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MONTHLY

The Wireless Constructor

EDITED BY
PERCY W. HARRIS, M. I. R. E.
Vol. VI. SEPTEMBER, 1928 No. 23.

"ADDING RANGE TO YOUR MELODY MAKER" BY PERCY W. HARRIS
M. I. R. E.

*No coils
to change!*

**HOW TO
BUILD THE
OFFICIALLY
APPROVED
HE UNIT**



**MORE ABOUT THE WONDERFUL
"STEDIPOWER" L.T. UNIT**

I would not be
without them



I'M talking of radio valves. Mullard P.M. Radio Valves with the wonderful P.M. Filament. The wife and the children think the same, and you know kids, as a rule, have very keen ears It was a long time ago, shortly after people first started talking about these Mullard P.M. Filament valves, that I bought one as a try-out, since all valves they said were pretty much of a muchness. Well, believe me! The improvement that Mullard valve made in my set plainly showed that there was only one thing to do—fit Mullard all through I wouldn't be without them now and so many others think the same, it kind of gets you interested in the reason why.

Anyway, the secret of the whole business lies in the Mullard P.M. Filament. First of all it has a greater emission surface, in other words *there's more of it*. The remarkable length and thickness of the Mullard P.M. Filament is really amazing, and it results in a greater flow of electrons from the filament to the specially constructed plate. This increased flow is perfectly controlled by a grid designed in keeping with the Mullard Matched Electrode System of valve construction.

There are many other interesting points about this filament. It operates at such low temperature that there is no question of the filament losing its original nature, it remains tough. Why! . . . You can tie it in a knot long after a thousand hours of life, and again its low current consumption (.075 amps) is very, very easy on the L.T. Accumulator.

I'd advise you to put a Mullard P.M. Valve in every valve holder on your set. However, try a couple and you'll realise the truth of what I've told you. They are the easiest valves to buy—every radio dealer in the country sells MULLARD.

Mullard

THE · MASTER · VALVE

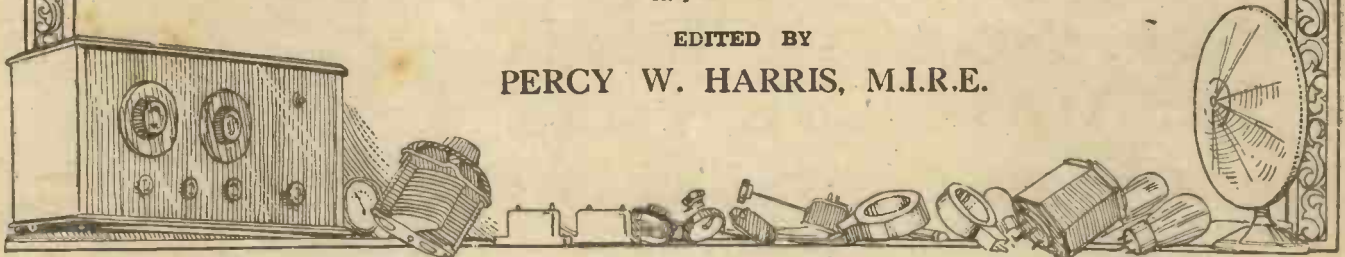
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As some of the arrangements and specialities described in this Journal may be the subject of Letters Patent, the amateur and trader would be well advised to obtain permission of the patentees to use the patents before doing so.

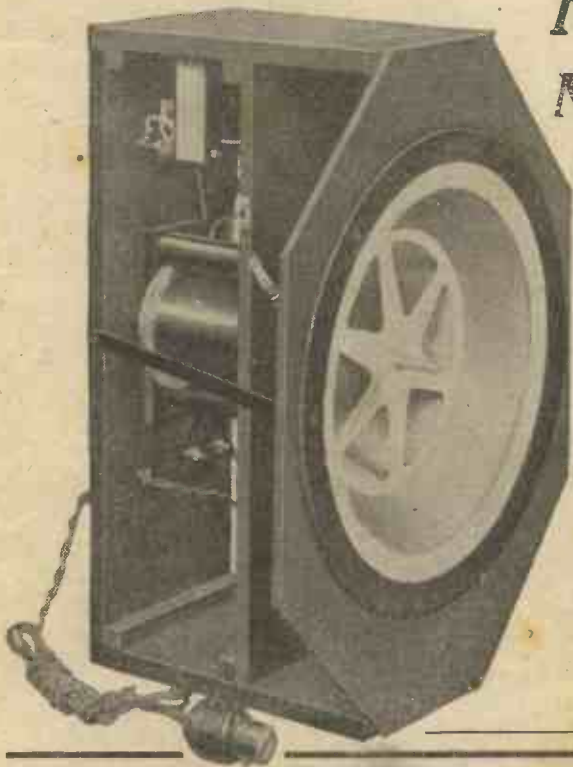
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PERCY W. HARRIS, M.I.R.E.



THE NEW

MARCONIPHONE MOVING COIL UNIT



This new Marconiphone Unit represents an enormous advance in moving coil loud speaker design. The entirely new system of double suspension obviates resonances and gives a remarkably even response to all frequencies. Furthermore it completely eliminates side-play and tendency to sag. Absolutely parallel motion is assured and the smaller air gap makes possible a reduction in the size of the magnet system. Thus not only does this new construction offer markedly superior reproduction, but does so at definitely moderate prices.

The complete unit, assembled, needing only a baffle for immediate use, costs **ONLY 6 gns.**

MARCONIPHONE MOVING COIL UNIT.

No. B.1290 for operation from D.C. or A.C. mains (the A.C. Unit requires in addition a rectifier).

No. B.1291 for operation from 6-8 volts Accumulator. Price either Type 6 gns. Complete cabinet models also available in oak and mahogany. Full particulars on request.

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COSSOR for DISTANCE

Build the new Harris H.F. Unit for your Cossor "Melody Maker"

All owners of the Cossor "Melody Maker" should build the new H.F. Unit (described in this issue) which Mr. Percy Harris has designed for this famous Set. Cossor Valves made possible the amazing success of the "Melody Maker." Now Mr. Harris finds that a Cossor Valve in his new Unit helps to make the "Melody Maker" even better still. Cossor Valves are uniformly good. Each type gives maximum results. Cossor Valves made possible the "radio from seven countries" with the famous Cossor "Melody Maker." Cossor Valves improve any Receiver. Use them throughout your Set. There's melody in every Cossor Valve.



COSSOR VALVES improve any Set


Get this Book FREE!
Please send me a copy of your 48-page Book "How
to get the best from your Cossor Melody Maker."

Name

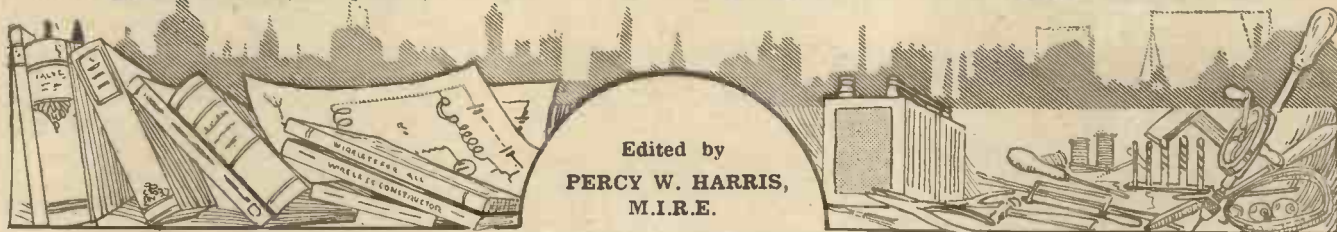
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The WIRELESS CONSTRUCTOR



Edited by
PERCY W. HARRIS,
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Published by the Amalgamated Press, Fleetway House, Farringdon Street, E.C.4.

THE EDITOR'S CHAT

In which Percy W. Harris, M.I.R.E., Editor of the "Wireless Constructor," discusses a few of the main features which appear in this month's issue.

ALTHOUGH, due to the fact that the WIRELESS CONSTRUCTOR goes to press some time in advance of publication, it is still too early to judge the full effects of the publication of the "Stedipower" L.T. Unit, at the time of writing these notes there is no doubt of the enormous interest already aroused. The advantages of having a steady supply of power from the mains for lighting the filaments of our valves, the negligible cost of running the unit, the total absence of those wearying journeys to the charging station, and, not the least advantage perhaps in the eyes of the feminine members of the household, the total absence of dangerous acid, has certainly taken radio reception one step nearer to the goal of ultimate perfection.

"Stedipower" H.T. Unit

As a companion unit for the "Stedipower" L.T. Unit we are presenting this month the "Stedipower" H.T. Unit, designed to match the former instrument and possessing a number of advantages not usually found in mains units. Giving plenty of H.T. current, perfectly smoothed up to a voltage of two hundred, and showing exactly what the voltage is given by each tapping, the "Stedipower" H.T. Unit will bid fair to rival the popularity of the L.T. model. This pair of instruments, supplying both filament and plate current for even a seven-valve set, takes no more current than is used by an electric lamp for lighting a living room. Furthermore, the design of these units is such that

they can be fitted into one cabinet, thus providing a complete "power station" for running your existing receiver entirely from the A.C. mains.

Thousands of listeners who have

WASH AND BRUSH UP!



Cleaning the insulators of the aerial at the London station—a regular and necessary practice.

built the popular Cossor "Melody Maker" will find in the current issue a simple and inexpensive H.F. unit which, when placed in front of the "Melody Maker," will add very con-

siderably to its distance-getting properties and selectivity. Being specially designed to work with a particular receiver, it is matched not only in its exterior form but also in its internal characteristics, the change from short to long waves being carried out, not by removable coils, but by utilising a push-pull switch as in the original instrument. In order that readers may feel assured that the unit is suitable in every way for operation with the original "Melody Maker" design, it has been submitted to, and officially approved by, Messrs. A. C. Cossor, Ltd., as will be seen by the letter published on the next page.

Moving-Coil Speakers

The current issue also contains an important article entitled "The Lure of the Moving-Coil." All readers should study this carefully, for in it we make clear the attitude of the WIRELESS CONSTRUCTOR towards this important type of speaker, which is, briefly, that while it gives marvelously faithful reproduction—the best yet obtainable—it cannot be expected to perform properly unless it is supplied with adequate power for its operation. To repeat a well-worn phrase, the strength of a chain is in its weakest link. Thus we have heard of a large number of cases where people having purchased a moving-coil loud speaker, and connected it to their existing set, have found the results obtainable were decidedly inferior to those they had previously had from a good modern cone type. The reason for this state of affairs and how to

The Editor's Chat—continued

remedy it is made clear by the article referred to.

A few years ago a considerable stir was created by the publication of what was called "The Super-Regenerative Circuit," by which enormous magnification was obtained with only one or two valves. This magnification was accompanied in most cases—at least as far as the ordinary broadcast band was concerned—by a certain distortion which rather militated against its popularity, and comparatively little has been heard of the circuit for some time. Super-regeneration, however, has enormous possibilities on the very short wave-band, and in the next issue Mr. L. H. Thomas, who has done a great deal of short-wave work, will describe a most interesting receiver in which this particular effect is utilised to great advantage in the new field of low wave-lengths. The particular receiver to be described was tried out in the WIRELESS CONSTRUCTOR laboratory, and the results were certainly amazing, not the least of its advantages being its simplicity of handling and the ease which short-wave stations could be found and tuned in at maximum strength. Another interesting feature of this receiver is the unique way in which the super-regenerative oscillator is constructed.

Efficient Crystal Set

Contrary to the predictions of many prophets who foretell its death with amazing regularity, the humble crystal receiver still has a large following. It is still the only type of set which requires no current to operate it (other than that supplied by the broadcasting station), and as many hundreds of thousands of people live

within a few miles of a main station it provides considerable and inexpensive pleasure for a great number of people. At the same time, a very large number of crystal receivers now in use have a very low efficiency, and by reconstructing them it would be possible to increase signal strength as much as two or three times. The

Officially Approved!

Dear Mr. Harris,

We have now had an opportunity of testing out the H.F. Unit which you have designed, we understand, for the readers of the "Wireless Constructor" who own Cossor "Melody Maker" receivers. Even before we tested out this unit we were much impressed with its clean design and the obvious care which you had taken to produce an instrument suitable even for the novice.

On test, we were frankly surprised to find such selectivity and exceptional amplification. In broad daylight, when reception conditions were extremely bad, we were able to receive Hilversum on a Cossor "Melody Maker" in conjunction with your H.F. Unit on a very short indoor aerial.

This certainly speaks well for the efficiency of your Unit, and we congratulate you upon it. We believe that the enormous number of owners of "Melody Maker" receivers will find this little inexpensive unit of considerable value.

Yours faithfully,

A. C. COSSOR, Ltd.
(Signed) W. R. Bullimore,
Managing Director.

crystal receiver described by Mr. Clark in the current issue, simple though it is, has been carefully worked out so as to obtain more than ordinary signal strength, so that those readers who keep a crystal set as a "spare," or as a second receiver when only headphone listening is required, should try-out this design and compare it

with their existing sets. The increase of efficiency will probably surprise them.

In our monthly article on "Using the Thirty-One Tested Circuits" we explain one of the problems that has puzzled many readers in relation to screened-grid valves, namely, their apparent lack of selectivity. The lack of selectivity is really due not to the valve but to the absence of sufficient tuned circuits for the big magnification obtained. This is made quite clear in our article, which should be studied by every screened-grid-valve user.

Letters from Readers

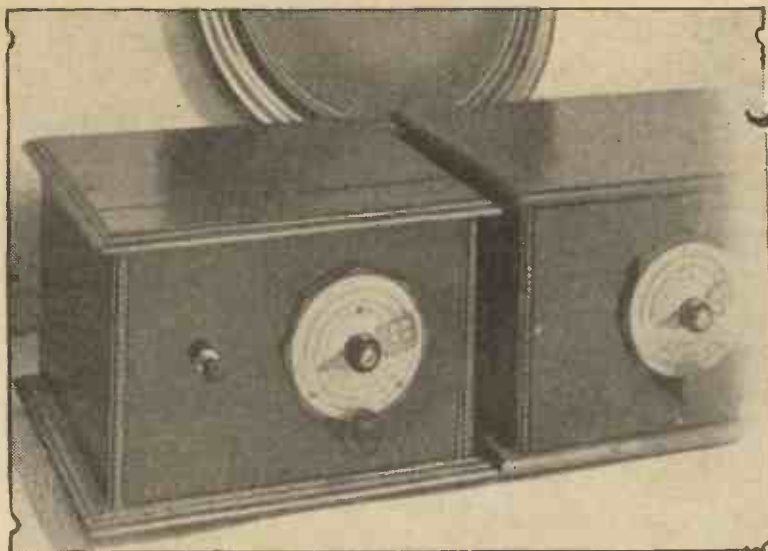
The letters in response to our request for readers' views are still coming in, the later arrivals being from the more distant parts of the world. They have been too numerous to answer individually, but we would again take this opportunity of thanking everyone who has so kindly submitted his or her ideas. Every issue contains articles that have been specially asked for, and the laboratory is continually working on problems and special designs to meet the widest possible requirements.

Exhibition Number

Our next issue will be a special Exhibition Number, and as we happen to know that this year's exhibition will surpass in size and interest any previous wireless exhibition held in this country, special pains are being taken to make the issue worthy of the occasion. Quite apart from being a general guide to the show, it will contain a particularly novel feature which will be of the greatest use to every visitor and unobtainable elsewhere. Be sure you order your copy in good time, as the demands for this issue will be more than usually great.

That Ballet Music!



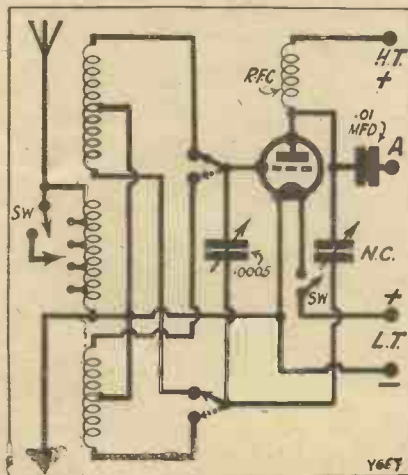


Adding Range to Your "Melody Maker"

by Percy W. Harris M.I.R.E.

AMONG designs published by valve manufacturers with the idea of popularising radio and selling their own valves, the Cossor "Melody Maker" stands out very prominently. This set was first produced at the 1927 Wireless Exhibition, and many hundreds of thousands of constructional sheets of this receiver have since been distributed free all over the country.

When built up according to the instructions given by the designers the set gives excellent results in both



distance and quality, but consisting, as it does, of a detector valve followed by two stages of low-frequency amplification, it lacks the sensitivity of a set fitted with a high-frequency valve, and it is therefore not surprising that a number of new readers of the WIRELESS CONSTRUCTOR have written to me asking whether it is not possible to add a stage of high-frequency to the Cossor "Melody Maker" thus adding considerably to its distance-getting qualities.

This is an H.F. unit specially designed to give the highest possible efficiency with the Cossor "Melody Maker." It has been officially approved by Messrs. Cossor, Ltd., and it should be noted that the unit incorporates a simple yet scientific wave-change scheme which, as with the "Melody Maker" itself, completely obviates the necessity of coil changing.

The WIRELESS CONSTRUCTOR has already published several high-frequency units, designed with the purpose of placing in front of existing receivers. Among these we can name the "Radiant" high-frequency unit, which was designed to give high-frequency magnification to those people who did not care for neutralising methods; the high-frequency unit in the January, 1918, issue; and the "Screened-Grid Valve H.F. Unit" in the February issue, all of which are adaptable to the Cossor "Melody Maker."

The screened-grid unit is, to the best of my knowledge, the only

screened-grid valve high-frequency unit designed to take both the double-ended screened-grid valves and the newer type of valve with four pins at one end and a terminal at the other. Although published in February, 1928, the unit is still right up-to-date in its design, being immediately adaptable to the latest types of screened-grid valves which are only just appearing.

Wave-length Change

There are many people, however, who do not wish to purchase the more expensive screened-grid valve, and who desire to retain if possible the most popular feature in the Cossor "Melody Maker," namely, the change over from the short to the long waves without interchange of coils. All of the high-frequency units so far described have required a change of coil when going from the lower to the upper band, so experiments were begun in the WIRELESS CONSTRUCTOR laboratory to see whether it was

COMPONENTS REQUIRED

- 1 Cabinet with 9 in. baseboard to take 10 in. x 7-in. panel (Peto-Scott). (Arteraft, Caxton, Cameo, Pickett, Makerimport, Raymond, etc.)
- 1 Panel 10 in. x 7 in. x 1/4 in. (Any good make).
- 1 Double-pole double-throw jack switch, with terminals (Lotus).
- 2 On-off switches (Lotus). (Duco, Igranic, Lissen, etc.)
- 1 Variable condenser (.0005 mfd.) (Formo). (Lissen, Igranic, Raymond, Cydon, Bowyer-Lowe, Jackson, Peto-Scott, etc.)
- 1 Vernier dial (Ormond, to match original set).
- 1 Neutralising condenser (Igranic). (Peto-Scott, Magnum, or any good make with terminals.)
- 1 Sprung valve holder, with terminals.
- 1 Terminal strip.
- 6 Terminals.
- 1 Former for coil, 7 in. long, 4 in. diameter, or ready-wound coil (Magnum). (Peto-Scott, etc.)
- 1 Fixed condenser (mica), .01 (T.C.C.). (Dubilier, etc.)
- 1 Radio-frequency choke (Peto-Scott). (Lissen, R.I.-Varley, Magnum, Climax, etc.)
- 1 "Crocodile" clip.
- No. 20, 24 and 32 D.S.C. wire (if you wind your own coil).
- 1 Metal screen, 6 in. x 8 1/2 in. (Magnum). (Peto-Scott, Paroussi, Bowyer-Lowe, etc.)

Adding Range to Your "Melody Maker"—continued

possible to evolve a thoroughly efficient high-frequency unit to match the Cossor "Melody Maker," not only in its outward appearance, but in the valuable feature of being able to change from the lower to the upper band without lifting the lid of the cabinet.

Easy to Build

I am pleased to say that the experiments have been quite successful, and we are able to publish this month a simply constructed unit which has the official approval of Messrs. Cossors, and is recommended for use with the "Melody Maker."

The requirements which we set before ourselves in the laboratory when we started to design the H.F. unit for the "Melody Maker" were that it should be simple to construct, no soldered connections being used—that the total cost of the unit should be kept down to as low a figure as possible—that any special coil should be home-wound (with the option to buy a ready-wound coil if desired)—and that the parts should be readily obtainable everywhere.

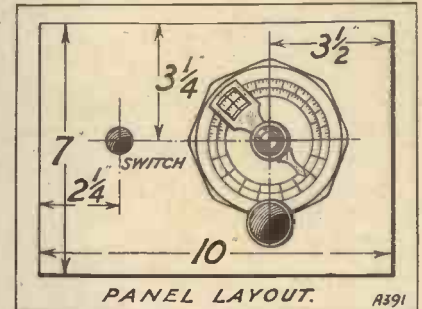
"Maker," it was not considered necessary to publish a full-sized chart of wiring, as this latter has been made so simple that the wires can be cut and fitted in place as one goes along.

By keeping the wiring very simple, it is possible to use a number of alternative components provided they are of satisfactory design, and thus the reader is not tied down to certain particular makes. The one or two exceptions to this are in components which are inexpensive and readily obtainable.

Parallel-Feed

First of all, a word about the circuit. There is in practice only one circuit available for high-frequency units which have to be connected to an existing set without making wiring alterations in that set. This method is known as the "parallel-feed tuned-anode" and consists of coupling the aerial to a suitable tuned coil, which, in turn, is connected to the grid and filament of the high-frequency valve, placing in the plate circuit of this valve a radio-frequency choke which

These radio-frequency currents reach the filament through a coupling condenser, and the grid coil of the circuit to which the unit is coupled. When this arrangement is adopted it is only necessary to take a lead from the high-frequency unit to a suitable



terminal on the "Melody Maker" and to transfer the aerial and earth connections from the "Melody Maker" to the H.F. unit.

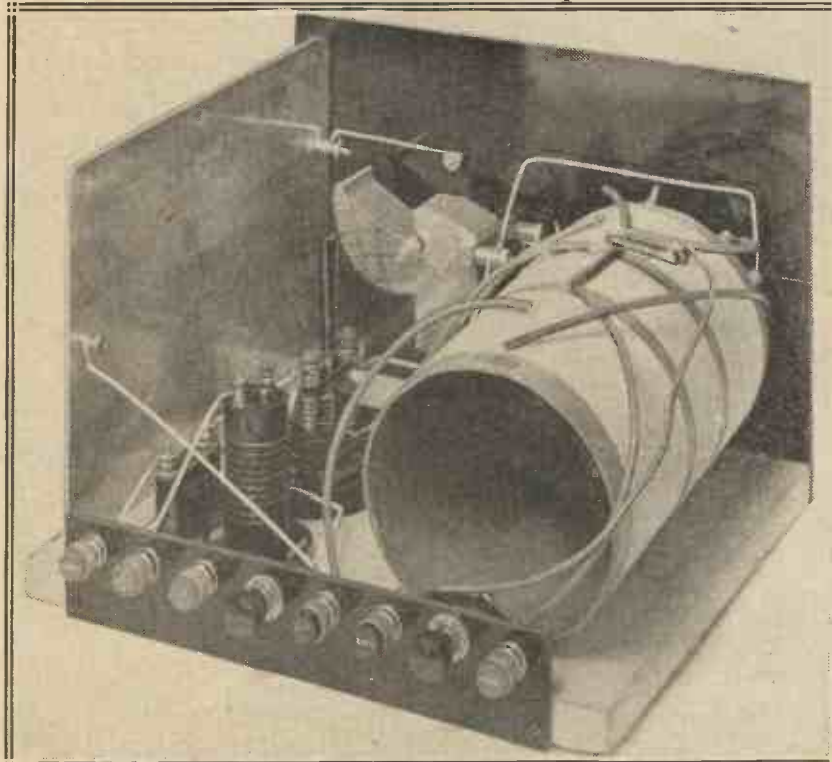
A well-designed high-frequency circuit will oscillate violently of its own accord without any reaction unless some scheme is adopted to obtain stability. The two leading methods of obtaining stability are by the "losser" method and the "neutralised" method (disregarding the screened-grid-valve method, which is a special application).

Neutralised H-F.

The "losser" method when well handled is capable of giving quite good results, although they are not so good as obtainable with a neutralised arrangement. The neutralising circuit, on the other hand, wants a little care in its preliminary adjustment, though when this is accurately done it need not be touched again. In the present unit a neutralised method is chosen, and the little preliminary trouble in adjustment is well repaid by the higher efficiency obtained.

While there was nothing particularly new to work out so far as the circuit was concerned, the problem of how to change over from the short to the long waves in a set with a coupled aerial circuit and neutralisation was no easy one! After a large number of experiments had been made a scheme was worked out with the aerial coil arranged between the two grid coils, one for the long waves and the other for the lower wave-band.

The number of turns in the aerial coil were chosen to be correct for the long-wave band, and arrangement



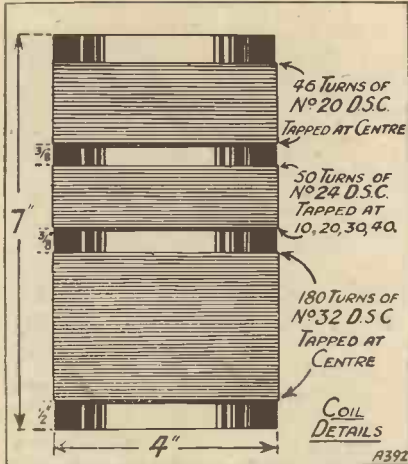
Every terminal is plainly marked and you will notice that on the same strip are two simple switches.

In view of the fact that the unit would be constructed in the main by those who have already built the "Melody

allows the direct current to pass through this valve but offers a barrier to the radio-frequency currents.

Adding Range to Your "Melody Maker"—continued

made so that on the lower band the additional turns not required were shorted out. The centre taps on the grid coils, being connected to the filament, could be left joined up permanently on each arrangement, and it was then only necessary to change over the two ends of the grid coil by means of a double-pole double-throw switch.



For this purpose a switch fitted with terminals was chosen, and this was placed in a convenient position on the front of the panel, so that when the switch is pulled out the receiver is set for the lower band, and when it is pushed in it is correct for the upper band. This arrangement corresponds with the switch position on the original "Melody Maker" and saves much confusion.

Matches "Melody Maker"

The switch for shorting out the unwanted turns in the aerial circuit is placed at the back, as adjustment of this is not always necessary. For general reception on the local station all of the aerial turns can be left always in circuit, and when higher selectivity is required the additional turns can be short-circuited. The on-and-off switch is also placed at the back of the cabinet to correspond with the position of the on-and-off switch on the original "Melody Maker."

So far as the general appearance of the unit is concerned, the cabinet chosen matches the cabinet of the "Melody Maker," alongside which it is shown. Similarly, the same type of vernier dial has been chosen, but, of course, in those cases where the builder of the original "Melody

Maker" has used a different type of condenser or dial from that shown in the original design he will naturally choose that type again for his high-frequency unit. Any good make of vernier dial and any good make of variable condenser can be used for the high-frequency unit.

Same Gauge Wire

Looking down on the set with the lid up, we see a large metal screen interposed between the high-frequency unit and the "Melody Maker" itself, and a large coil which for convenience is wound on the same size former as that used for the original coil in the "Melody Maker." Similarly, and also for convenience, the long- and short-wave coils are wound of the same gauge wire as originally, only the aerial coil being of another gauge. Full particulars of the gauges of wire and the number of turns will be found in the illustrations.

The baseboard carries in addition to the coil a high-frequency choke, a coupling condenser, a valve holder, and a neutralising condenser, while on the front panel is carried a variable condenser, the double-pole double-throw switch, and the vernier dial.

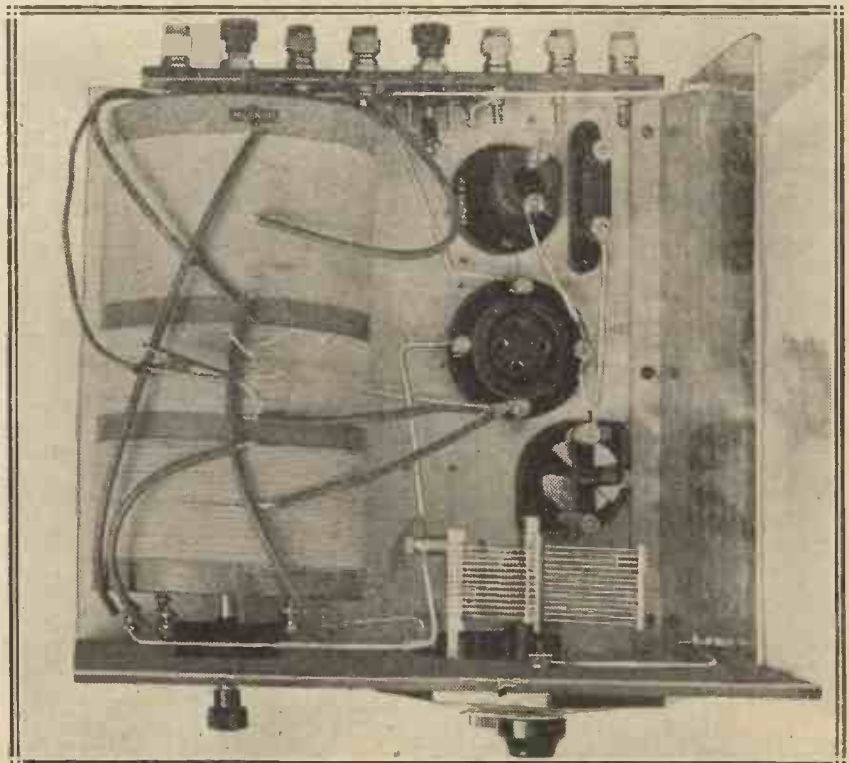
Incidentally, the Ormond vernier dial shown is fitted with an earthing plate, which is *not* connected with either the fixed or moving plates, and is a preventative of hand-capacity effects.

With the particular circuit used this dial is recommended, as it is very useful to have a screening plate with any split-secondary circuit, and it must be remembered that this screening plate must not be connected to either moving or fixed plates of the condenser. The terminal connected to the screening plate is shown at the back of the panel and is joined to a terminal on the vertical screen affixed to the baseboard.

No H.T. - Terminals

The terminal strip at the back carries terminals for aerial, earth, low-tension negative, low-tension positive, high-tension positive, and output. Notice particularly that no high-tension *negative* is here, for the connection from the high-tension negative to the low-tension circuit is already made in the "Melody Maker" itself.

The terminal strip also carries two push-pull switches, one for shorting out the undesired aerial turns and the



The clip is taken to that tapping on the coil which suits your own particular aerial conditions. After this it can remain permanently in position.

Adding Range to Your "Melody Maker"—continued

other for switching the filament on and off. This latter switch is also very useful when neutralising.

As no two aerials are alike, provision has been made for preliminary adjustment of the aerial tapping for the short-wave band. A spring clip for this purpose is shown in the illustration.

When the best tapping has been found in the preliminary experiments, which will be described later, the clip

The first step in the constructional work is to wind the coils. For this purpose take the former and pierce a small hole for the beginning of the long-wave winding, and then wind on half of the number of turns for the long-wave coil (see diagram), and then leave a long loop (not less than six inches), twisting the loop together so that the wire at the base of the loop is fairly tight.

Now carry on winding in the same

when you should pierce two holes and thread the fine wire through it, leaving again a long piece (about eight inches) for subsequent connection. A touch of shellac varnish here and there will serve to keep the turns in position.

Wind Carefully

Be careful to wind the coil evenly and with turns touching. Now measure the distance shown between the long-wave coil and the aerial coil, pierce a couple of holes for securing the ends of the wire, and wind your aerial coil, making a short loop about an inch long at every tenth turn, and twisting the wire of the loop tight so as to carry on without the wire slipping. You should leave a length of about eight inches at the beginning of this winding and about the same length at the end for subsequent connection.

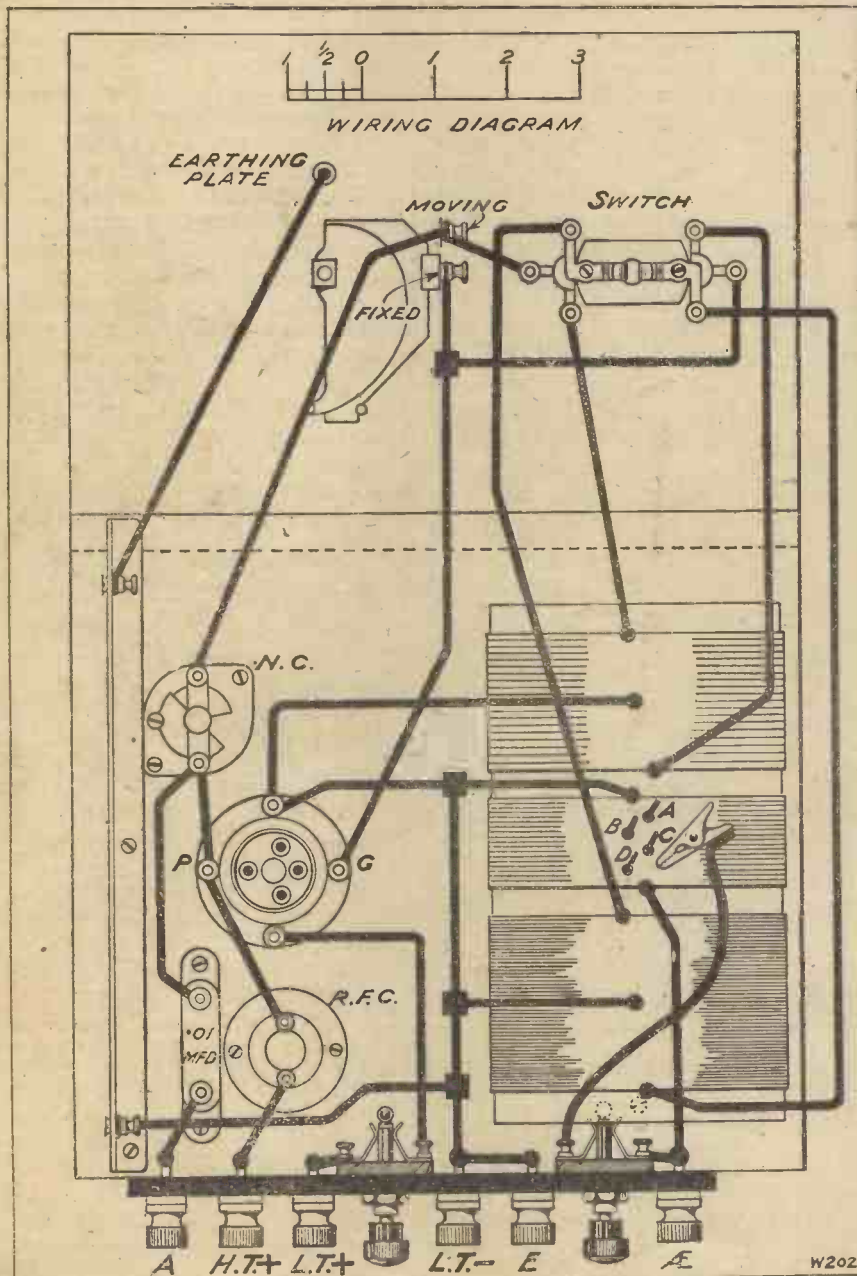
The wire should be secured at the beginning and end by threading through a couple of holes, which should be pierced with a sharp needle, a scriber or other instrument. The third coil (the lower wave-band centre-tap coil) should now be wound on, leaving an 8-in. length as before in the centre, and three or four inches of wire at each end.

