

The Wireless Constructor

6^D
MONTHLY

EDITED BY
PERCY W. HARRIS. M.I.R.E.
Vol. VII. DECEMBER, 1928 No. 26.



THIS BOOK
FREE
Inside!

In this issue

"BIG BEN"
THE STRIKING
RECEIVER
DESIGNED BY
PERCY W. HARRIS M.I.R.E.



ONE DIAL TUNING



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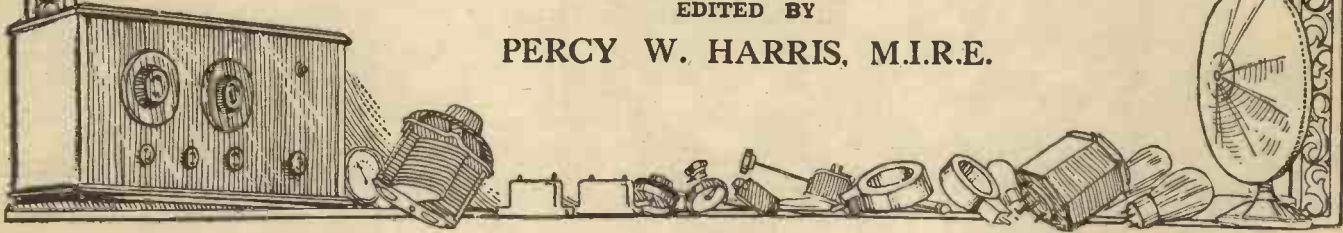
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CONTENTS

	Page		Page
Editor's Chat	89	Television and the B.B.C.	126
All About Home Construction.. .. .	91	In Lighter Vein	129
"Big Ben"	95	Chats at the Work-Table	133
All From "D.C."	103	Happenings at Savoy Hill	137
Queer Queries	106	Comments from Constructors	141
"Stedipower" Junior	107	Laboratory Notes	145
Some More Frame-Aerial Circuits	111	A Home-Constructed Double Cone Loud Speaker	148
Within the Vacuum	113	What's New	149
The "Collector" Two	115	Our News Bulletin	152
Radiogramphonics	125		

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 patentee to use the patents before doing so.

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



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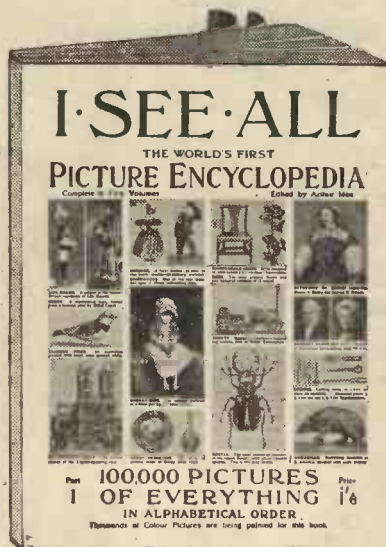
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The WIRELESS CONSTRUCTOR



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., the Editor of the "Wireless Constructor", discusses the invaluable circuit book presented free to readers this month.

WITH every copy of this issue readers will find a special free gift of "Thirty-One More Tested Circuits," prepared by the Editor. This book is entirely new, and will be found of immense use to every wireless enthusiast.

Not only are these circuits all tried and practical, but many are novel, and never before has such a remarkable selection been brought together between two covers. Regular readers will notice that the book is twice the size of "Thirty-One Tested Circuits," which was presented free to readers of the February, 1928, issue, and the presentation of such a large and expensive circuit book has only been made possible by the remarkable support they have consistently given to this journal.

Our Great Gift

Beginning with certain valuable introductory articles, "Thirty-One More Tested Circuits" tells our readers how to join up local and long-distance receivers with push-pull and parallel output valves (for use with modern moving-coil speakers, and the latest valves); how to effect the wave-change from short to long waves by means of switching; how various forms of high- and low-tension mains units are wired up, both for alternating and direct current mains; how to build a loud-speaker control unit with output filter, tone control and volume control; how to add additional taps to any existing mains units; how to charge high-tension accumulators from either A.C. or D.C. mains; how to introduce jack

switching so as to cut out the last low-frequency valve; how to make a very highly selective yet simple receiver; how to make a very economical and powerful receiver; and many other valuable features.

The explanatory text under each diagram is much fuller than in our previous circuit book, the diagrams are larger and clearer and the scope of the whole publication much broader. The valuable information contained

in its pages has previously been unobtainable at any price in book form, and altogether it represents the finest gift yet made to WIRELESS CONSTRUCTOR readers.

New Series for Constructors

Every owner of the new circuit book should make a special point of beginning the new series of articles on this book due to commence in our next issue. Each month the Editor

ORDERS FROM HEADQUARTERS



A radio section of the Royal Corps attached to the 2nd Division working their transportable wireless station in a country lane near Pulborough.

The Editor's Chat—continued

will take one particular circuit, or group of circuits, and discuss its practical applications in full detail, while from time to time constructional articles (complete with diagrams and photographs) on some of the more important circuits in the book will appear. This feature alone should win many new readers for the journal, but in addition to this series of articles a number of remarkable new sets will be described in early issues, representing the outcome of the most up-to-date researches in constructional design. Just as the WIRELESS CONSTRUCTOR was the first journal to show its

readers how to build a mains unit to supplant the accumulator on alternating current mains, so it has been the leader in many other directions: Just as that reader who has alternating current mains available in the house is being adequately catered for in the WIRELESS CONSTRUCTOR, so will be the listener who has only direct current mains.

All From D.C. Mains

In the present issue an important article on circuits for running receivers entirely from the D.C. mains is published, and next month full constructional and photographic de-

tails will be given of a remarkable new receiver that has just passed our tests, and which will operate entirely—low-tension, high-tension and grid bias—from a lamp holder on direct current mains. So perfect are the results obtained by this set that when a pair of telephones is connected to the loud-speaker terminals and no signals are being received from a broadcast station, no more hum can be heard than with a set using batteries throughout.

A Timely Tip

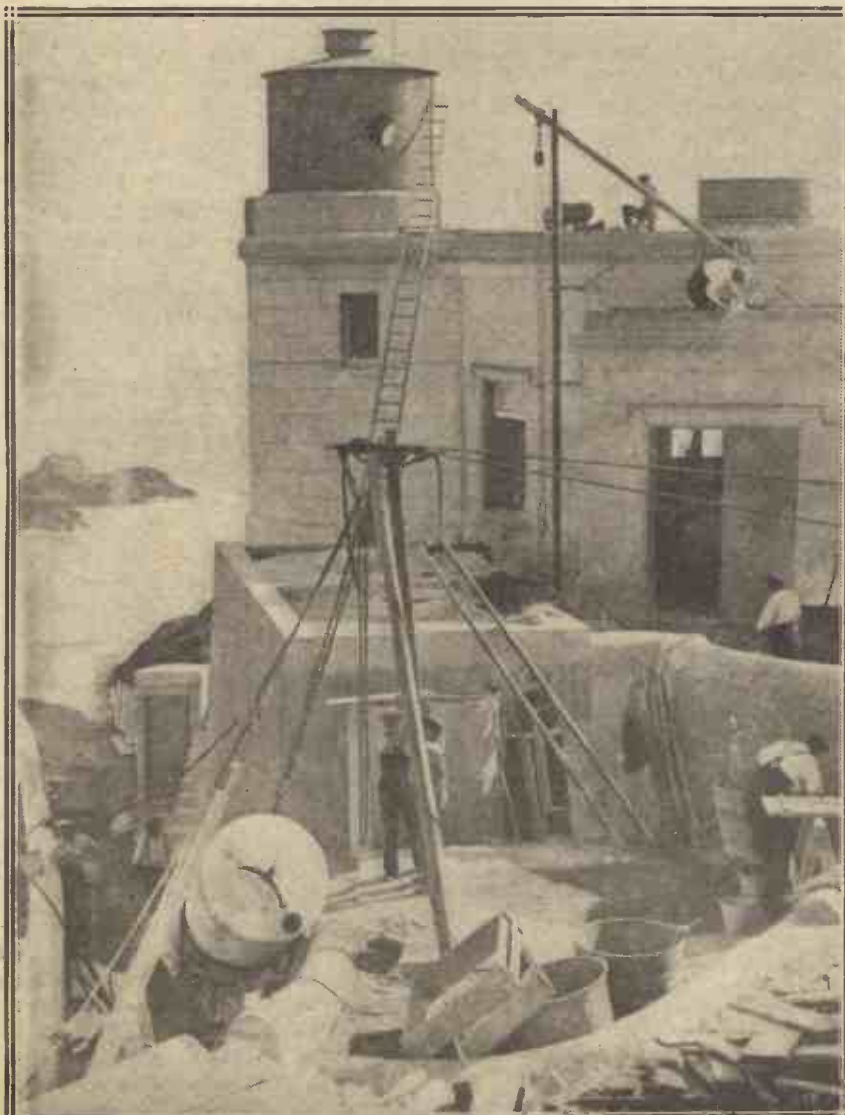
Readers to whom this issue of the WIRELESS CONSTRUCTOR is the first introduction to our journal are recommended to place a regular order with their newsagent for future issues in order to avoid disappointment. Arrange with him to keep your copy each month on the day of publication and do not rely upon picking it up from any bookstall you happen to pass. No bookstall manager or newsagent can tell exactly how many copies to reserve for chance customers, and you may often be disappointed if you rely on this method of purchasing. Book your copy in advance and you will be sure to have it!

 * TESTING CONDENSER *
 * INSULATION *
 * FROM A CORRESPONDENT. *

FIXED condensers are worse than useless in a receiver unless their internal insulation is sound. This is specially important in H.T. battery shunting condensers, and those who have electric supply mains available can test any doubtful condensers in the following way.

Cut one of the leads to a lamp, leaving the other lead intact, and connect the ends of the cut lead to the terminals of the condenser. The lamp and condenser are then in series, and when the switch is put on, the lamp should *not* light, if the condenser dielectric is sound. Any fixed condenser should be able to withstand safely the 220 volts of the mains, so that no damage will result from the test. In the event of a fault in the dielectric, and a consequent contact between two adjacent plates of the condenser, the lamp will light, acting as a safety resistance and preventing a short-circuit in the mains.

A NEW RADIO BEACON



At work on the Start Point (Devon) lighthouse which is one of seven stations to be erected in connection with a new radio beacon scheme. The turret on the left is for the fog signalling apparatus.



ALL ABOUT HOME CONSTRUCTION

Some practical notes on the assembly of radio sets, written especially for new readers.

BY THE EDITOR.

THIS article is written for the man who has not yet built his own wireless receiver, who has perhaps purchased a WIRELESS CONSTRUCTOR for the first time, or who has had his curiosity and interest aroused by the undoubted pleasure which thousands of people obtain by indulging in this extremely popular hobby.

Now, although thousands of wireless enthusiasts have found home construction and wireless experimenting the most fascinating of all hobbies, there are still thousands more who would take it up if they only knew how to start. "I could not build my own set," you may say. "I am not clever enough with my hands."

Set Assembly is Easy

Don't you believe it! Wireless set construction has been so simplified that it comes within the scope of any

intelligent man or woman or boy. There are degrees of skill, of course,



Two tools which set-makers find invaluable. (Left) A pair of flat-nosed cutting pliers, and (right) round-nosed cutting pliers. The latter are very useful for wiring a set.

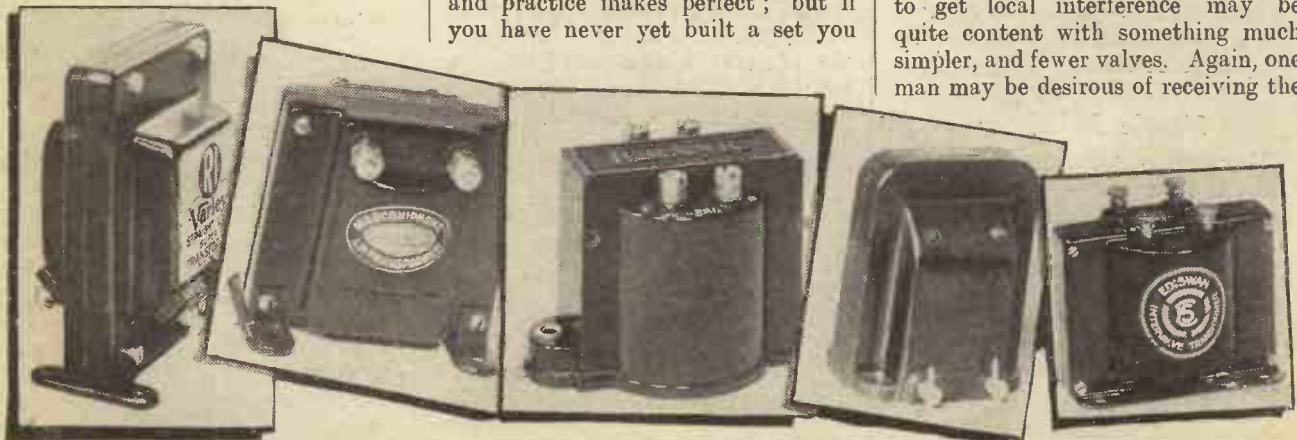
and practice makes perfect; but if you have never yet built a set you

can learn how to do it in no longer than is necessary to read this article.

You may smile incredulously, but thousands of readers of this journal who indulge in their hobby will endorse my statement, if you ask them. The WIRELESS CONSTRUCTOR is the practical home constructor's journal, and its sole object is to provide such enthusiasts with regular up-to-date designs to suit all needs, to give them all the constructional guidance they need, together with essentially practical articles, test reports, descriptions and modern circuits.

Sets for all Purposes

Every month several designs are published, not because those previously issued have immediately become obsolete, but because requirements vary from time to time. One man may require a highly selective multi-valve set, while another who is not sufficiently near any one station to get local interference may be quite content with something much simpler, and fewer valves. Again, one man may be desirous of receiving the

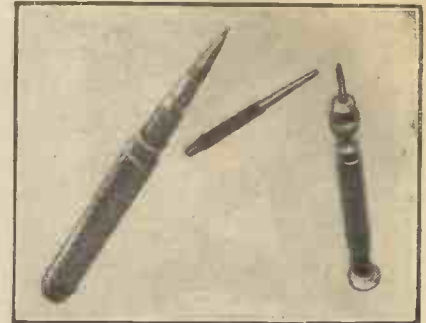


Here are five well-known makes of L.F. transformers, and you will see that they vary both in shape and in the positions of their terminals. Further, the placing of their mounting "feet" or holes differ. Allowances for such divergencies are made in "Wireless Constructor" set designs.

All About Home Construction—continued

local station only at good strength and high quality, while another may not be particularly interested in programme listening but may desire to switch from one station to another. In this way he may compare reception results from different countries, study the most interesting phenomenon of fading, get the maximum out of a single valve, see what degree of sharpness is obtainable without sacrificing quality, and, in fact, study the hundred and one different aspects of wireless reception.

The three-valve set consists of a detector and two stages of low-frequency magnification, and there are other features in it which will make a strong appeal to the more experienced constructor, but this is not to say that this is the only successful way of building a three-valve set. If you peruse our correspondence columns regularly, you will find dozens of letters from delighted readers who have built the "Radiano" Three, where the change of wavelength is obtained by lifting the lid



Scribers (sharp-pointed instruments for panel marking) and small screwdrivers are very useful gadgets.



Ratchet and Archimedean screwdrivers enable screws to be driven home very quickly and easily.

Some designs are published because they have a very wide appeal, others because they illustrate a new principle just revealed, while still others indicate how to use old parts in a new way, perhaps with the addition of one or two of the latest components. Every reader will naturally not want to build every set, but it must not be forgotten that wireless as a hobby is unique in this. All or some of the component parts of any set can often be re-arranged with little or no additional expenditure to give some entirely novel results.

Simple Switching

Then, again, take the question of individual preference. In this issue you will find a three-valve set, strikingly novel in several of its aspects, in which the change from the wave-band between 200 and 600 metres up to that between 1,000 and 2,000 is effected simply by moving a switch. In order to do this there is a slight additional complication to wiring, but many home constructors and set users are happy to go to a little additional trouble in order to obtain this advantage.

and changing the interior coils. It is a little more trouble to do this, but then the set is a little simpler to build!

What the Wiggles Mean

So you will see that with the variety of requirements, the infinite number of possible combinations of circuits and parts and the steady progress in the art, a journal which really caters for home-constructional interest must publish a regular series of designs. Do not run away with the idea that it is no good building a set this month because next month's issue will render it obsolete. We do

not all like the same kind of set any more than we all like the same kind of car or the same brand of tobacco. If we all liked the same kind of set it would be a very dull world.

"I understand all that!" you may say. "But just how do I start about this hobby that you are extolling so highly?" "I don't understand all those wiggly lines and things. It is all so much Dutch to me."

You Can Start To-day

Fortunately there is no need to know anything about these wiggly lines when you are beginning home construction. They are called "theoretical diagrams," and represent a kind of technical wireless shorthand in which a curling wiggle represents a certain kind of coil and a zigzag wiggle a particular kind of resistance. You will find them very interesting and

A panel being marked out with a rule and scriber. Scribing should be carried out on the back of the panel in order not to spoil its appearance.



All About Home Construction—continued

helpful later, and not half so difficult as they appear to be.

Incidentally, this general type of hieroglyphic is used in other walks of life, for we all know the triangle which represents a four-wheel-brake sign, the circle which indicates the ten-mile limit, and the various road signs indicating level-crossings, sharp bends and the like. Never mind about the hieroglyphics for the time being. First of all you want results and you can leave reasons till afterwards.

Put very briefly, a wireless set consists of a box, a supporting framework, sundry component parts, and



The panel should be laid on a piece of paper or cloth, and the drill held perfectly straight.

the wires which join these parts together. When I first began to make my own wireless sets, just twenty years ago, we had to make practically every part ourselves. There were no wireless dealers, for the simple reason there were no ready-finished parts to deal in, and, of course, there was no broadcasting—only signals in Morse. Nowadays, there is no need whatever to make a single component part yourself.

No Need to Solder

All you have to do is to purchase the various pieces—and they are by no means as expensive as you might imagine—assemble them in a certain way, mount a few of them on a panel by the simple process of drilling one or two holes and screwing them in place with locknuts, and then join the parts together by means of suitable wires. In many designs it is not necessary to make a single soldered

connection, and it is worth pointing out that the WIRELESS CONSTRUCTOR pioneered the method of assembling a wireless set without soldered connections.

The WIRELESS CONSTRUCTOR, in its published designs, tells you first of all the parts that are needed to build the particular set; secondly, the dimensions of the baseboard and panel; thirdly, just where to drill the few holes that are necessary for mounting the parts; fourthly, just where to place the other components on the baseboard; fifthly, where the wires go that join them up; and, sixthly, how to adjust and operate the set so as to get the best results.

Few Tools Required

The tools required are very few, although you may like to add to them from time to time. You will need, first of all, a screwdriver; secondly, a pair of wire-cutting pliers; thirdly, a hand drill capable of taking drills up to $\frac{3}{8}$ in. diameter, together with very few drills of assorted sizes; and, fourthly, a small scratching tool, known as a scribe, which is obtainable for a few pence at any tool shop.

In addition, it is as well to have a metal rule some 12 or 18 in. long marked off in inches; and a fretsaw is very useful, although not often needed. Add to this a smooth file and a soldering iron, and your outfit is about complete. If you make up such a design as the "Radiano" Four described last month, or the "Radiano" Three described in envelope form, you can even dispense with the file and soldering iron.

An assortment of twist drills is useful, but the ones actually needed

in most work are comparatively few in number. The most useful of all is the $\frac{3}{8}$ -in. drill, for the few components which are mounted on the panel are nearly all of what is termed the "one-hole-fixing" variety, and a $\frac{3}{8}$ -in. hole

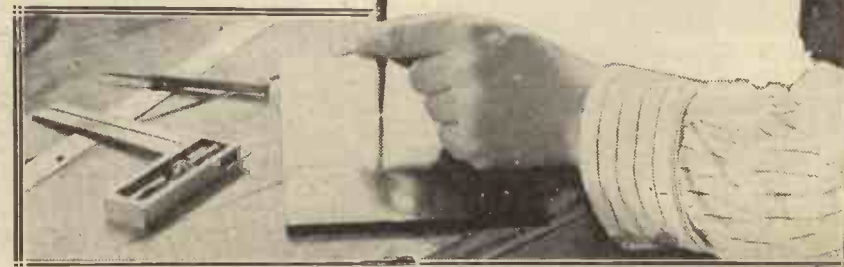


An angle bracket is necessary to provide extra support for the panel should a number of components be mounted on this.

has been standardised for these. What are known as a 6 B.A. clearance drill and a 4 B.A. clearance drill will do most of the rest of the work for you.

From time to time articles dealing with such phases as soldering, drilling, cutting, etc., appear in this paper, and every month you will find a section called "Chats at the Work-Table," in which an experienced contributor gives you many valuable hints. A set with properly soldered connections looks

The position of a hole in a panel should be marked by means of a cen re-punch, a gentle tap on this with a hammer being all that will be needed. The scheme greatly facilitates drilling, as it makes it easier to centre the drill.



All About Home Construction—continued

very neat, and it is well worth taking a little trouble in learning how to do it, but do not let any absence of knowledge of how to solder deter you from setting up home construction.

In addition to the actual tools, you will need an assortment of wood



If you solder see that you keep the iron clean.

screws of the round-headed variety, for securing the components to the baseboard; and if you have the space and facilities for erecting a smooth-topped bench, so much the better—but do not forget that nine home constructors out of ten use the kitchen table in the evening!

Factory and Home-Made

It is as well to point out here the essential difference between factory-built wireless sets and home-construction designs. Externally, and in operation and results, a well-designed and well-built home-constructor's set is in every way the equal of the best commercial set (and better than a good many, as a large number of readers can testify). Internally, however, there are often very considerable differences, because the professional set-builder can use parts, methods and machinery which are not available to the home constructor.

The professional set-builder also knows exactly what components will be used and he can specify certain ways of using these combined with other parts, with the full knowledge that they, and they alone, will be used. It is not desired that there should be any

individuality of expression on the part of the man who actually makes the set.

If it were the policy of the WIRELESS CONSTRUCTOR to design sets for the use of certain specified components only, if every home constructor had presses and metal working tools, lathes and such facilities available, then our designs would be quite different in appearance, although the results would not greatly differ. It is always borne in mind in working out the designs in the WIRELESS CONSTRUCTOR laboratory that the British wireless enthusiast is particularly fortunate in having a wide range of excellent components to choose from.

Varied Makes

It would be manifestly unfair for a journal of the influence and circulation of the WIRELESS CONSTRUCTOR to bring out a set which would only work with one particular make of low-frequency transformer when there were other equally good makes obtainable. Transformers, to take one example of a wireless component, differ considerably in their external make-up. Some are larger than others, some taller than they are broad, and others broader than they are tall.

The fixing holes differ in position, the terminals do not always come in the same part of the casing; in fact, there are all those differences

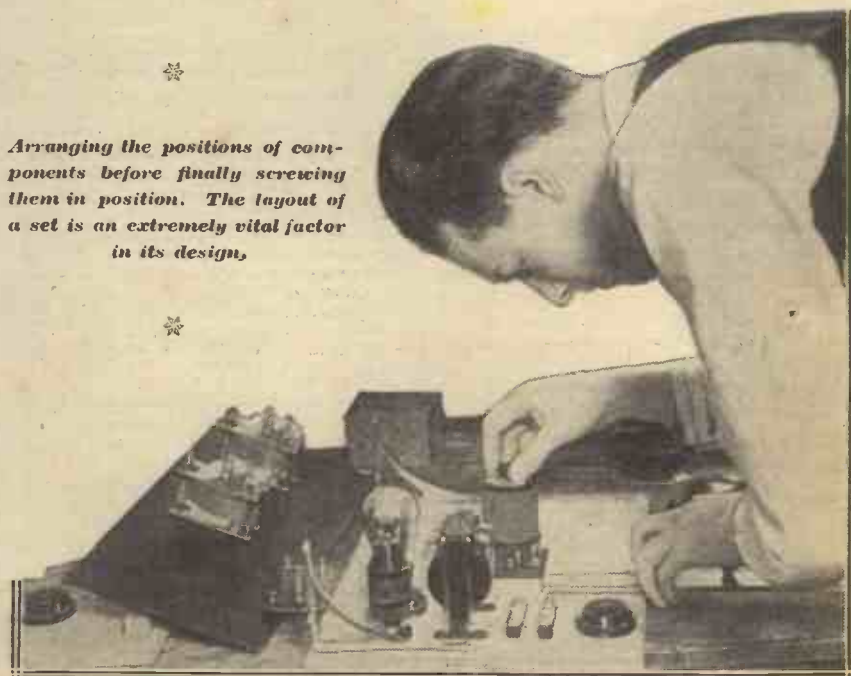
which enable the manufacturer and the designer of the transformer to express his own ideas in a good mechanical and electrical form. If you examine some of the commercial sets you will find the parts so closely arranged that it would be absolutely impossible to replace the particular low-frequency transformer used by an equally good one of another make, as space would not permit of it.

Interchangeable Parts

Now examine a WIRELESS CONSTRUCTOR design. Obviously, when making up the model set some definite make of component must be used—one cannot put every make in every set—but you will always see that there is sufficient space to put a different make if you so desire. Similarly with variable condensers, radio-frequency chokes, resistance-capacity-coupling units, and the like. When you are building a set to a WIRELESS CONSTRUCTOR design you may have a good low-frequency transformer on hand, which is not the actual one illustrated in the photograph. Provided it is a high-quality instrument you can use it in place of that which is shown, with the full assurance that the design will work well. In a very few cases, where certain particular components are needed and others will not work,

(Continued on page 166.)

Arranging the positions of components before finally screwing them in position. The layout of a set is an extremely vital factor in its design.





"BIG BEN" THE STRIKING RECEIVER

—by—
PERCY W. HARRIS MIRE

A universal three-valve set, for use on long or short broadcast waves and suitable as well for real short-wave reception down among the twenties and thirties.



"BIG BEN" is one of several wireless designs evolved in response to readers' requests expressed in replies to my recent invitation. In addition it contains a number of features of interest, which will be described later, having important bearing upon high quality reproduction. It is called "Big Ben" not only because its performance is big—and "striking"—but because, with its short-wave feature, it can "carry" the note of the famous Westminster bell into the most remote corners of the Empire.

"Universal" Set

It can, in fact, be truly termed a "universal" receiver, for normally it will change in a moment from the

lower to the upper band simply by operating a switch, while when it is desired to receive the very short waves (down to about 20 metres) it is but the work of a few seconds to lift the lid and replace the two coils used for ordinary reception by a special coil for the very short waves. Alternatively it can be arranged so that, without lifting the lid, the change-over switch turns reception from the 200 to 600-metre band down to the very short wave-band.

A long study of the problems connected with low-frequency magnification has shown me that no matter how straight the curve given by a transformer, no matter how horizontal the curve given by resistance-capacity coupling, the combination of either, or

even one of each, may often result in very poor quality. For example, the combination of two perfectly good transformers may give not only distorted reception, but even result in a continuous audio-frequency howl.

First-Class Quality

There are a number of ways of overcoming this difficulty with two transformers or with a resistance unit and a transformer, particularly when the designer knows that certain picked combinations will always be used. It is, however, the policy of the WIRELESS CONSTRUCTOR to work out and publish designs of the widest possible utility—that is to say, designs that can be successfully worked with a large number of different makes

COMPONENTS REQUIRED.

- 1 Panel, 16 in. × 8 in. × $\frac{1}{4}$ or $\frac{3}{8}$ in. (Ripault). (Becol, Radion, Ebonart, Trolite, etc.)
- 1 Cabinet to suit, with 9-in. baseboard (Pickett Radiola Model de Luxe). (Raymond, Camco, Caxton, Maker-import, Gllbert, Bond, etc.)
- 2 Panel brackets (Peto-Scott). (Magnum, Kay Ray, Camco, etc.)
- 1 Variable condenser, .0005 mfd. (Formo). (Lissen, Ormond, Jackson, Peto-Scott, Dubilier, Bowyer-Lowe, Igranic, Raymond, Cydon, etc.)
- 1 Variable condenser, .000 mfd. (Formo). (Lissen, Ormond, Jackson, Peto-Scott, Dubilier, Bowyer-Lowe, Igranic, Raymond, Cydon, etc.)
- 2 Push-pull on-and-off switches (Lotus). (Lissen, Benjamin, etc.)
- 1 Double-pole, double-throw lever switch (Utility).
- 2 Vernier dials (Lissen). (Igranic, Ormond, Bowyer-Lowe, etc.)
- 2 Rectangular bases for 6-pin coils (Colvern). (Lewcos.)

- 1 6-pin coil for 200-600-metre band (Colvern "Master Three" coil or Lewcos magnetic reaction aerial).
- 1 6-pin coil for 1,000-2,000-metre band (Colvern "Master Three" coil or Lewcos magnetic reaction aerial).
- 1 Lewcos A.M.S.4 short-wave coil or Colvern short-wave coil.
- 3 Valve holders (Benjamin). (Lotus, Redfern, Magnum, Burndept, Bowyer-Lowe, W.B., Igranic, etc.)
- 1 Fixed condenser, .0002 (Lissen). (Dubilier, Igranic, Graham Farish, Mullard, T.C.C., Atlas.)
- 1 Fixed condenser, .0003, with clips (Lissen). (Dubilier, Igranic, Graham Farish, Mullard, T.C.C., Atlas.)
- 2 Fixed condensers, 2 mfd. (T.C.C.). (Dubilier, Ferranti, Lissen, Hydra, Mullard, etc.)
- 2 Fixed condensers, 1 mfd. (T.C.C.). (Dubilier, Ferranti, Lissen, Mullard, Hydra, etc.)
- 1 Grid leak, 4 megohms (Dubilier). (Lissen, Mullard, Igranic, etc.)

- 1 Radio-frequency choke (Lewcos).
Note.—If it is intended to use this set for short waves, then a choke should be chosen which will go down to short waves. The Lewcos and the Wearite are two which are particularly good in this direction. For the ordinary wave-lengths any good make will give satisfaction.
- 1 R.C.C. unit (R.I.-Varley type B). (Mullard, or other wire-wound type.)
- 1 High-quality L.F. transformer (Igranic type J, 3-1). (Ferranti, R.I.-Varley, Lissen Super, Pye, Marconiphone Ideal, Brown type A, etc.)
- 1 Output choke of good quality (Pye 20-henry). (R.I.-Varley, Ferranti, etc.)
- 1 Wire-wound resistance with holder, value not critical, but 20,000 ohms is quite satisfactory (Ferranti). (R.I.-Varley, Lissen, Igranic, etc.)
- 1 Terminal strip, 12 in. long with 12 terminals.

"Big Ben"—The Striking Receiver—continued

of components, rather than with just one or two. For this reason the combination of one resistance-capacity coupling unit and one transformer is more often used, because it is largely immune from tendencies to howl.

At the same time, with the steady improvement in loud speakers, greater perfection in valves, and progress in resistance-capacity and transformer designs, it is not sufficient that a set should be merely stable on its low-frequency side. We want to know that the combination of coupling units chosen will give really first-class quality in all conditions.

Battery Coupling

We must seek then to eliminate those troubles which give rise to distortion in low-frequency stages. Careful investigation spread over many months shows, as indeed has been foreshadowed in the WIRELESS CONSTRUCTOR, that the battery coupling is the most grievous of all these causes.

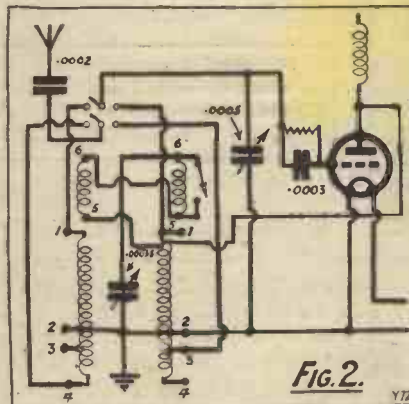
Battery coupling should really be termed "high-tension supply coupling," for it occurs not only with batteries and accumulators, but even more so with mains units. Indeed, these latter give far more trouble than many care to admit.

Expressed more technically, the trouble arises from the existence of a common resistance in the plate circuit

duce distortion, which is often blamed to valves, loud speaker—in fact, anything but the true cause.

Need for Purity

The reader should not conclude from what I have just written that battery coupling, or rather distortion arising from it, is inevitable in receivers. Many show no such effect noticeable to the ear, while others



show it very badly. This explains the mystery that I am occasionally asked to elucidate, as to why one set, made with what is known to be an inferior transformer, gives better results than another made with a high quality transformer. The explanation is simple. In the receiver which sounds

and this year's loud speakers are distinctly better than any we have had previously. Better valves and better transformers mean greater magnification, and greater magnification means a greater tendency to battery coupling troubles, while better loud speakers mean that we should all the more feed them with good quality signals.

Simple Wiring

Now if you will examine the theoretical circuit of "Big Ben" you will see that it appears to be a conventional detector with two stages of low-frequency, capacity-controlled reaction being used; but it differs from most arrangements in having in the anode circuit of the detector valve an additional high-resistance shunted on the coupling-unit side by a large condenser to negative L.T., together with a choke in the anode circuit of the last valve combined with a large condenser to form an output filter.

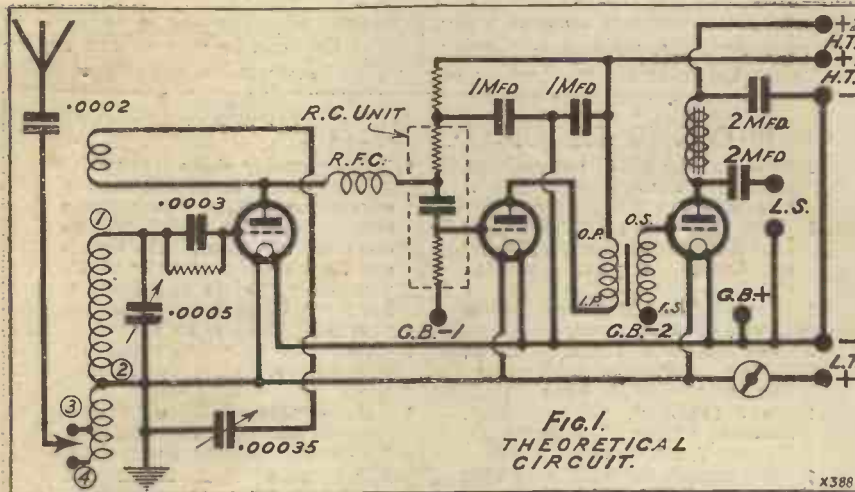
The wiring is made as simple and direct as possible, and a high-grade, radio-frequency choke is used in the detector circuit. Both the resistance-capacity coupling unit and the transformer are also high grade-instruments, and when used with modern valves, not only the magnification but the quality are remarkably good. The combination of the output transformer and the anode-feed resistance assures freedom from battery coupling troubles on dry batteries, accumulators or H.T. mains units.

It will also be noticed that large condensers are shunted across the H.T. supply, thus compensating to some extent for the inadequate shunting capacity which is a feature of some lower-priced mains units.

Efficient Switching Scheme

But the feature which will have perhaps the widest appeal is the particular switching scheme adopted for rapid change-over from one band to the other. Looking at the front of the panel it will be seen that there is a lever switch on the left, while immediately below this there is a small push-pull switch.

Another push-pull switch is situated on the extreme right. This last is the on-and-off switch controlling the filaments, while the push-pull switch immediately below the lever is only used occasionally—chiefly when one is using very short wave-lengths. The two dials are used for tuning



of all the valves, the voltage drop across this common resistance serving to give a back-coupling between stages. If this is very strong, audio-frequency howling will result. If it is not strong enough to give such a howl (which means continuous L.F. oscillation) it may still be sufficient to pro-

duce the better of the two the effects of battery coupling are negligible.

You may think I am over-emphasizing the point about battery coupling, but it should be remembered that this year's transformers are much superior to last year's; this year's valves give greater magnification than last year's,

"Big Ben"—The Striking Receiver—*continued*

and reaction, both being of the vernier type, making adjustment easy and certain.

The switching scheme is quite novel, and has several special merits. A number of schemes have been tried from time to time, some in the nature of compromises giving none too sharp

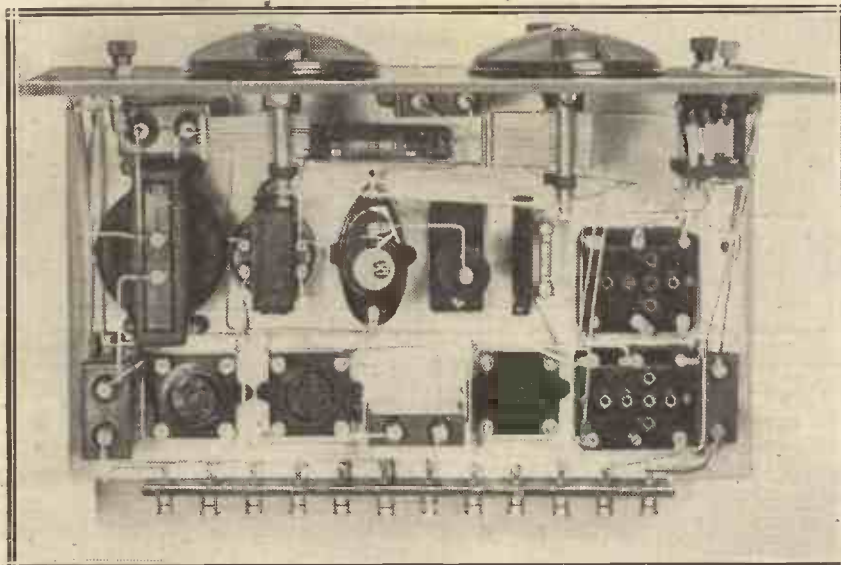
one wave-band to another, two bases are used and both coils are in position at the same time. The advantage of using standard six-pin coils is not only that they are easily obtainable, but when desired they can be lifted out and replaced by a special short-wave coil or coils.

to another, and the other changing over the grid windings. The reader may now ask, what about changing over the reaction winding? The answer is simple.

In the scheme used in "Big Ben" the two reaction windings are joined in series and thus do not come into the switching at all! When the particular coils specified are used it will be found that easy and smooth reaction is obtainable over the whole range, but in order to obviate any possible difficulties which might arise with home-made coils having reaction windings not quite of the correct values, a little shorting switch is placed on the front of the panel so that, when desired, pulling it out short-circuits the long-wave reaction winding when one is using the lower-wave coil.

An Advantage

In addition, this switch, by short-circuiting the reaction terminals on the base nearest the panel, enables a special short-wave coil to be used alone in the socket nearest the terminal strip, and also enables a single coil to be used if the builder does not desire to use the set for two wave-bands. In this way it is only necessary to buy the coil for the wave-band desired, leaving the other



A plan view of "Big Ben." Note the anti-motor-boating device between the two variable condensers and close to the panel.

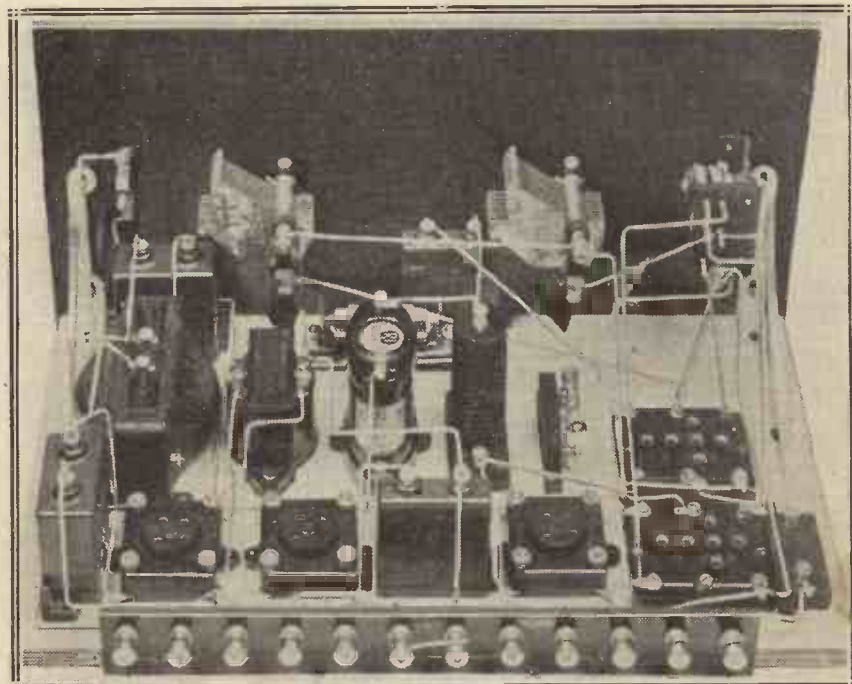
tuning, and many of them requiring special coils.

