. Despite this, no carrier-wave "howl" is heard and signal strength is generally poor. In other instances the effect of parasitic oscillation is merely to render the receiver completely "dead" so that reception is impossible. Oscillation, in the latter case, can be detected by the usual method of touching the detector-grid terminal with a moistened finger; a loud "double-plop" is a sure sign of oscillation.

When trouble of the kind referred to is experienced, it can generally be traced to long wires in the grid or anode circuits which are interacting to produce oscillation at the "wavelength" of one of the wires. Another frequent cause of parasitic oscillation, especially on long waves, is the use of a tapped coil in the tuned-grid circuit following an S.G. valve; oscillation then occurs at the wavelength of that portion of the coil "above" the tapping. The most certain cure is to dispense with the tapping and make connection to the ends of the coil only. Sometimes it can be prevented, however, by inserting a 100 ohm resistance between the detector anode and the reaction condenser.

One-knob Control

I HAVE often wondered if the old hand at radio really views with approval the modern fetish for "one-knob" control. I know I myself have no great love for it, even though I am not blind to the very obvious advantages it possesses for inexperienced "knob-twiddlers," but I think the experienced man has a tinge of regret at the passing of the sets with a large number of controls. Tuning to-day is so elementary, and with the improvements in "ganging" it has become so simple a matter, that the radio expert of the family is no longer needed when a distant programme is required, in fact, even the baby can use some modern receivers. This is undoubtedly a very fine thing for the family, but it is a bit "tough" on the expert who has to cool his heels until perhaps television will give him another opportunity of demonstrating his prowess. Talking of ganging reminds me that it is as well not to change the value of your H.T. tappings too much in a ganged set, or you may put the tuned circuits seriously out of step. Variation of H.T. value might cause a change of input capacity, so that it is best to decide on the H.T. voltage before setting the trimmers.

Wavelength and Frequency

SOME of my readers may be confused between the calibrating of stations in wavelengths or frequencies, and it has long been felt that some ruling on the subject should be made. We still know most stations by their wavelengths, whereas officially the separation between them and other matters is always considered in kilocycles. It is a simple matter to convert wavelengths into kilocycles, for if 300,000 is divided by the length in wavelengths the result will be the frequency, and *vice versa*, dividing 300,000 by the frequency in kilocycles will give the wavelength. For many years the National Physical Laboratories have maintained a standard of frequency based on a tuning-fork, and a properly designed and operated tuning-fork can form a standard frequency unit of reliability of about one part in ten million. This is quite equal to the results obtained from the best pendulum clocks, with the advantage that the tuning-fork is less susceptible to earth tremors and disturbances. During a slight earthquake last year a small change was recorded in the rate of the pendulum clock kept as a standard, and the error—about four parts in ten million—was recorded on the tuning-fork chronograph which was unaffected by the shock. Either of these results would seem to be fairly accurate, accurate enough, at any rate, for all practical purposes.

Practical Letters from Readers.

The Editor does not necessarily agree with opinions expressed by his correspondents.

A Receiver for Flat-dwellers Wanted

SIR,—I have been a reader of your journal from about the ninth week of its start and find it most helpful and interesting, but I am disappointed that although you said earlier that so many of your readers wanted particulars of a portable or transportable set suitable for amateurs to make up and at a reasonable price, that you hoped shortly to cater for them, I have watched in vain for the details. By the way, I have never seen explained to beginners *why* one cannot use any set on a frame aerial and no earth. The beginner's courses never make this clear. I agree with your correspondent of a few weeks ago who pleaded for *quality* rather than quantity. Please do something for we flat-dwellers. There are thousands of us, and whilst there are sets of every description detailed for aerial and earth users, we only get an article on a portable set very occasionally.—M. J. RUSSEL (London, W.).

[*Particulars of a Lightweight Portable of up-to-date design are given elsewhere in this issue. A frame aerial may, of course, be used as an ordinary aerial by connecting one end only to the aerial terminal. Normally, however, it is used as a "closed loop," and as such takes the place of the tuning coil.*—ED.]