Do not try to rush the winding of this coil. The best way of winding after you have threaded the end of the wire in the two holes is to place the former on your knee and rotate it firmly in the hand, holding the wire taut in the right hand and rotating the former with the left. The reel of wire can be allowed to lie on the floor, or can be allowed to rotate loosely round a peg on the bench, if you are blessed with such a convenience.

Assembly

Now stand the coil aside and drill the panel for the variable condenser dial, on-and-off switch, and three small holes for screwing the panel against the baseboard. Mount whatever condenser you have chosen and the switch on this panel.

Next, temporarily screwing the panel to the front edge of the baseboard, lay the coil in position (notice that parts of the D.P.D.T. switch come *within* the coil former), and see that your condenser clears the coil in every position. With some makes of



is left in position and need not be touched again unless the aerial is changed.

direction, leaving the loop free at the moment, until you have reached the total number of turns on this coil,

Adding Range to Your "Melody Maker"—continued

condenser it may be necessary to rotate the framework slightly in order to do this. With the coil temporarily in position and the panel temporarily in place, lay out your baseboard components according to diagram and screw the screen in position together with the other components.

The terminal strip can next be drilled, making sure that the terminals do not foul the two on-and-off switches. For this reason it is best to drill the holes for the on-and-off switches first and to screw them in position before you drill the holes for the terminals.

The terminal strip can now be secured in place. Wiring up is extremely simple, for no soldered connections are used, terminals being fitted to every component. Most of the wires are but an inch or two long, and you can use either a thin flexible wire insulated with sleeving such as Systoflex, or ready-insulated wire such as Glazite.

Many readers will like to use the "Radiant" scheme with flexible rubber-covered wire and pinch-on tags, while others, of course, will like to solder all their connections. It is a question of taste and skill.

Flexible Leads

Where the connections are made from the coil to the various parts of the apparatus I have slipped Systoflex sleeving over the wires, as this gives a much neater appearance, and incidentally enables me to show you very clearly in the photographs just where the wires go. This sleeving is not essential, but is recommended to the man who likes to build a neat-looking set.

As the wires from the coil are all flexible it will be found convenient to secure most of them in position (particularly those which go to the double-pole double-throw switch on the panel) before the coil is actually screwed in place. Fortunately, however, the diameter of the coil is such that the hand can be inserted right through from one end to the other in order to get at the screw terminals on the switch fitted to the panel, so that you will have no difficulty whatever in making good connections here.

The actual clip I have used for connecting the aerial turns is what is known as a "Crocodile" clip. I do not know the actual maker, but most

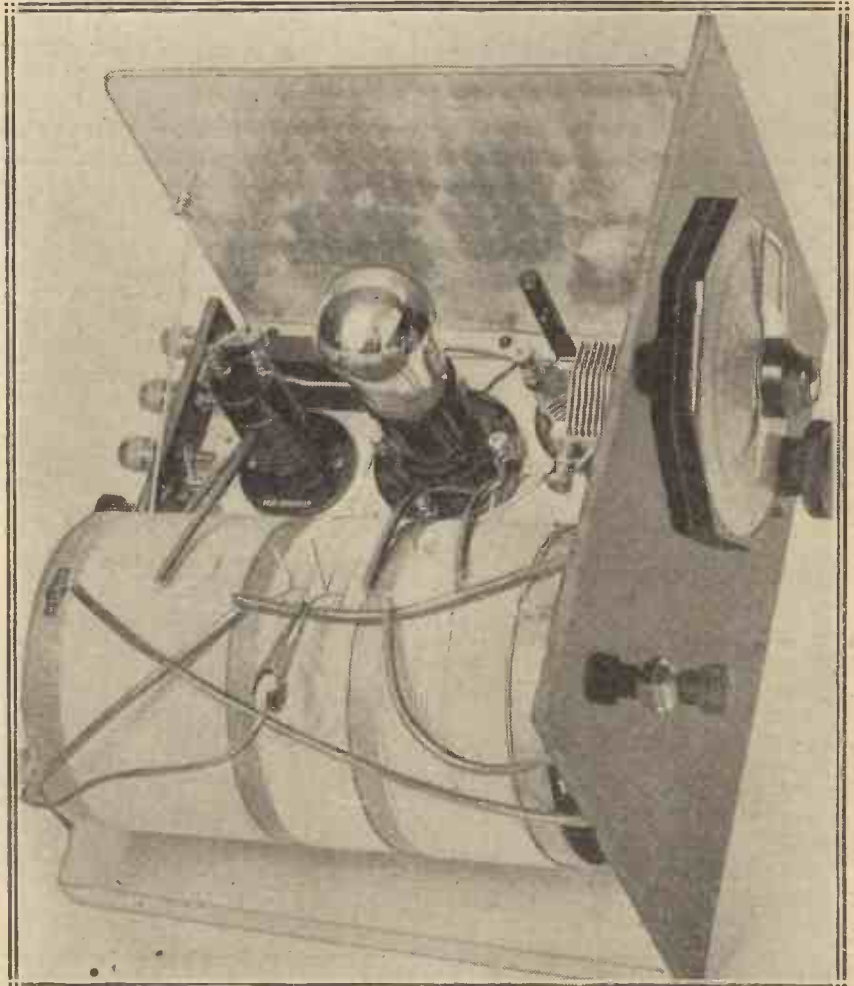
wireless dealers sell them. The advantage of this type of clip is that no soldered connection is needed, a screw terminal being fitted for connecting the wire.

Earthed Dial

The terminal on the panel which is connected to the terminal on the vertical screen is a special feature of the Ormond dial, and will not be found on other vernier dials. With

terminal strip. The coil is quite light, and one screw will be found to hold it firmly in position.

Do not forget to make the connection between low-tension negative and the vertical screen. Notice that the aerial terminal is connected to the switch terminal immediately adjacent to it, but that the other switch terminal is *not* connected to the earth terminal. Similarly, although earth and low-tension negative are joined



You will see that the screen is arranged so that comparatively it is a long way from the coil, and that the coil is also arranged so that it lies at right angles to the coil in the "Melody Maker."

other condensers and dials these terminals will therefore be missing. It is not vitally essential, but, as previously mentioned, removes the slight hand-capacity effect sometimes found in such split-secondary circuits.

When all of the connections to the coil have been joined up, hold it in place and screw it down with a single wood screw at the end nearest the

together, low-tension negative is *not* joined to the adjacent terminal of the on-and-off switch. See that proper clearance is given here, otherwise there may be a short-circuit.

Connecting Up

The method of connecting the high-frequency unit to the "Melody Maker" is very simple. First of all join up

Adding Range to Your "Melody Maker"—continued

your "Melody Maker" in the usual way and see that it is working satisfactorily. Now set reaction condenser at zero, and then disconnect aerial and earth lead from your "Melody Maker," placing them on the marked terminals of the high-frequency unit.

H.T. Values

Next join up the L.T. negative and positive terminals of the high-frequency unit to the same accumulator as that used for the "Melody Maker," and join H.T. positive to about 60 volts on the high-tension battery; the value is not very critical. If you are using two 60-volt high-tension batteries in series connect H.T. positive on the H.F. unit to the first tapping of the second battery after the negative.

Insert a Cossor H.F. valve, pull the switch on the front of the "Melody Maker" out (for short waves), pull the switch on the H.F. unit out, and the aerial switch at the back of the H.F. unit out also. Connect the spring clip to the first tapping nearest the panel.

These tappings are easily made by simply scraping the insulation off the twisted loop. Take a lead from the output terminal of the H.F. unit to the terminal marked 32 on C_2 on the "Melody Maker." Set the plates of the neutralising condenser so that they are most widely separated and switch on. Endeavour, if you are near a station, to tune it in (for tuning purposes you will use both the H.F. unit condenser and the "Melody Maker" first condenser). As soon as you have tuned it in switch off the valve in the high-frequency unit, but do *not* switch off the "Melody Maker." Retune carefully, particularly on the high-frequency unit, and if your local station is within ten or fifteen miles you will probably still hear it on the loud speaker, but more faintly.

Neutralising

Now carefully turn the neutralising condenser until the plates are just slightly meshed and again adjust the tuning condenser, making sure you are accurately tuned. A point should be found when by a slight adjustment of the neutralising condenser you can make the local station signals inaudible. This is the correct neutralising point, and, once it has been found, it need not be touched again.

If you now switch on you will get your local station at tremendous strength, and probably distorted owing to the great volume, so tune the condenser to another station and you will find that the range-getting powers of your "Melody Maker" have been very considerably increased. Reaction on the "Melody Maker" will be used as before for increasing strength and selectivity.

If you are so situated that the nearest station is some distance away, then the best way of neutralising is to tune in some station on both condensers with the high-frequency filament on, and if there is a sign of oscillation, even when



The specially designed coil used in the H.F. Unit.

the reaction condenser is at zero, carefully adjust the neutralising condenser until this oscillation ceases. You will find with whatever neutralising method you use that the neutralising point on the neutralising condenser is fairly critical, as before and beyond it the set will oscillate.

When neutralising by the distant-station method, when you have stopped the oscillation to which I have just referred, turn the "Melody Maker" condenser to about ten or fifteen degrees (keeping the reaction condenser at zero) and then turn the

high-frequency unit condenser backwards and forwards round about the ten-degree point, and see whether the set tends to oscillate at any setting. If it does, carefully adjust the neutralising condenser until this ceases. When correctly neutralised the set should not oscillate at any setting of either of the tuning condensers when the reaction condenser is at zero.

Changing Wave-length

Which aerial tapping you use will depend on your particular aerial, and after you have carried out the experiments to which I have just referred try changing the clip from the first to the second or even the third tapping. You will probably find louder signals at a higher tapping, but poorer selectivity. You will soon find which tapping will suit your own aerial conditions best, and once you have found it you can leave it.

For long-wave working it is only necessary to change over by pushing in both the switch on the "Melody Maker," and the switch on the high-frequency unit, and pushing in the switch for the aerial turns on the back of the H.F. unit.

The set will be found stable on the long as well as the short waves, so there will be no need to reset the neutralising condenser, on the long waves, if it has been properly done on the short waves. If, in spite of all you have done, there is still a tendency to oscillation, reduce the high-tension voltage on the high-frequency valve.

A Refinement

I have found it a distinct advantage when using this high-frequency unit in front of the "Melody Maker" to insert a high-frequency choke of any of the well-known makes between the plate of the detector valve and the resistance R_2 . The new connections to this are as follow: Disconnect wires 24 and 25 from the plate terminal marked A on the detector valve, and connect the plate terminal to one end of the radio-frequency choke.

The other terminal of the radio-frequency choke should be joined to R_2 and C_1 in place of the wires 24 and 25. The long wire coming from the reaction coil to C_1 should be detached from C_1 and should be

Adding Range to Your "Melody Maker"—continued

connected directly to the plate terminal of the detector valve. Room for the radio-frequency choke will be found on the baseboard between the terminal E and the resistance R_1 .

Do not expect to obtain best results with this unit in the first five minutes. It is always more difficult to tune with two condensers than with one, but once you have become accustomed to handling this unit you will be delighted with the results obtained. At the same time, do not expect results from a high-frequency unit which it cannot give.

Not for Local Work

Remember that it will not add to the strength of the local station signals if these are already very loud, and that if you are already getting loud signals from your local station the placing of a high-frequency valve in front will not only *not* improve the quality, but will simply serve to overload the detector and to give distortion. When the high-frequency unit is placed in front of the "Melody Maker" and used for local station reception it should be detuned slightly to avoid overloading the "Melody Maker."

This high-frequency unit really shines on the more distant stations which it will enable you to receive much more clearly and distinctly. Whereas with the original "Melody Maker" a distant station required a certain amount of reaction to obtain it clearly, with the high-frequency unit in front the station will come in at the same strength with much less reaction, and therefore with a much better quality. Also, by using properly adjusted reaction, you will be able to get the distant station much louder than you did before, as well as many others you had not even heard before.

With Other Sets

Although specifically designed to work with the Cossor "Melody Maker" this unit will work just as efficiently with the "Radiano" Three (the output terminal of the H.F. Unit being connected to the aerial terminal of the "Radiano" Three, with the X coil used with the larger number of turns) and with many other sets consisting of detectors followed by note magnifiers.

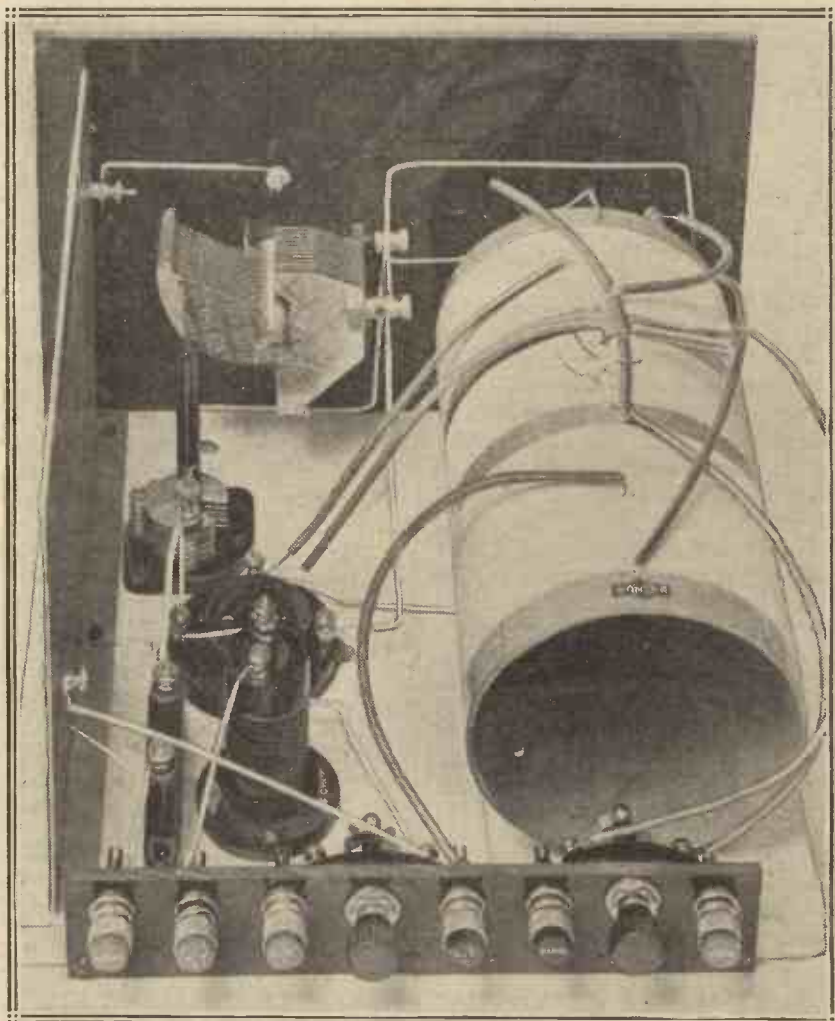
It should also be noticed that quite apart from its magnifying powers

it adds considerably to the selectivity of any set with which it is used. The chief impressions one gets when using the unit are that it makes the distant stations sound much nearer, and converts a poor aerial into a good one.

By the way, those of my readers who wish to take advantage of the new free booklet issued by Cossors, "How to Get the Best From Your Cossor 'Melody Maker,'" should mention the WIRELESS CONSTRUCTOR when

reception. But it is often overlooked that the cause of most distortion does not lie in the intervalve coupling and the loud speakers employed so much as in the incorrect working of the L.F. valves. It may safely be said that in nine cases out of ten where distortion is experienced, it is due to the valve before the loud speaking being overloaded.

The input to a valve may be measured in voltage variation applied



This photo very clearly shows the majority of the connections to the coil unit.

writing to Highbury, as this will ensure their getting the promptest possible attention.

* **OVERLOADED VALVES** *

QUITE a large amount of interest is at present being given to the question of pure loud-speaker

to the grid, and termed "grid swing." If a valve is to correctly amplify these voltage variations, they must not be of more than a certain voltage for a given value. A small power valve is capable of dealing with a larger grid-swing than an ordinary L.F. valve, and a super-power valve is capable of dealing with an even larger grid-swing than an ordinary power valve.



Some typical faults and remedies reviewed.

By P. R. BIRD.

Trouble With Tuning

ALTHOUGH I think I mentioned the matter in these notes some months ago, a minor outbreak of tuning trouble and of the local station shifting its setting upon the tuning dial makes it necessary to offer a reminder upon this curious fault. The symptoms nearly always occur in summer only, and the trouble generally manifests itself as a slight falling off in signal strength and an unaccountable shifting of the "setting" of the tuning condenser.

If, for instance, the local station generally comes in at ninety degrees it will be noticed that on some nights the condenser has to be set at eighty-five degrees, or, perhaps, one hundred degrees, to get maximum results. After a time signals fall off, and when a return is made to the old position it is found that the station has come back again, or can be found at some other unusual dial-setting.

Generally the cause of this fault is poor contact underground. So any reader who has to do this dial-dodging business should try the effect of a bucket or two of water round the earth lead. He will probably be astonished at the improvement in the earth-plate's condition when it has "taken the waters."

Plug-In Contacts

One of the best forms of contact is the plug and socket type, such as is provided on the ordinary plug-in coils, valves, etc. The excellence of the system lies in the fact that a certain amount of "spring" is almost invariably present, and the act of inserting and withdrawing a valve or

coil ensures that the contacts of the plugs in the sockets are reasonably tight. But it should not be forgotten that whilst the valves may fit snugly in the sockets, there are four plugs and four sockets to be considered in such a case, and they may not all be making equally good contact.

A Case in Point

One of the queerest faults I remember in this connection was that of a portable set which was continually giving its owner trouble

THE TECHNICAL QUERIES DEPARTMENT

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The WIRELESS CONSTRUCTOR Technical Queries Department has been thoroughly reorganised and is now in a position to give an unrivalled service. The aim of the department is to furnish really helpful advice in connection with any radio problem, theoretical or practical.

Full details, including the revised and, in cases, considerably reduced scale of charges, can be obtained direct from the Technical Queries Department, WIRELESS CONSTRUCTOR, Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do: on receipt of this all the necessary literature will be sent to you free and post free, immediately. This application will place you under no obligation whatever. Every reader of WIRELESS CONSTRUCTOR should have these details by him. An application form is included which will enable you to ask your questions, so that we can deal with them expeditiously and with the minimum of delay. Having this form you will know exactly what information we require to have before us in order to solve your problems.

because of its unreliability. It was built into a suitcase, and although it generally went very well, there were occasions when he had gone to the trouble of taking it out into the country only to find that it sulked abominably.

After he had rewound the frame

aerial, torn out a good many of the components in the set (and handfuls of hair from his head), he discovered that the whole trouble was caused by the fact that the grid socket of the first valve did not always make a perfect contact with the plug on the valve.

Fortunately, such trouble seldom occurs nowadays, because valve manufacturers have obtained a very commendable degree of dependability where such contacts are concerned, but even nowadays one comes across queer cases sometimes which, after patient investigation, prove to be due to nothing more nor less than bad contacts between a plug and a socket in valves or plug-in coils.

A Short-Wave Mystery

As the reception of short-wave signals imposes a far greater test on the efficiency of a set than when it is used for receiving programmes on the ordinary band of wave-lengths, one often finds some surprising results due to imperfect contact on a short-wave set. Nor are such symptoms confined to the set itself.

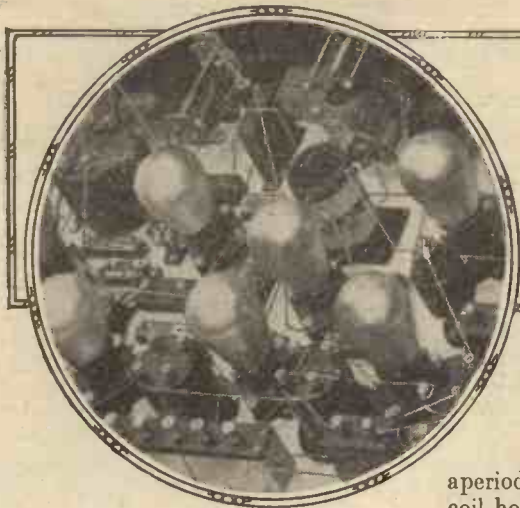
Many mysterious noises and symptoms are directly traceable to poor contacts in the aerial or earth systems. One well-known worker upon the short waves recently told me that he had no end of trouble with a crackling noise which defied all efforts at detection.

Eventually this trouble was traced to the fact that one strand of his aerial was broken, and apparently the slight movements caused by a breath of wind swaying the aerial caused a little gap to open and close between the ends of this broken wire, thereby making and breaking a contact. It sounds a very small thing to have affected reception, but on a short-wave set it is the small things which cause the trouble, and it is only by perfection in the little points—contacts, and so forth—that really reliable reception is obtainable.

Switch Tricks

On two occasions lately I have come up against "mysterious" faults which proved to be nothing more than faulty pressure at switch contacts. The trouble with this class of fault is that it often escapes observation because the two parts appear to be touching, but are not pressed together sufficiently well for current to flow.

So if you are not an old hand, and are getting mystery fluctuations, try tightening up all springy contacts that may have worked loose—it's surprising how much they matter.

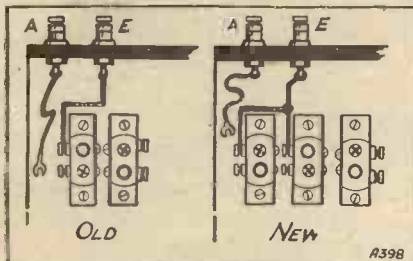


COMMENTS FROM CONSTRUCTORS

What about 5 S W?—Short Waves on "Radiano"—The "Roadside" Four—Powerful Mains Unit—The "Short-Wave Three"—More about the "Roadside" Four.

What About 5 S W ?

SIR,—Listeners abroad will thank you for the energetic remarks of your Special Commissioner headed, "What About 5 S W ?" in your July number. This especially refers to Britishers who are fated to reside in countries where reception on the ordinary



Mr. Marsh's modification.

broadcasting range is rendered difficult or impossible by static and long hours of daylight in the summer months.

We would beg you to continue to use your influence, not only to ensure the permanence of 5 S W, but to obtain a greatly desired extension of its very useful work in the form of news and week-end transmissions.

Yours truly,

GEORGE BOAG.

Aguilas (Murcia), Spain.

Short Waves on "Radiano"

SIR,—I have experimented with short waves and I find as good a set as any I have tried is a "Radiano" Three, with another coil holder

aperiodically coupled to the aerial coil holder. The aerial can be joined in a moment to the extra coil holder and short-wave coils plugged in. I use a .0001 grid condenser and 5-meg. leak, which I find functions on all bands, and my choke is a Climax. Of course, I appreciate the fact that a short-wave choke would be more efficient, but I do quite well. I offer the suggestion, hoping it will interest readers of the WIRELESS CONSTRUCTOR. Here is a sketch of the alteration. Of course, when using ordinary wave-lengths the extra coil holder can be left loafing. It is earthed and will do no harm.

Yours sincerely,

LEONARD J. MARSH.

Hants.

The "Roadside" Four

SIR,—I have again the pleasure to thank you for a really efficient circuit, the "Roadside" Four.

I had already ordered cabinet as specified for another set, and thought I would try the "Roadside," as per the enclosed photos.

I have both aerials, S.W. and L.W., on the one frame, with common lead to left-hand top socket; two sets of plugs through panel, and on-and-off switch on panel; "Blue Spot" speaker unit, and free-edge cone on rubber washer; using all components and valves as specified.

The tone leaves nothing to be desired, and results are so good that three of my friends (wireless enthusiasts like myself) have components on order to construct the same. I find 5 X X and Radio Paris come

in fairly good in the Thames Valley. Anywhere in the Surrey Hills I have 5 G B, 2 L O (and Langenberg, after dark) at full strength.

Again thanking you for all you have done for our most interesting hobby.

I enclose photos for your consideration and reproduction if worthy.

Yours very gratefully,

WM. J. CARPENTER.

Surrey.

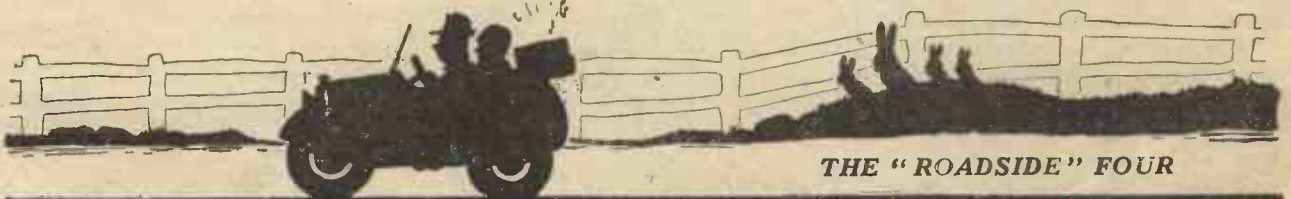


Mr. Carpenter's "Roadside" Four, referred to above.

The Powerful Mains Unit

SIR,—You may remember that I communicated with you some time last May regarding the H.T. eliminator published in the WIRELESS CONSTRUCTOR of last June.

Being desirous of an efficient A.C. mains unit for my five-valve neutrodyne receiver, and having thoroughly studied your circuit, I decided to make up the unit. The specification re components was exactly followed,



THE "ROADSIDE" FOUR

Comments from Constructors—continued

but the layout is not quite as you described, as I wanted it to fit base of my cabinet. The result—the unit has been in use since May 20th—is excellent. Using a large cone speaker, there is just a suspicion of hum during an interval in a programme, but none of my friends has noticed it until reminded of the fact, and then one must go close up to the speaker to detect it. Needless to say, I am very pleased that I invested in this unit. It is certainly worth while because with a good receiver one expects good quality reproduction, and your A.C. mains unit positively gives it.

Should you have any inquiries re this unit from readers of the WIRELESS CONSTRUCTOR, you are at liberty to give them my name and address so that they may call and see your mains unit in use. Being delighted with it, I am proud to let anyone see it.

Thanking you for designing such an efficient unit and bringing it to the notice of wireless enthusiasts,

I am, sir,

Yours faithfully,

D. OSWALD MORGAN.

London, W.2.

"Short-Wave Three"

SIR,—I was very interested to read in a recent number of WIRELESS CONSTRUCTOR of the results obtained by your correspondent, Mr. J. Alams, with the "Short-Wave Three"; in fact, I have been somewhat surprised not to have seen some mention of this instrument before.

I, too, made up the "Short-Wave Three," and although I cannot claim, as so many amateur constructors do, "that I simply switched on and station after station simply swept in, you know," I can agree with the correspondent above that when one has learnt to handle this very interesting short-wave set properly, and conditions are good, 3 L O (Melbourne), 2 X A D and K D K A (of the United States) come in at quite remarkable loud-speaker volume. I am sure it will also interest you to know that up to just recently, since when his power seems to have dropped off considerably, P C J J has often been received without aerial or earth.

By the way, I wonder if anyone has heard the wonderfully powerful German station that is working on a wave-length in the neighbourhood of 40 metres? To my mind its modulation is about as perfect as can be. Its

volume is very nearly as great as Bournemouth, three miles away. Poor 5 S W! Its voice here is rarely heard above a whisper. I do hope it wakes up before getting far from home!

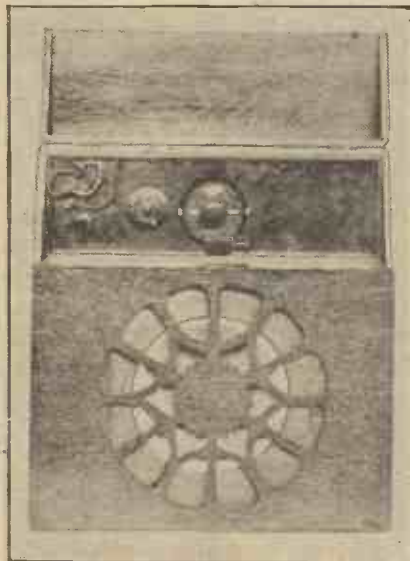
Reverting for a moment to the "Short-Wave Three," I might mention that in the early days of its life I had some difficulty in picking upon a really suitable detector. It may be of some help to other amateurs to state that my best results were, and still are, obtained with a Cossor 6-volt L.F. "Black Band."

This far outclasses any other in the 6-volt class that I have tried, and is particularly suitable for use with the American coils for which the "Short-Wave Three" was designed.

Yours faithfully,

Dorset.

A. E. HENWOOD.



The "Roadside" Four constructed by Mr. Carpenter, who details his experiences with this set on the preceding page.

More "Roadside" Four Results

SIR,—The "Roadside" Four is really great. I have just completed it, and the family are delighted with it. Microphonic valve troubles were cured by your Plasticine method, but I had to make complete coverings for the glass bulbs of the first two valves, and now it is splendid. 5 G B comes in at wonderful strength. 2 L O (50-odd miles) is medium strength, and I have had several foreign stations weekly with a H.T. battery down to 80 volts.

Here is a tip which may interest your readers: Now that summer-time is here, very few car-owners use their lights, consequently the car

provides a convenient home battery-charging station. On many dashboards there is a pair of sockets wired for the insertion of an inspection-lamp plug. If leads are carried from this plug to the wireless accumulator, it will be charged from the car battery.

One lead must, of course, be broken and carried through a resistance bulb, the socket of which can be screwed behind the dashboard out of the way. A suitable bulb must be inserted to reduce the voltage and pass the required amount of current for correct charging.

Charging at Home

In my case, as my lighting equipment is a 12-volt, and I use a 2-volt wireless battery needing a charging rate of 3 amps, I use a 12-volt 36-watt bulb. If the sockets are not marked, in order to find out which is positive the plug can be inserted both ways, and the brilliancy of the light from the resistance bulb noticed.

One way round it will be carrying a voltage of 14, or the car battery and wireless battery voltages added, and the other way round a voltage of 10, or one voltage deducted from the other. The lower voltage is, of course, required. When that is found the sockets can be marked, and the plug always inserted the same way.

When standing in the garage, an adaptor and long flex can be fitted into the bulb socket and the light used as a garage light. This ensures the batteries always being correctly charged, and saves the possibility of damage which may easily be done by careless people at the charging station.

Yours faithfully,

Cambridgeshire. A. E. LEE.

On The Broads

SIR,—Allow me to congratulate you on the results of your "Roadside" Four.

5 G B comes in at excellent volume in the daytime. I have made one or two alterations as follow:

Lissen L.F. transformer in second L.F. stage; and Amplion "Dragonfly" loud speaker in place of Amplion cone assembly A.C.13.

In use on the Norfolk Broads one could scarcely credit the performance it gave.

Thanking you, and wishing you every success.

Yours faithfully,

Lowestoft

S. RUSSELL.



The LURE OF THE MOVING COIL

By the
EDITOR



IT is over three years since I presented my credentials at the Research Laboratories of The General Electric Co., in Schenectady, for the purpose of examining the control room, transmitting apparatus, and the studios and research laboratories of W G Y and 2 X A F.

"I would like you to hear our new loud speaker," remarked my guide, pointing to a square box standing in one corner of a small studio. "We think it is the best yet!"

Immediately adjacent to this room, and separated from it by a sound-proof glass partition, was a larger studio, photographs of which have appeared on many occasions in this and other journals. Taking me into the larger studio the studio manager sent for an accompanist, who forthwith sat down at a grand piano and played a rather intricate, and certainly very charming, tune, which had probably been chosen for its wide range of tone.

The First Experience

"Listen carefully," said the manager, "and then come and listen to the same tune on the Rice-Kellogg loud speaker."

We returned to the first and smaller studio, and shut the door. Connections were made so that a condenser microphone in the main studio picked up the sound-waves and passed them to the station amplifiers. Instead of being put "on the air," the signals were led to the Rice-Kellogg loud speaker and the strength

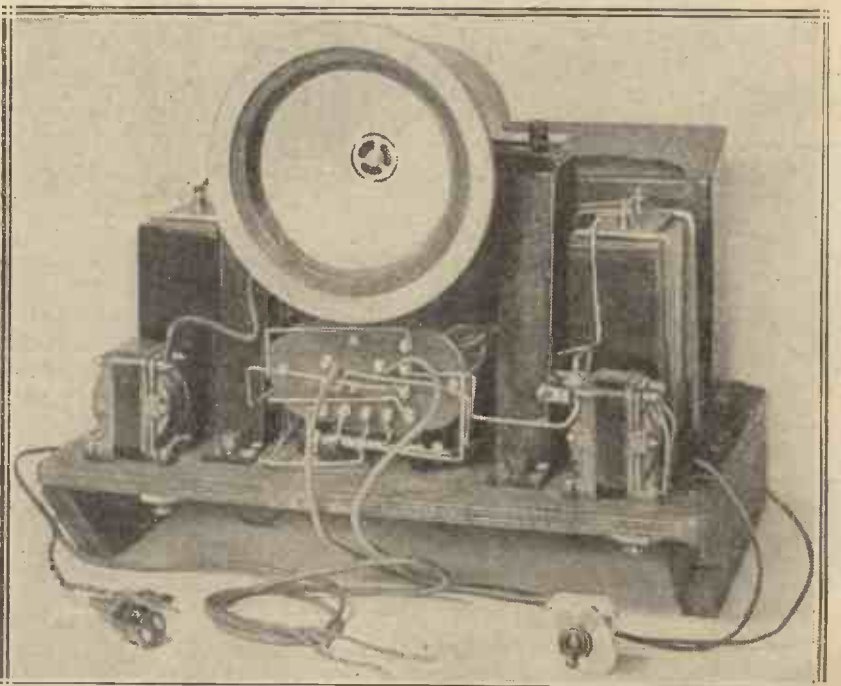
The moving-coil speaker, which is capable of uncannily realistic reproduction, is now within the reach of many amateurs. In this article Mr. Harris deals with these instruments in his usual practical and very interesting manner.

adjusted so that the reproduction from the speaker was about equal to the original strength from the piano direct.