In view of the large demand for sets with really efficient wave-change switching, experiments were made in the WIRELESS CONSTRUCTOR laboratory to evolve a scheme which could utilise a coupled aerial giving reasonable selectivity, a really efficient grid winding and the simplest possible switching for both efficiency and saving of space. Some of the sets with wave-change switching are ridiculously large, which means needlessly expensive cabinets and panels. It will be noticed that "Big Ben" includes not only the wave-change switching scheme, and the coils, but also an output choke and the special device already mentioned, without unduly crowding a cabinet with a standard 16 in. by 8 in. panel.

Wave-Change Method

And now to examine the switching scheme in detail. It will be noticed that standard 6-pin coils are used on standard bases, but instead of using one base and pulling out one coil and replacing it by another every time it is desired to change from

An anti-capacity double-pole double-throw switch is used, one arm changing over the aerial from one coil



The set has two coil holders, one for short- and one for long-wave reception, the panel switch controlling the two coils.

"Big Ben"—The Striking Receiver—continued

base in position in case it is desired to use two coils later.

A third point in the design is that the controls are so arranged that they can be fitted into the oval of a handsome cabinet when it is desired to make a self-contained receiver. The cabinet shown in the illustration can be used to include not only the set but all the batteries, or, if so desired, the "Stedipower" Units for L.T. and H.T., or the "Stedipower" L.T. Unit and H.T. batteries, an accumulator and a mains unit, or any other combination the reader likes.

All From Mains

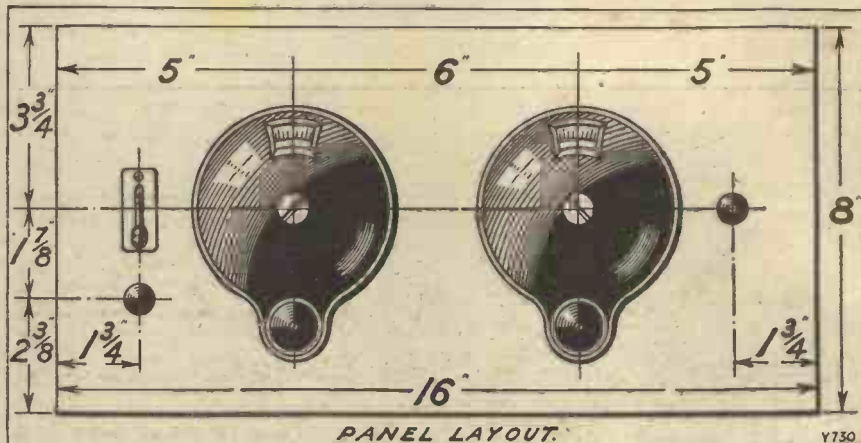
The set illustrated has been joined up to run entirely from the mains, thus being a true "all-electric" set of high quality.

At the same time, many readers will not find it convenient to choose so large a cabinet, so the set is made so that it will slide into any standard 16 in. by 8 in. cabinet of standard depth.

Before beginning the constructional work, a few words as to the capabilities of this set. On the 200- to

600-metre wave-band it will, with an outdoor aerial, bring in quite a number of stations quite free from the local, and will challenge comparison in sensitivity, selectivity and quality

from the local and the alternative station, and will generally bring in several others, for reaction control is extremely smooth, enabling us to use the detector in a very sensitive



with any set consisting of detector and two low-frequency stages, while having considerably sharper tuning than most.

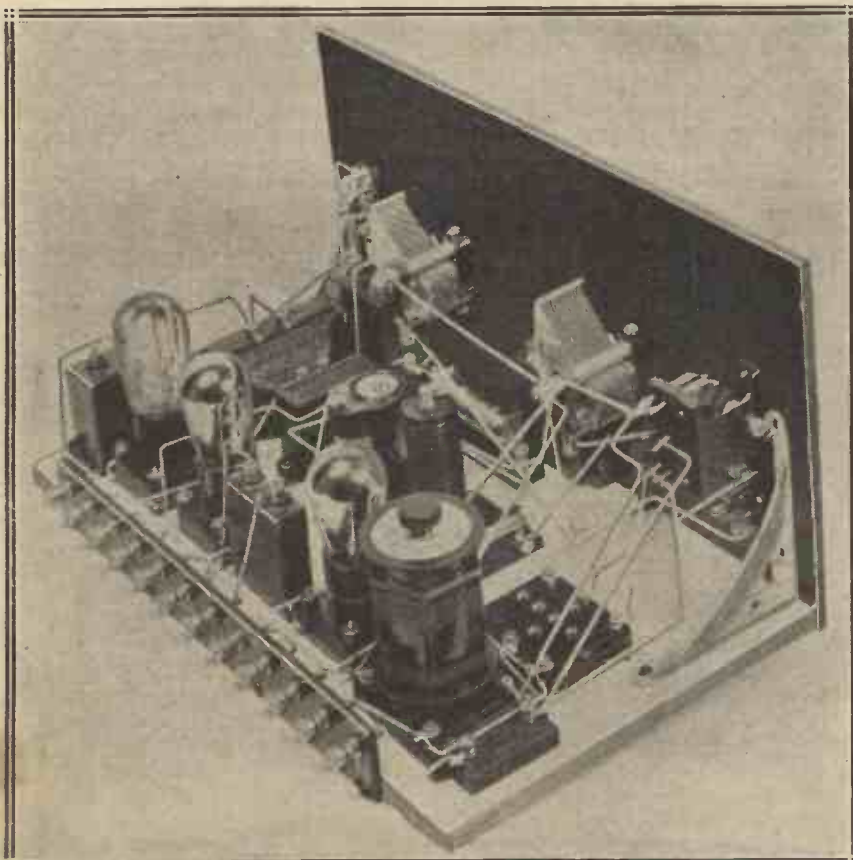
On a small indoor aerial it will give splendid loud-speaker signals

condition. On the upper wave-band, Hilversum, Radio-Paris, 5 X X, Motala, Königswusterhausen, and a number of others are audible at good strength on the loud speaker. 5 X X and Radio-Paris particularly are easily separable.

Short-Wave Successes

On the special short-wave coil, 2 X A D has frequently been received at full loud-speaking in quite a large room, the set being remarkably free from hand-capacity effects even on the short waves such as this. P C J J can easily be mistaken for the local, and, in fact, any of the leading short-wave stations can be picked up quite easily when conditions are favourable (as they are nearly every night during the winter months). It is, indeed, a first-class, sensitive, selective and high-class quality receiver, and will do all that, and indeed more than, we have been led to expect from a soundly designed three-valve set.

Constructional work has been so arranged that those who desire to avoid soldered connections can cut the number down to very few. This might indeed be called a connoisseur's set, as the attempt has been made to make the set worthy of the attention not only of the beginner, but of the much more skilled home constructor. A fairly wide range of alternative components is available, but the reader is advised to select parts of high quality throughout so as to do full justice to the



The detector end of the set, showing the ultra-short-wave coil in position—ready for the reception of 2XAF, PCJJ, and other famous short-wavers.

"Big Ben"—The Striking Receiver—*continued*

design. A few shillings extra in getting good quality parts will be well repaid by the results obtained.

The panel should first of all be laid out and drilled, the two condensers being of the one-hole-fixing variety, as also are the push-pull switches.

is much safer than to attempt to find the positions by measurements, as if an error is made the appearance of the front panel may be spoilt.

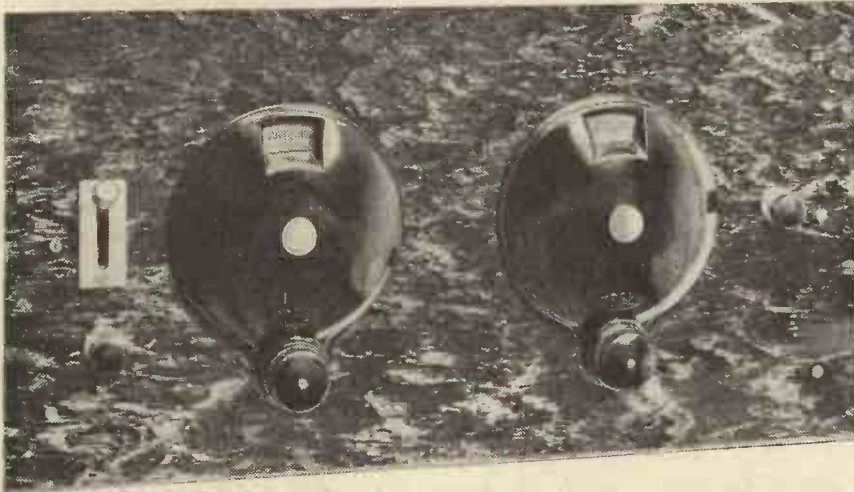
Although it is not essential, it generally adds to the rigidity of the structure to drill three small holes

After the switches and the variable condensers have been mounted on the front panel, it can be stood temporarily against the front edge of the baseboard and the other parts laid out. Follow as closely as possible the design shown, as there is a distinct reason for the choice of position for every one of the components, and unless this general arrangement is used your wiring may be complicated. Note particularly the wiring from the double-pole double-throw switch to the coil bases.

Wiring-Up

When wiring up proceed systematically with the work, beginning at the aerial end and wiring up the switch and bases first of all. Keep the coils handy and insert them in their sockets from time to time to see that your wires do not foul them.

Now a few words about the choice of components and alternatives. The variable condensers and vernier dials can be of any good make, but in view of the fact that the receiver will often be used for very short waves be careful to choose variable condensers which have good sound contacts between moving plate and terminals. While theoretically the switching scheme shown in this set can be used with



The panel of "Big Ben" is neatly laid out, and can be used in the ordinary square cabinet or in one with a vignette as shown in the heading photograph.

The lever switch requires a slot to be cut together with two holes, but this will be found quite simple if the front plate is detached and used as a template to cut out the slot and find the position of the two fixing holes.

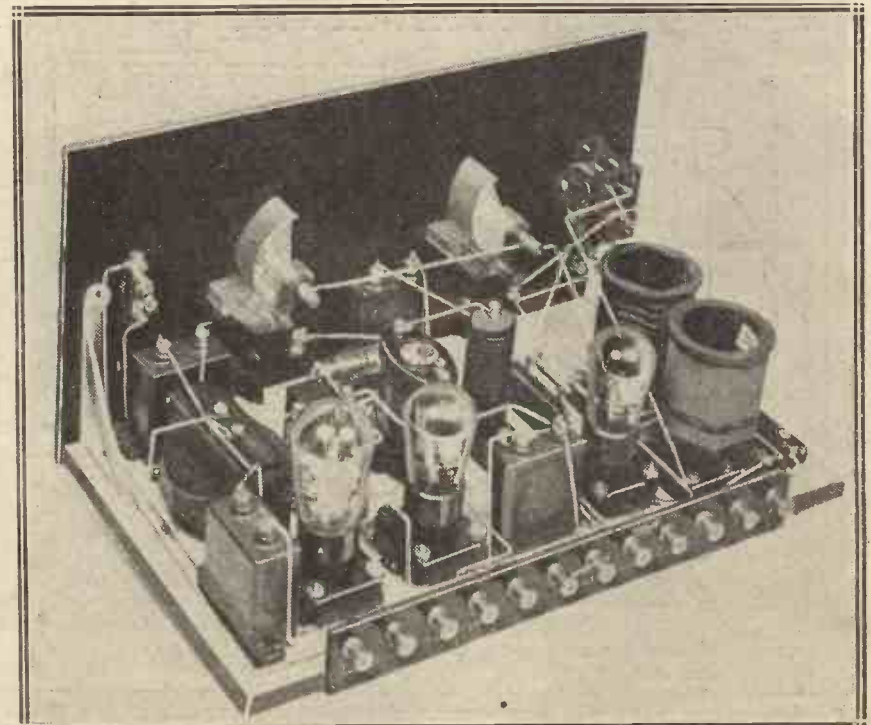
The slot can be cut by drilling a number of holes and then breaking away the webs with a file. It does not matter if this hole is a little rough, as it will be covered, front and back, by the front plate and the switch itself respectively. The vernier dials are mounted quite simply and the dial makers supply particulars of how to do this in the cartons.

Mounting the Panel

It will be noticed in the photographs that a mahogany finished panel is used, but this, of course, is a matter of personal taste, as is the cabinet also. There will, indeed, be no loss of efficiency whatever if a plywood panel is used, for the moving plates of both condensers are at earth potential and there will be no high-frequency losses of any kind.

So far as the mounting of panel brackets is concerned, I have found the best way is to mount the brackets on the baseboard first of all, then to hold the panel against the front edge of the baseboard, using the holes in the panel brackets as templates to mark the positions for drilling. This

along the bottom of the front panel for screwing it against the front edge of the baseboard. In some cases this counteracts a slight tendency of some panels to warp when used in exposed places.



The wiring may look complicated, but when you tackle the job you will find it is not nearly as bad as it looks.

"Big Ben"—The Striking Receiver—*continued*

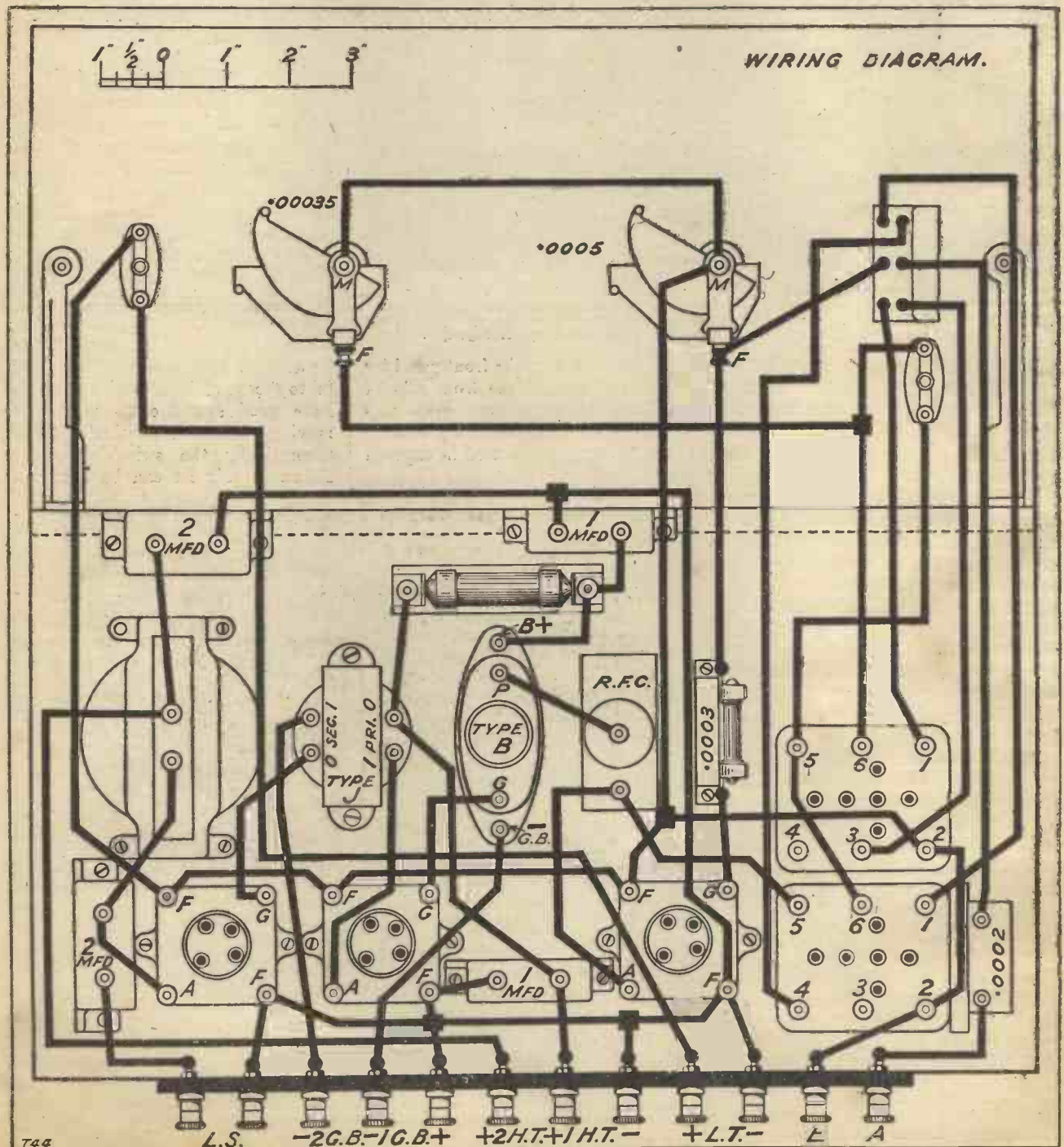
almost any coils having aerial, grid, and separate reaction windings, the coils chosen are specified in detail in the accompanying list of components.

Concerning Components

The high-frequency choke must not only be of good quality, but also capable of going down to very short wave-lengths. Fortunately there are

several of these now available. It is, of course, essential that the output choke should be of good quality, otherwise reproduction will suffer. The names mentioned in the list of alternatives are all perfectly satisfactory. Any high-grade low-frequency transformer can be used, the one actually shown being typical of a high quality modern production.

It will be noticed that there are two high-tension positive terminals, and as the arrangement of these is somewhat different from usual, a word should be given to them. High-tension positive 1 supplies the detector and first low-frequency stage, while high-tension positive 2 supplies the output stage. In the great majority of cases, high-tension positive 1 and 2 can be joined, using one voltage throughout,



"Big Ben"—The Striking Receiver—*continued*

say, a 100 or 120. If, however, the user desires to work a moving-coil loud speaker with this set, using for the purpose a special super-power valve with high anode voltage, he can use this high voltage on the last valve alone, without risk of injury to the others.

Operating the Set

In such cases, however, it is essential that the low-frequency choke chosen should be capable of carrying the large current required by such valves. As the majority of readers will desire to purchase the coils ready-made, commercial coils are specified in the present article, but next month particulars will be given of how to make not only the medium and long wave-band coils, but also those for the short waves.

Finally a few notes as to operating the set. Once you have wired it up you will need to choose your valves. For the first valve use one of those specially designed for resistance-capacity amplification. For the second, one of those known as high-frequency valves, and for the output valve, a power or super-power valve, according to the high-tension supply available.

Remember that super-power valves give by far the best quality, but are rather greedy in high-tension current, requiring either large dry batteries for satisfactory operation or else high-tension accumulators or a mains unit. Either 2-, 4-, or 6-volt valves can be used, and incidentally it might be mentioned that this year's 2-volt valves are practically equal to last year's 6 in performance!

Reaction Control

Aerial and earth are joined as usual, and the low and high-tension batteries, while grid bias is arranged according to that specified by the makers of the particular valves for the voltage used. Using 120 volts H.T., I generally use 3 volts on G.B. negative 1, and on negative 2 about 16 or 18 with the newest 2-volt super-power valves.

The reaction condenser should be set at minimum position before switching on, the long-wave coil should be placed in the socket nearest the panel and the medium wave in the socket nearest the back. Remember that the wave-change switch is arranged to be "up" for the upper band, so that you will remember the

position easily. The small switch immediately below the wave-change switch is pushed in and left there, unless required as mentioned earlier.

By turning the tuning dial (that on the left) you will soon be able to pick up your local station, while the reaction dial will serve to increase strength and sharpness of tuning. Beware of carrying reaction too far, otherwise oscillation will take place. Before changing from the lower to the upper band, reset the reaction condenser at zero, for it is probable that the reaction adjustment on the two bands will not be the same, and you do not want to oscillate unnecessarily.

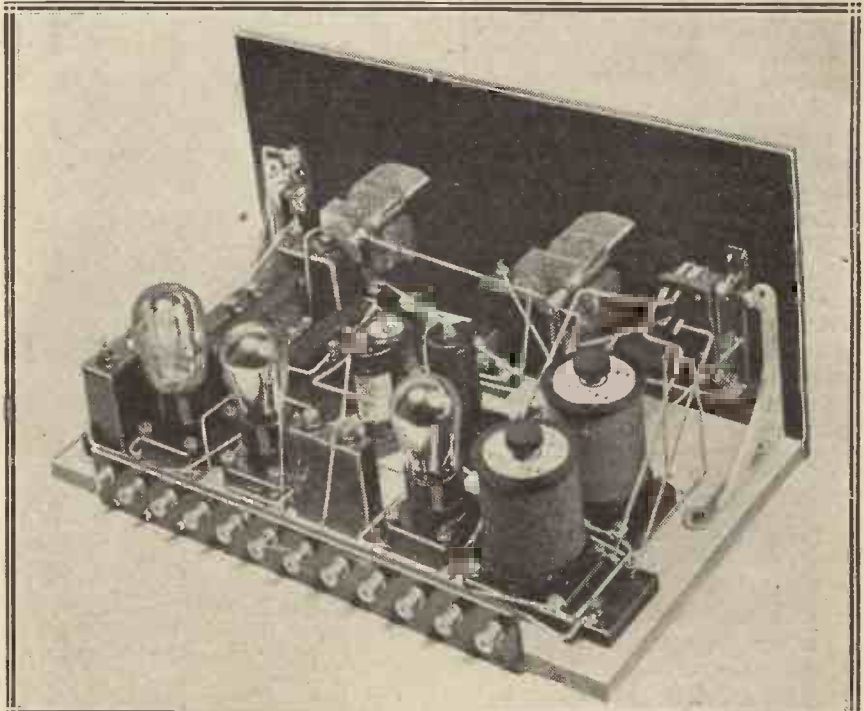
When you are on the lower wave-band you can, if you like, pull out the switch below the wave-change switch. It will alter the reaction setting slightly and may occasionally serve to make reaction a little smoother and easier with some valves on certain parts of the lower band, but generally

"out," and put the wave-change switch in the down position. You will then find the set operates just as before. More notes about this receiver will be given in next month's WIRELESS CONSTRUCTOR.

* **CONTROLLING OSCILLATION** *
* **ON SHORT WAVES** *

THRESHOLD oscillation is that peculiar howl which is sometimes experienced on short-wave sets, and which is somewhat similar in sound to a "grid-leak" howl. It occurs just about at the point where the set should commence to oscillate in the normal manner, but as soon as the reaction control is tuned to make the set oscillate more strongly, the threshold howl ceases.

There are two points which will



In this photo a different make of six-pin coils is shown, and any good make can be used provided it is of the correct type.

I do not find it necessary to touch this switch when the set is working. To pick up the very short waves on the 20-metre band, lift the lid of the cabinet, remove both coils and insert the special short-wave coil mentioned previously in the back socket. In this case always pull the small switch below the wave-change switch to

invariably be found to help matters if not to completely cure the trouble. The first is to use a higher value grid leak than the usual 2 megohms, one even as high as 5 megohms sometimes being desirable. Secondly, the effect of reducing the H.T. voltage on the detector valve should be tried.

A. S. C.

Loud-Speaker Developments

Can the reed-driven loud speaker "come back," and beat the moving-coil type?

An interesting article by
SEXTON O'CONNOR.

WITHIN the last year or so the moving-coil speaker has gained marked ascendancy over all other competitors—at least, where really high-grade reproduction is concerned. The claim is now made that it is possible to secure an equally high standard of reproduction on a reed-vibrated diaphragm, driven from a "fixed" magnetic movement.

The moving-coil instrument is admittedly expensive both to instal and maintain, more especially as an extra supply of current is generally necessary to energise the field windings of the magnet, which in most cases involves the addition of a mains-supply unit to the speaker outfit.

If the same musical qualities can be obtained without the use of specially energised field windings, this point will undoubtedly make a strong appeal to listeners who are not "on the mains," and who shirk the inconvenience of maintaining extra battery power.

The merits of the new reed-driven speaker which is being marketed by the Amplion Co. as the "Lion" brand, depend in part upon a special construction of the conical diaphragm, and in part upon a particularly fine adjustment of the reed-armature relatively to the pole-pieces of the magnetic movement.

The Diaphragm

The conical diaphragm is made of hot-press paper of such area and mass that whilst it vibrates as a whole for frequencies of, say, less than 80 cycles per second, for higher frequencies the surface "breaks up," so that the effective area in vibration is less than the actual area of the diaphragm.

As the frequencies increase, so does the effective vibration area. The weight mass and elasticity of the reed is also specially calculated so that in combination with the diaphragm the overall frequency response remains constant from the lowest to the highest musical range, instead of tending to favour the higher notes at the expense of the lower, as usual.

In the ordinary type of reed-driven speaker, the reed is mounted so that it normally lies parallel to the surface of the pole pieces.

Reed Movement

Under the influence of an increasing magnetic field, the reed moves downwards towards the poles. It does not, however, keep parallel to the pole surface during this movement. In its flexed position, the tip of the reed, i.e. the part farthest away from the pivot or point of support, lies nearer to the poles than any other part.



The latest reed-driven type—the Amplion "Lion" table cabinet model which sells for £10 10s. 0d.

The magnetic field naturally concentrates itself across the narrowest point of the gap, with the result that, acting mainly on the tip, it exerts a greater leverage or torque than it would if the reed were maintained strictly parallel to the pole surface throughout the whole of the vibration period.

Even if the reed always moved parallel to the poles, the attractive force acting on the reed naturally increases as the reed moves nearer to the magnet. This effect is partly offset by the fact that the poles are already permanently magnetised, but it still exists to some extent.

When added to the increased average previously mentioned, the combined effect upsets the strict linear proportion that should exist

between any variation in the applied current, the resulting mechanical vibration imparted to the reed, and in this way introduces distortion.

In order to overcome this defect, the magnetic movement in the new "Lion" speaker is pivoted about a carefully calculated axis of rotation, the arrangement being such that, in effect, the pivot or support of the reed lies slightly below the level of the pole pieces.

Accordingly, as the reed is vibrated the nearest approach to the poles is made by an intermediate part of the reed, and not by the "tip." The narrowest part of the gap is, therefore, moved over closer to the pivot or fulcrum, so that the leverage or torque applied by the magnet is decreased as the reed swings downwards, instead of being increased. The new mounting thus automatically removes a source of distortion that is inherent in most speakers depending upon a purely magnetic driving movement.

* A "SAFETY FIRST" *
* POINT *

WHEN experimenting with H.T. eliminators worked off D.C. mains there is one little point which must not be overlooked. Always insert a 2-microfarad high-voltage condenser in the earth lead, that is to say, the actual wire from the earth is joined to one side of the condenser and a lead is taken from the other side to the terminal marked "E" or "earth" on the set.

This condenser is inserted to avoid the possibility of the mains becoming shorted, and thus blowing a fuse. It will be appreciated how this could happen if it is remembered that one side of the mains is invariably earthed, and that H.T. — is connected to earth either through the L.T. battery or direct. Therefore should the positive main be earthed, a direct short will occur. Nothing, of course, will happen if the negative main is earthed.

May be Incorporated

It is always advisable, however, to insert this condenser, unless one is already incorporated in the actual eliminator. If the earth lead has to be connected to the eliminator and a wire from the earth terminal on the set has to be connected to the eliminator also, it may be taken that a condenser is incorporated.

ALL FROM "D.C."



No batteries are required by the man who has D.C. mains—if he builds a set on the lines described here.

By G. V. COLLE.

Has it never struck you how, when a manufacturer or designer evolves a new mains receiver, it is almost invariably arranged to operate from A.C. mains? This fact

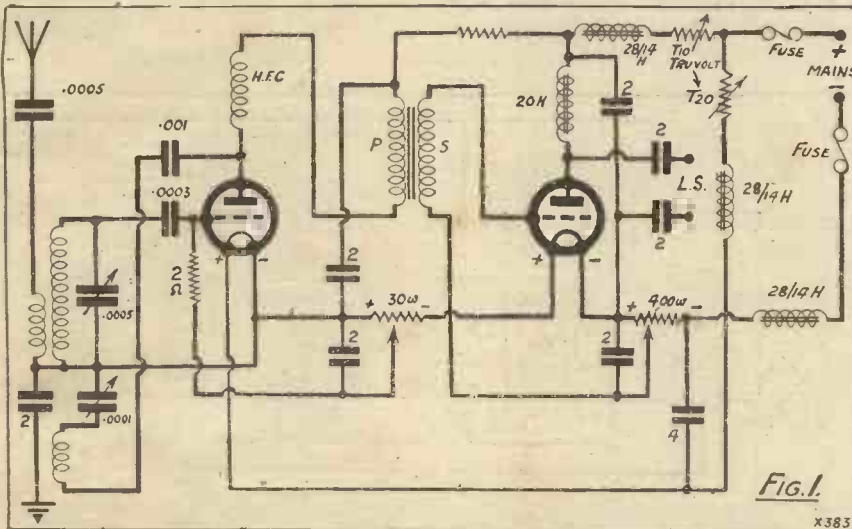
actual current drawn from the A.C. supply being but a fraction of that delivered from the secondary of the transformer. It is possible, in consequence, for anyone to maintain a set

working entirely from A.C. mains at a very reasonable cost, while special A.C. valves to operate with raw A.C. on their filaments have assisted greatly in making the scheme a very practical one.

Economical Connections

Coming now to the subject of our discussion, it will be readily appreciated by those conversant with direct current mains that it is not possible to increase the voltage except by adding batteries externally, nor yet to decrease the voltage without the addition of series resistances.

Whatever the voltage, the current drawn will be in direct proportion to that delivered by the mains, so that if, say, one wishes to draw one ampere at 20 volts from a 220 volts supply, then a series resistance capable of passing one ampere and having a voltage drop of 200 must be included in the circuit; the 200 volts being dissipated as heat and therefore representing waste.



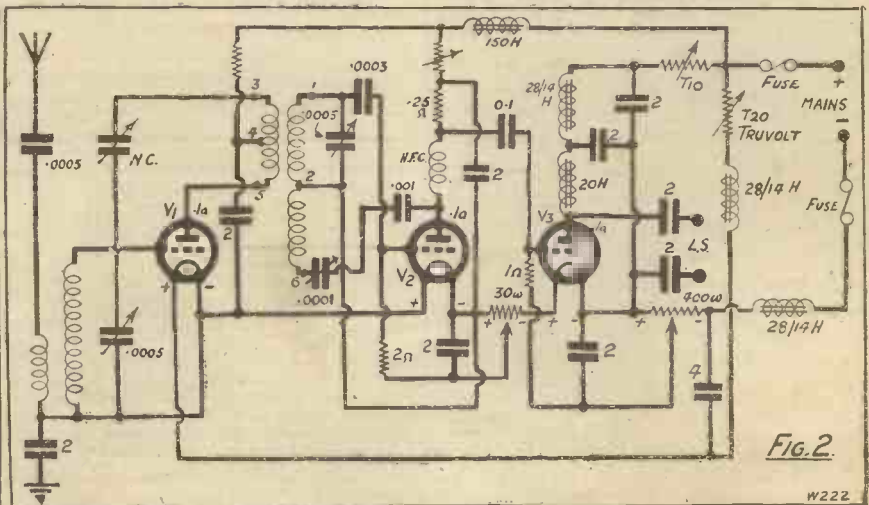
Two-valve circuit. Anode-bend detection is shown, but greater sensitivity can be obtained by connecting bottom end of grid leak to the filament positive of V₁.

is all the more striking because over sixty per cent of electric mains are direct current.

Cost of Upkeep

Apart from this question, which means, in effect, that manufacturers are catering for the minority of mains users, there emerges a host of indisputable facts regarding the use of electric supplies for radio sets.

For instance, alternating current mains are far more versatile in their utility than direct current mains, since it is possible to increase the voltage by any desired amount or, alternatively, decrease the voltage to any fraction of the original without the use of resistances, by a step-down transformer. Further, heavy currents can be drawn at low voltages, the



Circuit for 1-ampere valves. Resistance marked 30 ohms can be filament rheostat with "free" end connected to make it a potentiometer. 400-ohm potentiometer is obtainable from various makers.

All From "D.C."—continued

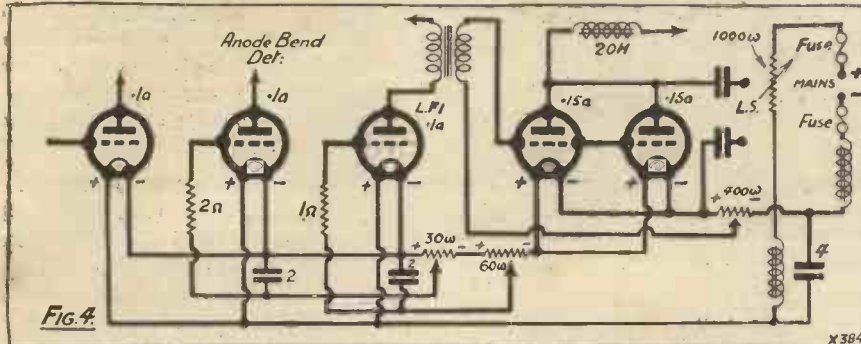
The sliders or moving arms are then joined to the ends of the respective grid leaks, or, in the case of L.F. transformers, to the "bottom ends" of the secondaries; 2-mfd. condensers

in each case. Also, in cases where 60-ohm "resistances" are shown, values of 50 or 70 ohms can be substituted if the value stated is not procurable.

In regard to the H.T. supply, very little can be said on this subject, as any associated problems are similar, if not the same, as met with in any ordinary H.T. unit. The first point to remember is that the maximum H.T. voltage available will be the voltage of the mains, minus the voltages of the filaments of the valves following, minus certain of the potentiometers and then minus the drop across the H.T. L.F. choke.

The Applied Voltage

As the circuits shown are arranged, it will be found that the maximum H.T. available is given to the last valve and lower H.T. voltages to the preceding valves. Taking Fig. 2 as an example, the H.T. to V_3 will be the voltage of the mains, less the



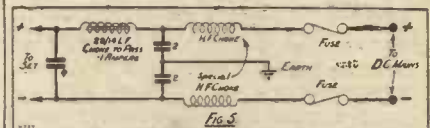
Four-valve set with two valves in parallel in last L.F. stage. It is assumed 1-ampere valves are employed in the first three positions and 15-ampere valves in the last stage.

of fairly low test voltages being shunted across the slider and positive end of the resistance element (negative of valve concerned) in most cases, principally to take up variations in grid bias, due to fluctuations in the voltage of the supply.

The value of any potentiometer can be calculated by Ohm's Law, assuming the current to be passed and the grid-bias voltage are both known. The formula is $R = \frac{E}{I}$, where

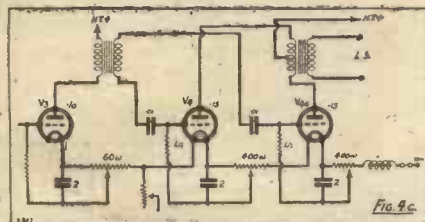
R =resistance of potentiometer, E =grid-bias voltage desired, I =current passing in filament circuit. Thus if we wish to provide, say, 6 volts grid bias on a first L.F. valve and the filament current is .1 ampere, our formula becomes $R = \frac{6}{.1} = 60$ ohms.

Finally, while on the subject, always allow for a slightly greater



Auxiliary smoothing circuit for use with "rough" mains. The H.F. chokes must be wound with No. 18 or 18 S.W.G. enamelled wire and can be "hank-wound."

400-ohm potentiometer (40 volts at .1 ampere), less the drop across the 28/14-henry choke, and then the drop across the resistance in series with it, the latter being variable to reduce the voltage, in case it is in excess of

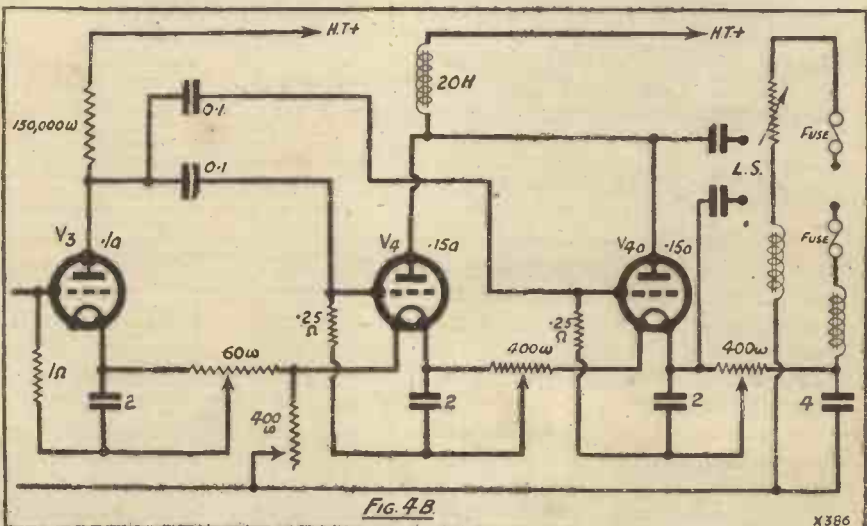


Push-pull output (which can be applied to the circuit Fig. 4a), instead of paralleling two valves.

It is hardly necessary to add that the potentiometers must be wire-wound and capable of carrying the necessary filament current, which in most cases will be .1 ampere. Most makers make a point of mentioning the current carrying capacity of their resistances and potentiometers, but if any reader experiences difficulty he will find that the Igranic catalogue shows resistances and potentiometer that will carry at least .1 ampere.

Potentiometer Problems

In reference to the same subject, it will be noticed potentiometers of 30 to 60 ohms are employed in some of the circuits, and here ordinary base-board filament rheostats of suitable resistance can be employed, the "free" ends of the resistance elements being utilised to form the third connection



Parallel output (employing series filaments 15-ampere valves), with resistance coupling to the preceding L.F. valve.

grid bias than that needed, in case a valve taking a larger bias is substituted at any time.

the permissible maximum which can be applied to the anode.

(Continued on page 160.)



Some typical faults and remedies reviewed.

By P. R. BIRD.

Is Neutralising Necessary?

THIS seems rather a queer question nowadays, when neutralisation is an accepted method of stabilising an H.F. circuit, but, nevertheless, it is a question which is frequently asked. The answer is that although a set which is not neutralised at all, or not neutralised properly, will sometimes work all right to the extent that it brings in stations, etc., it is a shame not to neutralise a set which is supposed to be neutralised, for it means losing several distinct advantages.

For one thing, the correct adjustment and handling of the set is much easier when it is neutralised, and it does not then cause interference with neighbouring sets. Quite as important as this is the effect upon sensitivity. A long-distance set that is badly neutralised will not bring in half the stations it is capable of bringing in when the neutralising adjustment has been properly made.

An Easy Method

On most sets an easy method of neutralising is the following:—

First of all, set the vanes of the reaction condenser all out, and also those of the neutralising condenser. Choose a time when there is no broadcasting on so that you can hear easily in the 'phones whether the set is oscillating or not, and keeping the neutralising and reaction condensers at zero, set the aerial tuning condenser about half-way round. Then *slowly* rotate the high-frequency condenser and note whether the set starts oscillating or not.

Probably it will do so at just

one or two degrees on the dial when the two circuits are in resonance. Make a note of the dial reading and then slightly advance the neutralising condenser. A position for this will soon be found at which the set has no tendency to oscillate even when

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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 supplied 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.

the two tuned circuits are in resonance.

When this has been done, introduce a little reaction into the circuit by tuning that condenser, say, three or four degrees, and then listen carefully when the two tuned circuits are readjusted. When the set oscillates again, carefully readjust the neutralising condenser and probably the oscillation will cease when its setting has been increased slightly.

A little more reaction may again be introduced, small increases of

the neutralising condenser adjustment enabling you to balance the feed-back and make the set stable again. Proceeding this way you will soon find a point where the adjustment of the neutralising condenser appears to be *overshot*, and further increase of its capacity makes the set oscillate, instead of stabilising it. When this happens, slacken off just a little and try to find the exact spot where, when the maximum permissible reaction is used, the slightest variation on the neutralising condenser either way results in a tendency to oscillate. This is the correct adjustment for neutralisation.

A Spark in the Dark

Many listeners have been perturbed because when putting the set on when the light is not good, they have noticed that when the H.T. negative or the positive plug is put into the H.T. battery a small spark occurs.

