

THIS YEAR'S "CHITOS TWO" (See Page 283.)

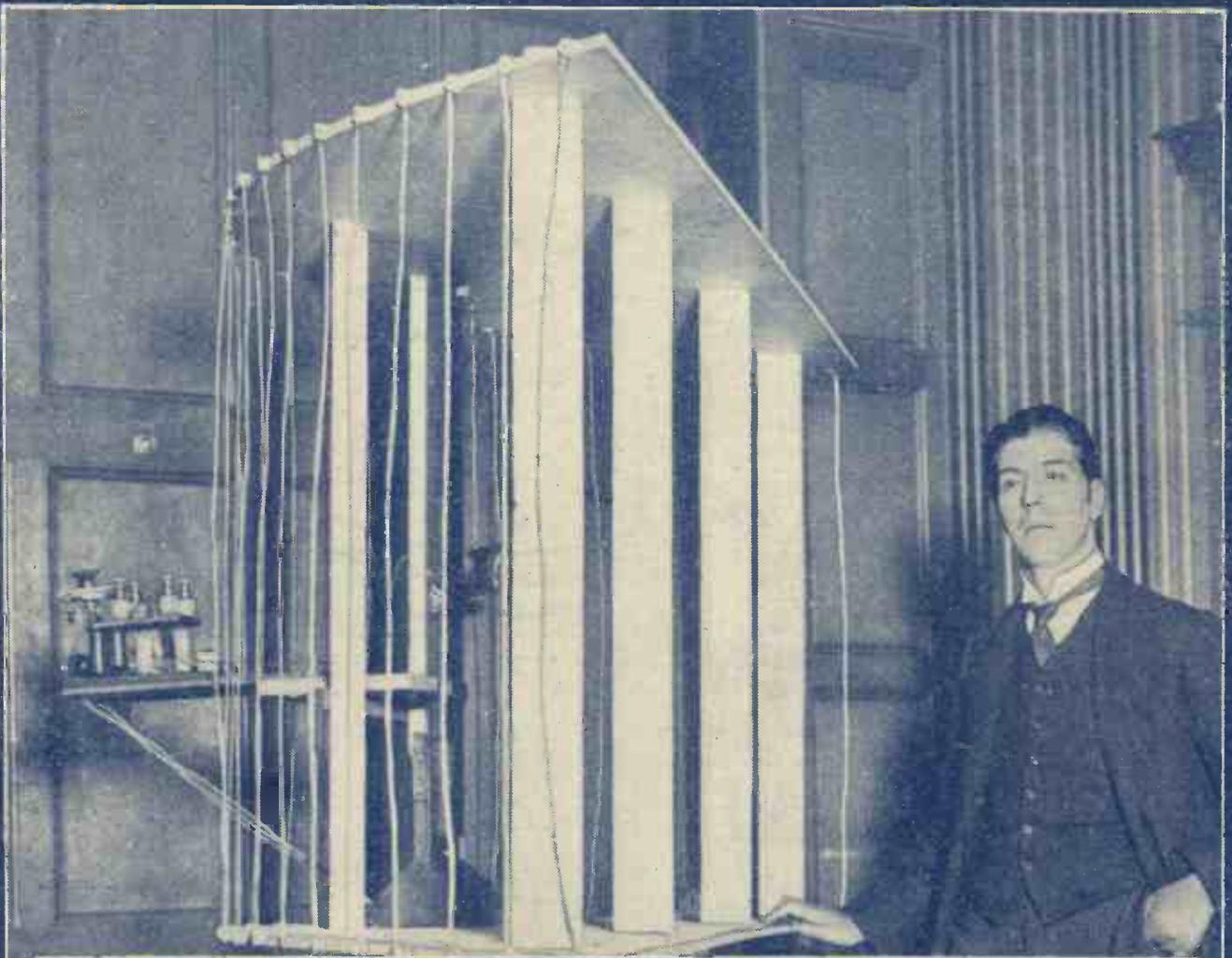
Popular Wireless

Every Thursday
PRICE
3d.

No. 307. Vol. XIII.

INCORPORATING "WIRELESS"

[April 21st, 1928.



