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Amateur Wireless

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Vol. XIV. No. 357 Saturday, April 13, 1929

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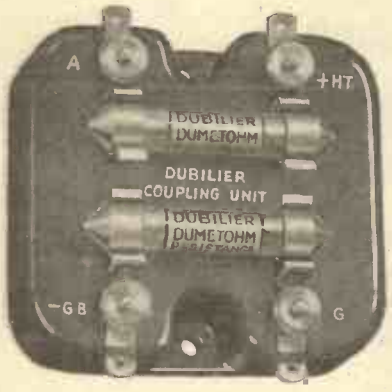

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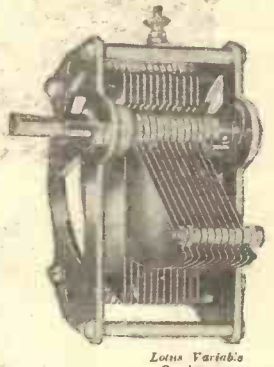

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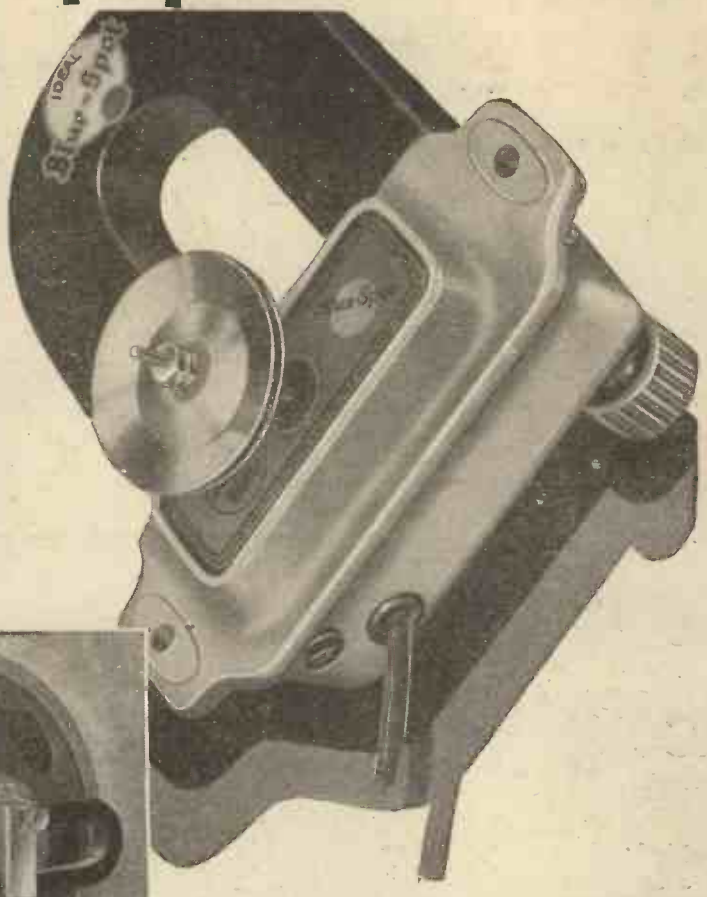

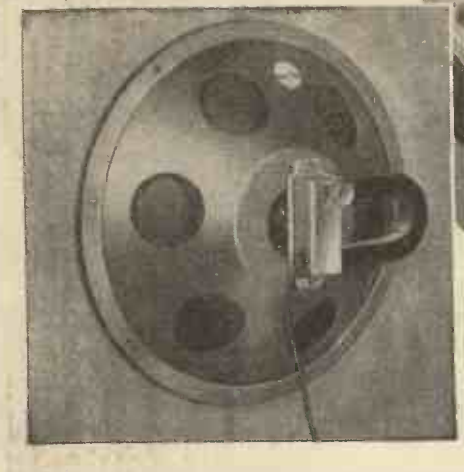

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APRIL 13, 1929 No. 357. Vol. XIV.

Amateur Wireless and Radiovision

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Editor: BERNARD E. JONES

Technical Editor: J. H. REYNER, B.Sc., A.M.I.E.E. :: Research Consultant: W. JAMES :: Assistant Editor: H. CORBISHLEY

That B.B.C. Ban—A Radio Hero—Radio at 103!—"Talkies" are Booming—The Unseen Five Hundred—"Threes" and "Fours"

That B.B.C. Ban—There is still much ado about nothing—namely, the B.B.C. ban on the announcement of names of dance tunes. It has been suggested, we know, that this ban is the result of interested people having used the microphone as a means of publicity. However this may be, we are rather inclined to agree with a correspondent who says that it is *not* a coincidence that there is more variety in the programmes while the ban is in action!

A Radio Hero—Yet another wireless operator hero. In this case he is R. Osbjornson, the operator of the ill-fated cargo steamer *Selje*. He remained at his post in the sinking vessel, sending out calls for help until the generator room was flooded, and the transmitter went out of action. He then went up on deck to find that the other members of the crew had gone to the steamer *Kaituna* (with which the *Selje* was in collision) without realising he was left behind. He managed to sound the ship's siren just as the vessel sank in shark-infested water.

Radio at 103!—At Chelmsford, Essex, is what the newspapers call "a wonderful young woman"—she celebrated her 103rd birthday last week! In a recent interview the good lady, after airing her views on modern girls and short skirts, said that she has only two interests in life. One is preparing for the celebration of her 104th birthday and the other is *listening-in*. We wish her many more years in which to enjoy her hobby.

"Talkies" are Booming—If one is to believe what one is told by film stars themselves, soon no cinema in any civilised country will be showing "silent" films. "Talkies" will be all the rage. Douglas Fairbanks and Mary Pickford (his wife) are talking about a giant combination in which Warner Bros. are to take part. Charlie Chaplin has not yet definitely "fallen," but Chaliapine, the famous singer, is a newcomer to the cinema and will probably appear in talking films this summer. Incidentally he has been offered £100,000 to make a talking film of *Boris Godounov*. If technical developments keep pace with these giant artistic and commercial forecasts, then there should be a great deal in "talkies" to interest wireless fans.

The *City of Glasgow* leaving Croydon, with which it will be in radio communication, on the first trip of the Air Mail Service to India

The Unseen Five Hundred—Incidentally a new use is being found for loud-speakers on the stage. At the Charlottenburg Opera House in Berlin, they are bringing Wagner up to date, and by means of microphones and loud-speakers "there are brought on the stage the voices of a chorus of 500 (*sic*!) for whom there would be no room in front of the footlights." With the unlimited possibilities of electrical public address and gramo-radio, what giant operas Wagner could have produced!

Wireless and Weather—So the old rumour that wireless causes bad weather is still afoot! We have never seen any statistics to prove the point but here are some figures from the Royal Meteorological Society, which, if you are a lover of statistics, may kill the old rumour once and for all. "The average rainfall in England requires for its production roughly 330,000 horse power per square mile, night and day throughout the year. The total horse-power used by all broadcasting stations in Gt. Britain and Northern Ireland is under 55 horse-power; the corresponding figure for Europe being about 400 horse-power. Any effect of broadcasting on weather would therefore be due to sub-homoeopathic doses of less than one in 1,000,000,000! Applying the same arithmetic to domestic affairs one finds that to produce a year's rain for the tennis court by means of an electric kettle, would cost over £800." We cannot vouch for these figures, but they sound convincing!

Radio at Brooklands—An "A.W." Correspondent who was at Brooklands at the recent opening meeting of the season, had his ardour damped by the rain, but was cheered to find the old familiar loud-speaker "putting" over gramo. music during intervals.

"Threes" and "Fours"—This week we deal at greater length with the up-to-date version of "Britain's Favourite Three"—a really good "three" for broadcast reception. Next week we are to have an efficient four-valver designed by our Technical Editor, Mr. J. H. Reyner, with dual-range, simplicity of control, and "super" performance. *In toto*, a "four" worth waiting for!

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An interior view of Dr. Reisser's Ether-policing Station

POLICING THE ETHER

An Account of Dr. Reisser's Station in Germany

By Dr. ALFRED GRADENWITZ

I HAD, of course, been acquainted with the excellent work done by Dr. Reisser for the Reichsrundfunk-Gesellschaft (German Broadcasting Corporation) in policing the ether, superintending the activities of German transmitting stations and performing a number of other useful duties. His "den" turned out to be the snuggest, most up-to-date, and best equipped wireless laboratory I have yet come across.

There, all around the walls, could be found an imposing array of the most efficient wireless receivers, by means of which any wireless station in Germany or elsewhere in Europe or beyond the seas could at a moment's notice, be heard.

Apart from superintending what is going on in the ether, checking, controlling and policing the German stations and comparing their performance with the working of foreign stations, this laboratory is intended for the occasional re-transmission of German or foreign broadcasting stations to the transmitters of Berlin and stations connected up to Berlin.

The equipment of the laboratory comprises a large number of receiving sets for wave ranges of from 12 to 2,000 metres.

These receivers are accurately calibrated so that any station can be identified with absolute certainty.

Two lines connected with the preliminary amplifier room at the Voxhaus headquarters of the Berlin broadcasting station serve for transmission and telephone communication respectively.

All connections between sets on the one hand and the switchboard on the other are laid out permanently under the table carrying the apparatus. Switch panels are provided at every operator's seat. A 4-volt circuit serves to supply the heating current, alternating-current mains supply the anode current, and H.T. accumulators are also available.

There are in all, four outdoor aerials, 40, 30, 15, and 10 metres in length respectively, in addition to frame aerials.

BAIRD TELEVISION—FACILITIES AT LAST!

A Letter from the Postmaster-General to the Baird Television Development Co., Ltd.

Sir,

The Postmaster-General has considered the results of the recent television demonstration, in conjunction with the British Broadcasting Corporation, and his technical advisers, and he has reached the following conclusions which accord generally with the opinions of those who witnessed the demonstration. The demonstration showed that the Baird system was capable on that occasion of producing with sufficient clearness to be recognised the features and movements of persons posed for the purpose at the transmitting-point. It is not at present practicable to reproduce simultaneously more than perhaps two or three individuals or to exhibit any scene or performance which cannot be staged within a space of a few feet in very close proximity to the transmitting apparatus.

In the Postmaster-General's opinion the system represents a noteworthy scientific achievement; but he does not consider that at the present stage of development television could be included in the broadcasting programmes within the broadcasting hours. He bases this view not so much upon the quality of the reproduction which further experiments may be expected to improve, as upon the present limited scope of the objects which can be reproduced.

The Postmaster-General is, however, anxious that facilities should be afforded, so far as is practicable without impairing the broadcasting service, for continued and progressive experiments with the Baird apparatus and he would assent to a station of the British Broadcasting Corporation being utilised for this purpose outside broadcasting hours. He understands that the Corporation would agree in principle to this course, provided satisfactory terms were negotiated between the Corporation and the Baird Company.

It will probably be essential that any experimental demonstrations of television should be accompanied by the broadcasting of speech and, in consequence, two wavelengths and two transmitters would be required. It will not be possible to provide a second transmitter in a suitable locality which will avoid interference with important wireless services in Central London until the completion of the new station of the British Broadcasting Corporation at Brookmans Park, which is expected to be ready in July. In the meantime, it is suggested that the Company should open negotiations with the Corporation as to the financial and other arrangements which may be necessary, and it would probably be advantageous to them to enter upon discussions of the technical aspects with the Corporation's Chief Engineer.

In order to find room for a television service in broadcasting hours it will probably be necessary to utilise for the reproduction of vision wavelengths outside the bands now being used for speech broadcasting. These bands, as you are doubtless aware, are already highly congested and it is important therefore, that the Company should press on with experiments on a much lower band which will be notified to the Company in due course.

In conclusion, it is necessary to emphasise that in granting facilities for experimental demonstrations in which the public can if they so desire take part, neither the Postmaster-General nor the British Broadcasting Corporation accept any responsibility for the quality of the transmission or for the results obtained. The object of the demonstrations is to afford the Baird Company a wider opportunity than they at present possess for developing the possibilities of their system of television and for extending the scope and improving the quality of the reproductions. While the Company will not be precluded from selling apparatus to anyone who desires to purchase it, the purchaser must understand that he buys at his own risk at a time when the system has not reached a sufficiently advanced stage to warrant its occupying a place in the broadcasting programmes.

(Signed) G. E. P. MURRAY.

General Post Office March 27, 1929.

An All-mains Two

A No-trouble Receiver for those who have A.C. Mains—Safe and Simple

A YEAR or so ago people used to say how nice it would be if batteries could be dispensed with altogether in wireless sets, and how the scope of radio would be widened if the whole business of operating a receiver could be reduced simply to the simple job of tuning-in and switching on and off.

Well, since then mains eliminators have been developed, and the lucky possessors of either A.C. or D.C. mains, of any normal voltage, can now work their sets direct from the public supply. Thus they can dispense with the high-tension battery—a costly article, particularly if the receiver is a large one—the accumulator, which formerly required laboured journeys to the charging station at all-too-frequent intervals, and even the grid-bias battery if desired.

High- and Low-tension from the Mains

This set is a "two," entirely self-contained, and takes both H.T. and L.T. "juice" from A.C. mains. In this particular instance the grid bias is obtained from an ordinary 9-volt battery, because in a receiver of this type the extra complication in order to obtain smooth D.C. G.B. from A.C. mains is hardly worth while. Grid-bias batteries are so cheap and last until their initial cost, of a shilling or so, is forgotten!

This receiver will find a warm reception from two classes of AMATEUR WIRELESS readers. First, there are the experienced people who realise the difficulties which attend obtaining H.T. *and* L.T. from A.C. mains and in working a two-valver from alternating current without any humming or motor-boating.

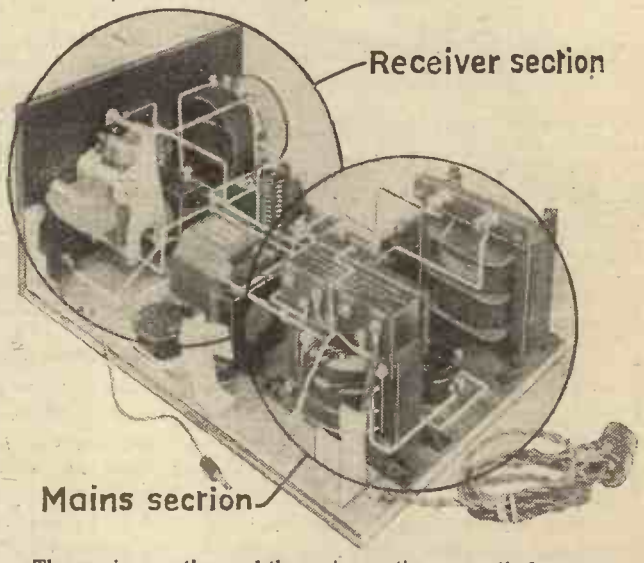
Second, there are those programme enthusiasts who do not care very much about the technical side of their sets, but who have always wanted something which has no battery bothers. A large number in this latter class will possibly get the receiver made up for them by one of their more technical friends.

Just what this "two" will do is this. It will give ample loud-speaker strength from a main broadcasting station up to about twenty-five miles or so distant. At greater distances than this it will still give satisfactory loud-speaker strength, but there will not be that amount of volume in hand which is always dictated by purity critics.

There is no reason why, if the mains are fairly quiet in working, headphones should not be used and quite a respectable D.X. reception log obtained. Loud-speaker working at normal distances from B.B.C. stations is, however, the "daily bread" of this two-valver, and it has been designed primarily for those who want broadcast programmes without battery troubles. It has been designed as a two-valver because quite a large number of those who make up this receiver will have to keep economy in view, and for ordinary broadcast reception a really good two-valver is as much as many folk require.

If you glance at the photographs you will see that the whole receiver is very compact, when the fact is taken into account it is *all complete* and that no external batteries or accumulators have to be housed. The one lengthy flex lead to a convenient lighting plug does the trick!

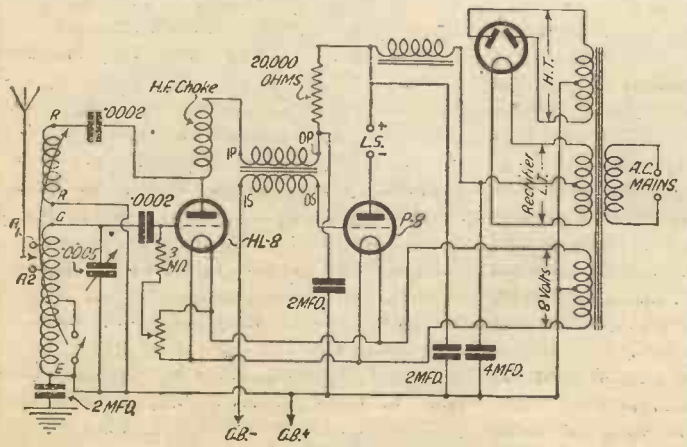
To beginners the baseboard may seem to present a rather fearsome appearance, and this is perhaps because, in addition to the normal components necessitated by the circuit, the baseboard carries the few extra "gadgets" which provide both H.T. and L.T.