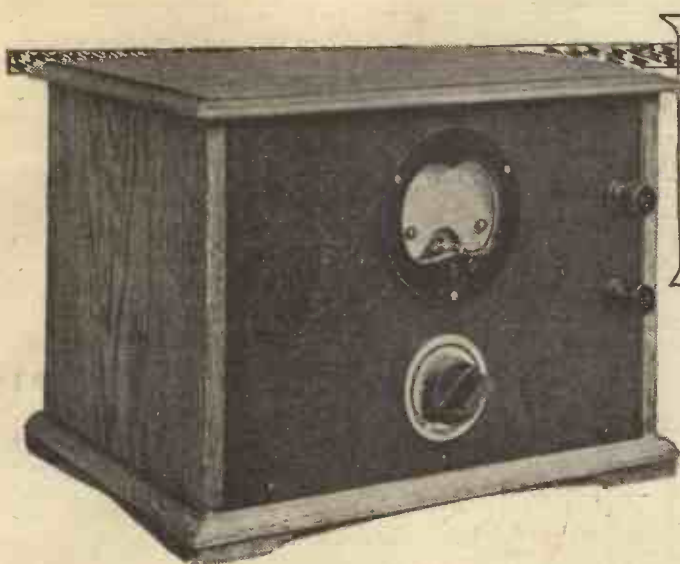
This often happens even when the filaments are not switched on, and therefore when there should be no current flowing through the valves. Generally such an H.T. spark only occurs when the set is newly connected up after a period of rest. If, however, it has been working just previously, the adjustment of the same plug as before will not give the spark, and this gives us the clue as to the cause of the small flash.

Although at first sight it might appear that no current should flow in a valve circuit when the valves are not alight, it should be remembered that in a great many sets, especially in those designed a year or two ago, there are large fixed condensers connected across the H.T. battery. It is the current which is required to charge "a reservoir" of this kind that causes the spark.

When once the small current required to charge it has been drawn from the battery it will not take any more current, but after the set has been shut down for an hour or two, the potential across the condenser tends to leak away across insulation, etc., so every time the set is switched on again the condenser requires recharging. In any case, where the spark seems rather heavier than it should be, it is a good plan to try the effect of disconnecting the large fixed condenser, because its insulation has become faulty it is better out of use.

For Bursledon Readers

NOTE:—Will the Bursledon reader who sent 1s. 6d. to the Technical Query Dept. please furnish his name and address so that a reply can be sent to him?

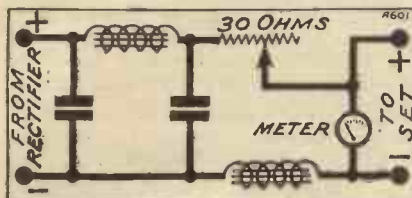


“Stedipower Junior”

By the Editor

You can connect this simple unit to a trickle charger, and immediately obtain smooth, constant L.T. without using a battery.

THE “Stedipower” system of supplying low-tension from A.C. mains for filament lighting is rapidly gaining adherents all over the country. As this issue of the WIRELESS CONSTRUCTOR will reach many thousands of new readers, we would take the opportunity of pointing out that the WIRELESS CONSTRUCTOR was the first British journal to show readers how to build a unit



which would enable them to dispense with an accumulator for the running of their existing set, providing alternating current is in the house.

The first “Stedipower” L.T. Unit was published in the WIRELESS CONSTRUCTOR for August, 1928. This unit, which was generally acclaimed to be the biggest boon for years, was easily assembled by any home constructor and gave a perfectly smooth supply of low-tension current at either two, four or six volts (or for that matter any intermediate voltage should it be required) up to a maximum of one ampere, which is more than sufficient for practically all modern sets.

Completely “Hum-Free”

The output is completely “hum-free,” and the results cannot be distinguished in any way by those given by a fully-charged accumulator. The advantages over the accumulator are, of course, enormous. First of all, there is no trouble about charging, no

drop in voltage, no acid or liquid of any kind to spill and burn the carpet, no regular and tedious journeys to the charging station, no bills for charging, and the cost of running is less than that of an ordinary electric bulb used for lighting. No current whatever is consumed when the set is switched off.

It is the policy of the WIRELESS CONSTRUCTOR to help its readers to use their existing apparatus to best advantage and to do so as economically as possible. A large number of readers do not desire as much as one ampere from their L.T. unit, half an ampere being more than sufficient for them.

No Accumulator

Furthermore, many possess excellent trickle chargers, such as those made by Ferranti, Regentone, Burndeft, etc., and these in conjunction with accumulators have given them quite good service. To meet the requirements of readers who do not need so much as one ampere and who possess good trickle chargers, “Stedipower” Junior has been designed and is described for the first time in this issue.

“Stedipower” Junior is a unit which, when attached to any trickle charger, enables the accumulator to be dispensed with, and the filaments run direct from the mains. In appearance, as will be seen, it is a handsome unit, extremely simple to build, simpler still to operate, and when initially adjusted to suit the particular set with which it is used, it can be left entirely alone, the set being simply switched on from the electric light switch just as if it were an electric lamp.

Furthermore, the “Stedipower” Junior Unit (or the 1-ampere “Stedi-

power” Unit described in our August issue) in conjunction with any good mains H.T. unit enables you to convert your existing receiver into an “all-from-the-mains” receiver without altering your present set by so much as a single wire, and without purchasing a single new valve. This point will be particularly appreciated by those readers who have built a

COMPONENTS REQUIRED.

- 1 Cabinet to take 10 × 7 in. panel, with baseboard 7 in. deep.
 - 1 Panel (that illustrated is the new black Ebonart with moire finish) (Becol, Radion, Trolite, Ripaults or any high-grade cut panel can be used).
 - 1 0 to 7½ volts high-resistance voltmeter (Ferranti). (Western, Sifam, Hunt, etc.)
 - 2 Terminals marked L.T. positive and 2 terminals L.T. negative (Belling-Lee, Eelex, Igranic, etc.).
 - 2 Harris “Stedipower” chokes (R.I.-Varley, Ltd.).
 - 2 Electrolytic condensers, each 750 mfd. (T.C.C.).
 - 1 Tobe “A” condenser (Rothermel Corporation, Ltd.).
 - 1 30-ohm porcelain mounted filament resistance (Igranic Electric, Ltd.).
- SPECIAL NOTE.**—Ordinary chokes which are perfectly satisfactory for high-tension mains units are totally unsuitable in every way for the Harris “Stedipower.” The chokes specified were worked out in the “Wireless Constructor” laboratory specially for the “Stedipower” system.

WIRELESS CONSTRUCTOR set, who like it, and who find that it meets all their requirements so far as range, selectivity and reproduction are concerned.

The more technically inclined readers will be interested to know that “Stedipower” Junior is essentially the smoothing and voltage regulating portion of the “Stedipower” 1-ampere

“Stedipower” Junior—continued

unit, minus the mains transformer and the dry rectifier used for stepping-down and rectifying the mains current, this function being performed perfectly satisfactorily in the “Stedipower” Junior by the trickle charger, which really consists of a similar type of transformer and a similar dry rectifier. Again, whereas in the 1-ampere model voltage-adjusting resistances capable of carrying one ampere on the other hand, and giving a very fine adjustment for small loads on the other, were necessary, in the “Stedipower” Junior a single 30-ohm voltage-adjusting rheostat capable of carrying half an ampere satisfactorily performs all that is necessary. A good quality voltmeter is, of course, essential in this as in the previous unit, and no attempt should be made to use a “Stedipower” scheme without one.

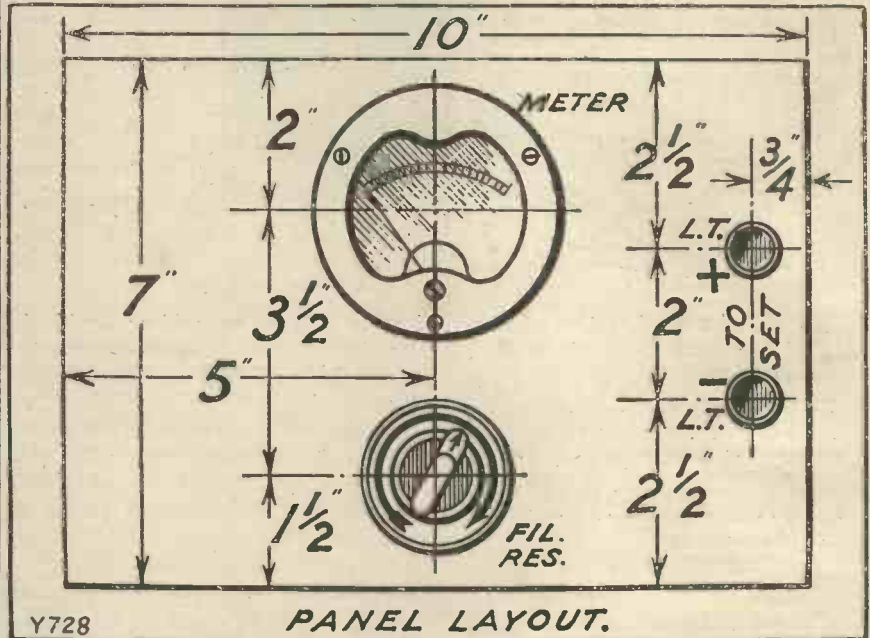
Extremely Simple

Scarcely anything needs to be explained regarding the constructional work of “Stedipower” Junior, as most of it will be quite obvious from an examination of the photographs and diagrams. The least easy work will be to cut the hole for the meter. Several methods of doing this are available.

One of the simplest is to scratch a line indicating the size of the hole required, drill a few holes round its edge and then cut out the ebonite by means of an ordinary fretsaw. Cutting round holes in ebonite with a fretsaw is far easier than most people imagine. Another way is to drill a number of

holes round the edge of the circle, with practically no separation between the holes, and then remove the centre portion by breaking away the webs with a sharp knife or round file.

A reader recently wrote and upbraided me for recommending the fretsaw method, when these tools were cheap and easily available. He was, of course, unaware that I have



The third method, used by some readers, is to obtain a special tool from the tool-shop designed to cut large holes and adjustable for the size of circle. These tools are inserted in the jaws of the brace and, when they are sharp and properly adjusted, they can cut a very perfect circular hole. When they are *not* sharp and *not* carefully adjusted they can make a horrible mess of your panel.

about three of them, but have discarded them all, after trial, reverting to the fretsaw method with thankfulness.

It is unnecessary to use an ebonite panel when cost is of primary importance, and a plywood panel will be as good electrically. But long experience in set design and an intimate contact with readers of this journal has taught me that the great majority of them prefer the smart and business-like appearance of an ebonite panel to that of wood or other substitutes.

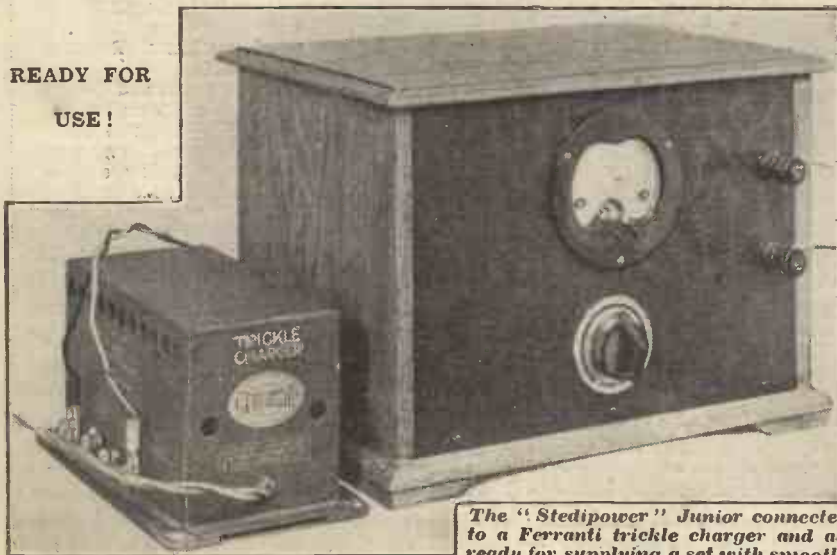
Avoid Cheap Instrument

Do not be tempted to use a very cheap voltmeter in this instrument. There are two important reasons why you should not do so. The first is that you want to adjust your voltage accurately, and it is no good having a meter which reads, say, 6 volts when the actual voltage is 5½; or, worse still, one which reads 5½ when the voltage is 6!

Secondly, the cheap meters take a great deal of current to operate them.

Remember that this meter is in circuit all the time, and that the current taken by the meter is subtracting from that available for your

READY FOR
USE!



The “Stedipower” Junior connected to a Ferranti trickle charger and all ready for supplying a set with smooth, reliable L.T.

"Stedipower" Junior—continued

VALVE COMBINATIONS FOR "STEDIPOWER" JUNIOR.

"Stedipower" Junior, when used with a 6-volt $\frac{1}{2}$ -ampere trickle charger, will give up to half an ampere on 2 volts, up to .45 ampere on 4 volts, and up to .35 ampere on 6 volts. Thus the following combinations are possible :

2-volt range.

Up to 5 valves at .1 ampere.

Up to 3 valves at .1 ampere, and 1 at .15 ampere.

Up to 2 valves at .1 ampere, and 1 at .25 ampere.

4-volt range.

Up to 5 valves at .07 ampere.

Up to 4 valves at .1 ampere.

Up to 2 valves at .07 ampere, or .1 ampere, and 1 at .25 ampere.

6-volt range.

Up to 5 valves at .07 ampere.

Up to 3 valves at .1 ampere.

Up to 2 valves at .07 or .1, and 1 at .15 ampere.

NOTE.—Although the unit will give more than half an ampere on the 2-volt range, do not exceed that figure or you will overload the trickle charger. Whatever output voltage is being used, the "Stedipower" Junior Unit is always connected to the 6-volt terminals of the trickle charger.

set. Similarly, the choice of the 30-ohm porcelain-mounted Igranite resistance is no mere chance, for a resistance continuously carrying half an ampere gets quite hot—hot enough to soften many of the moulded compositions of which some of them are wound. Remember the ordinary variable filament resistance rarely has to carry more than a quarter of an ampere, and generally something in the neighbourhood of 100 milliamperes.

An Important Point

A filament resistance may be perfectly satisfactory and well-designed for valves, but will not suit the "Stedipower." The fact that the Igranite is wound on a porcelain base and is rated to carry half an ampere continuously makes it particularly suitable for the unit in question.

When you have wired up the whole instrument, you will naturally want to try it as soon as possible. Before doing so, however, pay particular attention to the following points, as ignorance of them may cause you to burn out your valves, or do other damage.

The "Stedipower" scheme operates as follows: First of all, an alternating current of the mains voltage is passed into one side of a transformer,

and at the other side of this transformer alternating current at a low voltage emerges. This low-voltage alternating current is passed through a rectifier which turns it into a uni-directional pulsating current. There is a slight voltage loss in the rectifier.

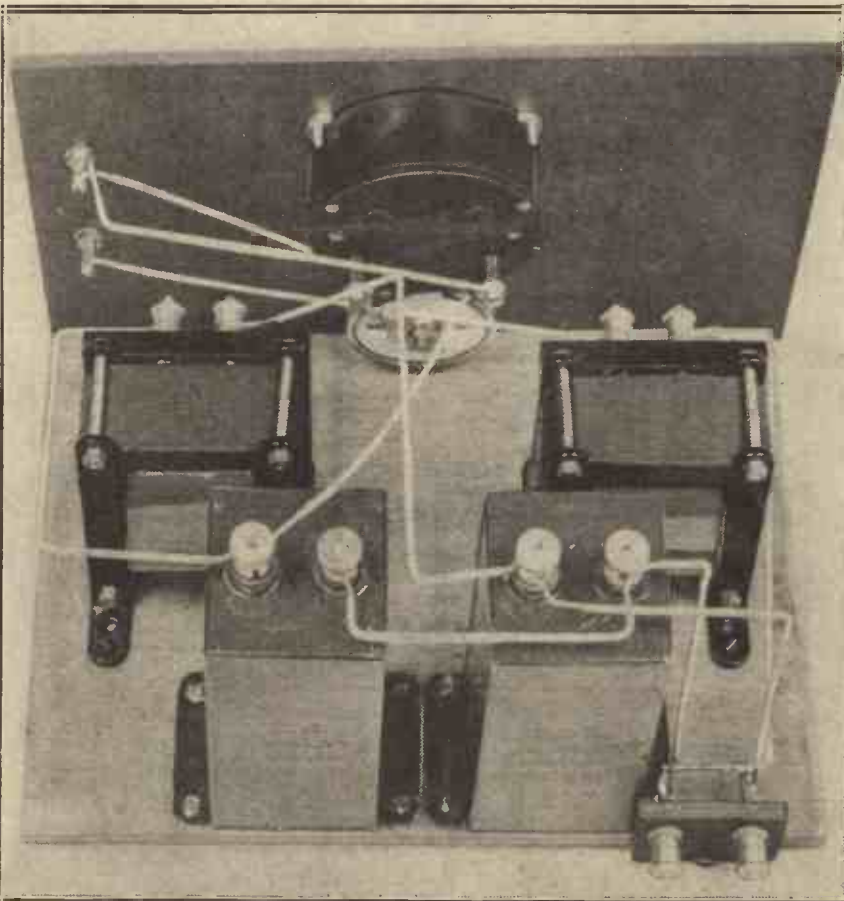
Smooth Supply

Coming out of the rectifier, the current passes into a filter circuit consisting of very high-capacity condensers and very low-resistance chokes, the effect of capacity and chokes being to smooth the current completely until at the end of the "Stedipower" smoothing circuit it emerges as a direct current strictly comparable with that given by an accumulator. I have already mentioned that there is a voltage drop in the rectifier, and there also is a voltage drop in the condensers and chokes. For this reason the input voltage to the rectifier and filter must be higher than the required output voltage.

How much higher depends on the current you want to take out from the whole unit. After the current emerges from the smoothing system of the "Stedipower" it passes through a variable resistance in which it can be made to drop further in voltage if desired within certain limits. Across the output terminals is shunted a voltmeter, so that you can tell exactly what voltage you are getting at the moment. It is not yet possible to provide a unit of the non-adjustable variety which can be guaranteed to give 2-, 4-, or 6-volt output at any load up to the maximum without any adjustment, although experiments on this line are still being conducted in the WIRELESS CONSTRUCTOR laboratory.

Why Resistance is Used

The present scheme, which is a perfectly practical one, is to provide a device which will give a maximum of 6 volts when 1 ampere is taken from the unit described in our



As you will see by this photo the "Stedipower" Junior is a remarkably simple unit. The two large fixed condensers are of the 750-mfd. electrolytic type.

"Stedipower" Junior—continued

August issue, and less than this through the "Stedipower" Junior. As the voltage drop in the rectifier and smoothing system is dependent upon the load taken, if we take less than 1 ampere the voltage rises. To compensate for this a variable resistance is introduced, and is set to absorb the excess voltage to any degree required.

Voltage Variations

The actual voltage and current delivered by "Stedipower" Junior will depend to some extent, upon the particular trickle charger used. There is, however, no need to do any calculations when using a trickle

charger. All one does is to adjust the variable resistance to the "off" position before connecting "Stedipower" to the set, and then slowly to turn it on (with the set switched on) until the voltage on the voltmeter reaches that desired—2, 4, or 6 volts.

The reader will now see that if the "Stedipower" is connected to, say, a 2-volt set, with the filament resistance at the "full on" position, and the "Stedipower" switched on, a much higher voltage than two would be given and the valves would be burnt out or injured. Remember, and carefully bear in mind, the points just raised—never switch on an *unadjusted* "Stedipower" to a set without

first of all putting all of the adjusting resistance in.

Adjusting the "Stedipower"

Once the "Stedipower" unit has been adjusted to a particular set no further adjustment of the filament resistance will be needed, and the set can be switched on and off by means of the electric-light switch controlling the trickle charger. If you should alter the type of valves used in the set from, say, $\frac{1}{4}$ -ampere valves to .1 ampere or .075, or vice versa, then proceed as if you were adjusting the "Stedipower" to the set for the first time.

Brief operating instructions for the "Stedipower" Junior then are as follow :

First of all, join the two terminals on the front panel to the filament terminals of your set and switch the filament switch of your set at the "on" position.

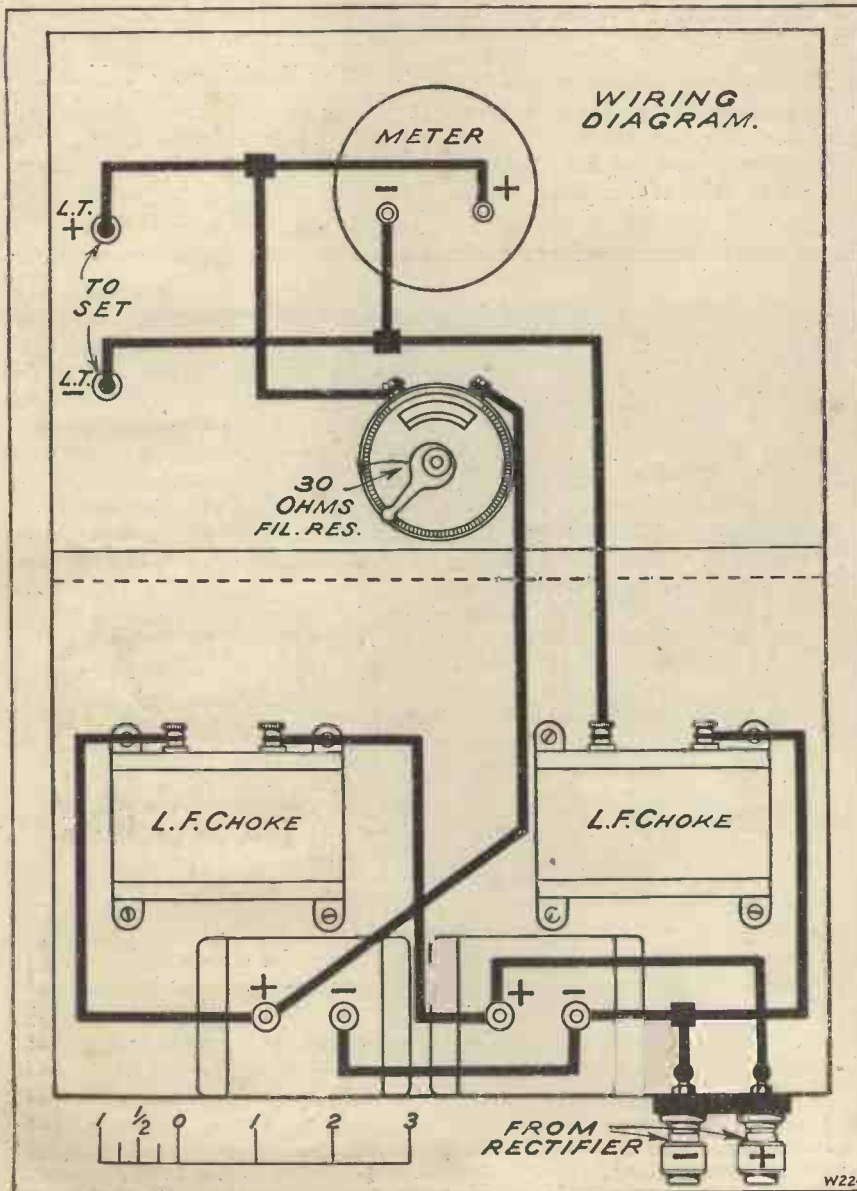
Next, without connecting the trickle charger to the mains, join the positive and negative terminals of the charger (always the 6-volt terminals) to the positive and negative terminals at the back of the "Stedipower." Set the variable resistance on the front of the panel to the "off" position and finally insert the plug of your trickle light charger into the electric light socket and switch on. Now carefully turn the knob of the variable resistance on the "Stedipower" slowly in a clockwise direction, watching the needle of the voltmeter.

Leave Unit Set

As soon as it reaches the voltage of the valves you are using, stop turning and watch the needle for the first five minutes. With the T.C.C. electrolytic condensers the maximum voltage will be reached quicker than with the Tobe-Deutschmann, although the final results will, of course, be the same. If the needle shows a tendency to go above the figure required, readjust the knob slightly. Make a pencil mark on the frosted metal plate of the Igranite resistance to indicate the correct position for your particular set, in case you should ever alter it. After this you can switch the set on and off just as you please.

When you have finished running the set, switch off, not by the switch on

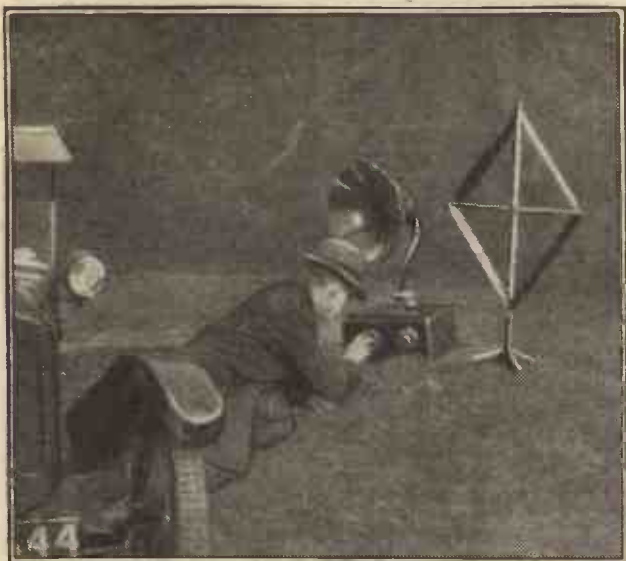
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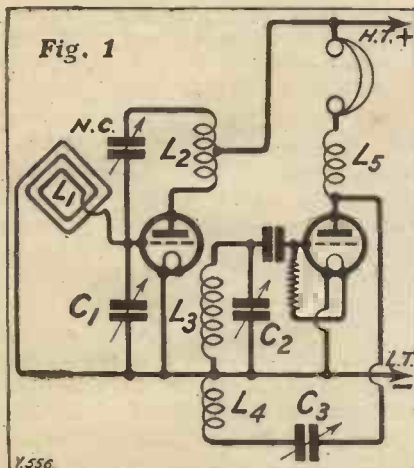
SOME MORE FRAME-AERIAL CIRCUITS

Describing the practical application of frame aerials to circuits incorporating H.F. amplification.

By C. P. ALLINSON, A.M.I.R.E., F.Inst.P.Inc.



WHILE on the question of frame aerials it may be of interest to discuss the use of a frame aerial in a set in which H.F. amplification is employed. I think that it will be fairly obvious in view of the low damping of the frame aerial that it will be necessary for a neutralised circuit to be employed, since otherwise the receiver will be uncontrollable owing to self-oscillation.



In the case of such a receiver the use of a tapped or untapped frame aerial will depend on the neutralising circuit which it is desired to employ. If a split-primary neutralising circuit is used, as shown in Fig. 1, then an untapped frame aerial can be used.

Reaction Control

In this case, of course, the reaction will not be taken to the frame aerial, but is preferably taken from the plate of the detector valve into the detector circuit itself, and this is certainly preferable from the point of view of easy operation of the receiver. If reaction is taken to the frame aerial,

then difficulty may be experienced in tuning in when the set is on the verge of oscillation, owing to interaction between the tuning controls.

In the case of a split-secondary neutralised circuit, then, of course, a tapped frame will be required.

An arrangement I have actually employed in practice is shown in Fig. 2. The frame consisted of 12 turns, a tap being taken at three turns from one end. All 12 turns were included across the variable condenser tuning the H.F. input circuit, the tap was connected so as to be at 9 turns from the grid end of the winding and was taken to L.T.—through a resistance of 200 to 400 ohms.

Anode-Bend Rectification

Care had to be taken, of course, when using this frame aerial to make sure that any coupling between the frame and the H.F. transformer was reduced to a minimum, since if this had been appreciable, trouble from instability would have resulted, especially when the directional properties of the frame were used and the frame was rotated.

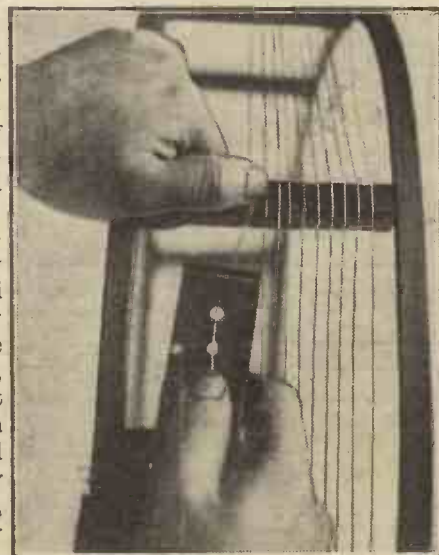
When using a detector only in conjunction with a frame aerial it may be an advantage to use anode-bend rectification, in view of the low damping of the frame aerial. In the case of a highly damped circuit, especially where a fairly inefficient coil is used tightly coupled to an outside aerial, the use of leaky-grid condenser rectification undoubtedly gives the greatest signal strength, since the extra damping imposed by this method of rectification is probably negligible compared to the damping already present in the cir-

cuit. Where, however, we have a very low-loss circuit, then the use of anode-bend rectification will, in many cases, give a marked improvement in results, and this is likely to be the case with a frame aerial, since anything like an averagely efficient frame aerial will have an H.F. resistance in the neighbourhood of 4 or 5 ohms.

Resistance Coupling

Under these circumstances it will be best, of course, to use resistance-capacity coupling between the detector and first L.F. valve, and an exceedingly efficient three-valve circuit for use in conjunction with a frame aerial is shown in Fig. 3.

In order to obtain the maximum efficiency it is advisable to use as large a frame as possible and tune it with a fairly small variable condenser.



Fixing the wire on a frame aerial is not always an easy task, but it is essential for good results that it be done properly.

Some More Frame-Aerial Circuits—continued

For instance, a 20-turn frame on a 2-ft. side tuned with a .0003 variable condenser will give a greater signal voltage than a smaller number of turns in conjunction with a larger condenser. An extra three or four turns will be required for reaction, and a .0001 reaction condenser will usually be found a suitable size. Anode-bend rectification is obtained in the usual manner, a by-pass condenser being shown connected across the biasing battery and the potentiometer to L.T. negative. In the plate circuit of the detector valve is an H.F. choke, whilst a high resistance having a value of .5 megohm is the coupling resistance between it and the first L.F. valve.

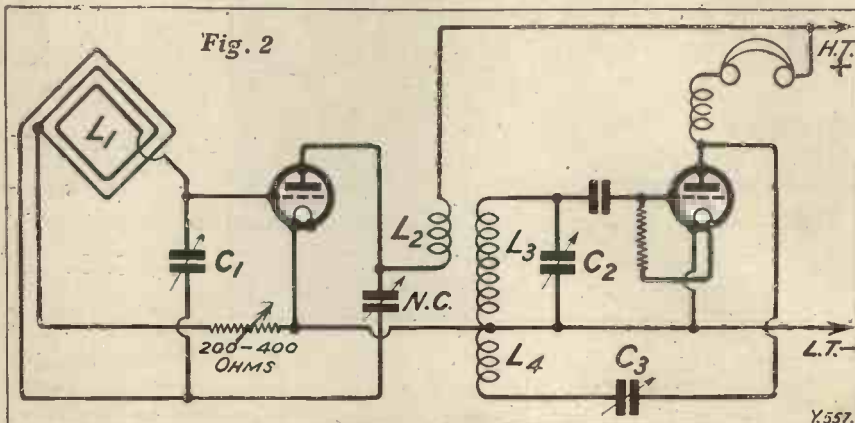
Sharp Tuning

The value of the coupling condenser should be about .004 to .006, and an H.F. stopper is shown at R_2 , which may be .25 megohm. The grid leak, R_3 , should be of 2 to 3 megohms, grid bias being applied through it in the usual manner.

Transformer coupling may be used with advantage between the first and second L.F. valves, and where very great purity of tone is desired this should be a low-ratio instrument having a very high primary impedance. If, however, greater volume is required and a small degree of purity may be sacrificed, then a 6-1 ratio instrument can be used and still give excellent reproduction from the loud speaker.

The correct valves to use will be a high-mag. R.C. valve such as the P.M.5B., S.P.50B., B.T.-H. R.C.607 for detector, an H.F. valve such as

aerial guy ropes from the effects of continual moisture, and, of course, their employment is quite effective. However, such preparations are open



the H.L.610, P.M.5X., etc., for the first L.F., while the last valve will be chosen to deal with the maximum volume the set will give. Normally, a small-power valve will be big enough, but where the set is to be used close to a transmitting station a super-power valve may be required.

to the objection that they render the aerial rope sticky.

An Easily-Made Preparation

A damp-resisting preparation which is not attended by this objection is the following one:

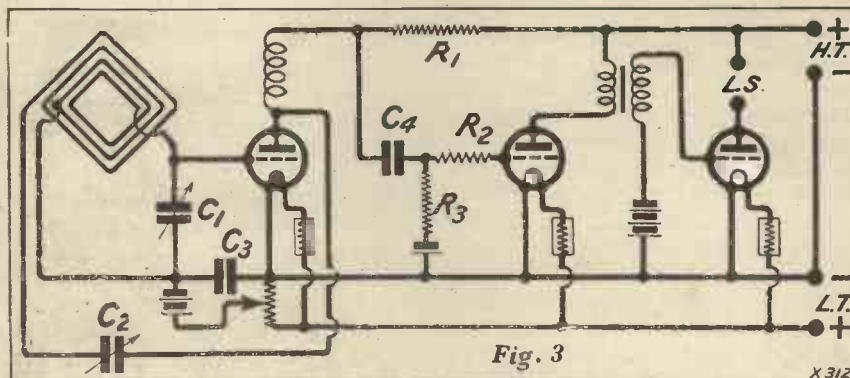
Dissolve two pounds of ordinary alum in a bucket of boiling water. Allow the water to cool, and then steep the aerial ropes in this liquid for two days. After the lapse of this time remove the rope from the alum solution and, without any rinsing, hang it up to dry.

By this simple procedure the rope will be rendered waterproof for at least a year. The process is an efficient one; its cost is almost negligible, and it is clean to carry out.

The process may also be applied to the waterproofing of fabrics which are used to cover up any articles or instruments of electrical and radio use which may have a temporary or a permanent position out of doors.

* WATERPROOFING *
* THE AERIAL ROPES *

ALTHOUGH the electrical and insulating efficiency of the aerial should naturally receive first



Incidentally, tuning will be found to be pretty sharp when using a frame aerial, and some form of a slow-motion dial is certainly a necessity, while also hand-capacity effects may make themselves noticeable, especially if the connections to the variable condenser are not made the right way round.

attention, it is not wise to forget all about the other components of the aerial system.

For instance, aerial guy ropes, after they have been in use for a season or two, often show signs of deterioration owing to their continual exposure to inclement weather. Tarry preparations are often used to protect

POPULAR WIRELESS

is Britain's Leading Radio Weekly.

¶ "P.W." is published every Thursday—and Thursday always seems a long time coming to "P.W." readers.

¶ Invest threepence this week and you will find you've got value for money.

But Make Sure It's
POPULAR WIRELESS



Makers of sets from the Thirty-One Tested Circuits given away with this issue of the "Wireless Constructor" will find assistance in the choice of their valves in the details given in this article.

By KEITH D. ROGERS.

WITH this month's WIRELESS CONSTRUCTOR readers will notice that a book containing a further Thirty-One Tested Circuits is being given away, and it may be of assistance to some of my



A useful L.F. six-volter is the Edison L.F. 610, which has an impedance of 10,000 ohms and a magnification factor of 15.

This makes an excellent 1st stage L.F. valve preceding an L.F. transformer.

readers if I briefly discuss the question of choosing valves for the circuits described in the book.

The choice of valves is not a difficult matter, provided you bear one or two fundamental points in mind. In the first place it must be remembered that a valve will only handle a certain amount of input before distortion will arise, while for good reproduction it is essential that the impedance of any valve be many times less than that of the external plate circuit of that same valve.

High-mag Valves

In other words, if you have a resistance-coupled stage with a resistance of the order of 100,000 ohms,

you must not expect to get good magnification out of a valve having an impedance somewhere about 80,000 ohms. If you wish to use a valve of that calibre, then you must use an anode resistance of somewhere about 500,000 ohms.

But, unfortunately for the man who wants to pick out valves for a new set, and who is not really used to the various types and characteristics of the valves on the market, a valve with a high impedance almost invariably has what we call a small grid swing.

That means it will take only a very small input before it will start to cause distortion, or, as we say, be overloaded.

Avoid Overloading

Now high-impedance valves are not useful simply because of their impedance, but because with this impedance we usually get a high magnification. High impedance is an evil which is usually essential where high magnification is to be obtained. If we could get valves with very low impedance and yet with very high magnification powers, and also so designed that they could handle a reasonable input without causing distortion, then the efficiency of radio receivers would go up by leaps and bounds; but as it is, we must face the necessary evil—impedance—if we want the magnification.

And if we have magnification, we must be careful that we do not give the particular valve too much input, otherwise distortion will be the result.

Now let us discuss the choosing of valves and give some broad rules for picking out valves for those circuits mentioned.

H.F. Circuits

In the first place, in modern wireless receivers you are likely to come across three types of H.F. circuits in which the ordinary valve can be used, besides special H.F. circuits requiring screened-grid valves.

If the screened-grid valve, of course, is required, then nothing more need be said about it here, but where the ordinary circuits are concerned, then you might imagine that you have quite a wide choice from which you

The P.V.225 is one of the latest 2-volt super-power valves, and is capable of carrying a very useful grid swing without overloading.

The modern 2-volt output valve is a long way in advance of the 2-volt valve of a year ago.



might take your valve, though when you look thoroughly into the matter it is not really difficult. It boils down to only one class of valve.

Within the Vacuum—continued

Let us take the average tuned-anode circuit. Here it is best to use a valve which will give quite a good magnification factor and which has moderately high impedance. I do not advise you to use a resistance-coupled valve, although this could be done; but I should think a valve having an impedance of somewhere between 20,000 and 30,000 ohms and a magnification factor of anything from 20 to 40 would be most suitable.

The Detector Stage

In the case of the resistance-coupled H.F. stage which is shown in Circuit No. 15, then a resistance-coupled valve should be employed, and where transformer coupling is employed and neutralisation is used, you should use an ordinary H.F. valve of the order of 16,000 to 30,000 ohms, with a magnification factor of something like 16 to 30.

For the detector it is usually best to employ an H.F. valve similar to those I have just mentioned (of 16,000 to 30,000 ohms). It is possible in many cases to use a resistance-coupled valve, especially if you are a long way away from your local station and want the highest magnification you can get, but as a rule I think you will find that an ordinary H.F. valve will be far more fool-proof, and liable to give far greater general satisfaction than the resistance-coupled valve.

R.C. valves are quite often recommended, but personally I prefer the H.F. valve in the detector stage, even when that detector stage is resistance-coupled to the next stage. When it is transformer-coupled, of course, it is useless to use a resistance-coupled valve.

L.F. Amplification

For the first L.F. stage you have to look out for the bugbear of overloading. This overloading will depend largely upon the output from the detector. For instance, if you have a resistance-coupling valve in the detector stage, and a big amplification is given by it, then overloading in the first L.F. stage is far more likely to occur than if the valve in the detector stage is of the ordinary H.F. variety. And that is one of the chief reasons that I prefer an H.F. valve for the detector stage.

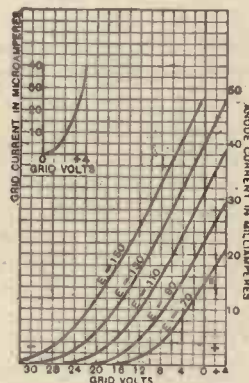
So, therefore, I would advise the use of an H.F. valve in the detector

stage and then a first-stage L.F. valve, which, while being suitable for the plate circuit of which it is to form a part, is also suitable to carry quite a moderate grid swing without overloading.

Core Saturation

I find that as a rule a valve of the order of 10,000 ohms is about right. There are many such makes on the market with suitable impedances and with magnification factors of somewhere about ten.

Even if the stage is resistance-coupled to the next stage, it is not usually advisable to use a valve with a greater magnification factor than about fifteen, otherwise overloading in the last stage may occur, while besides this quality of high magnification within the valve itself it will have a limited input range, and be likely to be overloaded itself.