SPECIAL FEATURES IN THIS ISSUE

**IMPROVING YOUR RESULTS. SUCCESSFUL SOLDERING
MOVING WITH THE TIMES. USING THOSE SPARE PARTS
VALVE VARIATIONS. THE £1,000 TELEVISION CHALLENGE**

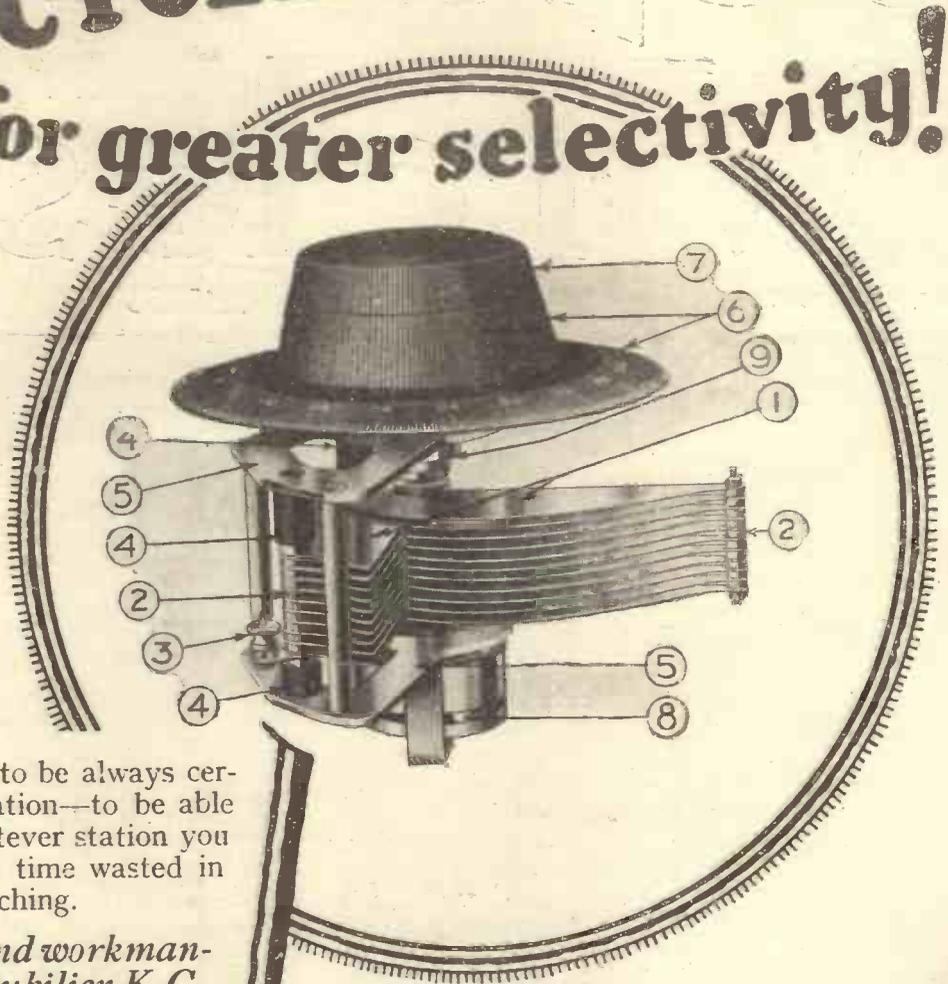
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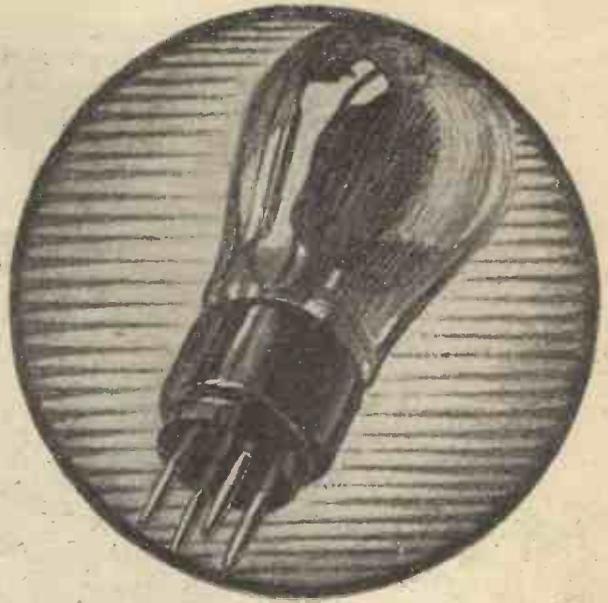
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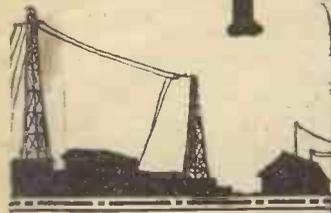
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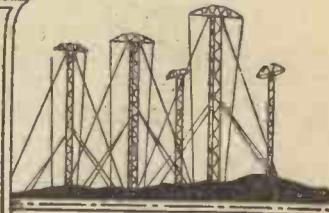
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Popular Wireless