The receiver section and the mains section are entirely separate as this picture shows

Of course, to constructors of AMATEUR WIRELESS sets, one set can hardly ever be more "difficult" to construct than another, because it is child's play to mount the components and just as simple to wire them up with the aid of a combined blueprint and wiring diagram. And, while talking of blueprints, don't forget that one can be obtained for this receiver, price 1s., post free, from AMATEUR WIRELESS, 58-61 Fetter Lane, London, E.C.4.

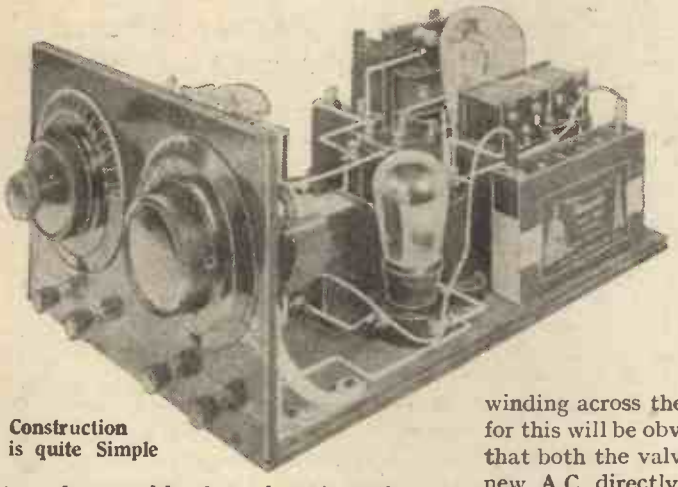
Technical readers will be anxious to understand the working of this all-from-A.C. "two," and the rather less technical enthusiasts must forgive the following brief description and analysis of the circuit. They can pass on direct to the constructional details.



The circuit diagram of the All-Mains Two

"AN ALL-MAINS TWO" (Continued from preceding page)

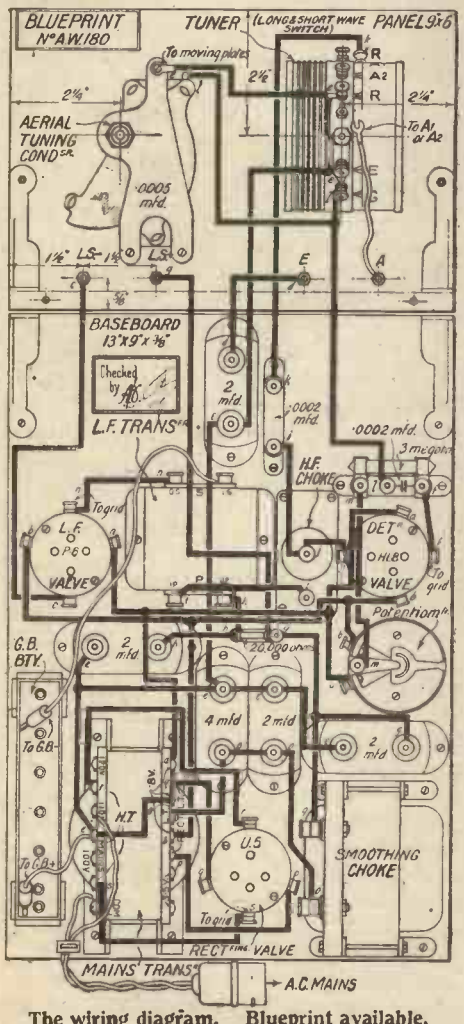
Basically, and leaving out the mains eliminator part, the set is of the ever-popular "det. and one L.F. (trans.)" type, and transformer coupling has, of course, been employed in order to give a satisfactory degree of loud-speaker strength.



Construction is quite Simple

Semi-Reinartz type reaction is employed and the tuner is of the dual-range type with incorporated moving reaction.

From the circuit diagram you will see that the dual-range scope is obtained simply by short-circuiting one section of the winding for the short waves, both sections being in series for the long waves. There are two tappings on that portion of the winding which is not short-circuited on the medium waveband, and by means of a flex connection which makes contact with either one or other of the tappings the degree of selectivity can be very easily controlled.



The wiring diagram. Blueprint available, price 1/-

A leaky grid detector is employed with the lower end of the grid leak taken to a tapping on a potentiometer winding across the filaments. The reason for this will be obvious when it is explained that both the valves employed are of the new A.C. directly-heated type, and it is therefore important to get a proper medium tapping for the grid leak.

An anti-motor-boating unit is inserted in series with the primary of the L.F. transformer, and will be found of inestimable advantage in getting the best out of the set without any tendency whatsoever towards uncontrolled L.F. oscillation. The unit consists simply of a 20,000-ohm fixed resistance in series with the primary winding of the L.F. transformer and a 2-microfarad fixed condenser between this junction point and earth.

The Mains Section

Now for the mains-supply section. In the present set a Marconiphone power transformer (type M) is used and is arranged to provide double-wave rectification (in conjunction with a suitable rectifier valve) for H.T.; a separate winding with a centre tapping gives the necessary "juice" for lighting the filament of the rectifier, while yet a third winding provides .8 volts of A.C., which is taken direct to the filament of the receiving valves.

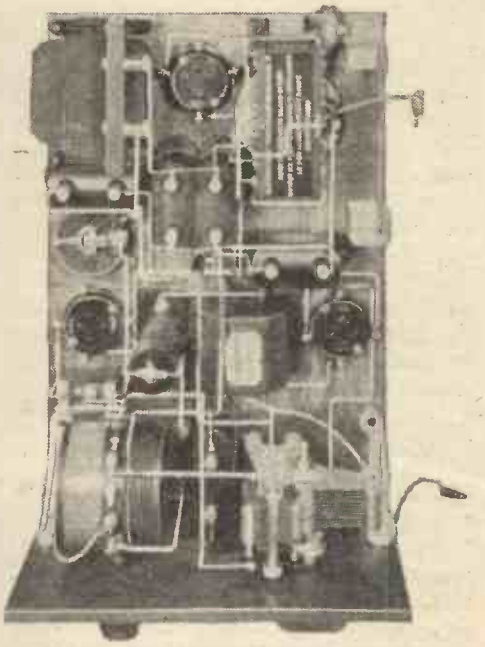
There is really nothing to go wrong, and the combination of power transformer, rectifier valve, and smoothing choke and condensers is comparatively cheap (much cheaper in the long run than batteries), and entirely safe and foolproof.

So far as the operation of the set is concerned, the panel carries a .0005-microfarad tuning condenser, the knob of the reaction control with which is mounted concentrically the wave-change switch, and terminals for aerial, earth, and loud-speaker.

At the back of the set is a flex connection which is taken to any convenient lighting point. No switching is needed, for there is no "juice" to waste. When you insert the plug in the lighting socket the set works and when you remove it it stops working! If you care to do so, you can control the receiver by the ordinary lighting switch. The current consumption is not worth considering, for it is very small.

The only difference which the constructor should make when building up this set, as distinct from an ordinary battery-operated "two," is to take the most particular care to get the connections right first time. Of course, if you are careful to check the wiring over with a full-size blueprint, marking off in pencil each wire as its actual counterpart in the set is checked as O.K., you can't go wrong.

For the construction of this "two" you will require the following components, and for the guidance of those who want to make up the receiver exactly as described it should be explained that in each case the first-mentioned component is that used and illustrated in the original set.



—and the wiring is no more complicated than with an ordinary receiver

The alternatives are those which have, as near as possible, the same electrical characteristics and (in most cases) very similar dimensions.

Ebonite or bakelite panel, 9 in. by 6 in. (Raymond, Becol, Ebonart, Paxolin).

.0005-microfarad variable condenser (Igranic, J.B., Lissen, Polar, Ormond Burton).

All-wave tuner (Wearite, type WG2).

Baseboard, 13 in. by 9 in. (Pickett, Clarion, Camco).

Three valve holders (Burton, Lissen, Benjamin, Wearite).

.0002-microfarad fixed condenser with grid-leak clips (T.C.C. S.P. type, Dubilier, Mullard, Graham-Farish).

(Continued on page 576)

CIRCUITS FOR YOU TO TRY

From time to time our Technical Editor has described various circuits of particular interest to those who are experimentally inclined; on this page are two more which will repay investigation

I RECEIVED an inquiry a few days ago from a reader who was anxious to try one screen-grid valve and one ordinary H.F. valve in conjunction with "Q" coils. He said that he felt that a circuit such as this ought to give him good selectivity with comfortable signal strength, which it undoubtedly will do. Moreover, if the apparatus is fairly well spaced there should be little danger of trouble from instability.

At any rate, a circuit of this nature is an interesting one to hook up, and the details given in Fig. 1 will make it clear as to how such an arrangement could be adopted. The aerial circuit contains one of the latest type of aerial coils, the QAA. This, as readers will remember, is a new form of tapped aerial coil, which gives better selectivity and better wavelength range than the older form of QA coil. The only difference in its use is that the aerial is connected to terminal No. 4 instead of to terminal No. 1, the same .0001 or a pre-set condenser being used in the aerial circuit.

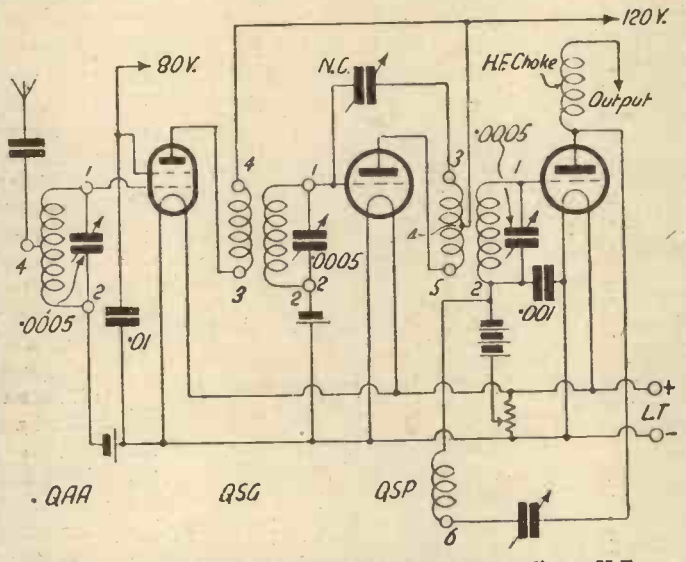


Fig. 1. A combination of screen-grid H.F. and ordinary H.F. valves used in conjunction with a "Q" coil

This circuit feeds the screen-grid valve. This has been placed first in the circuit in order to avoid coupling between the later circuits and the aerial. It is sometimes found that alteration of the aerial or its capacity has an effect upon the neutralising of the ordinary form of H.F. circuit, and for this reason the neutralised stage has been placed second. Following the screen-grid valve is a QSG coil, a screen-grid transformer giving rather more selectivity than the tuned-anode arrangement.

The neutralising stage is placed third and feeds an anode-bend detector. It is becoming an axiom—as, indeed, it should be—that any receiver employing an appreciable measure of high-frequency amplification should utilise an anode-bend detector, because the grid detector overloads seriously if the signal strength is at all large. The L.F. stages are not shown. The detector may be followed by a resistance-coupled arrangement or, if desired, by transformer-coupled circuit, in which latter case it will be preferable to use either an L.F. valve or one of the new special detector valves made by the Mullard Company. The reason for this is that the heavy negative grid bias causes considerable increase in the resistance of the valve, and this is liable to affect quality unless arrangements are so made that the actual resistance of the valve under working conditions is approximately that for which the transformer has been designed.

A Dual-impedance System

Another circuit which is of interest is that shown in Fig. 2. This is an L.F. arrangement pure and simple, and is a development of the well-known dual-impedance system. Dual-impedance coupling is a system in which high-tension is supplied to the anode through a low-frequency choke. The L.F. voltages are by-passed to the next grid through a coupling with a choke, it will be understood, the usual leak being replaced with a choke. The values of the coupling condenser and choke are so chosen that a resonance occurs between the two in the bass regions, in consequence of which the ordinary tendency of the curve to fall away at about 200 cycles is arrested, and in place a slight resonance peak is introduced which keeps the curve fairly level down to quite low values of frequency.

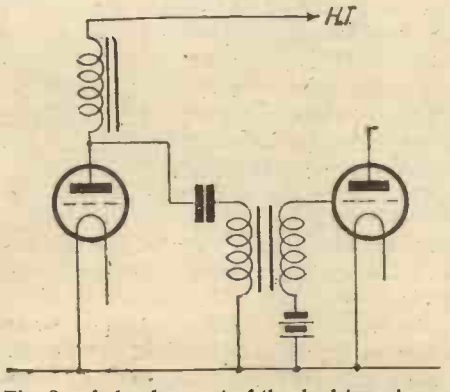


Fig. 2. A development of the dual-impedance system

Such an arrangement suffers from the disadvantage that no step-up is obtained, and the circuit shown in Fig. 2 illustrates a system in which the advantages of the dual-impedance coupling are retained together with a step-up effect. The H.T. supply to the valve is fed through a good make of low-frequency choke, while the low-frequency impulses are passed through the coupling condenser on to the primary of a 6-1 transformer. For this purpose a good form of 6-1 transformer, such as the Igranic type J, should be used.

If the coupling condenser is made of the order of .05 microfarad we shall obtain a resonance between this coupling condenser and the primary inductance in the neighbourhood of 100 cycles per second. This will result in the bass being very well maintained, perhaps even slightly boosted, which will allow for the defects in the remainder of the amplifying system, including the loud-speaker. At the same time, owing to the fact that we have a 6-1 transformer, we shall obtain a large step-up so that the system, although apparently a little cumbersome at first sight, is one having considerable promise.

The arrangement can be used following a valve having quite a high resistance, with a correspondingly high amplification factor.

MY WIRELESS DEN

By W. JAMES

Weekly Tips, Constructional and Theoretical—

For the Wireless Amateur

Metal-panel Matters

WHEN a metal front panel is used it is necessary to take steps which will ensure that only parts which are earthed shall make contact with the metal and that all other parts are insulated.

It is usually not very difficult to arrange that the various switches and tuning condensers shall have the side which makes contact with the panel at earth potential, but in an endeavour to effect this one or two weak points may be left. As an example I will take the case of a tuned anode circuit (Fig. 1).

Plates A of the variable condenser are connected to earth and plates B (the fixed ones) are joined to the anode of the shielded valve. The full voltage of the H.T. battery is, therefore, across this variable condenser, and the battery would be short circuited were the plates to touch.

This arrangement may correctly be termed a dangerous one, although when a good component is employed the chances of a short-circuit taking place are remote. Nevertheless, one would feel better satisfied with the circuit were a protecting condenser included in series (Fig. 2).

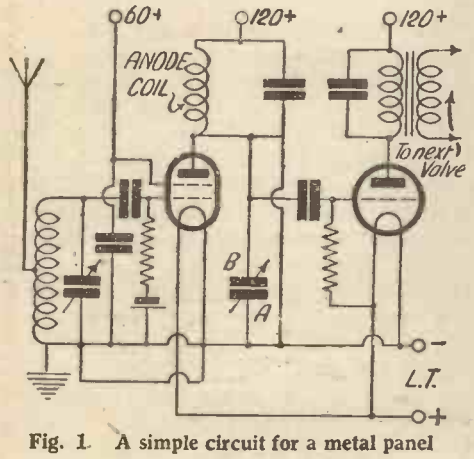


Fig. 1. A simple circuit for a metal panel

The safety condenser may have a value of .002-microfarad or more, and it need not necessarily be of the type having mica insulation. If this condenser has too small a capacity the tuning range of the circuit would be restricted and a poor condenser would reduce the amplification and have the effect of broadening the tuning. Ordinary mica condensers have reasonably low losses, however, and may be used in this position.

Cutting out the "Stray"

Tuning coils having a small stray field are popular just now and, indeed, I have found this type of coil to be practically essential for use in circuits with shielded valves. There are several forms of construction, and a particularly simple one is shown in Fig. 3.