A "Priceless Book"

SIR,—As an old hand at wireless dating from pre-war days, I feel I must express my appreciation and thanks for my copy of the Constructor's Eycyclopædia. In the early days I would gladly have paid 10s. or more for such a priceless book, but all my information had to be bought from experience (oft times very costly). Your paper is in the unique position that it is the only journal that is in every way *practical* and essentially a wireless journal for the wireless man. Thanking you and your staff for at last giving us a real wireless paper, and wishing it all success.—C. M. POPE (Forest Gate).

H.T. Batteries for Class "B" Amplification

SIR,—May we draw attention to a point which we feel has not been given sufficient consideration in connection with the use of the new Class "B" valves, viz., the absolute necessity of providing such valves with an H.T. Battery of very low internal resistance capable of giving during its normal life peak currents of 40 to 50 milliamperes. Although the ordinary type of H.T. Battery will undoubtedly operate a Class "B" valve for a time, we are of the opinion that the full benefit to be derived from the new method of amplification will only be secured by the use of the triple capacity of power type of H.T. battery.

It is possible that objection to this type of battery may be raised on the score of bulk and weight, and also the fact that in existing sets which are modified for Class "B" amplification the accommodation for the H.T. Battery may be limited. In order to meet this objection we are introducing a 120 volts double capacity battery which, whilst retaining the normal length and breadth of the standard battery, is increased in height to about 3¾in. This battery is our No. 1168 size, measuring 10in. x 6in. x 3¾in. high, fitted with plug socket tappings in 10-volt steps. The list price is 17s. 6d. The normal discharge rate can be taken as from 12 to 15 milliamperes, i.e., the average discharge rate for a Class "B" amplification set.—A. WILLMOTT, Siemens Electric Lamps and Supplies Limited.

WHAT IS SERVICE?

Every reader of "Practical Wireless" is entitled to FREE Advice!

(See Page 315)

A "Practical Wireless" Receiver in India: Remarkable Results

SIR,—After using the Newnes "Long Distance Four" (S.G., Det., and 2 L.F.) for one year in India, I think you will be interested in the results which I have obtained with it. The set was used in Quetta last year for eight months, and

(Continued overleaf.)

CUT THIS OUT EACH WEEK.

DO YOU KNOW?

—THAT the grid bias applied to two valves in push-pull is the same as for one similar valve used alone.

—THAT a fuse bulb may be connected to a battery to provide a very simple circuit tester.

—THAT a receiver described in any periodical should not indiscriminately be placed on a metal chassis or in a metal cabinet.

—THAT for similar reasons, a circuit design should not be altered without consulting the designer.

—THAT the presence of an earthed metal body seriously affects valves as well as coils.

—THAT interaction can take place between the anodes of two valves if these are of the non-metallized variety.

—THAT the average mains supply meter does not record the consumption of power below about 5 watts.

NOTICE.

The Editor will be pleased to consider articles of a practical nature suitable for publication in PRACTICAL WIRELESS. *Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor,* PRACTICAL WIRELESS, *Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.*

Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

(*Continued from page 313.*)

since November has been in use here at Simla. The results have been excellent on short, medium and high wavelengths. Throughout last summer I received Chelmsford, Rome, Paris and Moscow, also many other short-wave stations at loud-speaker strength. The first two in particular, were very good.

Since the Empire Station at Daventry started in December, I have listened to the programmes nearly every night. Some nights it has been so loud that I have had to use the volume control. In addition to the Empire service for the Indian Zone, I have received the programmes radiated to the Australasian, Canadian and South African Zones. Recently, during a thunderstorm, I used the lead-in only (12ft. of wire from door to set) and a temporary earth, and received at loud-speaker strength PHI experimenting on 25 metres. The medium and high waves are sometimes spoilt by atmospherics, but otherwise are received clear and loud. The medium-wave stations include London National, Heilsberg, Scottish Regional, Breslau, Paris, Mühlacker, London Regional, Bombay and Calcutta. During the winter these stations were received at loud-speaker strength, but now, owing to the lighter evenings, they are much weaker, and are received best late at night. I have not devoted much time to high wavelengths, but during the little time which I have spent, I have received Moscow, Tashkent, and two or three other stations unidentified.