*
The P.425 has a grid swing of 25 to 35 volts, and will take up to 150 volts H.T. with ease. It has an impedance of 2,300 ohms, and a magnification factor of 4.5.
*

If this stage is transformer-coupled to the next stage, then, of course, it would be very inadvisable to use a resistance-coupled valve, and unless you are using one of the special high-power transformers which are capable of carrying about twenty milliamps without saturation, it also is advisable not to use a valve having an impedance less than about 10,000 ohms.

Such a valve as the new D.E.L.610, which has an impedance of 7,500 with a magnification factor of 15, would saturate the average transformer core, and it should be noted that this valve wants very careful use if the best results are to be obtained. The old D.E.L., with impedance of 13,000, is, of course, quite suitable.

The Output Valve

It is a very efficient little valve, and if you have a transformer which will carry the current, or if you are using resistance coupling, then the D.E.L.610 is an ideal little valve, but

for general purposes I would advise the 10,000-ohm mark as a fairly safe guide.

The last stage depends really on three things: (1) Whether you want a big volume; (2) whether you want plenty of bass; and (3) whether you have sufficient H.T. capacity. It is no use using a super-power valve unless you can supply it with plenty of H.T., and, above all, plenty of H.T. current.

Super-Power Types

A super-power valve will work very well on 120 to 150 volts high-tension, but it will want about 18 milliamps, and you must be prepared to give it that 18 milliamps if you want really satisfactory results. If you cannot, then you will have to use an ordinary power valve, and you will have to be careful to watch the amount of input you give it in order to avoid distortion.

Obviously a power valve of the ordinary 6,000-ohm type will not carry the same grid swing as the super-power valve with an impedance of 2,400 or even 1,700 ohms.

If you look at the characteristic curve of any valve you will find along the bottom line the grid-bias figures, and on the curve itself you will find the high-tension voltage. If you look at the maximum high-tension voltage with which you can supply the valve, and then find the middle of the straight portion of its curve at that voltage, and go vertically down, you will come to the grid-bias figures going along the bottom at some certain figure, and that figure will give you a rough idea of the grid swing of the valve in volts.

Question of Grid Swing

Now if you take the ordinary power valve and its curve, and then take the ordinary super-power valve having an impedance of somewhere about half or a third that of the power valve, and you look along the same value high-tension line and down to the grid bias, you will find that the super-power valve requires a far greater grid bias in the centre portion of that same line than the power valve. Or, in other words, the super-power valve will carry a bigger input voltage than the power valve.

So it is a very definite advantage to use a super-power valve if you can, in conjunction with a good filter output choke, and it will give you really good reproduction on the average speaker.

(Continued on page 165.)

The "Collector" Two



Selectivity and ease of control are the main features of this simple, inexpensive, but highly efficient, long-range telephone receiver set.

Designed and Described by
A. S. CLARK

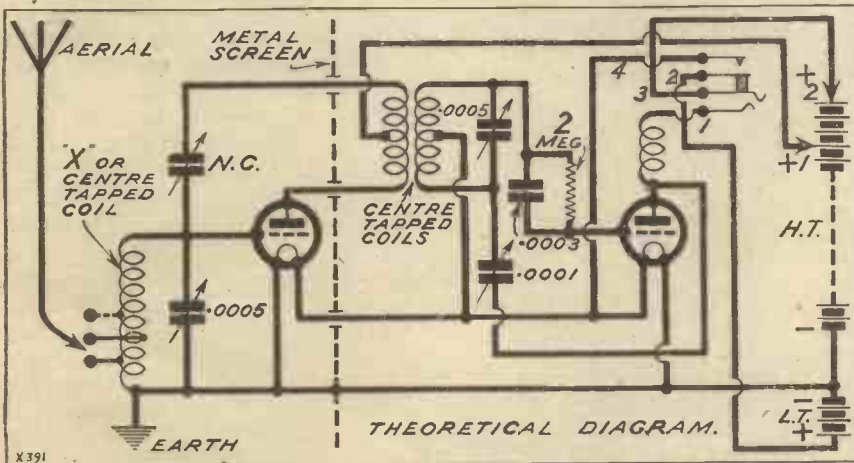
IN spite of the present general aim at getting very good volume and purity from the local station, and perhaps one or two other stations, there are still many enthusiasts interested in distant reception. Most of these, either for reasons of economy or merely because they are not interested in loud speaking, only require 'phone reception.

Turning to the second point, namely, ease of control, it will be appreciated that this is an advantage which makes the set eminently suitable for beginners in H.F. work, who generally find the extra tuning controls necessary rather difficult to manipulate. The fact that it is possible to have direct coupling on a centre-tapped coil for the aerial

and it will be appreciated from the above that the set is very pleasant to use and free from a number of drawbacks which such a receiver often possesses.

The Circuit Employed

If you turn to the theoretical circuit diagram you will be able to follow the arrangement employed. The aerial circuit is shown as either an "X" coil or a centre-tapped one. Both of these will give very good selectivity for work near to the local station. They are not necessary,



To these the receiver described in this article will have a special appeal. It is designed for really good 'phone reception of a large number of distant stations, although, of course, the local and other near stations come in as well as with any ordinary set.

High Selectivity

The receiver has two qualities which make it a first-class receiver for the purpose for which it is designed. The first is selectivity and the second ease of control. Even when used with a direct-coupled aerial circuit, the selectivity is such that stations can be tuned out in one or two degrees of the second tuning dial. Also the local station does not spread over a wide band, and can be restricted to very small limits.

circuit makes the tuning on the first variable condenser quite flat. This enables searching to be almost completely done on the second condenser, and avoids the difficulty often experienced where an H.F. stage is employed of keeping both circuits in tune.

Apart from the above the set has an almost uncanny stability, and the tuning dials seem delightfully independent. When a really weak station has been tuned-in it is possible to remove the telephones and hand them to someone else with a certain feeling that the transfer will not upset the tuning adjustments at all.

Reaction is quite smooth, and the set does not have to be worked absolutely on the verge of oscillation for good results. There is no hand-capacity effects with any of the dials,

COMPONENTS REQUIRED.

- Panel 14 in. x 7 in. (Radion, Beol, Kay Ray, Ebonart, etc.).
- Cabinet for above with baseboard 9 in. deep (Cameo, Artercraft, Kay Ray, Gilbert, Pickett, etc.).
- 7 Terminals with ebonite strips for same (see article for dimensions).
- 2 0.0005 variable condensers (Cydon, Ormond, Raymond, Jackson, Ripault, Lissen, Igranic, etc.).
- 1 0.0001 reaction condenser (Peto-Scott, Cydon, Dubilier, Bowyer-Lowe, etc.).
- 1 "Filament single-control" jack (Lotus, Bowyer-Lowe, Frost, etc.).
- 2 Anti-vibration valve holders (Lotus, Benjamin, W. & B., Godwinex, etc.).
- Standard 7 in. x 6 in. screen (Magnum, Parex, Pilot, etc.).
- 1 N.C. condenser (Peto-Scott, Igranic, Magnum, etc.).
- 3 Coil mounts (Any good make).
- 1 H.F. choke (Lissen, R.I.-Varley, Lewcos, Climax, etc.).
- 1 0.0003 fixed condenser with 3-megohm grid leak (Dubilier, Lissen, T.C.C., Atlas, Igranic, etc.).
- Wire, flex, screens, etc.
- For accessories see text.

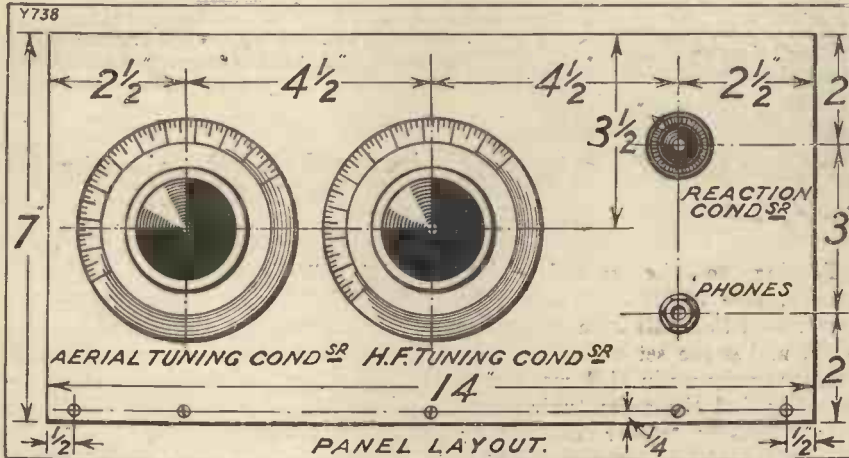
however, at a distance of about eight miles or more, and it is then possible to employ a direct-coupled arrangement. This will have the effect of making tuning on the first variable condenser even less critical than would otherwise be the case.

The "Collector" Two—continued

A flat metal screen is employed to screen the grid circuit of the H.F. valve and its associated components from the remainder of the set. This

either end, it is possible to run the L.T. + wire along near the panel without insulating the wire and taking it through the screen.

All three coils are of the ordinary two-pin plug-in variety, the two which form the H.F. transformer being carried in coil mounts placed fairly close together. It will be noticed that a 3-megohm grid leak is employed in order to ensure smooth reaction control, which is an absolute necessity if successful long-distance reception is to be accomplished.



Well-Spaced Components

The baseboard and panel have been chosen with ample proportions for the set, thus allowing plenty of room for the components to be spaced. Incidentally, it also makes the wiring an extremely simple matter, as a glance at the photographs of the interior of the receiver will prove.

Before commencing the construction of the set, all the components

prevents back-coupling between the coils and thus helps towards stability. The H.F. valve is also neutralised to keep it stable.

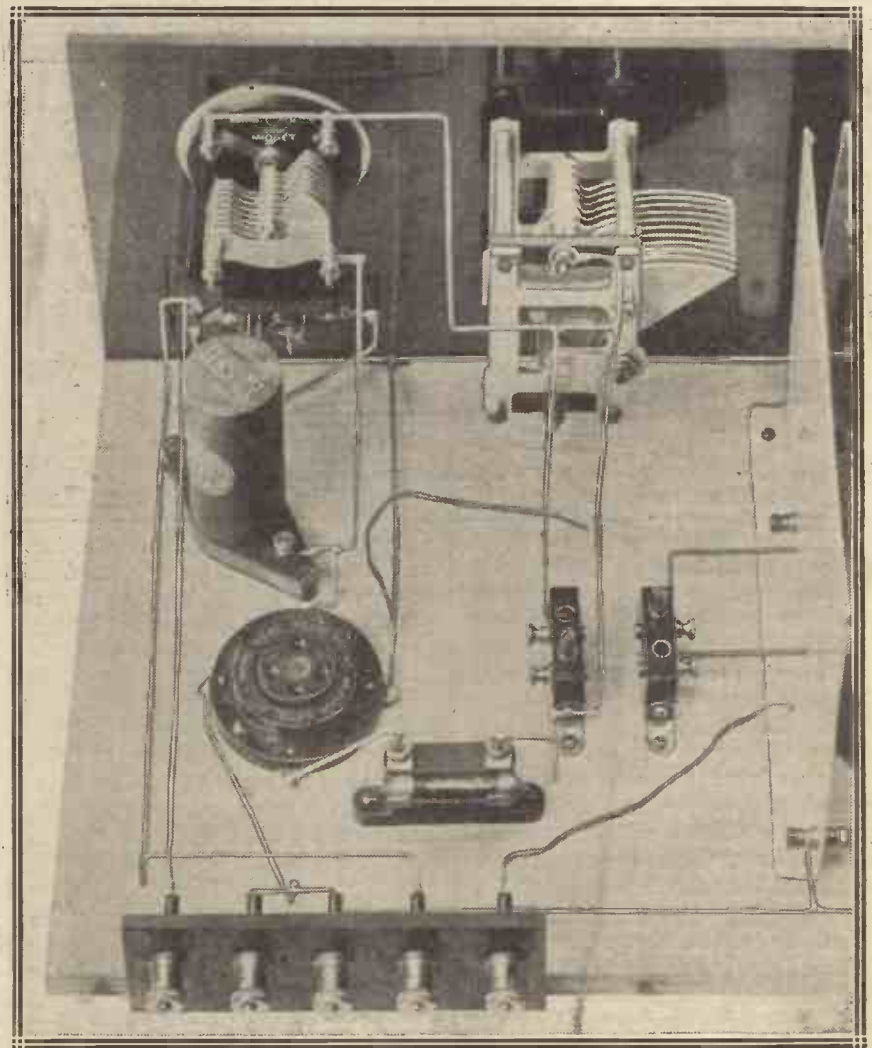
This is carried out by means of a split-primary arrangement. Coupled to the primary and neutralising coil is another centre-tapped coil. This forms the inductance for the grid of the detector valve, which rectifies on the leaky-grid-condenser method. The whole of this coil is tuned, and the centre-tap is connected to L.T., reaction therefore being obtained in the well-known "Hartley" manner.

In order to avoid the use of both L.T. switch and telephone terminals, which if used are desirable on the panel, a single open-circuit filament-control jack has been employed. Thus the set is switched on by merely inserting the telephone plug in the above-mentioned jack.

Neat and Businesslike

The front of the set presents a neat and businesslike appearance with its two tuning controls, reaction condenser and jack. All battery terminals and aerial and earth terminals are carried on strips of ebonite at the back of the set, two separate H.T. + taps being provided.

This enables the best value of H.T. voltage to be applied to both H.F. and detector valves. The flat metal screen is of standard specification, and is so arranged as to come between the two variable tuning condensers. As it is not quite so deep as the baseboard, an inch being left clear at



A large-scale view of the detector-stage portion of the set. The terminals from left to right are H.T. plus 2, H.T. minus, L.T. minus, L.T. plus, and H.T. plus 1.

With Lissen transformers, each stage of amplification emphasizes the silence of the background — the startling definition of the notes!

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VOLUME AND RETAIN
PURITY IF YOU USE
LISSEN TRANSFORMERS

BECAUSE Lissen Transformers amplify in a background of *dead* silence, each added stage of amplification makes more noticeable the startling definition of the notes. There is no parasitic noise to be heard, no extraneous sound to mingle with the incoming signals. As the volume is increased by extra amplification, so do the notes of music seem more and more to stand out in sharp relief. The low notes as well as the high ones are there, because there is even amplification over the whole band of audible frequencies.

LISSEN SUPER TRANSFORMERS, 19/-

In transformers in this price field, you expect something approaching perfection of amplification—and in Lissen you get it! The laboratory curves taken of the Lissen Super Transformer prove that there is exceptionally even amplification over the whole band of audible frequencies, and it should be noted that these curves have been taken with ordinary standard valves. If you are building for a quality of reproduction that cannot be excelled, use the Lissen Super Transformer for each stage.

Two ratios, $3\frac{1}{2}$ to 1 and $2\frac{1}{3}$ to 1, 19/- each.

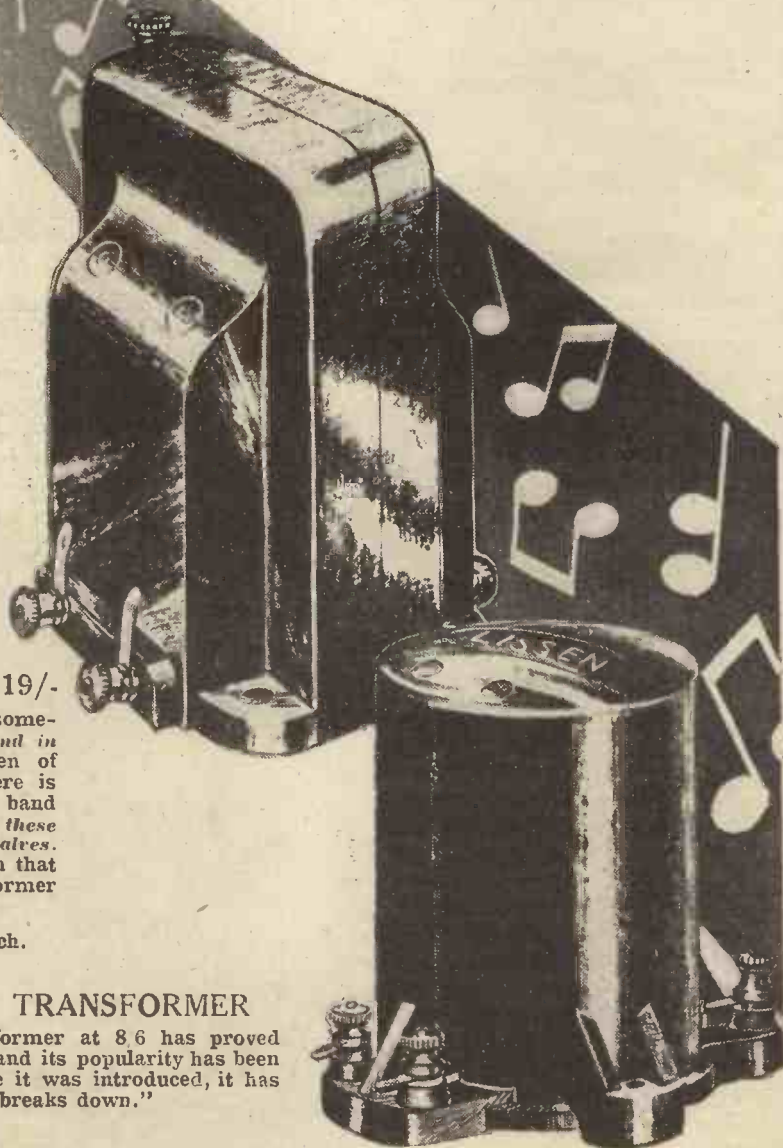
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The "Collector" Two—continued

required should be collected. A complete list of these is given in another part of the article, and the names of suitable makes are mentioned. It must not be assumed,

The next step is to mount the components on the panel. This is a quite straightforward proceeding, and needs no remarks. After it is accomplished screw the panel to the baseboard, and

The terminals are $\frac{3}{4}$ in. from the top of the strips, and the strips should both be 1 in. from the ends of the baseboard.

Before proceeding further the components should be prepared for wiring. This consists of tinning all points to which soldered joints are to be made, such as soldering tags, terminal shanks, etc., both on the components mounted already and those yet to be fixed in place.

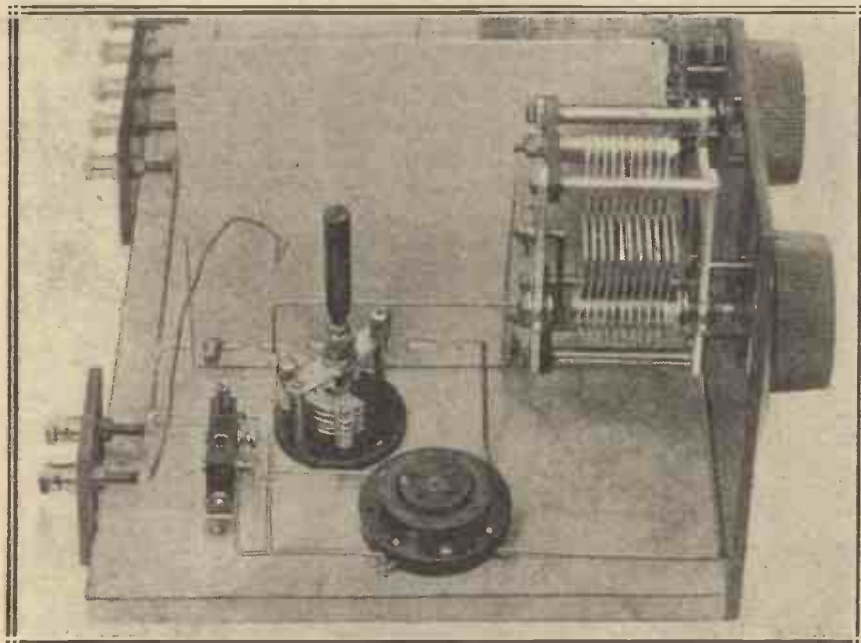
Wiring-Up

The object of the above is to simplify wiring, as it is not an easy matter to file and tin terminals when all the components are in place, besides the question of getting rid of the filings.

Now turn to the wiring diagram, and, using it as a guide to the positions of the components on the baseboard, fix these in place. Do not put the coils which are parallel to the screen too close to same, and fix the screen so that it is about one inch from the front and back of the baseboard.

The set is now ready for wiring, and attention may be turned to this operation. It is carried out with stiff wire, either covered or bare. Do not hurry the wiring, as on it depends the neat appearance of the back of the receiver.

The majority of wires are run parallel, right-angle bends being employed, but a number of short leads are taken straight from one point to another. The photographs of the



The H.F. side of the screen. A tapped coil is accommodated in the coil holder which can be seen.

however, that these are the only suitable ones, as any good components of the right type may be employed. The names are merely given as an indication of the sort of component to choose.

The set, unlike some with an H.F. valve, is not at all critical where components are concerned, and other makes than those specified may be used with every confidence of success providing they come from a reliable firm, such as those advertising in the columns of this paper. Having purchased or collected together all the necessary parts, the construction may be carried out without a break.

Commencing Construction

First of all mark out the panel on the back with a scriber. The dimensions given on the drilling diagram should be followed, care being taken to remember to reverse the positions of the holes, since the panel is marked out on its back and the diagram is of the front of the panel. Having completed the marking out, centre-punch the points where the panel is to be drilled, and then drill the various size holes required.

also the terminal strips, which should have the terminals mounted on them.

Two of these strips are required, one 2 in. long with two terminals, and the other 5 in. long with five terminals. The strips are 2 in. deep and the terminals should be spaced 1 in. apart, the end ones being $\frac{1}{2}$ in. from the ends of the strips.



Two tuning dials and a reaction dial figure on the symmetrically arranged panel. There is also a telephone receiver plug which operates as an on-off switch in addition to its normal duty.

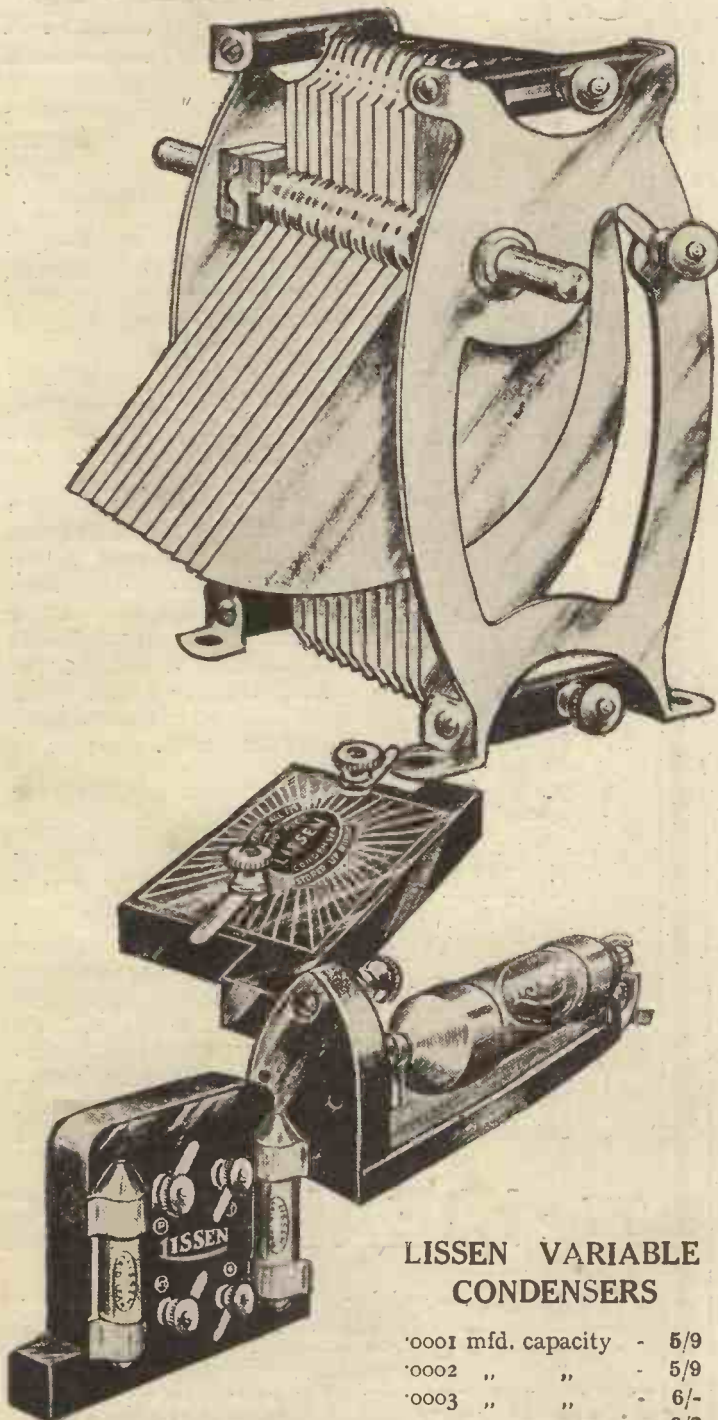
Lissen consider that you know best —

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YOU do not want to be tied down to a kit of parts on the minor recommendation that they give you ease of assembly when you know that by substituting Lissen parts you will not only get ease of assembly but better results at less cost. Think of the advantages of using Lissen parts, too, when you come to alterations and improvements in your set. Then it is you will congratulate yourself that you had the initiative to use Lissen parts instead of those others which were specified, for Lissen parts are standard components which you can move about in any circuit and in any way.

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·0002 " "	-	5/9
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·00035 " "	-	6/3
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Ohms.	Price.	Ohms.	Price
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		250,000 ohms	6/6

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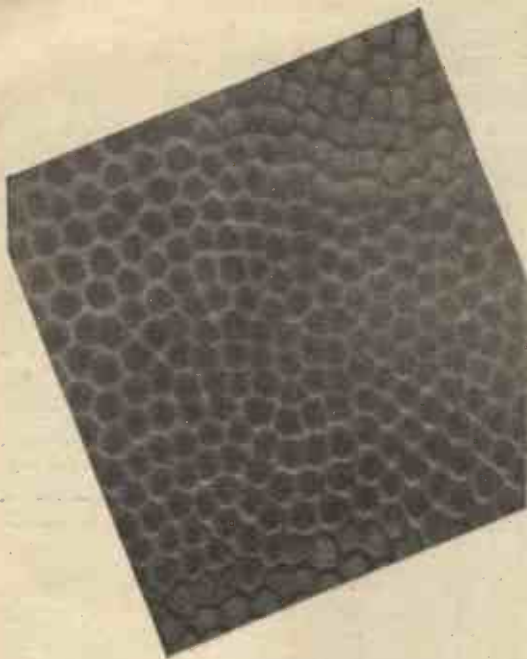
·0001 to ·001	1/- each.
·002 to ·06	1/6 each.

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Provides a complete Resistance Capacity Coupling Unit. Includes 2 LISSEN Fixed Resistances and 1 LISSEN Condenser. May be mounted upright or flat. 4/-

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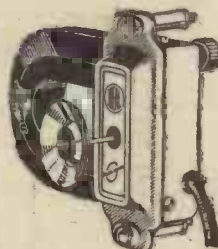
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Speaker for
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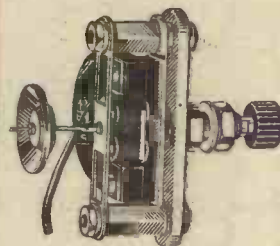


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The 66K four-pole balanced armature unit (adjustable type).

The Blue Spot units—66K and 66Z—get the best out of every programme; handle with astonishing realism those passages in which the ordinary driving unit tends to "fall down"; put life and colour and verve into every item.



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These Blue Spot units are the basis on which you can build at home a cone speaker equal in reproduction to the best on the market. Full instructions for building a speaker of either closed or open cone type are included with every unit sold.

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"Ideal Blue Spot Cone Speakers are sold under full protection of the patents owned by Standard Telephones and Cables and the Hopkins & Lektophone Corporations."

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Complete instructions are supplied for building cone speakers—both floating edge and free edge type—around these units. Provided the speaker is built to these specifications, and the set is not forced or overloaded, we claim that reception will be virtually as good as if the listener were actually sitting in the transmitting studio.

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The "Collector" Two—continued

back-of-panel will help you to arrange the wiring more or less as it is in the original. The connections given in the wiring diagram must be followed exactly.

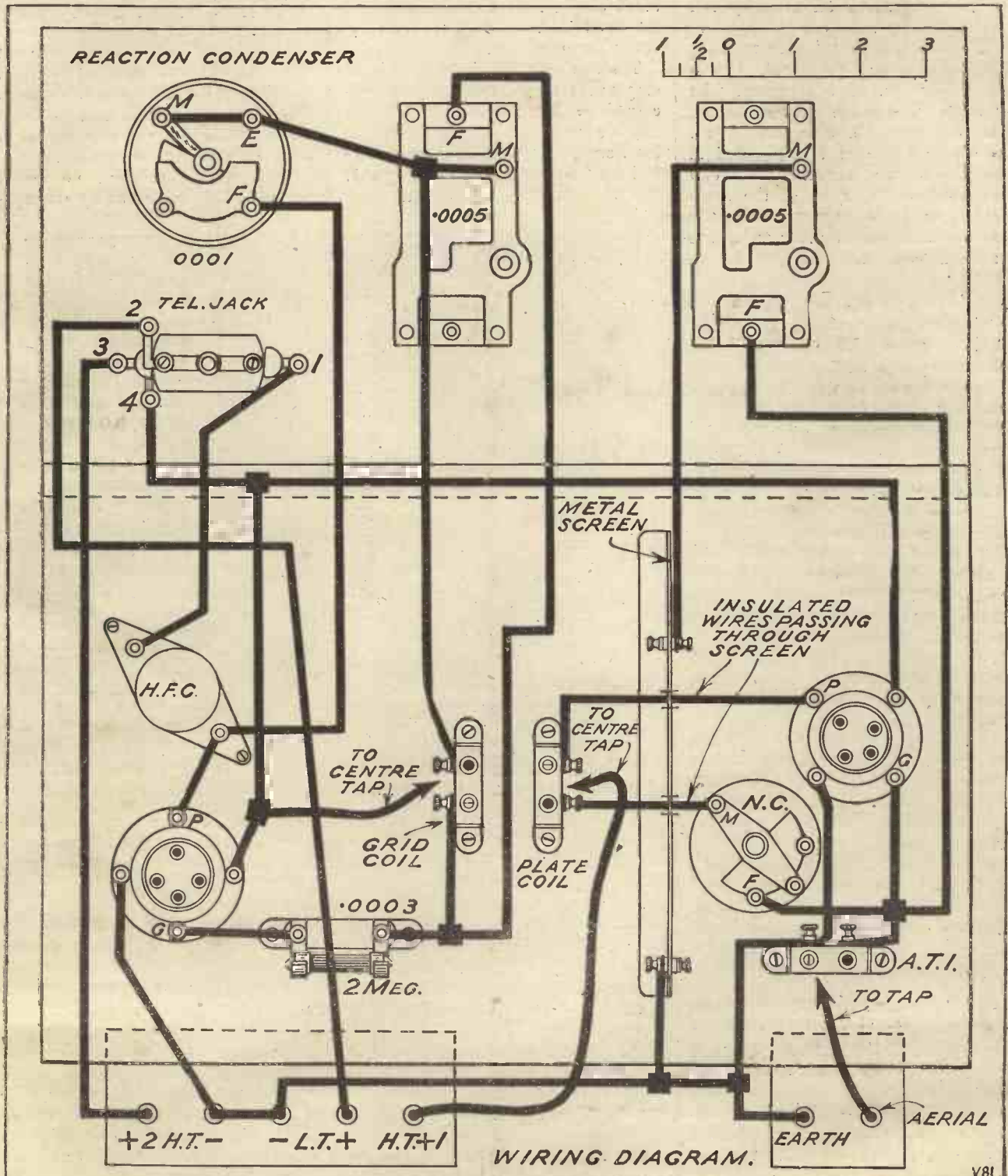
The two leads which pass through the screen to the anode coil must be

insulated, whatever wire is employed for the rest of the set. The L.T. + busbar is run along close to the panel in the angle made by the baseboard and panel. Do not run this wire away from the panel as it has to pass the screen, and if it were to touch this

the L.T. [battery would be shorted.

Take care not to run any wires where they will foul the valves or coils when these are put in place.

Before describing the operation of the set, a few words on the accessories required will not come amiss.



The "Collector" Two—continued

For the lower broadcast band a No. 60 "X" or centre-tapped coil may be used in the aerial coil socket. The "X" coil will only be required when the set is to be employed really near to the broadcast station. As already indicated, for distances above about eight miles an ordinary coil usually suffices.

The size of such will vary with the particular aerial employed, but a No. 35 or No. 50 will generally be suitable. The anode and neutralising coil may be a No. 60 centre-tapped, as also can the grid coil which is coupled to the former. These two coils should either be of the same make or have approximately the same dimensions in order to ensure sufficient coupling.

Long-Wave Reception

On the longer waves a No. 250 "X" coil or a No. 200 centre-tapped should be used for the aerial circuit. The same remarks apply on the long waves in regard to this coil as for the lower broadcast band, and a No. 150 will be required for direct coupling. The anode coil and grid coil should be No. 250 centre-tapped coils. Experiments with slightly different sizes of coils are always worth while.

Two H.F. type valves can be used, although the detector may be an ordinary "det. or L.F." valve if desired. An accumulator of a voltage to suit the valves, which may be 2, 4, or 6 volts, will also be required, and an H.T. battery of 60 or 100 volts. The more sensitive the telephones employed the better.

Although the feel of the set when neutralising is not quite the same as the average set, it is best to carry out the stabilising by the reaction demand method. This is done in the following manner. Having connected the set up and attached the aerial and earth, set the reaction condenser at zero and turn the second tuning dial backwards and forwards, listening for two clicks which indicate oscillation.

Neutralising

If these are heard, try increasing the capacity of the N.C., which should be put at its minimum capacity at the start. The above should be tried with 3 or 4 settings of the first condenser, and eventually a position will be found for the N.C. at which no oscillation at all takes place.

The next step is to turn the reaction condenser so that the vanes are just overlapping sufficiently for the set to begin to oscillate. Now try and stop this oscillation by slightly altering the setting of the N.C. Carry on in the above manner until further adjustment of the N.C. does not stop the set oscillating. The receiver is now ready for operation.

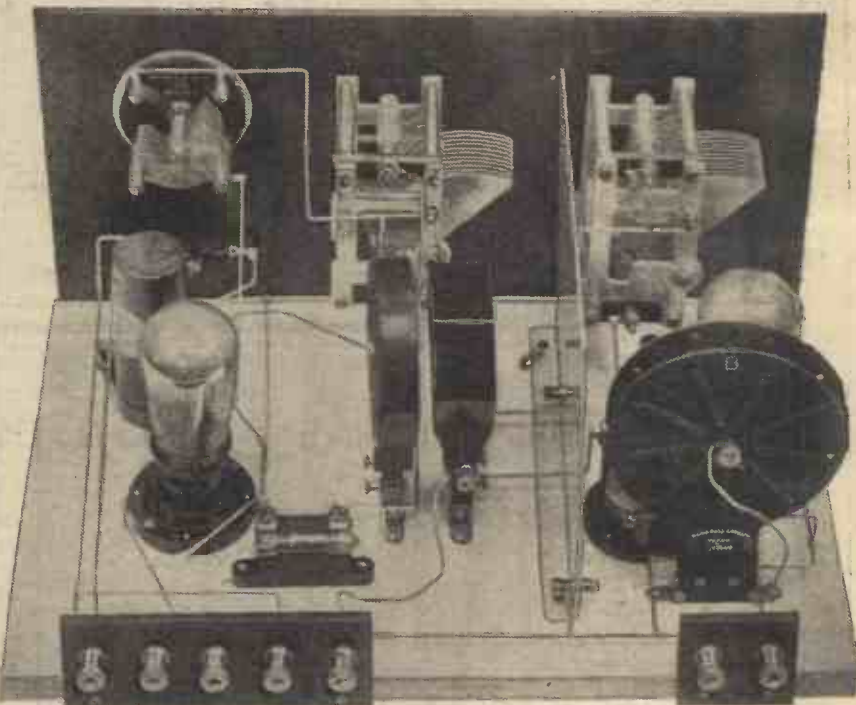
The two tuning dials will not be in step as far as dial readings are concerned, so that it is best to find their relative positions by tuning-in the local station. You will then be able to keep the dials roughly in step over the whole of their movement.

valve is governed by the control of reaction. A fairly high voltage should be used, but it must not be such that "ploppy" reaction is the result. Therefore use as much H.T. on the detector valve as smooth reaction control will permit.

Exceptional Results

The general impression of the set when on test has been indicated in the opening paragraphs of this article. Using the coils specified, the stations which could be properly tuned-in were too numerous to identify.

As a matter of fact, no useful purpose would be served by attempt-



A whole view of the back of the set, showing the coils and valves in position.

While searching the set may be treated practically as an ordinary receiver without an H.F. stage. That is to say, that so long as the first condenser is approximately in step with the second it may be ignored, the only controls to be manipulated then being the second tuning condenser and the reaction control.

Once a distant station has been properly tuned-in with these two controls, the first condenser should be adjusted to the position which gives the loudest results.

It is advisable to use as high an H.T. voltage on the H.F. valve as is consistent with proper neutralisation. The value of H.T. on the detector

ing to do so. It means much more to read in a test report that practically all the carrier-waves heard were properly resolved with little difficulty, than to have a string of names of stations tuned-in by an expert. On the receiver just described, stations were heard all round the dials, a fresh one coming in every two or three degrees on the lower band. Naturally the stations were not so numerous on the long waves, but it is surprising what a number can be found.

In conclusion, the author can state with every confidence that anyone making this set up with the idea of using it for what it was designed, will be highly pleased with his results.



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RADIOGRAMPHONICS

A monthly article for the gramophone enthusiast.

A Pick-up Potentiometer—Semi-balanced Tone-arms—Using a Pentode, etc.

By A. JOHNSON-RANDALL.

WE have recently received for test one of the Centralab potentiometers especially designed for pick-up volume control.

The device has a value of 20,000 ohms and consists of a circular non-inductive strip with a noiseless contact common to all Centralab type resistances.

There are three terminals. The two outer terminals represent the ends of the resistance element and are joined one to each terminal of the pick-up. The centre terminal goes to the moving arm of the potentiometer and is joined to the grid of the first valve of the amplifier. Hence, the strength of the music can be controlled at the source. The device is well finished and is dustproof. Only one hole is required for mounting purposes, and the movement is pleasantly smooth.

The Centralab potentiometer is marketed in this country by Messrs. Rothermel.

Needle Adjustment

Just a few words about needles. This seems to be such a small matter, but it has an all-important effect upon the results. When you purchase your pick-up, ask the makers whether they recommend the needle to be pushed well home.

With some carefully designed pick-ups this is essential.

The reason is that if the needle is only inserted just far enough for the screw to secure it, the fact that nearly all of its length is projecting may have a detrimental result on quality. An excess in the length of the needle projecting tends to alter the damping of the pick-up, and if carried to extremes the very troubles which the makers have taken pains to overcome may reappear.

Those of you who use your ordinary gramophones for pick-up work may sometimes wonder how to dispose of the long flexible lead from the pick-up to the set. I quite agree that it is rather difficult to close the lid of the

gramophone cabinet in these cases, while if

the lid is left partly open the chatter from the pick-up tends to become a nuisance. The best scheme I think is to drill a hole in the side of the lid and simply to pass the flexible cord through this hole, laying it along the tone-arm and securing it lightly so that it does not bear on the record surface or foul the pick-up. Of course, you must leave enough slack to permit free movement of the tone-arm.

By the way, do you notice the marked tendency on the part of manufacturers to provide semi-balanced tone-arms for their pick-ups. Some of these are designed so that the length of the arm can be varied, and then again there is the scheme of employing a spring to give an upward push to the arm, thus reducing the effective weight of the pick-up on the record. This goes to show how much thought makers are expending on this problem of perfect electrical reproduction, and it proves that they are fully alive to the fact that you can wear a record out—and pretty quickly in some cases.

The Pentode

Lots of readers are keen on using one of the new Pentode valves in the last stage of their amplifier. I suppose this is only natural. Here is a valve with a very high amplification factor, and the knowledge that one can do away with the preceding L.F. stage and still retain adequate volume seems very attractive.