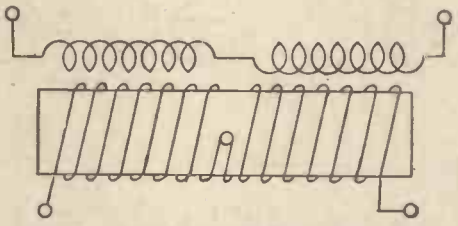


Fig. 3. Scheme of coil with small stray field

Here, one half of the coil is wound in the reverse direction from the other and the two halves have an equal number of turns. The efficiency of such a coil is naturally less than that of a coil having a straightforward winding and of the same bulk, but this is usually a matter of no great importance. What is important, however, is the distance separating the two halves.

It will be clear that if the two parts were widely separated the coil would have a relatively large stray field which is therefore reduced as the two parts are brought together. In practice a separation of about a ¼-inch is often employed with good results although it should not be thought that such a coil has *no* stray field. It is certainly small, and would be smaller still were the two parts wound even closer together. There is a practical side to the question, however, and a designer so adjusts the various factors that the best of all-round results are obtained.

A Soldering Tip

There are occasions when, either because of lack of space or the need for economy, one is tempted to solder connecting wires to anode resistances or grid leaks instead of employing suitable holders. The practice of soldering wires is, however, not always to be recommended for the reason that unless great care is taken the heat from the soldering iron will loosen the cap of the resistance or grid leak, or even disconnect the "internals" of the component. Grid leaks in particular should be handled carefully.

That H.T. Spark

Many a beginner has felt there was perhaps something wrong with the wiring of his newly constructed receiver because a small spark is produced by brushing the high tension lead across the positive terminal of the battery. The spark is quite harmless, and is due to the large condensers in the receiver charging or discharging.

It is not unusual for three or four condensers of one or two microfarads each, to be included in an ordinary three-valve receiver, and, collectively, they will store quite a fair amount of electricity.

Anyone who has connected a 2-microfarad condenser across an H.T. battery and then placed a screwdriver between the terminals of the condenser will be familiar with the spark created. It is only to be expected that when the high-tension wire is drawn across the terminal of the battery sparks will be produced and they may give the

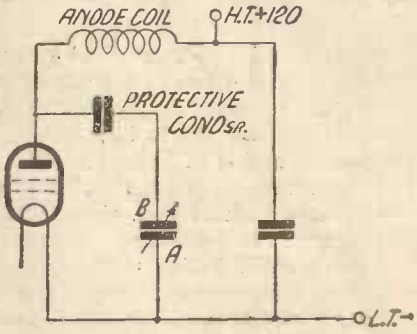


Fig. 2. A protecting Condenser for Fig. 1

novice quite a surprise until it is realised to what they are due.

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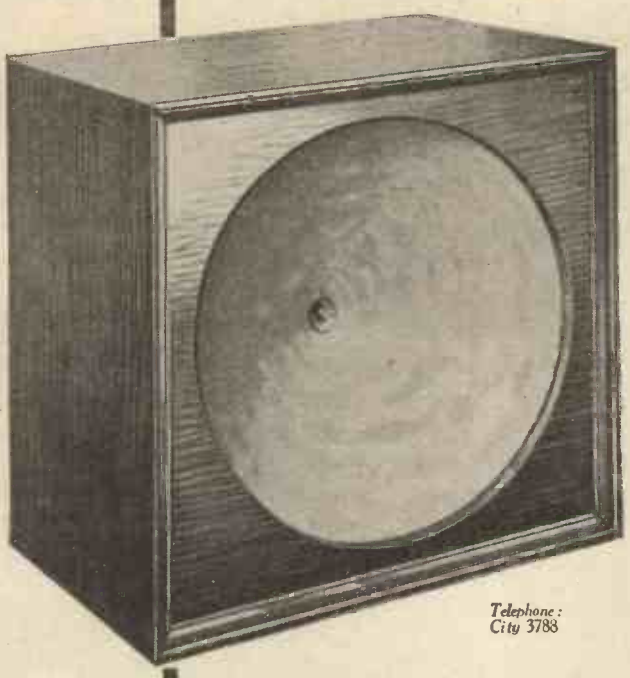

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PR 4	2	.095	120,000	32	R.C.
PR 9	3.5-4	.063	18,000	14	H.F. Det.
PR10	3.5-4	.063	10,000	8.7	L.F.
PR11	3.5-4	.063	88,000	40	R.C.
PR17	5-6	.1	18,000	17	H.F. Det.
PR18	5-6	.1	9,500	9	L.F.
PR19	5-6	.1	80,000	40	R.C.
PR20	2	.15	7,000	6	Power
PR40	4	.15	7,000	6	"
PR60	6	.1	5,000	6	"
PR120	2	.3	2,750	4	S.P.
R140	4	.2	2,500	4	S.P.

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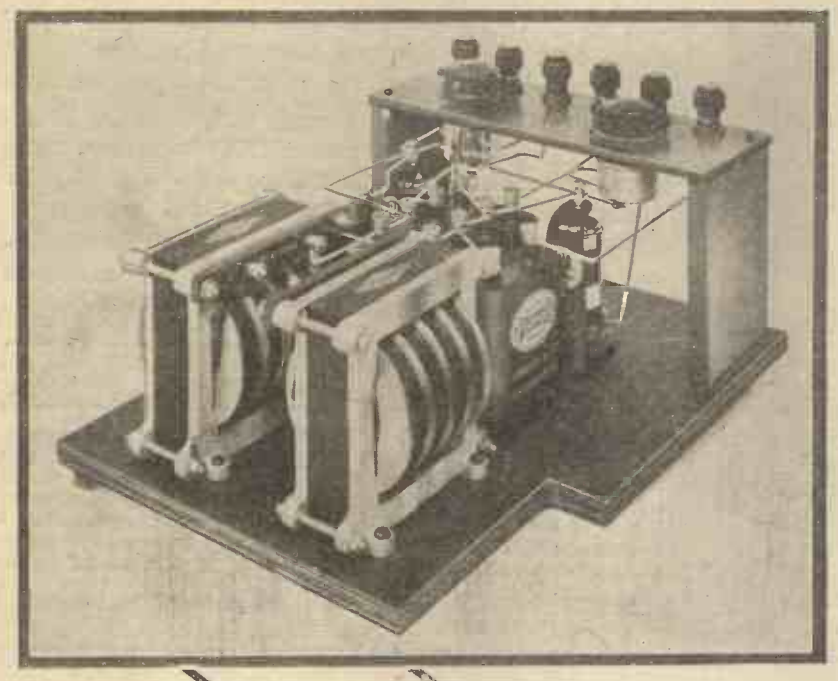


THOSE who have a direct-current supply of electricity in the house for lighting, sometimes consider they are not so fortunate as those having an alternating-current supply.

Whilst it must be admitted that it is much easier and cheaper to obtain a supply of current for filament circuits, or for battery charging, from an alternating-current source, the user who has access to direct current of 200 volts or more is generally the more fortunate in the ease with which current for high tension may be secured.

This efficient unit has been specially designed by W. JAMES, and can be built with ease by any reader of "Amateur Wireless." Full constructional details, together with many photographs and diagrams, are given in the "Wireless Magazine" for April.

This is the completed High-tension Unit for D.C. Mains complete in its metal box

On Your Wavelength!

A Wonderful Broadcast

THE broadcast of the funeral ceremonies of the late Marshal Foch was, I think, one of the most impressive wireless occasions that we have ever had. One thing, though, struck me as a very great pity. The commentator was absolutely first-rate, making one see every scene and every incident; but he spoke in French, and thousands of those who listened in this country must have been unable on this account to follow closely what was going on. On such an occasion one would have thought that the B.B.C. would have had its own commentator and have conducted its own broadcast of the proceedings. So far as I can make out, they simply relayed the broadcast by Radio-Paris, picking it up by wireless at Keston. I am almost sure that this was the case, since when I tuned in Radio-Paris direct I found C.W. interference in the background, and this same C.W. was distinctly audible when one turned to 2LO, 5GB, and 5XX.

Try for These

There are some wonderful stations at work just now below 300 metres. If you have not a set of coils that will drop down to the lower portion of the broadcast band let me counsel you to beg, borrow, buy, or make them at once, if not sooner. I am not exaggerating in the least when I say that Turin, Hoerby (the big Swedish station), Cologne, and Nuremberg are receivable on favourable nights with the quality and, if the set is reasonably well furnished in the way of H.F. amplification, all the strength of the local. So powerful are Turin and Hoerby on good nights that full loud-speaker strength is obtainable with a three-valver, and if the first valve is of the screen-grid kind you probably won't have any need to use reaction. Other stations that can be quite marvellous below 300 metres are Flensburg, Kaiserslautern, Limoges, and Cork. Taking the broadcast band as a whole, the number of quality stations now receivable is wonderfully big.

—and Some Others

In addition to those mentioned I find that real alternative programmes—that is, those providing music that can be listened to with genuine pleasure—are obtainable from Huizen (especially when he is using the long waves), Radio-Paris, Kalundborg, Motala, Hilversum, Budapest, Vienna, Brussels, Langenberg, Frankfurt, Stuttgart, and Barcelona. I don't mean that you will hear every one of these stations on any night of the week, but you will certainly find in normal circumstances that you have half a dozen or more first-rate foreign transmissions from which to choose. Fit a good high-frequency stage, if you haven't already got one, and you can have all the variety that you want.

Economy in DX

For real efficiency combined with economy in long-distance work I can strongly recommend a set of the type that I am using now, which contains only three valves. The first is a screen-grid H.F. amplifier, the second an anode-bend rectifier, and the third a pentode. The total filament consumption at 4 volts is only .35 ampere, whilst the H.T. drain is 17 milliamperes. This may seem a good deal, but it must be remembered that the set is used for producing a big volume of sound, and I don't know that you can manage with much less nowadays if you want first-rate quality.

I find that the pentode will take more grid bias than the characteristic curve would lead one to expect, which means that one can cut down the H.T. current considerably. Normally a pentode with 150 volts on the plate and screen grid, and given a bias of about 7½ volts negative, takes something over 20 milliamperes to its own cheek. Experiment shows that a good deal more grid bias can be applied without producing any trace of overloading or distortion.

Another Saving

With a three-valve set of this kind one saves also in other ways. Screen-grid valves and pentodes are rather expensive, but if the whole set contains only three "toobs" there is clearly a big economy in components. In fact, all that one wants is two pairs of coils (one for the medium and one for the long waves), two .0005-microfarad variable condensers and one midget, a pair of H.F. chokes, three valve holders, a good low-frequency transformer, an output transformer, the usual fixed condensers, and an on-and-off switch. In addition to these, a volume control is also desirable, for the huge amplification available is often considerably more than one needs. The pentode is a delightful valve to use, since, owing to its enormous amplifying powers, quite a small applied grid swing produces a big output in the plate circuit. It is perfectly stable and gives a dead quiet background.

An Error

I was very sorry to find the B.B.C. allowing the talk recently given on foreign affairs to include certain rather scathing remarks about the policy of a very distinguished man who is the leader of one of the great allied nations. "No politics" is supposed to be the rule of the B.B.C., and except that our own domestic affairs may be dealt with at election time this rule should be strictly adhered to. Everyone is entitled to his own opinions about the governments of other nations, but it is certainly quite out of place to broadcast criticisms, especially as the B.B.C. is now a Government department. People sometimes forget that broadcasting knows no frontiers. Actually 5GB and 5XX are regularly tuned in by dwellers in countries all over Europe, and criticisms such as that referred to must give widespread offence.

A Good Selection

The B.B.C. did us very well indeed in the matter of holiday programmes at Easter. Those responsible are to be congratulated on the way in which they exactly matched the holiday spirit by the choice of programme items. I am sure that the big output of light entertainment, variety, tuneful music, and humour was appreciated far and wide.

"A Noteworthy Scientific Achievement"

The Postmaster-General is to be congratulated on his excellent summing up of the recent official tests carried out between the Baird Television Development Co., Ltd., and the B.B.C. The purport of his communication to the Baird Company indicates that we can look forward to real "seeing-in" in a relatively short time. With television as an ally, broadcasting will take on a new interest.

The other day I read an article in an American paper which questioned whether wireless broadcasting would be so effective if it were accompanied by television. Summing up the situation, the writer held that he who travels by the wireless with imagination for his guide may enter into those realms of gold which are closed to those who, seeing all, blindly seek a certainty.

Doubly Girded

I am afraid, however, that the arguments put forward were far from convincing. Imagination is a wonderful asset to the individual when applied in the right direction, but to use that as an excuse for discounting television is certainly wholly wrong. To the amateur this new science opens up what may be regarded as a virgin field of investigation, and for that reason alone we shall welcome its appearance. Of late, I have been making a careful study of the problems involved and find that once the elementary principles are thoroughly understood "seeing by wireless" is really only slightly more complicated than sound reception.

"Listening" With Your Eyes!

Have you ever *seen* speech or music? No, I am not taking flights into the realms

On Your Wavelength! (continued)

of fancy, but am perfectly serious. My thoughts over the week-end had been centred round that very absorbing science which has been so much in the public eye of late, to whit television, and I was wondering how long we should have to wait before regular transmissions took place, so that it would then be in the public eye in more senses than one. I therefore turned on my favourite set (perhaps one of these days I shall let you into the secret as to which one this is), and having tuned in a fairly strong signal I substituted an ordinary neon lamp, just a simple beehive pattern, for the loud-speaker.

You should try this for yourself, as the previously audible signals now become visible, inasmuch as you can see the flickerings of the lamp in place of hearing the vibrations of the diaphragm. Whereas in this instance the flickerings were due to passages of music interspersed with speech, I knew that if I had been able to tune in the characteristic television note, the lamp flickerings would then have been reproducing the reflected light from the object being televised. Actually, this provides the gradations of light and shade that enable us to distinguish form, and all that remains is to arrange the series of light flashes over a surface or area corresponding to that occupied by the object we desire to see.

A Glowing Plate for a Canvas

Put into more familiar language, this is the same as saying that a picture must be formed out of the succession of light and shade in just the same way as the artist forms his picture by a succession of brush touches on a canvas. In actual television practice this is effected at the receiver by employing a scanning disc having the same number of holes and running in synchronism with the disc at the transmitter. What we may regard as the canvas is the glowing plate of the neon lamp, it being borne in mind, of course, that the actual neon lamp is not like those we use as night lights, but has a comparatively large, flat, rectangular-shaped positive plate. Now, when the first hole of the transmitter disc explores a line across the object and lets the reflected beams of light fall in succession upon the "photo-electric microphone" so the receiver disc has a hole which explores a line across the glowing plate of the lamp, and it is seen bright in one spot and dark in another as it flickers.

Creating the Form

With perfect synchronism between the transmitter and receiver discs the succession of lines build up an image identical in light and shade to the original form, the spread of the light impulses over a surface creating this form. Naturally, this process must be effected at sufficient speed to prevent the eye from dwelling on the mechanics of the scheme, as thereby the light flashes are seen in their proper place, and not actually as a sequence. That is why the minimum number of complete picture scans is usually given as fifteen per second, corresponding to a disc speed of 900 revolutions per minute. Images viewed under these conditions are really excellent.

Needle Scratch

The general use of electric gramophone pick-ups has created two great new "schools of thought." One huge section of pick-up users is in favour of the abolition of the irritating background noise caused by needle scratch. The other section, the minority movement, agrees with all these admirable sentiments, but expresses the view that any electrical or mechanical "damping" introduced for cutting out needle scratch must inevitably reduce the strength of high notes, harmonics, and sibilants of speech. The "minority movement" resigns itself to the awful presence of needle scratch, rejoicing in the more even response of their gear to all the musical frequencies.

Cutting it Out

Naturally, the decision as to whether you will cut out needle scratch or not depends on the type of pick-up you use and its particular resonances in relation to the band of frequencies carrying the scratch. The use of a fairly "blunt" filter circuit which will shunt frequencies of the order of 6,000 cycles is the most effective weapon for cutting down the scratch without injuring the tone values too much. But the design of such a circuit is tricky, and the capacities of the condensers employed, etc., will vary according to the type of pick-up used and other factors. The easiest way is to shunt a condenser in series with a variable resistance across the pick-up leads, respective values being about .1 microfarad and 0-5,000 ohms. Variation of the resistance will then alter the amount of "damping" on the needle scratch as required.

Another Remedy

Personally, I have used neither filter nor "integration" (shunt condenser) for some time in connection with my own pick-up. I don't buy any but the best records and endeavour to reproduce them as well as possible, neglecting the question of needle scratch. The blare of the brass and the high harmonics of the violin, as well as speech sibilants, come out very well and I am satisfied. Any kind of filter circuit is bound to cut these down; and I'd sooner have the scratch than that! If the gramophone companies made their records with a terrific resonance on musical notes around 6,000 cycles, then one could employ a filter on the reproducer to diminish this resonance, which would at the same time cut out the needle scratch. But I am afraid that there are too many mechanical gramophones in use for the gramophone companies to do anything like this.