Considering the distance of all of these stations (even Bombay, our local, is about 1,000 miles away) and the reception being at good loud-speaker strength, it speaks very highly of such an excellent receiver.

This is another case where the old two-pin plug-in coils are giving first-class reception, and the little trouble taken in coil changing is worth it.—A. E. CLARKE (Simla, India).

From a South African Reader

SIR,—I am a regular reader of PRACTICAL WIRELESS, and I must offer my appreciation of its contents. It is indeed a practical paper, for every wireless listener and experimenter and I can confidently recommend it to any one taking up wireless.

Can you publish a set for overseas conditions, about five valves, with a range of 10—650 metres without changing coils? Long waves are not suitable for South African conditions as they only bring in noise and atmospherics. The British Empire short-wave station for the South African zone comes in very weak, and fades out at times. I have received your Constructor's Encyclopædia, and I am very pleased with it. Wishing your paper every success.—M. LEVENTOSH (Cape Town).

A Beginner's Appreciation

SIR,—I have just received one of the most remarkable books on wireless ever published. Of course I refer to "The Wireless Constructor's Encyclopædia." To the man in the street it will prove a rare treasure store of knowledge.

I cannot praise it highly enough, for above all it explains in simple language all that one could wish to know about the great "mysteries" of wireless, whilst at the same time it is presented in a manner acceptable to the expert and amateur alike. For years I have been "interested" in wireless and yet have feared to explore the realms of mystery which I thought surrounded it, until there appeared on the market your very excellent weekly,

(*Continued in column 3*)

RADIO CLUBS & SOCIETIES

Club Reports should not exceed 200 words in length and should be received First Post each Monday morning for publication in the following week's issue.

SLADE RADIO

Mr. G. T. Peck repeated his recent lecture on "Dual Speaker Equipment" at the meeting of the above Society held recently. After describing the set which is capable of receiving any one of six stations at will he gave details of the special remote control switch which also incorporates a volume control. The special selector switch was described and also the amplifier which includes a control valve to deal with peak voltages. A demonstration of the radio portion was followed by a selection of gramophone records, each of a different type. The reproduction with the dual speakers proved exceptionally good and although the output available was 7½ watts there was no trace of distortion. At another meeting of this Society, held last week, there was a debate on "Should long-wave broadcasting be scrapped?" Before the debate started a vote was taken, which showed an overwhelming majority against, but the result was not made known until the close of the meeting. The first speaker was Mr. G. T. Peck, who raised quite a number of reasons why it should be scrapped. The second speaker was Mr. A. Freeman, who spoke for the retention. A general discussion then took place and a number of very interesting points were raised. Just before the end of the meeting another vote was taken, but with the same result. At the next meeting there will be a lantern lecture entitled "The acoustic side of reproduction," by Mr. A. S. Radford. Details of the Society, which offers exceptional facilities to those interested in wireless, will be sent on application. Hon. Sec., 110, Hillaries Road, Gravelly Hill, Birmingham.

ANGLO-AMERICAN RADIO AND TELEVISION SOCIETY

The West London Branch of this Society is now being organised. Those interested should write to A. D. Menezes, 9, Warrington Crescent, W.9 for particulars.

HACKNEY RADIO AND PHYSICAL SOCIETY

At a meeting of the above club held on April 24th we had the pleasure of according Mr. A. Deutsch a warm welcome when he gave a very interesting lecture on the Variable-Mu Valve and Automatic Volume Control. After explaining the construction of the Variable-Mu valve, and the manner in which many problems associated with its construction have been overcome, Mr. Deutsch dealt at length with its characteristics and advantages. Having dealt fully with this type of valve the lecturer spoke at length on Automatic Volume Control, and explained many methods of accomplishing this. An interesting programme has been arranged for the coming weeks, and local readers of PRACTICAL WIRELESS are invited to write for particulars.—Hon. Sec., A. F. Rogerson, 19, Sewdley Street, Clapton, E.5.