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RADIO NOTES AND NEWS.

The Event of the Year—Teashop Tattle—London's Largest Musical Library—
 Another Radio Mystery—A World Beater—The Amateur's Paradise—Radio Scepticism.

The Event of the Year.

IT is announced that the National Radio Exhibition, organised by the Radio Manufacturers' Association, will be held this year at Olympia (New Hall), September 22nd to 29th inclusive. Five months' notice is given to enable any genuine "fans" who may have intended marrying that week to alter their arrangements.

"Mike" Cult Spreads.

THE Government of Colombia (South America) has ordered a broadcasting station for Bogota, the capital, and the presumption is that the service will be operated by the Government—at a dead loss, I should say. Colombia is a hot-bed of "atmospherics" most of the year, and is covered with mountains; hence reception will present some pretty problems, and a "regional scheme" would make Captain Eekersley think on all gears at once.

If—

IF—a big if—the Post Office line telegraphs and radio services are handed over to private enterprise, will the Post Office stick to the very profitable job of collecting our licence fees, or will this become the prerogative of the combine? And if private enterprise takes it over will there be more prosecutions or more "pirates"? Finally, will the Post Office still be the licensing authority and if so, why? Why should it have the last word on the subject if it has had to give up its services? These questions are hypothetical but fascinating.

Hint to Aberdonians.

MAN! I mind the nicht, a few weeks syne, when something fozzled my set bang in the middle of an orchestral piece for which I have a weakness. What did I dae? Stifing the appropriate adjectives, I sprang to the mantelshelf and seized a thin, trumpet-shaped glass vase. I happened to know that the man next door kept his set against the party wall, so, clapping the base of the vase flat against the wall I applied my ear to the open end—and heard the piece through, losing not more than a dozen bars. Surprising, but true.

Teashop Tattle.

MY modest club having been rendered uninhabitable by spring-cleaners I took my morning, meditative coffee last week in the smoking-room of a tea-shop, one branch of a firm of caterers who sternly forbid one to tip the "nippy." But how changed things were! Instead of the clash of dominoes I heard the steady hum of the radio fan. It occurred to me that the back cover of that very sporting tariff ought to be left blank for the pencil of the diagram draughtsman, a piece of eraser being fastened to the sugar-tongs. A small black-board, too, would prove popular. And why are there no loud speakers in lieu of the piano-fiddle-cello band of the more pretentious branches?

Music Note.

AS we are favoured with much jazz by radio it may not be out of place to reveal the origin of the saxophone. According to the B.B.C. the thing was

invented in 1840 by Adolphe Sax, who specialised in making wind instruments for French military bands.

Selected Numbers.