Sound Films

The boom in talking pictures has resulted in a steady flow of engineers and programme builders from the B.B.C. to the film studios. R. E. Jeffrey, the B.B.C.'s chief dramatic producer, has moved his tent to Elstree, quickly followed by K. V. Wright, "O.C. Noises," and about half a dozen engineers. All these people have been absorbed by one producing concern only! Meanwhile, there is keen competition for the services of some of the leading B.B.C. engineers in both sound film and gramophone recording studios.

Fieldless Coils and Reaction

In many sets nowadays astatic coils are used to prevent interaction effects and to minimise eddy current losses where screening is employed. A difficulty sometimes presents itself when the grid coil of the detector valve is of this kind and it is desired to make use of reaction. The trouble is, of course, that one half of the coil is wound in one direction and one in the other. The reaction coil tends, therefore, to ginger up one half of the coil and to do just the opposite to the other. I have come across several cases where friends who had made their own coils were very much puzzled by failure to obtain proper reaction effects. Investigation showed that the end of the grid coil remote from the reaction coil had been wound clockwise and the other end anti-clockwise, the reaction coil itself being wound clockwise. If the usual plate and grid connections are made, the reaction coil then exercises a reverse effect upon the end of the grid coil to which it is coupled and rather queer results occur. The rule is always to wind the reaction coil in the same direction as that of the grid coil to which it is nearest. If this is done and capacity control is used a short series of experiments will serve to determine the position for the reaction coil which gives the optimum degree of coupling.

An Unexpected Emergency

Doubtless I had the sympathy of readers last week when I described how I was "let down" by the burning out of an anode resistance just when I had promised a special concert to some musical highbrows. I told you how I used a moving-coil milliammeter in the plate circuit, in place of the resistance. Well, I must crave still further sympathy—this time for a slip of the pen! Of course, I meant to say that I used a voltmeter, and not a milliammeter in place of the defective and now defunct anode resistance. It is certainly a tip worth remembering, for most enthusiasts have a high-resistance voltmeter.

THERMION.

THE WIRELESS CONTROL OF MODELS

By MAJOR RAYMOND PHILLIPS

Part Two—

THE RECEIVING GEAR

THE last article dealt with the construction of a simple "spark" transmitter arranged to function each time selected words are spoken into a special microphone. As there may be enthusiasts who would like to possess a radio transmitter fitted with a special microphone, and morse key, the latter can be inserted in the primary circuit of the small spark coil as shown in Fig. 1. When using the morse key it is advisable (for some experiments) to disconnect the microphone circuit, otherwise there would be a risk of signals being transmitted when not required.

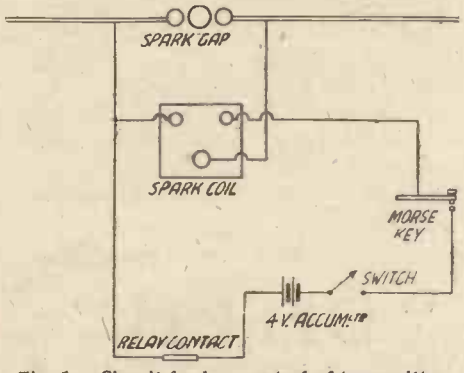


Fig. 1. Circuit for key control of transmitter

Such a method is useful where a number of controls have to be effected in "sequence" and where it is necessary quickly to pass over contacts on a selector drum which may not at the time be required. For instance, the writer often found it necessary when manœuvring his well-known wireless controlled airship quickly to pass a series of contacts in order to select circuits connected with the different electric motors, so that steering and general control could rapidly be effected.

Fig. 2. Photograph showing under-carriage of model locomotive

Alternative Use

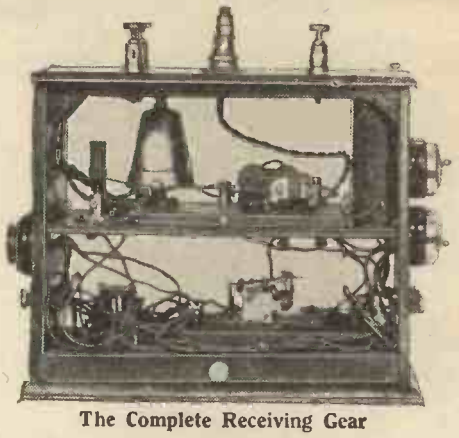
It will be necessary to construct special receiving apparatus for use with the microphone transmitter already described, but the circuits of the receiver are so arranged that a morse key can if desired be used with the transmitter. Before giving constructional details of the special receiving apparatus, it will be well briefly to refer to various types of model electric locomotives suitable for wireless control. Many model electric locomotives are fitted with permanent-magnet type electric motor. This only involves the necessity of reversing the flow of electric current to the "conductor," and "outer" rails of a model railway in order to cause a model locomotive to run forwards, or backwards, as desired. It sounds like a fairly simple operation, but unfortunately it means introducing slight complications in a selector, or distant-control switch fitted in receiving apparatus.

Sequence Control

For simplicity of control the better plan is to have a model electric locomotive (as shown in Fig. 2) fitted with "sequence" reversing mechanism. This involves switching electric current "on" and "off." The reversing mechanism fitted to such a model locomotive functions in "sequence," so that each time electric current is switched on to a model railway the locomotive will run forwards, or backwards in sequence. As the mechanism acts very rapidly, it is not a difficult matter to cause the model to run in the same direction on two successive occasions if desired, as it is only necessary to switch electric current "on," "off," and "on" again quickly. This type of locomotive is also fitted with a locking lever, so that the running position can be fixed if desired.

The construction of special receiving apparatus suitable for use with the microphone transmitter will now be described. The following components (some of which can be purchased "ready-made") will be required: coherer, de-coherer, relay, special selector, two ordinary electric-light switches (5-amp.), pneumatic dashpot device, eight large terminals, and about four yards of flexible electric-light wire.

The coherer can be purchased ready-made. A de-coherer simply comprises the movement of a 3-in. electric bell. A suitable relay can be purchased from almost any dealer in wireless apparatus, but an old G.P.O. type rewound with No. 36-gauge



The Complete Receiving Gear

enamelled copper instrument wire to a resistance of 100 ohms gives excellent results. A pneumatic magnetically-operated dashpot will have to be made specially. The device shown by Fig. 3 functions perfectly, and is fairly simple to make. An ordinary wooden block (such as is used for mounting electric light switches) 9 in. by 3 in. will provide a base, and the electro-magnet shown should have cores 1½ in. long by ½ in. diameter, and the bobbins be wound with No. 25-gauge enamelled copper wire.

The armature of the electro-magnet

Fig. 3. The pneumatic "dashpot"

should be made of soft iron, 6 in. long by 1 in. wide by $\frac{1}{16}$ in. thick, and at one end (which should be bent at right angles) there should be fitted a piece of vulcanised fibre 1½ in. square by ⅛ in. thick. Two screw-threaded holes should be made in the fibre to accommodate two ½ in. No. 6B.A. brass screws, the latter to form contacts. The two spring contacts shown in Fig. 3 should be made of No. 26 gauge hard brass sheet, each contact being ½ in. wide. The main contact should be 3½ in. long. The shorter one (de-coherer contact) should be 3 in. long.

(To be continued)

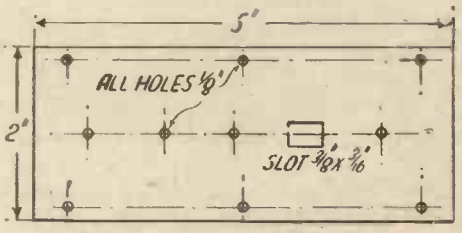


Fig. 4. Base for Selector

For the Newcomer to Wireless: LOW-FREQUENCY TRANSFORMERS

WOULD you mind clearing up matters about low-frequency transformers? I was told the other day that they can give perfect reproduction, but in a book that I have just been reading, I find that they must always lead to distortion.

When was your book published?

Three or four years ago.

Then the writer was quite correct, for at that time even the best transformers were a long way from perfect.

And can we obtain real quality from them to-day?

Certainly we can, if we purchase first-rate components and use them as they should be used.

How do you mean?

The secondary of a transformer cannot contain more than a certain number of turns for various reasons; and obviously if we want a step-up ratio the primary must have a smaller number of turns.

That's quite clear.

Since you cannot increase the number of secondary turns it's plain I think that the only way of obtaining a big step-up ratio is to have a few turns on the primary.

That seems obvious.

The fewer the primary turns the smaller the inductance of that winding.

I think I see what you are driving at. It comes to this; the bigger the step-up ratio the smaller must be the inductance of the primary.

Exactly, and this means that you cannot use a transformer with a big step-up to couple a high- or even a medium-impedance valve to the next one.

I don't quite follow that.

If there's not to be a suppression of certain notes the impedance of the primary winding must be kept high at all frequencies. Now the impedance of a transformer primary depends very largely upon its inductance and if the inductance is not big enough the impedance will be too small at low frequencies, with the result that there will be a suppression of the bass notes, for they will not be properly amplified.

Can you give me any kind of rule to go by?

Several!

Well, please fire away.

In the first place don't use transformer coupling after an anode-bend rectifier. You will find that the resistance-capacity method is better here. Next, if the makers state the inductance of the primary when a normal current is passing I can give you a good rule of thumb.

What is that?

The minimum inductance value for good results is five times as many henries as there are thousands of ohms in the valve impedance. That is to say, if the rectifier has an impedance of 20,000 ohms you want a transformer with 5 by 20 or 100-henry inductance to follow it. Supposing that you want to couple note-mag. number one to note-mag. number two by means of a transformer and that the first has an impedance of 6,000 ohms, then a 30-henry primary is needed.

But supposing that they don't state the inductance value?

Then you are pretty safe in taking it that a 20,000 ohm valve is the highest that can be used satisfactorily with transformer coupling and that for this class you must not use a bigger step-up than about 3 to 1. For the 8,000-ohm type of valve a 4-to-1 transformer may be used whilst a 6-to-1 may follow valves of 5,000 to 6,000 ohms impedance. A really big step-up such as 8 to 1 can be used with advantage only after quite low impedance valves.

FROM ACROSS THE "DITCH"

JOTTINGS FROM MY LOG :: By JAY COOTE

HAS it ever struck you to what extent radio has annihilated distance?

Recently, during a period when the Channel was blotted out by a bank of fog, it took some friends of mine almost an entire day to cross from Calais to Dover; on the same evening, when they called on me, I was able to switch them over to Brussels (their native city) by the mere turn of a wrist. Through the loud-speaker, the news bulletin which interested them was received as if the announcer had been in the same room, yet he was on the other side of the "ditch"!

On many evenings, instead of pottering around in an aimless manner, I devote some time to individual stations. In view of the fact that Radio Belgique is now playing with a higher powered transmitter, I have followed its programmes more carefully than hitherto. At the end of what is usually an excellent musical programme, you will be treated to a very remarkable series of announcements, inasmuch as they comprise the latest news items, political, social, or commercial, interlarded with advertisements and puffs. On one occasion following the details of a particularly gruesome murder, the announcer ended up with: "If you want to sleep soundly to-night, drink a large glass of ——" and followed the name of a well-known Belgian beer!

In this bulletin one finds references to tinned tomatoes, radio components, the names of seaside resorts at which you are invited to spend your holidays, and apparently contracts are made with advertising firms, for the same publicity is given out nightly.

Radio Belgique receives no subsidy from the State, and relies entirely on voluntary contributions. For this reason appeals are made to listeners to buy listening cards, the cost of which is 25 francs per annum (under 3s.) or entreats them to become patrons at the cost of 100 francs yearly.

By the way, all the transmissions from Brussels regularly close down to the playing of "La Brabanconne" on a gramophone record.

◆ ◆ ◆

Another station to which I listened regularly during the last few nights is that of Frankfurt, of which, for some reason or other, the reception has gradually become weaker. Although the studio has a very full day, when I was last in that city, I ascertained that the bulk of the work is done by one announcer whose call, *Frankfurt-am-Main und Kassel* must now be familiar to you all.

"CUTTING OUT THE HIGH-TENSION BATTERY"

A Patented Circuit

WHEN our Technical Staff prepared the article "Cutting Out the High-Tension Battery" that appeared on pages 485 and 486 of our March 30 issue, we believed that the circuit on which the article was based was common property. Since publication of the article, however, Messrs. E. K. Cole, Limited, "Ekco" Works, London Road, Leigh-on-Sea, have courteously drawn our attention to the fact that the circuit in question is fully covered by their patent No. 262567. It follows, therefore, that readers may only construct the D.C. mains unit described in the article for purely experimental purposes, since only the patentees and their agents have the right to make and sell a unit built in accordance with that circuit.

We express to Messrs. E. K. Cole, Limited, our regret that, being unaware of their patent, we quite inadvertently used the circuit as the basis of our article.

WITHOUT FEAR OR FAVOUR

A Weekly Programme Criticism by Sydney A. Moseley

WHAT beautifully expressive music is Grieg's! The holiday programme of the great Norwegian composer's works was incomparably rendered by the Wireless Symphony Orchestra, Kate Winter, and Maurice Cole. What poetry, what longing there is in "First Spring." And what grotesqueness in the "March of the Dwarfs." In pre-wireless days the multitude knew only "Peer Gynt." Now these

Miss Jessie Matthews—as our artist sees her.

and other musical treasures are being disclosed to people whose musical souls were half-starved.

◆ ◆ ◆

Song recital by Olga Haley good. "Serenade" by Strauss has become a best singer. Oh, by the way, where did Esther Coleman get her translation of "I Love Thee"?

◆ ◆ ◆

Interesting, isn't it, to watch jokes grow?

"What's your name?"

"Watt!"

"That's what I asked you. What's your name?"

"Watt!"

And now the variation.

"Where do you live?"

"Ware!"

"That's what I asked you. Where do you live?"

"Ware!"

How the music-hall audience roared!

◆ ◆ ◆

It's quite a useful thing to barge into people whose work you criticise, or people well up in the world of wireless who criticise you! For instance, I had something to say about Lance Sieveking's production recently.

"I don't forget you wrote, 'Keep your hand out of the till,'" he said as we walked away from Savoy Hill, "but my next production will have an equally big caste."

Well, if the money's worth it, Lance, we'll break no more lances. (Oh, cheap! cheap!)

◆ ◆ ◆

Sieveking, by the way, made a spirited defence of those at the B.B.C. who work seriously and conscientiously on behalf of the listener. Productions that go over badly apparently hurt the producers as much as they hurt listeners. I have, however, paid tribute to the type of earnest worker at Savoy Hill.

◆ ◆ ◆

I was glad to hear from such an eminent expert as Professor Appleton that he and others supported my "clean radio" campaign. Apparently the comments in this page have been closely followed.

◆ ◆ ◆

We shall have to mind our pros and cons, for the wife of another radio professor tells me she reads us "first" each week. Frank criticism may rub some of the victims up the wrong way. Honesty is not the best policy if you desire to "keep in" with everybody. As it happens, I don't wish to keep in—or out—with anybody except the bulk of my readers. And this sort of unexpected tribute helps me in my attitude.

◆ ◆ ◆

Professor d'Andrade is another interesting personality who told me he had kept certain cuttings of mine. But the subject turned out to be—*spiritualism*! I wonder, by the way, whether we shall hear any more of those spirited and well-informed talks of his.

A young author who is doing enterprising work in the production line is Holt Marvel. He tells me that I "gave away" his identity. Did I? He ought to be proud of it if I did. He is certainly brimful of ideas, and I gather we shall soon be listening to more of his work.

◆ ◆ ◆

And, yea, verily, among others, whose names are familiar to readers, whom I met in the flesh was my old tried and trusted friend, Captain Eckersley. As a matter of fact, I got him to televise for the first time in history! But about all this I shall have to refer readers to my "secret history" book which I hope to write one day.

◆ ◆ ◆

Another chat I had was with R. E. Jeffrey. He believes a visual audience is essential to the temperamental radio artiste. I think Eckersley would dissent. So do I. Still, R. E. J. is frightfully keen on the future of "sight and sound" entertainment, and I wish him luck.

◆ ◆ ◆

Sullivan's *Ivanhoe* is little known. Why? Because it was "grand opera" and unlike the rollicking Sullivan airs that helped to pack the Savoy Theatre. Still, it is a beautiful opera, and one is grateful for the opportunity of hearing it.