Weird and Uncanny

To say that I was startled would be greatly to underestimate the effect

produced. It was weird and uncanny in its naturalness. Up to that time by far the best loud-speaker reproduction I had heard emanated from the Western Electric Kone loud speakers, used in conjunction with the Western Electric public address system in the Hotel Pennsylvania, New York. These cone loud speakers distributed the music through the hotel from a band playing in one of the dining-rooms. Hearing these had



This is a front view of the Rice-Kellogg loud speaker manufactured by the B.T.-H. Co. The instrument includes a power amplifier and complete H.T., L.T., and grid bias from the mains

The Lure of the Moving Coil—*continued*

given me a shock, for their reproduction was greatly superior to anything I had heard up to that time in England. Nevertheless, I was totally unprepared for the big advance given by the Rice-Kellogg at W G Y.

After the piano test one of the engineers went into the main studio and read about half a page of a magazine. Through the glass door I could see his lips moving, while his voice was coming from the Rice-Kellogg loud speaker.

Perfect Realism

It was difficult to realise that nothing whatever was coming directly from him. A minute or two later he stopped, came through the door, and repeated the same passage "in person." It was quite impossible to distinguish the difference.

In the afternoon I visited the various research laboratories which are distributed throughout large buildings. The policy of the General Electric Company is to engage a large number of brilliant scientists—mostly

young men—and to equip them with everything they need for first-class research work, leaving them to work out their ideas without being worried every few minutes to see whether they have produced a commercial invention.

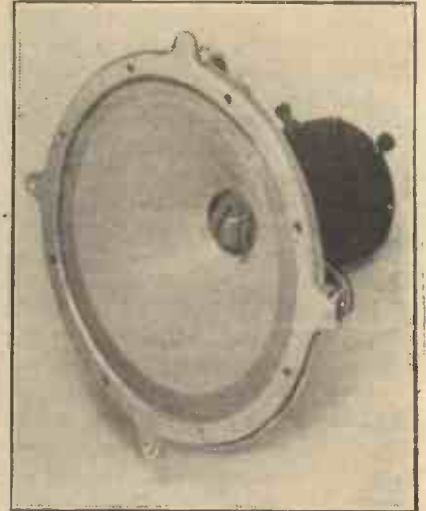
The Inventors

The idea is an expensive one, but I am sure it pays. Sometimes these men seem to work for a year or two without apparently producing anything of value, but at last comes some important invention which proves to be exceedingly profitable to the company.

In the late afternoon I was taken into the laboratory of Mr. Rice and Mr. Kellogg, who had worked together so successfully in evolving the new loud speaker. Around the laboratory were specimens of almost every known loud speaker, and switches by which they could be rapidly compared. There was also an audio-frequency oscillator capable of giving a pure note which could be varied from the

lowest to the highest in the audible range.

I learned a great deal about loud speakers that afternoon, and many of my illusions were shattered. I realised for the first time how hopelessly inadequate was the reproduction of the low notes by the then existing loud speakers, and how those



The "Sylphone" moving-coil speaker unit which possesses several novel features.

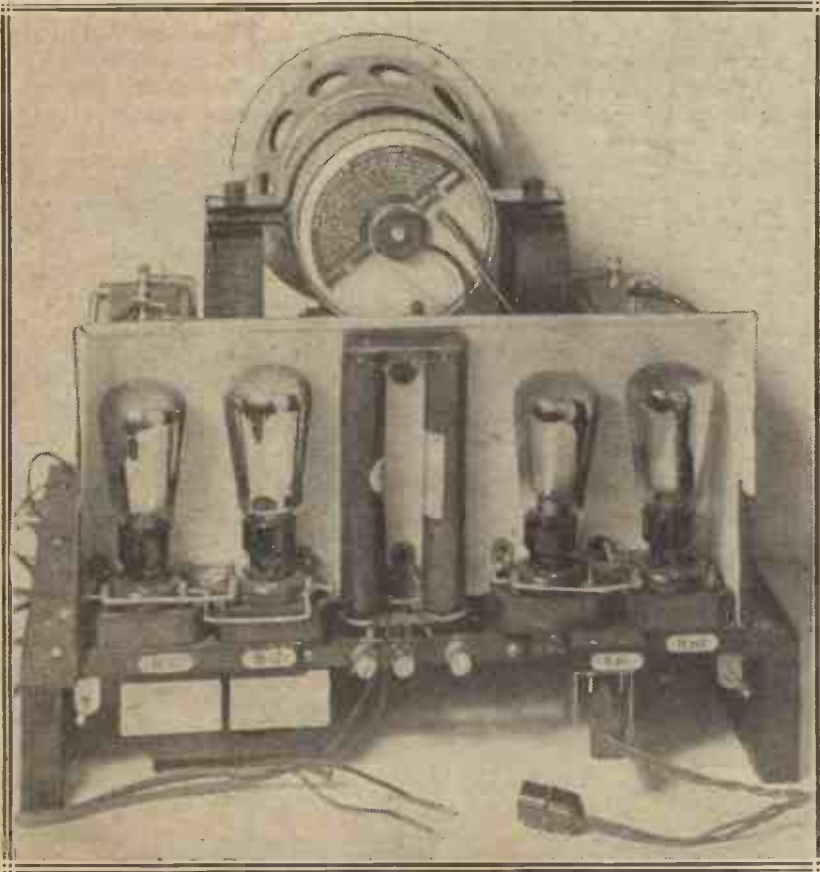
which seemed to reproduce the lower tones gave them very unfaithfully.

I also realised how the repression or accentuation of the harmonics of a note can completely alter its character. One experiment which Mr. Kellogg showed me brought this out very clearly.

An Interesting Test

Suspended from a piece of board were a number of very large glass bottles, the mouths of the bottles projecting through the board. Water at various depths had been poured in these bottles, and a kind of xylophone rod placed over each so that when the rods were struck one obtained a musical note which resonated in the bottle, giving rather a pleasing and rich musical effect, this being largely due to the number of harmonics of the fundamental note.

Mr. Kellogg then played a few simple tunes on the scale so that I could accustom my ear to the true reproduction, and then went into another room and played the same little tunes before a microphone so that the output could be fed into any of the loud speakers in the laboratory where I was listening. I now had



Another view of the B.T.H. Rice-Kellogg instrument showing the power amplifier and rectifying valves.

The Lure of the Moving Coil—*continued*

another shock—in fact, I was becoming accustomed to shocks on that memorable day—for the sound which emerged from the various loud speakers did not in a single instance even remotely resemble the tones I had heard directly from the instrument.

Other Types Fail

In many cases the change from one loud speaker to another produced an entirely different set of sounds, only recognisable as coming from the same source by the continuation of the air. Mr. Rice now switched the output of the microphone over to the Rice-Kellogg speaker, and immediately the reproduction was faithful to the original.

I was then shown how important was the influence of the baffle board, for without this board reproduction was thin and poor, and not greatly superior to that given by the best of the other loud speakers. While the tune was being played the baffle board was gradually brought closer and closer to the cone, and as soon as it became within an inch of it low tones began to be produced which had been inaudible before.

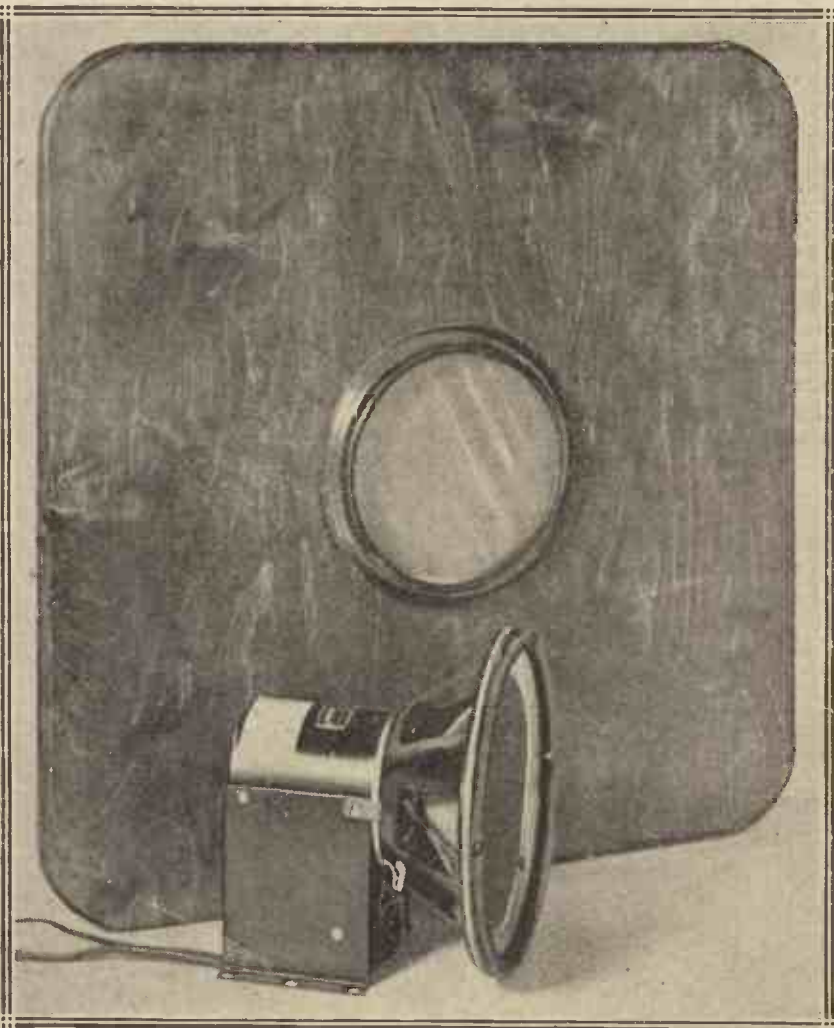
All this happened three years ago, and I suppose I was one of the very first—if not actually *the* first—Englishman to hear this now famous loud speaker. I described it on my return, and within the last twelve months a large number of moving-coil speakers based on the same general principles have been produced and kits placed on sale, so that this high-quality reproduction is becoming more and more available to the man-in-the-street.

"Now On Sale"

The official Rice-Kellogg loud speaker has been on sale in England for some time by the British Thomson-Houston Company, but its price—or, rather, the price of the outfit as sold—placed it beyond the reach of the ordinary man until a few weeks ago. I have heard many grumble at the high price charged by the B.T.H. Co. for this loud speaker, but it should be remembered that it included not only the loud speaker, but a high-grade amplifier, together with means of obtaining from the mains not only the large value of high-tension current necessary, but also the low-tension current

for lighting the filaments of the amplifier valves. The complete outfit contains a transformer, two rectifying valves, means of obtaining a large value of grid bias, two amplifying valves, input and output transformers, a complete smoothing system with chokes and condensers, a large electro-magnet energised by a current obtained from the rectifying and

been careful not to mislead its readers into thinking that a moving-coil speaker without adequate amplifying devices will give satisfactory reproduction on an ordinary set. A moving-coil speaker without the amplifier can now be obtained at a reasonable price, the B.T.H. and Magnavox moving-coil speakers selling without their special amplifying equip-



A Magnavox unit together with a suitable baffle board. A baffle board is essential if the speaker is to operate with realism and efficiently project low notes.

smoothing device, and the speaker itself. Such a complete outfit, when attached to an ordinary receiver capable of giving medium loud-speaker strength, will immediately give a most wonderfully natural reproduction at a strength greater than is necessary for an ordinary living-room. It can, of course, be toned down to what one requires.

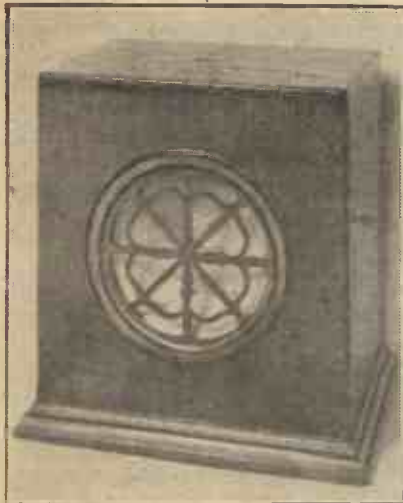
The WIRELESS CONSTRUCTOR, knowing the real facts of the case, has

ment at about £9 10s., while the home-constructor can build it for himself from kits of parts sold by many manufacturers a really excellent instrument at a much lower cost than this.

Average Conditions

Granted, however, that the reader has obtained a moving-coil speaker—either one of the makes named, or made up from a kit—what kind of

The Lure of the Moving Coil—continued



The "Camco" moving-coil speaker cabinet which gives an effect equivalent to a large baffle.

results is he going to obtain if he connects it to, say, an ordinary set consisting of a detector and a couple of note-magnifying valves? If he has a good moving-coil speaker, he will obtain results which in strength are generally inferior to those given by the horn or cone types, and in quality will be a little superior to those given by the ordinary types of cone. If he has not heard a good modern cone, he will perhaps be delighted; but if he is acquainted with the ordinary types of good

speaker, he will probably wonder whether the trouble he has taken is worth while!

It is not generally realised that the lower one descends in the musical scale, the greater amount of power is required to reproduce good notes on the loud speaker. No loud speaker can give a better reproduction than the set itself is capable of giving, and it can be taken as definite that an ordinary receiver, even with a super-power valve in its output, using 120 or 150 volts on the plate and proper grid bias, cannot properly reproduce the low notes which are in the transmission (and which a good moving-coil speaker is capable of reproducing) without reaching the blasting point.

Milliammeter Test

To give proper reproduction, free from distortion, the milliammeter in the plate circuit of the output valve should be perfectly steady all the time. You may imagine you are not getting distortion on your present outfit, but once you have heard proper, undistorted reproduction, you will never have any further illusions on the subject.

Because the ordinary set, using ordinary output arrangements, will not do justice to a good modern moving-coil speaker, many people

who have obtained such speakers, or built them up from kits, have been greatly disappointed.

Avoid Overloading

How, then, can we get that natural reproduction which should be



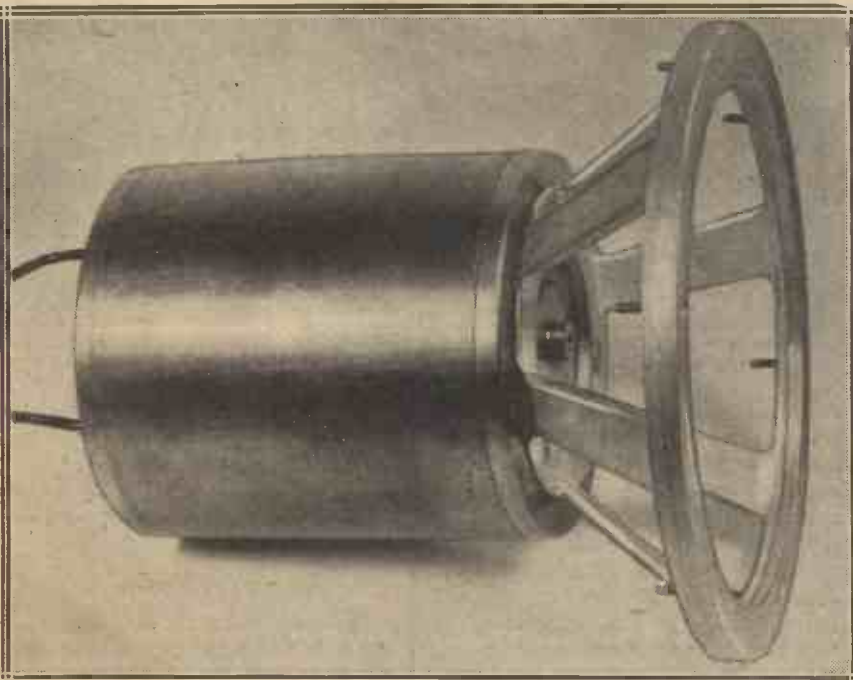
Another view of the "Sylphone" speaker showing the ventilation provided at the back of the instrument for cooling the "pot."

our reward for the work we do? Simply by seeing first of all that our loud speaker gives faithful reproduction by using high-grade transformers and/or resistance coupling, and, secondly, by seeing that our output valve or valves can handle the undistorted energy necessary for the proper reproduction.

With a single output valve, about 350 volts on the plate of such a valve as the L.S.5A., and something in the neighbourhood of 80 to 100 volts grid bias, is used by many experimenters who are only just getting what they want. High voltages are rather dangerous in unskilled hands, and, personally, after many experiments, I have found that for ordinary use a push-pull outfit with 150 volts on the plate of a pair of super-power valves will really do justice to a good modern moving-coil speaker and give delightfully natural reproduction.

A Suitable Amplifier

A suitable amplifier has already been described in these pages ("Super-Quality with any Set," March, 1928, issue), and for those readers who already have a set which they know gives good quality, but not quite sufficient output, the push-pull amplifier described in the last issue will



This is the field "pot" and frame of a moving-coil speaker unit. The moving coil and diaphragm have been removed.

(Continued on page 351.)



The B.B.C. and the Government

Some interesting points upon the paradox of monopoly.

By A Special Correspondent

WE have a way of doing things in this country which, to foreigners, is very often a matter of envy and admiration. This peculiarity of British psychology has, on more than one occasion, enhanced the glory of the British Empire, and from it we get such phrases as: "The Nelson Touch," "Britain Gives Her Best," "Britain Leads the Way," or, perhaps, best of all, "Britons Never Shall Be Slaves."

But when we consider the broadcasting debate in the House of Commons the other evening we can realise that this particular peculiarity of the British people, of which, on many past occasions, we have been so proud, can at times not only be annoying but ridiculous. The debate in the House of Commons was an excellent example of what might be called "The Post Office Touch," and it is just as well, when one comes to consider it, that debates in the House of Commons are not broadcast.

Smug Statements

The objection hitherto has been that it is desirable to maintain public respect for Parliament, but if that debate in the House the other evening were broadcast, and if listeners could have heard the Postmaster-General, Sir William Mitchell-Thomson, suavely declare that broadcasting in this country had been established on a foundation that was the envy of other countries, and if, in conjunction with this statement, listeners have reviewed the present position of broadcasting and the attitude of the Government towards it, we venture to say the public respect for Parliament would have dropped very considerably.

Up to a point, the Postmaster-General was right in saying that foreigners envy us our broadcasting system. What they envy is the

organisation and the mechanical perfection of our system. And no doubt other governments envy us because they see with covetous eyes the nice fat yearly sums appropriated by the Post Office from the revenue taken from listeners in the form of 10s. licence fees.

P.M.G. Not Interested

But it is certain that foreigners do not envy us when it comes to the point of programmes, the control exercised over them, and the attitude of the Government towards an organisation which has been granted a Royal Charter, and which is virtually a Government monopoly.

Although the Postmaster-General is the supreme arbiter of the B.B.C., it was peculiarly demonstrated at the House the other evening that he

doesn't interest himself to the slightest degree in the needs of those people who, by contributing 10s. every year, help to maintain the B.B.C. and, incidentally, provide the Post Office with very large sums of money. Parliament, in fact, seems to disclaim any responsibility now that the B.B.C. has been formed as a Corporation, and beyond attempting to ban controversial broadcasts—a ban which a member of the Government himself termed "ridiculous," and which eventually had to be lifted—the Government does not seem to be interested at all in listeners or their complaints.

A Peculiar Situation

So we have the peculiar situation of a Government department, constituted in a different manner from most other Government departments,



A party on board Senatore Marconi's yacht, the "Elettra." The vessel is equipped as a floating laboratory. Many of the experiments with the "Beam" system—since taken over by the Government—were conducted on board.

The B.B.C. and the Government—*continued*

but at the same time a department over which the Government does not seem inclined to waste any time in seeing that it is run efficiently, or to the satisfaction of those people who make that Government department possible. There is, consequently, no reliable channel through which the listener can voice his complaints or enforce his rights. The B.B.C., being a Government department, can only be tackled through parliamentary channels, and if we have complaints to make, beyond ventilating them in the newspapers, there is no other way of enforcing the justice of those complaints except through the medium of the Postmaster-General.

A Different Reception!

And the Postmaster-General does not seem to be inclined to concern himself with those complaints; in fact, he suggests that it is none of his business! The situation is indeed paradoxical. Whether the criticisms against the B.B.C., which found no uncertain voice in the Press the other day, have been justified or not is beside the point.

Criticisms against the police, made a few weeks ago, had a very different reception. An investigatory committee was set up at once to deal with the matter against the police, and this was thoroughly gone into—and the process is still going on. But there is no suggestion that the allegations against the B.B.C. should be investigated by an investigatory committee. We can only assume that the Postmaster-General does not think the matter sufficiently important, but it is inevitable that the tide of public opinion will, sooner or later, force the P.M.G. to reconsider his attitude.

Dictator of Broadcasting

The public is now beginning to realise that in theory the Postmaster-General is more or less the dictator of broadcasting. It is he alone who controls, in the final sense, the character of the programmes, and, as the "Evening Standard" pointed out the other evening, if a Puritan Postmaster-General were suddenly to take it into his head to forbid the broadcasting of dance music there would be nothing to stop him. The point is, would it then be considered, and maintained, that he was not responsible to Parliament for this arbitrary decision?

It is perfectly legitimate to point

out that the listener only pays a fraction of a penny per day for his programmes, and that he should be thankful if he gets only a few minutes' entertainment for such a small sum of money. But that is not really the point; if we are going to consider the relative value of programmes per head of the population, then the B.B.C. loses entirely that spirit of public utility service which, in the old days, was such an outstanding mark of its progress and national character.

The point is that the Government,

LONDON (BRIDGE) CALLING



Fitting one of the large loud speakers on London Bridge Station to be used for crowd control during the rush hours.

having decided to establish a broadcasting monopoly over which it has given itself supreme control, now proceeds to wash its hands of that monopoly and to allow its Postmaster-General to disclaim any responsibility for its conduct in the House of Commons; that is, its conduct as regards its service as an entertainment medium for the public.

The Liberal Member for Devonport, in the House of Commons the other evening, declared that the B.B.C. had dismally failed: "Simply to take a collection of ex-politicians,

ex-schoolmasters, and any citizen who had nothing to do, but was willing to render service in return for a salary, and put them in charge of a new invention full of great possibilities was wrecking the invention from its inception."

B.B.C. Programme Makers

That criticism was a bit far-fetched, but nevertheless there was a considerable amount of truth in it. Although the appointment of the Governors of the B.B.C. was made by the Government, there seems to be no Parliamentary discretion exercised with regard to the appointment of those members of the staff of the B.B.C. who have the very important task of deciding upon programmes, and it is not to be expected that a collection of amateurs in this important department will have the necessary psychology which will enable them to satisfy more successfully than hitherto the needs of listeners.

That the people at the B.B.C. are sincere no one will doubt, but whether they are the best people is another matter. Few of them have any experience at all in catering for the public as regards entertainment; they are, in fact, inclined to be a little too highbrow. They lack the common touch.

A Suggestion

The only real remedy for this state of affairs would be to take a plebiscite of listeners. It would be an expensive and perhaps tedious business, but it would give the B.B.C. facts and figures which would offer a very sound and justifiable answer to any policy they adopted as a result of this plebiscite. We feel certain of one thing: that if this plebiscite were taken it would indicate that in the opinion of listeners the B.B.C. organisation is first-class, its technical transmissions, etc., equally so, but its programmes inclined to be dull and lacking in that spontaneity and entertainment touch which is so essential if a large and widely scattered audience is to be more or less satisfied.

That they will be satisfied completely is too much to hope. In fact, it is impossible. But if the majority of listeners in this country could say "Yes, we are more or less satisfied," that would be something the B.B.C. might be proud of.



BUILDING the HARRIS "STEDIPOWER" H.T. UNIT

Following on the phenomenal success of the "Stedipower" L.T. Unit, Mr. Harris has designed a special H.T. battery eliminator to operate in conjunction with the L.T. unit. Full details for the construction of this H.T. power unit are given below.

By PERCY W. HARRIS, M.I.R.E.

IN the June, 1928, issue I described the construction of a powerful mains unit capable of delivering up to 100 milliamperes, if desired, at a high voltage—for a really powerful

LIST OF COMPONENTS

(Note.—Names in brackets indicate parts used in set illustrated. Other names are approved alternatives.)

- 1 Ebonite panel, $\frac{1}{8}$ or $\frac{1}{4}$ in. thick, measuring 7 × 7 in. (Any good make).
 - 1 High-resistance voltmeter for mains unit (Sifam), Ferranti, Weston.
 - 4 Sockets (Clix), Eelex, etc.
 - 1 Plug for same with length of flexible rubber-covered wire (Clix), Eelex, etc.
 - 2 Potentiometers, type T.100 (Tru-volt).
 - 4 Indicating terminals, H.T.—, H.T.1, H.T.2, H.T.3 (Belling-Lee), Igranic, Eelex, etc.
 - 2 Mains unit high-voltage test condensers of 2 mfd. each (Dubilier), T.C.C., Hydra, etc.
 - 1 Mains unit high-voltage test condensers of 8 mfd. (Dubilier), T.C.C., Hydra, etc.
 - 2 2-mfd. Mansbridge type condensers, receiver pattern (Lissen), T.C.C., Dubilier, Mullard, Hydra, etc.
 - 2 Eliminator chokes (Ferranti B.1.), R.I.-Varley, Pye, etc.
 - 1 Sprung valve holder (Benjamin), Lotus, Magnum, Pye, Igranic, etc.
 - 1 Mains transformer for U.5 valve (Ward and Goldstone). Note.—There are a number of excellent mains transformers made for this valve, but they will not all fit into the space available here. If an alternative make is chosen, care should be taken to see that it will fit into the space, as the unit is specially compact.
 - 1 Cabinet with perforated metal-top as described last month for the "Stedipower" L.T. Unit, or special cabinet by "Cameo."
 - 1 U.5 rectifying valve (Marconi, or Osram).
- Length of flexible wire and plug.

super-valve in the output stage of their set, and with accurately controllable voltage tapplings.

The "Stedipower" H.T. Unit described in the present article has been designed to fulfil their needs, at the same time matching the "Stedipower" L.T. Unit in shape and size, and possessing certain valuable advantages not hitherto made available to the home-constructor.

Plenty of Current

Readers who have carefully studied the series of articles on mains units which has already appeared in the journal will by now clearly understand the principles upon which all such units are worked out. In the present case we have a step-down transformer from the mains, supplying both filament current and high voltage to a single full-wave rectifying valve, the "U.5."

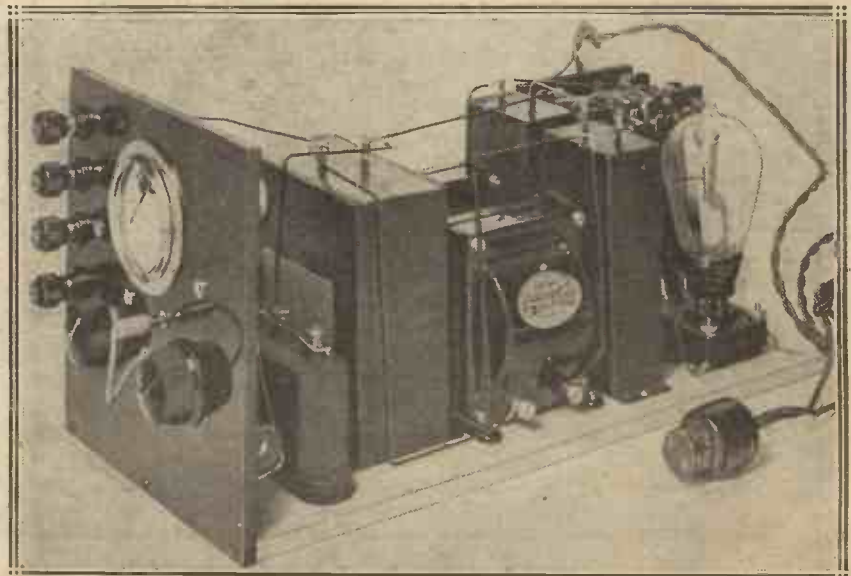
This valve works with five volts on the filament and is capable of taking up to 400 volts on the plate, although

we do not need to approach this figure in the present unit. The transformer is designed to give 200 volts on each side of the centre tapping, and therefore 200 volts to each plate.

There is a certain voltage drop in the valve and in the smoothing unit, and the output is therefore about 180 volts maximum. The set will give, without overloading, a good fifty milliamperes of completely rectified and smoothed current.

The smoothing system I have adopted is that which long experiment has shown me to be the most generally satisfactory, namely, a network of two 2-mfd. condensers, two chokes and an 8-mfd. condenser at the output end, with two 2-mfd. condensers across the lower tapplings. Both condensers and chokes are of high quality, and the method of voltage control, which will be explained in a moment, is one of the few which gives really accurate control of output voltage.

I may say that, so far as the smoothing is concerned, when this set is used



A general view of the Harris H.T. "Stedipower" Unit described in this article.

set. This unit met a distinct need, but larger numbers of readers desire to build a unit of somewhat smaller size yet still powerful enough to give an adequate current supply for a

Building the Harris "Stedipower" H.T. Unit—continued

to supply a receiver consisting of an anode-bend detector, one resistance-coupled note-magnifying stage and a transformer-coupled push-pull output, driving a high-grade moving-coil loud speaker, there is not the slightest hum audible when listening close up to the speaker. In such circumstances a well-known and expensive mains unit gives a hum which is clearly detectable.

Three H.T. Plus

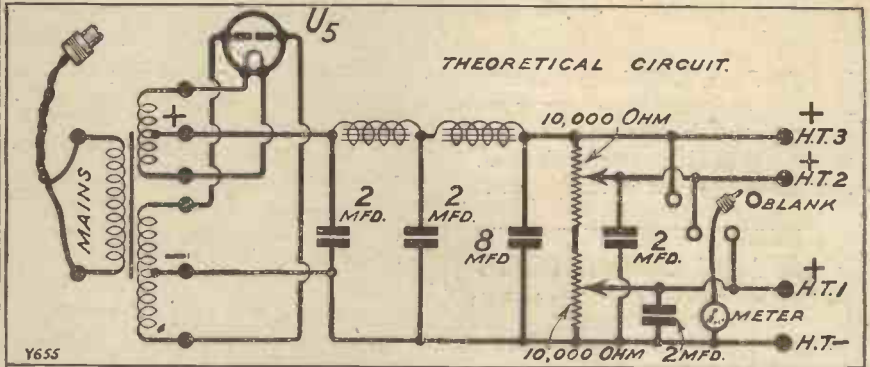
The front panel carries four output terminals (H.T. negative and three H.T. positives), two knobs for controlling the voltage on H.T. positive 1 and 2 respectively, four sockets with a wander plug, and a specially designed voltmeter made for use on high-tension units. Of the four sockets, one is blank and is used to prevent the wander plug hanging loose when one does not desire to take voltage readings.

The three other sockets give accurate readings of the actual output voltage on H.T. positive 3, 2, and 1 respectively, while the voltages on H.T. positive 2 and 1 can be controlled very finely by turning one or

other of the knobs and watching the meter. This control is particularly important when supplying a screened-grid-valve set, where we want to know exactly what voltage we are applying to the screening grid.

A variation of ten volts on either side of the correct figure will easily upset the working of such a receiver,

series resistances or by a potentiometer effect. Personally, I prefer the potentiometer arrangement, as if by any chance there should be a break in the high-tension lead from the unit to the set the full rectifier voltage, plus surge voltage, is not suddenly thrown upon the condensers, with a consequent risk of



and it is the greatest advantage to be able to set this tapping to exactly what is wanted. And now a word about the method of voltage control.

As I have previously explained in the "mains" articles, we can control the voltage on the output either by

breakdown. With the potentiometer scheme there is a continual load on the rectifier which considerably steadies the general working and adds to the safety of the unit.

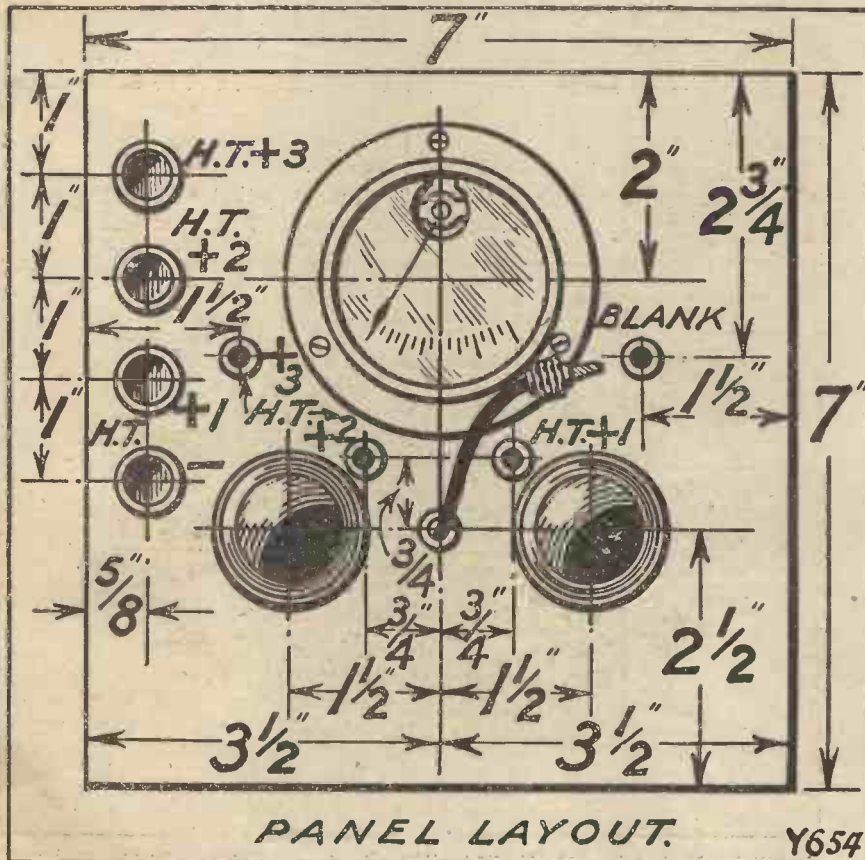
In the "Powerful Mains Unit" already described I used a potentiometer scheme consisting of a 20,000-ohm resistance with a number of tapings on it. I have found 20,000 to be a very suitable value in such cases, this figure being neither too high nor too low.

The Potentiometer

In the present instance I have used two 10,000-ohm potentiometers, of special construction, in series, the slider of one being joined to the terminal H.T. positive 2, and the slider of the other to H.T. positive 1. H.T. positive 2 can run from half the total voltage up to the maximum, while H.T. positive 1 can run from half the maximum voltage down to zero, so that it is very easy to get a very low detector voltage if required, and a high intermediate voltage—a matter which is not too easy with some designs.