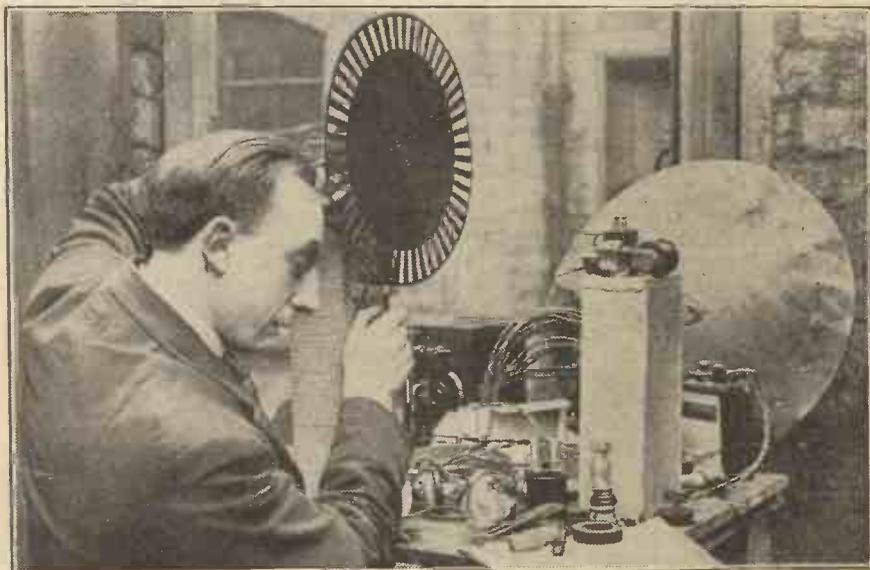
APRIL 20th: Last National Concert of season; Queen's Hall; Sir H. Wood. April 19th and 21st: concerts by the newly-formed National Orchestra of Wales. April 21st: Murton Colliery Prize Band from Newcastle. April 23rd: St. George's Day. Performance of "Henry V"; also Lord Birkenhead's speech at the Annual Banquet of the Royal Society of St. George, relayed to 5 G B.

London's Largest Musical Library?

I WONDER. Anyhow, the B.B.C. Music Librarian at Savoy Hill claims that he has of orchestral pieces alone no less than upwards of 8,000, some of them having a hundred different parts. In addition, he keeps six or seven thousand vocal scores,

(Continued on next page.)

WAIT—AND SEE?



This optimistic home-constructor tackled the task of assembling "television" parts, but judging by his expression appears to have struck a snag.

NOTES AND NEWS.

(Continued from previous page.)

and several hundreds of military band parts. As an interesting sidelight, it appears that dance music is not so carefully classified as the rest, because it lives only for about six weeks. "Chamber Squeals" evidently rank higher than dance music. But that is probably due to the carelessness of some office boy.

Another Radio Mystery.

COPENHAGEN reports that an iron-handled coal shovel hanging from a hook, attached to a water-pipe at Kalmar Fire Station, Sweden, has taken to acting as a loud speaker; perfect enunciation and intonation. Experts are rushing to the spot in the hope of (a) proving the shovel to be a spade, and (b) getting a novel idea for the autumn exhibitions.

The Opportunist.

I READ in the newspapers that last month Judge Sturgess, in the course of a case involving a dispute about some wireless sets, remarked that there was not much doing, so they might as well hear the wireless; which they did. Not the first time that the "lyre" has occupied the attention of a court of law. One is bound to admire the judge's "nerve," though whether the audition was in keeping with the dignity of a court is another matter.

A World Beater.

IN each one of the 7,700 guest-rooms of the Statler hotels in six U.S.A. cities there are arrangements for radio reception, with a choice of two programmes. Guests can have radio at any time without request or charge. In addition to the two programmes, which are looked after by skilled operators in the control-room, the hotel orchestra is sometimes "laid on," as well as important speeches during banquets. In the larger rooms there are loud speakers; in the others the 'phones are placed in a drawer of a table near the head of the bed.

Cure for Oscillation.

A BATH victim of oscillation recommends that the owner of a set which offends by oscillating should disregard the B.B.C. pamphlet, attach his "earth" wire to the positive H.T. terminal and connect his aerial to the "earth" terminal of his set. Not bad—but too lenient. I recommend that the A and E wires be connected together, that the pos. and neg. of the H.T. be connected to L.T. pos. and neg. of the set, and that the mains be connected to H.T. pos. and neg. This is a "money back" cure.

A Real Test.

AN expedition under the leadership of Major Court Treatt is now on its way to a little-known part of the Sudan and it is taking with it a transmitter specially designed by Marconi's for communication with England. It is a one-valve transmitter using about 20 watts on the anode, said watts being delivered by a hand-generator. The wave-length will be about 30 metres and a half-wave-length aerial 15 metres long is to be used. DX hounds will now place their noses down and their tails up, for this is a scent worthy

of their skill. Who will be the first to "give tongue"?