An impression of Jack Hobbs

BRITAIN'S "FA

UP-TO-

Further Details :: How to

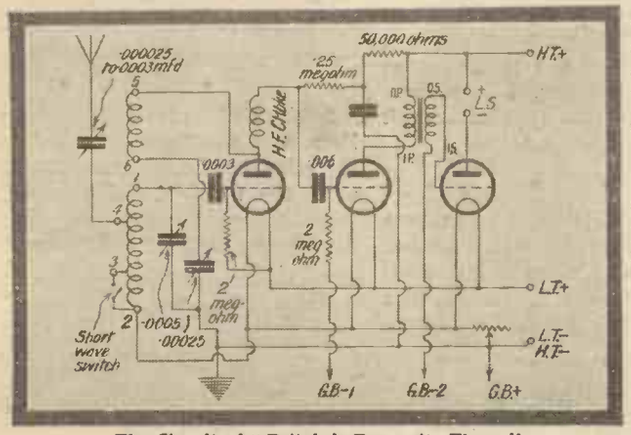
FOR the benefit of those who did not have the opportunity of reading the constructional article last week which dealt with an up-to-date version of that ever-popular receiver "Britain's Favourite Three," it must be explained that so insistent has been the demand for new facts about this set that it was deemed advisable to produce an absolutely up-to-date version.

You may remember that the "Favourite" owed its inception to a competition which was held in AMATEUR WIRELESS in order to decide the most popular circuit. The "Favourite" was the result, and was published at the beginning of 1928 and it embodied everything that an amateur required for general-purpose reception.

A Popular Combination

At the time when it was produced high-frequency amplification had not been developed to the extent which it has been to-day. As most readers of AMATEUR WIRELESS will be aware, high-frequency stages, once the playthings of more or less experienced set operators, can now safely be included in the specification of general-purpose receivers.

Some very popular three-valvers have been described in AMATEUR WIRELESS, and these, while designed for the "wireless man in the street," have included what would once have been considered a difficult stage to operate, namely, a stage of screen-grid H.F. amplification.



The Circuit of "Britain's Favourite Three"

But there are still many reasons why three-valvers with two stages of amplification on the low-frequency side, and with no H.F. boosting whatsoever, are very popular, and why, if the voting were taken again, three-valvers without H.F. might conceivably not be swamped by their more distance-getting counterparts with one H.F. stage.

The whole question resolves itself on the point of economy, both as regards valves and running costs.

There is quite a big step of difference both in outlay and in the continued expense, month by month, between a three-valver and a four-valver; in very many cases the necessity to own a "three" is quite clearly dictated. Well, if it is to be a "three," the next question which automatically arises is: is it to be used mainly for "family" work or for DX reception?

A Double-purpose Receiver

If the set has as its main duty to receive 5XX, 5GB, and the local station at good loud-speaker strength, but when the rest of the family has gone to bed pater-familias likes to put up a good showing against some of the neighbours' super-hets and multi-stage screen-grid job *postes*, then an H.F. stage is essential. This, of course, means that there is only one low-frequency stage, and unless the circuit is carefully designed and the very best components are used, the home-broadcasting results may suffer.

On the other hand, if the three-valver is used just as an alternative to the gramophone and only Daventry and the local station are to be received at adequate volume, then two L.F. stages and no high-frequency stage is the obvious arrangement.

This is just what is done in the case of "Britain's Favourite Three," and, as we have said, when it was voted (in 1928) to be the most popular circuit, screen-grid stages were not such an everyday matter as they now are.

With the additions described in the 1929 model it is in every sense an up-to-date three, capable of giving a good show without any unnecessary frills.

A Popular Type

As even the least technically-minded reader will gather from a cursory inspection of the photographs and theoretical circuit diagram, "Britain's Favourite Three" is of the ever-popular detector, R.C., and transformer-coupled L.F. type.

Those who take an interest in the working of their receivers will perhaps care to examine the various features obvious from the circuit diagram. The detector operates on the leaky-grid principle, and this is because at normal ranges and owing to the fact that there is no high-frequency amplifier preceding the detector, there is no tendency for the leaky-grid system to be over-loaded.

As is well-known, the great advantage of employing the anode-bend system, instead of leaky-grid rectification, is to be found when the input to the detector is already fairly large, and there is a danger that the proper functioning of the condenser and leak, in the leaky-grid system, might be upset by the comparatively heavy grid voltage.

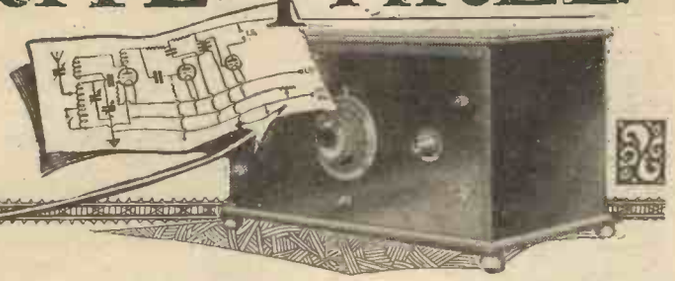
COMPONENTS REQUIRED

Ebonite or bakelite panel, 16 in. by 8 in., and strip, 4 in. by 2 in. (Becol, Raymond, Paxolin, Radion).
.0005-mfd. variable condenser, log mid-line type (J.B., Polar, Ormond, Burton, Burndept).
.00025-mfd. variable condenser, log mid-line type (J.B., Polar, Ormond, Burton, Burndept).
7-ohm panel-mounting rheostat (Lissen, Igranic, G.E.C., R.I. & Varley).
Push-pull switch (Lotus, Lissen, Trix, Wearite).
Panel brackets (Bulgin, Camco).
Dial indicator (Bulgin).
Three antimicrophonic valve holders (Benjamin, Lissen, Burton, Wearite).
.0003—.000025-mfd. pre-set condenser (Formodenser type J, Igranic).
.0003-mfd. fixed condenser with series clip (Dubilier, Lissen, Graham-Farish, Mullard).
2-megohm grid leak (Dubilier, Lissen, Graham-Farish, Mullard).
Six-pin coil and base (Tunewell, Lissen, Lewcos, Peto-Scott).
High-frequency choke (Lissen, R.I. and Varley, Burndept, Polar, Tunewell, Trix).
Resistance-capacity coupling unit (Dubilier, Lissen, R.I. & Varley, Graham-Farish, Mullard).
50,000-ohm resistance (Graham-Farish, Lissen, Dubilier, Mullard, R.I. & Varley).
2-mfd. fixed condenser (Lissen, Dubilier, T.C.C., Ferranti, Mullard).
Low-frequency transformer (R.I. & Varley, Lissen, Philips, Mullard, Cossor, Igranic).

VOURITE THREE"

DATE

et Best Results



The various technical merits and demerits of each system have been discussed in the pages of AMATEUR WIRELESS, but it may be taken for granted that in a general-purpose receiver, such as this "Britain's Favourite Three," and where there is no amplification preceding the rectifier, the grid condenser and leak system is preferable. The values for the condenser and leak are conventional, being .0003-microfarad and 2-megohm respectively.

A little hint which may be appreciated is that with some detector valves and under certain working conditions slightly better sensitivity, though sometimes at the expense of purity, is obtained if the value of the grid leak is raised somewhat—to, say, 3 or even 5 megohms.

The values of the condenser and leak in the R.C. coupling system are also conventional, that is, for an R.C. stage immediately following a detector valve.

The anode resistance used in conjunction with these components has a value of .25 megohm, and in series with this is the 50,000-ohm resistance, which forms part of the anti-motor-boating unit.

Grid-bias battery clips (Bulgin). Two black and one red wander plugs (Clix).
Baseboard, 16 in. by 9 in. (Pickett, Clarion, Camco).
Connecting wire (Glazite). One yard of thin flex (Lewcoflex).
Seven terminals, marked: Aerial, Earth, L.T.+, L.T.—, H.T.+, L.S.—, L.S.+ (Belling-Lee, Eelex, Igranic).

Six-volt Valves to Use with the Up-to-date "Favourite Three"

Make	*Det.*	*1st L.F.*	*Power*
Cleartron ..	CT25F	CT25	CT25X
Cosmos ..		DE50	
Cossor ..	610RC	610LF	610P
Ediswan ..	RC610	LF610	PV610
Marconi ..	DEH610	DEL610	DEP610
Mazda ..	RC607	GP607	P615
Mullard ..	PM5B	PM6D	PM6
Osram ..	DEH610	DEL610	DEP610
Six-Sixty ..	6075RC	6075HF	610P

1929 Modifications

The additions to the original 1928 "Favourite" are the following: The plug-in coils are scrapped in favour of a six-pin dual-range coil, and the wave-change switch is placed on the panel just below the centre tuning condenser; a pre-set condenser is incorporated in order to give the very best selectivity; this condenser is mounted on the baseboard and can be put in or out of circuit as required, simply by changing over a flex connection from one terminal to another; the third addition is an anti-motor-boating unit which enables a high value of H.T., a large power-valve or a mains eliminator to be employed without any fear of motor-boating.

As a matter of fact, possessors of old "Favourites" will find very little difference between the operation of the new set and the 1928 edition. Valves and battery details are, of course, relatively important. For the guidance of new constructors of the "Favourite" a table is given showing a selection of six-volt valves which will work very well in combination. As in most other receivers, 2- and 4-volt equivalents can be used and the final decision with regard to type rests almost entirely with the set user and the type of accumulator he has available.

It is recommended that about 120-volts H.T. should be used, in conjunction with a 9-volt grid bias battery, and about 3-volts negative G.B. being applied to the first L.F. valve.

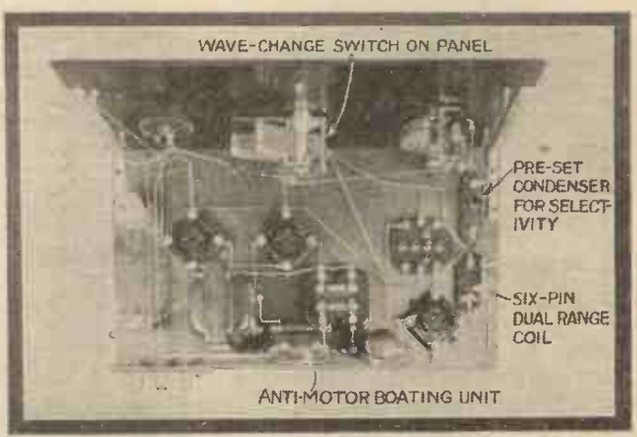
It is opportune at this point to note that in the accompanying valve table, valves suitable only for ordinary requirements are given; that is to say, the last valve is of the normal power or large L.F. type, capable of dealing with a reasonably extensive grid swing, and giving an output for one of the larger cone type or smaller moving-coil loud-speakers.

There are, however, still larger power valves on the market, and in cases where exceptionally large output is required one of these may be used, provided that a corresponding alteration in H.T. and grid-bias voltage is effected.

A glance at any list of typical two-volters in this super-power class shows such valves as the Cossor 230XP, the Marconi or Osram DEP240, Mullard PM252, Ediswan PV225, Mazda P227, and Six-Sixty 230SP.

For a preliminary test, tune in the local station. To do this fully screw in the knob of the pre-set condenser and with the reaction condenser at practically zero, slowly rotate the main tuning condenser until the desired station is heard.

Then reaction may be adjusted until volume is at the required degree and the knob of the pre-set condenser can be slacked off a little, if desired, though there is really no need to do this in the case of local station reception, which is generally free from interference. H.T. and G.B. values can then be adjusted to a nicety and an attempt may then be made to tune in some of the more easily receivable foreigners.



This picture shows the 1929 modifications

If interference from the local station seems to cover an unduly large section of the tuning scale, the knob of the pre-set condenser can be slacked off, thus reducing the capacity until the required selectivity is obtained.

The simple push-pull switch on the panel changes over from the long- to the short-waves and this is a convenient point which will be most appreciated by users of the former edition of the set and who may have had cause to grouse at the job of changing over the coils.

"A.W." TESTS OF APPARATUS

Conducted by our Technical Editor, J. H. REYNER, B.Sc. (Hons.), A.M.I.E.E.

New Wearite H.F. Choke

THE Wearite H.F. choke has, since its inception, earned a good name for itself because it will operate in a reliable manner from below 20 metres up to wavelengths exceeding 2,000 metres. This shows that the value of inductance is sufficiently great and the self-capacity sufficiently small for efficient choking both on the high and the low wavelengths.

A new model of this popular component has recently been put on the market. This differs from the older form in that the two terminals are placed on the base instead of one being on the base and the other at the top of the former. Tests which we conducted on the old and the new type of choke indicate that the new type has a slightly higher self-capacity owing to the positioning of the terminals. This, however, is scarcely noticeable, being less than one micro-microfarad and in practice no difference in the operation of the instrument

New Wearite H.F. Choke

could be discerned over the entire working range.

As before, the finish and appearance of this choke are excellent. The makers, of course, are Messrs. Wright and Weaire, Ltd., of 740 High Road, London, N.17.

An Automatic Time Switch

IT is very annoying to miss the beginning of a much-desired programme simply because one forgets to switch on the set at the proper time. Also, if a set is to be left in non-technical hands it is satisfying to know that it can automatically be switched on and off without any chance of the other controls being upset.

These two needs are supplied by the Setalite, which is an automatic time switch, manufactured by Setalite, Ltd., Morley House, Regent Street, London, W.1. It incorporates a clock-work mechanism which needs no special winding.

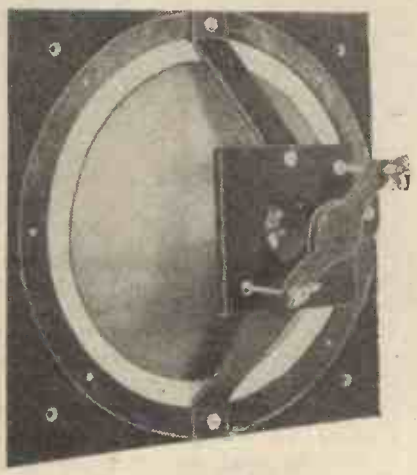
All that it is necessary to do in order to make the set operative in, say an hour and a half's time, is to turn the knob on the front of the Setalite until the setting of 1-30 is obtained on the dial. This is all the winding that is needed, and the instrument then goes on ticking, until the proper period has elapsed, when two contacts are closed and the set is switched on.

Setalite Time Switch

The Setalite is capable of switching either on or off at any predetermined time, and a simple push-pull switch on the side of the case arranges for it to switch on or off as required. We have tried one of these switches in conjunction with an ordinary set and have found that it gives a very satisfactory degree of accuracy.

Floating-cone Unit

THE advent of the moving-coil speaker with its floating diaphragm has demonstrated the advantages of using a floating diaphragm with magnetic vibrating armature units. If a diaphragm is free to



A. W. Knight's Floating Cone

move at the periphery there is more chance that the motion will take place as a whole rather than in small segments.

We have recently tested a floating cone, marketed and submitted by Messrs. A. W. Knight and Co., of 180 Tower Bridge Road, S.E.1. This is simply and inexpensively made but is an efficient article of its kind and capable of giving good reproduction.

A 7½ in. cone is attached at the periphery to circular pieces of chamois leather and is finally clamped to a small baffle board having overall dimensions of 10 in. square. The baffle board is covered on the outside with green baize, so that it can be fitted if desired to a larger baffle without loss of signal strength or tendency to rattle.

During our tests we connected several units in position, in turn, and affixed an extra 2 ft. baffle; the results obtained were quite pleasing, the reproduction from high-class units being good and free from undesirable rattle, even when large volume outputs were obtained. This cone assembly can be recommended.

Polar Ideal Condenser

THE Polar Ideal variable condenser is well-known as a robust instrument of high-class design fitted with a reliable and smooth slow-motion device working on an interesting and practical system of ball-bearing.

Readers will probably be interested to

Polar Ideal Condenser

know that this condenser may now be obtained with a drum dial, a form of control which has recently become popular owing to the neatness of such a fitment.

The drums of the Polar condenser consist of two insulated mouldings, having a diameter of 2¾ in.; these are knurled to afford a suitable finger grip. Between the two drums a cylindrical ivorine scale is fixed and this rotates directly with the left-hand drum. The right-hand drum is attached to the slow-motion spindle giving a reduction of approximately 20 to 1.

Fitting this condenser to a panel presents no difficulty whatsoever. A portion of the panel must be cut away to take the neat escutcheon plate and allow the drum to project slightly. The actual condenser is held in position by drilling two holes on the panel on the left of the drum and placing screws through these into two brackets provided on the instrument.

The makers are Messrs. Wingrove and Rogers, Arundel Street, Strand.