Considerable interest attaches to the particular form of potentiometer chosen for this set. The method of construction by the manufacturers is as follows.

First of all, an enamel copper wire is taken and this is covered with asbestos. Next around this asbestos-covered enamelled wire is wound the actual nichrome resistance wire, used



Building the Harris "Stedipower" H.T. Unit—continued

much as one might wind string around a lead pencil. The result is a great length of bare resistance wire wound on a length of asbestos-covered wire.

The resistance unit is then formed



The panel holds the voltmeter and the variable tapings for the H.T. unit. The voltage of either the three H.T. + feeds can thus be seen at a glance.

by winding the wire so made up spirally on a grooved former of heat-resisting insulating material, so as to form a coil. This finished coil is then mounted on a suitable framework with a slider, which can run from one end of the grooved former to the other, making contact at each turn with the bare resistance wire.

The advantage of this scheme is that the contact is as firm and definite as in the ordinary form of wire-wound potentiometer, while the resistance wire is exposed to the air, which is helpful in dissipating the heat generated. The unit is known as the Truvolt and is obtainable in all types of resistance values to suit particular requirements. As mentioned, in the present case two of 10,000 ohms each are used.

Suitable Meters

The meter, which reads up to 220 volts maximum, has a resistance of 1,000 ohms per volt, and therefore in itself takes very little current even on the maximum tapping. It is essential that a very high-resistance voltmeter be used here as the ordinary types of voltmeter take so much current that the voltage with the voltmeter connected is quite different from that without it. The three types of high-resistance voltmeters named in the list of components are all thoroughly reliable and can be recommended.

This unit has *not* been fitted with an on-and-off switch, as many readers

find it convenient to do their switching from the particular lamp socket used, while if this unit is used in conjunction with the "Stedipower" L.T. Unit the switch on the L.T. unit can be made to operate this set as well, simply by joining the leads which go to the mains side of the transformer on the "Stedipower" L.T. Unit.

Your first step should be to prepare and drill the front panel and to mount upon it the various components as shown. There are several ways of cutting the large hole for the meter, but personally I prefer to scratch a circle slightly larger than the size of the meter, to drill one or two holes near the edge of this, and then to saw out the piece with a fretsaw.

Mounting Components

Those who do not possess a fretsaw can drill a large number of holes round the edge of the circle until the centre drops out. The hole can then be smoothed off with a file.

If you adopt this method be careful that you do not make the hole too large, or the holes in the flange of the meter cannot be used to secure the meter to the panel. The voltage-control potentiometers are single-hole mounting and present no difficulty.

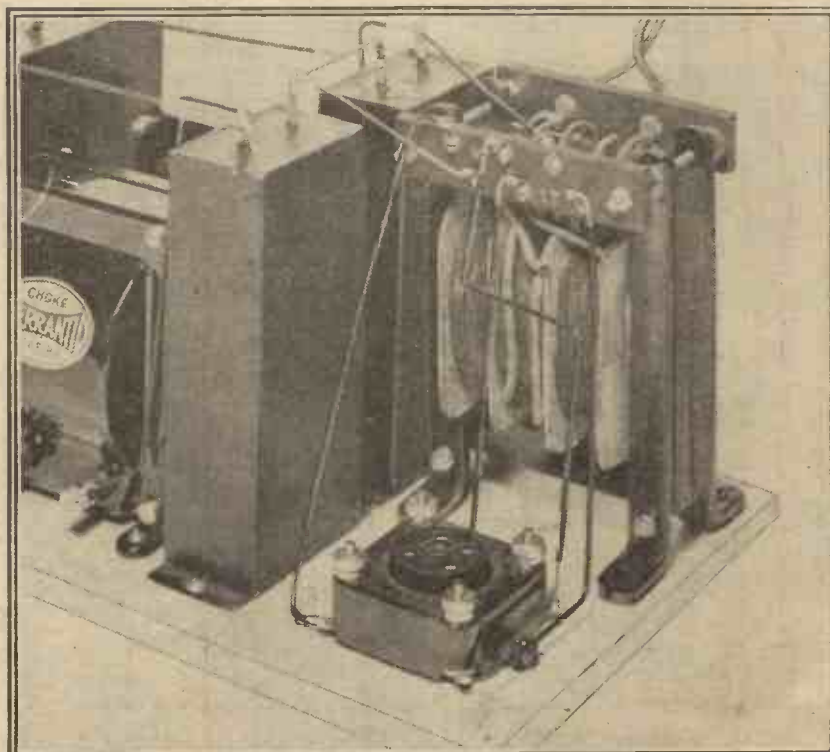
When you have finished the front panel, attach it temporarily with a couple of screws to the front edge of the baseboard, and lay out your other components. The arrangement is compact and symmetrical, not only for appearance but for convenience of wiring.

The Rectifying Valve

Fit your valve temporarily in the valve holder before deciding on the position of this latter in case the valve should foul the transformer. If care is taken it will be found that there is adequate room for each part without undue cramping.

When purchasing your rectifying valve be sure you obtain the correct type, namely, the Marconi or Osram U.5. There are other makes of rectifying valves excellent in themselves, but which have not quite the same characteristics.

For example, another make of full-wave rectifying valve has a 4-volt filament, and as the particular transformer used here is designed to give five volts on the filament of the U.5, obviously using it for the 4-volt valve would result in seriously over-running with consequent short life.



The input transformer and the valve holder for the U.5 valve. Note how compactly the unit is arranged.

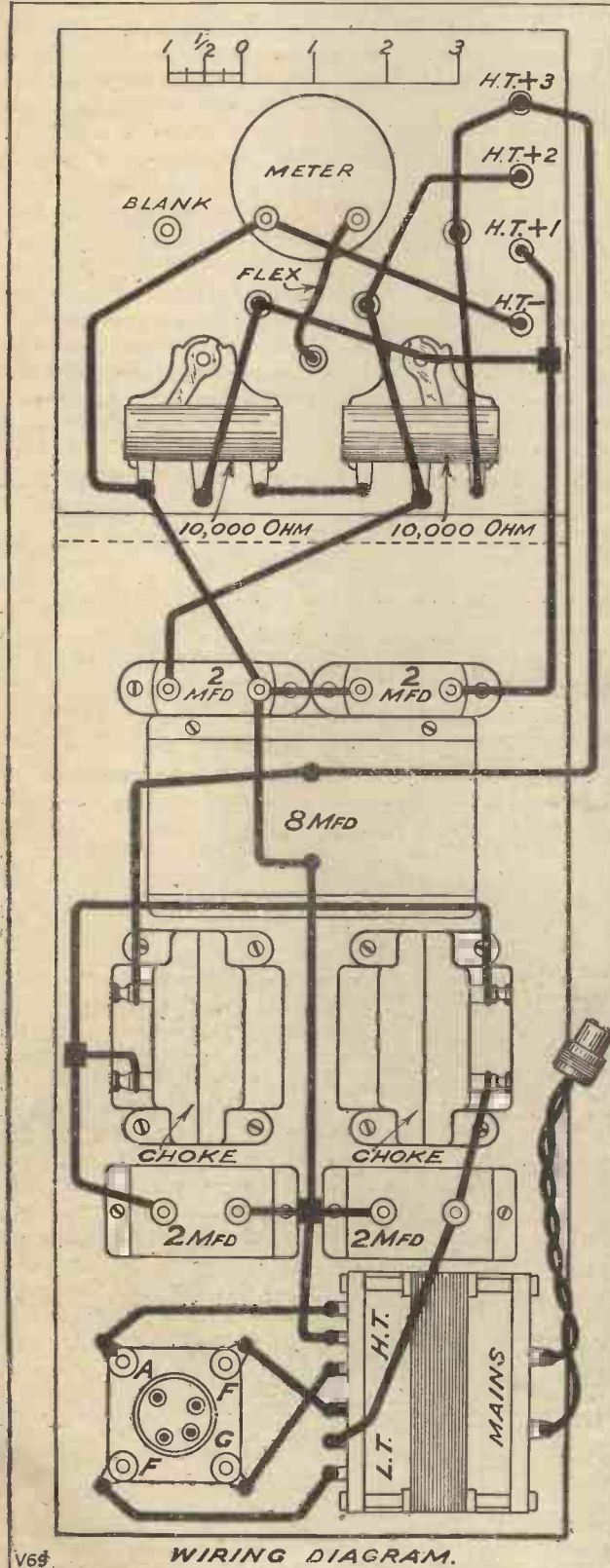
Building the Harris "Stedipower" H.T. Unit—continued

When everything has been joined up, place the Clix plug in the socket nearest to the terminals, and without

attaching anything to the terminals place the valve in its socket and insert the plug into the nearest lamp socket.

The valve should immediately light up, and you should get a high reading on the voltmeter representing the maximum voltage of the unit when there is no load upon it.

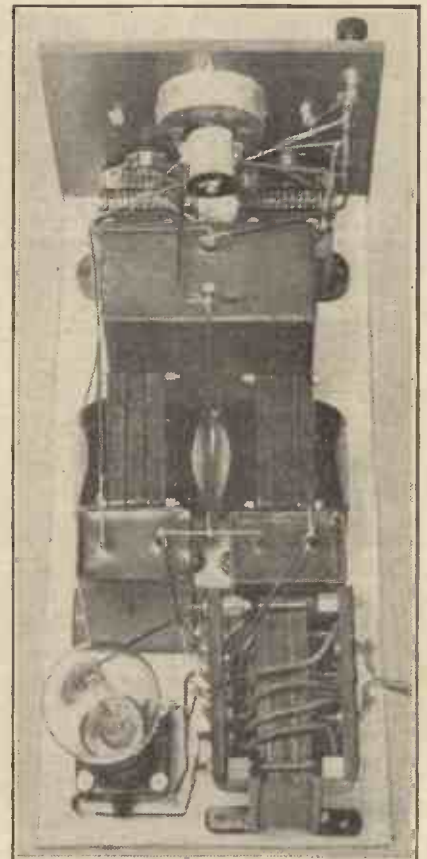
Be careful to switch off when changing the position of this plug, as if you touch any metal portion you will get a shock. Switch off for a moment and change the plug to the second socket from the left (that immediately adjacent to the left-hand knob).



COMPARE THIS DIAGRAM WITH THE PHOTO ON THE RIGHT.

It is useful when wiring up any wireless set or eliminator to have in addition to the wiring diagram a photograph of the interior of the set taken from approximately the same angle as is the diagram—in other words, a plan view. The photograph on the right shows the "works" of the Harris "Stedipower" H.T. Unit, and when used in conjunction with the wiring diagram, makes the positioning of the components and the subsequent wiring up an extremely simple matter.

CHECK YOUR WIRING CAREFULLY BEFORE USING THE UNIT.



Now turn this knob backwards and forwards and you will find you can vary the voltage from the maximum already shown to half of the maximum voltage. Switch off again and insert the plug in the third socket (that immediately above the right-hand knob).

Here you will find you can vary the voltage from half maximum to zero. The last socket on the right is a blank and is provided for the purpose of holding the plug when you are not taking any voltage reading.

If you find that you get the readings correctly on the three sockets and the voltage controls are working properly,

Building the Harris "Stedipower" H.T. Unit—continued

you are now ready to connect the unit to your set. Before you do this, however, make sure that so far as your low-frequency valves are concerned you have the correct grid bias for the voltage you are likely to put upon them.

If you are using a super-power valve in the output then 180 volts is the maximum you should place upon this, and at the same time you should be sure you have the correct amount of grid bias otherwise you will injure the valve. If the chart with the valve gives the grid bias for 125 and 150 volts respectively and nothing higher, then add the difference between the grid-bias voltage at 125 and 150 to the grid bias figure given for 150. This, with two or three volts added, will be the correct voltage for 180.

Switching Off

Never connect up the set and switch on the eliminator until you have at least enough grid bias applied to your super-power valve for the voltage you are going to give it, and never in any circumstances vary the grid bias while the H.T. is on, otherwise you may ruin your valve. Always switch off the mains unit before you make any voltage changes of this kind.

H.T. positive 2 will be very useful for resistance-capacity-coupled valves as you will be able to vary this voltage from about 90 upwards, while H.T. positive 1 will suit for either a lower voltage detector or a screen-grid valve. The voltage you get on any one tapping when the set is operating will be less than the voltage reading you obtained in your first experiment with no load on the unit, so that after the set is operating try the voltages again and make slight adjustments if necessary on the two knobs.

The Voltmeter Plug

There is no harm in leaving the voltmeter connected to any socket for quite a length of time if you are doing experimental work, and you can, for example, leave the plug in the maximum all the time as a check on your output voltage. On the other hand, there is no need to use the voltmeter excessively, and therefore when you have adjusted all the voltages as you want them you can insert the plug into the extreme right-hand socket and so cut it out.

The position of the terminals on the "Stedipower" Unit is such that the unit can be stood very conveniently

on the right-hand side of the set with the "Stedipower" L.T. Unit on the left, or both can be placed at some convenient position under the table.

 * "THIRTY-NINE KNOWN" *
 * STATIONS " *

SIR,—I feel I must write to congratulate you on the remarkable results obtained with your Seven-Valve Super-Heterodyne. Ever since the publication of the "P.W." Super-Het., I have been using a super-het. circuit of one sort or another. Until yesterday morning I was using the circuit given in "31 Tested Circuits," when I altered it to a cross between that circuit and that of the WIRELESS CONSTRUCTOR'S seven-valve set, so that now my set consists of oscillator and 1st det., as in your Seven-Valve Super-Het., followed by 3 I.F.A., 2nd det., and 1 L.F.

Valves used: 1st det. and I.F. valves are Mullard P.M.3A.

Oscillator and 2nd det., P.M.4.
 L.F., P.M.3 (which gives better results than P.M.4).

I am convinced that the improvement is due to the most efficient oscillator coupler that I have yet experienced, for that is where I have *always* had trouble of one sort or another.

I tried it out last night (Friday) between 6 p.m. and 2 a.m., and definitely identified 17 European stations (not B.B.C.), 2 Z Y, 5 G B, 6 L V, 5 X X (presumably on harmonic), 2 R N, 2 B E, two American stations, and fourteen amateurs, together with about a dozen whom I did not identify, making a total of thirty-nine known stations and about fourteen others.

Truly yours,
 J. V. O.

Birkenhead.



The whole unit is enclosed in a box with a perforated lid, rendering the outfit completely fault-proof.

Using the Thirty-One Tested Circuits.

In this, the seventh article of a series by the Editor dealing in detail with the "Thirty-One Tested Circuits" Booklet, presented free with the February issue of the "Wireless Constructor," the screened-grid-valve circuits are explained. This series of articles, together with the gift booklet, should be studied by every home constructor, and new readers are advised to obtain the back numbers through their newsagents.

THE Booklet of Thirty-One Tested Circuits contains three circuits with screened-grid valves, marked respectively I1, I2, and I3. I1 and I3 have only one screened-grid valve, while I2 has two. Before discussing the circuits in detail, it would be well to consider a few points regarding the screened-grid valve and the reason why a number of readers have found results with these valves (in any kind of circuit) rather disappointing.

The screened-grid valve used in a proper circuit gives a far greater high-frequency magnification than has been obtainable in the past with any other type of valve. Speaking in general terms and taking the ordinary run of sets, it can be said that one screened-grid-valve high-frequency stage gives results practically equal in sensitivity to those previously obtainable with two high-frequency valves.

Screened Grid Valves

At the same time it makes it possible to dispense with the neutralising methods which have hitherto been necessary in order to obtain stability with sensitivity.

But while the screened-grid valve gives greater magnification it does not give greater selectivity—in fact, one frequently hears it said by those who have tried the valve that screened-grid sets are "very unselective." What is really meant in such circumstances is that comparing two sets, one with a single screened-grid H.F. valve and the other with two ordinary H.F. valves arranged to give the same degree of sensitivity, the results with the two stages of ordinary high-frequency magnification are far superior in selectivity to those obtainable with the one stage with a screened-grid valve. A moment's consideration will show us that this is bound to be the case.

Why They Lack Selectivity

Let us assume for the minute that we are endeavouring to tune-in a station, the signal from which is accompanied by a certain amount of interference from another wavelength. We will assume, for example,

that the strength of the wanted station is four, and that of the unwanted station one (after the signals have been picked up on the set), using

A READER'S RESULT.

Sir,—I have just finished wiring-up one of your 31 tested circuits, given free with that splendid monthly book you are editor of, and I would like you to know the number of stations I have logged after hearing the call-signs.

The set is on page 23 of the booklet, but I have made a few alterations to the circuit. Wired with 16-gauge wire and working off a 34-ft. indoor aerial—water-tap earth (which improves signal strength by 30 per cent), 6-volt accumulator and 128-volt accumulator H.T.

List of stations logged every night for a week:

1,000–2,000 metres, on 4 valves: Hulzen, Norddeich, Radio Paris, Daventry, Motala, Königswusterhausen, Boden, Kalundborg, Hilversum.

Below Hilversum two wireless beacons G.G.M.—

Had a station between Hilversum and Kalundborg, which I take to be Warsaw (no call heard). Interference from both stations. If Warsaw, strength about R3 or R4.

These stations are very good in daylight, but there is an increase in signal strength at night-time, and on these waves the set is very selective, with the exception of Motala and 5 X X.

Medium waves, 250–550 metres (I can get up to about 550 metres with these coils): Budapest, Milan, Munich, Vienna, Brussels, Aberdeen, Berlin, Langenberg, Frankfurt, Glasgow, Hamburg, Toulouse, Stuttgart, Leipzig, 2 L O, Cardiff, Prague, Bournemouth, Breslau and Dublin.

Lyon on 291 metres is a good signal only after dark, also I have had Cologne very good.

I have had most of the B.B.C. Relays and can get, much lower on the condensers, Cologne, but I cannot get 2 L S.

I am very pleased with the results I have had up to now, and I must tell you that reaction has made a big improvement in signal strength—only a little has to be used. The coils, of course, are the B.A.C., B.T.A. and B.A.R.

Most of the foreign stations' C.W. can be heard in the daytime, but no speech or music; this only applies to the 250–550 waves; the long waves are good in the daytime as well as night.

I might mention that I have had to short-circuit the second H.F. choke since putting the reaction in the set, as the set oscillated with the reaction condenser vanes all out.*

Wishing you very best success with your paper, and thanking you.

I remain,

Yours sincerely,
C. C. LOTT.

Liverpool.

* Editor's Note.—This suggests that the minimum value of the reaction condenser is too high. Try a fixed condenser in series—say, .001 mid. Also see notes in this month's "Tested Circuits" article.

only stage of ordinary high-frequency magnification.

We will now assume that on the set using only one stage of screened-grid magnification the strength of the wanted signal is sixteen and that of the unwanted four (the same

proportion). Now let us add another stage of high-frequency to our set with the ordinary high-frequency magnification. This stage gives a further magnification of four, together with a further four-to-one selectivity. What will be the result? We shall have our wanted signal at the strength of sixteen and our unwanted signal only magnified by a quarter of four, namely, one.

Another Important Point

The net result therefore will be that the strength of the wanted signal is sixteen and an unwanted signal of one. Comparing this with the screened-grid set, which has a wanted signal strength of sixteen and an unwanted strength of four, we shall see that the selectivity, or rather the *apparent* selectivity, of the screened-grid set is far lower than that of the set with two stages of ordinary high-frequency. What we have to remember, in justice to the screened-grid valve, is that the more stages of tuning you have the greater the selectivity you obtain.

There is another point in selectivity, however, to which we have so far not referred. In the screened-grid set it is necessary, for reasons already explained in this journal, to have a very high-impedance plate circuit in order to obtain the magnification from the valve. An impedance which will be very satisfactory with an ordinary valve (such as a simply designed high-frequency transformer) will be thoroughly unsuitable for use with a screened-grid valve.

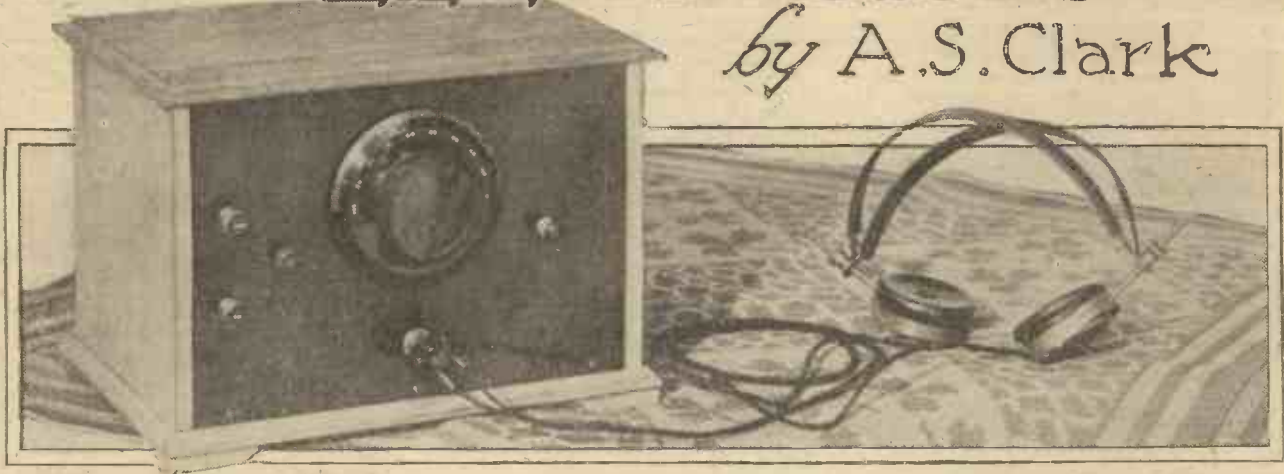
Not Really the Valve

In fact, if we want to get the maximum magnification out of the screened-grid valve it is practically essential to use something in the nature of a tuned-anode circuit, which is known to give a lower selectivity than a properly designed transformer. We should thus remember when considering the screened-grid valve that, owing to our habit of associating high magnification with high selectivity (by reason of the additional circuits needed to obtain high magnification

(Continued on page 350.)

The "SELECTACRYS"

by A.S. Clark



SELLECTIVITY is a necessary quality of a modern crystal set since most crystal users are within the range of at least two broadcasting stations. However, to obtain selectivity in a simple set is not easy without losing a large percentage of volume. An endeavour, which proved quite successful, was made in designing the crystal set described

A highly efficient crystal set suitable for the reception, free from interference, of the alternative programmes. Arrangements are made for loading the set for 5 X X.

which the aerial is joined. Instead of being connected direct, as is the usual practice, the aerial is joined to one of the taps via a variable capacity. This capacity takes the form of a Formodensor, or similar mica-dielectric condenser, and is controlled from the front of the panel.

Variable Taps

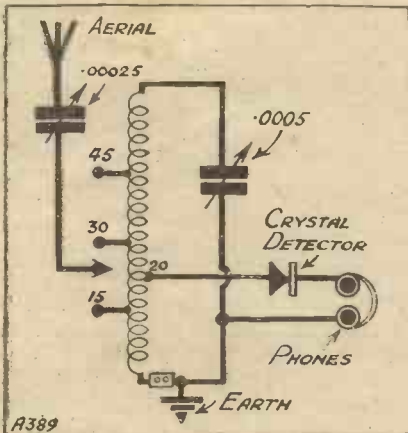
By means of the taps and the variable series condenser any degree of selectivity may be obtained, and it is continuously variable. Thus no unnecessary waste of energy need be made through having the set the slightest bit more selective than is necessary to cut out the unwanted transmission.

Provision for a loading coil is made so that 5 X X may be tuned in if

desired, but, of course, selectivity is not so great on the long waves. This is not a drawback since it is not really required, as there is only one station on the long waves to which the crystal user can listen.

For Long Waves

Reference to the theoretical diagram will show how the loading coil

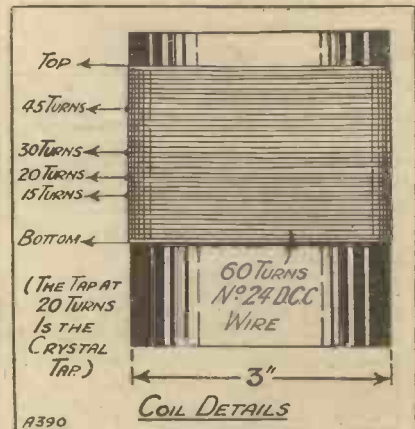


herewith to get selectivity with good signal strength.

Good Selectivity

Recent experiments in the WIRELESS CONSTRUCTOR laboratories have shown that when the crystal and telephones are tapped across one-third of the tuned winding, signals are at an optimum, falling away slightly as the tap is moved in either direction. This scheme was therefore incorporated in the crystal set, and in itself gives fair selectivity since the tuned circuit is not damped much by the resistance of the crystal.

Further selectivity is obtained by means of taps on the tuning coil, to



is connected in circuit. It will be observed that not only does it load up the tuned circuit, but the aerial turns are also increased. This is obviously necessary as the small number of aerial turns required for the lower wave-band would not give sufficient coupling for the longer waves. The net result, however, is that the aerial and earth are shunted across a much larger portion of the tuned winding than is the case with the lower waves. This also applies to the crystal detector, and accounts for the already mentioned point of smaller selectivity.

The set is constructed on an upright ebonite panel, with baseboard in the

COMPONENTS USED

- Panel 10 in. x 7 in.
- Cabinet for above with 7-in. deep baseboard.
- 0005 variable condenser (Lissen).
- 4-in. dial for same (Igranic).
- 00025 Formodensor, panel-mounting type.
- Crystal detector, semi-permanent type (Liberty).
- Single telephone jack and plug for same (Lotus).
- 2 Terminals, marked Aerial and Earth (Belling-Lee).
- Single-coil mount (Lotus).
- 3-in. dia. Pirtoid tube 4 in. long (Atlas).
- Spring clip.
- Quantity of 24 D.C.C. wire.

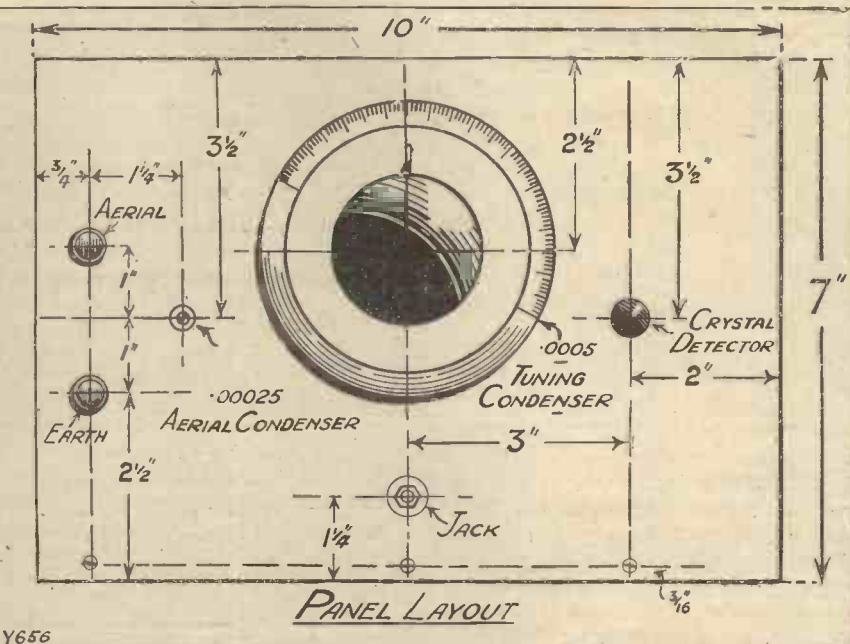
The "Selectacrys"—continued

approved modern style. Only two terminals are employed, as will be observed from the photograph of the front of the panel. The telephones are connected into circuit by means of a plug and jack. This method was chosen since it is an easy matter to remove the telephones when the set is not in use and put them away somewhere where they will be free from dust and will not make the place untidy.

The Tuning Coil

A list of the component parts required for this set will be found on the previous page. The variable aerial condenser used in the original set was a "Formodenser," with a maximum capacity of .00025. A condenser with this maximum value may not be obtainable in other makes, in which case the nearest to it should be chosen. Any makes of good components may, of course, be employed.

The first thing to do in the construction of this set is to make the coil. The diagram of same gives all the necessary details. Four taps have to be made, at 15, 20, 30 and 45 turns.



Y656

The end of the coil should be left fairly long as the wire is connected direct to some other point on the set.

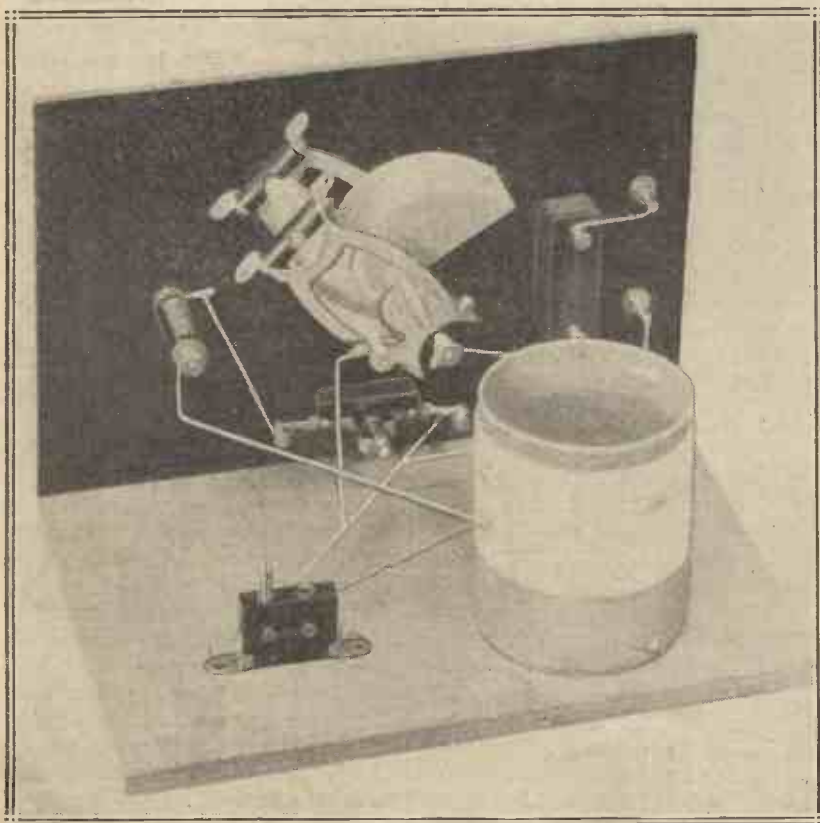
Having constructed the coil and

collected all the components together, they may be prepared for mounting. This consists of soldering on little pieces of wire bent to right angles to the tapings 15, 30 and 45 on the coil, and heavily tinning all soldering tags, terminal shanks and other points to which joints are to be made. This will greatly simplify the actual wiring of the set, and help to keep it clear from brass filings.

Constructional Details

The holes to be drilled are indicated on the drilling diagram. Do not forget that, as this diagram is drawn looking at the front of the panel, and the marking out has to be done on the back, the position of the terminals must be reversed. When the drilling is completed, insert the panel and baseboard into the cabinet and screw the former to the baseboard. Now remove and mount the coil on the baseboard. This is done by fitting a strip of wood across the end of same and screwing through the former into it, and then fixing to the baseboard by means of a screw through the strip of wood.

Attention is now turned to the wiring. It may be carried out with any type of wire the constructor desires, either covered or bare. The two ends of the coil are taken direct to the points to which they have to be connected. The wiring diagram must be carefully followed.



An idea of the simplicity of the set can be gained by this view. Note the holder for the long-wave loading coil.

THE "SELECTACRYS"

—continued from page 312.

The operation of the set is quite simple. When Daventry 5 X X is not to be received, the loading coil—which should be a No. 150 or No. 200—has to be removed and its mount shorted. The aerial clip should be placed on the 45 tap and the aerial condenser at maximum. Now tune in your local station, finding a good sensitive spot on the crystal detector.

If sufficient selectivity is not obtained, try reducing the capacity of the aerial condenser, at the same time readjusting the tuning condenser. It will be found that selectivity will increase as the capacity in the aerial lead is reduced. Probably strength also will be found to improve. If the set is required to be extra selective, the 30 or 15 tap should be employed. When listening to 5 X X put the aerial condenser at maximum and use the 45 tap on the coil.

Very Strong Signals

On 2 L O, at about nine miles, signals were very strong, whilst the 45 tap gave sufficient selectivity to tune in 5 G B without interference from 2 L O. Fairly strong signals were received from 5 X X also.

(A peculiar thing was noticed with the particular aerial employed, which was rather on the small side, and that was that on 2 L O and 5 G B loudest signals were received with the aerial series condenser at its minimum.)

 * **RADIO IN AUSTRALIA** *
 * From a Correspondent. *

THE average Australian wireless enthusiast has a lot to be thankful for. Receiving conditions are perfect, the only troubles being fading and static, and the distances which one is able to cover are astounding. In Adelaide and Sydney, 3 L O Melbourne, operating on 5 kilowatts, can regularly be heard on the simplest of crystal sets almost any night after the local stations have closed down, and in Adelaide there are instances of 2 F C being received 600 miles away on the crystal; 2 F C also being on 5 kilowatts.

Excellent Programmes

The programmes are excellent, and the technical transmission from all stations is perfect.

At the beginning of 1928 fees were

reduced to 24s. for an ordinary broadcast listener's licence, from the customary 27s. 6d. which had been levied before.

Although to English listeners this fee must seem very large, one must not forget that in a large area like Australia—over twenty times as large as the British Isles—supporting only a trifle over 6,000,000 people, the fees

LOOK OUT FOR OUR
SPECIAL EXHIBITION NUMBER
 NEXT MONTH.

must be high to enable the broadcasting stations to operate. Exact figures are not available for the number of licences issued, but it is believed to be around 300,000—that is, about 5 per cent of the population.