INTERNATIONAL SHORT-WAVE CLUB

The London Chapter of the International Short-Wave Club held a very successful meeting at the R.A.C.S. Hall, Wandsworth Road, S.W.8, on Friday April 28th, at which Mr. R. H. Woodhall, A.M.I.E.E., gave a lecture on Rotary Transformers for radio purposes. His lecture was illustrated by lantern slides. Various rotary transformers were exhibited, including a hand driven generator which can supply H.T. and L.T. to a radio transmitter in case of emergency. A special colonial supersonic receiver was also demonstrated. This was supplied by current with an M.L. Converter. At our next meeting on May 19th we are to have a lecture by L. H. Fitz Gibbons, A.M.I.R.E., on Short-Wave Converters.—A. E. Bear, European Representative, 10, St. Mary's Place, Rotherhithe, London, S.E.16.

(*Continued from first column.*)

PRACTICAL WIRELESS. I enjoy the hours I spend reading through its many pages as much as I enjoy reading a thriller, because it is presented in such an interesting and instructive manner. Do please "carry on" with the good work.

I have read PRACTICAL WIRELESS each week since first it appeared, and in that short time I have learnt more about my set, how and why it works than I ever did plodding a lonely furrow for many years before. I shall continue to read your journal and trust you and your staff will accept my sincere appreciation.—R. A. KEMP (Muswell Hill, London, N.).

IMPRESSIONS ON THE WAX

(*Continued from page 311.*)

unaffectedly. His voice is first-rate, and this record will find many places in the average listener's collection.

Lastly, one for the elect. The *Andante Cantabile* movement from Schubert's *Death and the Maiden* has been done by the Léner String Quartet on *Columbia LX*201 (6s.). There is a wealth of beauty in this piece. Chamber Music at its best here; if your tastes run that way, hear it. If you think your tastes ought to, hear it just the same.

Handel is so Jolly

Did you hear *Handel's Origin of Design* broadcast for the first time some weeks ago? The Ballet music from it has been recorded for *Columbia* by the *London Philharmonic Orchestra*, conducted by Sir Thomas Beecham. It has a bubbling, infectious gaiety plus Handel's emphatic straightforwardness. There is only one fault with this recording—the whole work should have been done. When it is done, there's an interesting story to tell. Meanwhile, hear record *LX*224.

The Light (and Not So Light) Fantastic

Here is a new band worth watching—John Jackson's. You will find two excellently played fox-trots on *H.M.V. B*6322; the titles are *I'm Playing with Fire* and *Sittin' in the Dark*. Another first-rate pair is on *H.M.V. B*6300. These are *My Darling* by Don Bestor's Orchestra, a fine band with a dreadful vocalist, and *One Little Word Led to Another* by Isham Jones's Orchestra. Two good fox-trots, these. The play *He Wanted Adventure* gives two good numbers by Ray Noble's Orchestra. These are *My Heart's to Let* and *When You've Fallen in Love*. On *H.M.V. B*6323.

A singularly restrained, but interesting, couple of slow fox-trots are on *Brunswick* 1447. Guy Lombardo's Royal Canadians play *I Called to Say Good Night* and *Street of Dreams*.

Rumbas have a vogue just now. There is a good one on *Decca F*3454 called *Serenata Cubana*, backed by a beguine *La Belle Créole*. These are quite the genuine article. There is a tremendous lot for money on one of the new 4-*in*-1 records (*No.* 31), *Puss! Puss! Puss!* and a song *Night After Night*, besides two others as well. There is too much vocal, really. A *Sterno* (*No.* 1134), *Standing on the Corner* and *One Little Kiss From You*, is quite good. Oscar Rabin's Romany Band play them, but I don't think they are much more gipsy than their blouses, or whatever they wear. Their style is anything but!

TO HAVE *BECOME* FIRST INDICATES SERVICE IN ITS REAL SENSE! TO HAVE *BEEN* FIRST MERELY PROVES ANTIQUITY.

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

REPLIES TO QUERIES and ENQUIRIES

by Our Technical Staff

The coupon on this page must be attached to every query.

If a postal reply is desired, a stamped addressed envelope must be enclosed. Every query and drawing which is sent must bear the name and address of the sender. Send your queries to the Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton St., Strand, London, W.C.2.