EXPERIMENTS WITH NEON TUBES That You Can Make

The Neon Tube has many peculiar characteristics which will well repay investigation. This article gives some suggestions for its use

By H. F. LEECH

AMATEURS who have experimented with neon tubes have found that they can successfully be used for many purposes formerly only served by the more costly three-electrode or two-electrode valve. It is intended here to give an outline of the properties and characteristics of neon tubes with a view to helping the amateur to form an idea of what can be done with these lamps. It should be understood that the results are obtainable using any make of neon tube which operates on about 200 volts, the electrodes being of iron and situated fairly wide apart. There are several makes on the market, such as Philips and Osram, and a slight variation of the characteristic will, of course, be produced by using different types. This variation may be easily met by an adjustment of the resistance and capacity values in the figures of circuits shown.

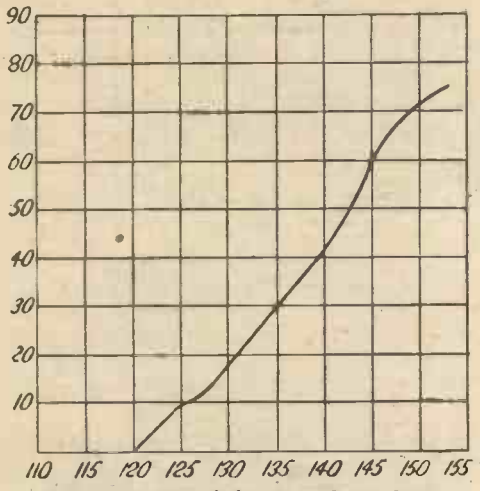


Fig. 1. Characteristic curve of neon lamp


The Raytheon neon tube as used for television purposes

In the neon tube a luminous ionised gas discharge takes place between two metallic electrodes in a rarefied atmosphere of neon gas, which latter possesses a remarkably low-ionising potential and a comparatively high electrical conductivity. The neon lamp requires about 200 volts across its terminals. According to modern standards, the vacuum is an extremely soft one, pressure being equal to several millimetres, or even a centimetre of mercury. A slight trace of helium is also contained in the "space," and possibly also a very slight trace of hydrogen.

Contained in the brass cap of the lamp is a safety resistance, usually consisting of a quantity of fine wire wound on an earthenware or cardboard bobbin. This resistance must be removed before experiments are undertaken, as its presence would seriously interfere with the action of the lamp, particularly when dealing with high-frequency currents.

There is no need to damage the brass cap in removing the resistance: the cap is convenient for plugging the lamp into the standard bayonet lampholder. The best procedure is as follows: Grasp the glass bulb firmly in the left hand and carefully heat the brass cap in a small flame, being careful not to allow the flame to play on the glass. This has the double effect of melting the solder which secures the lead-in wires to the contacts, and of softening the cement which holds the bulb in the cap; so that it is a simple matter to grasp the cap with a pair of pliers and pull off the cap gently, thus revealing the resistance. Remove the resistance, and after making suitable connections between the lead-in wires and contact lugs, fix the cap on again. If it is afterwards required to use the lamp across the ordinary lighting mains, an ordinary lamp should be used in series, since after removal of the resistance any overload in the current would blow the neon lamp if connected alone.

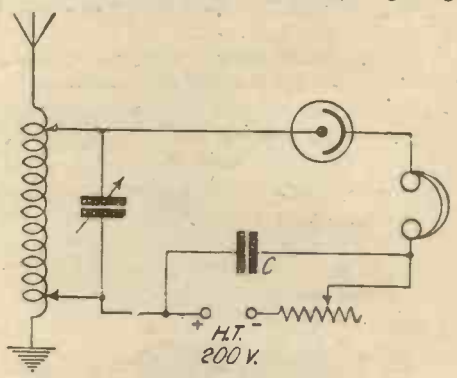


Fig. 2. A detector circuit using a neon tube

Characteristics of the Neon Lamp

Fig. 1 gives the characteristic curve of a typical neon lamp. No two lamps have the same characteristic curve. The unsteadiness of the discharge position gives kinks in the curve. The extinction and lighting-up potentials are not identical, in that the discharge will not commence before a certain minimum potential is applied, but once the lamp glows the potential necessary to keep it alight may be lower than that required for starting the discharge.

In a lamp containing electrodes of unequal size the conductivity is not the same both ways, the lamp conducting better when the larger electrode is the cathode. Should the lamp be inserted in its socket the wrong way round, the glow appears at the smaller electrode, and less

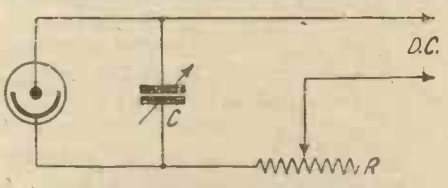


Fig. 3. Arrangement for production of oscillations

HAVE YOU NOTICED

—that the standard values for leaky grid rectification are, in England: Condenser, .0003 mfd.; leak, 2 megohms; in France: condenser, .00015 mfd.; leak, 3 megohms? It would be interesting to know what are the standard values in other countries, why there should be differences, and on what reckoning the decision of the respective values has been arrived at.

current passes through the lamp than when it is connected in the normal manner. A typical lamp tested in this manner, using about 200 to 220 volts, passed about 15.4 milliamps in the normal direction, but only 12.8 milliamps in the reverse direction. A neon lamp requires a smaller minimum ignition voltage when the smaller electrode is used as the cathode.

Rectification by Means of a Neon Lamp

The properties already explained are all due to the fact that a neon lamp does not obey Ohm's law, and this fact, together

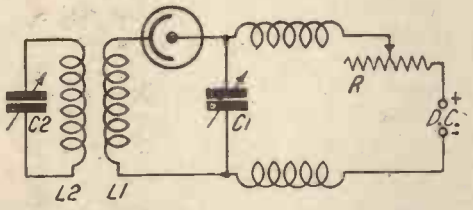


Fig. 4. Arrangement of neon lamp oscillator for a 300-metre wavelength

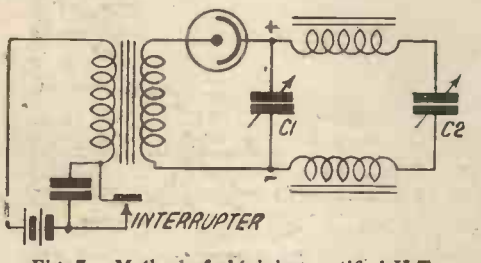


Fig. 7. Method of obtaining rectified H.T. from spark coil

with the power of partial unilateral conductivity, makes it possible to rectify, to a certain extent, oscillations occurring in a circuit. The rectification, however, is incomplete and is really inferior to a good crystal rectifier, and thus this use will not find a very extended application.

Fig. 2 shows a circuit suitable as a detector circuit. In series with a pair of telephones, a high variable resistance R, and a H.T. supply of 200 volts, is a neon lamp. C is a large capacity by-pass condenser. This condenser is absolutely essential. The resistance should be adjusted until the lamp glows very feebly and the receiver then tuned in the usual manner.

Production of Oscillations

A neon lamp is capable of converting a D.C. supply into regularly pulsating current. Fig. 3 gives a suitable arrangement.

When the supply is switched on a rapid series of pulses will pass through the lamp, when the resistance is adjusted so as to cause the lamp just to glow. The frequency of the discharges depends on the rate at which the supply current through the resistance R can charge up the condenser C to the ignition potential of the lamp. It will be readily seen that decreasing the resistance increases the frequency of the pulsations, and, also, the smaller the capacity of C, the higher will be the discharge frequency. Any frequency may be obtained from, say, one pulse every two or three seconds up to about 20,000 per second by suitably adjusting R and C. The potential drop in R should be approximately equal to the potential drop in the lamp for best results.

These pulsations are really detached uni-directional surges, and not sinusoidal oscillations; therefore, we must expect an enormous number of harmonics to be present. Cause a lamp to pulsate at about 15,000 per second, and listen on a heterodyne receiver, and a strong C.W. note will be heard on a wavelength of about 20,000 metres; then tune the receiver down, and we come to harmonics of two, three, four, and five times the fundamental wavelength. The higher the frequency tuned—i.e., the lower wavelengths—the more congested these harmonics become. Below 400 metres the harmonics are feeble, but come in in very rapid succession.

Maintenance of Oscillations

If an oscillatory circuit, coupled to the neon lamp circuit, be tuned to one of the short-wave harmonics, this harmonic will predominate more strongly than the others. Fig. 4 gives an excellent arrangement for a neon lamp oscillator to generate oscillations of 300 metres wavelength. Connect the neon lamp to produce the pulsations, as in Fig. 3, except that an inductance L1 is put in series with the lamp. Adjust R and C1 so as to cause the lamp to pulsate at as high a frequency as possible. The inductance L1 must be of such a value that in conjunction with C1 it will tune to the desired frequency—1,000,000 per second—although, strictly speaking, the circuit L1C1 is not really a tuned circuit owing to the inclusion of the lamp.

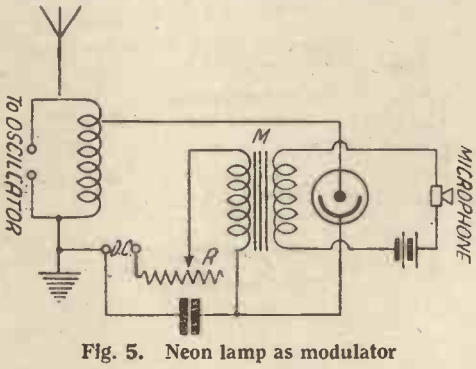


Fig. 5. Neon lamp as modulator

Once the circuit L2C2 has been tuned to 1,000,000 per second a slight adjustment of C1 or R will bring a harmonic into exact synchronisation with L2C2. The coupling between L1 and L2 must be tight. High-frequency chokes may be inserted in the supply leads as shown in Fig. 4, though the resistance R may be high enough to keep the oscillations out of the supply leads.

To use the arrangement as a transmitter a tuned-aerial circuit should replace L2-C2. Each aperiodic discharge from the lamp gives a kick to the circuit L2C2, which oscillates in its own natural period until the next kick is produced to keep the oscillations going. If the lamp is discharging at the rate of 20,000 per second and the circuit L2C2 is tuned to a frequency of 1,000,000, a kick is administered to L2C2 once every fifty oscillations, and so, if L2C2 possesses low H.F. losses, practically undamped oscillations will be sustained in it.

The Neon Lamp Transmitter

Only very small power is available with

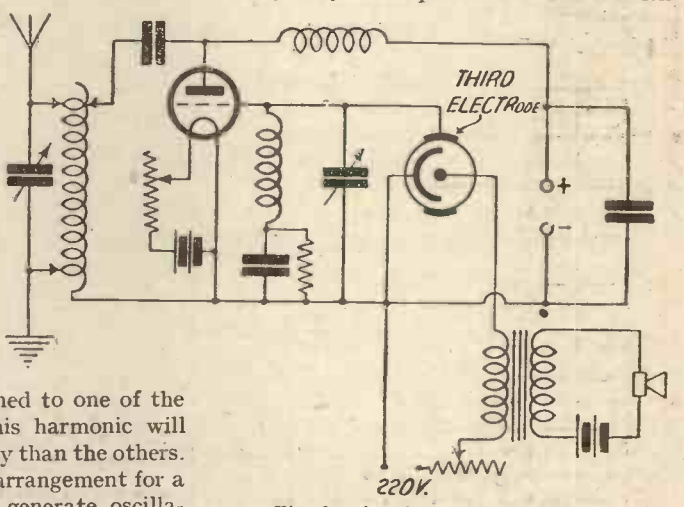


Fig. 6. Another modulator circuit

a neon lamp circuit, as standard lamps consume only 5 watts; since they pulsate only at almost extinction point, about only 1 watt is available for use. If the lamp is overrun on about 400 volts the glow will change to a pale violet colour. This enables the lamp subsequently to pulsate on higher power, because once the lamp has been overrun it requires a considerably higher voltage to work it afterwards, and also this overrunning causes it to pulsate on a higher fundamental frequency and to give stronger harmonics. The oscillatory properties of a neon lamp, then, are greatly improved by about twenty minutes' overrunning.

It is highly important that the supply current be absolutely regular and constant. The frequency is not determined by a tuned circuit—the fundamental lamp frequency, that is—but is chiefly a function of the supply circuit and the large condenser in the lamp circuit. Should small variations occur in the supply current, the fundamental pulsation frequency of the lamp will vary. These variations are enormously magnified in the selected harmonic, and hence the necessity of keeping the supply constant.

The Neon Lamp as a Speech Modulator

The susceptibility of the oscillations to any variations has a great advantage in

(*Continued on page* 574)

Can We Amplify on Short Waves?

Some Considerations of a Possible New Method

By J. H. REYNER, B.Sc., A.M.I.E.E.

MATHEMATICS are troublesome things to the average man at the best of times, and indeed the amateur prefers, as a rule, to leave such matters strictly alone, confining his attention to the actual practical results obtained. Nevertheless, there are undoubtedly occasions on which a mathematical analysis serves a very valuable purpose.

Perhaps one of the most interesting examples of this is that of Maxwell's theory of light. Long before the end of last century, Clerk Maxwell evolved his wave theory of light, which he worked out to fit in with the facts known in those days. Having decided the general principle upon which he thought light radiations were operating, he investigated the subject and made a complete mathematical analysis. This went far ahead of practice in those days, and not only predicted numerous effects concerning light waves which were ultimately found to be true, but also foretold the existence of wireless waves.

He said we should find that such ether vibrations which we now know as wireless waves would be capable of production, that they would obey the same laws as light vibrations, due allowance being made for the difference in frequency, and he gave various estimated theories regarding their operation. It was not until the beginning of this century, many years after the first predictions, that wireless waves were actually produced and found to conform to the laws which Clerk Maxwell had laid down for them. Still, in those days the full significance and the enormous applications of the new vibrations were not realised, and it remained for Marconi to make the first practical utilisation of the new discoveries.

So to an increasing extent the pure mathematicians have started the engineers thinking. The mathematical mind is quite distinct from that of the engineer or physicist. A mathematician can deal entirely in symbols and formulae, and can deduce from them other formulae which upon examination may indicate an entirely unsuspected state of affairs. The engineer or physicist in his turn investigates the practical way of carrying out the new methods disclosed, and in general he prefers to carry a mental physical picture of what is happening, using mathematics more as an aid than as a primary structure on which to build his ideas. The net result, however, is generally progress, for even if the mathematics prove incorrect, owing to insufficient knowledge regarding the assumptions or for some other unforeseen cause, a train of thought is started which usually results in an interesting development.

Divided Opinions

The problem of amplification of the very short wavelengths has been exercising the minds of radio engineers for some considerable time past. Opinion is very much divided on this subject. One school stoutly affirms that, although a high-frequency valve can be made to hand on high-frequency energy with no serious loss of volume—i.e., so that it is not definitely worse than a simple detector arrangement—it cannot be made to give any appreciable amplification effect over a reasonable wavelength band. Others, on the other hand, claim that with correctly designed apparatus and careful construction, real amplification is possible, although this may not be of a very high order. Even an amplification of 2 or 3 serves to give a margin of reserve over and above the ordinary detector circuit, which makes tuning easier and tends to minimise the disadvantages of fading.

Possibilities

Any suggestion that an amplification of the order of 10 to 15 is possible would seem, on the face of it, ludicrous. Yet a recent detailed analysis on the operation of the standard three-electrode valve, published by F. M. Colebrook (Journal I.E.E., vol. 57, page 157), indicates that there are certain unsuspected effects taking place by the utilization of which we may obtain a distinct amplification on these high frequencies.

The first thing that emerges from the analysis is that the maximum amplification is obtained from a valve not quite at the point where the anode circuit is tuned to resonance, but at a point where the impedance of the anode circuit is slightly inductive. This effect is almost negligible at ordinary broadcast frequencies, but on short waves the difference is appreciable. This does not mean that there are two tuning points, for the apparent tuning point will be that where maximum signal strength is obtained, and one automatically tunes the condenser until this maximum amplification is produced. The fact remains, however, that at this point the circuit is not really tuned, but is slightly undertuned, so that the impedance is inductive.

When this is the case a resonance effect occurs between the anode circuit and the internal capacity of the valve, and, due to this, the voltage developed on the output may be more than m times the input, m being the

(*Continued on page* 569)

American Broadcasters you may have heard on the short waves from KDKA—The Happy Wonder Bakers

RADIOGRAMS

LISTENERS to 2LO and 5XX will be given an opportunity of hearing Mrs. Baldwin on April 28, when she is to make an appeal on behalf of the National Birthday Fund for Maternity Services.

The concert to be given at Queen's Hall on April 12 and to be conducted by Sir Henry Wood will consist entirely of Wagner music. The soloists for the evening are Walter Widdop and Tatiana Makuschina.

On April 18 a special broadcast version of the *Nine O'Clock Revue* is to be given from 5GB. Morris Harvey, part-author and one of the principal stars in the original production at the Little Theatre, London, will be responsible for its presentation before the microphone. The performance will be repeated on April 20 for the benefit of listeners to 2LO and 5XX.