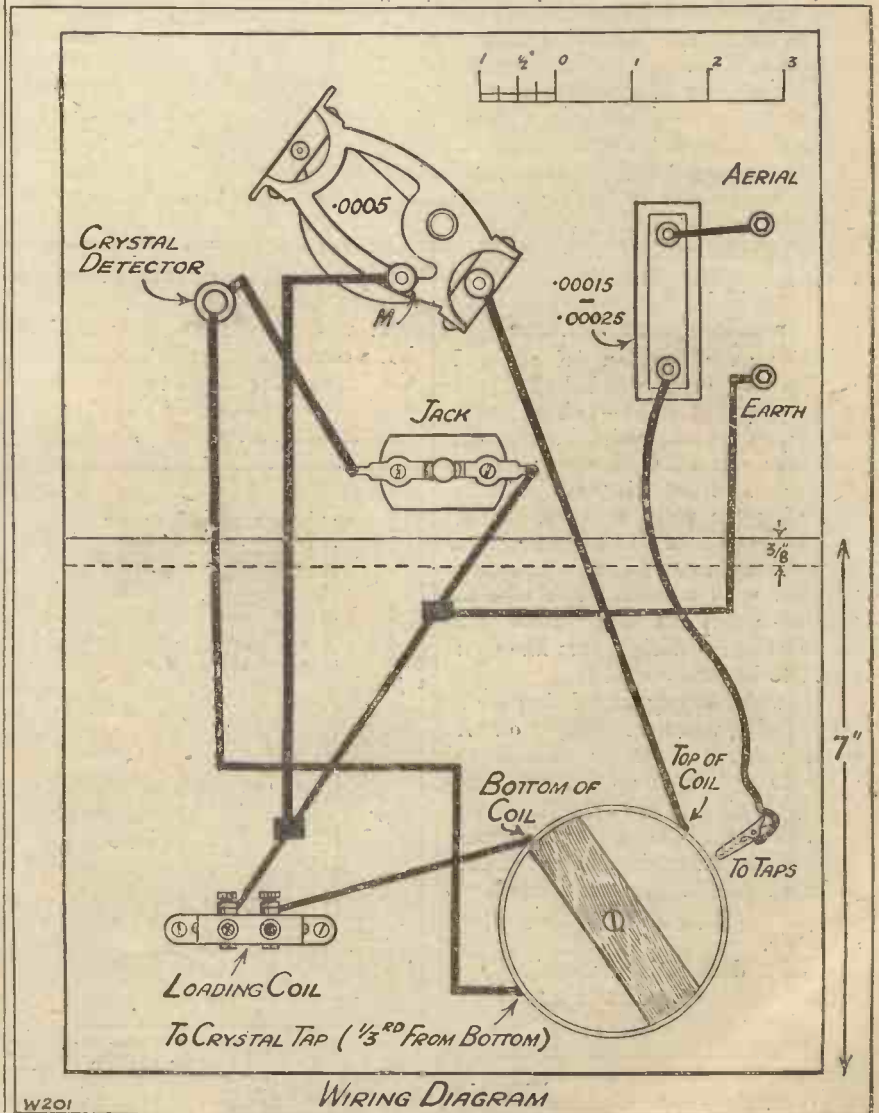
In Victoria alone there are believed to be at least 150,000 issued, which is equal to the number in the rest of the states put together. This is due

to the popularity of station 3 L O, Melbourne, which in both programmes and transmission seems to be far ahead of any other station in Australia.

American and English parts have about equal sale out here. However, both are losing ground, especially the former, to the Australian product. Valves are mainly American, but, however, as they are mostly general-purpose valves, they are losing favour, and the English product is getting a good sale. The screened valve has not made its appearance yet, and so I do not know how it will be received.

Scope for English Trade

If the English producer makes a determined effort to capture the wireless trade here from America, he will do it easily enough, and keep it by producing sets and components which are both popular with Australians and suitable to our conditions.



W201

Power for Nothing!



EVEN with 1 D.E. valves, the cost of battery recharging often mounts up to a considerable sum in the course of a year, especially with a three-valve set going two to four hours a day. My own set, at a modest estimate, costs anything from 15s. to £1 every twelve months.

With electric light in the house, there are several varieties of battery-chargers on the market which cancel this expense, but if you live in a village four miles from the nearest charging station, with no current laid on to the house—or even gas, for that matter—the efficiency of “trickle-chargers” is not of much interest to you, is it?

Consequently, once having got my first set working satisfactorily, my biggest consideration was low-tension current supply.

An Unpopular Scheme

Being an electrician (of sorts) I straightway commenced building a small charging plant—1 h.p. petrol engine, dynamo, switchboard, etc. Ominous remarks, however, from neighbours on both sides of the house regarding the noisy exhaust, fumes, etc., coupled with still more ominous remarks about creating a disturbance, together with a passing reference to the police, put the “kybosh” on the whole scheme. (Neighbours like that ought to be transported.)

The water supply, as offering some possibilities, was next thought of. A small water turbine guaranteed to generate $\frac{1}{2}$ h.p. was tried out, but failed to give even a tenth of its rated output, the water pressure being 20 lb. per sq. in., instead of the more usual 60 lb. Pressure drop along a four-mile pipe is apparently considerable.

Finally, desperation succeeding exasperation, recourse was made to primitive methods, and while granting that the resultant child of my imagination resembles an early effort of

Ten or fifteen minutes' easy and healthful exercise every evening keeps our contributor's accumulators charged and in first-class condition.

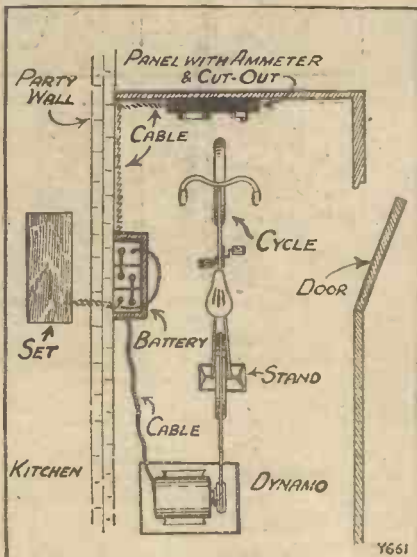
By J. BOUD.

Heath Robinson, I have the satisfaction of knowing that my batteries are always fully-charged, and, furthermore, that the charging costs—*nothing*.

New Use for a “Eike”

An old pedal cycle, recovered from the scrap-heap, was persuaded by emery cloth and a copious dose of oil to function again. After removing the remains of the outer cover and inner tube on the back wheel, a derelict motor-cycle stand was bolted to the back axle, and the bike jacked up on to it. By this means it was possible to sit on the saddle and by turning the pedals revolve the back wheel at a fairly high speed.

It was a trifle unsteady at first, but a couple of long cleats bolted over the base of the stand to the wooden floor of the shed made the assembly as firm as a rock—nearly.



This is the arrangement of our ingenious contributor's man-power station for the charging of accumulators.

A small platform was next built to carry the dynamo (this, by the way, is a small automobile-type generator rated at 8 volts 50 watts), the platform being screwed to the floor about 3 ft. behind the rear wheel of the cycle.

Then by coupling the dynamo to the rear wheel of the bike with a light belt it was possible to drive the generator at any speed up to 4,000 revs. per minute by choosing suitable pulley ratios.

Some trouble was experienced at first with belt slip, but this was finally obviated by wrapping layers of adhesive tape round both pulley and cycle wheel. Using a $\frac{1}{8}$ -in. round belt, similar to that on treadle sewing machines, the drive is absolutely positive, except, perhaps, at very high speeds—over 3,000 revs. per minute, anyway.

Permanently Installed

On test, the results were so promising that I decided to make a permanent job of the outfit. The cycle, dynamo and stand were given a neat coating of dull black enamel, and a shelf, also enamelled and strong enough to carry the accumulator, was screwed to the party wall of the shed.

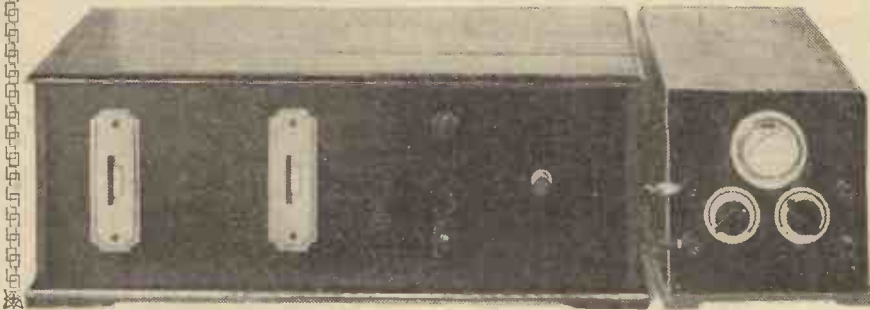
A small hole drilled right through the wall allows me to carry flex connections straight through to the set on the other side of the wall in the kitchen. These wires, incidentally, are barely 3 ft. long. A further pair of cables ran down from the battery to the handlebar of the bike, where a small switch and ammeter were inserted in the circuit, then along the top tube, down the seat stays and across to the dynamo; all the wiring being permanently cleated in position.

Thus it was only necessary to get astride the bike, run the dynamo up to speed and pull over the charging switch on the handlebar, where the ammeter showed the charging rate.

The switch was a bit of a bother, so

(Continued on page 349).

THE HARRIS "STEDIPOWER" L.T. UNIT



More about this remarkable advance in radio reception.

By PERCY W. HARRIS,
M.I.R.E.

As was to be expected, enormous interest has been aroused throughout the country by the publication of details of the Harris "Stedipower" Unit. The demand for parts is so great that many readers have been kept waiting for their components, but those who have had a little delay in this direction are asked to accept our assurance that the WIRELESS CONSTRUCTOR is doing everything in its power to expedite delivery and to see that every reader who has ordered the parts gets them at the earliest possible moment.

Suitable "Dry" Units

A number of readers have asked whether it is possible to use the Westinghouse, Brake & Saxby Signal Co. Ltd. dry rectifier in conjunction with the "Stedipower" Unit. The principle of the Westinghouse dry rectifier makes it admirable for use in such a design, and the sole reason it was not referred to in the original article was that at the time of the experiments and at the time of writing there was not a suitable Westinghouse unit available.

For example, the Westinghouse dry rectifier unit, type R.4-2-2, arranged for a D.C. voltage of 6 and a D.C. amperage of 1, is designed to take an A.C. voltage of 8 to 9 volts maximum. With this input voltage the unit when connected in the Harris "Stedipower" Unit will not give sufficient output voltage at the current we require, unless we connect to A and C., when a higher voltage is applied than the makers recommend. If used it should be joined to the terminals marked A. and B.

Question of Characteristics

This is not condemnation of the unit, which is excellent for the purpose for which it is designed. The fact is simply that its characteristics are not

those that meet the requirements of the dry rectifier in the "Stedipower" Unit. A Westinghouse unit suitable in all respects for the "Stedipower" will soon be on the market.

Trickle Charger Adaption

A very large number of readers of the WIRELESS CONSTRUCTOR are using, and many more are acquainted with, the excellent Ferranti trickle charger which is capable of giving half an ampere when charging accumulators from the A.C. mains. This unit incorporates a transformer to step-down the voltage from the mains, together with a Westinghouse dry rectifier.

Readers who possess this unit will be interested to know that by connecting the trickle charger to the chokes of the "Stedipower" Unit in place



The Westinghouse R.4-2-2 unit—a dry rectifier designed for a D.C. voltage of 6 and current of 1 amp.

of the two connections on the Kuprox unit they can obtain an output of approximately $\frac{1}{4}$ of an ampere at 6 volts from the unit (and, of course, lower currents and lower voltages). This means that by using a Ferranti trickle charger, if they already possess one, in place of the transformer and rectifier in the "Stedi-

power" Unit, they can run a set running up to four 1-ampere valves just as satisfactorily as with the original unit, thus saving themselves the sum of £2 7s. 6d. (the cost of the special transformer and the Kuprox rectifying unit). It should be noted, however, that when using this arrangement they will *not* be able to get so much out of the L.T. unit as with the complete unit already described.

The Volt meter

Some readers have enquired whether it is not possible to use a cheaper voltmeter than those mentioned in the original article, as for a few shillings it is possible to obtain what appears to be a good 6-volt voltmeter. The reasons for specifying a high-grade voltmeter here are three-fold.

Firstly, most of the cheap voltmeters take a good deal of current to operate them, and it must be remembered that as the output voltage is dependent upon the current taken, if we keep permanently in circuit a voltmeter taking a good deal of current we are robbing our valves of the current taken by the voltmeter and we shall not get the same output and voltage as before.

Secondly, it is important that we should not run our valves over the voltage for which they are designed and many of the cheap voltmeters are hopelessly inaccurate.

Safety First

Thirdly, the cheap voltmeters are not recommended for continuous connection in circuit. The experienced experimenter who possesses a high-grade 0 to 6 voltmeter, and who does not wish to "lock it up" in one particular instrument, can, of course, dispense with it on the panel, applying it when he desires to check up his voltages, but the average user will be in a much safer position if he follows

The Harris "Stedipower" L.T. Unit—continued

the line already published and uses a scheme where he has a constant visual check that all is well.

Still another point on which questions have been asked is whether it is not possible to use chokes which many readers already have in hand and which have proved excellent in H.T. mains units. The answer is, emphatically, NO! For it is essential that the choke in the Harris "Stedipower" Unit shall be of very low ohmic resistance, much lower than even the best and most expensive choke used for H.T. units.

Choke Considerations

A resistance of two or three hundred ohms may be negligible in a choke for a high-tension unit, but a few moments' consideration of Ohm's law will show that in order that a 100-ohm choke will pass one ampere we should have 100 volts across the choke! Add to this the resistance of the load connected to the unit and we should require over a hundred volts at the input!

Using over 100 volts input to get six volts output would be a hopelessly inefficient arrangement, and, in any case, the choke would burn out long before the current of one ampere was reached. The D.C. resistance of the Harris "Stedipower" choke is extremely low, being in the neighbourhood of one ohm.

As there are two of them the total choke resistance is about two ohms, and thus even at one ampere the voltage drop through the choke is only in the neighbourhood of two volts.

The condensers themselves are, of course, of very considerable interest, and many wonder how it has been possible to get such an enormous capacity into such a small space. A few notes on these condensers may therefore be welcome.

Mansbridge Condensers

The ordinary type of large value capacity—such as the 1, 2 and 4 mfd. used in mains eliminators—are made up of sheets of thin metal separated by thin paper. The paper is, of course, specially selected to stand high voltages and must be chosen most carefully to avoid flaws which would cause breakdowns.

This type of condenser is generally called the "Mansbridge" type, from the particular process invented by

Mr. Mansbridge, in which a long strip of specially selected paper is given a fine metal coating on each side, the two metal coatings forming the two plates of the condenser, and the paper between them the dielectric. The long strip is then rolled up tightly and sealed into a container to prevent the entry of moisture, against which the paper must be carefully guarded.

Special sealing compounds are used in this process. A very large number of mains condensers nowadays are, however, made with sheets of metal foil separated from the paper, and whatever process is used (the Mansbridge or the separate foil and paper) paper is the dielectric throughout. When the paper is properly chosen, carefully tested, and when the condensers are well made, it forms a thoroughly satisfactory dielectric for condensers used in mains units.

Cost of Mica

Mica would be better, but the cost of a condenser of, say, 2 mfd., made up with mica dielectric would be quite prohibitive for ordinary purposes. To give some idea of the cost of large condensers using a mica dielectric, two of the condensers used in the laboratory of the WIRELESS CONSTRUCTOR may be instanced. One, which is variable in steps by a plug, has a maximum value of 11



The front of panel of the Harris "Stedipower" Unit showing the L.T. terminals and the voltmeter which enables you to see the exact voltage applied to the receiver.

mfd. The cost of this condenser is £14. Another, a single mica condenser of .33 mfd., cost over £10.

The condensers required for the "Stedipower" L.T. Unit have not to withstand a very high voltage—

15 volts at the outside—and thus the strength of the dielectric need not be so great as is the case with those condensers which have to withstand the high voltage of the ordinary H.T. mains unit. At the same time, it is not practical to make up, say, a thousand microfarads along the lines of the ordinary paper condensers.

A New Process

A new process is therefore used. To understand the principles of the new condensers we must consider for a moment what happens in certain circumstances when two metal plates are inserted in a conducting liquid and a current passed through the liquid. As soon as an electrical pressure is applied to the plates a current will begin to flow, but will soon be interrupted by the formation of a film of gas bubbles on one of the metal plates.

We say, then, that the cell through which the liquid is flowing is "polarised," and in so-called dry cells (which are really moist cells) a special substance called a "depolariser" is incorporated to prevent the formation of this gas film on one of the electrodes. If, however, we have a cell in which no precautions are taken to dissipate the gas, no current will flow after a short time. In the dry cell the current flows through the cell and the external circuit by reason of chemical action in the cell.

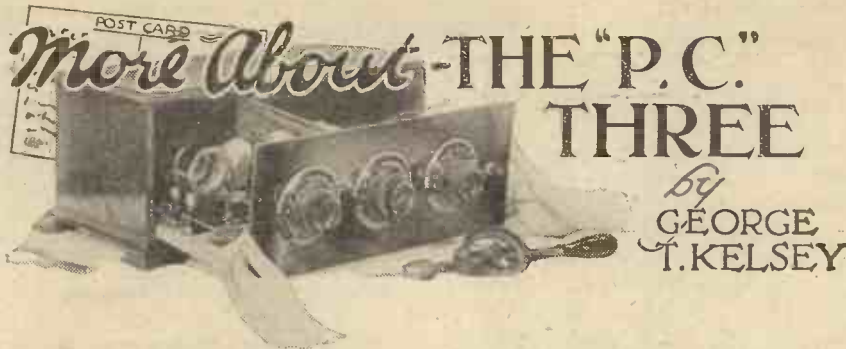
Equally we can take another form of cell and pass a current into it. The whole point is that the current passing through the electrolyte from plate to plate causes a formation of a gas film on one of the plates.

The Gas Film

Now this gas film is exceedingly thin, and if we imagine a cell in which the passage of current has been interrupted by the formation of the gas film we shall realise that it consists, firstly, of a metallic plate, secondly, an insulating gas film of exceedingly thin formation, and, thirdly, of a conducting substance (the electrolyte) which is in direct electrical contact with the other plate of the cell.

When the current has ceased to flow, the cell forms a condenser, of which one plate is the metal plate on which the gas film has been deposited, a dielectric consisting of this gas film, and the second conductor made up

(Continued on page 347).



Further practical notes on a first-class receiver which was described last month.

THE "P.C." Three receiver, of which full details were given in the August issue of the WIRELESS CONSTRUCTOR, has now been tested on long waves with very satisfactory results, and although your set is probably bringing in plenty of stations with the present H.F. transformer, there is much of interest to be heard above 1,000 metres.

What is more, it is often possible to find a programme on the long waves when nothing is happening on the broadcast band. It is therefore well worth while to go to the trouble of constructing a long-wave H.F. transformer, and it is proposed in the following article to give all the necessary details, together with a list of some of the stations heard.

On account of the number of turns required to cover the long-wave range, the former used for the first H.F. transformer was found to be of little use for the new coil. To get the required number of turns in the available space it would have been necessary to have used a very fine gauge of wire, and the manipulation of such wire is a job which calls for a great deal of skill.

The Transformer Former

Experiments were therefore carried out with a view to employing one of the standard loading coils, already described by Mr. G. P. Kendall in these columns, for the new H.F. transformer, and by careful arrangement of the primary, neutralising and reaction windings a transformer was produced which was found to give very efficient results.

Although complete constructional details are to be given for the construction of the transformer, it should first be mentioned that the former with the secondary already wound can, if desired, be obtained from Messrs. Burne-Jones & Co., Ltd., and Messrs. Peto-Scott, etc.

The former consists of a piece of

ribbed ebonite former such as "Be-col" with an outside diameter of 2 in., and 1½ in. is the length required. It will be found that there are six ribs, and in each one of these eight slots should be cut to the depth of the rib, each slot ⅛ in. wide and spaced at ⅓ in.

The First Windings

Having prepared the former, obtain a quantity of No. 26 wire, and wind 27 turns in each slot, taking care to keep the whole winding (216 turns) in the same direction.

For the primary and neutralising windings an ounce of No. 34 D.S.C. wire will be required, and since both of these windings are done simultaneously, it will be necessary to wind about 40 ft. off on to another reel.

Secure the two ends thus formed

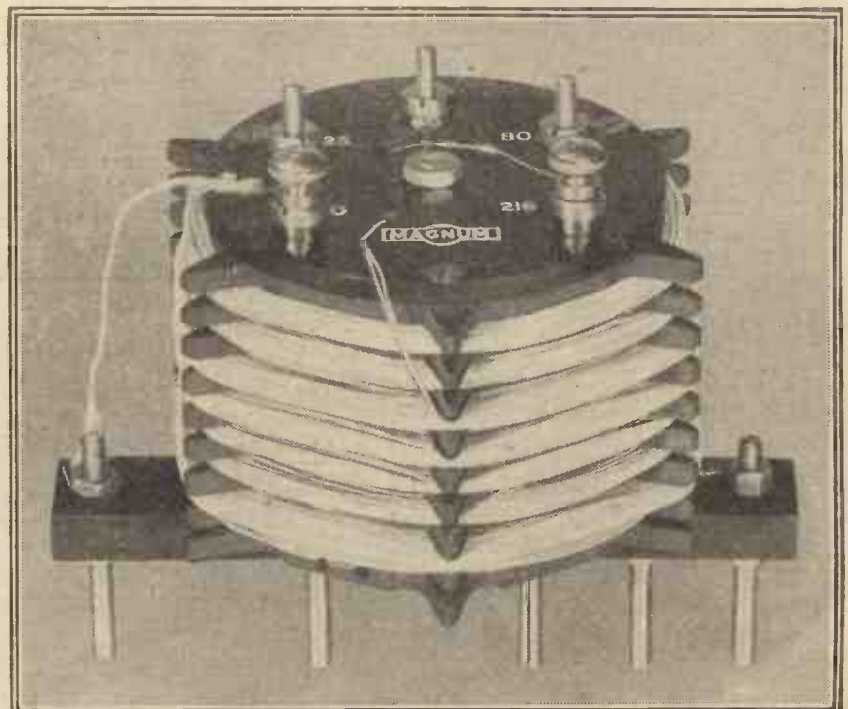
to a convenient position on the former, and commencing in the third slot from one end, and taking great care to proceed in the same direction as the secondary, wind on 22 turns of the double wire. Now cross over to the next slot (No. 4) and, as before, wind on another 22 turns, again taking particular care to keep the double winding in the same direction.

Testing the Connections

This point reached, the two ends can be secured through holes in the former as at the start. The reaction winding is placed in the second slot from the opposite end, and consists of 40 turns of No. 34 D.S.C. wound in the same direction as the secondary.

In the matter of connections, in order to avoid confusion a detailed drawing is given in Fig 1, and with the aid of this readers should not have difficulty in determining the various connections to the five-pin base.

Since the primary and neutralising windings are in slots, it may be found difficult to determine which is the start and finish of each winding unless, of course, you do them with different coloured wires. If this difficulty should arise, connect one side of a pair of 'phones to one side of a 1½-volt cell, and join the remaining side of the dry cell to one of the two wires at the start. Now by touching



Although complete constructional details are given for the winding of the transformer, it should be mentioned that the former with the secondary already wound can, if desired, be obtained from Messrs. Burne-Jones (Magnum, as above) and Messrs. Peto-Scott, etc.

More About the "P.C." Three

—continued

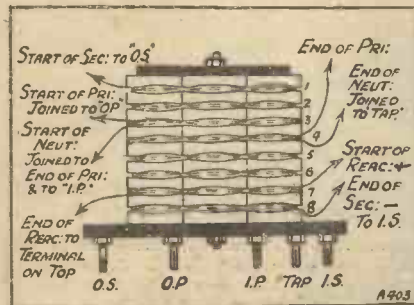
the remaining 'phone tag on the two ends of the windings, the one at which a click occurs is the winding to which the cell is connected.

Those readers who have constructed their own formers will require to mount an ebonite strip across the end of the former, upon which to mount a terminal for the end of the reaction winding. In the case of those purchased ready-made, however, it will be found that five terminals are already mounted on the end. It will therefore only be necessary to disconnect the wire to one of these, preferably the one marked "216," or "end of winding," since this particular wire has to be joined to the five-pin base.

Securing the Coil

It only remains for me to mention that the coil can be secured to the five-pin base by means of a piece of tapped rod with a nut at each end.

In order to use the set on the long waves, insert the new transformer into the five-pin base, place a No. 100 or 150 coil (depending upon the size



of your aerial) in the aerial socket, and a No. 200 or 250 in the remaining coil socket. Make certain that the set is correctly neutralised, and then proceed to operate in exactly the same way as on the broadcast band.

Stations Heard

There are four stations above 1,000 metres which in the long-wave tests of the receiver were found to come in at pleasing loud-speaker strength, and these were Hilversum (1,069 metres), Konigswusterhausen (1,250 metres), Daventry 5 X X (1,604 metres), and Radio Paris (1,750 metres).

In connection with the long-wave coil, it should finally be mentioned that the windings over the top of the secondary have an effect upon the

wave-length range of this latter coil, and if you find that the set will not quite tune down to Hilversum, take 20 turns off one end of the secondary.

Stations received on the broadcast band:

Munich	Stuttgart
Brussels	London
Daventry (5 G B)	Cardiff
Langenberg	Prague
Frankfurt	Huizen
Hamburg	Bournemouth
Toulouse	Breslau
Muenster	

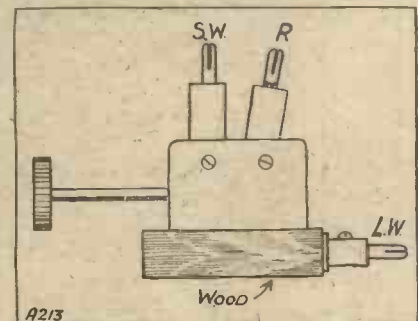
ELIMINATING COIL CHANGING

By F. HAWLEY.

A HOUSEHOLD radio set must be a trouble-free instrument. There are many units on the market which incorporate coils for the long and short waves, the change being made by a switch; but most of them are expensive and would necessitate removing the existing components.

Easily Arranged

The following method will enable any constructor to avoid coil changing at the cost of a few shillings. The ordinary two-way coil holder is mounted on a block of wood, which must be thick enough to permit a single coil holder to be screwed thereto, as marked L.W. in the sketch. The long and short-wave coil connections are then taken to a double-pole double-throw switch mounted near the coils in a convenient position.



The wiring to the fixed coil has, of course, been removed and also taken to the switch which then operates the change over. Tests will soon show the size of reaction coil most suitable for both fixed coils.

"SELECTIVITY" DISTORTION

AN interesting case of distortion came to my notice the other day. It was due to the use of a receiver unsuitable for the work it was called upon to perform. The receiver is situated within a mile or two of the London station, and the aim of its owners is to get good volume and really good quality.

The trouble was that volume could only be obtained with a sacrifice of quality, so that the household had to be content with only moderate signal strength from the loud speaker.

Too Selective

The loud speaker, a large cone, was beyond reproach, though the symptoms, a "twanginess" of music and speech, especially piano music, suggested too fine an adjustment of the reed. The receiver had two valves, detector and transformer-coupled L.F., so that there should have been no difficulty about getting loud signals.

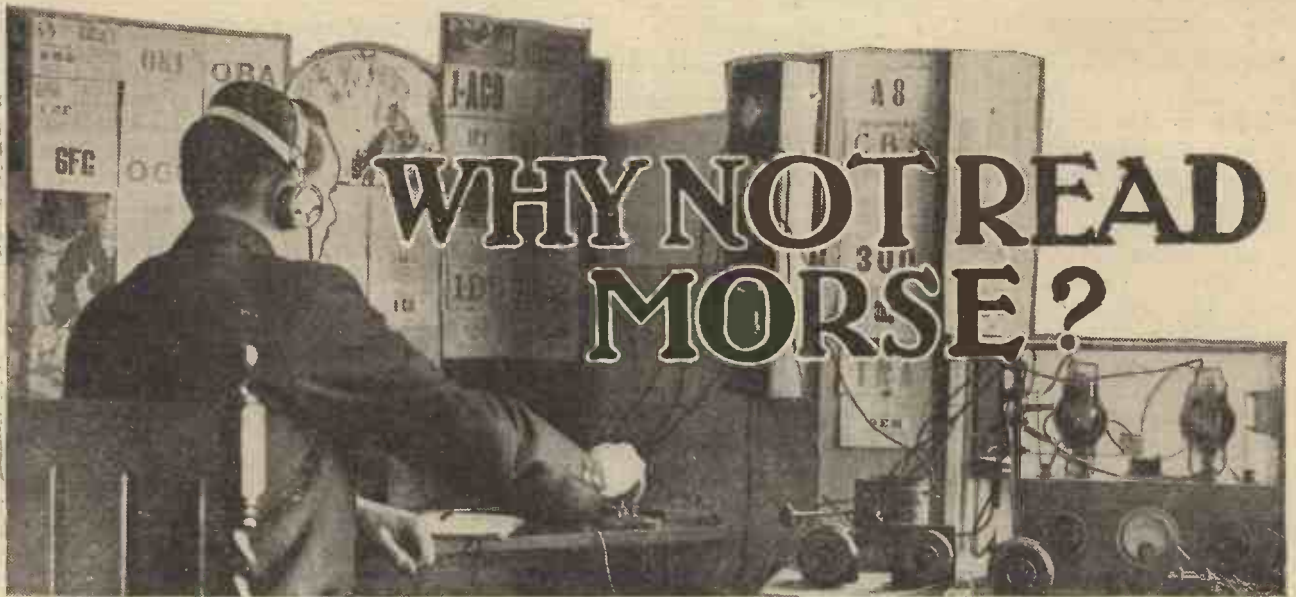
Inspection of the receiver showed that a 6-pin coil was used, carrying an "aperiodic" aerial winding, a tuned secondary and a reaction winding, with a reaction condenser in series. Tuning was very sharp, even at that short distance from the station.

Now the owner of the receiver had no desire to cut out London and receive other stations; he had another receiver for that purpose. The selectivity of this receiver was therefore being wasted, and was in fact responsible, in a sense, for the distortion. A new coil was wound, a tuned circuit coupled direct to the aerial, the reaction winding remaining as before.

Flatter Tuning

This naturally flattened the tuning, but the local station came in at full loud-speaker strength with the reaction condenser at zero. Nothing else in the receiver was touched, and the quality was as good as could be desired.

The same result might have been arrived at by rewinding the primary of the original coil, increasing the number of turns. In its original form of a few turns only it was serving no useful purpose in a receiver intended for the local station and no other.



WHY NOT READ MORSE?

PROBABLY the first thought of nine people out of ten on reading the title of this article will be: "Well, why should I, anyway?" So the first thing to be done is to explain just why, in the writer's opinion, it is so desirable for everyone who makes a hobby of wireless in anything but its simplest form to be able to read Morse.

Well, it all comes down to this: If you cannot read Morse you are missing some of the most interesting things in an already fascinating hobby. It is some consolation, when your programme is interfered with by Morse, to be able to identify the interfering stations, but undoubtedly the great value of a knowledge of Morse to the amateur is to be found in the field of short-wave reception.

Pleasures You May Be Missing

Here the ability to read Morse, even although it may be only at a moderate speed, enormously increases the amount of pleasure to be obtained from a simple receiver. Without such a knowledge all that one can do is to search for telephony transmissions, and this means that one is limited to picking up such regular broadcast transmissions as those of K D K A, 2 X A F, and so on, and an occasional amateur, the latter as a rule only at fairly short distances.

When, on the other hand, one can read Morse, it becomes possible to tune in scores of those little chirping sounds with which we are all familiar on the short waves, and sort them out as amateur transmitters working from all sorts of distant lands, even including such places as New Zealand, Australia, South and North America,

Are you missing half the interest of your short-wave set? Why not learn to read Morse by the special easy methods described in this article?

By G. P. KENDALL, B.Sc.

and so on. Then it really does become worth while to keep a log of stations heard!

Thinking these points over, it becomes pretty obvious that a little facility in reading Morse is capable of increasing greatly the pleasure to be derived from a set, but there still remains the widespread feeling that such facility is a difficult thing to acquire, and we must try to clear this away before proceeding any farther.

If the reader will just consider for a moment exactly what it is that he will have to do, his fears are pretty sure to disappear, because after all it is really quite a simple business. All that has to be done is to memorise a new set of symbols for the letters of the alphabet, and to practise their use sufficiently assiduously to be able to "read and write" them, so to speak, with sufficient facility to transcribe them at the moderate speeds likely to be called for in the particular application in which we are interested.

An Easy Task

That, then, is all that you have to do; just learn twenty-six new symbols for the letters of the alphabet, and practise their use until you can



Where accuracy in Morse reading may make all the difference between safety and disaster. The wireless gear on board a "D.H. Hercules" air liner

Why Not Read Morse?—continued

recognise each letter as it is sent in Morse, and write them down in the ordinary characters.

To learn to read Morse at a sufficient speed for our purpose is a task within anybody's capabilities, provided that they will devote just a little regular time to practice, with which assurance we can get down to business and consider ways and means of learning and practising the use of the Morse alphabet.

First and foremost we must endeavour to gain a clear idea of what the Morse alphabet really is, and it is quite essential for all who would become reasonably skilled in

Thus, if a dot takes one-tenth of a second (as in telegraphy at a moderate speed) the dash will occupy 0.3 of a second. The dots and dashes can be represented in a great variety of ways, such as long and short blasts upon a whistle, or flashes of light, long and short buzzes or musical notes in a telephone receiver, puffs of smoke or waves of a flag, and so on. In fact, the possible applications of the long and short alphabet to signalling of all kinds seem inexhaustible.

Due spaces are to be observed, also, between the various dots and dashes forming each Morse character. These spaces are equal in length to

cisely, for skill of this sort is the essential basis of good, clear sending and accurate reception. Never give way to the temptation to send in a sloppy, careless manner without proper spaces between the letters and words.

Methods Good and Bad

Take pains in the early stages when sending at low speeds, and by the time you acquire the power to send rapidly you will space correctly without effort—indeed, automatically.

Now that we understand just how a Morse letter is constructed we can proceed to our main task of the actual learning of the alphabet. Now, all sorts of ingenious methods have been devised in the past for this task of memorising, some very good and some so complicated as to be more difficult than simply making an effort and learning off the alphabet without any assistance whatever.

In the course of a lengthy experience of teaching work it has been the writer's experience that a relatively simple method is best, which makes some demand on the learner's memory powers and does not confuse him with too great a number of complicated aids to memory.

Thinking over various systems tried out in the past, it seems that the one most suited to the wireless listener's needs is that known as the method of "opposites," a term which will become clear as we go on. This method is one which the writer used with considerable success in the instruction of signallers during the war, and, though it seems rather elementary, in principle it is based upon certain sound psychological rules which make it extremely easy for the learner.

We will take first the three simplest letters of the Morse alphabet, T, M, O. Now, in Army days it was only necessary to say "T.M.O." for one's hearers to think of the words "Trench Mortar Officer" immediately.

All Dashes!

These are the key-words to the Morse symbols corresponding to the letters T.M.O., and we must endeavour to keep them in mind for a few minutes. Let us recollect next that the trench mortar officer was something of a pariah in France, loathed of all men, on account of his practice of turning up unexpectedly in the front-line trenches with some of his



Although telephony is used to some extent on the larger liners, Morse is still the main means of communication. This is the elaborate installation on board the motor liner "Alcantara," where a special system is provided to enable the Daventry programmes to be distributed all over the ship when desired.

its use to get a thorough grasp of the mode of construction of the Morse characters. The essential point to be grasped is the fact that the alphabet is based upon accurate timing of certain symbols, both as to their duration and the intervals separating them from each other.