SPECIAL NOTE

We wish to draw the reader's attention to the fact that the Queries Service is intended only for the solution of problems or difficulties arising from the construction of receivers described in our pages, from articles appearing in our pages, or on general wireless matters. We regret that we cannot, for obvious reasons—

(1) Supply circuit diagrams of complete multi-valve receivers.
(2) Suggest alterations or modifications of receivers described in our contemporaries.
(3) Suggest alterations or modifications to commercial receivers.
(4) Answer queries over the telephone.

Please note also, that all sketches and drawings which are sent to us, should bear the name and address of the sender.

SCREENING THE AERIAL

"I am most unfortunate in my wireless hobby, and the reason is easily explained. I am living in the same road as is used for the trolley-buses, and over a shop. There are two electric neon signs on the shop, and next door is a cinema. This has a flashing sign on the roof (not more than 20ft. from my aerial), and the motor and other electrical apparatus in the cinema kick up a most awful din during the evening. I did not know this until I bought a six-valve set. Now I can't use it, but can you tell me how I can do something to get a little clear music sometimes? I believe you will be able to help me, as I see from your letters page that you have helped others in their difficulties."—(W. F., Nottingham).

You are certainly unfortunate in your position, W. F., but there is hope for you yet. As you have got a commercial receiver we do not recommend you to tamper with that, but your aerial and earth may be arranged so as to reduce to a minimum the interference which you experience. First of all, experiment with the following different types of earth. (1) A coil of wire, say about 50ft., loosely bunched up, and left on the floor under the table on which your set stands. (2) A sheet of copper gauze, or perforated zinc, about 2ft. square, arranged in the same way. (3) An 8 mfd. fixed condenser joined to the earth terminal. One of these will certainly be found as good as an outside earth with your particular set. For the aerial, the smallest indoor wire will be sufficient, but if you must use an outside wire, obtain a length of the special new type of screened lead-in which is advertised in our pages, and connect the screening of this to earth. It will be found to create a vast improvement, and the combination of this and one of the above earths should enable you to receive many stations clear of the interference. Of course, your range will be somewhat reduced, but this you must be content with if you are to reduce the noises with which you are troubled.

SPARKS FROM THE FURY

"I have built the Fury Four, and have used a metal foil on top of the baseboard in order to ensure stability and to facilitate the earth return leads. When I switched on I had forgotten to plug in the H.T. negative plug, and so I switched off, and when I put the plug against the socket of the battery I got a flash. I waited a moment and attempted to put in the plug again, but got a spark every time. What does this show? I expect something is wrong, but I do not know where to look."—(U. G. F., Brixton).

Obviously you are short-circuiting the high-tension battery in some way, and although there are many places where you could do this owing to a mistake in the wiring, we think you will find that the fault has arisen through your using the metal foil on the baseboard. The H.T. positive lead is taken to a soldering tag, which is screwed to the underside of the baseboard, and you have probably used a rather longer screw than you should have done, and the point of this has protruded sufficiently to touch the metal foil. A moment's thought will show that the two terminals of the H.T. battery are thus connected, as the foil is joined to H.T. negative. Remove this screw before you look elsewhere for the trouble.

FUSE FOR BATTERY SET

"I have finished the construction of a three-valve set, and before putting it to use would like to fit a safety fuse. Where should this go, and what value do you have to make sure that the valves will not be damaged owing to a short on the H.T. side?"—(S. H., Enfield).

The choice of a fuse is carried out in the following way. Firstly, you must total the filament consumption of all your valves. Thus, if you are using two .1 and one .25 valve, the total current is .45 amps. Therefore the fuse should be chosen which will blow at some value lower than this (.45 amps. is 450 milliamps). Obviously, it would be possible to use a 20 milliamp fuse, but you must remember that there may be reservoir condensers in the circuit and the charging current required may rise to such a value that the fuse will be blown unnecessarily. Therefore, use the highest value which is obtainable, and which is just lower than the rating of the total filament current.

DATA SHEET. No. 34.

Cut this out each week and paste it in a Notebook.

OPTIMUM LOAD VALUE FOR PENTODE VALVES.