Hunt the Caravan.

HERE'S an interesting search for short-wave enthusiasts who know how to comb the ether. A Chevrolet caravan left Cape Town on March 7th, en route to Stockholm. It has with it a transmitter worked by a generator driven off a belt from the car. Transmissions are made every day (elephants, etc., permitting) on 20 and 40 metres, with the call-signal A 8 M. These transmissions take place most days at midnight and 4.0 a.m. G.M.T. Now then! If you suffer from insomnia, here's something to pass the time.

Humble Suggestions.

IF we must have "talks," and, of course we must, I suggest that the B.B.C. should attempt to introduce more "human touch" and to eliminate more of the academic, text-book, element;

SHORT WAVES.

One man is said to have written over five hundred letters to the B.B.C. His wireless licence should be endorsed for exceeding the screed limit.—"Humorist."

TO-DAY'S FABLE.

During the emission of a Quiet Talk on Marine Algae and British Rock-Pools from 2 L O the other evening, Professor Google suddenly went mad and began to scream and tell smoking-room stories.
Listeners-in, on reading of the sad affair next day—(etc.)—"Daily Mail."

The mystery of the man who wrote to the B.B.C. and signed himself "Satisfied Listener" has now been explained. The B.B.C. apparently failed to discover the "Dis."

PRACTICE MAKES PERFECT.

First Hubby: "Is your wife getting much help from the daily cooking hour on the radio?"

Second Hubby: "Oh, in a way. To-day she got three new recipes while she let the pie burn."

"Wireless in Warfare; Distant Control of Death-dealing Machines" runs a headline in the "Manchester Evening Chronicle."
The eight-valve super-het next door would be quite a useful item to hurl at the enemy.

Never refuse your neighbour the loan of a valve—that is, of course, providing you have several duds on hand.

A FILAMENT ELIMINATOR.

There was a young radio student
Who was told to be careful, but wouldn't:
On "A plus" he placed
"B.90" in haste—
Then he tried to tune in, and he couldn't—
"Radio News."
(In America the H.T. is called the "B"
and L.T. the "A" supply.)

that it should try to "make contact" with listeners. For instance, I believe that a series of talks about health, by some doctor who is not a crank, would be welcomed. Here are a few titles: "How to conserve health at twenty, forty, and sixty"; "The truth about tobacco and alcohol"; "How the mind affects the body"; "A healthy body—what is it?"

Talks Without Tears.

YOU will notice that I have excluded vitamins and phagocytes. Then, what about "Careers for boys and girls"—a mighty problem for most parents in these days. Again, "How to travel abroad"; heaps of people miss foreign travel for lack of plain information about where to go and how much it costs. They

stew in some crowded seaside place and spend almost as much as would pay for a trip to Spain or Switzerland. Finally—but only because space is limited—why not some more talks by workers? We all like to know about the next man and his job. Common people are closer to us than things, theses, and theories.

A Little Learning—

... is a dangerous thing, but not nearly so funny as none at all. Talking of "talks," which, under the present broadcasting regime, give us a smattering of lots of things, I read a good joke about a man who told a friend that at a dinner the night before, his hostess had asked him whether he liked Botticelli, and that he had replied that he preferred Chianti. "You ass!" said his friend, "Botticelli isn't a musician, it's a kind of cheese."

The Amateur's Paradise.

MY notes from time to time on this subject bring in a steady trickle of letters which already begins to show that South Africa has been specially favoured. This is not surprising, as old radio hands will agree when they recall the extraordinary distances over which ships were able to communicate with that part of the world. But all is not well with South African broadcasting, and I shall revert to the subject shortly. I thank C. R. S. (S. Africa) for his letter and invite him to make up the "Sydney" Two and give me news of it.

They Say—What Do They Say?