Simple Characters

Actually, the symbols are only two in number, and the characters are formed by combining them in various ways. These two symbols, of course, are known as dots and dashes, or longs and shorts, and they differ from each other in their length, the dash being exactly three times as long as the dot.

one dot, or one-third of a dash. Thus a letter such as "A," which in Morse is dot dash, will be composed of a dot taking one unit of time, then a space of one unit of time, followed by a dash lasting for three units of time.

Further, a longer space must be introduced between the various letters forming a word, and a still longer pause must be made to separate each word from that which follows it. The space between letters is equal to one dash, and that between words to two dashes.

From the very first, great pains should be taken to observe these spacings with accuracy and to cultivate the power to estimate them pre-

Why Not Read Morse?—continued

infernal machines, discharging sundry bombs at Fritz before anyone could stop him, and then tactfully withdrawing and leaving the regular inhabitants to bear the brunt of the reprisals which followed.

Naturally, the T.M.O. became associated in everyone's mind with epithets unprintable, best represented by dashes, and this association can be turned to good account in memorising the Morse equivalents of the letters T, M, O, which also consist entirely of dashes. Thus, T is one dash, M is two, and O is three dashes, which can be firmly grasped by noting that the word trench contains *one* syllable, mortar has two, and officer has three.

And Then the Dots

Put it in this form in your mind :
T for trench, one syllable, one dash ;
M for mortar, two syllables, two dashes ;
O for officer, three syllables, three dashes.

Now take the letters consisting of dots only, which are four in number, namely, E, I, S, and H. Unfortunately, E.I.S.H. does not seem to suggest anything helpful, being merely the Arabic word for bread, which does not promise much assistance. However, by the aid of a dictionary the writer found a combination of four words which solves the problem in a simple way.

At the time, of course, Ireland was still an unwilling member of the United Kingdom, and the words "Eight Irish Seditious Haberdashers" had a topical appeal, which made their memorisation easier ; moreover, there seems to be something ludicrous to most people in the idea of a seditious haberdasher—why, it is a little difficult to see. But when we have eight of them, and Irish ones at that, the thing becomes sufficiently absurd to impress the key-words upon the mind with some force.

Enough For One Lesson

We have, then, that the letters E.I.S.H. consist entirely of dots, and stand for the words Eight Irish Seditious Haberdashers ; and these key-words indicate, by the number of their syllables, the number of dots forming the Morse characters. Thus, E is *one* dot, I is *two*, S is *three*, and H is *four*.

That is about as far as this method can be carried without boring the

learner, and it will have served its turn if it has enabled him to memorise seven letters with very little effort. Also, he will have learned quite enough for one lesson if he stops at this point, for it is a great mistake to try to memorise too much of the alphabet at once.

By way of fixing these first seven letters firmly in the memory, take a few hundred words of printed matter and write out all the T's, M's, O's, E's,

the letters in groups of about eight. First, it should be explained that "opposites" are pairs of letters whose Morse equivalents are such that either dots in one letter are dashes in the other, or that the symbol for one is simply that of the other reversed.

Simple Opposites

Thus, A and N are opposites, because A is represented by dot dash in Morse, whereas N is dash dot.



It requires a good operator to read Morse correctly in these conditions. One of the latest "Whippet" tanks, showing the radio-man's quarters.

I's, etc., in dots and dashes on a piece of paper as you come to them. That done, put the whole thing aside until the next day, to give the seven letters time to soak in.

Next day remind yourself about the trench mortar officer and the seditious haberdashers, and take the piece of paper on which you wrote out the dots and dashes and turn them back into letters, writing each against its Morse equivalent.

The rest of the alphabet (with certain exceptions) is to be memorised by the method of "opposites," taking

This will be perhaps made clearer by an inspection of the first group, which is given below :

MORSE	LETTER	LETTER	MORSE
· - -	A	N	- - -
· · - -	U	D	- - · -
· · · -	V	B	- - - ·

This group contains six letters, each of which is composed of one dash, preceded or followed by dots varying from one to three in number. The method of arrangement is such that after running over them mentally a

(Continued on page 348.)

RADIOGRAMPHONICS

A monthly article for the gramophone enthusiast.

Volume Control—Record Speeds—Typical Queries.

By A. JOHNSON-RANDALL.

ONE of the troublesome problems in pick-up work is that of controlling volume so that the last valve is not overloaded on loud passages.

It seems to me that a strength control of some kind is more necessary in gramophone work, because in radio a certain amount of attention is given to this point at the transmitting end, and those sudden increases in strength so liable to cause "blasting" are not so frequent.

Starting at the pick-up itself, perhaps the simplest procedure is to get to know the records and to choose the needles accordingly. There are, for instance, soft, medium, loud, and very loud needles, and quite a lot can be achieved by inserting a suitable type in the pick-up. Of course, many makers supply a volume control suitable for use in conjunction with their pick-ups, and in these cases there is no need to adopt any special method of cutting down the strength.

Use of Potentiometer

If no control is available, however, it is always advisable to adjust the small screw usually provided on the pick-up for the purpose of increasing or decreasing the sensitivity of the device. This screw in most cases alters the distance between the armature and the magnet pole-faces.

Alternatively, one can obtain a 500,000-ohm potentiometer and connect this across the

pick-up terminals. Normally, these terminals will be joined, one to the grid of the first L.F. valve, and the other to L.T.— or G.B.—.

Connecting Up

In connecting the potentiometer, the lead from the pick-up to the grid of the valve should be disconnected, and the grid joined direct to the arm of the potentiometer. The connections then are: One terminal of pick-up to L.T.— or G.B.— and to one of the outside terminals of the potentiometer. The remaining outside terminal of the potentiometer goes to the other terminal on the pick-up, and the centre terminal or moving arm of the potentiometer goes to the grid of the valve.

Rotating the potentiometer arm will give the desired variation in volume. The potentiometer chosen must have a high-resistance, not lower than 500,000 ohms, and should be non-inductive. There are several suitable types on the market, among which is

the 1-megohm potentiometer marketed by the G.E.C.

Records should be run at a certain specified speed for the best results. The correct speed in revolutions per minute is marked on the record. A simple method of determining this speed is as follows:

Place a chalk mark or a small spot of white paper on the edge of the disc. Start up the motor with the pick-up in position and the needle bearing on the surface of the record in the normal manner.

Then count the number of times the mark passes a given point in a quarter of a minute, and multiply this result by four. This will give the number of the revolutions of the disc per minute.

Stopping Howling

It is useless running the record "light," i.e. without the needle bearing on the surface, because the motor may slow down a little directly the "load" of the pick-up and tone-arm comes into play.

If various readings for different adjustments of the speed regulator are obtained, the turntable can be calibrated, and it is then a simple matter to adjust the regulator to give any desired number of revolutions per minute.

Recently I was informed of a method of stopping howling in an amplifier which became unstable whenever a pick-up was used.

The amplifier, incidentally, was quite O.K. for radio reception.

If a pick-up was connected up in the usual manner, the L.F. stages immediately showed a tendency to oscillate. My informant stated that when he "earthed" the tone-arm of the gramophone by connecting it



One of the best and simplest methods of controlling the volume from a pick-up is to utilise a variable high-resistance like the one shown to the right.

Radiogramphonics—continued

to L.T.— the howl immediately stopped. This is certainly a tip worth trying, but, of course, it would not apply to every case. For instance, it is doubtful if "earthing" the tone-arm would have any beneficial results in cases where the pick-up is insulated from it by a rubber sleeve.

SOME READERS' QUERIES

P. R. L. (Luton).—"I am hoping to run a 'pick-up' dance in the near future, and during the evening it will be necessary for me to make several announcements between the dances. Unfortunately, the size of the room will not permit of the apparatus being in the ballroom, and I should be grateful if you could suggest some simple transmitting arrangement which would enable me to say what was wanted without going into the dance hall. I would add that I have already tried a

switch should be used. The loud speaker should be connected to the contacts at one end and the pick-up to those at the other. The two centre contacts should, of course, be joined across the grid and filament of the first valve.

Regulating the Speed

H. K. (Birmingham).—"When I change over from the ordinary sound-box to the pick-up, is there any need to alter the speed of the motor? At present, when I make the change the music from the loud speaker appears to be of a higher tone than that from the gramophone."

The actual speed at which the turntable revolves depends, apart from the governors, upon the weight and the extent of the damping in the sound-box. If you, therefore, change over to a pick-up which is lighter and less damped than the normal sound-box, the turntable may revolve at a greater speed, and reproduction

pick-up to reproduce the record apart from the electrical reproduction, in fact, the majority of pick-ups do it to some extent.

In this connection, the advantages of using a gramophone with a lid that can be closed will be appreciated, and in cases where the instrument has no lid the only alternative is to use the gramophone and loud speaker in two separate rooms.

Overloading

L. M. N. (Southall).—"My set is a three-valver (det. and two L.F., one resistance and one transformer) and although it gives perfect results on broadcasting, as soon as I change over to the pick-up the results are badly distorted on heavy passages. I have got a jack arranged across the grid and filament of the detector valve which cuts the grid condenser and leak out of circuit when the pick-up is in use. Is there any way in which I can cure the distortion?"

From your description we should imagine that your trouble is partly due to overloading in the first stage. The pick-up, if it is reasonably sensitive, is probably giving a much greater output to the detector valve than is normally received from the broadcasting station, with the result that distortion is occurring in the first valve and is being amplified in the successive stages.

To cure the trouble we suggest that you use a much higher H.T. voltage on the detector valve when using the pick-up, and with the higher voltage it will probably be necessary to use grid bias on the first valve.

If the pick-up is very sensitive, it would also be advisable to use a volume control across it in case overloading occurs in the second or last valve of the amplifier.

Scratch Filter

P. R. N. (Glamorgan).—"I have seen a needle-scratch filter advertised, but have been told not to use one, since all the notes above the scratch-frequency are cut out as well. What is your opinion, please?"

We are of the opinion that it would be quite permissible to use a scratch-filter without fear of impairing the reproduction. The frequency of the scratch is so high that the notes which are cut off above it will not, so far as the ear is concerned, affect results.

WORLD'S WONDER WIRELESS STATION



A view of the Marconi Beam transmitting station at Dorchester. Seven Beam transmitters are installed on the raised platform shown at the back of the picture.

carbon microphone, but it seems to make everything jerky."

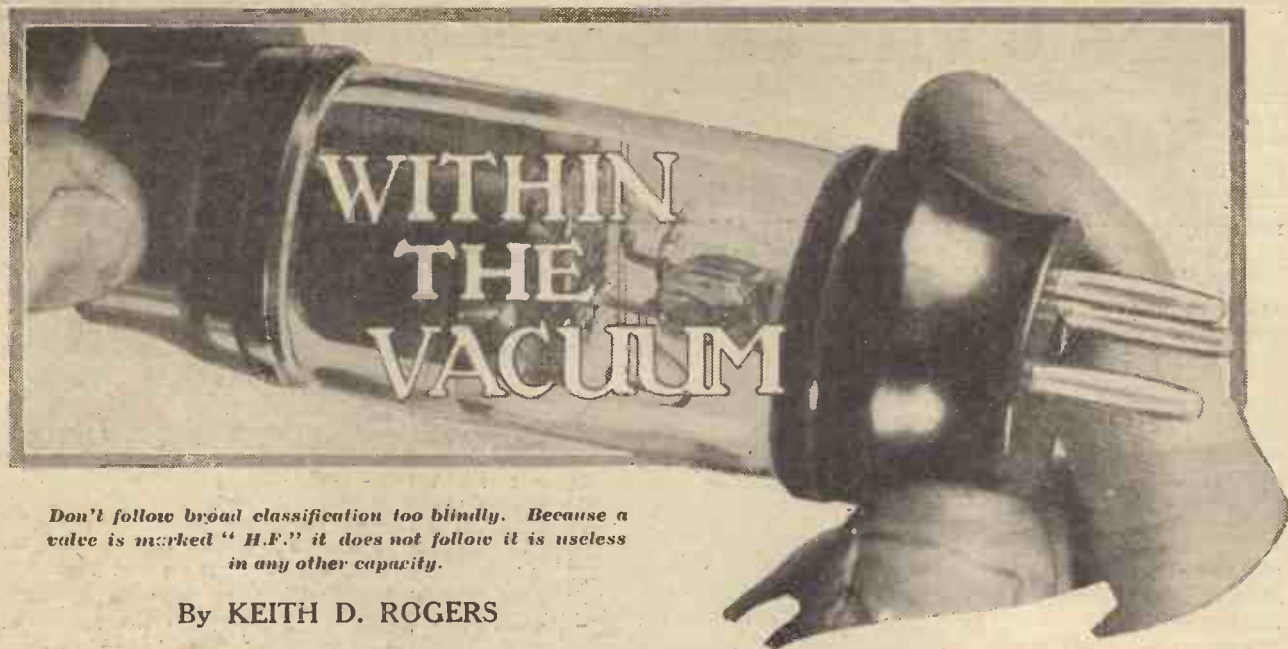
Very satisfactory results can often be obtained by using a fairly sensitive loud speaker, either a horn or cone type, as a microphone. The two leads from the loud speaker should be connected across the grid and filament of the first valve in the amplifier. To facilitate the change-over from "microphone" to pick-up, a double-pole, double-throw

from the loud speaker will, in consequence, appear to be higher pitched. Should this be the case, adjustments should be made to the regulator until the speed becomes normal.

A Normal Occurrence

M. D. (Douglas).—"The whole time that my pick-up is in use it plays a tune on its own. Is this normal, or have I got a faulty pick-up?"

It is quite a common thing for a



Don't follow broad classification too blindly. Because a valve is marked "H.F." it does not follow it is useless in any other capacity.

By KEITH D. ROGERS

ANOTHER month will bring us near the annual radio show with its galaxy of new wireless components, and no exception to the custom of "new for the show" will be made in the world of valves. There are rumours of some really interesting additions to the lists of valves, and I hope we shall also see some much-wanted deletions from the same lists.

Also, with the coming of the radio season, a large number of constructors will be scrapping their sets, or adding to them, or building fresh ones, and it is to those that I address these few words.

Those of you who have doubt as to the way to choose valves for your new or modernised sets should remember that it is no good too slavishly following the rough classification of the makers, as many valves can be classed in several categories:

Rough Classification

The makers usually term their valves H.F., L.F., R.C., and Power valves, and while this system has its uses, it must not be followed blindly.

For instance, we might say that the P.M.5X, with its impedance of 19,000 ohms and its magnification figure of 17.5, is an H.F. valve. So it is, but it is also useful as a detector, as an R.C. second-stage valve, and as an L.F. valve preceding a transformer where the input is not likely to be very great.

Thus it must not be thought that because a valve is labelled H.F. or L.F. by the makers it cannot be used in any other type of circuit.

A valve's suitability for one circuit or another depends upon its impedance and magnification figures.

Take a valve with 10,000 ohms and 10 magnification factor. This valve is quite a typical one of the L.F. type.

But it would be quite useful in a second-stage resistance-coupled amplifier, although it could not be classed as an R.C. valve.

In this latter class the valves can be used as anode-bend detectors, and also for H.F. tuned-anode or R.C. circuits, though it is more usual to employ them as detectors followed by resistance coupling to the next stage.

And so most of the valves, with

the exception of the power and super-power valves, can be used for jobs other than those indicated by their classification.

There is, however, another side to the question of valves and their names. This concerns their use in the classes to which they belong. Let me explain.

Probable Overloading

If a resistance (R.C.) capacity valve is used as a first-stage amplifier, or as a detector followed by a resistance stage, all is well, but if it is employed in a second or third stage then trouble due to overloading may occur. The design of the valve does not allow it to handle



It is not an easy matter to test the voltage obtained by means of an H.T. mains unit unless you have the proper apparatus. Here we see the Sifam (left) "Elimeter," and the Ferranti 1,000 ohms per volt triple-range meter, both being suitable for use with battery eliminators.

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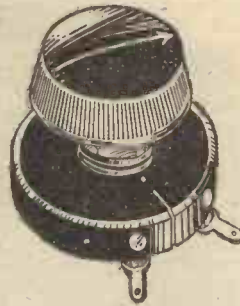
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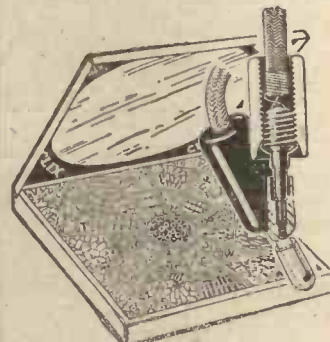


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Within the Vacuum—continued

any large grid input, overloading occurring and subsequent distortion on strong signals.

Let us take a concrete example and see what would happen if we adhered too closely to the H.F., etc., description of the average valve, and let us see how valves should really be chosen.

Many of you will remember the "General-Purpose 3-4" receiver published in the WIRELESS CONSTRUCTOR for May, the set being of the H.F., Det., and 2 L.F. type, the low-frequency valves being transformer-coupled.

The H.F. Valve

Now as the H.F. valve is coupled by the tuned-anode system, a valve having a fairly high magnification factor is required, for as the stage is neutralised we can make the most of the valve's amplification powers. Thus a valve of the R.C. type could be used, or one of the ordinary H.F. with a magnification factor of 20 could be employed—the former valve giving the higher magnification if carefully neutralised.

The detector valve is transformer-coupled to the next valve, and, moreover, is operating on the grid leak-condenser type of rectification, so we must use a valve of moderate impedance. Low impedance would be unsuited to the transformer coupling at this stage of the proceedings. A valve of 15,000 to 20,000 ohms impedance will do quite well here.

In other words, the detector valve should be chosen from the ranks of the H.F. valves, and not from the L.F. types.

The first L.F. valve, being transformer-coupled to the last, must have an impedance to suit the primary impedance of the following transformer. At the same time, it must have such characteristics as will enable it to deal with a reasonable input without causing distortion.

Saturation

We find that with moderate signals a valve of the 10,000-ohm to 15,000-ohm type will suit quite well here, and will not cause saturation of the transformer core by demanding too heavy an anode current—a state of things that might

follow upon the choice of a low-impedance L.F. valve.

The last valve is usually best chosen as a super-power valve if the H.T. current supply can be made large enough. Here the impedance should be chosen to suit the loud speaker. If this has a low impedance the valve's impedance should be low—certainly not higher than that of the loud speaker, or loss of bass notes may occur.

That is the reason why transformer or choke output is preferred in most cases—the loud-speaker impedance does not affect the choice of the last valve nearly as much when such output circuits are arranged.

The choice of valves for any set is not, as will be seen, an easy task, and must not be done *purely* on the H.F., Det., L.F. system. Care must be taken and much thought must be expended upon the suitability of each valve from the point of view

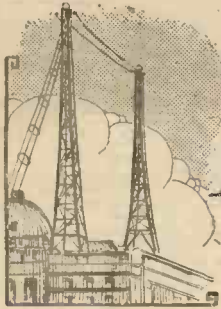
of grid swing, impedance, magnification, and anode current requirements. That is why the designers of sets published in the WIRELESS CONSTRUCTOR always suggest suitable valves, and these valves should be adhered to and the designers' advice taken.

Follow Designer's Choice

If one went by the maker's rough indication (H.F., R.C., L.F., etc.) one would get into a hopeless muddle, because it would be found that a set having, say, 1 H.F., det. and 2 resistance-coupled valves would have H.F., R.C., R.C. and power valves—a state of affairs that would probably cause very bad reproduction to be the result. No difference in H.F. would be made for transformer or tuned anode, neutralised or not, and a great deal of distortion, self-oscillation or lack of magnification would inevitably result.



Captain Otho Fulton, with his radio-photo receiver, a successful demonstration of which was recently given in London.



HAPPENINGS AT SAVOY HILL



By OUR SPECIAL COMMISSIONER

Change In "Advisors" Policy

I HEAR from a friend of one of the chief B.B.C. "advisors" that the Governors have laid down a new policy in this matter. The old plan was to retain two or three specialists on a generous fee with a view to making the appointments permanent after a few years. It was under this plan that Mr. George Grossmith and Mr. Filson Young were engaged.

The new plan is to make these appointments much more temporary and more numerous, and therefore of smaller reward. It is not suggested that the present advisors will be dispensed with if they agree to the new terms of employment. The point at issue between the old system and the new is this: Is the advantage of knowledge of technique and experience of the personnel and the new medium neutralised by the lack of variety which is consequent upon sticking to the same advisors over a period of years?

These appointments are undoubtedly of vital importance to the broadcasting service. They mean much more than the 10,000 letters a week received from listeners. It is necessary and laudable that the Governors should exercise great care about expenditure, but a mistaken economy in this particular direction might have serious consequences. It would seem as if there is room for both the old and the new systems of "Advisors."

The Right Line on Education

There has been much coming and going, with some skirmishing, since the Hadow Report on Adult Education by broadcasting. That report recommended the appointment of an "Interim Committee" to carry on and elaborate the work suggested by the Committee.

The plan was that out of the Interim Committee should emerge a Permanent Council—a new body of pundits charged with the uplift of the ether on its non-religious side. The B.B.C. wisely delayed the setting up

of the Interim Committee as long as it decently could.

Then Lord Justice Sankey took the chair, and the new committee set about things with rather uncomfortable vigour. As long as benevolent generalities were discussed, and as long as there were sufficient opportunities for tributes to the "pioneering work" of the B.B.C., all was lovely in the garden.

But the question of financial support could not be evaded indefinitely. So when the Interim Committee began to discuss tangible ways and means, the fur was soon flying. The Savoy Hill

revenue at present allotted to them by the P.M.G.

Therefore, if the "new ventures" are to be developed it must be with funds that are provided from the substantial reserve the Treasury keeps back from licence revenue. But the "Interimists" reply that this extraction of the "ready" from the Treasury will be a long process, and that in the meanwhile the B.B.C. should substantiate its sincerity by keeping the pot boiling.

There is in the controversy the makings of a big row with far-reaching consequences. Of course, the B.B.C. attitude about the money is perfectly logical and correct, and must be maintained at all costs. But Savoy Hill stands suspect of having done a little astute exploiting of the poor innocent highbrows who got tangled in its machinations. It would have been better not to have had so much trumpet work over the Hadow Committee and its celebrated "New Ventures."

Rehearsal Reforms

It is understood that at long last the B.B.C. will introduce reforms to straighten out the deplorable condition of rehearsing for musical performances. There is to be a compulsory rule of two complete rehearsals for all works of artistic importance. Those who fail to attend will be disqualified from taking part in the performance.

If this plan is faithfully applied, it will lead to about one hundred per cent improvement in the general standard of musical rendition from Savoy Hill. By the way, I hear that Captain Eckersley is turning his attention more and more towards the music of broadcasting. It would not be surprising if he took over that part of the programme work from his brother, whose task is growing beyond recognition.

The Work in Scotland

The growth of the popularity and influence of broadcasting in Scotland during the past eight months or so has been one of the most remarkable

THE RADIO VICAR



The Rev. "Dick" Sheppard with Mrs. Sheppard in their Surrey garden, where he is recuperating after his strenuous labours at St. Martin's-in-the-Fields.

view is that while they will do all they can to stimulate and help this side of broadcasting, they cannot spare any money from the proportion of licence

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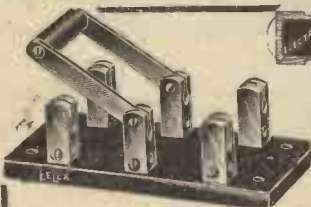
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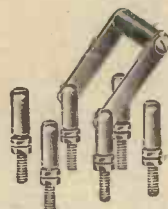
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Happenings at Savoy Hill—continued

developments connected with the B.B.C. and its work. The series of National Gaelic concerts, just completed, represented a fitting climax of a season of revival in more ways than one. The principal secret of this great change is the devolution of authority and control from Savoy Hill to Glasgow.

Scottish broadcasting has been encouraged to work out its own destiny on characteristic lines. Thus the programmes of the stations north of the Tweed are now quite different from what they were even nine months ago before the "new freedom" was uncovered.

In music, drama, education, and religion, most of the transmissions are adapted to their special constituency. Thus there is a far higher proportion of serious and instructional matter than in the English programmes. The education transmissions are more

The religion, too, is more robust and more in relation to the actuality of life in Scotland. There is little doubt that on the serious side of the work, Mr. Cleghorn Thomson and his able staff have rapidly outdistanced their more pretentious and numerous colleagues in London.

A Charlot Limerick

Despite Tommy Handley's shattering mimicry, Andre Charlot survives, and adds to his thousands of ardent admirers. His limerick competitions appear to retain their hold on the public interest. When I saw him the other day, Mr. Charlot showed me a few sample limericks picked at random from the enormous pile that had arrived by the last post.

Charlot has always emphasised that entries to be accepted must reach him by noon on the following

an admirer in the Argentine, enclosing the following limerick:

"Insist that they reach you by noon
On Monday? You silly great loon;

What better conundrum

To the City of London

My postcard should reach you so soon."

Fate of the Relay Station

In the absence of an authoritative statement from Savoy Hill, it is a little difficult to unravel all the conflicting rumours about prospective changes affecting the relay stations. Of course, Captain Eckersley is the key to the situation, and a study of his recent expressions of opinion will probably put one on the right course. Captain Eckersley has been preaching the doctrine of "fewer stations of higher power" for years.

He has also affirmed his view that the place of origin of a programme does not matter a scrap as long as the programme is good, and capable of general reception in its service areas. This train of thought leads the Chief Engineer to oppose almost any separate programme establishment outside of London. Then there is the failure of the international common waves. It has now been decided that these are to be superseded, so far as Britain is concerned, by national common waves.

Common Wave Failure

This means the abandonment of transmissions on international common waves. This means that all relays must work one wave-length during main programme periods. This entails the demobilisation of nearly all the staffs and organisation at the eleven relay centres. Thus there is a convergence between the necessity of the international *impasse* and the theory of progressive concentration so ardently advocated by Captain Eckersley.

Therefore, I think I can piece together the future without asking Savoy Hill any questions. Some time this winter relay organisation will be "wrapped up" and replaced by uniform "S.B.," perhaps modified temporarily by some "group" transmission, particularly in the North of England, where Manchester is gaining an increasing hold to the disadvantage alike of London and the localists. Anyway, from the viewpoint of listeners the tendency is eminently sound.

RUSSIAN'S INTERESTING RADIO MUSIC



Professor Theremin, the 31-year-old Russian scientist, explaining his oscillating valve method of music-making to Sir Henry Wood (centre) and Sir Oliver Lodge (right).

advanced, and therefore more in keeping with the superior educational standards and achievements of the North.

Monday. His usual day is Friday. Now Charlot's hour is followed as far away as South America. Amongst the letters I was shown was one from

IN LIGHTER VEIN



As I was still feeling the heat a little when the time came to write my monthly report of the Mudbury Wallow Wireless Club's doings I arranged with Mr. W. W. J*c*bs to carry on for me.

She Breezes

By W. W. J*c*bs.

The night watchman spat meditatively into the loud speaker.

He continued to glare fiercely at the waters of the Mudbury Wallow canal, which, unable to retaliate,



"... displaying the homing instinct of its race."

slipped away as fast as the sluggish current would allow them to do so.

"'Orrible sight, all this water," he remarked wearily. "It 'ud fair give me the creeps if it wasn't that it 'ad somethin' o' the beautiful colour o' beer."

Tankard Tactics

With head flung back and raised elbow he conveyed to his lips the tankard that the Stranger had thoughtfully provided. The portable set emitted the shrill and wobbling shriek that proclaims to the world that a broadcasting soprano has been more or less successful in her search after the top note.

"Women!" snorted the night watchman; "you can't get away from 'em even in wireless. The country's fair crawlin' with pink silk legs and shingled heads as empty as this 'ere pot."

He emphasised his point by setting the tankard upside down upon the portable receiver. The Stranger beckoned to a small boy who was doing his best to support the cobbling trade by playing solo football with an ancient tomato can. By the offer of a suitable reward he induced the lad to convey the tankard to the

"Brussel Sprout" for replenishment. So absorbed had the night watchman become that on its return he absent-mindedly emptied it at a draught and handed it back with a murmured "Same again." The Stranger sighed and nodded to the ragged Ganymede. When it was once more placed before him the night watchman seemed to have recovered a little.

Returned With Thanks?

"Women!" he said, picking up a dead cat and lobbing it gently into the cabin of a passing barge, "you never knows where you are with 'em. If they says 'no' they means 'yes,' and if they says 'yes' it generally means they 'aven't been listenin'."

A hand bearing the cat emerged from the scuttle of the barge. It was followed by an arm and then by a tousled head. The cat described a curve through the air and, displaying even in death the homing instincts for which its race is renowned, brought up on the night watchman's waistcoat.

The tousled head opened and a shrill voice began telling the night watchman facts and fancies about himself, passing on presently to his near ancestors and then to those more and more remote. Its owner had got back to his maternal great-great-grandmother, who, it appeared, was little if any better than she should have been, when the barge passed out of sight round the bend by the gasworks. Fainter and fainter sounds, however, borne by the evening breeze indicated that his unflattering pedigree was still in process of being traced.

Those Women!

"She'll go on like that," said the night watchman, "till she gets back to Adam and Eve or to Wapping, whichever happens fust."

He paused a moment for lubrication purposes, but casting an eye round and observing that there was now no small boy in sight, set down the tankard still three parts full.

"Yus," he continued, "I've 'ad my bit of trouble along o' women. It weren't so bad when I were at sea with Captain Buckett. Bo's'n I

was to 'im aboard the *Priscilla Jane*. But when 'e'd retired and come to live 'ere in Mudbury Wallow with me as 'is 'andy man to look after 'im then things began to 'appen as you might say.

"'Now just you keep things ship-shape, Bill,' he says to me. 'Sweepin' decks and polishin' brass and givin' a lick of paint when she needs it is right enough, but I won't 'ave none of this 'ere spring-cleanin'.

"'No, nor I won't 'ave no woman inside my 'ouse to leave brooms and pails for me to tumble over.' It weren't much above a week after that when 'e began to wish as 'e'd touched wood and crossed 'is fingers when 'e made that there statement. 'E was gardenin' one evenin', which means 'e was picking off snails that was plentiful like from 'is cabbages and chuckin' 'em over the fence into Professor Goop's. 'E was stoopin' down after a extra fat 'un when somethin' 'its 'im splosh on the ear'ole, and 'e finds it was the biggest snail 'e'd seen yet, wot'd flown over the other fence from Miss Worple's garden. 'E picks it up and goes and looks over 'er fence all red and bristlin'. 'Ere,' 'e says, 'May I hask what you mean by peltin' me with snails in my own garden?'

Helping the Captain

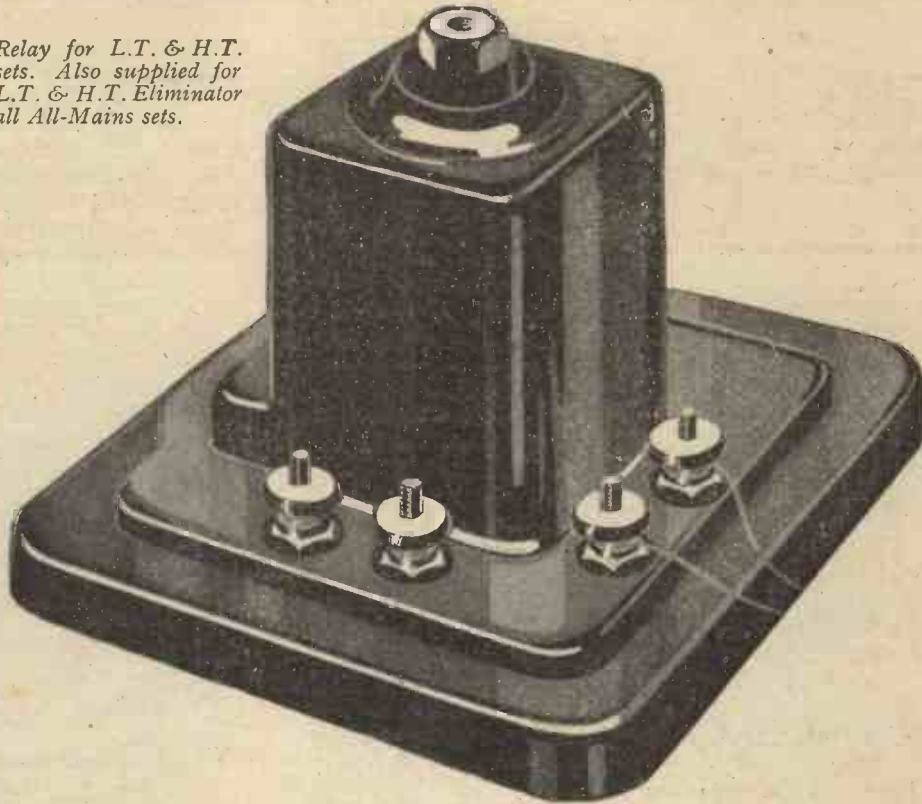
"Miss Worple explained to 'im as she were that fond of dumb animals that she couldn't bear to kill one. 'So I just passes 'em on, knowin' that a big, strong, clever man like you will soon be able to get rid of 'em.'



"Something 'its 'im splosh on the ear'ole."

"Next day she comes round to borrow the captain's lawn mower, and as she's waitin' in 'is den I sees 'er draw 'er finger across the top

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In Lighter Vein—continued

of 'is mahogany table. Then I knew as we was for it. Sure enough she comes in next day with 'er maid, bustles the captain and me out of the 'ouse and tells us she's goin' to make it comfortable.

"I dunno 'ow it is, but women seems to love dust. Fust of all they whacks it up off the floor with brooms so as it can settle all over everythin'. Then they takes dusters and pushes it back again on to the floor. And then they tidies up by puttin' everythin' underneath or be'ind some-thing' else.

"The captain fair groaned when 'e couldn't find none of 'is papers or 'is wireless things; but 'e was as 'elpless as a new-born babe. A 'orrible thing 'appened one day when she persuaded the captain and me to go off to London to give 'er what she called a free 'and.

"When we got back we found that she'd painted the ceiling of his den black with yeller spots on it, and the door and skirting boards was done in pink and green stripes. The captain said 'e'd 'ave to turn teetotaller if 'e 'ad to sit in a room like that.

Miss Worple Gets Busy

"Once she'd got the 'abit of lookin' after Captain Buckett Miss Worple soon turned 'er attention to others. Professor Goop's wife was away with the kids at the seaside and so was Mrs. Wayfarer. Before the Professor and Mr. Wayfarer knew where they was they 'ad both been spring-cleaned to within a inch of their lives.