Well, there are always certain little difficulties which have to be overcome with a new device. The Pentode is no exception. In the first place it requires a fairly heavy anode current of from 12 to 16 milliamperes. This in very many cases is not a serious matter, because any decent eliminator



will supply the necessary juice. But what about those listeners who use dry batteries. Well, it means that only the type which have large-sized cells are suitable. These are usually known as triple-capacity batteries, but they are sometimes sold under other names, such as "extra heavy duty," or "super batteries."

In any case, the cells must be capable of supplying a steady current of, say, 14 milliamperes plus the anode current required by the remaining valves in the amplifier.

Then there is the question of a suitable output circuit.

Output Transformers

The Pentode has a high impedance, and if maximum quality is desired it is inadvisable to place the loud-speaker winding directly in series with it. Apart from the question of impedance and its effect upon the bass, one should remember that an anode current of 14 milliamperes or so can produce a considerable voltage drop across the average speaker windings, a fact which must be taken into consideration when we are endeavouring to get the very best reproduction.

Now, the average choke-filter output circuit, for reasons which cannot be entered into here, is not ideal, and the solution at the moment seems to lie in the direction of an output transformer of suitable design. Fortunately, manufacturers have been working on the problem, and by the time these words appear in print it is probable that there will be at least two or three special Pentode output transformers on the market.

Incidentally, the Pentode owes its magnification to its high amplification factor, and its available grid sweep

(Continued on page 165.)

TELEVISION AND THE B.B.C.

The protracted negotiations and discussions upon the practicability of Television have now reached a decisive phase, which is discussed frankly below.

ON October 9th representatives of the B.B.C. investigated the Baird Television System. Among those present were Captain Eckersley, Admiral Carpendale, Mr. Roger Eckersley, Major Gladstone Murray, and other technical administrative representatives of the B.B.C.

Result of the Test

The test was given as a result of an application by the Baird Company for the co-operation of the B.B.C. in broadcasting television. The Post Office suggested to the B.B.C. that one of their stations should be lent for this purpose, but the B.B.C., in reply, stated that they could not see their way to do this until the Baird Company had granted their representatives a test.

If the test were satisfactory, then the matter would be considered. The test has *not* proved satisfactory, for, on Thursday, October 18th, the B.B.C. issued an official announcement which stated, *inter alia*: "The opinion of the B.B.C. representatives was that, while the demonstration was interesting as an experiment, it failed to fulfil the conditions which would justify trial through a B.B.C. station. The Board of the Corporation has decided that an experimental transmission through a B.B.C. station should not be undertaken at present. The Corporation will be ready to review this decision as and when development justifies it."

New Discovery Wanted

Readers of this journal, and of our contemporaries "Popular Wireless" and "Modern Wireless," are well aware of the fact that we have from time to time criticised the publicity statements made concerning television in this country. For example, as an outcome of certain statements made in connection with television, our contemporary "Popular Wireless" issued a thousand pounds challenge to Mr. Baird—a challenge made in all friendliness, but asking Mr. Baird to prove by a demonstration that his apparatus was capable of

televising by wireless certain simple objects. That challenge was refused.

We have also published in the "Big Three" articles by some of the greatest living physicists, showing that known television systems—and, after all, there is no great secrecy about known television systems—would not be capable of giving a satisfactory public service or a service any way approaching the early cinematograph service, until certain fundamental problems had been solved. And it was clearly pointed out by Sir Oliver Lodge, by Dr. J. H. T. Roberts, by Dr. Lee de Forest, by Mr. A. A. Campbell Swinton, and by many other highly qualified experts, that the solution of the television problem lay not in a development of known methods, but in the discovery of a new and radical principle; that is to say, a discovery of something which might be likened to the discovery of the valve.

known to man—wirelessing by Morse and wirelessing by speech are two very different things.

Although wireless by speech is possible without the aid of the valve—the Poulsen Arc system of telephony was known long before the valve—it required a fundamentally new principle (such as was contained in the discovery of the valve) before wireless telephony became a practical proposition, and before it was in a state fit to be released from the laboratory and offered as a contribution to the progress of wireless from the public service utility point of view.

In Laboratory Form

The discovery which will lift television out of the laboratory stage has not yet been made, and, although there are many eminent people in various parts of the world devoting themselves whole-heartedly to the discovery of this new principle, at the moment of writing we are confident, from the information in our possession, that no such discovery has yet been made. It may, of course, be made the very day this journal is on sale; and we can assure our readers that whenever it is, the arrangements we have made with technical correspondents throughout the world are such that we shall be able to give our readers the very first *authentic* news concerning such a possible discovery.

Mr. J. Logie Baird, adjusting one of the £150 televisions during a demonstration of land-line television held at the recent Wireless Exhibition at Olympia.



Many people, of course, have always held the view that television must inevitably progress, and develop, and become more and more perfect, just as inevitably and as logically as the development of ordinary Morse wireless, and wireless broadcasting. But these critics forget that—although wireless in the wide sense of the term has progressed with probably more rapidity than any other scientific discovery

But at the moment it may be said, as we have stated innumerable times before, that such a discovery has not yet been made and that television still remains in the embryo; that is, still in the laboratory stage.

Consequently, we trust that in future we shall not find the following statements being believed in so credulously by the general public: "We

(Continued on page 158.)



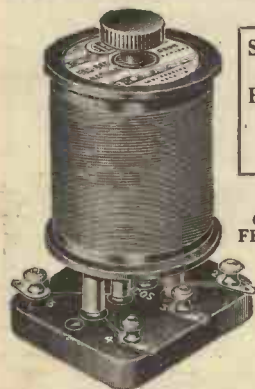
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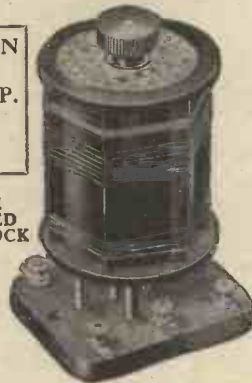
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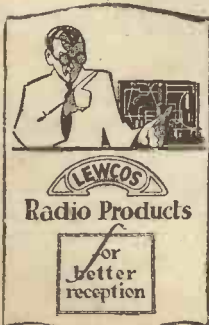


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IN LIGHTER VEIN

By
Wireless
Wayfarer



THE Professor and I were indulging in a little rest after the labours of the day. When we work, we *do* work, I can tell you. Snatching a bare three hours for lunch and ninety minutes or so for tea, we had toiled like navvies from the stroke of midday until the small hours of the afternoon. Naturally such a strain begins to tell a little. However, when one is labouring in a good cause one does not mind taking it out of oneself a bit.

We had been engaged in the potting sh—, that is to say, the laboratory, in researches into the chemistry



The Professor's countenance was hardly so white!

of the dry cell. Really, I can never understand why manufacturers of those things should make their insides so messy. I mean, what is the use of having all that black stuff inside the big things? I had been busily scooping out this horrible compound, when the Professor remarked that he had a fly in his eye and requested me to remove it instantler.

A Black Outlook

Of course, I flew to the rescue. With one hand on his cheek and the other on his forehead, I forced the lids apart. "That," cried the Professor, "is the wrong eye." I hastily changed my hands over, and by the time that I had tracked down and removed the insect from its lurking place the Professor's countenance was hardly so white as it had been; in fact, one might almost say that it was distinctly black. I suggested that he should retire to the house for a wash. Hardly had the door of the laboratory closed upon him when a piercing feminine shriek reached my ears.

Dashing out, I found the Professor endeavouring to soothe the Miss Worple, who appeared to be on the verge of collapse; in fact, she had so far collapsed as to be sitting on the path. She had come upon him suddenly as she turned the corner of the house, and the sight had proved too much for her nerves. When she had calmed down a little, we learnt she was going to a tea-fight that Mrs. Goop was giving. This, of course, explained why she was all toggged up in a pale grey dress. "Hadn't you better get up?" I asked. "I am sure you will be getting rheumatism or something."

The Worple Tragedy

Miss Worple held out her hands. I seized them and helped her to her feet. Then she smoothed down her rumpled raiment. Every pat produced a large black dab and every stroke a smear. Suddenly she saw what was happening. If you will believe me she was really a bit put out about it, and we had quite a business to explain to her that such little incidents must be taken as part of the day's work by those who are engaged in the service of that stern taskmistress Science.

The Professor assured her that he could remove the stains in a moment. I think, though, that the bottle that he brought must have been the wrong one. The stuff certainly removed the stains, but it seemed to dissolve the material at the same time. And as fast as one patch was got rid of two others seemed to appear, for, somehow, I kept forgetting the state my hands were in, and assisted the Professor by stretching the material tight whilst he applied the stuff.

Things Become Darker

Miss Worple at length departed in rags and a bad temper, whilst we retired to the house to wash. "Don't touch the door handle," said the Professor. "Wait here. I will run round by the back door and let you in." Whilst I was standing on the door step, Goshburton Crump arrived and shook me warmly by the hand. It is a pity that he has a nervous

trick of passing his hand over his chin; however, as I did not want to make him ill at ease I said nothing about it.

Just then Sir K.N. and Lady Pepper arrived. Looking rather curiously at Goshburton Crump, they shook hands with both of us. Lady Pepper straightened her husband's tie, leaving a kind of jazz pattern on his shirt and collar. "Thank you, my dear," said Sir K.N., fondly patting her cheek. Passing his hand over his fevered brow, Sir K.N. stood for a moment stupefied. Just then the Professor opened the door.

"Has the whole dam world gone mad?" bellowed Sir K. N. Pepper. "I thought we were coming to tea and not to a nigger minstrel entertainment."

We Clean Up

The Professor and I fled, remembering that absence is held to make the heart grow fonder. We had an awful time in the bathroom. You see, you have to turn on a tap to get water. When you have removed some of the dirt from one hand, you get it just as bad again by applying it to the tap to turn off the water. Really, I think it's a low-down trick of battery makers to mix graphite with the other



—looking rather curiously at Goshburton Crump.

stuff, for the more you rub it the deeper it goes in. You can get it off your hands more or less with bathbrick and pumice and monkey soap and emery cloth, but the Professor's face was a problem. After I had been over it once with the bathbrick, which I assured him would produce the healthy glow of a schoolboy complexion, he refused firmly to have any more of that treatment. For a moment I was baffled. Then I remembered how once in my youthful

IN LIGHTER VEIN

—continued from previous page.

days I had had a black eye painted out in order to enable me to attend a dance. If a black eye could be painted out, then why couldn't a black face. I despatched the Professor for Mrs. Goop's beauty box. On his return I applied a light coating of grease which I covered thickly with white powder. A few deft touches with lipstick and rouge and the Professor would have been the certain winner in any male beauty competition.

You will understand, then, that after so strenuous a time we felt that our little rest was well earned. I was just jotting down in my notebook the results of our researches, which had proved conclusively that $MNO_2 + C$ is of a dark colour and that $MNO_2 + C + H_2O + SOAP$ leaves things much as they were before, when the Professor suddenly shot a question at me.

A Bit Tied Up

"Are you satisfied," he asked, "with the modern spoudleaker?"
 "You mean loukspeader," I said, laughing heartily.

"Idiot," roared the Professor, "I should have said speadlouker. Tut, tut, my tongue is becoming twisted. What I intended was, of course, leak-spouder."

"Come, come, this will never do," I cried. "Let's start again. You wished, I think, to say something about spoukleaders. Oh, hang it all, speaklouders. Oh, well, let's drop



A certain winner in a beauty competition!

the wretched word and call them talkle tabers, as the Americans do."

We looked at each other rather blankly. When the Professor, after a pause, went on to say that he had been thinking a lot about hogarithmic lorns and coving moils, we realised that we had both got it rather badly, and that distinct distortion was taking place in our reproduction.

"Let us try another subject for a change," I suggested. "It might help to straighten out the kinks in the characteristics of our tongues. Has it ever occurred to you that so

far no poet has taken wireless for his subject?"

The Professor admitted that it had not.

Crammed With Inspiration

"Yet," I murmured, "wireless is simply crammed with inspiration; it is full of the most marvellous themes. Here's a little thing that came to me in my bath this morning:

"There was an old man of the Peak
 Who said 'My reception is weak,
 I think that it must
 Be the coating of rust
 That I notice upon the grid leak!'"



"There was an old man of Koenigswusterhausen."

"That is true poetry," beamed the Professor. "Ti tumtity tumtity tum; ti tumtity tumtity tum. Ti tumtity tum; ti tumtity tum. Ti tumtity tumtity tum! Let me see:

"There was a wild fan of Berlin
 Who made all his panels of tin,
 When they asked 'Don't they
 short?"

He replied with a snort,
 'Here and there; but they're gorgeously thin.'"

The Regional Scheme

"Not bad," I said. "Can't we do something about the regional scheme?"

"Your turn," said the Professor politely.

I rumbled my hair, retied my tie in a large and floppy bow and began:

"Oh, the regional scheme's in the air
 And the B.B.C.'s tearing its hair.
 But where are the stations
 For twin radiations?
 And Ecko's heard answering
 'Where?'"

"Anyhow," smiled the Professor, "I bet you can't go on with this one.

"There was an old man of Koenigswusterhausen—"

"Easy," I replied.

"Whose loud speaker the cat put a mouse in.

When the cause he found out
 He exclaimed, 'Sauerkraut!
 Donner! Blitzen! and likewise
 Potztausen!'"

 * NOTES AND JOTTINGS *
 * Some Terminal Tips *

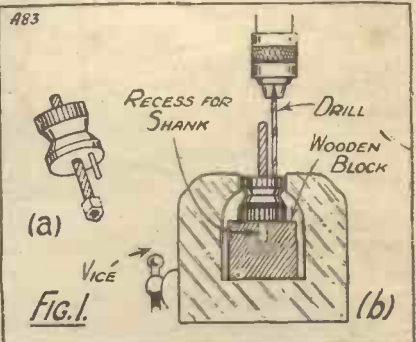
WHEN you have finished soldering the wires to the terminals of your receiver you usually have to go round them all and tighten up the nuts. The heating of the terminals has softened the ebonite, and nuts which you turned tight home are now quite loose. If you have had to keep the iron on one terminal for some time, there will be a sort of raised ring of ebonite on the face of the panel round the head. The ebonite has bulged with the heat.

You can avoid this disfigurement by turning the nuts home only just far enough to keep the terminals steady, till you have done the soldering. Then, when the terminals are cool, go round with a spanner and tighten them as much as you like.

Preventing Turning

Another way of ensuring that terminals do not turn in the panel when the receiver is finished is to fit them with locking pins.

To fit the pin, put the terminal upside down in the vice (Fig. 1). A block of wood underneath will help to support it and to prevent it from tilting sideways. In the underside of the head drill a hole with a fine drill, midway between the shank and the edge of the head. In the hole put a piece of hard brass wire. This should be a tight fit in the hole, projecting about 1/8th in.



To mount, drill the usual clearance hole in the panel for the shank, put the terminal in, and give it a light tap with a mallet, so that the pin makes a mark on the panel. Centre-punch this mark, and drill a hole with the same drill as before. When you put in the terminal, tap it home with the mallet, and secure with the usual nut.



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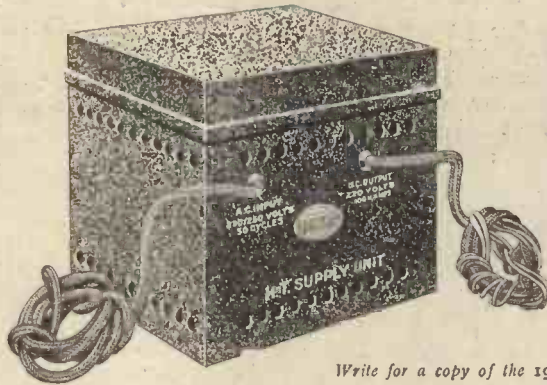
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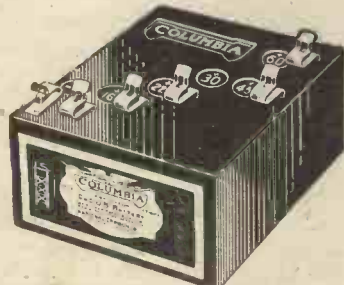
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CHATS AT THE WORK-TABLE

Many points of practical interest to all radio constructors are dealt with under this heading.

By R. W. HALLOWS, M.A.

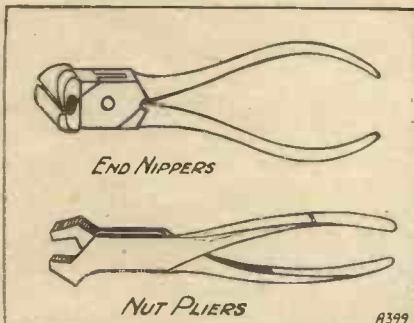


WITH the arrival of winter, which is undoubtedly the best part of the year for wireless reception, readers apply themselves with redoubled energy to the business of construction. Many are old hands at the game who have made and improved countless sets since they first became converts to the greatest of all hobbies.

A large number of others, though, will be starting for the first time to construct apparatus. It may therefore not be out of place if we spend a little time in discussing the very important question of workshop outfits. Constructors may be divided into two classes. Many people begin by belonging to the first and pass as their skill increases into the second. Others who have already some skill in the use of tools began their wireless careers as members of the more advanced class.

Constructors Classified

To the first class of constructors belong those who use nothing but



such components as can be bought ready-made. Their work is confined in the main to following carefully the instructions given by the writers of

constructional articles. Most of them drill their panels and fix them to the baseboards, but there are others who have drilling done for them and purchase prepared panels ready for fixing up and for the mounting of components.

Beyond this the chief task is to fix the baseboard components in their places with screws, and to attach the necessary leads to them by means of screw-down terminals.

Simple as is the work to undertake, such constructors obtain first-rate results if they are careful to follow along the lines laid down, since every writer in the WIRELESS CONSTRUCTOR pays particular attention to choosing components suitable for the work in hand, and draws his layout diagrams in such a way that the best method of placing parts is indicated.

But the same set made up by two different readers may present two quite different appearances, especially when the lid of the cabinet is opened and one glances within. Both will probably work equally well, but one is much more pleasing to the eye than the other. In the one case, suitable tools have been used with care; in the other, "any old tool" has been pressed into service, and the job shows that it has not been too carefully tackled.

The Advanced Constructor

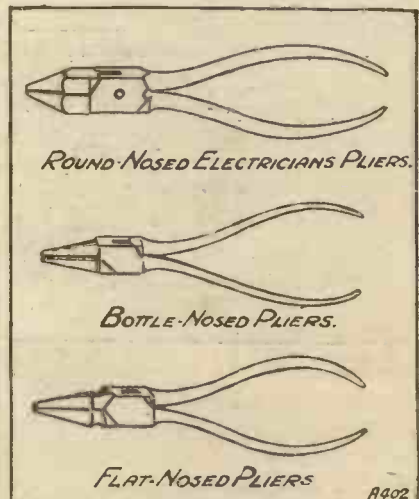
The constructor of the second class prides himself in doing a great number of jobs for himself. He realises, naturally, that unless he has a splendidly-equipped workshop and possesses a thorough knowledge both of the theory and practice of electricity there are many components that

are far better bought than made in the home workshop.

He would not, for example, tackle such jobs as the making of low-frequency transformers or variable condensers, since he knows that by purchasing from firms of repute he can obtain a far better article than he can ever hope to construct, and that the purchase price will probably be considerably less than the amount that he would have to spend if he attempted to turn out such things in his own workshop.

Home-Made Components

But he does make up a great many simple components. He performs all his own drilling and tapping and frequently cuts out, trims and polishes ebonite panels for himself.



If he is fond of woodwork, he may turn out cabinets for instruments and for receiving sets, taking pride in

Chats at the Work-Table—continued

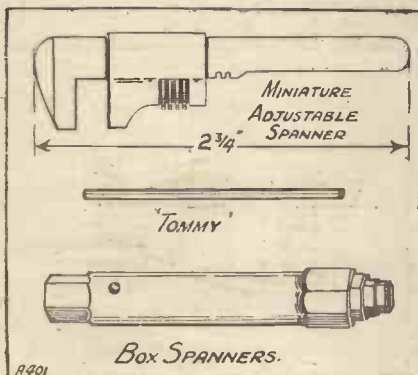
producing a professional-looking finish to his french polishing.

For the beginner at constructional work, or the man who intends to do only the simplest constructional work, the necessary tool outfit is a small one, but it should be chosen with discrimination. Let me say at once that even if you are going to provide yourself with only a few tools, it is hopeless false economy to buy cheap ones of unknown make from the first shop that you happen to come to which deals in such things. By spending a few shillings more on your outfit and choosing tools really suitable for the work, you will obtain far better results with a great deal less trouble.

Buy Good Tools

Good tools are trouble-savers; bad ones are trouble-makers. The minimum outfit consists of a screwdriver, a pair of pliers, and both flat and box spanners for 4 B.A. and 6 B.A. nuts. If you are only going to have one screwdriver, buy one with a blade $\frac{1}{2}$ in. in width, and before you put down your money try it in the nick of a 4 B.A. screw or of a small wood screw, such as you generally use, to see that it is a good fit.

If it fails to bottom properly in the nick, or if it is a loose fit, you may be quite sure of two things: you will spoil the look of your sets by damaging screw heads, and your screwdriver will soon become so mutilated that it



will neither drive in nor extract screws without a good deal of trouble.

Choose a longish screwdriver with a round handle. This is far easier to work with than a short one or one with a flat grip. You will be better advised to purchase at least two screwdrivers, one of the size mentioned and one with a blade $\frac{3}{8}$ in. in width.

Still better, add a third to the outfit with a $\frac{5}{16}$ -in. blade.

Pliers

If you propose to make a single pair of pliers do all the work, you cannot, I think, do better than invest in the type known as round-nosed electrician's pliers—but see that they are of very good quality. You will see them illustrated herewith.

The nose is rounded so that they can be used quite well for shaping the ends of leads to fit over terminals, and since the gripping surfaces are flat they are useful for straightening wires or for bending them at angles. These pliers have also a pair of cutting blades at the side with the help of which pieces of wire of the required length can be snipped off or unwanted ends trimmed off.

I would tempt you, though, to be rather more extravagant in your plier outfit, for jack-of-all-trade tools do not make for the best work. You will see also four other kinds of pliers, each of which is specially designed for its own particular job. The flat-nosed are for straightening or shaping wires, the bottle-nosed for making loops in the ends of leads, and the end nippers for cutting. The nut pliers enable one to tighten nuts of all sizes without rounding off their corners through the tool slipping.

Spanners

There is one rather serious "snag" in confining the spanner outfit only to the 4 and 6 B.A. sizes. The trouble is that though definite standards are laid down the nuts that one purchases from wireless shops are often considerably under the proper dimensions.

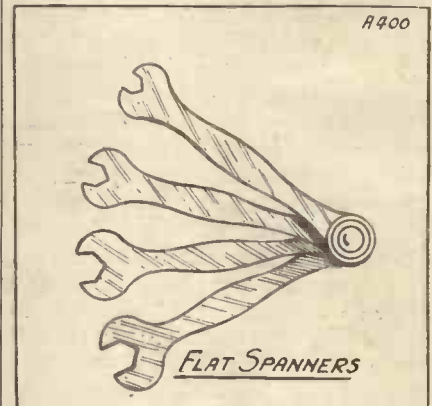
Thus one may find that a nut which is tapped 4 B.A. and runs nicely on to a terminal of that size is actually 5 B.A. or 6 B.A. dimensions over the flats. 6 B.A. nuts bought for 6 B.A. may apparently be of almost any size. A sound scheme is to purchase a set of both box and flat spanners taking in 4, 5, 6, 7 and 8 B.A.

One is then pretty sure of having something in the tool outfit that will tackle whatever nuts may come along. It is handy to have also an adjustable spanner. Very neat little miniatures made on the lines of the ordinary adjustable bicycle spanner are to be purchased cheaply from most tool shops.

Drilling

All the tools previously mentioned will be common to the outfits of both the elementary and the advanced wireless constructor. Another which may be regarded as practically a necessity, since it will certainly be wanted at some time or other, is the hand drill. There is no need to purchase anything large or very expensive.

All that is wanted is a neat, well-made tool with a three-jaw chuck capable of taking drills with shanks up to $\frac{1}{4}$ in. in diameter. Unless you purchase a hand drill of well-known make, look it over carefully before you decide about having it.



The first thing to do is to screw the chuck right up with no drill in it in order to see whether the three triangular jaws fit tightly and snugly. In some hand drills of poor quality the jaws fit badly and there is difficulty in mounting a small drill. Don't take anything for granted.

Make sure that the jaws have a quarter-inch gap by trying a drill of this size in it. Many small hand drills will take nothing larger than about $\frac{3}{16}$ in. With a chuck of the size recommended one has all that one wants, for it will take much larger drills of special construction, as will be shown in a moment. The drills needed for the simplest form of wireless construction are only four in number: No. 34 morse size (6 B.A. clearance), No. 26 (4 B.A. clearance), $\frac{1}{4}$ in. and $\frac{3}{8}$ in.

The last two are used for drilling panels in order to pass the spindles of components. Those of the one-hole fixing types generally require $\frac{3}{8}$ -in. holes. But how are we to drill such holes with a hand drill whose chuck

(Continued on page 160.)



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**YOU CAN BET
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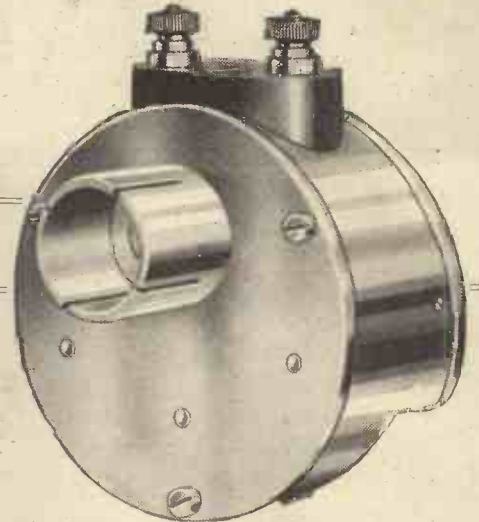
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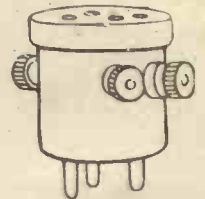


Helped by the Brown Pick-up your radio set and loudspeaker will reproduce your Gramophone records electrically. Consequent improvement of reproduction is amazing. Needle-scratch and extraneous noises are eliminated, you can control the volume from soft to very loud, and the music is clearer.



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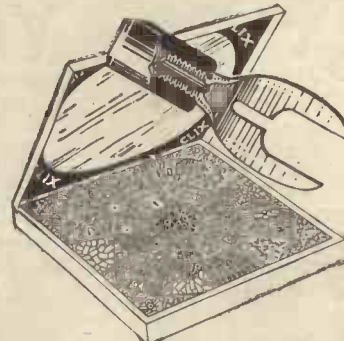
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HAPPENINGS AT SAVOY HILL

By OUR SPECIAL COMMISSIONER



Complaints from the North

ALL is not well with the arrangement for news at the B.B.C. stations which owe allegiance to Manchester under the new scheme of Area Grouping. When the B.B.C. puts its relay stations on a single wave-length, thereby eliminating local programmes, the news of local happenings was also sacrificed. Manchester continued its specialist service of cotton prices and other items of interest to the northern metropolis. But so far as Sheffield, Leeds, Bradford, Hull, and Liverpool are concerned the period previously occupied by local news is now being filled with "piano music" from London.

The disappearance of local news is most keenly resented in Hull, Sheffield and Liverpool. If the B.B.C. finds it impracticable to resume a service of purely local news, they should do the next best thing, and that is to organise for the North of England a comprehensive Regional Bulletin of the same kind as that which is given to Scotland, with such general satisfaction North of the Tweed.

Toward More Concentration

Close students of the B.B.C. policy are agreed that its tendency is towards more and more concentration of programme effort. The propaganda of alternative programmes has been entirely superseded by the doctrine of "fewer stations of higher power." References to the new stations of the Regional Scheme are careful to omit the expression "twin wave," which occurred so frequently in times gone by.

Having disposed of the relay stations as programme initiators, it is perhaps natural that the B.B.C. should now be considering whether it might not be possible to do away with all the main stations except London and Belfast.

The transmitters would be built as planned, but all programme efforts would originate in London. However unpopular such a plan might appear at this moment, I would hazard a

prophecy that it will be realised within five years. The saving in money and in effort would be very considerable.

How is the B.B.C. Run?

This is an interesting speculation. It was believed in the days of the Broadcasting Company that the B.B.C. was managed as a personal autocracy, the benevolent despot being Sir John Reith. During the past two years, however, it has become apparent that the regime of autocracy has receded. Having overcome the main obstacles in the way of broadcasting and having established the B.B.C. on a firm basis of public service, Sir John Reith deputed increasingly to his subordinates.

Board of Governors, whose activities have never been described, and which are presumed, rightly or wrongly, to be innocuously negligible.

Then comes the Control Board, made up of departmental chiefs, presided over by the controller, Admiral Cappendale. Then there is the group of specialists composing the Programme Board. These three committees between them constitute the government of the B.B.C. As an effective form of control, it cannot compare with the autocracy which it succeeded. Hence the slowness of the present "machine" at Savoy Hill.

Broadcasting in Parliament

The opening of the present session finds members of Parliament much

RADIO REACHES WRONGDOERS



The Police Force in Paris has recently been equipped with a special motor van fitted with a wireless installation, which enables the police to follow any demonstration or any criminal attempt, and immediately signal to the Central Station for help. These signals are promptly acted upon and reinforcements sent wherever required. The aeriels, placed above the car, are collapsible, and the car is then disguised as an ordinary trader's van.

It would appear that this has resulted in a modified form of committee government, with both the advantages and disadvantages of the inevitable bureaucracy involved. First of all, in point of rank, is the

more alert to broadcasting problems than has ever been the case in the past. The "vigilance group" formed last spring is now fully organised. It continues, however, to take the most elaborate precautions to preserve

Happenings at Savoy Hill—continued

secrecy about its proceedings and its intentions.

Individual members of Parliament who had the temerity to attack the B.B.C. "on their own" complain that there have been unpleasant indirect reprisals in their constituencies. Several of these parliamentarians suspect the existence of a vast network of espionage and "terrorism," with its headquarters at Savoy Hill. Hence the precaution to preserve secrecy until the new group is strong enough and sufficiently well prepared to give its members comparative immunity against the vengeance of the B.B.C.

A Ministry of the Arts

The recent move by Mr. J. C. Squire to have the licence "surplus" devoted to encouragement of the "arts" is likely to have widespread effect. The B.B.C. is prevented

for combining idealism with practicalism. If Mr. Squire can put his idea "across" to Sir John Reith it is bound to succeed.

B.B.C. News Bulletins

I am told that Mr. Macer Wright, a journalist of some years' Fleet Street standing, had the interesting experience this summer of handling the B.B.C. news bulletins during the holidays. It is stated that he discovered that these bulletins were normally produced by "officials" entirely devoid of journalistic or news "background." Moreover, Mr. Macer Wright came away with the feeling that, given a reasonable measure of foresight and good management, the B.B.C. might run the most important and interesting news service in the world.

I gather he has told the B.B.C. this. What will they do about it?

junct to the spoken word by radio. Meanwhile, "television" seems as far away from Savoy Hill as ever—at least as regards incorporation in regular transmission. But the rumours of "mergers" grow incessantly, and I should not be surprised to find all the picture concerns—"still" and "televising"—in one big concern this time next year.

* THE "ROADSIDE" FOUR *

SIR,—No doubt it will be of interest to you to know that I have just completed the "Roadside" Four, and wish to congratulate you on the excellent and simple circuit described by you in your May edition.

I made up this set exactly to your specifications, and it only took me a very short time to build, and the results I have obtained from it absolutely astounded me. The volume and tone is all that can be desired, and I am now the proud possessor of a portable which has given me and a number of my friends many happy hours when we have been out in the open, on the beach, and the bay.

Excellent Results

On a recent holiday we packed up and went out in the car for the day and took the set with us, we went about thirty miles outside Durban, and the results obtained at this distance were excellent.

We have only three broadcasting stations in South Africa—Durban, Johannesburg, and Capetown, so consequently I have not been able to get the other two stations, and also the hours of broadcasting are not too convenient.

I am the only one here who has a portable, and it is causing a great deal of interest where I take it.

I have been a regular subscriber to your paper for some considerable time, and have also built up several of your circuits.

Again congratulating you, and wishing your paper every success.

Yours sincerely,

ROBERT J. McINTOSH.

Mayville,

Durban, S. Africa.

WHERE IS THE ENEMY ?



Radio signallers hard at work during the Eastern Command manoeuvres in Essex.

from taking too active a part in this because their present constitution debars them from claiming a larger proportion of licence revenue until 1930. On the other hand, it is obvious that Savoy Hill is not going to oppose a move designed greatly to increase its future resources and influence.

Mr. Squire sees a chance of mobilising behind him all those interests which require some measure of public financial aid to survive on a worthy scale. Opera, orchestral music, the national theatre, repertory, even painting, come within the scope of his scheme. The application of such a scheme would really transform the Board of Governors of the B.B.C. into a Ministry of the Arts. And why not? Here is a Heaven-sent chance

I wonder if they can do anything in view of the renewal of the agreement with the news agencies for two more years? It would be a dreadful derogation of responsibility if this muzzling agreement were still further extended.

The Choice of Broadcast Pictures

From the early pictures "Fultographed" by the B.B.C. it appears that the belief in official circles is that the permanent value of a radio-picture service is for the transmission of "utility" messages such as weather bulletins, stock-exchange lists, sports results and so on.

This is sound doctrine and contains the possibility of a permanent ad-



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and it is the finest "speaker" value you can possibly buy. A speaker built on the moving coil principle which requires neither accumulators, mains connections, special valves, nor transformers! A self-energising model exclusive to M.P.A. ! More sensitive than a magnetic movement, yet *uses no more H.T. voltage than an ordinary loud speaker!* Low notes without a boom! High notes without shrillness! Every part balanced and in perfect unison! Speech excellent! "*It gets the best from your set.*" Ask for the M.P.A. DUAL INDUCTANCE SPEAKER. Price 7 guineas.

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Wherever you encounter a *resistance problem* in radio, there is a "ClarOstat" which has been *designed* to take care of it, and to solve it better than any other make of competitive resistance.

For "Eliminators" incorporating *continuously variable* tapings the Standard "ClarOstat" is ideal: noiseless: micrometric adjustment: perfectly made: low price: instantly fitted: foolproof if used as directed: utterly reliable: carries *continuously* 18-20 WATTS.

STANDARD CLAROSTAT

For volume control or for "tone" control (transforming your old-fashioned horn speaker into a "New Speaker," which reproduces well the low tones of the newer cones and moving-coil speakers), there is a special model. It is also made as a table type, for those who require a *distant control* of volume and/or "tone." The ordinary "Volume Control ClarOstat" is also *perfect* for "anode-feed" schemes and for dozens of other purposes. Rating, 7 watts.

For LARGE, POWERFUL ELIMINATORS, with outputs running into hundreds of volts, there is the POWER CLAROSTAT (rating, 40 watts).

ALL "ClarOstats" are sent out complete with exhaustive data, also with bracket for baseboard mounting; normal method of fixing is single-hole panel-mounting.

ALL GOOD DEALERS STOCK "CLAROSTATS." NO OTHER COMPONENT IS "JUST AS GOOD." ASK GENTLY BUT FIRMLY FOR "CLAROSTATS," AND SEE THAT YOU GET THEM. IN CASE OF DIFFICULTY, SEND US YOUR DEALER'S NAME AND WE WILL SEE THAT HE IS SUPPLIED.

VOLUME CONTROL CLAROSTAT, approx. zero to 500,000 ohms	8/6
TABLE TYPE (providing "Distant Control")	13/6
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*POWER CLAROSTATS, Universal range, 200 to 100,000 ohms	15/-
THE NEW DUPLEX CLAROSTAT (Two Clarostats in one)	13/6

* These types are also made in a wide variety of other resistance ranges.

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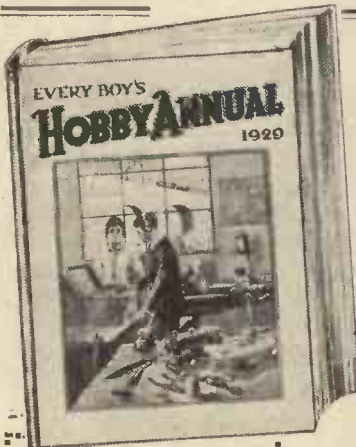
Beautifully Made. Micrometer Adjustment.

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Here is a big book that will appeal to boys and their fathers as well! A book that shows "how things work" and how things can be made at home at very little cost. It is packed with fascinating articles and crystal-clear drawings and diagrams that "show how" in the simplest way.

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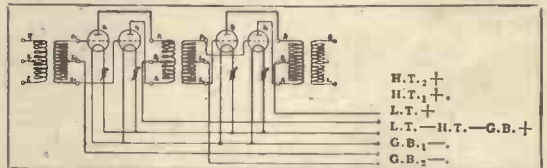
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A PUSH-PULL AMPLIFIER for Gramophone Pick-up



LOOK out for these circuits in every WEILO advertisement. No. 3 will be an H.T. Eliminator (A.C.) for use in conjunction with this circuit. The above circuit shows an up-to-date Push-Pull Amplifier that is pre-eminently adapted for use with an electrical gramophone pick-up. For the Transformer work you cannot do better than specify Weilo for complete success.

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These wonderful heavy core transformers, completely saturation proof and with their amazing purity of maximum amplification and quality workmanship, rival the highest price class.

PRICES: Weilo Push-Pull Model 7 for 2-valve units, 33/6 per set. Model 8 for 3 valves, 45/- per set. Model 9 for 4 valves, 49/6 per set.

For general use,

Model 10 POWER	Model 3 Heavy type
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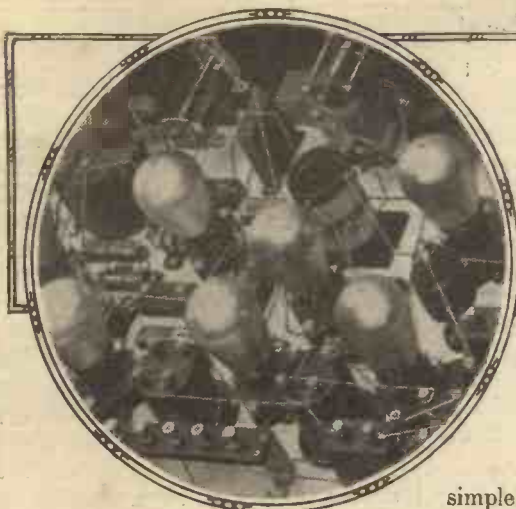
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COMMENTS FROM CONSTRUCTORS

More "Radiano" Successes—The "Roadside" Four for Distance and Quality—Keep 5 S W!—A D. X. "Local."

More "Radiano" Successes

SIR,—Some three months or so ago I wrote to you reporting the excellent results I had obtained with the "Radiano" 3. At that time my bag of real loud-speaker stations was confined to about five.

Since then I have improved my aerial and earth system with the satisfactory results of obtaining the undermentioned stations, received at full loud-speaker strength during one hour's sitting:

Dublin	Aberdeen
Breslau	Berlin
Langenberg	Zeesen
Stuttgart	Hilversum
Hamburg	5 X X
Bournemouth	Eiffel Tower
Cardiff	Radio Paris
Vienna (Wien)	Frankfurt
Brussels	Leipzig
Rome	Madrid (E A J 7)
Newcastle	Barcelona
5 G B	(E A J 13)
Milan	Ditto (11)
Manchester	Belfast
Paris P.T.T.	Prague

Conditions during this test were rather good, but I have received these on more than one occasion.

Of course, the "Radiano" Silencer was in circuit when those stations near the locals were tuned in.

Owing to the enormous amplification and the consequent overloading of the last power valve I have had to make an alteration.

For the first transformer I have substituted one stage of R.C.C. followed by a Ferranti A.F.5. The last valve now used is a P.M. 254, with about 160 volts on the plate of this valve.

A P.M. speaker is coupled to the output circuit, which is protected by a 30-henry choke with the usual Mansbridge condensers.

The quality is absolutely O.K., and I must thank you again for such a

simple circuit and thank you in anticipation of the "Radiano" 4.

I am,
Yours sincerely,
H. RUSSELL.

London, S.W.19.

The "Concert" Four

SIR,—Allow me to thank you very much for "Concert" Four circuit, it is the best four-valver I have tested and I have tried some half a dozen or so this year, including some well-known circuits, but for ease in tuning and clear loud-speaker reception the above circuit beats the lot.