LET them say. Firstly, Mr. D. C. Thomson, Northern Area Director of the B.B.C., says that the B.B.C. considers that it is impossible for efficient use to be made of broadcast lessons without the co-operation of the teacher in the class-room. Oh, fountain of exhaustless wisdom! Next: Rortarian G. Pochin, referring to music by radio says, "Mechanical music has now become a menace." He added that music *via* radio is lacking in soul and inspiration. By dint of superhuman restraint I refrain from comment.

On the Right Track.

THE most sensible remark on programme building I have ever heard from a broadcasting authority comes from 3 L O (Melbourne). "It is only by a comprehensive study of average tastes and by psychological research that the broadcasting companies can gauge the requirements of listeners." The italics are mine. I recommend the B.B.C. to study that sentence, and beg them to accept the doctrine it contains.

Radio Scepticism.

MR. ELSTON certainly has "started something"—correspondence being a part of it. As our letter columns show, he has some sympathisers, but not a few antagonists. Mr. Rowett's letter, published in our issue of March 31st, hits one nail on the head when he suggests that skill in manipulation counts for a lot. I would suggest that some of the radio clubs should devote an evening to this matter and report to me what broadcasting stations they receive, to the satisfaction of all present, on a loud speaker, using a three-valve non-reflex receiver. Please mention type of receiver.

ARIEL.

THE importance of having an aerial of thick or stranded wire is generally realised, but it must be remembered that it is just as necessary—in fact, more so—to use low-loss wire for down-leads and earth wires.

The fact is often overlooked that the earth lead has as much effect on the tuning of a set as has the aerial itself, for it forms part of the aerial circuit, and it sometimes does not matter a great deal which terminal on the set is marked “aerial,” and which “earth.”

With regard to the earth connection, it is too often assumed that any water pipe is a good earth, and earth leads are sometimes found secured to waste pipes which never even enter the ground. If a water pipe is to be used, the main cold water supply pipe should always be selected.

Poor results are often obtained because of mistakes incorporated in the aerial tuning circuit of the receiver.

A tuning circuit employing a small coil and a large variable condenser which will cover a very wide wave-length range is not efficient. In fact, the smaller a parallel tuning condenser, the better.

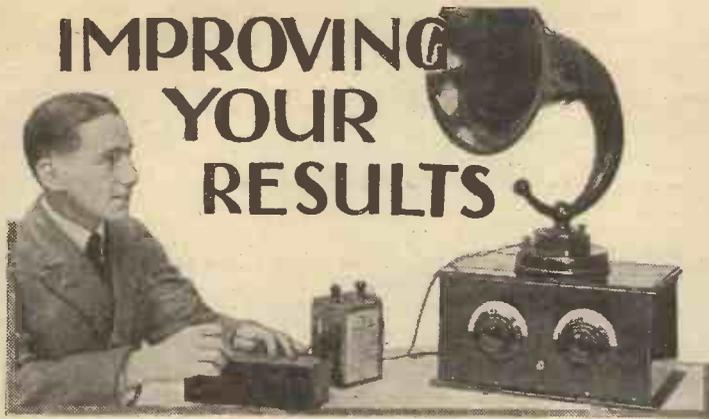
Tips on Tuning.

In the case of a two-circuit tuner, tightening the coupling between the coils does not necessarily increase signal strength, as is often supposed. If the coils are near enough to transfer a large amount of energy from primary to secondary, they are also near enough to transfer energy back to the aerial from the grid circuit, and damp out signal strength by radiation.

It is sometimes imagined that very critical tuning is ideal for selective reception. This is not the case, as *critical* tuning may simply depend upon the wave-length range covered per degree of the tuning condenser dial, and is not the same thing as *sharp*, or *selective* tuning which depends upon the narrowness of the wave-length band over which any station is heard.

Apart from the tuning arrangements, there are few mistaken ideas that can be entertained with regard to a simple crystal set, except perhaps the very serious and illogical error of supposing that “because it is only a crystal set, any old hook-up will do.” On the contrary a crystal set must make the best possible use of what it can derive from the ether, as it cannot release energy from a high-tension battery. We may take liberties with the efficiency of a valve set, but every detail

IMPROVING YOUR RESULTS



Some simple expedients which make for better radio reception.

By C. E. FIELD, B.Sc.

should receive consideration in a crystal receiver.

Valves, perhaps, come in for more misunderstanding than any other wireless component, probably because of the rapid advances that have recently been made in their design and manufacture.