"Then she went on to Mr. Tootle, Mr. Primpleson, Mr. Goshburton Crump and Sir K. N. Pepper. They tried to get Dr. Miggles to certify 'er, but 'e said that 'e didn't dare even go near 'er because 'is wife was



"Naturally, I glues my ear to the key-hole so as to be 'andy the moment when they wanted me."

away, too, and 'e had to be out of the 'ouse so much when 'e was on 'is rounds.

"One evenin', Professor Goop comes runnin' in to the captain's. As soon as ever I see 'im I knew 'e

'ad somethin' on his mind, because 'e was wearin' pyjama trousers with 'is dinner jacket. 'E'd only got one arm through the sleeve, too.

"Said somebody must 'ave cut the other one off, until I showed 'im as 'e'd pulled it inside out last time 'e took 'is coat off. 'E was followed soon after by Mr. Wayfarer and all the others.

Returning the Compliment

"Naturally, I glues my ear to the key-hole so as to be 'andy the moment they wanted me for anythin'. I 'ears Mr. Wayfarer say, 'As soon as we gets comfortably dirty that infernal woman comes round and spoils everythin'!' Then Professor Goop shouts, 'Listen, I 'ave a plan!' They drops their voices so that I couldn't 'ear no more.

"Next mornin' we sees Miss Worple and 'er maid go to the professor's 'ouse about nine o'clock. The professor and all the others was round at Captain Buckett's. They marches off to Miss Worple's 'ouse, taking me along with 'em.

"'We thought,' explained Captain Buckett, 'that we might as well return the compliment and see if we can't do somethin' to 'elp Miss Worple in view of all the trouble she's taken on our be'alf.'

"We spent an 'appy, 'ard-workin' day. Fust of all, we buried 'er silver teapot at the foot of 'er aerial mast, and ran a wire from it up to the aerial. Professor Goop said as she 'ad been complainin' for some time about 'er earth, and she ought to be sure of a good connection now with the aerial earthed at both ends.

Renovation Activities

"We installed Professor Goop and Mr. Wayfarer in the pottin' shed and left them to bring Miss Worple's wireless set thoroughly up to date. Supercetradyne they called it when they 'ad finished, but I could think of several much worse names than that. The professor told me that he was fitting one of 'is latest devices in 'er wireless room.

"You couldn't put yer 'and on the door knob to go out without gettin' a 'orrible shock. 'E said this was to make sure that you couldn't go out of the room without bein' reminded to switch off.

"Meanwhile, the captain and I and the others was workin' 'ard. It

seemed to us that the drawin' room wanted cheerin' up, so we made a rockery in one corner out of lumps of coal, and planted it with ferns and things. As it 'ad been rainin' and we 'ad to visit the garden frequently we felt some'ow as we 'ad left enough dust and mud on the carpet to warm the cockles of Miss Worple's 'eart when she saw it.

"It seemed to the captain as the kitchen was a bit too gloomy to make the maid quite 'appy, so 'e turns the dinin'-room into the kitchen, and *wicy-versa*, as they say in



"We buried 'er silver teapot at the foot of 'er aerial mast."

French. We 'ad a little trouble gettin' the range from one room to the other, and it didn't really seem as if the sweep 'ad remembered to call for some while.

The Story Ends

"'Owever, we remembered as she liked black ceilings, and that saved us a lot of trouble in the way of paintin'. We finished up by transformin' the coal cellar into Miss Worple's bedroom and takin' the coals upstairs to what 'ad been 'er bedroom, feelin' sure that she and the maid would bless us since coals is much easier carried downstairs than up.

"We leaves a note on the 'all table saying as how we'd done our bit to return 'er kindness, and as we 'oped she'd appreciate the improvements."

"Yes?" said the Stranger expectantly.

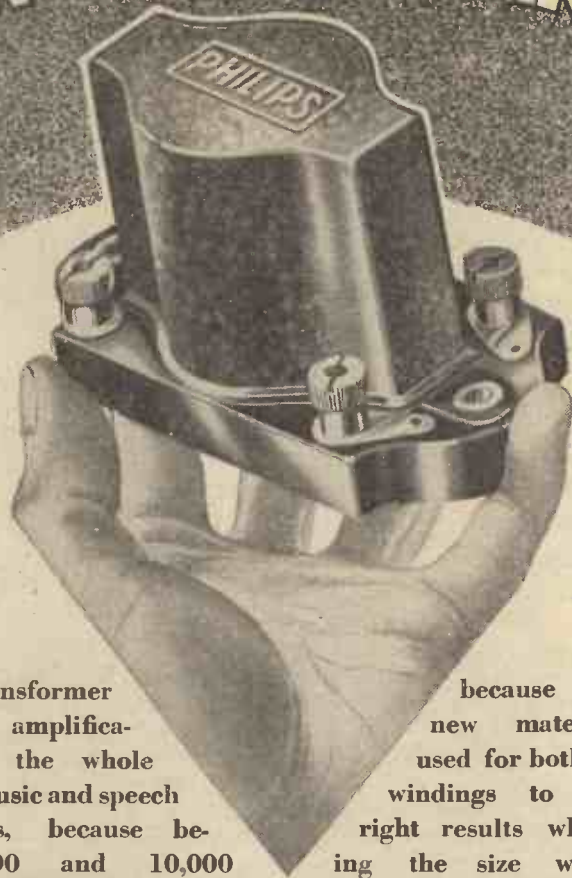
"It weren't no good," sighed the night watchman, "you can't do nothin' with women. Within a month she'd married Captain Buckett and moved into 'is 'ouse. Now 'e gets spring-cleaned every day, and I became night watchman for a little peace and quiet."

"Bill!" screamed a strident feminine voice.

"Comin'!" called the night watchman.

"My missus was Miss Worple's maid," he said, and moved off sighing heavily

THE NEW PHILIPS TRANSFORMER



Philips Transformer gives even amplification over the whole range of music and speech frequencies, because between 200 and 10,000 cycles amplification is absolutely constant and at even as low as 50 cycles it is well over half of the maximum. Intermediate and high frequency oscillations are not amplified, because beyond 10,000 cycles amplification rapidly diminishes to zero. The size is convenient and compact

because special new materials are used for both core and windings to give the right results while keeping the size within the smallest limits. Consequently Philips Transformer ensures very rich tone and faithful reproduction, prevents distortion and maintains purity, takes little space on the mounting board and is easily fitted, even to existing sets. The ratio is 3-1. Dimensions: Base $3\frac{5}{8}'' \times 1\frac{3}{4}''$. Height 2".

25'

PHILIPS

for Radio



A Neat Low-Frequency Choke

THE popularity of choke coupling has led the Marconiphone Company, Ltd., to produce the Marconiphone L.F. anode choke, type M, specially designed for intervalve coupling. The general appearance of this component can be judged from the accompanying photograph.

A MONTHLY REVIEW OF TESTED APPARATUS.

NOTE: All apparatus reviewed in this section each month has been tested in the Editor's private laboratory, under his own personal supervision.

The inductance at the current passed when this unit is correctly used is in the neighbourhood of fifty henries—a very suitable value for choke coupling—and if the component is used with a suitable valve, coupling condenser, and leak, excellent reproduction is obtained. It should be noted that this choke is not designed as an output choke or for use in eliminators.

Chokes for these latter purpose require quite different characteristics. The D.C. resistance of this choke, for example, on measurement proved to be 3,200 ohms, and while this value is by no means too high for the type of



An anode choke designed for intervalve coupling by the Marconiphone Co.

valve with which it is designed to be used, it is much too high for use as an output choke. Furthermore, the inductance with a heavy current as passed by an output choke would be insufficient.

This point is mentioned as there is a little confusion on the part of some readers regarding chokes. (Some think that because a choke is satisfactory in one position it is bound to be so in another.) Incidentally, the Marconiphone Company produce good output chokes and chokes for smoothing units, in addition to that under review.

An Interesting Cone

The Marconiphone Company, Ltd., have submitted for test an example of the Marconiphone Cone Speaker, model 75, which sells for the very low price of £3 15s. 0d. It can be said at once that this is a really excellent example of a modern cone loud speaker, with several novelties in construction and a quality of reproduction considerably superior to that given by several cones we have tested and which sell for much higher prices.

The cone itself is well protected, and the appearance of the speaker is very pleasing. The actual cone is relatively small, but being attached to a small baffle the reproduction is particularly good. Readers who contemplate purchasing a cone loud speaker are recommended to obtain a demonstration of this type. We congratulate the Marconiphone Company on giving such splendid value.

New Fixed Condensers

Messrs. Burne-Jones & Co., Ltd., have submitted several specimens of their new "Magnum" mica fixed condensers possessing several good points. We are glad to see that the capacities are clearly marked on the cases in such a way that the value is not obscured directly the component is attached to a receiver, which, unfortunately, is the case with several makes.

Nothing is more exasperating, when checking up or examining a set, than to find that it is not possible to check the value of a fixed condenser without completely removing it from the baseboard. The Magnum condensers are neat and compact in form, the cases being of moulded bakelite of a pleasant red tone.

Terminals are fitted, these being made with a cut for screwdriver tightening where desired. We should like to see soldering lugs as well. Tests of capacity on two specimens



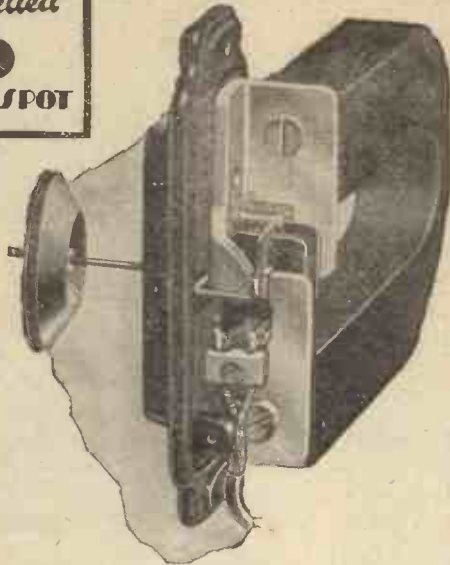
The new "Magnum" mica fixed condensers.

marked respectively .01 and .001 mfd. showed the values to be .0116 and .00098 mfd. respectively, which are well within practical limits for such condensers. These are good components and can be recommended.



The "Straight Line Super" transformer in its 4-terminal form. (See next page.)

and they're
labelled
●
BLUE SPOT



4-pole efficiency for your Cone Speaker

The well-known cone speakers embodying this unit are notable for purity of reproduction—particularly at the extremes of the tonal scale. This well-distributed reproduction results from an evenly balanced flow of current regulated by the special four-pole construction.

The use of the four-pole unit as a basis enables you to build at home a speaker with a tonal effectiveness actually superior to that of many highly priced models.

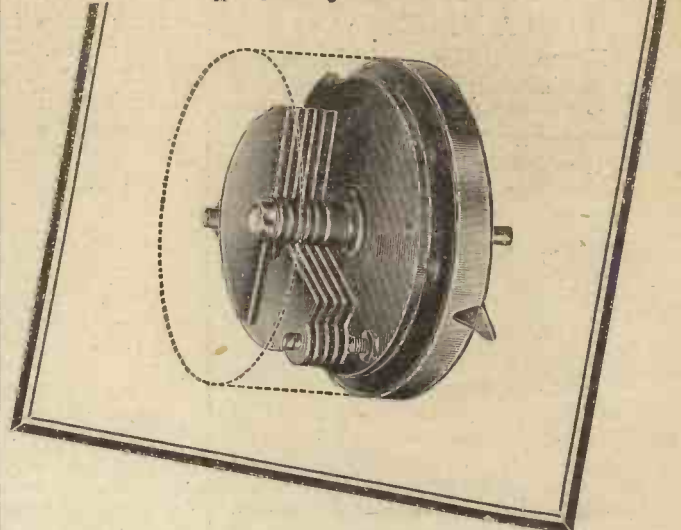
The magnet steel used in the Ideal unit is of a special kind, enabling a powerful flux and making the unit very sensitive. The armature is damped to obviate resonances produced by conflicting frequencies.

The IDEAL 4 POLE ARMATURE UNIT

The Ideal unit is supplied complete with two padded washers on threaded spindle. Complete instructions are given with each unit for building a cone speaker at home. Price 25/-.

F. A. HUGHES & CO., LTD. (Dep't. W.4)
204-6, GREAT PORTLAND STREET, LONDON, W.1
Manchester: 185 Princess Street.

No More Hand Capacity Effects



This specially designed reaction condenser entirely eliminates those annoying hand capacity effects. It can be placed in any capacity reaction circuit and adjusted to the edge of oscillation without it falling over when the hand is taken away, for the plates are insulated from the knob and entirely shielded. Its value of .00015 mfd. is just right and the straight line capacity type of plate is recognised the best for giving an even increase of reaction.

The Igranic Screened Condenser

Price 9/6

Write for the complete Igranic Catalogue, List No. J609, for full particulars of this and the many other Igranic components.



149, Queen Victoria Street, London, E.C.4.

Works: BEDFORD.

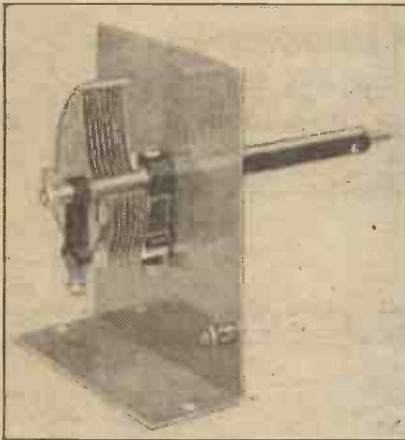
Branches: MANCHESTER, BIRMINGHAM, CARDIFF, LEEDS,
NEWCASTLE, BRISTOL, GLASGOW.

What's New—continued

A New Dress

Messrs. R.I.-Varley, Ltd., are now producing their well-known "Straight Line Super" transformer in a four-terminal model, for the convenience of those who wish, without diagrams, to connect this transformer into standard circuits which are marked for connection to four-terminal low-frequency transformers. The interior construction and performance of the new model are identical with those of the more adaptable type with six terminals which has been on the market for some time.

In the six-terminal model a wide variety of connections is possible, including the popular push-pull arrangement, and while the normal



For short waves the "Formo" Condenser is available with screen and extension handle.

model will always commend itself to the experimenter, there is no question that many people like a standard arrangement which does not necessitate any reference to a diagram in order to find just how it should be connected into a standard circuit. The four terminals are marked Anode, H.T., Grid Bias, and Grid respectively, and the slight simplification of construction has enabled the makers to produce the new model at the price of 22s. 6d.

We are asked to point out that the new model in no way supplants the six-terminal model but is simply an additional simplified version.

New-Pattern Condenser

Messrs. Arthur Preen and Company are now producing a new model of their well-known and inexpensive Formo condenser. In this model two end bearings are used and positive connections between terminal and

moving plates is secured by a concealed pigtail. At first glance it would appear that contact is made purely through the friction joint, but a closer examination reveals the fact that the spindle is hollow and contains a copper pigtail which assures positive contact at all positions.

This condenser might almost be termed a "de luxe" model of the Formo five-shilling condenser which has already been reviewed in these pages. At six shillings we consider this to be excellent value.

The same condenser is also produced in a special short-wave model, in this case a screen and extension handle being provided so that the condenser can be mounted some way back from the baseboard and operated by an insulated spindle, also provided. The condenser itself is attached to the screen and the screen is bent at right angles at the bottom so that it can be screwed firmly to the baseboard.

The extension rod, which is of ebonite, is made to grip on to the ordinary quarter-inch spindle of the condenser by means of a grub screw, while at the other end a length of quarter-inch rod allows of attachment to any of the well-known vernier dials. Tests on waves as low as ten metres show that this condenser is completely free from noise and is indeed a thoroughly efficient instrument for the purpose for which it is designed.



A close-up of the new model of the "Formo" variable condenser.

Lissen's New Condenser

To a long line of wireless components Messrs. Lissen have now added a variable condenser, several specimens of which have been tested in the laboratory. The construction has

several points of interest. One which will appeal to the experimenter, in particular, is that the condenser can be mounted either in the usual "one-hole" fashion on a panel, or without any panel, by means of feet which are an integral part of the end plates.

The electrical design of the condenser is good, the concentrated



The new Lissen Variable Condenser described below:

electro-static field being kept away from the solid dielectric, and positive contact between the moving plates and the end plate carrying the terminal is assured by a braided copper pigtail. Of the specimens submitted to us, with a nominal .0005 mfd. and nominal .0003 mfd. capacity, the maximum and minimum capacity of each model measured in the laboratory proved to be .00051 mfd. and .000021 mfd. for the larger model, and .0003 mfd. and .000016 mfd. for the smaller model.

Substantial terminals are fitted, the movement is smooth without being too tight, and a prolongation of the spindle enables several to be "ganged" where necessary with the greatest ease. Incidentally, when ganging, the fact that the condensers can be screwed on to a baseboard is of particular value, the assembly of even a triple gang in this way being a thoroughly rigid affair.

The spindle is the standard quarter-inch diameter, so that any of the numerous and excellent vernier dials can be fitted if desired. The one-hole fixing requires a slightly larger hole than usual. The condenser is one which can be thoroughly recommended.

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POSSESS ALL THE QUALITIES WHICH REALLY GOOD VALVES

SHOULD POSSESS

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Ask your Dealer for **SIX-SIXTY**
"The Valve that means the best in Radio"



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GLOWLESS VALVES

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High grade

QUEEN ANNE STYLE FIGURED OAK CABINET

Height 3 ft. 3 ins. Depth 1 ft. 3 ins.
 For Panels up to 21 ins. x 7 ins.

£5.5.0

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 Carriage Paid.

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 Manufacturer of all types of wireless cabinets and furniture of all description.

GILBERT,
CABINET MAKER,
SWINDON.

Estimates Free. Estd. 1866.



WORTH PAYING FOR

The all-round improvement in reception obtained by using the reliable and accurate Weston Voltmeters and Ammeters makes their small extra cost well worth while. They ensure correct electrical control of any set.

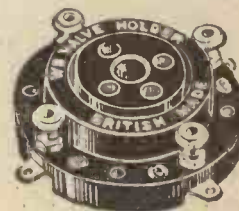
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WESTON ELECTRICAL INSTRUMENT CO. LTD.
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Cossor made no mistake!
 and Specified the
**W.B. Anti-Phonic
 Valve-Holder**



Yes, and not only Cossor, but every other discriminating expert. The W.B. Anti-phonic Valve Holder has been specified by the leading Wireless men of the day time and time again.

This speaks for itself, and when you fit W.B. Valve Holders in your own receiver you will find that their reputation is thoroughly deserved.

Price 1s. 9d. each.

Send for particulars of the range of Whiteley-Boneham Speakers. 47s. 6d. to 84s.

WHITELEY, BONEHAM & CO., LTD., Nottingham Road, Mansfield, Notts.

OUR NEWS BULLETIN

Some of the More Interesting Happenings in the Radio World this Month.

B.B.C. and Television

THE B.B.C. has made it quite clear that the rumours which have been going about lately that the B.B.C. is contemplating co-operating with television systems are untrue. Captain Eckersley, in an interview the other day, said he considered that some radically new discovery would have to be made before television became practicable from the public utility service point of view. This new discovery, he pointed out would be analogous to the wireless valve.

P.M.G.'s View

The Postmaster-General has also pointed out in the House of Commons in reply to questions that in the opinion of his engineers television is still in the experimental stage, and that the time has not yet come to make arrangements for the provision

of a public service. When the development of the science has reached the stage where some form of service would benefit listeners, and where this service could be guaranteed, the B.B.C. will be prepared, subject to the approval of the Postmaster-General, to co-operate in the matter.

Service?

It was announced recently that Mr. Baird had, for the first time, been able to conduct television without the aid of artificial light. News also comes to hand from New York that favourable television experiments have been conducted, in which the movements of a lawn tennis player in white flannels on the top of a skyscraper were clearly visible by television on a screen several floors beneath. This is the first time in America also that sunlight has been used instead of artificial illumination.

The experiment was conducted by Mr. Herbert Ives and Dr. Frank Gray.

Not by Wireless

A further report, however, states that this was not television by wireless, but television by wire—although, the report goes on to say, it was claimed it would be just as successful if wireless were used.

This raises a big question mark, for there is a very great difference between television by wire and television by wireless, and in the opinion of Dr. Lee de Forest, television by wireless, apart from all other technical considerations, will not be really successful until some practical method of eliminating atmospherics has been invented.

A Curious Position

In the House of Commons the other day the Postmaster-General claimed that, on the whole, the institution of the B.B.C. was an experiment which had justified itself. He thought it could be said it established broadcasting in this country upon a foundation which was not merely a firm foundation but the envy of other countries. He firmly refused to take

(Continued on page 342.)

Construct the

"STEDIPOWER" H.T. UNIT

as described in this issue.

	£	s.	d.
1 Oak Cabinet with baseboard as described	1	1	0
1 Ebonite Panel, 7 in. x 7 in., ready drilled	0	3	6
1 Magnum Vibro Valve Holder	0	2	0
1 Transformer for U.5 Valve as described	0	17	8
1 Sifam Eliminator	1	10	0
2 Truvalt Potentiometers, type T.100.	1	11	0
2 Ferranti Chokes, type B.1	2	2	0
1 Dubilier Condenser, 8 mfd., type L.A.C.	1	14	0
2 Dubilier Condensers, 2 mfd., type L.A.C.	0	17	6
2 Lissen Fixed Condensers, 2 mfd.	0	7	0
4 Belling-Lee Terminals	0	2	0
5 Clix Sockets	0	0	5
1 Clix Plug with flex	0	0	3
1 Lamp Adaptor with flex	0	1	6
Connecting Wire and Systoflex	0	0	4
	£10	10	0

Any of the above parts supplied separately if required.
The above unit, ready wired and tested, and including a U.5 Valve. Price £13 0 0. Royalty, 12/6.
Cabinet can be supplied in Mahogany at an extra cost of 2/-.

Wireless Constructor Envelopes

are now available
Price 1/6 each, by post 1/9 each.

- No. 1. The "Radiant Three"
- No. 2. The "Concert Four"

These envelopes contain Blueprints and full constructional details. We specialise in the above, and can supply all components specified. Lists on application.

"STEDIPOWER" L.T. UNIT

This Unit was fully described in the August issue of WIRELESS CONSTRUCTOR.



Complete set of components, including Cabinet £8 17 0
Or ready wired and tested £9 10 0
Any parts supplied separately, if required.

The "Stedipower" L.T. and H.T. Units operating from A.C. Mains entirely eliminate accumulators and H.T. Batteries with all their attendant drawbacks of recharging, etc.

The running and maintenance costs are almost negligible. A comprehensive range of lists including several new Magnum Products will be sent on receipt of 1d. stamp.

BURNE-JONES & CO. LTD.,
MAGNUM HOUSE
TELEPHONE: HOP 6257-8
288, BOROUGH HIGH ST.
LONDON. S.E.1

Construct the

"MELODY MAKER" H.F. UNIT

as described in this issue.

	£	s.	d.
1 Oak Cabinet, 10 in. x 7 in. x 9 in. with baseboard	0	15	0
1 Ebonite Panel, 10 in. x 7 in., ready drilled	0	4	6
1 Magnum Special Coil, as used in the original set	0	7	8
1 Magnum Aluminium Panel with 2 terminals	0	2	6
1 Magnum Neutralising Condenser	0	5	0
1 Magnum Vibro Valve Holder	0	2	0
1 Magnum H.F. Choke	0	7	6
1 Magnum Fixed Condenser, 0.01 mfd.	0	2	6
1 Magnum Terminal Panel fitted with 6 terminals and switches as described	0	7	6
1 Formo Variable Condenser, 0.005 mfd.	0	5	0
1 Ormond Slow Motion Dial	0	5	0
1 Lotus D.P.D.T. Jack Switch, with terminals	0	4	0
1 Crocodile Clip, connecting wire and Systoflex	0	1	0
	£3	9	0

Any of the above parts supplied separately if required.

The above Unit, ready wired and tested £4 0 0

Royalty 12/6

Cabinet can be supplied in Mahogany at an extra cost of 3/-.



FIXED CONDENSERS

Capacity 2 mfd.



Type C.1.
Working voltage up to
400 volts
Price 5/6

FOR SMOOTHING PURPOSES
AND FILTER CIRCUITS

Insulation Resistance not less
than 200 megohms for 2 mfd.

THE
BEST CONDENSERS
AVAILABLE



Type C.2.
Working voltage up to
200 volts
Price 3/6

FERRANTI Ltd., HOLLINWOOD, LANCASHIRE.

Choosing a Loud Speaker?

Then you ought to see the August issue of
MODERN WIRELESS
which is a Special Loud Speaker Number.

Going to Try for Australia?

Be sure not to miss "The 2.35 for Australia"—a
2-valve set, costing only 35 shillings to make,
described in the August issue of

MODERN WIRELESS

Do You Like Gramophone Music?

If you are going to try a "pick-up" and make
your gramophone play the loud speaker, you
ought not to miss the long illustrated Radio and
the Gramophone Supplement now appearing in

MODERN WIRELESS

Many other invaluable features are
included in the August number of

NOW
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PRICE
1/6

A REMARKABLE ADVANCE in MOVING-COIL SPEAKER DESIGN



Regd.
Design.
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GOODMANS have already established a reputation second to none in
Moving Coil Loudspeaker Parts. The "Centrex" Stand and Frame (Prov.
Pat.) marks a new era in Coil-Drive Speaker Stands. Correct tensioning and
centring are assured with the minimum of trouble by the use of a separate
member supported on special springs, adjustable by the wing nuts. This en-
ables the tension on the cone suspension to be varied at will. The POT
STAND is of unique and exceptionally sturdy design and incorporates the
well-known GOODMAN centring feature.
Write for illustrated descriptive lists for full particulars. In a recent con-
structional article "Popular Wireless" used Goodman's Moving Coil
Speaker Parts exclusively. (June 28th issue).

GOODMANS
27 FARRINGDON ST. LONDON. E.C.4
Telephone: G 4472.

OUR NEWS BULLETIN

—continued from page 340.

any responsibility himself for the details of the wireless programmes. As a result of this statement it is now an open question as to what possible channel the listener can use in order to voice his complaints. We are in the curious position, as is pointed out in an article in this issue, of having broadcasting controlled by a Government monopoly which refuses to take any responsibility for the method in which that department satisfies its clients.

The Potters Bar Site

Speaking about the Regional Scheme, the Postmaster-General said he authorised the B.B.C. to proceed with the erection of the Potters Bar station, and it is expected that it will be completed some time next summer. In the first instance, single-wave working only will be adopted, until it is found out by further tests whether reception from a twin-wave station is generally practicable.

Twin-Wave Stations

On June 14th the B.B.C. applied for general permission to proceed

with the preliminary steps for twin-wave high-power stations at Manchester, Glasgow and Cardiff, and a single-wave high-power station at Belfast. That application is "still under consideration," but the Postmaster-General anticipates he will be in a position to give permission almost at once for the erection of these other stations. He also added that he had authorised the B.B.C. to conduct ex-

"POPULAR WIRELESS"

is the leading radio weekly and has a **GREATER CIRCULATION** than any other journal of its kind. If you wish to maintain your keen enthusiasm in radio and keep abreast with all its modern developments you *must* read **"POPULAR WIRELESS"**

Every Thursday :: Price 3d.

periments in short-wave broadcasting to the outlying parts of the British Empire, and that these experiments were still in progress.

Speeches by Scientists

Education experts who will be attending the Meeting of the British Association in September will hear papers on the subject of broadcasting education by Sir John Reith and Mr.

Walter Davies, Director of Education for Kent. It is hoped that the speakers will also include Sir William Bragg and Sir Oliver Lodge.

What Programmes are Like

Mr. Hore-Belisha, M.P., made this statement the other day: "Would you ask Mary Pickford suddenly to take Gladys Cooper's part in a stage play? That is the sort of thing the B.B.C. is doing."

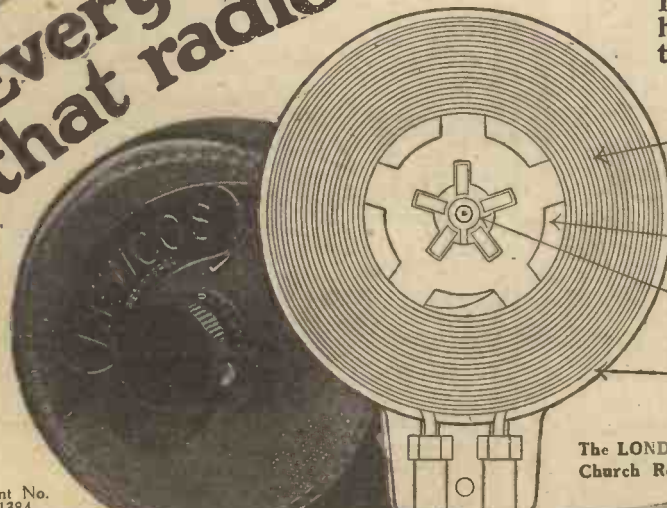
According to Mr. Hore-Belisha, the B.B.C. is making no effort to create professional broadcasters either in the form of directors or entertainers. "Until the B.B.C. appreciates the need for cultivating specialised people," he went on to say, "to provide a specialised form of entertainment, programmes will be open to criticism. I am a user of a wireless set, and I know what the programmes are like."

Dignified—but Unwise

There has been quite an attack on the B.B.C. programmes lately, and the columns of the newspapers have been pretty full of letters from listeners, chiefly those who have something hard to say about the B.B.C.

(Continued on page 344.)

Every quality that radio science demands!



In Lewcos coils you have every quality that makes for more selective tuning:

- ① **MAXIMUM INDUCTANCE** is ensured by close magnetic interlinkage between turns.
- ② **MINIMUM SELF-CAPACITY** is ensured by scientifically spaced sectional windings.
- ③ **CIRCUIT ADAPTABILITY** and coils are interchangeable and you have an option of centre-tapping.
- ④ **CONSTANT MAGNETIC CENTRE.** All coils have the same external dimensions.

Obtainable from all good radio dealers.
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Church Road, Leyton, London; E.10. Walthamstow 2531.

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COIL NUMBERS
25, 35, 40, 50, 60, 75, Price 3/6
100, 125, 150, 200, Price 5/3
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Nos. X60, X75 Price 4/9
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LEWCOS CENTRE TAPPED COILS
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FOR SELECTIVE TUNING



YOU MAY DRAW A BLANK

BUYING unknown and untested condensers is like taking a "Lucky Dip." You may be lucky and secure a prize. But you may draw a blank! You can't tell a good condenser from a bad one by looking at them. You buy on trust.

That's why it will always pay you to buy T.C.C. condensers instead of unknown condensers which may cost a copper or two less. T.C.C. Condensers are carefully made and exhaustively tested. They have behind them a 22-year-old reputation for minute accuracy and unfailing reliability.

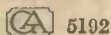
You can buy T.C.C. condensers with confidence.

Specified for the
Cossor "Melody Maker"



T.C.C.

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A NEW IDEA— "Two Stage" L.F. Unit

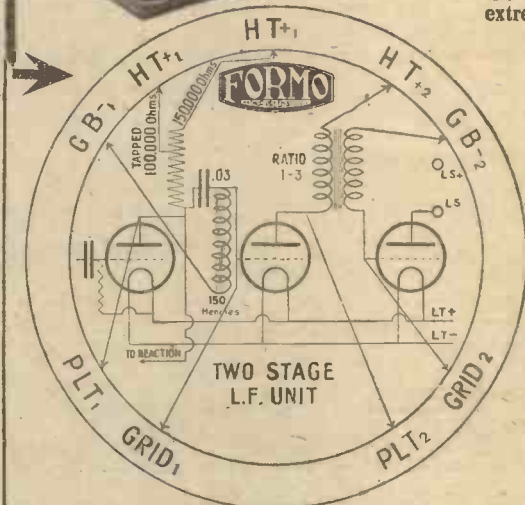


One stage RESISTANCE and one stage TRANSFORMER in sealed Bakelite moulding.

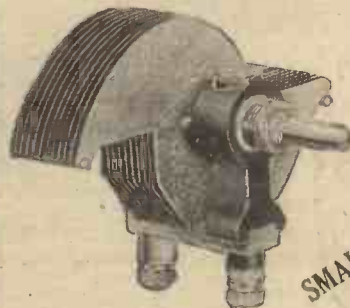
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Terminals very conveniently arranged, making the components extremely simple to wire.



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Telephone: Hampstead 1787.

OUR NEWS BULLETIN

—continued from page 342.

Few of these have been constructive, and when the B.B.C. was asked to reply, an official said: "That sort of attack may be safely ignored."

Controversial Talks

That is a dignified answer to give, but it is hardly a wise one. The B.B.C. ought to meet this sort of criticism with a disarming frankness, and of its own initiative investigate complaints. After all, attacks on the B.B.C. do form a good topic for the silly season of the newspapers, but it is not good policy to assume a contemptuous indifference to complaints which are more or less justified.

Mr. Bernard Shaw's views on broadcasting are always worth hearing. The recent "talks" controversy called forth some pungent remarks from him which (we hope) made the P.M.G. and others concerned feel a little sheepish.

"If you are going to have broadcasting at all you must have controversial broadcasting," says Mr. Shaw. "What on earth is the use of

going on with this stupid stuff about non-controversial broadcasting?"

"Everything that is broadcast is controversial. Even the weather is controversial sometimes. The whole thing is perfectly silly.

"Members of the Government have over and over again broadcast the most controversial matter, and the Government also took upon itself on one occasion to be very conspicuous in preventing me from broadcasting. I was asked whether I would undertake not to say anything controversial. I, of course, said I would not give any such undertaking, because, in the first place, I should be practically giving up my right of free speech and committing the sin of Esau.

"The whole thing is silly. I have no sort of patience with it all."

Broadcasting Parliament

Mr. Shaw obviously feels strongly about the matter! But then, intelligent people always do, when they hear some of the footling things which are inflicted upon listeners by the B.B.C.

Mr. Shaw does not appear to have much of an opinion about the broadcasting of the House of Commons.

"It would be a frightful affliction to the nation," he believes. "The

immediate result would be that the House of Commons would be abolished by general revolution at the end of about a month, or else the speeches in the House of Commons would be restricted to five minutes.

"The Government's conduct in the matter of controversial broadcasting has been so ridiculously inconsiderate. If they had considered it for five minutes they would have seen that all this business about controversial things is rubbish."

A Fair Verdict

Captain Ian Fraser may always be relied upon to give a fair verdict. Here is a verbatim "summing-up" of his views on the "controversy" argument.

"I am of opinion that the spoken part of broadcasting, compared with the musical part, is dull. This is not the fault of the B.B.C.