I have wound my own coils, using No. 26 D.C.C. wire for B.B.C. wavelengths, and No. 28 D.C.C. for 5 X X. My aerial is an indoor one stretched from corner to corner of room. My earth the worst ever: 35 ft. of wire to water-pipe, which has to travel all over the house over 30 ft. before it reaches earth, but with this handicap am able to get four stations at full loud-speaker strength, and another four or five at medium strength; on 'phones, too numerous to mention. Once again I thank you for your splendid circuit. Wishing your paper every success.

Yours faithfully,
A. CLARK.

Clifton, Bristol.

The "Roadside" Four for Distance and Quality

SIR,—I have made up the "Roadside" Four and am so pleased with the results that I feel I must write and tell you. The set was made up exactly as described, but I used the car batteries for my low-tension. The only other difference is the speaker, which is a small unit fastened to the lid of the case. The results are very nearly equal to a detector and two low-frequency stages on an outside aerial. The quality is nearly perfect,

and quite a few foreign stations come through after dark.

Yours faithfully,
J. MOORE.
Gloucestershire.

Keep 5 S W!

SIR,—Being a regular reader of your journal, and also being very interested in all things concerning short waves, I read with alarm the article on the proposed fading off the air of 5 S W (Chelmsford), and I am sure there are many like myself, scattered all over the Empire.

As the world is now linked up with wireless, if 5 S W goes, so does the only link which connects us Britishers up with the homeland, as far as wireless is concerned. For dozens of times have we listened to programmes from Hotel Cecil, Savoy Hotel, operas, and relays, and the chiming of Big Ben, 12 o'clock midnight at 8 o'clock the following morning, here "direct pick-up." I have two confirmation cards from 5 S W, so you can guess if 5 S W goes its a disaster for us.

Why we should have to depend on foreign stations for our wireless, on short waves, I cannot make out. Philips' valve people, P C J J, supply a good programme, especially for we Australian listeners, and their usual relay as well. They come over "great," in fact, they are the "star" station, and I am sure their trade in valves, etc., benefits by doing so. Nothing is too much trouble to them. A report on their programme brings in a reply right away. I have five confirmations from Holland.

Then there's America with 2 X A F, W G Y and K D K A, all appreciating reports with confirmation, and all their stations are really nothing to Britishers, and they carry on it seems for the benefit of all.

Yet our only British short-wave station which should be kept going,

Comments from Constructors—*continued*

if only to keep us linked up as one great nation, is talking about closing down. Why? I hope, sirs, that you will keep at the B.B.C. and point out its folly.

I remain,

Yours faithfully,

H. W. BACON.

P.S.—I picked up a new station on about 30.5 metres on July 7th, W. Australian time 6.30, morning; musical items, etc. No one knows the station here. Call-signs included: Hallo, Madiera! Hallo, Tangier! Moscow, Valencia, London, Radio Victoria, Antoris, Portuguis, etc., etc. Can any reader tell me who it might be?

Maylands,

West Australia.

I feel, however, that we who are at the ends of the Empire, and to whom wireless would be such a joy, have not had our needs considered to any extent in the designing of suitable circuits for our special requirements.

I am sure this has only to be brought to your notice when, with your vast experience, coupled with an up-to-date laboratory, you will be able to design a circuit more suited to our needs.

To give an idea of what we want I will state my impressions and give my geographical position. The set I have had in operation is the "Solodyne" Five.

1. My local station is Johannesburg, which is 1,200 miles away.

The following is my idea of what a design for a circuit should embrace.

(a) Designed for some form of aerial which is not a collector to any extent of atmospherics—(i.e. frame).

(b) Distance should not be sacrificed to making the receiver tune to knife-edge sharpness. The local station is 1,200 miles away, and will not interrupt.

(c) Sufficient valves to keep one well away from oscillating point, and to overcome any damping effect a special aerial may have.

(d) A range of 2,000 miles, and Europe, if possible, at times.

(e) Could a Rugby coil be incorporated to pick up Morse news broadcasted to ships?

(f) Economical in current consumption.

Have I asked the impossible?

AERIALS.—I have found the higher the aerial the more atmospherics it picks up. Could a form of shield be used on the aerial to earth the atmospherics? For instance, a basket aerial on top of a mast with a lead from each end—one to aerial and the other to earth—and a shield above it earthed. I cannot test this as I have not the right circuit.

BATTERIES.—Always a problem, but more so here. Dry cells seem only to last a week or so, due to tropical conditions, I suppose. Accumulators are a nuisance, as they have to be sent 200 miles for recharging. I am going to try the Leclanché wet cell for the H.T. I wonder if it is feasible to manufacture this type of cell for supplying the filament current?

Trusting you will design a circuit suitable for isolated spots like our own.

Wishing your journal every success.

Yours faithfully,

C. W. PLAYER MILES.

Private Bag,

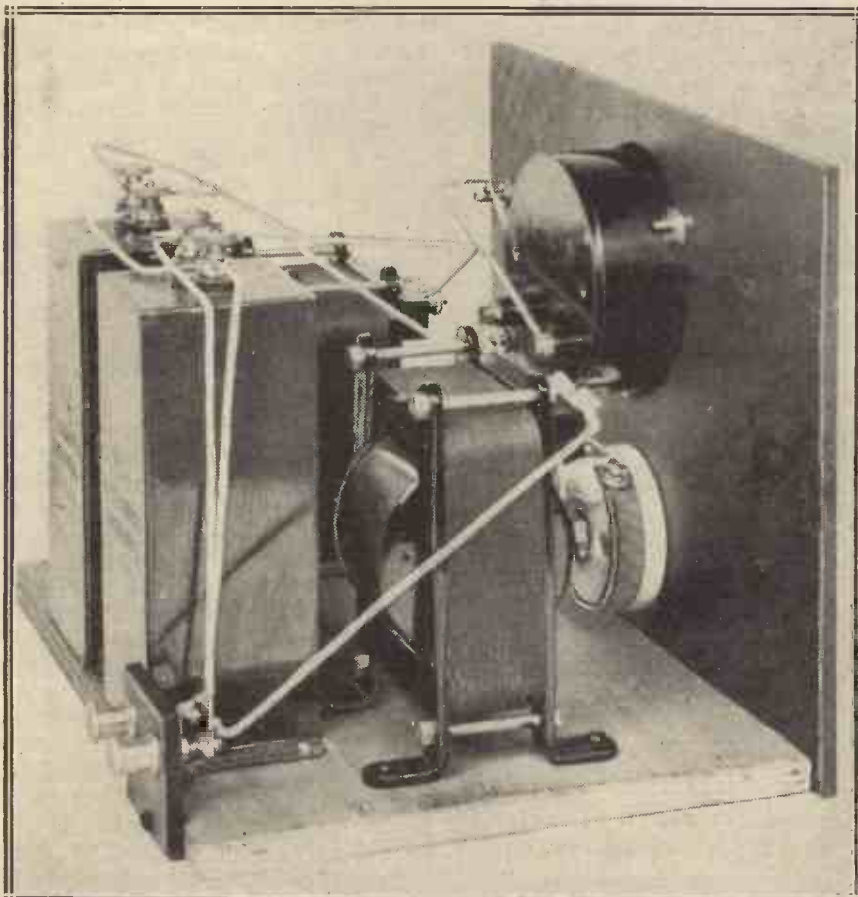
Zomba,

Nyasaland,

Central Africa.

EDITOR'S NOTE.—The seven-valve super-heterodyne described in our July issue was specifically designed to meet as far as possible the needs of our readers in the Dominions. This letter was, of course, sent off from Nyasaland before the July issue reached our correspondent.

Leclanché cells for filament lighting are now produced by the Standard Wet Battery Company, and should suit such circumstances quite well.



This is the "Stedipower" Junior L.T. Unit which is fully described in other pages in this issue.

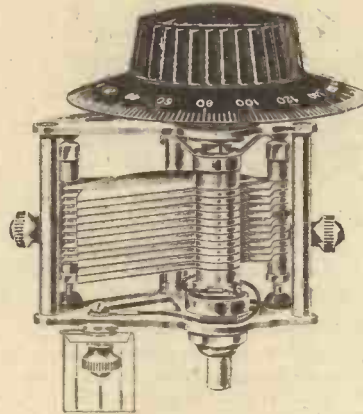
A D.X. "Local"

SIR,—Since broadcasting commenced wireless has made enormous strides and continues to do so. Your magazine has done wonders in designing sets for home constructors in the British Isles.

2. Atmospherics are deafening, and only on rare occasions are they sufficiently moderate to allow one to enjoy the programme.

3. The more one detunes, the clearer the signals and freer from atmospherics.

ORMOND SMALL LOGARITHMIC CONDENSER



TO meet the demand for a smaller type of Condenser designed to the best modern practice for use where space is very limited, we have produced a small Logarithmic model of extremely high efficiency with such value that law will be correct under average conditions in a similar manner to our larger standard model.

The Condenser may be adapted for "One hole fixing," Baseboard mounting, or "Along panel mounting" for drum control.

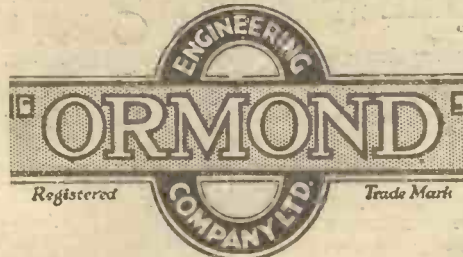
An extension of main spindle is provided at the rear end, in order that these models may be "ganged" quite simply.

Complete with 3 in. Knob and Dial.

PRICE :			
·0005	8/-	·00035
·00025	7/6	·00013
			7/9
			7/6

This condenser may be obtained with a modified type of our Friction Control, slow motion movement, with direct drive, but this model will not be suitable for "ganging" purposes. Complete with 3 in. Knob and Dial with small knob.

PRICE :			
·0005	12/-	·00035
·00025	11/6	·00013
			11/9
			11/6



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The 5 m.a. type is intended for use with the average 1 or 2 valve set working at present from a small capacity dry battery. For larger receivers, the 10 m.a. type should be used. Install a B.T.H. Eliminator today, and have a constant, unflinching, trouble-free and inexpensive supply of H.T. from now on. Ask your dealer to tell you all about these eliminators.

5 Milliamp Type
200/250 volts, 40/100 cycles.
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10 Milliamp Type
200/250 volts, 40/100 cycles.
Price £6 15 0, including valve

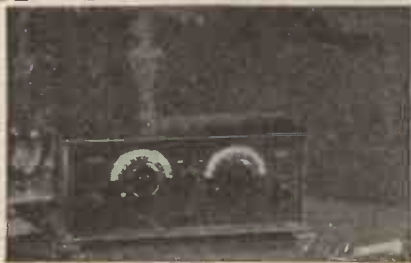
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B.T.H. ELIMINATORS

The British Thomson-Houston Co. Ltd.

5043

The Sensation of OLYMPIA



THE "PENTOVOX THREE"

A BIGGER brother to the marvellous Pentovox Two, the extra screened grid H.F. Valve extending considerably the range of stations and satisfying within few limitations the most ambitious "searcher." The Pentode amplifying valve preserves fine quality of reproduction in ample loud-speaker volume. Wave-length ranges are 250 to 500 metres, and 1,200 to 2,300. There are no coils to change. Log scales are provided to chart the various stations.

List No. 344. Set with three special valves tested and matched to set. Including Royalty £11.0.0

Write for full literature of Bowyer-Lowe Sets and Components.

Bowyer-Lowe
Pentovox 3

OTHER NEW BOWYER-LOWE SETS.
The Pentovox Two.
The Vox Populi Screened Three.
The Vox Populi Screened Four.
The Gramo-Radiophone.
The Senzor Cone Reproducer.

Bowyer-Lowe Co., Ltd., Radio Works, Letchworth, Herts.

HEAT DAMP OR COLD will not harm GRAHAM-FARISH Ohmite ANODE RESISTANCES

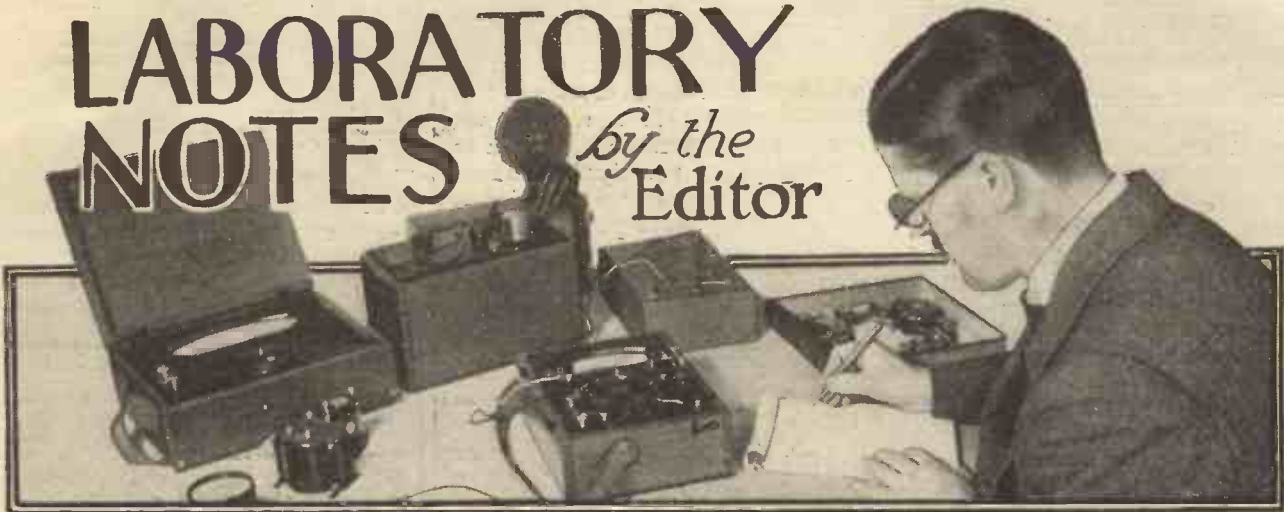
An Ohmite can be boiled or frozen without affecting its performance, but what is more important it is guaranteed to carry 10 milliamperes on voltages up to 500 volts D.C. They are

Better than Wire Wound!
PRICE ANY SIZE UP TO 1/2 WATT 2/3

GRAHAM-FARISH OF BROMLEY KENT

LABORATORY NOTES

By the Editor



Now that the wireless industry is emerging from what may be termed the "hit or miss" period of growth, more and more attention is being turned to definite measurements, not only of individual values but of the overall efficiency of receivers. A number of the more important firms have gone to considerable expense to equip themselves with adequate testing apparatus, to ensure greater overall efficiency.

Where the Constructor Scores

A receiver needs to be tested for sensitivity, selectivity, and faithfulness of reproduction. Some sets may shine in one of these respects, others may be good in two and woefully deficient in the third. Comparatively few would satisfy a discriminating critic with regard to all three.

The home constructor, by reason of the fact that he can make changes from time to time in his receiver with a view to improving its performance in one or more of these respects, is in a distinctly advantageous position. A good deal of the time in the WIRELESS CONSTRUCTOR laboratory is occupied in research on complete receivers, and some of the facts that have emerged may be of interest to many readers of this journal.

Fidelity of Reproduction

The quality of reproduction, or as it is much better termed "fidelity," is mostly concerned with the low-frequency end of the receiver, although overloaded radio-frequency and detector valves can spoil the best low-frequency reproduction. Assuming that the quality is not spoiled by valve overloading in the detector or earlier stages, with excessive use of reaction, either directly applied or stray,

In this article Mr. Percy W. Harris discusses the question of coupling as applied to various receivers.

assuming, too, that the tuning has not been made so very sharp that distortion arises from what is known as "cutting off side-bands," then quality of reproduction will largely depend on the following factors:

1. Well-designed coupling between the detector and the first low-frequency stage, and between the last low-frequency stage and the output valve.
2. Absence of reaction between these stages.
3. Suitable valves for use in this part of the receiver.

4. Adequate high-tension and grid bias.

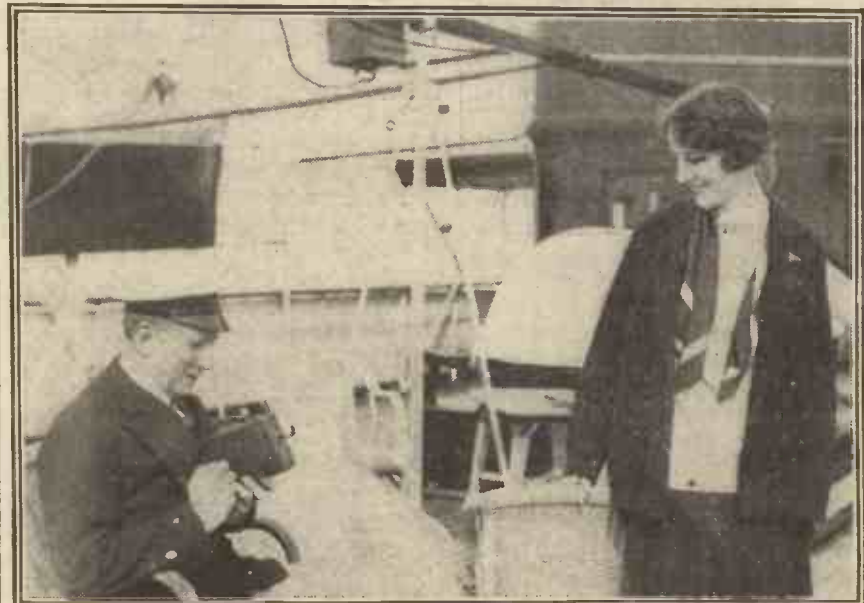
5. A good quality loud speaker.

6. Suitability of the loud speaker impedance for the output valve or output coupling used.

An Overlooked Factor

Plenty of receivers have been built with first-class coupling devices, such as low-frequency transformers, choke coupling and resistance-capacity coupling, as well as with good loud speakers, suitable valves and adequate voltages. One factor of which the importance has been far too little realised is the battery coupling of low-frequency stages, which frequently brings about enough low-frequency reaction to give thoroughly bad reproduction. How much better reproduction can be when suitable steps

MARCONI'S MARINE MOVIES



Senatore Marconi taking movies of his wife during a recent trip on his yacht "Elettra."

LABORATORY NOTES

—continued from previous page.

are taken to counteract battery coupling will be discovered by all who build "Big Ben" described in the present issue.

The trouble in judging wireless set reproduction by ear alone is:

1. That no two pairs of ears seems to be alike in regard to their uniformity of response over the musical scale.

FISK'S FINE FEAT



The first message ever sent by Beam between Melbourne and Canada was successfully transmitted to Montreal by Mr. E. Fisk, the Managing Director of Amalgamated Wireless (Australasia), Ltd.

2. Comparatively few people have a sensitive ear for slight differences in tone, and,

3. The human ear, or more accurately, the human mind, is extraordinarily adaptable and soon becomes used to a particular type of reproduction.

One of the most useful pieces of apparatus in the WIRELESS CONSTRUCTOR laboratory is a low-frequency oscillator which will give a pure musical note of any frequency between about 40 or 50 cycles and 10,000. This low-frequency oscillator has many uses, one of the most interesting being in the comparison of

the sensitivity to various frequencies of different loud speakers. For example, the output of the apparatus can be connected to a change-over switch so that in a moment the response to a given frequency can be compared on two loud speakers. This varying response explains a great many puzzling phenomena.

High Notes and Low Notes

For instance, some makes of loud speaker are very good indeed on speech but poor on music. Others seem to respond very well to music but are "woolly" and indistinct on speech. The former class of speaker when connected to the low-frequency oscillator shows an excellent response in the higher frequencies and a poor in the low, while those in the second grade respond fairly well to low frequencies but fall off rapidly as we pass up the scale. Nearly every loud speaker has a tendency to accentuate one or more of the musical notes and some are deliberately designed to over-accentuate certain low frequencies to compensate for the average deficiency in these frequencies of most sets.

Individual Inequalities

It has been very interesting to compare the response of different people to very high frequencies, say, those above 5,000. The instrument is so designed that one goes up to frequencies beyond audibility as slowly as one cares, and many tests have been made with two or three people simultaneously listening to see who can hear the highest note. Great variations between individuals are found in this way, and it was noted that when a listener has a cold his hearing of the higher frequencies is nearly always defective.

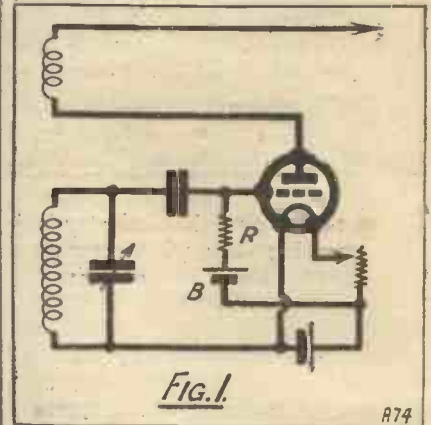
No existing loud speaker is perfect. All have some frequency deficiency, and one of the problems of design is that many people prefer a particular type of distorted reproduction and call it natural! To them really faithful reproduction sounds unnatural, so used have they become to their particular type of distortion.

A Question of Custom

For this reason when comparing two loud speakers, one of which has an over-accentuation of certain low frequencies, the more faithful loud speaker is often called "thin," the listener subconsciously missing the "boom" characteristic of the particular loud speaker to which he has become accustomed.

* **IMPROVING THE** *
* **DETECTOR** *

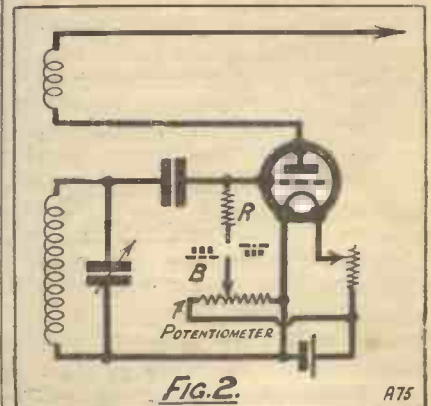
HAVE you ever been disappointed with the results which a 2-volt valve will give as a detector, compared with its 4- or 6-volt counterpart? It is, of course, convenient to run 2-volt valves from a 2-volt



accumulator, but put your 2-volt detector on a 4-volt accumulator, with a suitable resistance in the filament, of course, and you will usually notice an improvement at once.

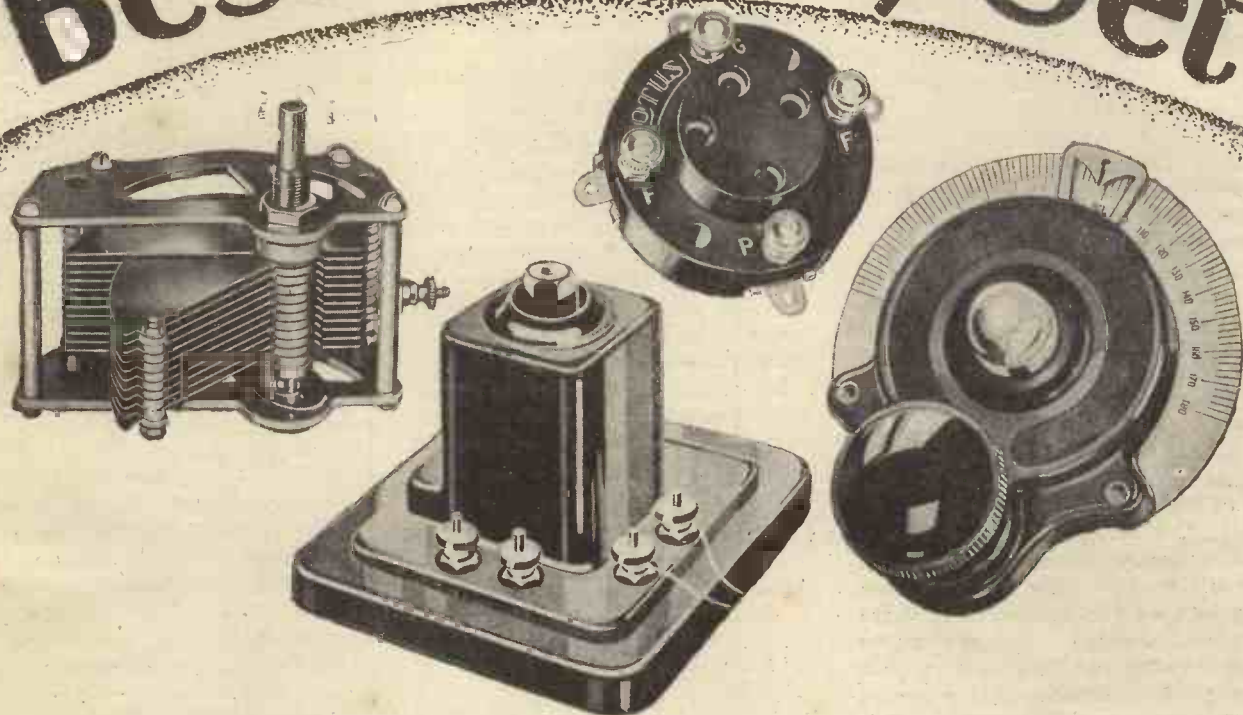
Assuming that you are confined to a 2-volt accumulator, you can get over the difficulty in another way. Instead of connecting the grid leak direct to L.T. plus, try putting a single 1½-volt cell between the grid leak and L.T. plus, as in Fig. 1.

This may overdo it, and really the better way is to add a potentiometer, as in Fig. 2. This gives you a finely variable control over the voltage range provided by the accumulator. Add a 1½-volt cell as well in



the lead to the potentiometer tapping. This cell is shown dotted in Fig. 2. You can connect the cell either way round, according to the bias which you require.
A. V. D. H.

Best for Any Set



Whether you make or buy your set, remember that good components make a good set. When you choose your set, choose Lotus Components. They are the best for any set. Experts recommend Lotus components. Choose them for all such circuits as Mullard "Master Three*" and Cossor "Melody Maker." Accurately made and beautifully finished, these components embrace valve holders, condensers, dials, jacks, switches, plugs and coil holders, as well as a range of Lotus Remote Controls providing wireless in every room for any kind of set.

From all wireless dealers.

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Made by the makers of the new Lotus Sets.

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Have you had the new Lotus Booklet? This little Booklet comes free on receipt of a post-card to Garnett, Whiteley & Co., Ltd. It tells you all about the new Lotus Screened and Pentone Valve sets. If you do not possess a copy, send for it to-day!

 ** A HOME-MADE **
 ** DOUBLE-CONE LOUD SPEAKER **
 ** By H. B. WEBSTER **

A VERY efficient double-cone loud speaker, simple in construction yet with excellent tone and appearance, may be made quite cheaply at home.

The materials required are few and easily obtainable. They comprise two pieces of stout drawing-paper, each 2 ft. square, some Seccotine or glue, the tin disc from an air-tight cigarette tin, and a Lissenola loud-speaker unit, together with the reed and nuts which go with it.

Method of Construction

On one of the sheets of drawing-paper describe a circle of $14\frac{3}{4}$ in. diameter ($7\frac{3}{8}$ in. radius) and, with the same centre, another of $10\frac{1}{2}$ in. diameter ($5\frac{1}{4}$ in. radius). Mark off along the circumference of the outer circle two points at a distance of $2\frac{1}{2}$ in. from each other and from these points draw lines to the centre of the circle as in Fig. 1. Now, leaving an overlap strip of $\frac{1}{4}$ in. or $\frac{3}{8}$ in., cut along the lines enclosing the shaded part shown in Fig. 1 and also cut along the circumference of the outer circle. Punch a small hole in the centre for the reed to pass through, then carefully bend back the paper along the inner circle. Complete this

time the overlap strip to the other cut edge and so complete the back cone.

Now fix the back cone to the front cone by Seccotining the bent-back edges together as illustrated in Fig. 3, thus making the double cone.

Two small tin cones of about 1 in. diameter should then be cut out of the tin disc and holes punched in the centres large enough to admit of the reed passing through. (Ordinary small brass washers might be used instead.)

Finishing Off

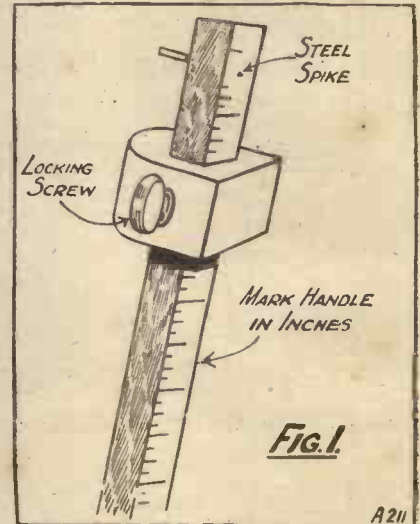
To mount the Lissenola unit, after fixing the reed in accordance with the maker's instructions, screw on one of the nuts to within $\frac{1}{2}$ in. of the top end of the reed, slip on one of the tin cones, and then insert the whole into the back cone so that the reed protrudes through the hole in the front cone; it will be found that the unit just fits into the large hole in the back cone. Now slip the other tin cone on the projecting reed and screw down the other nut on it.

 ** "WIRELESS AS IT **
 ** SHOULD BE!" **
 ** A Reader's Results **

SIR,—Having made up the "Super-Quality With Any Set" that you described in the March issue of WIRELESS CONSTRUCTOR, I thought you might be interested as to the results I am getting. In the first place, I must state that I have made

 ** A USEFUL GAUGE **
 ** From a Correspondent **

THE usual way of marking-out an ebonite panel for drilling is to use a ruler and scriber. To fit the positions of a row of terminals, for example, you have to scribe a line parallel with the edge of the panel, and to do this you have to mark points on the panel equidistant from



the edge and then join them with a scribed line.

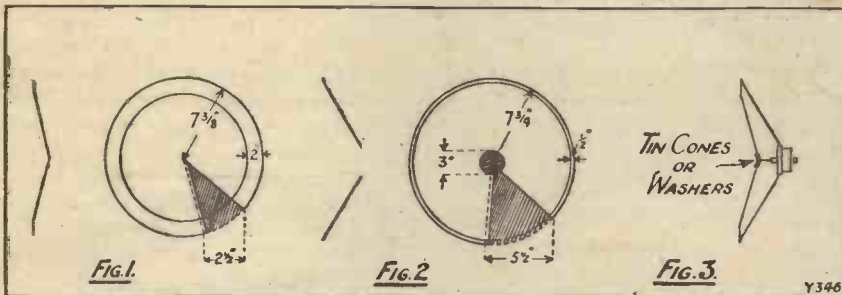
A simple tool, which will be familiar to woodworkers, will combine all the above operations. This is the marking gauge. The lines scribed are bound to be parallel with the edges of the panel if it is properly handled.

The form of marking gauge recommended is illustrated in Fig. 1. Any dealer in carpenter's tools will supply one. It consists of a hardwood handle, with a small steel spike driven through it so as just to project. Sliding on the handle is a block of hardwood, with a thumbscrew lock.

Easy to Use

To make the gauge really useful for scribing panels, you will do well to mark a scale of inches on it. Start at the scribing spike and make scratches on the handle with a sharp point at the inches and fractions of an inch.

To use the gauge, set the block at the required distance from the spike, and lay the panel flat on the table with the "working edge" overhanging. Keep the face of the block pressed firmly and squarely against the edge as you draw the tool along it, and there is your scribed line.



cone, which is the front one, by Seccotining the overlap strip to the other cut edge.

The back cone is made from the other piece of drawing paper. On this describe circles having the same centre and diameters of $15\frac{1}{2}$ in. and $14\frac{1}{2}$ in. In addition, using the same centre, draw another circle of diameter 3 in. As with the first cone, mark off on the circumference of the outermost circle two points $5\frac{1}{2}$ in. apart. Leaving as before an overlap strip of $\frac{1}{4}$ in., cut away all the shaded part shown in Fig. 2, and also round the circumference of the outermost circle. Secco-

the amplifier, with tuning as in the "Radiano" Three, using reaction only on Daventry 5 G B, for the purpose of cutting 2 L O, and replacing the Lissen X coils for ordinary plain 35 and 75 coils.

The least I can say of your amplifier is that it is a revelation. I think I am just beginning to hear wireless as it should be, after years of dabbling in fancy sets. I only wish that some wireless fans could spare the time to listen to the set.

Yours truly,
 F. W. GADD.

London, S.W.



Useful Volume Control

A RECENT addition to the growing list of interesting components made by Messrs. Burne-Jones and Co., Ltd., is the Magnum volume control, of which two different patterns were submitted to us. The first has a nominal maximum resistance of half a megohm, and the other of two megohms. In exterior appearance the two models are identical, both being of the conventional single-hole pattern with a handsome moulded knob and pointer. On the back of the casing are three terminals, two of these being connected to the ends of the resistance and the third to a slider, so that the device can be used as a potentiometer.

On test the movement proved smooth, both to the feel and electrically, while the measured resistance of the two models was half a megohm and 1.4 megohm respectively. The slider does not quite reach maximum or zero in either direction, but rotates over almost the entire scale. For all practical volume-control uses zero and maximum are reached, and when used for the purpose for which they are designed both of these components function satisfactorily and can be recommended.

New Wire-Wound Resistances

Lissen, Ltd., are now marketing a series of wire-wound resistances in cartridge form, together with a



The Magnum volume control, referred to above.

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.)

moulded holder which can be used either vertically or horizontally. These resistances are intended for use in resistance-capacity-coupling circuits and have a very low distributed capacity and inductance. A novelty



An excellent example of up-to-date cabinet design by the Caxton Wood Turnery Co., Ltd.

in construction is that instead of making friction contact with clips, as is usually the case, each cartridge is fitted with a terminal at each end so that a definite screw-down contact can be established with the clips. Substantial terminals and soldering lugs are fitted to the holder.

It is, however, unnecessary to use the holder in all cases, and the provision of terminals enables the resistance to be inserted between stiff wires where necessary. These resistances certainly make useful addition to the maker's range of components.

Some Harlie Components

From the manufacturers of the Harlie components we have received several interesting pieces of apparatus for test; the first, a valve holder,

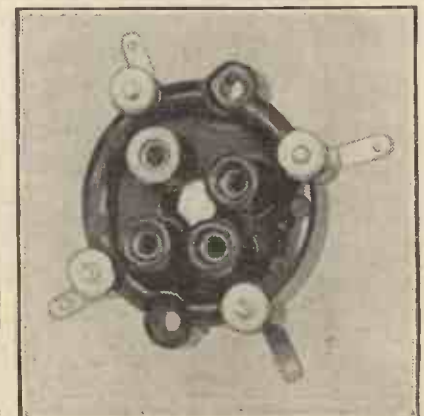
being a neat and ingenious construction, its spring suspension being quite satisfactory for both small and large valves. Both terminals and soldering lugs are fitted, and very sound contact between the pins and the actual socket is effected by coiled springs inside the insulating sockets.

The anode socket is marked with a red ring, and it is impossible to make contact between the pins and the sockets unless the valve is properly inserted. High-frequency tests were quite satisfactory, and we were glad to see that a good deal of solid material had been removed from between the sockets.

The only criticism we would make is that the holes in the securing lugs are a little on the small side in view of the length of screw necessary for securing purposes. It is quite a good valve holder, and comes well up to the standard expected of good components in these times.

The second component—a neat neutralising condenser of the screw-up-and-down type, made for baseboard or panel mounting by the one-hole-fixing method—is a particularly well-made little component. Its measured maximum capacity was 35 micro-microfarads, and the minimum negligible, so that its range covers all the needs of a good neutralising condenser.

The knob, which is of a brilliant red material, is slotted for the



The new Harlie valveholder.

What's New—continued

insertion of a screwdriver. Serviceable terminals and soldering lugs are fitted, the upper terminals, however, being so placed that when panel mounting is used it practically touches the panel. The position of this might be slightly altered with advantage, but in the majority of cases this condenser will be used screwed down to the baseboard near the valve. (In any case, we are not in favour of mounting neutralising condensers on the panel, as very inefficient wiring usually results). It is a substantial component of good design and can be recommended.

The third item—the Harlie wave-selector—consists of a neat casing carrying inside a tapped solenoid coil and a small variable condenser adjusted by a knob and dial. A report on this component will appear in a later issue.

A Useful Meter

Messrs. A. H. Hunt, Ltd., have submitted to us for test their combined 0 to 7 and 0 to 120-volt portable voltmeter of the special low current consumption type. The meter is well finished in a plated case with a point on the case which serves as the positive terminal, and two flexible leads, one marked red and the other black, the red being the negative terminal for the 0 to 7-volt readings, and the black for 0 to 120-volt readings. The resistance is stated on the case to be 6,000 ohms, and on



The Hunt voltmeter is of the double-range type.

measurement this figure was found to be accurate for the 0 to 120-volt range.

This means that when applied to a high-tension battery the current taken by the meter is fairly high, being in



Here is the Harlie neutralising condenser, referred to on this and the preceding pages. The various points named are well illustrated and the substantial nature of the knob and connecting points can be seen clearly.

the case of the 120-volt battery 20 milliamperes. At first some readers might consider this a disadvantage. Actually, in practice, the resistance is neither too high nor too low. It is sometimes an advantage for the meter to take a current round about this figure as the voltage of a high-tension battery is then tested under load conditions comparable with those of, say, a five-valve set using a super-power valve. A high-tension battery, when considerably run down, may easily show a good reading on a very high-resistance voltmeter, due to the fact that a very high-resistance voltmeter takes a very small load—much less than would be taken in practice. On the other hand, cheap low-resistance voltmeters, by making an enormous drain upon the battery, will give a very false reading.

The Hunt meter, with a resistance of 6,000 ohms, should give a very fair indication of the working condition of the battery, and in this way proves very useful. On the low voltage side the resistance was 70 ohms, quite a satisfactory figure for a low voltage reading. Tested against our standard the readings proved accurate. The movement is not quite dead-beat, but the needle settles down within a very reasonable period.

It is a good practical meter for the average experimenter who desires to measure the voltage of his high-tension battery or his accumulator. It should not be used for measuring the voltage of H.T. mains units, as these, for reasons already explained

in this journal, require special high-resistance meters.

The Peerless Valve Holder

A well-made anti-microphonic valve holder, known as the "Peerless shock-proof," has been submitted to us for test by The Bedford Electrical & Radio Co., Ltd. The method of suspension is sound, and a large central aperture enables a good deal of the solid material to be removed between the individual sockets, a point we like to see in valve holders of this kind.

Terminals only are provided for connection, but, of course, soldering lugs can easily be slipped under these if required. The holder is very light, yet strong, and the amount of solid material is particularly small. We can recommend this holder to be quite satisfactory for all purposes to which it is likely to be put, and for short-wave work it is considerably better than some we have tested.

An Ingenious Cone Loud Speaker

From Messrs. M.P.A. Wireless, Ltd., we have received the M.P.A. plaque loud speaker, Popular model, a particularly handsome instrument selling for the very low price of 29s. 6d.



The Peerless "shock-proof" valve holder reviewed above.

The speaker is of the cone type, the surface of the cone being gilded and placed behind a very attractive mahogany finished fret. Adjustment is made from the front and the instrument is supported on the table by feet of twisted metal framework.

On test the results were very good indeed for the price charged, being much more pleasing than the reproduction given by many speakers sold at higher prices.



Quality Tells!

MANY manufacturers of the finest receiving sets and eliminators use Electrad Resistance Controls. Scores of radio engineers and technicians specify them exclusively. Only controls of perfected designs, proven performance and dependability could enjoy such universal endorsement.

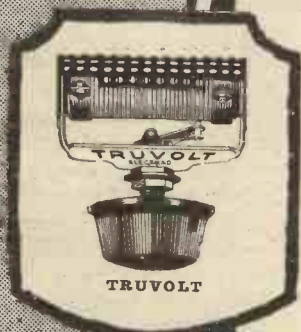
Electrad specializes in a full line of resistance controls for all radio purposes. Dealers everywhere sell them.

Truvolt All-Wire Resistances

The unique, air-cooled construction of Truvolts makes for unusual accuracy and permits the carrying of heavy current loads with a high factor of safety.

Truvolt Variables simplify H.T. Eliminator construction by eliminating difficult calculation and making all adjustments easy. Twenty-two stock types. **15/6 each.**

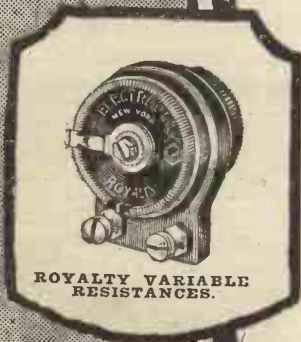
Truvolt Fixed resistors are adjustable to different set values by the use of sliding clip taps—an exclusive Truvolt feature! Made in all desirable resistance values and circuit ratings.