Act I of Richard Strauss's opera, *Der Rosenkavalier*, which opens the Covent Garden opera season on April 22, will be relayed to 2LO and 5XX. During the following weeks 5GB listeners will also be given opportunities of hearing excerpts from some of the performances.

Mr. George Allison on April 13 will deliver a running commentary on the international football match, Scotland *v.* England, which is being played on that date at Hampden Park, Glasgow; it is to be relayed to both 2LO and 5XX.

A polite satire, entitled *Square Pegs*, by Clifford Bax, is the title of one of the short plays to be found in the 5GB evening entertainment on April 20; it will precede *The Dear Departed*, a comedy of lower middle-class life, by Stanley Houghton.

Wagner's romantic opera, *The Flying Dutchman*, has been chosen as the work to be broadcast from the London studio on April 24; the cast includes Miriam Licette, Harry Brindle, Hughes Macklin, John Armstrong, Arthur Fear, and Evelyn Arden. The performance will be conducted by Percy Pitt.

Spanish Shawls, a novel entertainment specially written for the "mike" by Edmund Wynschenk, a Birmingham solicitor, will be presented at the 5GB studio on April 17. To use the author's own words, "the book with lyrics has been taken from the Spaniards when they weren't looking!"

Short-wave experimenters should be interested in the programme offered by the Cardiff station on April 13, for on that evening they will hear E. U. Ridgway and his partner, Frances Gayton, who are believed to be the first artistes to broadcast across the Atlantic on five metres!

Mabel Constanduros is responsible for another comedy *en casserole*, entitled *The Dragon's Bride*; it is to be heard from Belfast on April 22. In this short play she will herself take the part of Ju-Jube, a village maiden, and will be supported by Harold Clements as Liquorice, a deep-dyed villain, and Olive Groves as a princess.

The Belfast Wireless Orchestra is probably making more appearances in outside halls than any other B.B.C. orchestra. On a recent visit to Londonderry to give a concert in the local Guildhall, a journey of nearly one hundred miles had to be undertaken by road through some of the wildest parts of Ulster.

In Scotland it is necessary to employ at least one stage of H.F. amplification if 5XX is to be received at loud-speaker strength. The B.B.C. admits that in districts where there is no prepondering signal from 5XX, it is not possible, without some form of directive aerial system, to render a set sufficiently selective to receive 5XX free from interference by Zeesen without seriously impairing the quality of reproduction.

An idea which is proving popular in Scottish broadcast programmes is that of a "musical tour" of the country north of the Tweed, each town, village, or district visited being marked by the rendering of some song or melody closely associated with it.

Some districts on the south side of Glasgow are being troubled just now by a peculiar fading of the transmissions from the local B.B.C. station. No solution of the problem has yet presented itself, but it is noticed that the fading is usually at its worst between 6 and 8 p.m., while there is no trace of it during the morning transmissions.

A dispatch from Rome states: plans for a powerful wireless station which will transmit and receive has been approved by a commission which is acting as a provisory Government of the Vatican. The Papal wireless will enable the Vatican to communicate with the whole world and have a power equal to the Italian station at Saint-Paul.

On March 29 the wireless station of the Eiffel Tower began to broadcast on a shorter wavelength, 1,470 metres, in the hope that its reception would be improved and Radio Paris and Daventry would not be impeded in their service. The new wavelength will be used until the Ministry of Posts, Telegraphs and Telephones publishes its study of the most suitable wavelengths for the Eiffel Tower.

According to a report issued recently by George Engles, director of the American National Broadcasting and Concert Bureau, musicians in the United States owe more than a third of their income to wireless. Out of a total of £6,000,000 spent on music in the United States during the past year, his statements show that the broadcasting companies have contributed fully £2,500,000.

"CAN WE AMPLIFY ON SHORT WAVES?"

(*Continued from page* 566)

amplification factor of the valve. In other words, we can obtain a greater amplification from the circuit than that given by the valve itself. It should be remembered that we are dealing with ordinary three-electrode valves, which have an appreciable capacity between anode and grid, and it is due to this that the resonant effect is obtained.

There is nearly always some qualifying factor which has to be taken into account. In this case it is a fairly serious one, apart from any question of stability and avoidance of self-oscillation. The anode circuit of the valve has a very marked effect upon the input circuit. We are accustomed to regard the input circuit, i.e., the grid-filament circuit, of the valve as of practically infinite impedance. Where grid current is actually flowing, as in the detector circuit, this, of course, is not the case, as has been pointed out in certain recent articles, but for pure amplification, where we bias the valves if necessary with a negative voltage to avoid any flow of grid current, we usually assume that the input impedance is infinite.

This, however, is not the case, the input impedance being not only finite, but relatively low under normal conditions. At the point where the maximum amplification occurs on short waves the effect is to introduce a relatively low resistance across the grid circuits. In a particular instance considered of amplification at 28.3 metres the shunt was as low as 300 ohms, the damping effect of which would be enormous and would prevent the tuned circuit connected across the grid and filament from developing any appreciable voltage whatever.

A Cause of Failure?

Indeed, it is probable that this unsuspected shunt-resistance effect has been the cause of the failure to obtain satisfactory amplification on short waves hitherto. Not only would it prevent any development of the resonance effect just discussed, but it would prevent the first circuit from tuning satisfactorily, and thus nullify the effect of the amplification from the valves, if any, right at the commencement.

The difficulty may be combated by methods ordinarily used to minimise the effect of shunt-resistance across tuned circuits, but such methods usually result in such a loss of signal strength as to render the gains of other causes of no avail. Whether this is the case or not in the present instance remains to be seen, but if it does not prove to be so, then we can look forward to a new system of short-wave amplification which may conceivably give results superior to any yet obtained.

LETTERS TO THE EDITOR

The Editor does not necessarily agree with the views expressed by correspondents.

Correspondence should be brief and to the point and written on one side of the paper.

Linen Speaker Improvements

SIR,—Very many congratulations on the linen-diaphragm loud-speaker. It is wonderful. Your readers might be interested to hear how I overcame its two defects, namely ugliness and ungainly size. I screwed four twisted oak legs to the inside of the large frame and made the speaker into a table! Five-inch boards placed round the inside of the same frame between the legs act as a good baffle. The top was covered with fine-mesh wire netting to make a level surface. Over the top is then placed a "table cloth" of dark brown velvet. Light objects, such as a vase of flowers, can then be put on the "table," and the speaker is entirely disguised. K. L. D. (Richmond).

Organ Broadcasts

SIR,—I would ask your permission to support your contributors, Mr. Sydney Moseley and also Mr. J. B. Ingles, of Hawick, in their endeavour to get better broadcast organ music.

W. E. C. in his recent letter raises serious doubts as to whether he really knows anything about organs and organ music, in spite of his forty years of critical listening all over the world.

Recently I heard the Stoll organ, and this, in my opinion, would be far more suitable to broadcast. The gentleman who plays this organ is undoubtedly a musician, not a musical conjurer. The organ itself, too, is really an organ—unlike most cinema instruments.

I might add that I hold no brief whatever for the Stoll apart from expressing my appreciation of the performance of their organ and its player.

G. H. G. (Croydon).

Sunday Programmes

SIR,—Regarding "Thermion's" suggestion *re* church services via wireless, I maintain (1) that all licence-holders under the present conditions are really entitled to alternative programmes or a return of 5s. on their licences; (2) if we are to have alternative programmes they should be *really* alternative.

It naturally follows, then, that although any who may be so inclined may have a broadcast church service on the one wavelength, those who are *not* so inclined need not at the same time be obliged to listen to it, but instead may be amused without having to seek this from foreign stations or go without.

Nor do I favour too much broadcasting by the local stations on Sunday, as this would seriously interfere with the small-set owner searching abroad.

H. S. H. (London, W.)

SIR,—I am glad to see that AMATEUR WIRELESS is at last taking up the cudgels on behalf of the Sunday listener. I hope you will get Mr. Moseley interested in the subject, because his views are noticed even by those at Savoy Hill. I am one of thousands who don't want to listen to religion at all, and I object most strongly to the best part of Sunday evening being devoted to it. Fortunately, I possess five valves, and have all Europe to choose from; therefore, I have least right to growl; but, then, if I hadn't been driven out of my own country to find entertainment I wouldn't need five valves.

C. S. (Birkenhead).

SIR,—The Sunday programmes are very good as they are. To be of any use a service must come from a church. Studio services are paltry. 5GB and 2LO need not have them simultaneously, however. What about a little *real* organ music (not cinema piffle) that the B.B.C. often give when the breadwinners are at work! But, for heaven's sake, don't give the B.B.C. a chance to inflict Jack Payne's pains on us. Let us have one day of comparative peace!

P. P. P. (London, N.).

Linen-diaphragm Speakers

SIR,—Allow me, as one of your regular AMATEUR WIRELESS readers, to congratulate you on the huge success of the "Linen-diaphragm Loud-speaker." I built one a week after it was published in AMATEUR WIRELESS. Previously I had been using a good make of horn-type loud-speaker, which I exchanged for a Blue Spot unit. As soon as I connected the unit and switched on I was quite satisfied at parting with my horn speaker. Volume, as well as the fine bass, is a credit to this fine speaker. I used three-ply oak for the baffle, and completed the speaker by adding a fret-work front. No more horn loud-speakers for me. W. H. G. (Newport).

Appreciation

SIR,—Thanks for information *re* amplifier. The trouble is now remedied. Let me also thank you for the great help your excellent articles have given me. They are just what the amateur wants.

S. F. (Altrincham).

BROADCAST TELEPHONY

(Broadcasting stations classified by country and in order of wavelengths)

Metres	Kilo-cycles	Station and Call Sign	Power (Kw.)
GREAT BRITAIN			
25.53	11,751	Chelmsford (6SW)	15.0
243.9	1,230	Newcastle (5NO)	1.0
258.4	1,161	*Leeds (2LS)	0.13
270.3	1,109	*Sheffield (6LF)	0.13
288.5	1,040	*Bournemouth (6BM)	1.0
288.5	1,040	*Bradford (2LS)	0.13
288.5	1,040	*Edinburgh (2EH)	0.35
288.5	1,040	*Hull (6KH)	0.2
288.5	1,040	*Dundee (2DE)	0.13
294.1	1,020	*Liverpool (6LV)	0.13
294.1	1,020	*Stoke-on-Trent (5ST)	0.13
294.1	1,020	*Swansea (5SX)	0.13
302.6	991.1	Belfast (2BE)	1.0
311	964	Aberdeen (2BD)	1.0
323	928	Cardiff (5WA)	1.0
358.9	838	London (2LO)	2.0
378	793	Manchester (2ZY)	1.0
396	757	*Plymouth (5PY)	0.13
401	748.3	Glasgow (5SC)	1.0
482	622	Daventry Ex. (5GB)	25.0
1,562.5	192	†Daventry (5XX)	25.0
* Relay stations.		†Relays 2LO.	
AUSTRIA			
248	1,209	Linz	0.5
277.8	1,080	Salzburg (under construction)	0.5
354.2	847	Graz	0.5
456	694	Klagenfurt	0.5
456	694	Innsbruck	0.5
520	577	Vienna	20.0
BELGIUM			
220	1,360	Chatelineau	0.25
250	1,200	Schaerbeek-Brussels	0.5
275	1,090	Ghent	0.5
280	1,070	Liége	0.5
312	960	Arlon	0.25
512	580	Brussels	10.0
CZECHO-SLOVAKIA			
265	1,130	Kosice	2.0
278	1,080	Feriby (testing)	12.0
299.3	1,000	Bratislava	4.0
342	873	Prague (Praha)	5.0
432.3	694	Brunn (Brno)	2.4
DENMARK			
339	883	Copenhagen (Kjobenhavn)	1.0
1,155	259	Kalundborg	7.5
ESTHONIA			
408	735	Reval (Tallinn)	1.3
FINLAND			
374	800	Helsingfors (Helsinki)	0 8
1,804	159	Lahti	20.0
FRANCE			
30.75	9,755	Agen	0.25
200	1,500	Fécamp	0.3
211.3	1,420	Beziers	0.1
238	1,260	Bordeaux (Radio Sud-Ouest)	2.0
245	1,224	Lille (PTT)	0.8
252.1	1,190	Juan-les-Pins	0.4
253	1,185	Montpellier	0.25
254	1,180	Rennes (PTT)	1.0
255	1,175	Toulouse (PTT)	1.0
268	1,118	Strasbourg	0.3
274	1,692	Limoges (PTT)	0.5
291.3	1,030	Radio Lyons	1.5
301	997	Bordeaux (PTT)	0.5
305	982	Agen	0.3
305.6	981	Marseilles (PTT)	0.5
322	930	Vitus (Paris)	2.0
336	892	Petit Parisien	0.5
354	846.7	Algiers (PTT)	2.0
370	811	Radio LL, Paris	1.0
382.2	785	Toulouse (Radio)	9.0
400	749	Mont de Marsan	0.4
414	724	Radio Maroc (Rabat)	2.0
428	701	Grenoble (PTT)	1.5
430	697	Radio Flandre Lille	0.25
448	668	Paris (Ecole Sup., PTT)	0.7
473	635.1	Lyons (PTT)	5.0
1,470	203	Eiffel Tower	8.0
1,748	171	Radio Paris	8.0
GERMANY			
219	1,370	Flensburg	1.5
240	1,250	Nürnberg	4.0
250	1,200	Kiel	0.7
250	1,200	Cassel	0.7
263.2	1,140	Cologne	4.0
267.8	1,120	Muenster	1.5
272.7	1,100	Kaiserslautern	1.5
280.4	1,070	Königsberg	4.0
283	1,061	Berlin (E)	0.7
283	1,061	Stettin	0.7
283	1,061	Magdeburg	0.7
317.5	945	Dresden	0.75
321.2	937	Breslau	4.0
326.4	919	Gleiwitz	6.0
330	909	Bremen	0.75
361.9	829	Leipzig	4.0
374.1	802	Stuttgart	4.0
391.6	766	Hamburg	4.0
421.3	712	Frankfurt	4.0
455.9	654	Danzig	0.75
458	654	Aachen	0.75
462.2	649	Langenberg	25.0
476	630	Berlin	4.0
537	559	Munich	4.0
566	530	Augsburg	0.5
566	530	Hanover	0.7
577	520	Freiburg	0.7
1,650	182	Zeesen	20.0
1,650	182	Norddeich	10.0
GRAND DUCHY OF LUXEMBOURG			
1,280	234.2	Radio Luxembourg	0.25
HOLLAND			
31.4	9,554	Eindhoven (PCJ)	25.0
38.8	—	Kootwijk (PCL) (Wed. 12.40 G.M.T.)	32.0
337	889	Huizen (until 5.40 p.m.)	5.0
1,073	279.5	Hilversum (ANRO)	5.0
1,852	162	Huizen (after 5.40 p.m. and on Sundays)	5.0
1,852	162	Scheveningen-haven	5.0
HUNGARY			
548	548	Budapest	15.0
ICELAND			
333.3	900	Reykjavik	1 0
IRISH FREE STATE			
222.2	1,350	Cork (5CK)	1.5
411	730	Dublin (2RN)	1.5
ITALY			
276	1,080	Turin	7.0
333	900	Naples (Napoli)	1.5
387	775	Genoa	3.0
443.8	676	Rome (Roma)	3.0
456	658	Bolzano	0.3
504.2	595	Milan	7.0
JUGO-SLAVIA			
308.3	973	Zagreb (Agram)	1.25
452	664	Belgrade	4.0
582	515	Ljubljana	5.0
LATVIA			
529	567	Riga	2.0
LITHUANIA			
2,000	150	Kovno	15.0
NORWAY			
242	1,240	Rjukan	1.0
297	1,010	Notodden	0.7
365	820	Bergen	1.0
387	775	Fredriksstad	1.0
387	775	Aalesund	1.0
459	653	Porsgrund	1.0
496	604	Oslo	1.5
500	600	Tromsö	1.0
566	350	Hamar	0.7
POLAND			
314	955	Cracow	1.5
336	890	Posen	1.5
416	721	Kattowitz	10.0
456	658	Wilno	1.5
1,395	215	Warsaw	10.0
PORTUGAL			
317.5	945	Lisbon CTIAA (Wed. and Sat.: 10—midnight)	
ROUMANIA			
395	757	Bucharest	4.0
RUSSIA			
825	363.5	Moscow (PTT)	25.0
925	323	Homel	2.5
1,000	300	Leningrad	20.0
1,444	207	Moscow	30.0
1,685	178	Kharkov	15.0
SPAIN			
277.8	1,080	Barcelona (EAJ13)	2.0
309	970	Oviedo (EAJ19)	0.5
348	857	Barcelona (EAJ1)	3.5
370	801	Seville (EAJ5)	0.5
400	750	Radio España	1.0
404	744	San Sebastian (EAJ8)	0.5
426.7	703	Madrid (EAJ7)	3.0
456	658	Salamanca (EAJ22)	0.55
SWEDEN			
261	1,149	Hörby	10.0
265	1,130	Trollhattan	0.4
333	900	Falun	0.5
346.8	865	Goteborg	0.0
438	655	Stockholm	1.5
545.5	550	Sundsvall	1.0
770	390	Ostersund	2.0
1,200	250	Boden	2.0
1,325	223	Motala	30.0
SWITZERLAND			
406	739	Berne	1.0
489.4	613	Zurich	0.6
680	441	Lausanne	0.6
760	395	Geneva	0.5
1,010	297	Basle	0.25
TURKEY			
1,232	243	Stamboul	5.0
1,840	163	Angora	5.0

CHIEF EVENTS OF THE WEEK

LONDON AND DAVENTRY (5XX)

April 16. De Courville's Hour.
„ 17. A Military Ceremonial by the 2nd Battalion, the Norfolk Regiment, relayed from Aldershot.
„ 18. A Symphony Concert, relayed from the Queen's Hall.
„ 19. A Vaudeville Programme.