"It is due to the fact that English men and women hate lectures, but, in my opinion, are prepared to listen to argument. The introduction of controversy would immensely brighten up programmes which are at present generally regarded as dull.

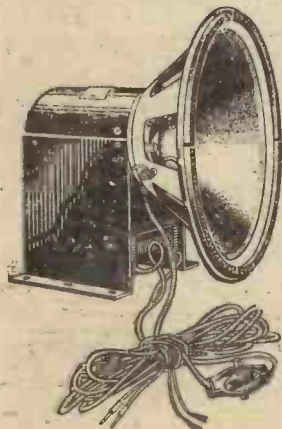
"Controversy will interest listeners. On the political side the

(Continued on page 346.)

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TYPE R.5. For operation from D.C. Lighting Mains 100/240 volt D.C. £10:10:0

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The Condenser you choose should have ample rigid bearings, accurately spaced vanes, and not be unnecessarily bulky. A large condenser will probably force you to crowd other components, thus leading to inter-reaction and oscillation. The mass of metal in such a condenser will, if it is anywhere near the coil, absorb energy and lead to damping and flat tuning.

A study of all J.B. Condensers reveals a wonderful compactness in design, such as is found in no other condensers.

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"I am tired of working for a small salary—tired of the strain of endeavouring to keep up appearances—tired of seeing others beat me in the struggle for promotion—tired of the fear of unemployment.

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Many a man, at last realising that tremendous handicap of being untrained, has thought along those lines and then become an I.C.S. student, greatly to his advantage and happiness.

In every line of business men and women are holding important positions and receiving splendid salaries—because they became I.C.S. students.

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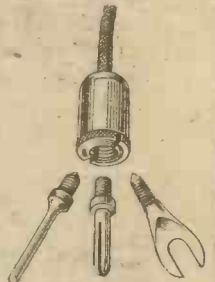
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MUST CLOSE FOR PRESS ON AUG. 28

The man who experiments—



cannot afford to be without "ELLIOTT" interchangeable connectors. Any desired terminal, Spade, Pin or Plug, may be instantly fixed without disturbing the leads. The terminal is screwed right down on to the wire of the flex, giving direct contact, and the frayed ends of the flex covering are tucked snugly away out of sight. Supplied in six colours, with or without flexible leads. Sample trial set of four connector bodies and eight assorted terminals for 1/2, obtainable from all retail wireless depots, or in case of difficulty direct from the manufacturers.



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Model DW (as illus.). For Full-Wave Rectification. H.T. Output 200+200 v.
Price **32/6.**

Suitable for U.5 Valves, can also be supplied to suit D.U.2 and Cosmos S.P.42U Valves.

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OUR NEWS BULLETIN

—continued from page 344.

politicians ought not to ignore the opportunity which science gives them of bringing their views before the people.

“Controversy, if fair, will not be objectionable.

“Any political broadcast would have to be carefully chosen and given at rare intervals.”

Washington Decisions

Reports on the subject of the Washington Conference which have now reached us indicate that this international conference has tried to divide up the ether among various countries and has more or less succeeded. Wave-lengths from 30,000 to 5 metres have been divided into bands, in all about sixty in number, and the various services are allotted particular wave-bands. Of course, all these decisions made by the Washington Conference have to be ratified by the various Governments concerned.

Short-Wave Bands

With regard to broadcasting, Great Britain does not seem to be greatly affected, nor are any existing broadcasting stations working about 1,000 metres in Europe to be interfered with. The medium band, given entirely to broadcasting, ranges from 545 to 230 metres, and as for short waves, those from 50 to 48.8, from 31.6 to 31.2, from 25.6 to 25.2 and from 19.85 to 19.55 metres are among those to be devoted to broadcasting.

A wave-length down to 13.9 has even been reserved for broadcasting purposes.

* “RADIANO” IN *
* SOUTH AFRICA *

AFTER listening in to J.B., Durban, and Capetown, till midnight on New Year's Eve, I thought I should try out the “Radiano” Two, which I had just completed. Judge of my delight when I picked up “London calling”; and then, “we are going over to the

Savoy Hotel for dance music till eleven-thirty.”

Having sat up so late, I decided to try America, and heard a comic song, I'm 94 to-day; the announcer saying, “You don't look it, guy!”

Later I tuned in a station which I took to be 2 X A D, and heard several items from “The Quaker Girl.”

I do hope that many more such glorious evenings will be my lot in the future.

H. G. Hayward.
Bethlehem, South Africa.

“POPULAR WIRELESS”
is the Paper you ought to
READ.

Bright in its outlook and appearance, it tells you the very things about radio that you want to
LEARN.

And these articles are not written by condescending high-brows, but are in the form which you can
INWARDLY DIGEST

Every Thursday. Price 3d.



The “Wireless World” says: “We hope that other dry battery makers will follow Messrs. Ripaults' lead and come out into the open with details of the average life which may be expected from their cells.”—See page 478, May 2nd issue.

FACTS AND FIGURES

The figures shown on the table below in respect of a “High-Class Ordinary Battery” are as a matter of fact identical with those which recently appeared in a Trade Organ, and from the figures quoted it will be seen that RIPAULTS' SELF-REGENERATIVE H.T. DRY BATTERIES have very nearly double the life of an ordinary high-class battery.

Capacity and rate at which discharged	Useful Life		
	Ripaults' Self-Regenerative Battery	Ordinary Battery Any High-class	Extra Life Given by Ripaults' Battery
Standard Capacity Discharged at 5 m.a.	550 hrs.	320 hrs.	230 hrs.
Double Capacity Discharged at 10 m.a.	475 hrs.	260 hrs.	215 hrs.
Treble Capacity Discharged at 15 m.a.	500 hrs.	280 hrs.	220 hrs.

STANDARD, 60-volt, 10/6; 99-volt, 16/6. DOUBLE, 60-volt, 15/6; 90-volt, 22/6. TREBLE, 60-volt, 19/6; 90-volt, 29/6.
RIPAULTS' LEAD IN LIFE, EFFICIENCY AND VALUE.
How do we obtain more than 1 1/2 volts per cell? Many Technical Experts will tell you this is impossible and yet, for example, our 99-volt models contain only 66 cells and the total E.M.F. is approximately 103 volts. The common practice of including additional cells to bring up the voltage is misleading unless the purchaser is warned that a Battery containing, for example, 43 cells should give a reading of not less than 66 volts, otherwise deterioration has already commenced. Write for “Life Chart” and “Right Choice” table W/C99, with full range of voltages and prices, also complete copies of technical Press “test” reports.

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GRAMOPHONE LOUD SPEAKER
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1928 Price 8/6
Post free.

TABLE TYPE CLAROSTAT

Place it by your side when dining, reading, resting in bed, etc., etc., thus providing distant-control. Cords have generous length.

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Loud or soft as your fancy dictates!
A “ClarOstat” enables you to apply Loud or Soft Pedals to your Speaker. Soft when desired just as a “background”: full volume instantly available when a particular item becomes the centre of interest, or for dancing. If you are reproducing Gramophone records you can dictate exactly the volume that pleases you, suiting the volume to the style of the record.

VOLUME CONTROL, TONE CONTROL, and 57 other uses.

Tone Control can also be arranged, lowering and mellowing the quality of your high-pitched Speaker until it reproduces rich, deep notes equal to the most expensive instruments.

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5183

THE HARRIS "STEDI-POWER" L.T. UNIT

—continued from page 316

of the electrolyte itself together with the other metal plate. We can thus consider the electrolyte as a liquid extension of the other metal plate.

With conductors of a given size, the thinner the dielectric the larger the capacity, so that the actual capacity of a condenser made up of two plates and an extremely thin gas film, such as occurs in the circumstances we have detailed, has a much larger capacity than would be the case of two similar plates separated by the thinnest paper it is practical to use.

The Special Condensers

The new type of the condenser used in this "Stedipower" Unit consists of long strips of special metallic foil, a thin and exceedingly porous paper separator, and a certain chemical treatment of the plates, the whole being suitably sealed. In this case the paper does not act as the dielectric, in fact, an examination of the paper shows that it is full of very large holes, and when the condenser is connected up to the circuit and a current applied to it a gas film immediately forms on one of the plates, and this gas film acts as the dielectric.

The conducting surfaces are thus extremely close to one another electrically, with the electrolyte acting through the paper, and the capacity thus obtained is extremely large.

In the Tobe-Deutschmann condenser block there are three terminals. One is marked negative and is connected to one side of each of two condensers, and the other two terminals marked R+ and C+ respectively are connected to the two other terminals of the condensers. The condenser connected between R positive and negative is of a smaller value than that between C positive and negative.

In using the T.C.C. condensers I have found it quite satisfactory to

(Continued on page 348.)

Utility in Reception!

You can only maintain a high standard of reception by frequent tests of H.T. and L.T. current. The Watts Universal Test Meter, besides doing this accurately, will give you the millamps taken by your receiver. Simple to use. Dependable. Low in price.

Full instructions with each meter.

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FOR THE MELODY MAKER**

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Send no money. We forward C.O.D. 35/- post free for

2nd Selection of above.
Lotus D.P.D.T. switch, 2 o/o switches, Raymond -0005, S.M. Dial, Igranic Neutralising, Valve-holder, Strip, Terminals, 7 x 4 former, enough D.S.C. wire to make coil, T.C.C. 01 mica R.F. Choke, Crocodile Clip, Screen, 81 x 8, Send no Money. We forward C.O.D. 30/- post free. Cabinet and Drilled Panel, with base-board, 12/6.

Wearite Low Wave Tuner, 20-70 metres, 10/6; Anticap. Switches, 2-way 6/-; 3-way 7/-; Plug Switch, 2-way o/o, 3/9; H.F. Choke, 6/6; Short-wave, 4/6; Aerial Coil, 15/-; H.F. Transformer, 21/-; Igranic L.F. Choke, Type G, 27/6; Smoothing Choke, 25/-; Indigraph Dial, 7/6; Universal High Resistance, 5/6; Patent Jacks from 2/-; Ask for List No. 1546.	R.I.-Varley Super-Power Resistances, for Battery Eliminators, various from 500 at 50 m/a to 3,000 at 20 m/a ohms. Each 12/9
Ediswan H.F. Unit parts: 1 "734" with Coupling Unit, 9/-; Filament Bridge, 3/-; Rheostat, 2/-; -0005 Variable Condenser, 5/6; Neutralising (Magnum), 5/-; Coil Mount, 1/-; 10 in. in 6 in. Aluminium Screen free with above lot. Total 22/6	Valves, all latest stocked. D. L.P. H.F., P., 10/6 & 12/6 each; D.U.10, 15/-; Mullard P.M.4.D., 12/6; Cossor, Mullard, Ediswan, Marconi, Osram, Six-sixty.
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	R.C.C. Units, various, Lissen, 4/-; Cosmos, 8/6 (with V.H. 10/8); Magnum, 7/6; Carborundum, 8/6; Marconi, "A" 7/3, and "B" 8/6; Dублиер, 7/-.
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14 x 7 x 9 ... 13/6	
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Also Cabinets in stock for P.M. Nelson de Luxe, Raleigh, Mullard 3, Cossor 3, Britain's Fav. 3, do. 2. Cheap (good), also in expensive quality.

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Cydon Condensers, all capacities, S.L.F., Log-mb line, thumb control models, short-wave (with or without brackets, etc.), stocked: "Bebe" 0001, 7/6; 0001 5, 8/-; 0002, 8/6; 0002 5, 9/6; 0003, 11/-.	Graham-Farish Resistance Cap. Coupler, almost a set in it 12/6 self ...
Ebonite cut while you wait at 1d. square inch, also 1 in. at 1d. Only the best supplied. No cheap rubbish.	P.W. Standard Loading Coil Formers, 2/6; Wearite, 5/-, (Wound), 7/6.

EVERYTHING FOR WIRELESS.

COSSOR MELODY MAKER

Watmel H.F. Choke now included

GENUINE COMPONENTS £4 10 0 kit.

2 Ormond -0005; 2 Do. S.M. Dials; 6 T.C.C. Condensers, 001, 002, two -0003, 0001, 2 mid.; 2 Grid Leak Clips, B.B.; 1 Var. B.B. Rheostat; 3 Grid Leaks, 25, 3, 4 Meg.; 3 Lotus V.H.; 1 Ferranti A.F.3; 2 Panel Switches; 1 Cossor Melody Wound Coil; Terminals, Name Tabs, Glazite, 9-v. Grid Bias, Watmel Choke.

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A prominent wireless trade paper awarded the highest place to "Celestion."

"A long way ahead of its class," and "The embodiment of all that is good," wrote "Popular Wireless" and "Wireless World" respectively. "Celestion" can justly claim to be the pioneer British reinforced large diaphragm loud speaker.

"Celestion" is British made throughout.

"Celestion" instruments are made under licence. Demonstrations daily without obligation at our showrooms, one minute from Charing Cross.

Models range in oak or mahogany from £5 10s. to £25. Write for full details of all models and of the Celestion "Woodroffe" Type Gramophone Pick-Up, price £4 4s. When ordering Pick-Up please state whether adaptor is H.M.V. or 3-inch size.



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Associated Company:
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THE HARRIS "STEDI-
POWER" L.T. UNIT

—continued from page 347.

Use two equal size condensers, as shown in our last issue. In this case the capacity of the first condenser is larger than the first condenser in the Tobe-Deutschmann block, whereas the capacity of the second condenser is smaller than the second condenser in the Tobe-Deutschmann. Whichever kind one uses the necessary smoothing is obtained with the choke and filter shown.

Different Construction

The construction of the T.C.C. condenser is somewhat different from the Tobe-Deutschmann, but they both utilise the same principle of the formation of a gas film to provide the necessary extremely thin dielectric. Once either make of condenser has been "formed" it is necessary that it should be connected the correct way round in circuit. The Tobe-

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THE
BEST and BRIGHTEST
Radio Weekly. In other words,
IT IS
POPULAR WIRELESS
THAT
YOU WANT

Deutschmann is clearly marked negative and positive, while the T.C.C. condensers have a black insulating ring round the negative terminal and a red insulating ring round the positive terminal.

Other Makes ?

I have no doubt that before long other makes of very high-capacity low-voltage condensers suitable for the Harris "Stedipower" L.T. Unit will be available.

The unit last month was a "universal" model with the widest range of adaptability. Those readers who wish to build the "Stedipower" L.T. Unit to suit one particular set only, there is, of course, no necessity to have both the 10- and the 30-ohm resistances. Either the 10- or the 30-ohm can be chosen, according to the demands of the set, as will be made clear from the "Rapid Guide to Adjustments," on page 228.

WHY NOT READ MORSE ?

—continued from page 321.

few times they will be remembered quite easily.

As soon as you feel fairly certain of these six letters, again take about 200 words of printed matter and write out in dots and dashes all the letters that you know, including T.M.O. and E.I.S.H., then put the whole thing aside, preserving the piece of paper upon which you did your "exercise" for use upon the morrow.

At the third lesson translate back into letters the series of T.M.O., E.I.S.H., and A.U.V., N.D.B. Morse characters; then take another longer passage of, say, 400 words, and once more write out the Morse equivalents of all the letters you know.

That done, tackle the next group, which is given here.

MORSE	LETTER	LETTER	MORSE
· · · ·	L	F	· · · ·
· · · ·	W	G	· · · ·
· · · ·	Y	Q	· · · ·

These letters, it will be discovered, are scarcely opposites in the obvious way that the others were, but nevertheless the helpful relation is there, and they will soon be learned. Drive them well home by doing one of the exercises previously explained, and again put the matter aside for a day.

Further Exercises

It must be emphasised that these intervals are to be strictly observed if the method is to be successful. It does not make use of any very elaborate devices for easing the mental effort involved, and hence the memory will be overtaxed if due regard is not paid to these injunctions to take small doses.

The final group now follows :

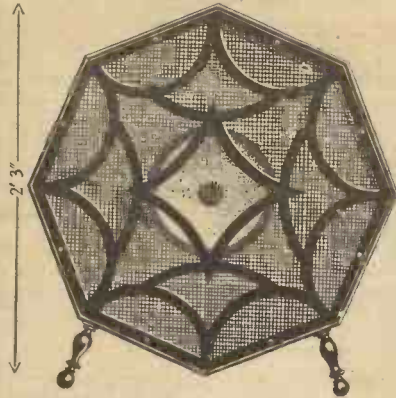
MORSE	LETTER	LETTER	MORSE
· · · ·	R	K	· · · ·
· · · ·	P	X	· · · ·

These four letters complete the list of opposites.

Next, set to work to impress them all with greater firmness upon the memory, and at the same time acquire facility in thinking of the Morse equivalent of any letter, or the letter corresponding to any Morse character. This is to be done as before, by writing out the dots and dashes of each of the letters which you know in a prose passage of about 400 words,

(Continued on page 349.)

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24, Leswin Rd., Stoke Newington, London, N.16.
Telephone: Clissold 0354.

WHY NOT READ MORSE ?

—continued from page 348.

and then, after a suitable interval, translating them back again.

After a little practice at this, the three remaining letters C, J, and Z must be memorised. These three have no opposites, and are best learned without any special method; the small mental effort involved seems to have a beneficial effect at this point.

Their Morse equivalents are these :

C - J -
Z -

A little more practice in writing out passages of 400 words or so in Morse, and then turning the dots and dashes back into ordinary script, will serve to fix the alphabet in the memory. You will then be ready to start one of the methods of practising Morse transmission and reception which follow.

(To be continued.)

POWER FOR NOTHING

—continued from page 314

decided to scrap it altogether and purchased an automatic "cut-out," such as used on all motor-cars equipped with electric lighting sets. This was fixed up with the ammeter on to a small ebonite panel, which was screwed to the wall of the shed, facing the bicycle, while the untidy wiring which draped the frame of the machine was removed and stapled along the wall in the approved wireman's manner.

Now, I simply walk into the shed, sit astride the bike, and commence pedalling. As soon as the dynamo voltage rises above that of the battery, the auto-switch completes the charging circuit, while with a falling generator voltage it opens the circuit as soon as the battery and dynamo E.M.F.'s balance, i.e. at 6 volts.

NOT HARD WORK

No doubt a great number of readers will imagine this is all very nice, but that it reads very much like hard work. This is not so. Now, just think. Take an ordinary three-valve set using .1-amp. D.E. valves for, say, three hours a day. The current consumption will therefore be .3 amp. for three hours, or, what is equivalent, .9 amp. for one hour, or, simplified still further, approximately 3 1/2 amps. for a quarter of an hour. So

(Continued on page 350.)



CONTROL

For hour after hour, a relentless droning monster winging through the air . . . space is nothing . . . night approaches . . . on through the dusk into blackness. Now circling helpless, lost in the air . . . swiftly supple fingers tap a message of distress to the world below . . .

Far below the listener waits. Will the message be helpless against a veil of atmospherics and distortion? Now CONTROL holds the reins . . . eyes intent on a dead white dial, watching the tell-tale waver of a needle . . . the tuning is altered with frantic speed . . . pen flashes to paper . . . the message is through!



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1 Ormond vernier dial ..	5	0	
1 Igranite neutralising condenser ..	4	6	
1 Anti-phonie valve holder ..	1	9	
1 Terminal strip ..			10
6 Terminals ..	1	0	
1 Ready-wound coil ..	7	6	
1 T.C.C. 'or mica condenser ..	3	6	
1 Peto-Scott radio frequency choke ..	6	6	
1 Crocodile clip ..			2
1 Magnum metal screen, 6 in. x 8 1/2 in. ..	2	6	
1 Valve as specified ..			10 6

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Bowyer-Lowe



2/3

POWER FOR NOTHING

—continued from page 349

that it is only necessary to charge the battery at, say, 4 amps. for fifteen minutes a day to ensure a constant low-tension supply.

Fifteen minutes a day! And if the dynamo output can be raised to 6 amps., ten minutes a day will be sufficient. Hard work, eh?

Actually, my own generator gives 4 amps. with surprisingly little expenditure of energy, while at top speed its output is nearly 7 amps., and as the accumulator is a 6-volt, 60-amp. car-type battery, it will stand anything up to a 10 amps. charging rate, so that there is little fear of damage through too high a current density.

The Daily Dose

Personally, I have made a practice of going round to my miniature "power-house" every night just before going to bed and "turning 'em round" for a quarter of an hour or so. Strange to relate, that fifteen minutes' exercise acts better than the finest sleeping draught in the world. (Victims of insomnia, kindly note.)

Anyway, the idea is not patented, so if you wish you can go ahead and make an outfit for yourself.

One word—don't make an agony half-hour of it. Take it easy, for there is no need to emulate an enthusiastic but youthful friend of mine who, not content with charging his own batteries, frequently takes in a batch from his friends and grinds away steadily from 6 till 9 every evening.

He is developing wonderful muscles, and I sincerely hope that his banking account is developing likewise. He certainly deserves it. Cheerio!

USING THE 31 TESTED CIRCUITS

—continued from page 310

with the ordinary scheme), we are inclined to blame the screened-grid valve for a lack of selectivity, which is really due, not to the valve itself, but to the absence of at least one tuned circuit previously used.

Coming to the actual circuits themselves, we find that in circuit II a tuned anode is used with reaction, a scheme which I can particularly recommend with the screened-grid valve as the reaction effect adds to the impedance of the tuned-anode

circuit in a very desirable fashion. Circuit I2 and I3 both used what is commonly termed the "parallel tuned-anode."

Parallel-Feed

The efficiency of a scheme using a radio-frequency choke as shown in these two circuits, with a coupling condenser and a tuned circuit connected between the grid and filament of the next valve, is lower than that obtainable with the scheme shown in circuit II, as the impedance of the radio-frequency choke and the impedance of the circuit L_3-C_2 are in parallel. The total impedance of the anode circuit of the screened-grid valve is thus not so high as that of the ordinary tuned-anode arrangement. At the same time, the parallel-feed scheme is a very practical arrangement and the advantages of this circuit rather outweigh the disadvantages.

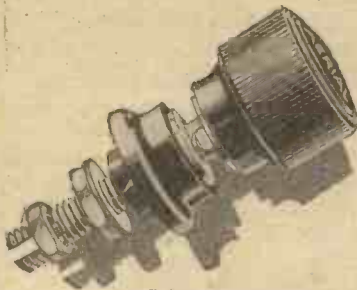
With the high magnification obtainable in the circuit I2 it is vitally essential to prevent any back-coupling, and for this reason the condensers C_{10} and C_{11} are very important. Full screening is required, the screens being indicated in I2 by dotted lines. Neither circuit I2 or I3 employs reaction, the idea being to get good quality rather than the last limit in sensitivity, although the circuit I2 is amazingly sensitive when properly made up.

For Local Work

Circuit I3 can be recommended as an excellent one for local station reception when the local station is not nearer than thirty or forty miles, and when a relatively poor aerial is used. At the same time, after dark it will pick up a number of others. The circuit will not be very selective, as there is only one tuned stage preceding the detector and no reaction on the detector is used. The reasons for the apparent lack of selectivity have already been explained earlier in the article.

Screened-grid valves have been on sale in America for some little time now, and an examination of their technical literature shows that in general it has been found that the screened-grid valve must be worked well below its maximum sensitivity in order to obtain the necessary selectivity which is so vital a matter for the American listener. Modifications of the various forms of transformer coupling are being tried, as the tuned-anode scheme gives far too low a degree of selectivity for American conditions.

THE FINISHING TOUCH



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THE LURE OF THE MOVING COIL

—continued from page 302

"fill the bill." Naturally one has the problem of high-tension supply, and this should come either from high-tension accumulators or from a mains unit.

It is hopelessly extravagant to try and use even the big dry cells to supply the amount of current required for proper reproduction with the moving-coil speaker. The "Stedipower" H.T. Unit described in the current number, forms an excellent source of supply for such a receiver.

Photographs in the present article illustrate moving-coil speakers which I have actually tested out in the laboratory and can recommend as thoroughly satisfactory instruments. The complete Rice-Kellogg outfit, showing the speaker and the amplifier, has been removed from its

"POPULAR WIRELESS"

is the WEEKLY RADIO JOURNAL that made

WIRELESS POPULAR

cabinet so as to show "the works." The baffle board has also been removed.

An idea of the relative size of a suitable baffle board and the speaker itself is shown in the illustration of the Magnavox moving-coil speaker and the baffle I use with this. It is not, however, necessary to have the baffle of flat formation, and the cabinet shown in another illustration gives fully adequate baffling.

Strong Magnetic Field

Whatever form of moving-coil speaker is used, it is necessary to have an intensely strong magnetic field before proper reproduction can be obtained, for the whole working of a moving-coil speaker depends upon the movement of a small coil carrying the varying currents from the receiver, in a narrow annular gap in which there is a highly concentrated magnetic field.

This magnetic field must be produced either by a very strong permanent magnet or by an electro-magnet. A detailed design of a permanent-magnet moving-coil speaker which

(Continued on page 352).

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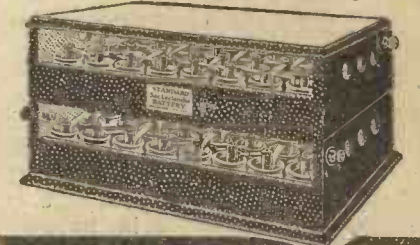
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THE LURE OF THE MOVING COIL

—continued from page 351.

gives excellent results has already been given in these pages.

Better results are obtained with an electro-magnetic field, but, of course, this takes extra current, which is a disadvantage to the man who has to get his accumulators charged and who is not on the mains. There are two kinds of excited field windings sold, one taking a fairly large current (half to one ampere) from a 6-volt accumulator and the other taking a small current at a much higher voltage either from a rectifier in the case of A.C. mains or direct from the D.C. mains, when these are available

Good Speakers

The strength of magnetic field produced in either form of electro-magnet is approximately the same, although the stronger the field the better. Personally, in the excited field type I generally use the low-voltage winding, running it from a trickle charger, such as the Ferranti, or from one of my "Stedipower" L.T. Units. It can, of course, be run quite successfully from ordinary 6-volt accumulators, but when we consider that a moving-coil speaker with a 6-volt winding requires as much current for exciting its magnet as do the filaments of a five-valve set, we see that the permanent-magnet type is bound to appeal to residents who are not conveniently placed for charging.

One illustration shows the excited field winding or "pot" obtainable for the Cromwell Engineering Company's speaker already described in these pages in its per-

manent-magnet form. Those readers who have the current available and who would like to change over from the permanent magnet to the excited field can obtain the necessary parts on application to the makers.

The Squire loud speaker also illustrated, and made up from their "kit," is a particularly good specimen of an excited field type having several original features. Personally, I place it in the very front rank. Another excellent "kit" speaker which has been greatly improved since it was first placed on the market is the Goodman.

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The Goodman is distinguished by a number of very ingenious mechanical devices and the method adopted by the makers for centring is particularly ingenious. The actual moving coil is supplied already wound and the work of making up the cone and its suspension is well within the capabilities of any ordinary experimenter.

The B.T.H. Co. are now selling a Rice-Kellogg speaker completely made up for use, but without amplifier, designed to run from a 6-volt accumulator. This speaker is identical with that used in the complete outfit already described. The Magnavox Company, who have a great experience in manufacturing moving-coil speakers, sell a 6-volt unit, as illustrated, both

with and without the amplifier. A complete Magnavox with amplifier can be obtained to run directly from the mains, the mains supplying not only the filament current for the amplifier, but also the plate current, grid bias and the exciting current for the field windings.

In addition to those speakers and kits named in the present article there are a number of others of excellent quality now available. The points which I would particularly like to emphasise are, firstly, that no moving-coil speaker can give a better reproduction than the set is capable of rendering, and, secondly, it is essential that the output of the wireless receiver should be undistorted and of adequate power.

Pure Output Essential

Moving-coil speakers as a whole are not so sensitive as the best modern cones, so that quite apart from obtaining undistorted reproduction we must have adequate volume to work them. Thirdly, remember that "the strength of the chain is in its weakest link," and that if in your receiver you have a poor resistance amplifying unit or a poor transformer the effects of these cannot possibly be corrected by the best push-pull amplifier.

To the man who wants the best quality reproduction now possible, I would say most emphatically, obtain a good moving-coil speaker, but if you are not prepared to supply adequate high-tension from H.T. accumulators or a mains unit and are not prepared to go in for "push-pull," parallel running of output valves, or a high voltage on a single output valve, then it is better to obtain one of the good modern cone loud speakers and to give up the idea of the moving-coil speaker for the time being.

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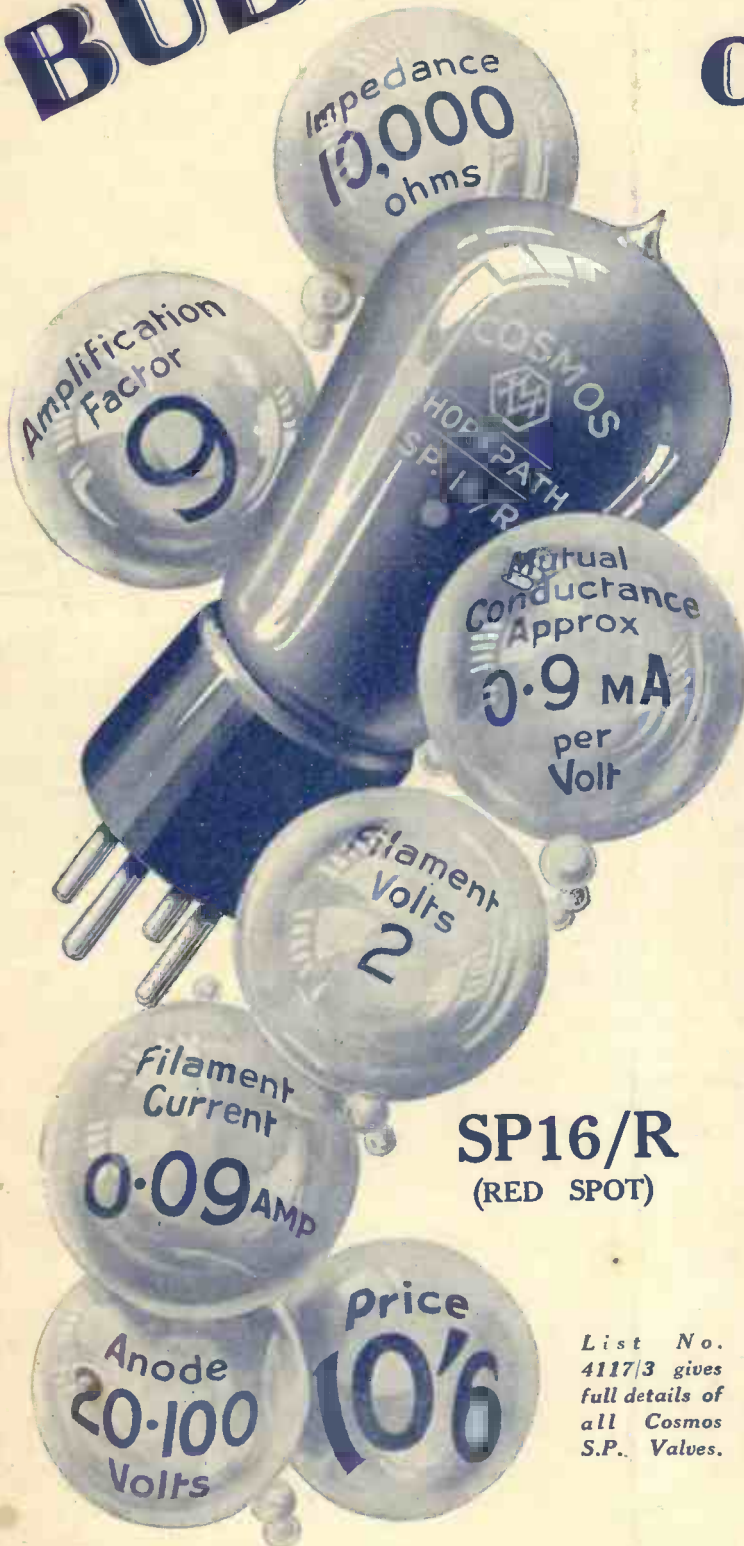
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Observe the Amplification Factor 9 and the Impedance of only 10,000 ohms. Then look at the Slope characteristic 0.9 mA. per volt. The combination of these points of character makes the S.P. 16/R (Red Spot) suitable for special purposes such as Reflex Circuits, the Oscillator Valve in a Super-Het., as an H.F. amplifier, and particularly when H.F. transformer loose coupling is employed.

In short, the Cosmos S.P. 16/R (Red Spot) is a General Purpose Valve with special characteristics.

Where current consumption is an important consideration, as in portable sets, the S.P. 16/R is quite a good Last Stage Valve, but, of course, is not capable of handling the same volume as the S.P. 18/RR, which should be used where possible. The price of the S.P. 18/RR is 12/6.

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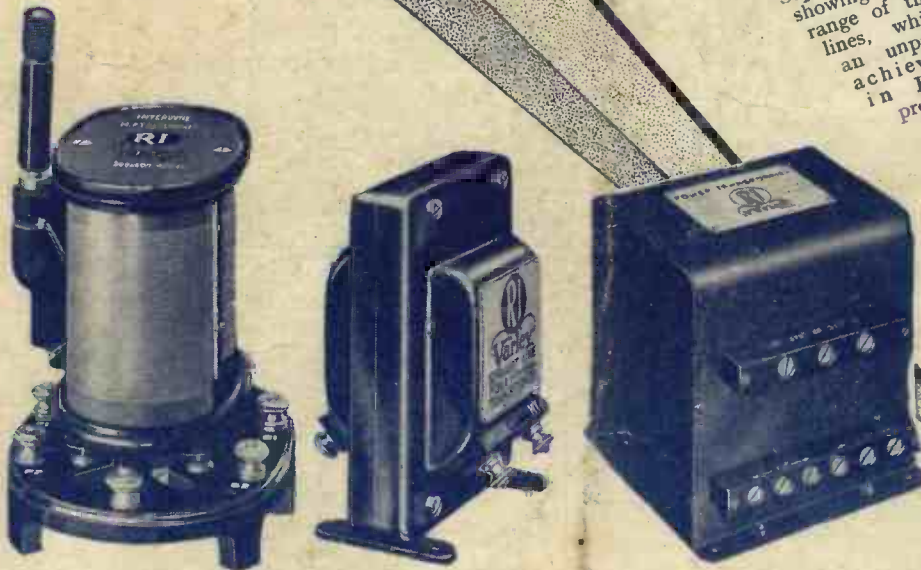
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Here is an entirely new range of components which retains that extremely high quality which is associated with all R.I. and Varley products. In the design of these components vast improvements have been made, and long outstanding difficulties solved.

The components illustrated are already available to the public, and in addition there is the Anti-Mobo, which has been specially designed for the Series Resistance Condenser method of preventing L.F. Reaction or Motor-boating, from which it gets its name.

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