Maker.	*Type No.*	*Optimum Load.*
COSSOR	220.HPT	17,000 ohms
	220.PT	7,500 "
	PT.41	8,000 "
	PT.41.B.	8,000 "
	MP/PEN.	10,000 "
LISSEN	PT.225	18,700 "
	PT.240	12.500 "
	PT.425	11,000 "
	AC/PT	8,000 "
MARCONI and OSRAM	PT.2	17,000 "
	PT.425	9.000 "
	PT.4	7,500 "
	MPT.4	8,000 "
	DPT	8,000 "
MAZDA	PEN.220	17,000 "
	PEN.220.A.	7,500 "
	AC/PEN.	8,500 "
	DC/PEN.	10,000 "
	DC.2/PEN	10,000 "
MULLARD	PM.22	8,000 "
	PM.22A	15,000 "
	PM.24A	10,000 "
	PEN.4.V.	8,000 "
SIX SIXTY	SS.220.PEN.	12,000 "

DAMAGED MOVING-COIL

"My loud-speaker is of the moving-coil type, and I have been fitting a new bolt to the top of the chassis to make it firmer on my baffle-board. I find, however, that it gives a nasty grating noise now, and I have done nothing to the electrical side of it at all. I did not even handle it, but left it attached to the front of the cabinet while I drilled the new hole. I did not use undue pressure, and cannot see how I can have damaged it. Can you offer any suggestion, before I dismantle it?"—(P. R. M., Teddington).

The reason is not far to seek. The speech coil of your type of speaker moves in a very small annular gap cut in the face of a powerful magnet. You have drilled a hole in a metal carrier, and have no doubt overlooked the fact that the falling metal dust would be attracted to the powerful magnet. No doubt, some of the metal filings have entered the gap and are causing the grating by rubbing against the speech coil as it vibrates in the gap. You will damage the speech-coil by leaving it as it is, and you must therefore completely dismantle it and clean away all metal dust and other matter which you will no doubt find in the gap. Afterwards, cover the speaker with a fine cloth bag to avoid a repetition of the trouble.

OUTPUT TRANSFORMER DATA

"I want to wind an output transformer for my receiver, which employs in the last stage a Marconi PX4 valve, and my loud-speaker is home-made, with a speech-coil of just under 10 ohms resistance. Can you tell me the windings and core size for the transformer, and give me any other details for it?"—(A. W. M., Surbiton).

The optimum load for the PX4 is approximately 3,000 ohms, and therefore, your transformer must have a ratio of 20 to 1. The anode current of the PX4 is just under 50 mA, so that the primary would have to consist of at least 34 gauge wire. Suitable stampings would be No. 30, of which 100 would be required, and the primary should consist of 3,000 turns of the 34 gauge wire, and the secondary would obvously consist of 3,000 divided by 20, or 150 turns. For this, a heavier gauge wire may be used, and No. 22, 24, or 26 may be used at your discretion. Terminal strips and fixing feet may be fitted according to your own ideas.

ELECTROLYTIC CONDENSER

"I have just bought an 8 mfd. electrolytic condenser, but when I tested it with a flash-lamp bulb it passed a light. Is this a sign that the condenser is faulty? I understood that a condenser should not pass a D.C., and I took the condenser back to the shop and got it changed, but the same thing happens with the new condenser. Where am I wrong in my test?"—(A. K., Ealing).

An electrolytic condenser is not a condenser until it is polarized by a fairly high current. The two electrodes of this type of condenser are separated by a fluid or paste, and they conduct current in their normal condition. When this current rises to a certain value a film forms over one plate, and they no longer conduct but act as a very efficient condenser. Your test with a 4-volt battery and lamp resulted in such a small current being passed that the film did not form, and therefore, you were not really testing the condenser. If you connect it as it is intended to be connected, in an eliminator circuit, for instance, you will find that it is a very efficient condenser indeed.

GRADED VOLUME CONTROL

"I have recently bought a volume control for use across my pick-up, and on examining it, I find that it is supposed to be 'graded.' Does this mean that it is different from the ordinary potentiometer, or that it is classified according to its value? Are the connections the same as in the ordinary case?"—(P. C., Birmingham).