For instance, because a valve is labelled “General Purpose” it does not follow that it is the most suitable valve to employ in any position. Rather should a general-purpose valve be regarded as “Jack of all trades and master of none.”

That Unwanted Impedance.

In the case of specialised valves, the significance of the valve *impedance* is often misconstrued. This is probably because, for high-frequency or resistance-coupled circuits a “high-impedance” valve is usually recommended, whereas it is a “high-amplification” valve which is really required. High impedance is a necessary evil, which is inseparable from

high amplification, and manufacturers strive to produce valves with the ratio of amplification to impedance (i.e. conductance) as high as possible.

Except from considerations of economy of high-tension current (but *not* high-tension voltage), high impedance is of itself no advantage.

Disappointment is sometimes expressed by experimenters who replace a small power valve by one of the super-power class, and find no increase in volume. This is as it should be, for the amplification factor of a super-power valve is con-

siderably lower than that of a smaller valve. If a large power input is being dealt with, however, the larger valve will give a very definite improvement in tonal quality. Nevertheless, it must not be forgotten that it will not even do this unless it is given an increased grid bias. A super-power valve with 4½ volts on the grid is no better than a general-purpose valve similarly biased, but consumes somewhere about 10 times as much high-tension current.

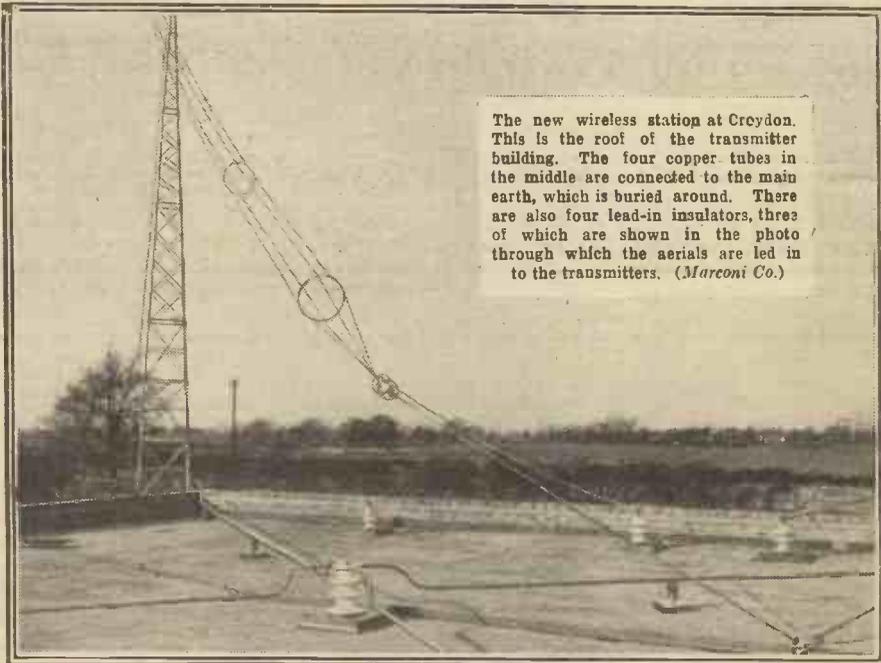
H.T. and Grid Bias.

The importance of high-tension voltage is not generally appreciated, and it is quite usual to find amateurs reluctant to employ more than about 100 volts in low-frequency amplifiers, for fear of increasing volume at the expense of quality. This is most unlikely, and in order to obtain the best results from an amplifier the high-tension should be twenty or thirty volts in excess of the maximum value recommended by the valve manufacturers, to compensate for loss of voltage in transformer or speaker windings.

In connection with the biasing of valves, it is evident from correspondence columns that many are under the impression that a high-resistance grid leak tends to prevent the grid voltage from reaching the grid of the valve. This is not so, for so long as no grid current is flowing (as occurs when a valve is over-run) there is no voltage lost in the grid-leak.

A further point regarding grid bias which is very well worth bearing in mind is that some H.T. batteries, notably the Lissen, have special 1½-volt tapplings at their minus ends, so that they can supply grid bias as well as H.T.