TRUVOLT

Royalty Variable High Resistances

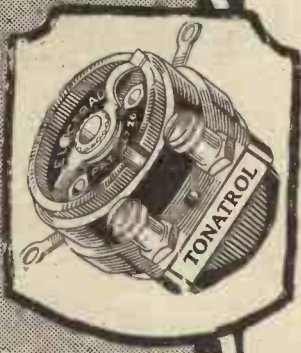
Here is a Variable High Resistance that is entirely free from harmful inductance and capacity effects. It is widely recommended wherever a unit of this type is required in the circuit. Eleven types covering a range for every purpose. **8/- each.** Potentiometers **9/- each.**



ROYALTY VARIABLE RESISTANCES.

TONATROL

Perfect control of volume to adapt your reception to the occasion and individual taste is necessary for the full enjoyment of your radio. Tonatrol Volume Controls are designed in types to meet the specific needs of all circuits—A.C. or conventional battery type. Furnished in standard types or with filament switch or power switch attached. **8/- to 15/6 each.**



Please send me descriptive folder on all Electrad products, and put me on your mailing list for similar literature.

I am particularly interested in

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Name

Address

Represented by The
ROTHERMEL CORPORATION, LTD.,
 24-26, Maddox Street, London, W.1.

Phone: Mayfair 0578-9, 4285.

Telegrams: "Rothermel," Wesdo, London.

ELECTRAD

Inc

OUR NEWS BULLETIN

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

The "Yorkshire" Regional

It is reported that the B.B.C. engineers have been making inspections of sites for one of the Regional high-power stations near Sowerby Bridge, in Yorkshire. There doesn't seem to be any definite news yet, however, whether one of the sites near this well-known centre will be chosen.

"All That Was Left Of Them"

The finest amateur choir in England has been formed by the B.B.C. It has two hundred and fifty members who are now in the course of rehearsing for the B.B.C. Symphony Concerts. The two hundred and fifty singers have been selected from applications sent in by six thousand singers. From the original six thousand, one thousand were invited for test, and out of that thousand

the final choice of two hundred and fifty was made.

Man-less Music

Our readers have probably read in the papers about the battleship "Centurion," which has recently been manœuvred and wirelessly-controlled as a target ship. The "Times" Correspondent had an interesting description the other day, which read as follows:

"It is customary for the bands of all large men-of-war to play on leaving or entering harbour, and the Centurion, having no musicians, has installed instead an amplifier fitted to an ordinary gramophone, which transmits martial music through a loud speaker on deck. It was played for our benefit, and we can quite believe that the music created some consternation when the ship steamed in and out of Malta Harbour."

It certainly must have scared some of the natives at Malta when this man-less battleship was manœuvred by wireless.

That Tremolo

There was an interesting note in the "Observer" the other day from a correspondent regarding the B.B.C.'s persistence in engaging singers who will use the tremolo. Some readers seem to think that the persistence in engaging offenders of this nature is ruining the taste of the rising generation. Many people think the use of the tremolo is simply a matter of taste, but it certainly is a fearful thing to listen to when one's loud speaker is not quite what it should be.

India's Troubles

The resignation of the European staff of the Indian Broadcasting Company has created something of a sensation. The original capital of the Indian Broadcasting Company was £45,000, and this money has now been expended and the company has been carrying on with a loan, which has also nearly gone. The staff has resigned because they say it is in their own interests, and that

(Continued on page 154.)

MAGNUM VIBRO VALVE HOLDER



Recommended for "Big Ben" Price 2/-

MAGNUM H.F. CHOKE

Recommended for "Big Ben." Specified for many of the latest receiving sets.

Price 7/6

Short-wave type, 7/6



Construct "BIG BEN"

as described in this issue.

1 Pedestal Cabinet, 16" x 8"	£ 6 0 0
1 Mahogany Panel Brackets	10 6 0
1 Pair Magnum Panel Brackets	2 0 0
2 Magnum 6-pin Bases	4 0 0
1 Magnum Terminal Strip, with 12 Terminals	6 0 0
3 Magnum Vibro Valve Holders	7 6 0
1 Magnum H.F. Choke, -0002	7 1 6
1 Magnum Fixed Condenser, -0003 & 2 meg. Leak	3 0 0
2 Magnum Push-Pull Switches	6 0 0
1 Formo Variable Condenser, -0005	6 0 0
1 Formo Variable Condenser, -0003	7 0 0
2 Lissen Vernier Dials	4 0 0
1 Utility D.P.D.T. Switch (Lever type)	12 6 0
1 P.V. Output Choke, 20 Henry	1 2 6
1 R.I. Varley R.C. Unit, Type B	7 6 0
1 Ferranti Resistance & Holder as specified	17 3 0
1 Igranio L.F. Transformer, Type J, 34-1	10 0 0
2 Master Three type Coils	13 3 0
	£13 3 0

NOTE.—Table type Cabinet can be supplied instead of above. Price £14 0 0
 Ready wired and tested in Pedestal Cabinet, including Royalty £15 0 0
 Ready wired and tested in Table Cabinet, including Royalty £10 0 0

Latest Catalogue and lists on receipt of 1/6 stamp. Full particulars of Magnum 1929 Screened Fire and Purity Three Constructional Sets now available.

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

MAGNUM "UNIVERSAL" THREE 15-2,000 metres.



A remarkable 3-valve Universal Receiver giving 5-valve results. Employs latest S.G. and Pentode valves, metal cabinet, crystalline finish.

Price, including 4 "Twintuna" Coils, 15-2,000 metres, 3 valves and Royalty, £18 0 0

Free demonstration in your own home within 50 miles radius from London. Full particulars on request.

The most perfect receiver for overseas reception:

MAGNUM PANEL BRACKETS

Recommended for "Big Ben." Specified for Mullard "Master Three Star," Six-Sixty Mystery Receiver and other modern receiving sets.

Price 2/6 per pair



BEST WAY TO ALL STATIONS

DARIO

VALVES

—AND THE CHEAPEST WAY, TOO,

guaranteeing utmost satisfaction. Just look at the prices below—made possible by reason of the biggest valve output in the world. Radio without Dario can never be radio at its best. SUPERLATIVE FINISH—LOWEST CONSUMPTION

2 V LT	General Purpose,	5/6
	.05 amp. R.C.C.,	.06 amp.
	Super-Power,	7/6
	18 amp.	

4 V LT	General Purpose,	5/6
	.05 amp. R.C.C.,	.07 amp.
	Super-Power,	7/6
	1 amp.	

From your dealer or direct:

IMPEX ELECTRICAL, LTD.
(Dept. L),

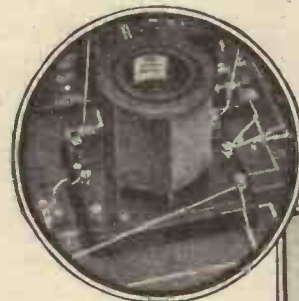
538, High Road, Leytonstone, E.11.

5/6

Irish Free State
Agent:
BURWOODS,
of Cork.

7/6

Specified for the new Master 3



Recognition of efficiency



Here we show the Colvern Combined Wave Coil in the new Mullard Master Three* as well as a view of the ingenious switch concealed in the base.

The Colvern Combined Wave Coil gives selectivity and volume

THE fact that coil-changing is dispensed with in The New Mullard Master Three is the outcome of the specially designed Colvern Combined Wave Coil specified. Its high efficiency is entirely due to skilful manufacture on the one hand and efficient design on the other.

Each coil is tested before despatch in a duplicate New Master Three Receiver in order to ensure that it functions exactly in conformity with that used in the original receiver. This is your safeguard and you are advised to adhere to the author's specification.

17/6

COLVERN ACCURATE SPACE WOUND COILS

Advertisement of Colvern Ltd., Romford, Essex

OUR NEWS BULLETIN

—continued from page 152

of the public. They maintain that the success of broadcasting must depend on the excellence and utility of the programmes, and without adequate finance this is impossible.

American Relays

Did you listen-in to the relay of the sounds of the arrival of the Graf Zeppelin, when it was being moored in America? This was certainly one of the best relays the B.B.C. has attempted. But we must also remember that a great deal of credit is due to the excellent short-wave transmission from the other side. Although atmospheric were bad, it was quite possible to follow the description broadcast from America, and my loud speaker very nearly fell off its pedestal, so realistic and loud was the sound of the Zeppelin's engines.

This is the sort of thing which makes one really believe in the possibility of the annihilation of space.

Music Halls and Broadcasting

Well, so there is a split at last in the stupid policy of the music-halls in refusing to co-operate with the B.B.C. We may hear now some rather good broadcasts from that excellent place of entertainment, the London Palladium, and it is to be hoped that it will mark a new era in the music-hall managers' attitude towards broadcasting. For long enough now they have persisted in this dog-in-the-manger tactics, chiefly to their own disadvantage.

There has been a lot of talk lately about the music-halls, and it is said that they are not doing well. Certainly, there could be no finer advertisement for their shows than reasonable excerpts being broadcast, which, if they were really good, would encourage people to go and see the complete show.

The Gramophone and the B.B.C.

A question has been asked in the papers lately as to whether broadcasting is becoming less popular, and has the recent gramophone boom done broadcasting any harm?

The B.B.C. affirms that the success of the gramophone companies and the immense sale of records has in no way been harmful to the B.B.C.

In fact, it quite rightly believes that the more people there are with musical interests in this country the greater is the potential listening audience of the B.B.C. The B.B.C. does not regard the gramophone as a rival, but rather as an ally. And this is an attitude that the music-halls and the theatres should copy.

An Ether Law-Breaker

There was an interesting report in the papers the other day about the French police having discovered, not far from the Italian frontier, an unauthorised wireless station for which they had been looking for some time.

The station was in an uninhabited cottage near Cannes. The police kept watch at midnight and arrested an Italian and a prominent anti-Fascist who had been convicted several times of political offences. It appears that anti-Fascist broadcasts have been made from this station and the authorities attach much importance to the discovery.

We wonder if any of our readers have heard this station, as it had a range of at least two hundred miles, although the wave-length is unknown to us.

(Continued on page 156.)

LOOK TO YOUR COMPONENTS



The BurTon Midget Valve Holder
Anti-Phonic and Self-Locating.

Registered Design. Patents Pending.

Diameter 1 1/8 in. Height 3/8 in.

Complete with Fixing Screws.

1/- each.

AND THEN LOOK AT

BurTon COMPONENTS THAT MATTER

It is with great confidence that we place before you the BurTon Valve Holder, which is unique in construction, being like our other products designed on novel lines which places it far ahead of any Valve Holder on the market to-day.

It is Anti-Phonic and Self-Locating and will be found to give prolonged life to your valves, undoubtedly the best and cheapest Valve Holder in Radio.

We would also draw your attention to the BurTon Resisters. These are wound with high resistance wire and carefully calibrated to give the resistance specified in every case.



Resister Controls

Patents Pending.

Supplied in 3, 6, 10, 15, 30 and 60 Ohms Resistances.

2/9 each.

Potentiometer, Similar in Design,

2/9 each.

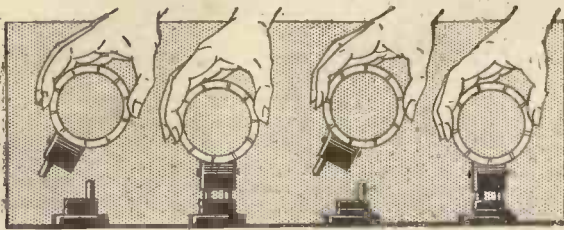


REGD. TRADE MARK



REGD. TRADE MARK

C. F. & H. BurTon, PROGRESS WORKS, WALSALL, ENG.



Why keep changing coils?

British General Aerial Tuning Unit

means that you no longer need use plug-in coils. It covers all wavelengths between 250-2,000 metres by means of a 10-stud tapping switch. Reaction is smooth and tuning simple. New bakelised former and special reversible dial to allow of upright or horizontal panel mounting.

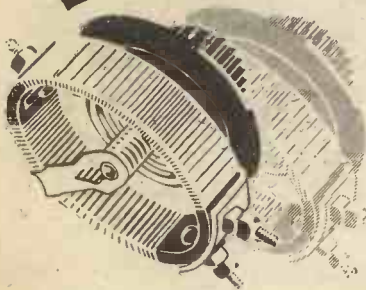
Price 18/6

From all good dealers or direct from—

BRITISH GENERAL

MANUFACTURING CO., LTD.,
BROCKLEY WORKS LONDON, S.E.4.

DUAL SALES



—and well on the way to triple sales! This Dual Rheostat has been designed to meet the demand for a resistance to cover the needs of both bright and dull emitter valves. It has two windings, one of a resistance of 6 ohms, and a continuation of this on to a 30-ohm winding. *One hole fixing.*

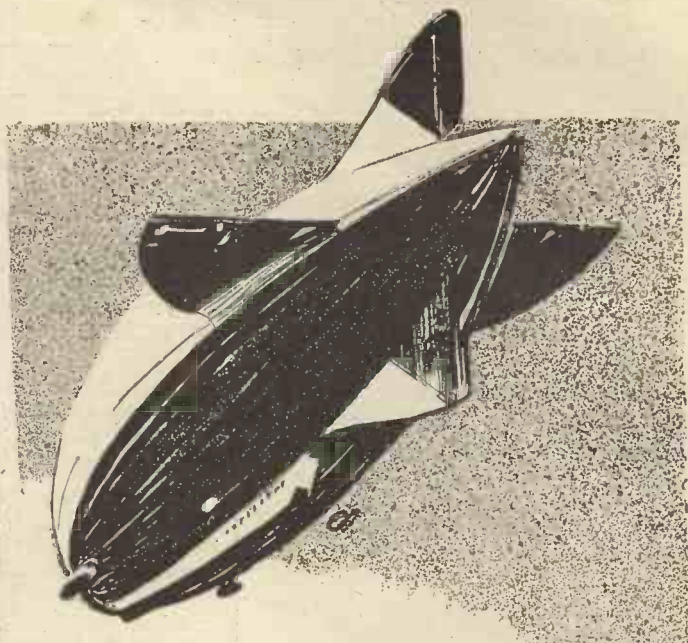
A USEFUL LITTLE COMPONENT.

Obtainable from all Dealers.

Send for new Catalogue of all "Peerless" Products.

"PEERLESS" DUAL RHEOSTAT **3/6**

The Bedford Electrical & Radio Co., Ltd.,
22, Campbell Road, BEDFORD.



ENGINEERING PRECISION

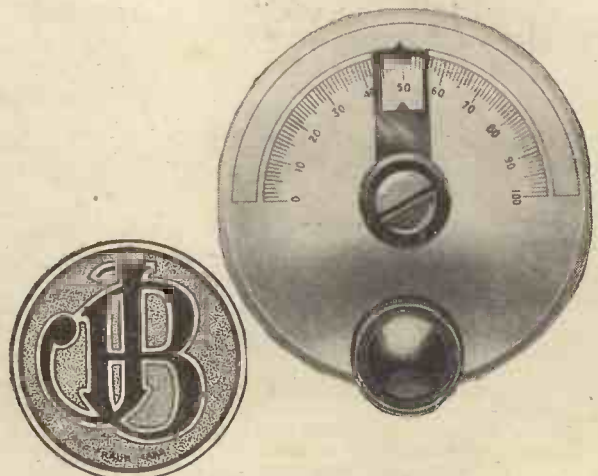
Think of the hours of thought and labour expended in design and construction of the wonderful *Graf Zeppelin*—the flying palace—which recently performed the colossal feat of crossing the broad Atlantic. One simple error meant irrevocable disaster.

But engineering skill triumphed over all difficulties as it has done throughout this wonderful century. Consider the amazing skill necessary in the design of Radio components . . . the difficulties which have to be overcome . . . and the absolute perfection of the finished products.

This brings our thoughts automatically to the new J.B. Vernier Dial which is a veritable triumph in Engineering skill. Perfect in every detail, the J.B. Vernier Dial is the most attractive dial obtainable, and is the only dial which is completely insulated.

The J.B. Vernier Dial is a wonderful example of Engineering Precision.

Price 5/6.



PRECISION INSTRUMENTS

Advt. of Jackson Brothers, 8, Poland Street, Oxford Street, London, W.1

OUR NEWS BULLETIN

—continued from page 154

The Closing of 5 N G

What do our Nottingham readers think about the new scheme? According to reports in the papers, the first of the transmissions for the Nottingham district was a fiasco, the general expression of opinion being that the closing of 5 N G is a step which should not have been taken until the B.B.C. could have assured listeners of a wireless programme of equal strength from a station well within range of crystal-set users in Nottingham. There has lately been a lot of bad feeling about the closing of 5 N G, but reports seem to be rather confused, and we should welcome any comments from Nottingham readers.

B.B.C. and Television

We hear that the Baird Television test for the benefit of the engineers of the B.B.C., held a few weeks ago, did not make Captain Eckersley and Admiral Carpendale, and other experts who were present, feel any different in their views concerning the suitability of television as regards

co-operation with the B.B.C. Perhaps now the matter is finally cleared up, until some new system of television is invented. We have heard so much talk about television lately that it is refreshing at last to have the matter disposed of.

Picture Broadcasting

The inauguration of a radio-picture broadcasting service was celebrated by a luncheon at the Savoy Hotel

POPULAR WIRELESS

IS THE LEADING
RADIO WEEKLY.

On Sale Every Thursday

on the 30th October, when Captain Otto Fulton, who was present, demonstrated the success of his invention. At the hotel two machines were wired-up to ordinary portable receiving sets. When Daventry announced it was about to broadcast the pictures, the Fultograph machines were set in movement, a drum revolved, the needle started to trace impressions, and within two or three minutes the guests present saw a very

fine reproduction of a photograph of the King.

Following this, the machines started to click again and began to reproduce a cartoon by Mr. Raymond Hill.

Really Marvellous

After the luncheon, Mr. Raymond Hill said that he was astounded at the reproduction: "It is really marvellous," he said, "considering that it is a rough cartoon done in a few minutes, and yet the wireless picture is absolutely true, and better almost than the original."

Daily Transmissions

The B.B.C. has made arrangements to broadcast four pictures a day, on Tuesdays, Wednesdays, Thursdays and Fridays. They will be made from 5 XX between 2 p.m. and 2.25 p.m.

Not Ready Yet

At the moment there are not many Fultograph machines ready for sale in this country, but we understand from Wireless Pictures (1928), Ltd., that before the end of the year production will be well in hand and the Fultograph receivers will be able to be purchased at a cost of about £20 each.

IGRANIC
COMPONENTS
IN THE

MYSTERY RECEIVER

3 Variable "LOKVANE" Condensers	Price
2—0005 mfd.	10/6
1—0003 mfd.	9/6
2 Indigraph Slow-motion Dials	6/-
1 Indigraph 2 in. dial	1/6

Price

1 50-ohm Rheostat (Igranic-Pacent)	2/6
1 Neutralising Condenser (baseboard mounting)	4/-
1 Single Filament Lighting Jack	3/9

INDIGRAPH

IGRANIC
ELECTRIC
CO. LTD.

The Indigraph Slow-motion Dial, here shown, is the one dial that guarantees the highly accurate selectivity demanded by Radio to-day.

IGRANIC ELECTRIC Co., Ltd. (Dept. J 682),
149, Queen Victoria Street, London, E.C.4.
Works: BEDFORD.

THE ONLY EFFICIENT METHOD OF BUILDING A WIRELESS SET IS TO SOLDER THE CONNECTIONS



AND THE MOST EFFICIENT SOLDERING IRON IS THE "K.N."

Guaranteed for one year.

K.N. Electrical Products, Ltd.,
87, Wardour Street, London, W.1.

Phone: Regent 4632.

ARTCRAFT RADIO CABINETS

In OAK and MAHOGANY Finish.

"Artcraft Popular Type" Cabinets

Panel Size Depth	Price Oak	Price Mahog.
1. 9 x 6 x 6	7s. 6d.	11s. 6d.
2. 10 x 8 x 6	9s. 6d.	13s. 6d.
3. 12 x 8 x 8	11s. 6d.	15s. 6d.
4. 16 x 8 x 8	15s. 6d.	20s. 0d.
5. Master Three	22s. 6d.	26s. 6d.
6. Corsor Melody Maker	25s. 0d.	29s. 0d.

CARRIAGE PAID. Enclose 1/- for packing for 1, 2 and 3, and 1/6 for 4, 5, and 6, to ensure safe delivery.

THE ARTCRAFT COMPANY,
156, Cherry Orchard Road, Croydon.

Illustrated Catalogue Free.

WHEN ORDERING CABINETS FOR

THE SIX-SIXTY MYSTERY RECEIVER

THE MULLARD PORTABLE V, etc.
BE SURE AND SPECIFY



AND ENSURE PROMPT DELIVERY

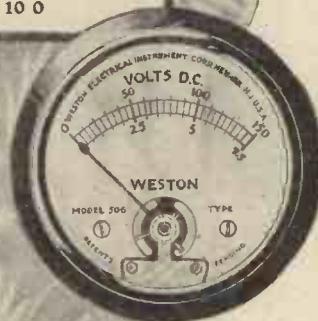
Send for our Latest Lists to:-
CARRINGTON Mfg. CO., LTD., CAMCO WORKS,
SANDERSTEAD ROAD, SOUTH CROYDON.
Phone: Croydon 0623

Weston sets the world's standard



Model 506 Pin Jack Voltmeter with High Range Stand. Measures High and Low Tension Voltages. The Weston free booklet "Radio Control" explains the uses of this and other Weston Radio Instruments. Write for your copy.

Price £2 10 0



Model 506 Mill-Ammeter should be placed in the H.T. circuit of the valve to ensure correct operation and check distortion. Panel mounting type.

Prices

£1.15.0—£2.15.0

Model 506 Panel Voltmeters ensure permanent accuracy. With a high internal resistance of 125 ohms. per volt, they make practically no load on the batteries. Neat and compact.

Prices

£1.15.0—£2.15.0



Model 489 Double Range D.C. Voltmeter is a necessary portable testing instrument for every radio enthusiast. It is of great use

in tracing circuit troubles. Made in various ranges with different sensitivities. Similar instrument for A.C. Model 528.

Prices £4.0.0—£7.15.0

WESTON ELECTRICAL INSTRUMENT CO. LTD.

15 GT. SAFFRON HILL, LONDON, E.C.1

TELEVISION AND THE B.B.C.

—continued from page 126

can all imagine for ourselves that the day cannot be far distant when, without leaving our chairs at home, we shall be able to see Ascot in all its excitement and glory, or a Test Match at Lords (or at Sydney, for that matter); see, that is, the actual events themselves at the moment of their occurrence, not just moving photographs of them some time afterwards. The truth is that, without envisaging these possibilities of the future, Mr. Baird has provided for our immediate assimilation as much as we can reasonably be called upon to digest."

A Lot of Nonsense

That quotation is an extract from an advertisement published some months ago by the Baird Television Development Company, Ltd. To-day after his system has been investigated and tested by some of the most competent experts in the country—and, after all, however much we may criticise the B.B.C. from a programme point of view, there is no gainsaying

the fact that its technical staff knows its job inside out—the most credulous critic must realise that there has been a good deal of nonsense talked about television.

There have been many excuses, of course, for the over-enthusiastic statements made and the over-enthusiastic reception given to them. But, sooner or later, we have to face cold, hard facts. Every possible facility has now been given to the exploiters of the Baird System to prove their claims

**YOU MUST BUY
"POPULAR WIRELESS"**
if you want to keep up to date
in radio.

On sale every Thursday, price 3d.

and to justify the remarks made in the above quotation; and, although we are the first to congratulate them on their excellent experimental work, and to wish them every possible success in the near future, we sincerely trust that until some new system has been devised which will give promise of justifying its actuality as a public service system, we shall not hear any more of these futuristic claims or remarks about "the day not far distant" when we shall be able to

see this, that and the other by television.

A Clear Indication

That day may not be far distant; but, on the other hand, it may be a thousand years distant. At the moment there is no evidence to suggest that it is very near. And as for the statement that "Mr. Baird has provided for our immediate assimilation as much as we can reasonably be called upon to digest," obviously the B.B.C. do not agree with that statement, for their report clearly indicates that, in their opinion, that system is not suitable and does not justify the experimental use of one of the B.B.C. stations for a series of television transmissions.

We hope that Mr. Baird will not be unduly disappointed at the B.B.C.'s decision and that he will not be disheartened, and will continue his experiments. We also hope that no further attempts will be made to offer the public something which, in the opinion of experts and those competent to judge—and in this particular case we refer to the B.B.C. experts as representatives of a Corporation which exists purely as a public service corporation—is, to say the least of it, at the moment only half-baked.

The Original Moving-Coil Speaker

The R.K. was the first of the moving-coil speakers. It is still the first in quality, for there is no other instrument capable of giving such faithful reproduction. Similar to the R.K. Senior (the original model) is the R.K. Junior—an instrument which gives perfect reproduction over the whole range of audible frequencies. Supplied for operation direct from A.C. or D.C. electric light mains.

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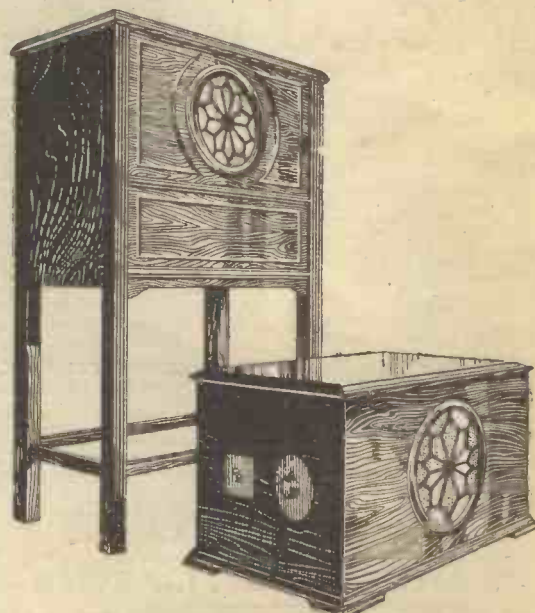


Table Grand Junior R.K. ...	A.C.	£34	15	0
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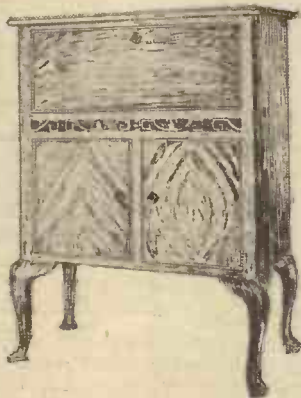
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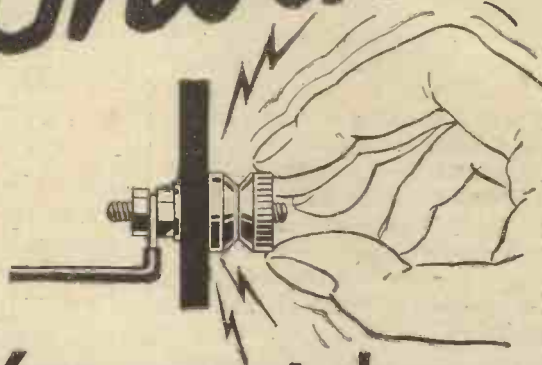
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Patent

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ALL FROM "D.C."

—continued from page 105

In the case of Fig. 2, V_2 , the H.T. will be that of the mains less the 400- and 30-ohm potentiometers, the filament of V_3 , the two L.F. chokes and the resistance in series with the anode resistance of V_2 , the remaining voltage being applied to the anode of the valve through the effective anode resistance.

Of course, the resultant voltage would be difficult to measure in the latter example, since a current of only a few micro-amperes would be flowing, but it offers a means of showing how the voltage is reduced. Also, in this case, the resistance in series with the anode resistance can be varied so as to enable a smooth control of reaction to be obtained.

Minor Modifications

Although only certain circuit arrangements are shown, which can be considered apart from the mains portion of the receivers, yet it is possible to employ tuned anodes in the case of H.F. valves, screened-grid valves, choke coupling for the L.F.,

and so on. Reflex circuits are not recommended for various reasons.

In the same manner, certain readers may wish to alter the H.T. part of the circuits and probably include L.F. chokes in each H.T. positive lead, as "anti-motor-boating" devices. Such arrangements can be readily welcomed as improvements, provided one

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a wireless set without much
technical knowledge
MAY READ
all about it in easy-to-un-
derstand language by taking
in
POPULAR WIRELESS
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is prepared for the extra outlay entailed. The point which has to be remembered in designing these receivers is that all smoothing devices incorporated shall be really essential and not be too costly, so that all the smoothing circuits can be considered of assistance in obtaining stability and "free-from-hum" reception.

CHATS AT THE WORK-TABLE

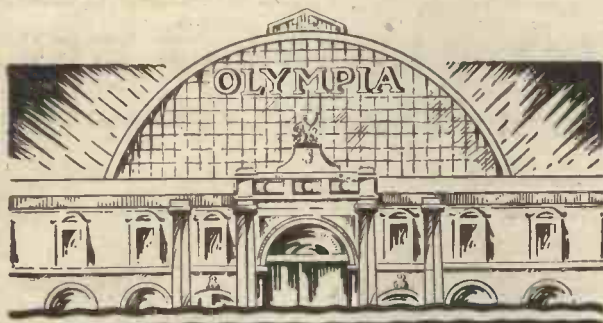
—continued from page 134

will take nothing bigger than $\frac{1}{4}$ in. ? Several firms are now marketing $\frac{3}{8}$ -in. and $\frac{1}{2}$ -in. drills with $\frac{1}{4}$ -in. shanks—an idea that was first suggested in these columns. Since one never has to bore through more than a quarter of an inch or so of ebonite, the small hand drill of good quality is amply sufficient to drive a $\frac{3}{8}$ -in. drill.

The advanced constructor will need drills of several other sizes. He will, in fact, be well advised to purchase a complete set, which is by no means a costly business. To hold them he can obtain either a stand or a canister. Stands are all very well if one's workshop is bone-dry at all seasons of the year, but if it is not, then the canister is to be preferred, as this does to a great extent protect drills from rusting.

The type that I use myself is extremely handy. It is about the size of a half-pound cocoa tin. The

(Continued on page 162.)



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PR 8	3.5-4	·063	23,000	15	H.F.
PR 9	3.5-4	·063	18,000	14	Det.
PR10	3.5-4	·063	10,000	8-7	L.F.
PR11	3.5-4	·063	88,000	40	R.C.
PR16	5-6	·1	19,000	18	H.F.
PR17	5-6	·1	18,000	17	Det.
PR18	5-6	·1	9,500	9	L.F.
PR19	5-6	·1	80,000	40	R.C.
PR20	2	·15	7,000	6	Power
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POPULAR WIRELESS, Sept. 8, 1928, says: "Has quite remarkably good characteristics, and should appeal to those to whom the price of the usual British valve is still too high."

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2 On-Off Switches	4	0	0
1 Utility D.P.D. Lever Switch	7	0	0
2 Lissen Vernier Dials	4	0	0
2 Lewcos 6-pin Coil Bases	5	6	6
1 Lewcos Short-Wave Coil	10	0	0
1 Lewcos Mid-Wave Coil	10	0	0
1 Lewcos Long-Wave Coil	14	0	0
3 Lotus Valve Holders	5	3	0
1 .0002 Lissen Condenser	1	0	0
1 .0003 Lissen Condenser	1	0	0
2 T.C.C. 2 mfd. Condensers	7	8	0
2 T.C.C. 1 mfd. Condensers	5	8	0
1 Dubilier 4-neg. Leak	2	6	0
1 Lewcos H.F. Choko	9	0	0
1 R.I.-Varley Type B. R.C.C. Unit	1	2	6
1 Igramic Type J. Transformer	1	7	6
1 Pte 20-henry Choko	1	0	0
1 R.I.-Varley 20,000-ohm Resistance	5	6	6
1 Terminal Strip	1	6	0
12 2BA Terminals	1	6	0
3 Valves, as specified	1	13	6
20 ft. Glazite	1	0	0
Screws, Flex, etc.	1	0	0
Total (including valves) £11 14 3			

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2 Lissen Variable Condensers, .0005	5	6	6
1 Peto-Scott Reaction Cond., .0001	1	3	0
1 Benjamin On-&Off Switch	2	6	0
1 Lissen P.M. Rheostat, 30 ohms	8	0	0
2 Lotus D.P.D. Switches, with ter- minals	8	0	0
2 Brass Rods, 2BA, 4 3/8" long	4	0	0
2 Magnium Panel Brackets	2	6	0
2 Terminal Strips, with 5 and 7 ter- minals	2	6	0
4 Lotus Valve Holders and terminals	7	0	0
4 Peto-Scott B.B. Coil Holders	6	0	0
2 T.C.C. Condensers, .001	3	8	0
2 T.C.C. Condensers, .0003	1	10	0
1 T.C.C. Condenser, .0003, with S.P. ter- minals	2	4	0
1 Dubilier Grid Leak, 2 megohms	2	6	0
1 Formocondens., .00003 max. Ref. A	2	6	0
2 Dubilier Condensers, 1 mfd.	5	0	0
1 Dubilier Condenser, 2 mfd.	3	6	0
1 R.I.-Varley Radio Frequency Choke	9	6	0
1 Mullard R.C.C. Unit	1	7	6
1 Phillips L.F. Transformer	1	5	0
1 Igramic Output Choke, type F	16	0	0
1 Peto-Scott Screening Box (M.W.)	12	6	0
25 Yards Lewcos Rubber-covered Flex	3	6	0
2 Sets Lissen Grid and high-wave	1	12	2
1 Set Cossor and Marconi Valves	2	16	0
Wood Blocks and Metal Screws	6	0	0
Total (including valves) £14 19 1			

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CHATS AT THE WORK- TABLE

—continued from page 160

lid is not detachable, but rotates. In it are three holes marked 0 to 20, 21 to 40, and 41 to 60. Round the flange of the lid are three rows of numbers corresponding to those against the holes. On the body of the canister is a small indicator.

If, say, a No. 38 drill is required, one moves a small knob in order to open the hole marked 21 to 40. The lid is then rotated until the number 38 is opposite the indicator. The required drill can then be shaken out into the hand. In addition to the contents of the canister it is as well to provide drills from 1/4 in. to 3/8 in. in 1/16-in. or, better still, in 1/32-in. steps. These may also be contained in a canister, but those who do not care to go to the expense can keep them quite well in a cigarette-tin half filled with common tea. Tea is a strongly hygroscopic substance which absorbs moisture so readily that it keeps the air round the drills themselves quite dry.

Saws

The advanced constructor will also require certain saws especially suitable for wireless work. The ordinary hacksaw is a useful tool, but for most ebonite, or small brass jobs I prefer to use either the coping saw or the jeweller's hacksaw. These enable very neat work to be done, and either pattern is obtainable quite cheaply from any good tool shop.

To show how useful these two patterns are, I may say that, though I have an ordinary hacksaw, it is very seldom used. Another useful addition to this outfit is a small tenon saw, which is exceedingly useful for cutting off such things as terminal strips. The fretsaw is handy, too, and if metal-cutting blades are obtained for it, it is a ever-present help in time of need for making large holes in ebonite panels for the mounting of millimeters and so on.

Files

No great outfit of files is required even for advanced constructional work. For the rapid trimming up of roughly shaped ebonite I like to have a big file of rather coarse cut, the first smoothing process being undertaken with a medium-cut flat file about nine inches in length by three-quarters of an inch in width. A fine-

cut file is useful for trimming up small brass objects.

For advanced constructors the outfit should certainly include a couple of rat-tailed files. The first of these is quite small, tapering from about 1/16 in. to about 1/8 in.; the second tapers from about 1/16 in. to 1/2 in. We are all liable to make small errors in measuring up and marking out. The small rat-tailed file often enables screws to be successfully inserted which would otherwise just refuse to bite.

The larger file is useful where something bigger than a 3/8-in. hole is needed. A drill of that size is run through first, and the file enables the hole to be suitably enlarged.

The widening of biggish holes is made still easier if the constructor purchases a D-bit to fit his brace. This is one of the handiest and most useful tools that I know. For trimming up terminals and so on, a magnetic file is useful, and you may include a half-round file in the general workshop outfit.

Further Additions

There is one tool which, in my view, should be included in the outfit even of the elementary constructor, though I did not allude to it earlier in the article, since many people use a sharply pointed pencil for marking out. It used to be held that this was bad practice, since pencil lines might provide leakage paths from point to point.

Tests show that pencil is practically guiltless as an insulation destroyer. It is not, however, completely satisfactory as a marking-out tool, for it is very difficult to see pencil lines on ebonite in certain lights. The scriber is by far the best thing to use for the purpose.

Using a Centre-Punch

The handiest form of scriber is one of the pocket type, with a reversible point. All who undertake drilling require to use a centre-punch. You may make shift with a nail, but, believe me, if you do so you will never obtain anything like accuracy in marking out your work. A small fine-pointed centre-punch is required, and it must be of good quality, for if it is made of poor steel it will soon cease to be efficient.

You cannot use a centre-punch without having a hammer. The most useful of all types of hammer for the wireless man is a light tool with one flat and one round end. With this all kinds of jobs can be done with real efficiency.

THE 100% Broadcast Receiver

BUILD and OPERATE in ONE EVENING



"Screened 3 Grid"

THE
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An Amazingly Simple Set—
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Programmes as
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List of Components Used by the Designer.

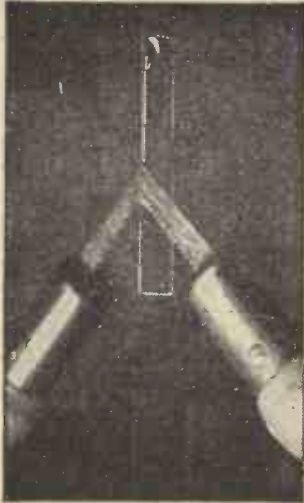
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|---|-----------|------------|------------|
| 1 "RITHO" All Metal Cabinet, complete with Panel and Screen, all holes drilled ready for assembly. Screws, nuts and rubber feet provided. | £ | s. | d. |
| 1 "JUNIT" Printed Plan-board | 0 | 2 | 0 |
| 1 Pr. "COLLETT" Brackets 6" x 6" | 0 | 1 | 9 |
| 2 FORMO "1928" Log Condensers, '0005 | 0 | 10 | 0 |
| 1 FORMO "1928" Log Condenser, '00025 | 0 | 5 | 0 |
| 2 BROWNIE "Dominion" Dials (Black) | 0 | 7 | 0 |
| 1 BULGIN "On" and "Off" Switch | 0 | 1 | 6 |
| 1 Do. Four Spring Switch | 0 | 2 | 6 |
| 1 Do. H.F. Choke | 0 | 5 | 6 |
| 2 FORMO 6 Pin Bases | 0 | 4 | 0 |
| 1 Do. do. Coil, No. SG. 1 | 0 | 10 | 6 |
| 1 Do. do. do. No. SG. 2 | 0 | 10 | 6 |
| 1 Package "Junit" A.B.C. Sleeved Links | 0 | 2 | 0 |
| 7 BELLING-LEE Terminals | 0 | 1 | 9 |
| 3 FORMO Valve Holders | 0 | 3 | 9 |
| 1 FORMO-DENSOR, Type "C" or "G" | 0 | 2 | 0 |
| 1 GRAHAM-FARISH Grid-Leak and Condenser | 0 | 2 | 0 |
| 1 Pair GRAHAM-FARISH Special G.L. Clip | 0 | 0 | 2 |
| 1 "Camden" MANSBRIDGE Type Condenser, '25 | 0 | 2 | 3 |
| 1 Do. do. do. 1'0 | 0 | 2 | 10 |
| 1 FORMO Transformer Output Filter Choke | 1 | 5 | 0 |
| 2 Ebonite Pieces, 2" x 1/4", drilled for terminals and screws | 0 | 1 | 0 |
| 1 Knob for Reaction Control | 0 | 0 | 6 |
| Screws, etc. | 0 | 1 | 6 |
| Total | £6 | : 6 | : 0 |

Use the Components specified. They are products of reputable BRITISH FIRMS

RECOMMENDED MULLARD VALVES

		2-volt	4-volt	
1st Socket	MULLARD Screened Grid Valve	P.M.12	P.M.14	22/6
2nd Socket	MULLARD L.F. Valve	P.M.11 L.F.	P.M.3	10/6
*3rd Socket	MULLARD Super-Power Valve	P.M.252	P.M.254	15/-
	*Where greater volume is required, use a MULLARD PENTONE VALVE	P.M.22	P.M.24	25/-

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See how cleanly "Resiston" can be cut—no crumbling or cracking — a clean edge every time

take no chances with your panel

The most expensive cabinet will be marred by the choice of an inferior panel, whilst a superb panel—such as "Resiston"—will enhance the appearance of even the most modest cabinet.