A graded volume control is simply a potentiometer with the resistance element arranged with a larger area at one end than the other. Usually, these are wire wound, with the wire wrapped round a flat, but wedge-shaped former, and consequently, the movement of the contact arm on one end of the element results in a greater variation from one turn to the next than at the other end of the element. The potentiometer should be connected in the ordinary way, that is to say, the arm is joined to the grid and the two ends are joined across the pick-up, but to obtain the advantages of the grading the larger end of the resistance should be remote from the grid-bias connection.

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This coupon is available until May 20th, 1933, and must be attached to all letters containing queries.
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To save readers trouble, we undertake to send on catalogues of any of our advertisers. Merely state, on a postcard, the names of the firms from whom you require catalogues, and address it to "Catalogue." PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8/11, Southampton St., Strand, London, W.C.2. Where advertisers make a charge, or require postage, this should be enclosed with applications for catalogues. No other correspondence whatsoever should be enclosed.

"RAWSWOOD" MAINS TRANSFORMERS

A USEFUL range of high-class power transformers and output filter chokes is given in the latest folder issued by Rawswood Electrical Co., Preston New Road, Blackpool. The instruments listed include standard and special voltage types, L.F. transformers and a power pack for use with A.C. Mains. Only the finest materials are used in the manufacture of the transformers, which are designed to function satisfactorily even under very difficult conditions. Core sizes are ample for the particular wattage output and periodicity for which they are designed. A copy of the folder can be had on application to the above address.

C.A.V. BATTERIES

IN a handy folder we have just received from C. A. Vandervell, Ltd., details are given of this firm's Non-Spillable "Jelly-Acid" Batteries, together with a range of H.T. batteries suitable for portable and transportable receivers. The non-spillable type, which can be fitted into a set in any position, is very clean and compact and requires no more attention than ordinary batteries. They are re-charged in exactly the same manner as the free acid type. Included in the folder is a useful chart of all the popular receivers showing the most suitable C.A.V. batteries to use with them. A copy of the folder will be forwarded to any reader on application to C. A. Vandervell, Ltd., Well Street, Birmingham.

NEW CLIX COMPONENTS

AMONGST the new components recently introduced by Lectrolinx, Ltd., is a seven-pin chassis mounting valve holder (floating type) with terminals. Each socket automatically aligns itself to any variation in the centres or angle of incoming valve pins, at the same time giving maximum surface contact between sockets and pins. Other new small components made by this firm are non-corrosive spade terminals, and chassis mounting strips with terminals. Further particulars and prices are given in a leaflet entitled "Further Aids to Constructors," a copy of which can be obtained from Lectrolinx, Ltd., 79A, Rochester Row, Westminster, S.W.1.

"WEGO" CONDENSERS.

A PARTICULARLY useful range of condensers of various types is given in a booklet we have just received from Wego Condenser Co., Ltd. Various types have been altered and the test voltage for type BLU has been increased to 750 v. D.C. rated for 350 v. D.C. working, and type CV, previously rated for 1,000 v. test and 400 v. working has been increased to 1,500 v. test and 450 v. D.C. working. This type is suitable for use with indirectly-heated valves and will withstand the heavy voltages when switching on. The working voltage of type H.R. tested on 2,000 v. D.C. has been increased to 800 v. All other types remain as before. In order to facilitate quick deliveries of these condensers, the Wego Co. announce that from May 1st stocks of all standard types will be held at 61, Spencer Street, London, E.C.1. Mr. F. W. Lechner is in charge of the department, the telephone number of which is Clerkenwell 7058. A copy of the booklet can be obtained from the firm at Bideford Avenue, Perivale, Middlesex.

HELLESEN CONDENSERS

THE firm of Hellesens, Ltd. is noted principally for batteries, but a most comprehensive range of condensers is also manufactured by this firm. The latest catalogue issued shows the complete range, and gives, in addition to the various types and values, complete physical dimensions of each type. The ranges include Wet Electrolytic, Dry Electrolytic, Moulded Mica, and in each type there are large and small units. Ten pages are devoted to the principles underlying the design of electrolytic condensers, and a description of the method of construction, operating characteristics, and other interesting information is included. The address is Hellesen Works, Morden Road, South Wimbledon, S.W.19.