DAVENTRY EXPERIMENTAL (5GB)

April 17. *Spanish Shawls*, a revue by Edmund Wynschenk.
„ 18. A Programme of Selections from the Musical Comedies.
„ 19. A Discussion on Broadcast Drama.

CARDIFF

April 15. "Young Wales," a programme contributed by some of the Winners at the Annual Inter-Collegiate Eisteddfod, 1929.

POLITICAL BROADCASTS

IT is welcome news for those who take an interest in politics, to note the number of political speeches to be given before the dissolution of Parliament. Each speech lasts about half-an-hour, and the starting time is 9.15 p.m. The programme of future speeches is as follows: April 16, Government; April 19, Opposition, Liberal; April 22, Government; April 25, Opposition, Labour; April 30, Government; May 3, Opposition, Liberal. During the time of the General Election one opportunity will be given to each of the three political parties to broadcast a speech.

WHICH MAINS WIRE IS EARTHED?

READERS may recall that information was given under the above heading in a recent issue, regarding the testing of the mains for polarity and earthing. It should have been stated that when testing for the polarity of the mains, one wire of the lamp adaptor should be connected to one wire of the lamp-holder, thus leaving one wire from the adaptor free and one wire from the lamp-holder free. These two wires should be kept well apart and after plugging a suitable lamp in the lamp-holder the adaptor should be inserted into one of the lamp sockets of the house. The two free wires should then be dipped into a glass of ordinary tap water. Bubbles will be seen to rise from the ends of *both* wires, but *more* bubbles will be seen to rise from the end of the wire which is negative.

Having determined the polarity and marked the house-lamp socket accordingly, the next step is to find out which main is earthed.

Negative or Positive?

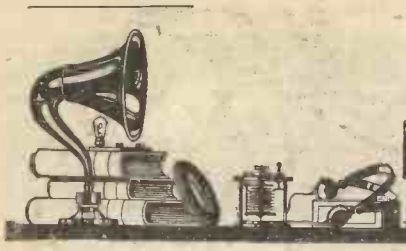
One wire of the lamp socket should be connected to an earthed object such as the lead covering of the mains or a water pipe, whilst the other wire should be connected to the negative main of the house. Provided there is a lamp in the holder and the lamp does not light the negative main is earthed. If the lamp lights then possibly the positive main is earthed. To make sure, connect the unearthed wire to the positive main, leaving the other flex still connected with earth. If the lamp does not light then the positive main is earthed. If the lamp does light, then it may safely be assumed that neither main is earthed. In every case the lamp should be rated at the full voltage of the mains and should light up at full brilliancy.

If the lamp only lights up at half brilliancy the mains should be treated as though neither main is earthed. If the lamp lights at full brilliancy on one wire and very dully on the other, then there is a faulty earth on the mains at the time of testing, and the mains should still be treated as though neither main were earthed. If your negative main is earthed you may certainly consider yourself lucky to a certain degree, but when in doubt treat them as though neither main were earthed. This means placing a large capacity fixed condenser between the earth terminal of your receiver and the actual earth wire. The condenser should be either .5 or 1 microfarad capacity and should be capable of withstanding double the voltage of the house mains.

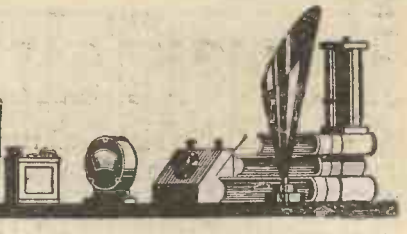
Finally, when testing or using the house mains always work on the house side of the house fuses, and not on the supply side of the house fuses.

Let "Amateur Wireless" solve your problems

Messrs. A. F. Bulgin & Co., of 9-11 Cursitor Street, London, E.C.4, have issued an interesting booklet illustrating and describing a selection of foreign-made components which Messrs. Bulgin import direct from all parts of the world. The list number of this booklet is 125, and readers can obtain copies on application.



OUR INFORMATION BUREAU



RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, layouts, diagrams, etc., on separate sheets containing your name and address. See announcement below. Address Queries—AMATEUR WIRELESS Information Bureau, 58/61 Fetter Lane, London, E.C.4

Indoor versus Outdoor Aerials.

Q.—*I have been informed that if I erect and use an indoor aerial I shall stand a better chance of getting distant stations than I do at present with an outdoor aerial. I have a four-valve set, with one stage of what is known as H.F. amplification, and was assured by those from whom the set was purchased that this set would be capable of getting foreign stations on my speaker. I can only get about two foreign stations and only three British stations, the latter being London, 5GB, and 5XX. Can you account for the apparent paradox regarding an indoor aerial being better for foreign stations when my outdoor aerial will not get them?—F. K. (Fulham).*

A.—This "apparent paradox" is easily explained. When using an outdoor aerial close to a broadcasting station the amount of energy actually picked up by the outdoor aerial from the local station is sufficient to swamp out all weaker signals. By using an indoor aerial the amount of pick-up from the local station is considerably reduced, thus permitting the selection of signals from more distant stations. This is practicable only in sets having at least one H.F. stage to offset the reduced pick-up of the aerial. In some cases quite good results can be obtained with a plain detector set and an indoor aerial, but most satisfactory results are obtained when a stage of H.F. is used. —A. L.

When Asking Technical Queries

PLEASE write briefly and to the point

A Fee of One Shilling (postal order or postage stamps) must accompany each question and also a stamped addressed envelope and the coupon which will be found on the last page. Rough sketches and circuit diagrams can be provided, but it will be necessary to charge a special fee (which will be quoted upon request) for detail layouts and designs.

Wavemeter Calibrating.

Q.—*I have a buzzer wavemeter covering from 250 to 500 metres. Will you tell me how to calibrate and use it?—S. M. (Blackheath).*

A.—Tune in any station working between the wavelength limits you mention, and set the wavemeter buzzer in operation. Turn the tuning dial of the wavemeter until the sound of the buzzer is heard in the phones or loudspeaker with the greatest intensity. If the buzzer can be heard over a great range of adjustments, move it farther away from the set. When you have decided with which wavemeter setting the buzzer is heard at the greatest strength make a note of the reading. Do this with as many stations as practicable. Now either make a table showing the relation between the wavemeter readings and wavelength or draw a graph showing this. In order to pick up a station with the aid of the wavemeter, set the latter to the reading corresponding to the wavelength of the desired station, and set the buzzer in operation. Then alter the tuning of the set until the buzzer is heard most strongly, when the set will be tuned to the station. Cut off the buzzer and listen for the station itself. To find the wavelength of an unknown transmission which has been tuned in, adjust the wavemeter until it is most strongly heard, and then find the wavelength corresponding to the wavemeter reading.—R.

"EXPERIMENTS WITH NEON TUBES"

(*Continued from page* 564)

that one can obtain extremely sensitive modulation by inserting the secondary of a modulation transformer in series with the supply leads. Fig. 5 gives a suitable circuit for neon lamp modulation. Although the neon lamp may be no better as a modulator than the ordinary three-electrode valve, yet it is certainly much cheaper and is capable of giving excellent results.

How It Modulates

Across the aerial circuit is shunted the lamp in series with the secondary of a modulation transformer M and a high-tension supply. Adjust the resistance R until the lamp glows feebly. When the microphone is spoken into the potentials set up across the transformer vary the conductivity of the lamp, owing to its non-linear characteristic, causing a varying damping effect on the aerial circuit. Another and preferable circuit arrangement is shown in Fig. 6. Here a third electrode is formed by neatly sticking a coat of tinfoil to the outside of the bulb by means of shellac varnish. The tinfoil should cover the whole of the bulb, but on no account must it be allowed to touch the cap of the lamp or any other conductor at earth potential. Bind a piece of copper wire round the bulb so as to make good contact with the tinfoil. This wire should then be connected to the grid of the oscillator valve.

When the lamp glows the bulb-space becomes semi-conductive, and the capacity effect of the outer coating with the interior forms an excellent conducting path for H.F. currents. The most effective modulation is obtained by using a tuned grid circuit and shunting the absorption modulator across this. By adjustment of the grid circuit tuning condenser a very flexible control of the extent of modulation is obtained. The polarising potential for the neon lamp may be derived from the oscillator high-tension if desired.

Rectified H.T. from a Spark Coil

Fig. 7 gives the connections for obtaining H.T. supply from a spark coil, and is suitable for use with C.W. and telephony transmitters. The condensers should be built to stand very high peak voltages. When the interrupter of the coil "makes" the circuit only a low voltage of a certain polarity is set up in the secondary, and this is insufficient to drive any current through the lamp. At "break," however, a high potential is set up across the secondary, and this easily passes through the lamp and charges up condensers C1 and C2. Since only the "break" currents get through the lamp, and these are always of the same polarity, it follows that the condensers are charged with D.C. Probably two neon lamps will have to be connected in series, as one lamp may not stand a back-voltage of more than 200.

BLUEPRINTS

Copies of the "Wireless Magazine" and of "Amateur Wireless" containing descriptions of all these sets can be obtained at 1s. 3d. and 4d. respectively, post free. Index letters "A.W." refer to "Amateur Wireless" sets and "W.M." to "Wireless Magazine" sets.

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CRYSTAL SET (6d.)

1929 Crystal Receiver AW165

ONE-VALVE SETS (1s. each)

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"Q"-coil (D, Trans) WM62
Key-to-the-Ether Two (D, Trans) WM107
Meteor Two (D. Trans) WM114
Clipper Two (D, Trans) WM135

THREE-VALVE SETS (1s. each)

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Bantam Three (D, RC, Trans) AW160
Hartley Dual-range Three (D, RC, Trans) .. AW166
Listener's Three (HF, D, Trans) price 4d. free with copy of "AW" AW169
The Binowave Three (D, RC, Trans) .. AW172
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New Year Three (SG, D, Pentode) WM123
The Q3 (D, RC, Trans) WM124
Lodestone Three (HF, D, Trans) WM129
Simple Screen Three (HF, D, Trans) WM131
Dynamic Three (SG, D, Trans) WM136

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The Ranger (SG, D, RC, Trans) AW145
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All Europe Four (2 HF, D, Trans) AW173
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Touchstone (HF, D, RC, Trans) WM109
Reyner's Furzehill Four (SG, D, 2Trans) .. WM112
Economy Screen-grid Four (SG, D, RC, Trans) WM113
Binowave Four (SG, D, RC, Trans) WM119
Standard-coil Four (HF, D, 2 RC) WM122
Dominions Four (2SG, D, Trans) WM134
The Drum Major (HF, D, RC, Trans) WM137

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Empire Five (2 SG, D, RC, Trans) WM96
Fidelity Five (HF, D, 2 RC) WM130

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Eagle Six (3 HF, D, RC, Trans) WM106

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"A.W." Gramophone Amplifier (3RC) .. AW162
Searcher Unit (HF) AW176
True-tone (3 valves) (Trans, RC) WM47
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Arcadian Linen-diaphragm Loud-speaker (Full-size) AW177A
D.C. Unit (HT) AW178
"Junior" Moving-coil Loud-speaker WM81
Universal Short-wave Adaptor WM82
Buzzer Wavemeter (6d.) WM121
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Lodestone Loud-speaker WM126
James H.T. Unit for D.C. Mains WM133

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Arcadian Portable (SG, D, 2 Trans) with linen-diaphragm loud-speaker (half-scale) AW177 1/6
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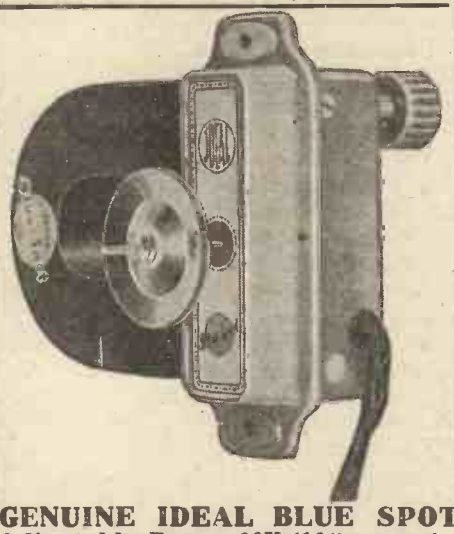

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Adjustable Power 66K (101)
4-pole Balanced Armature
Complete with Cord **25/-**

HANDSOME OAK POLISHED SPEAKER CABINETS 13 x 13 x 6

Cannot guarantee exact pattern of front panel, but all good designs.

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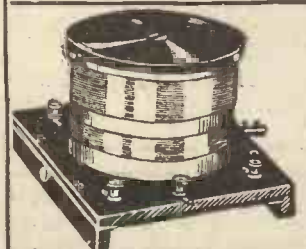

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QSP, QAR, QSG, QAM, 21/- each.

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Complete with Switch.

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Dubilier K.C. Condensers, Friction Control, .0005 and .0003, each 12/-. Thumb Control, ditto, 15/6. Telsen Radio Grand L.F., 12/6. Telsen Ace L.F., 8/6. Brown H.Q. Speaker, £3/3/0. Amplion A.C.2., 21/-. M.P.A. Popular Plaque Speaker, 29/6. Ormond Turn-table for Portables, 6/-. Bulgin All-wave Tuner, 15/6. British General Tuner, 18/6. Wates 3 in 1 Test Meter, 8/6. Lotus Condensers, .0005, 5/9; .0003, 5/6. Colvern Master 3 Star Dua Coil, 17/6.

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"AN ALL-MAINS TWO"

(*Continued from page 550*)

3-megohm grid leak (Dubilier, T.C.C. S.P. type, Mullard, Graham-Farish).

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Low-frequency transformer (Cossor, Mullard, Lissen, Ferranti, R.I. & Varley, British General).

20,000-ohm resistance (Graham-Farish, R.I. & Varley, Lissen, Mullard, Dubilier).

Mains power transformer (Marconiphone model M).

Smoothing choke (British General, R.I. and Varley, Ferranti, Igranic.)

Small panel brackets (Magnum, Camco).

Grid-bias battery clips (Bulgin).

Connecting wire (Glazite).

Flex and adaptor (G.E.C.).

Red and black wander plug (Clix).

One yard of thin flex (Lewcoflex).

With the blueprint as a drilling guide and layout template, those who have tackled set construction before will be quite capable of making the first steps in building up this "two." Novices should, however, be guided solely by the constructional instructions which will be given in next week's issue, and which will deal fully with small snags which might arise.

A point which will be of great interest to London listeners is that this all-from-the-mains "two" will be exhibited in the Somerset Street windows of Messrs. Selfridge, Ltd.

It is always a help to be able to see a set actually in the "flesh" before building it up. Intending constructors within easy distance of Messrs. Selfridge's premises would be very well advised to take a glance at the set in the Somerset Street windows before making it up themselves.

The Practical Electricians' Pocket Book—This handy reference book has been issued for thirty years, but the 1929 edition has been entirely revised. Measuring instruments, power-station plant, boilers, switchgear, illumination, wiring, pyrometry, armature construction and repair, dynamos, transformers, overhead transmission systems, and electric furnaces are just a few of the section headings. A valuable section for the wireless amateur is a tabular list of central stations throughout the United Kingdom and Ireland, giving details of the supply voltages and the systems used. It is published by "Electricity," 93 Long Acre, London, W.C.2, price 2s. 6d. nett (2s. 10d. postage paid); and contains 596 pages with many illustrations.

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