A cheap panel loses colour very rapidly. It does not cut readily. And, finally, its electrical efficiency is so low that serious leakage may be set up and the efficiency of the receiving set considerably impaired.

"Resiston" panels retain their deep lustrous black—they can be drilled, sawn, or cut with ease. Low dielectric loss is a chief feature. To be quite safe ask for "Resiston."


Send for new booklet.

Please send me, free, a copy of your new booklet, "The Panel Makes all the Difference." "W.C." Dec.

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ADDRESS.....



6016 

American Hard Rubber Co., Ltd., 13a, Fore St., E.C.2

"STEDIPOWER" JUNIOR

—continued from page 110

your set (which, when the "Stedipower"—either Junior or the 1-ampere model—is used, should *always* be left on), but by the switch controlling the trickle charger. This is important for, unlike an accumulator, when you switch off by means of a switch on the set you cut off the current going to the valves; but a certain current will still pass in and out of the filter system and the condensers will be subjected to unnecessary strain.

Overloading the Condensers

If you should be using a Tobe-Deutschmann condenser and not the T.C.C. with this unit, notice that the Tobe condenser has three terminals, one being marked negative and the other two positive. The negative corresponds to the common connection of the two negatives on the T.C.C. condensers, and the two positives are for the two separate condensers inside.

Do not, in your experimental work, ever subject "Stedipower" Junior to a higher input voltage than that given by your trickle charger, as the electrolytic condensers of very large capacity are not made to withstand high voltages, and in this respect differ entirely from the ordinary Mansbridge type. Used for the purpose for which they are designed they are perfectly reliable, but I doubt whether any of the makes will stand more than 20 volts without breaking down.

A New Model

The Dubilier Condenser Co., Ltd., have recently advised me that they are now in production with their model of electrolytic condenser, and I hope by the time this article appears these condensers will be available. In this case two Dubilier electrolytic condensers can be used equally well in the "Stedipower" Junior, or in the "Stedipower" 1-ampere model previously described.

Those readers who wish to build a complete unit containing transformer, rectifier, chokes, smoothing condensers, voltage control, etc., which can be plugged into the mains and used as a complete substitute for accumulators, are advised to obtain the August, 1928, issue of the WIRELESS CONSTRUCTOR (while the available copies last!). The article in that issue deals very fully with the whole problem and gives complete constructional details and drawings.



LISENIN'S THREE LATEST TRIUMPHS

SIX-SIXTY RECEIVER

2 Spade Ends
3 Wander Plugs

MULLARD MASTER 3

8 Wander Plugs
2 Spade Ends

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4 Plugs and Sockets
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(See page 153.)

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Two required for each hole.

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NUMBER 0 1 2 3 4 5 6
Hole in Bush 6BA, 4BA, 2BA, 1, 5/16", 3/8", 7/16"
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SAVES UPKEEP EXPENSES

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To your sizes.

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Brings to your Set a NEW CHARM!—a FURNITURE model enhancing the HOME!

Over 3,000 delighted clients have bought Pickett's Cabinets THROUGH THE POST. Every Cabinet is sent ON APPROVAL. Guaranteed complete satisfaction.

"The HALL MARK by which your Set is judged and admired."

LET US HELP YOU. Send for lists to actual makers:—

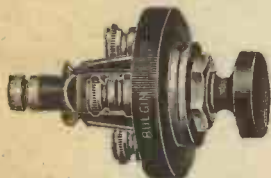
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THE
TRIPLE S.C. SWITCH



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BAKER'S Selhurst

RADIO

23 SELURST RD.

SOUTH NEWWOOD, SE 19

WITHIN THE VACUUM

—continued from page 114

So, put briefly, we use an H.F. valve for every H.F. stage, unless another is particularly specified, and an H.F. valve for all detector stages whether resistance or transformer-coupled.

The first L.F. stage, whether resistance or transformer-coupled, should have a valve having an impedance of not less than 10,000 ohms, unless a special transformer is employed, and not greater than about 17,000 to 19,000 ohms unless you are employing a very special amplifier and know exactly what you are doing.

In the last stage use a valve that can carry the grid swing required to give you the output power you need for your loud speaker. Then you will be on the safe side.

Always have a factor of safety both in the magnification of your set and in its volume carrying capacity. Then you can be sure that however hard the man hits the drum, or however loudly the soprano may shriek, you will not have any of that nasty roughness due to overloading in any of the stages of your receiver.

If you do this, and choose your valves carefully and circumspectly, you will get the fullest satisfaction out of the Thirty-One More Tested Circuits given away this month.

RADIOGRAMOPHONICS

—continued from page 125

is comparatively small. In consequence, it is advisable to incorporate a volume control in some part of the amplifier preceding the valve, in order to avoid overloading on very loud passages. If you neglect this point do not blame the valve if you get distortion.

You cannot supply a big kick to the grid such as you can with a super-power valve, but for a small input you obtain a very large output, which after all is what everybody is really aiming at.

I often talk to you about L.F. howling, and in these articles I have, from time to time, suggested remedies for the various L.F. oscillation troubles which have been brought to my notice.

The other day I witnessed a demonstration by Mr. Kendall, on the production of artificial low-frequency oscillation and its cure.

(Continued on page 166.)



STOP WASTING HOURS

There is Money in Spare Time!

Here is a really genuine chance for making money in your spare hours which you must not miss. It is unique and quite dissimilar to all other schemes for making money at home.

Seriously and genuinely, a Golden Opportunity is now knocking at your door. The Coupon below is the latchkey which will open the door for you. Use it to-day!

In the hours you now spend just "passing the time away" you could be making money, producing a patented article, for which there is a constant demand. No cumbersome "plant" is necessary. Your own Kitchen Table can be your factory. Only a few simple tools which you can make are required. The work is simple and easy—even the children can help. The possibilities of making money are only limited by the time you spend on it.

Up to £300 a Year Earned!

Think of the luxuries and comfort you could enjoy with £300 a year extra! Then send the Coupon below to-day for full particulars. For your own sake! For your family's sake! Only a restricted number of persons are allowed to manufacture under my Royal Letters Patent. This protection ensures a fair market for all. Arrangements will be made to take surplus output off your hands, thus guaranteeing your profits.

YOU can do it!

Seize your opportunity NOW. Don't say "I'll do it to-morrow"—for to-morrow never comes. The man who "wins" is a man of action—so "act" now. The posting of this Coupon is the first swing of the pendulum—the starting of the clock, ticking away, not WASTED HOURS, but GOLDEN HOURS—for YOU!

It is so easy to take the first step THIS MINUTE by simply sending the Coupon below to Mr. V. England-Richards, 98, King's Lynn, Norfolk—will you do it?

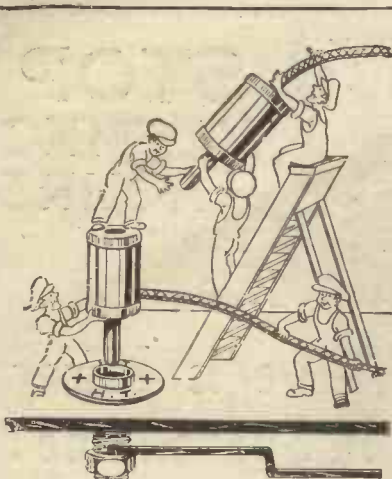
"MAKE-MONEY-AT-HOME" COUPON

To Mr. V. ENGLAND-RICHARDS, The England-Richards Co., Ltd., 98, King's Lynn, Norfolk.

Sir,—Please send me at once, and FREE, full details as to how I can Make Money at Home in my spare time. I enclose 2d. stamp for postage.

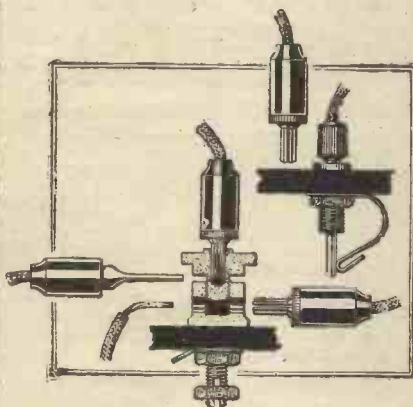
Print your name and address boldly in capital letters on a plain sheet of paper and pin this Coupon to it.

"Wireless Constructor," Dec., 1928.



“Two into one will go!”

All Ealex accessories have multiple uses, and above you see the Ealex gnomes of efficiency making two joints into a socket by means of Ealex plugs. It's surprising how the number of connections and wires can be reduced by using Ealex terminals, spades, plugs, pins and eyes and how neat your set can be made to appear. Also the Ealex system of standardisation makes the possibility of a wrong or accidental connection practically impossible. All constructors should write for a copy of the new Ealex Booklet V63—which tells you about the Ealex gnomes of efficiency and describes all the Ealex wireless accessories—free on receipt of a post card.



The diagram above shows the use of spring jack attached to a socket for use with phone or loud-speaker tag ends or plugs. Also the famous



TREBLE-DUTY TERMINALS

with their multiple uses. There are 40 different indicating tops and six colours available.

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 LONDON, E.C.1.

'Phone Clerkenwell 9282.

RADIOGRAMOPHONICS

—continued from page 165

Mr. Kendall took a transformer-coupled two-stage amplifier and inserted a resistance in the H.T. “feed” in order to obtain the effect of a high-resistance H.T. battery.

The result was a high-pitched whistle not unlike the heterodyning of two stations on near wave-lengths.

He then joined either a choke-filter output device of normal type in circuit, or placed an “anti-motorboat” resistance and by-pass condenser in the plate circuit of the first valve. The whistle ceased, and Mr. Kendall demonstrated the fact that to bring back the trouble when either of these devices was in use it was necessary to increase the value of the resistance (artificial battery resistance) from 20 to well over 200 ohms. When both devices were in use together no amount of resistance within practical limits would restart the howl. I mention this because I think that it is very interesting, and I believe that the scheme adopted will do a great deal towards the solution of those annoying low-frequency troubles which are produced by external effects in batteries and eliminators.

ALL ABOUT HOME CONSTRUCTION

—continued from page 94

the fact is plainly stated in the article.

You will see in every article a list of components. In building up the set an attempt is made to pick representative good quality components typical of the best modern practice. If you see one make used in a set this month you will probably see another make used next month, for the very simple reason that the continued use of one make might create the impression that that was the only make considered good by the Editor of the journal.

Your Component Guide

In addition to the name of the part used, names of suitable alternatives are given, and if you study the “What's New” columns month after month you will see individual test reports, prepared in our laboratory, on the new components. This also will act as a guide. In any case, you can rest assured that no component

(Continued on page 167.)

fit

HYDRA CONDENSERS

and forget them

You know how troublesome cheap condensers can be—when your set is out of use, or breaking down in your eliminator and causing trouble all around.

Fit HYDRA Condensers in your set or eliminator and you need never give them another thought

Because HYDRA condensers are made to a scientific standard of precision which is constant throughout their life; they are constructed with the one dominating idea that the name of HYDRA must always stand for utter reliability.

Tested 500 volts, 240 volts D.C. or 160 A.C. working voltage.

PRICES: 2 mfd. . . 3/6 1 mfd. . . 2/6
 Obtainable from all radio dealers. If any difficulty write—

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“RED DIAMOND” 2-WAY COIL HOLDER



No. RD 32.

Parallel working. Fine adjustment. Worm driven. Coils cannot fall. Easy movement. Perfect finish. Of all high-class radio dealers, or by insured post, 4/6 each.



RD 39. Pull-and-Push Switch
 Robust construction. Definite “on” and “off” positions. No shaking. Perfect contacts. Terminals for easy fitting. Price 1/3 Or by insured post 1/6.

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PERFECT CONTROL of H.F. & L.F.



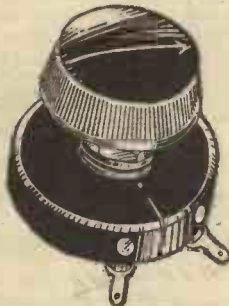
THE NEUTROVERNIA

The ease and accuracy with which you can adjust the Gam-brell Neutrovernica makes it a perfect means of controlling the High Frequency side of your receiver, enabling you to get greater selectivity and easier tuning.

Practically every known set designer has used and recommended this condenser, which can be used as either a balancing, Neutralising, or Capacity Reaction Condenser (Capacity 2/38 mfd.).

Price 5/6

THE VOLUVERNIA



Here is a true volume control, one which does not create distortion. It gives you just the volume you desire and keeps your reproduction pure at all times. Don't detune, that is the cause of distortion. The "Voluvernica" gives perfectly smooth control from maximum to minimum for Gramophone Amplifier or Radio Receiver.

Price 6/9

These are obtainable from all Dealers. Write for "Components' Booklet-C."

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Type "A," Unit and Framework 38/6
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Moving-coil Speakers, Transformers, Pick-ups, Electric Gramophone Motors, High-Tension Generators, Rotary Converters D.C. to A.C. for B.T.H. Rice-Kellogg Speakers, etc., etc.

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

ALL ABOUT HOME CONSTRUCTION

—continued from page 166—

is ever used in a WIRELESS CONSTRUCTOR set which is not thoroughly satisfactory, and the names given as alternatives are not intended to be looked upon to be any way inferior to the ones used in the set.

After you have joined the ranks of the home constructor you will probably find certain makes of variable condenser or transformer appeal to you. Use them by all means, and remember that if a variable condenser is used in one design it is a pretty good indication that it can be used in any similar design.

Substituting Components

The experienced reader likes to go through every one of the constructional articles, looking at the various components, and by the photographs and general layout he can learn how they appear and are fitted. Perhaps he may like to substitute the condenser or transformer in his present set by one he has just seen used in a new design this month. Many readers, of course, like to make up the set exactly as described, and for this reason the actual components used are always named.

Every set described in the WIRELESS CONSTRUCTOR is actually built and thoroughly tested before the article describing it and its work is published. The sets are first of all designed, built in a preliminary form (sometimes two or three times before the best arrangement is found), and finally after tests in practical working conditions with various types of valves, and working on two or three different aerials, photographs of the actual set are taken.

Our Test Reports

The greatest care is taken in preparing test reports of great accuracy, and in a large number of cases readers who have successfully built up the set have written in to say that the results obtainable by them are far better than described in the test report. This is only natural when one considers varying conditions, for some readers have better aerials than others, and some are situated better.

Test reports on WIRELESS CONSTRUCTOR sets are all taken on medium aerials of the general size, type and efficiency found in the majority of average readers' homes. It would, of

(Continued on page 168.)

K. RAYMOND

27 & 28a, LISLE ST., LONDON, W.C.2

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Hours 9 a.m. to 8 p.m.
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C.O.D. orders must be over 5/-

We stock Igranite, Climax, Ever-Ready, Hellesen, Siemens, Formo, Ferranti, Wearite, Ormond, J.B., Benjamin, Lotus, Mullard, Dubilier, Lissen, Lewcos, Utility, Magnum, Peto-Scott, Peerless, Burnside, Eya, Marconi, McMichael, Cosmos, Garbrundum, R.I. Varley, Gambrell, Brown's, Sterling, Amplions—in fact, everything it is possible to stock.

KITS of parts for "BIG BEN" and all Circuits described in this number.

Make out LIST for keen quotation. DON'T worry, if it's Wireless WEHAVEIT.

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Spares for Same—separately (post extra),
2 Ormond .0005 Log at 6/- each; 2 Cossor pattern S.M. Dials at 3/9 each; Ormond Reaction .0001 (brushed), 4/-; Ormond P.P. Switch, 1/3; 6-ohm Rheostat, 2/- (all knobs to match cabinet); 5 Lotus new type Valve Holders at 1/3; 1 Wearite H.P. Choke, 6/8; 3 T.O.C. Condensers, 2 mid., 3/10; S.P. .0001, 2/4; 1, 1/10; Dubilier 3 meg., 2/6; 3 to 1 L.F., 15/- (compact, well-known British make); 2 Wound Coils, 12/6, B.B.O.

Total List £3 : 17 : 6

SENT POST FREE FOR £3 : 10 : 0 nett.

CABINETS WITH SCREEN, 17/6 Post 1/-

5XX COILS 15/- pr.

COUPON No. 11 (W. CON. DEC.)

ONLY ONE COUPON ON ANYONE ORDER IF YOU SPEND 25/- OR MORE YOU CAN BUY FOR 3d. EXTRA ONE (ONLY) OF THE FOLLOWING:

S.M. Dial, Permanent Detector, 100 ft. 7/22, 12 Nickel Terminals, Battery Switch, Indoor Aerial, 60X Coil, .0003 and 2 meg., 12 yds. Lead-in, H.P. Choke, 9-volt Grid Bias, 6-pin Coil Base, Fuse Bulb and Holder, Pair Panel Brackets, 12 yds. Twin Flex, Loud Speaker Cord.

ONE OF ABOVE, 3d. WITH 25/- ORDER.

MULLARD MASTER 3*

This new and wonderful set must appeal to young and old, amateur or experimenter—in fact, EVERYBODY!

YOU CAN PURCHASE

ANY ITEM SEPARATELY (OR A KIT OF PARTS), Every component is available at short notice. This list is strictly to Mullard specification.
3 Valve Holders, Lotus, at 1/3. Colvren Combined Wave Coil, 17/6. Ferracore Transformer, 25/-, Climax "LFA" Transformer, 25/-, Climax H.F. Choke, 7/6. Benjamin Battery Switch, 1/3. J.B. .0005 Log, 11/6; .00035, 10/6. Mullard .0003 and 2 meg. 5/-, Mullard Panel Brackets, 2/6. Mullard .0001 Fixed, 2/6.

Total £5 : 12 : 6 Carriage Paid

VALVES, 2 at 10/6. Power, 12/6.

OAK CABINET, hinged lid, 12/6. Carriage 2/-.

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K. RAYMOND

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MULLARD VALVES
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H.F.; L.F., R.O., 10/6. Power, 12/6. Super Power, 15/-, Screen-Grid, 22/6. Pentodes, 25/-.

LISSEN

Valve Holders, 1/-; Fixed Con., 1/-, 1/6; Locks, 1/-; Switches, 1/6, 2/6; Latest 2-way Cam Vernier, 4/6; Rheostats, 2/6; B.B., 1/6; Lissencola, 13/6; P.P. Transformers, 8/6; Coil, 60 X, 6/4; 250 X, 9/9; 60-v. H.P., 7/11; 100-v., 12/11; Super 60-v., 13/6; Grid Bias, 1/6; 4-5 5d.; Super L.F. 12/6; V.I. 12/6; .0003, 6/-; .0005, 6/6.



THE famous Celestion group of loud speakers, British made throughout, consists of four models in oak or mahogany, as shown, with prices varying from £5:10:0 to £25. Also the Celestion Woodroffe Gramophone Pick-Up at £4:4:0.

Insist on your dealer demonstrating, or call at our new and luxurious showrooms, one minute from Victoria Station.

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 SHOWROOMS:
106, VICTORIA STREET,
LONDON, S W.1.

ALL ABOUT HOME CONSTRUCTION

—continued from page 167

course, be easy to prepare a test report under ideal conditions, on the very best aerial and by picking a perfect night; which would look very well on paper, but which would not faithfully reflect the average capabilities of the set. This is not the policy of the WIRELESS CONSTRUCTOR.

Standardisation, as far as possible, is aimed at in our articles. For example, standard sizes of cut panels are always used, standard components obtainable through your wireless dealer, and standard cabinets. Particularly is this the case with coils, for although special coils can be evolved with particularly high-efficiency, it is much more interesting to the home constructor to have a set in which a coil readily obtainable is used rather than one which he has to make up specially, or must use in place of something existing. At the same time new coils are described when needed.

True Economy

It is surprising what a degree of interchangeability is reached in this way, and I have often heard of cases where a reader has changed an old set into a new one with the expenditure of only a fraction of the cost of all new components. For the very reason that good quality parts are usable again and again, I strongly advise you to see that you get the best class of goods. It is false economy to try and save a few pence by purchasing parts of unknown make.

Remember, that a maker who produces a good article is only too pleased to place his name upon it, or to make it known in some way that he is directly identified with its manufacture. — Look through the advertisement pages of this issue and you will find that wireless manufacturers are now offering first-grade component parts at very reasonable prices, and indeed at varying prices to suit every pocket.

After all, is there any pleasure so keen as that of watching the expressions of delight on the faces of your family when your first home-built wireless set gives forth the evening programme with crystal clarity? Yes, there is perhaps just one, and that is to hear your neighbour tell you that your new set works better than his which cost three times as much.

THE P.D.P. WAY
 BUY your Components, Loudspeakers, H.T. Units, etc., etc., from US.
 BUILD your Receiver and SAVE MONEY.
EVERYTHING WIRELESS ON EASY PAYMENT TERMS
 EKCO H.T. UNITS and ALL MAINS Receivers;
 NEW COSSOR MELODY MAKER;
 NEW MASTER THREE;
 NEW COSSOR H.F. UNIT;
 NEW MASTER FIVE PORTABLE;
 MULLARD H.F. UNIT; NEW EDISWAN SETS;
 RADIANO FOUR, etc., etc.
 COMPONENTS for ALL circuits supplied.
 COMPLETE RECEIVERS of all makes supplied.
 Call and see us or post your list of requirements.
 Best Monthly Terms Quoted By Return.
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 COILS for ALL circuits, Standard Loading Coils, Derby Three Coils, etc.
 COMPONENTS for P.W. CIRCUITS.
 Simple A.C. H.T. Unit; Regional Three Crystal Set; Wave Change One; Regional Three; Bandmaster; Any Mains Two; Antipodes Adaptor; Long Range Three.
The P.D.P. Co., Ltd.
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 Phone: City 9846.

DARIO
 KEEPS EVERY SET
 "In Training"
 (See page 153).

REPAIRS
 Any make of L.F. Transformer, Loudspeaker or Headphones repaired and despatched within 48 HOURS—TWELVE MONTHS GUARANTEE with each repair, 4/- Post free.
 Terms to Trade.
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THERE IS STILL TIME
 and before the issue goes out of print, secure your copy of the
GREAT GIFT BOOK
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MODERN WIRELESS
 IT DESCRIBES
SETS FOR EVERY POCKET FROM 2/6 TO £10
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HINTS FOR SHORT-WAVE ENTHUSIASTS
Some Notes from an Irish Experimenter.
 By **ROBERT D. SCOTT.**

A GREAT deal of attention is being paid to the short wave-lengths at the present time, and consequently many wireless enthusiasts are building receivers which will receive signals from all parts of the world with ease. The wave-lengths below 50 metres differ in many ways from those of the ordinary broadcast band. The long-distance work which can be accomplished with very small power is a factor which makes the short waves very fascinating, with the result that increasing interest is being shown in them almost week by week. Along with the advantages of increased range, however, are a number of great disadvantages, which may make the newcomers to short waves feel so disheartened as to lose their former enthusiasm. It is with the object of helping these persons that the following lines have been written.

Choosing a Condenser

These problems may be grouped into two classes. The first, troubles arising in the receiver itself, and the second, those of external origin. Those of the second class are by far the worst, and are usually most difficult to locate.

Consider, first of all, the receiver used. Perhaps the most important component in a short-wave set is the slow-motion condenser. This must be of a reliable make, and great care should be taken to ensure, when purchasing one, that there is no tendency to backlash, and above all it must be dead silent in action. The type employing a friction-drive vernier is very popular amongst the active transmitters in the Irish Free State.

A Note on Noise

Valves which work perfectly on broadcasting wave-lengths may be quite noisy when used in a short-wave set, especially in the detector stage. So if there are noises in your set, try inserting a different valve before turning to other possible sources. One valve in particular which was used in the detector stage of the writer's short-wave receiver refused to oscillate at times, and on transferring it to the broadcast receiver was found to work perfectly as a L.F. amplifier.

(Continued on page 170)



ASK YOUR DEALER OR WRITE DIRECT

Readings.
 0-150 VOLTS. 0-6 VOLTS.
 0-30 MILLIAMPS.

Resistance.
 5,000 OHMS. DEAD-BEAT MOVEMENT. CRYSTALLIZED BLACK FINISH.

PRICE
8/6

Stocked by Malford's Stores, Curry's Stores, and most good-class Radio Dealers.

This new Wates Volt-Amp. Meter has caused a complete revision of all existing standards of measuring instrument values and performance! Single-purpose meters are an unnecessary waste of money. This super meter with its wonderful "three readings on one dial" feature gives every essential measurement demanded by modern standards of set control and maintenance.

The only Radio Meter that does the work of Three.—No valve set/user should be without it. Finished in attractive crystal black and nickelled plated fittings. Guaranteed dead-beat accuracy. From all good-class dealers or complete with explanatory leaflet direct from Dept. W.C.

WATES
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VOLT-AMP
 RADIO TEST METER

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The HOME for your WIRELESS SET

With Drop Front.

OUR STANDARD CABINETS fit for any Mansion, are the best made on the market, at most moderate prices. The Model D, illustrated, solid oak throughout, is made in various sizes for small or large Receivers. Accommodation for batteries and loud speaker. Many other models for choice. Sent on 7 days approval, so you take no risk. Delivery from stock.

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**NO RADIO
WITHOUT
DARIO**

(See page 153).

PLEASE be sure to mention "Wireless Constructor" when communicating with Advertisers. THANKS!

**HINTS FOR SHORT-WAVE
ENTHUSIASTS**

-continued from page 169

There was undoubtedly some defect in the valve as all others tried oscillated without any difficulty.

Blank spots at which the receiver may refuse to oscillate may occur. These usually come about 45 and 22½ metres when using an aerial which is about 100 ft. long. Such blank spots are often caused by harmonics of the aerial, and the cure for them is to insert a small condenser (.0001 mfd. will do) in series with the aerial lead to the receiver. Quite a satisfactory method is to twist together two pieces of insulated wire, each about 12 in. long, and to connect one to the aerial and the other to the aerial terminal on the set. If this does not affect a cure, the cause may be too long leads to the H.T. and L.T. batteries.

Aerial Coupling

A direct-coupled aerial is often used in a short-wave set, and in such cases it may be difficult to obtain oscillation. It may be possible to insert a larger reaction coil, but even this sometimes will not suffice. Short-wave receivers are often made with fixed coils, and so it is desirable to find some cure other than that of changing the coils. Disconnect the aerial from the set, which should then oscillate easily. If this happens, couple the aerial to the grid coil by means of a small coil of about 4 turns, varying the degree of coupling until the set oscillates without difficulty. If, however, the set does not oscillate at all without the aerial, the coils should be reconstructed on low-loss lines. At the same time, if it can be used satisfactorily, a direct-coupled aerial will often give signals stronger than those given by a loose-coupled one.

The L.F. Transformer

The matter of low-frequency transformers needs some consideration. Although it may seem peculiar, it is a fact that some of the best quality transformers on the market, when used in a short-wave set, may give rise to a continuous howl. This may very often be cured by replacing the transformer by a cheaper one. The writer does not mean to advise the use of cheap transformers, but rather the contrary, because the windings of the cheap variety very often break in a short time, and consequently are not

(Continued on page 171.)

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TO PERFECT RADIO**

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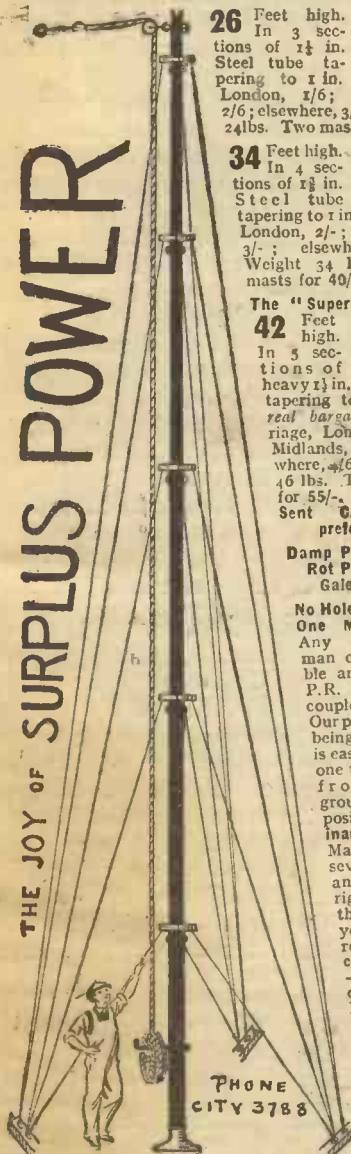
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Everybody knows that to have a high aerial is to get extra powerful signals. The difficulty of fixing up a high aerial is banished if you fit a

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P. R. MASTS are made of British Steel in 9 ft. lengths, from 1 1/2 in., tapering to 1 in. and are supplied with cast-iron bed plate, steel ground pegs, stay rings, galvanised steel flexible wire stays cut to lengths, pulleys, bolts and fullest erecting instructions. No further outlay necessary.

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GUARANTEE.
Money refunded without question if not satisfied.

Minimum Radius 3 ft. 6 ins.
PAINTING.

Any protective coating applied before despatch gets so damaged by the Carriers that it is essential to paint the Mast before erection. All P. R. Masts are sent out oxide-finished ready for painting. One coat of P. R. Colloid covering applied—a 10 minutes' job—to all parts of the Mast when ready to erect sets dead hard in an hour and protects it against all weathers.

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P. R. Colloid Covering sufficient for a Mast—with Brush, 2/6, Halyard Log Line—Ryland's patent rot proof:—

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Opposite G.P.O. Tube.

HINTS FOR SHORT-WAVE ENTHUSIASTS

—continued from page 170

so reliable as those of a good make. It is difficult to find a remedy for this kind of howl, but varying the voltage of the H.T. to the detector valve, and also that of the grid bias, may lead to some improvement.

Threshold "Howl"

Threshold "howl" will usually be overcome by increasing the resistance of the grid leak, and also by decreasing the H.T. voltage to the detector. Ploppy reaction may be remedied in the same way. Objectionable noises are often produced by faulty H.T. batteries, intermittent contacts, and other things which can be fixed without much difficulty.

Many receivers suffer from bad hand-capacity effects. This is a state which should not exist, and it is no indication of sensitiveness in any set. The first short-wave set used at this station was a shunt-feed Hartley, and hand-capacity was a serious drawback. Earthed plates were tried, but with little success, so it was decided to re-design the set. The new design was wired as an ordinary straight detector, with swinging-coil reaction, and without any high-frequency choke. The detector was followed by one stage of low-frequency amplification, and the components used were those which had been in the Hartley set. The result was better than had been expected, because in addition to having no hand-capacity drawbacks, this receiver was found to give much stronger signals than the Hartley.

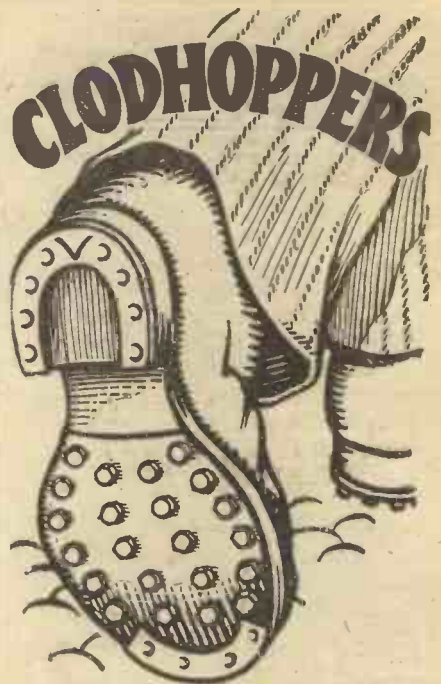
Points in Design

When designing any set it is best to lay out the components as the circuit is drawn, and to keep all apparatus which is at high-frequency as far away from the front as possible. Space the components well, without making the wiring too long, and especially keep the detector and high-frequency parts of the set far away from the L.F. circuit. A badly-designed receiver, no matter what circuit is used, may give good signal strength, but the hand-capacity from the tuning condensers will eliminate all ease of adjustment.

Let us now turn to the difficulties one is liable to encounter which have their origin external to the receiver.

If the cap is screwed off a switch in the house-lighting system, where D.C.

(Continued on page 172.)



THAT'S precisely what it does sound like when someone blunders across the room and all you hear from the Loudspeaker is a wail. . . . Clodhoppers.

You don't need to worry about that thump if you have W. B. Anti-phonic Valve-holders in your set. Microphonic noises disappear altogether.

Ask your dealer to show you these valve-holders which were included in the famous "Cossor Melody Maker." The price is 1/6 complete with terminals, or 1/3 without terminals.

Write to us also for our catalogue showing a complete range of Radio products, including the famous Whiteley-Boneham Loudspeakers



ANTI-PHONIC VALVE HOLDER

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

HINTS FOR SHORT-WAVE ENTHUSIASTS

—continued from page 171

mains are in use, it will often be found that the brass parts of one side of the switch are corroded, and covered with a green substance. Defective connection is almost certain to take place in such a switch, and scratching noises in the receiver will probably result. This is due to sparking, the switch acting as a miniature spark transmitter, and being picked up by the oscillating receiver. The contacts of the switch should be sandpapered, and smeared over with vaseline*. Care should be taken to see that a proper connection will be made when the switch is in use.

There are two more possible sources of disturbance in connection with the house-lighting system. The first is in the lamps. Many lamps, especially in reading standards, where they are liable to injury, often have broken filaments, the ends of which have come together. The result is that the lamp lights probably more brightly than usual, but a proper connection is not being made, and consequently crackling noises may be heard in the receiver.

Generator Hum

The next cause of trouble is the hum from the generators at the power-house. The writer has no experience of A.C. mains, but for some time D.C. mains gave very great annoyance. In the case of a transmitting station, generator hum may be very bad, on account of the transmitting apparatus being connected to the mains. In this case, it is best to put a switch in the lead to the transmitter, as near as

*After switching off at the mains!—Ed.

possible to the source of power, and just to turn it on when starting up the transmitter. It may be thought that a double-pole switch would be more satisfactory than a single-pole one, but in some cases the hum will be lessened when one pole of the mains is broken and the other unbroken. Which pole to break is an important point that can only be decided by experiment, and the most satisfactory method to adopt is to break both wires by means of two single-pole switches. It is then a simple matter to find whether the hum is least when both are disconnected, or only one. If it is found necessary to break only one wire, the second switch may be removed if desired.

The "Junk" Box

It is advisable to keep the "junk" box far away from the receiver, because otherwise pieces of wire, coils, and tools lying together in the box may be shaken into contact with one another at times, giving rise to corresponding crackling noises in the 'phones. The importance of this fact can be very well demonstrated by placing two metal tools within about 12 inches of the coils.

Adjust the set so that it is in its most sensitive state, that is, just oscillating, and then allow the metal parts of the tools to touch one another. A distinct scratching noise will be heard whenever the tools come into contact, thus showing the extreme sensitiveness of a short-wave receiver to such occurrences.

A most potent source of crackling noises at this station was the aerial of a neighbour which was so slack that, although the ends of the wire were about 16 or 18 ft. high, the aerial used to sag so much as to touch a clothes-line, only about 8 ft. high. In windy weather the aerial was

blown about and rubbed on the clothes-line, producing terrific noises in the short-wave receiver. The same aerial, when not in use, was earthed in a very crude fashion. The lead-in and earth lead were loosely wound together outside the house. The result was that a good contact was never made, and a faulty one was made and broken so often in windy weather as to render working with a receiver on 45 or 20 metres an absolute impossibility. On many occasions short-wave transmissions have had to be abandoned because of this nuisance. The only course to adopt under such circumstances is to see that the owner of the offending aerial rectifies the trouble.

A person who is badly situated as regards an aerial can manage quite well with a short one indoors, because when dealing with short waves, height and length do not matter very much. Many amateurs use a small indoor aerial in preference to an outdoor one, and excellent results have been obtained by some with a vertical indoor aerial only two metres long.

Indoor Aerials

Atmospherics are considerably reduced in strength by the use of such a system. Thus it will be seen that one who is unable to receive broadcasting on the 300- to 500-metre band may hear short-wave transmissions from all parts of the world.

Indoor aerials should not be made too long, and should be run near an outside wall of the house. This will help to keep it away from house lighting wires, thus avoiding the chance of picking up hum.

No short-wave enthusiast should be without a wave-meter, whether the absorption or heterodyne principle be used. As in all short-wave work, a reliable condenser should be used.

INDEX TO ADVERTISERS

American Hard Rubber Co., Ltd.	164	Edison Swan Electric Co., Ltd.	135	Mullard Wireless Service Co., Ltd.	Cover ii
Arercraft Co.	157	England-Richards Co.	165	Norton Welding Co.	166
Bedford Electrical & Radio Co., Ltd.	155	Ferranti, Ltd.	132	Ormond Engineering Co., Ltd.	143
Benjamin Electric, Ltd.	124	Formo Company, The	163	Peto-Scott Co., Ltd.	170
Belling & Lee, Ltd.	159	Garnett, Whiteley & Co., Ltd.	147	P.D.P. Co.	164
Bond, V. C. & Sons	164	Gilbert, J. C. (Cabinets)	159	Pickett's Cabinet Works	165
Baker's Selhurst Radio	165	Graham Amplion, Ltd.	123	P.R. Masts	171
Bowyer-Lowe Co., Ltd.	144	Graham-Farish	144	P.R. Valves	161
British General Mfg. Co., Ltd.	155	Gambrell Radio, Ltd.	167	Popular Wireless	163
British Thomson-Houston Co., Ltd.	131, 141, 158	Harrods, Ltd.	161	Raymond, K.	167
Brown, S. G., Ltd.	136	Holzman, Louis	166	Ready Radio Supply Co.	162
Bulgin, A. F. & Co.	165	Hughes, F. A. & Co., Ltd.	120	Ripaults, Ltd.	136
Burne-Jones & Co., Ltd.	152	Hobby Annual	140	R.I. & Varley, Ltd.	Cover iv
Burton, C. F. & H.	151	Igranite Electric Co., Ltd.	156	Rothermel Corporation, Ltd.	87, 151
Cromwell Engineering Co.	167	Ilford Electrical Products Co.	159	Scott, S. W., & Co.	160
Carrington Manufacturing Co., Ltd.	157	Impex Electrical, Ltd.	153, 164, 168, 170	Siam Electrical Inst. Co., Ltd.	170
Celestion Radio Co.	168	I See All	86	Standard Wet Battery Co.	169
Clarke, H. & Co. (M/cr.), Ltd.	127	Jackson Bros.	155	Taylor, C.	170
Colvern, Ltd.	153	Jewel Pen Co., Ltd.	166	Taylor, J. H. & Co.	170
Cossor, A. C., Ltd.	88	Kay, H.	170	Telsen Electric, Ltd.	159
Caxton Wood Turnery Co.	161	K.N. Electrical Products, Ltd.	157	Transformer Repair Co.	168
Day, Will, Ltd.	160	Lectro Linx, Ltd.	136	Telegraph Condenser Co., Ltd.	123
Darex Radio Co.	164	Lissen, Ltd.	117-119	Weston Electrical Inst. Co., Ltd.	157
Dubilier Condenser Co. (1925), Ltd.	124	London Elec. Wire Co. & Smiths, Ltd.	128	Whiteley, Boncham & Co., Ltd.	171
Eastick, J. J., & Sons	166	London Radio Manufacturing Co., Ltd.	160	Wireless Constructor Envelopes	132
Electradix Radios	170	Lewis, S. W., & Co., Ltd.	140		
		Lisenin Wireless Co.	164		
		Lyons, Claude, Ltd.	140		
		Makerlport Co.	169		
		Marconiphone Co., Ltd.	85		
		Metro-Vick Supplies, Ltd.	Cover iii		
		M.P.A. Wireless, Ltd.	139		
		Morris, J. R.	132		

All communications concerning advertising in "Wireless Constructor" must be made to John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4. Telephone: City 7261.

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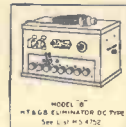
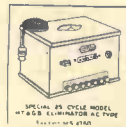
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