Replies to Broadcast Queries

URWINS (Scarborough): DIQ, Koenigswusterhausen (Germany), relaying programme to U.S.A. (29.16 m.). WHISKERS (Blackpool): G5ML, F. W. Miles "Tudor Lodge," Gibbet Hill, Kenilworth, Warwickshire; G6LP, Cannot trace, write to Radio Society of Great Britain, 53, Victoria Street, S.W.1; G6VK, A. E. Brookes, 19, Alexandra Road, Uplands, Bedminster, Bristol (Glos.); G6PY, C. W. Parry, 13, Huddersfield Road, Barnsley, Yorks; G5UI, J. E. Perkis, 67, Arthur Street, Ryde, Isle of Wight; G6IH, J. C. G. Kealy, 5, St. John's, Bedford Road, Kempston, Bedford; G6US, N. E. Read, 32, Earl's Court Road, Kensington, London, W.8. SEAR (Belfast): CUS, Beam Station, Lisbon, Portugal; FRO, St. Assise, near Paris (France); ILX, regret, cannot trace; PDI, cannot trace this call, but undoubtedly commercial transmitter at Kootwijk (Netherlands); DEZ, call sign apparently mutilated but no doubt a commercial transmitter at Zeesen, Germany. DX ENTHUSIAST (Luton): SU1EC, Lieut. E. S. Cole, Haking House, Abbassia, Cairo (Egypt); SU6HL, I. E. Hill, Royal Air Force, QSL to BM/2HXG, London, W.C.1; G2QX, A. E. Groom, 13, William Street, Luton, Bedfordshire; G6PY, L. W. Parry, 13, Huddersfield Road, Barnsley, Yorks.

A Home-constructed Microphone

(Continued from page 296.)

holes, take the front piece off again and glue the diaphragm on the back of it, as in Fig. 3. Various types of diaphragm may be used, those suggested being oiled silk, thin rubber, thin mica (which is fairly expensive) or even paper. The best yet tried has been oiled silk stretched across the front and glued. Keep the diaphragm under a weight till it is fixed, and the microphone is then ready for filling with granules. These are the fine grade supplied for the purpose by Messrs. Le Carbone, Coventry House, South Place, London, E.C.2, at 5s. per ounce. Half an ounce is sufficient for two microphones. Fill the depression level with the top and place the top on, sandwiching the diaphragm between the two pieces of wood. Screw the whole down tightly so that no granules can leak out. These granules have a habit of getting through the smallest chinks.

Using the Microphone

The microphone is now ready for use. It must be used with an amplifier of at least three stages if loud-speaker results are required. The microphone must not be used with the usual microphone transformer as it has a high resistance; the best way to couple it is by the resistance or choke method, as indicated in Fig. 5. The voltage required across the microphone itself is about 30 for best results, but this must be found by experiment. Many uses can be found for an instrument of this type.

ADVERTISEMENT INDEX

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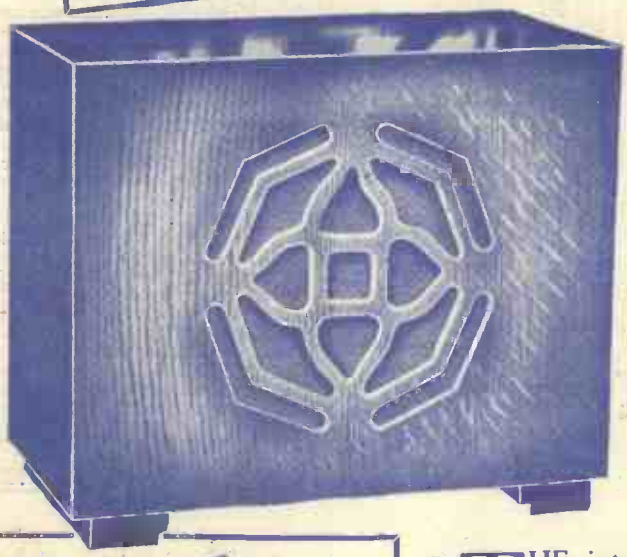

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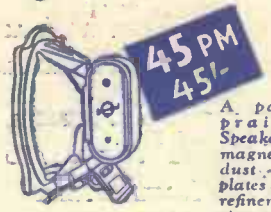

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