The effective H.T. minus in such a case can be, for instance, the 9-volt tapping. This will also represent grid-bias plus. The lower tapplings can then be used as bias negatives.



The new wireless station at Croydon. This is the roof of the transmitter building. The four copper tubes in the middle are connected to the main earth, which is buried around. There are also four lead-in insulators, three of which are shown in the photo through which the aeriels are led in to the transmitters. (Marconi Co.)

THE £1,000 TELEVISION CHALLENGE.

Mr. Baird Fails to Accept.

By THE EDITOR.

WE have to announce this week the formal withdrawal of our £1,000 Television offer to Mr. Baird and to the Baird Television Development Co.

We will not reiterate the terms of that challenge, nor the reasons which inspired it. Our readers are familiar with both, not only through the columns in this journal,



Mr. John Logie Baird.

but also through the columns of the daily Press. We are sorry that Mr. Baird and his company did not accept our challenge and thus, for the first time, demonstrate before an impartial investigatory committee, composed of scientists of repute, the real possibilities of the Baird Television system; and we are all the more sorry because the acceptance of the challenge, and the ensuing demonstration would have completely cleared up the misapprehensions existing in the public mind with regard to television generally.

"Excessively Optimistic Beliefs."

However, the effect of Mr. Baird's refusal to accept our challenge has, at any rate, done a great deal to dispel many excessively optimistic beliefs held in connection with television, and we are glad to report, from reliable information supplied to us from various sources, that our relation of the exact position of television to-day, and the views of eminent scientists we have published, have had the effect of warning many enthusiastic but over-credulous people who intended spending a good deal of money on home television outfits, component parts, etc., in the belief that they would have television in the home.

Although, from the large correspondence received from our readers, we are convinced that our policy with regard to television, and in particular to the Baird Co., has been correct, and in the best interests of our readers, we have received one or two letters from readers reproaching us for attempting to "crab" television experiments.

We always welcome criticisms, but

criticisms of this nature are not very valuable, inasmuch as they show an ignorance of the views we have expressed editorially, the views expressed by Sir Oliver Lodge, Dr. Roberts, and other scientists, and the terms and conditions of the offer made to Mr. Baird.

Mr. Baird has been reported in the Press as giving at least three separate and different reasons for not accepting our challenge—all more or less contradictory—and in the second issue of a paper devoted to the subject of television we find the following editorial comment:

"We note that one of our wireless contemporaries is now endeavouring to put before its readers the real facts about television. The only comment which we would make, in passing, is that whilst the journal in question was endeavouring to cast ridicule on Mr. Baird's proposed transatlantic demonstration, the said demonstration actually took place; and while it was calling upon Mr. Baird to demonstrate television by wireless over a distance of twenty-five yards, the Baird Company forestalled the publication of the challenge by transmitting recognisable images of human faces to the Cunard liner 'Berengaria,' then 1,500 miles away in mid-Atlantic. *Verb sap.*"

The "Berengaria Experiment."

We would, very briefly, point out to our readers that the "Berengaria" experiment was a repetition of the first transatlantic experiment—both meritorious, as we have more than once stated; but both experiments were beside the point when considered in the light of the terms of our challenge and the reason for that challenge.

We do not propose to weary our readers with another recapitulation of the reasons for our challenge. Perhaps the only comment necessary is one which was published by "The Electrician" (March 16th), with which we entirely agree:

"The Electrician" stated (*inter alia*): "We have nothing but admiration for the progress that has been made, so far, but do not favour the publicity methods that are at present being employed. In the case of the transatlantic 'success,' we can hardly imagine the disgust of the American newspapers at having missed such a 'scoop.' Now, although this kind of thing may have publicity value, it is calculated to undermine the confidence of those who are looking for evidence of definite scientific achievement, and when the complaint is made, as we have recently seen it in print that Mr. Baird's work is criticised in 'certain quarters,' we feel that Mr. Baird has only himself to thank, for having acted in a manner which provokes distrust. We do not think that commonplace home television can be expected for some considerable time to come. The systems of which we have knowledge appear to be either too crude to be of more than experimental interest, or else, where some higher degree of success has been attained by way of results, the cost has been prohibitive."

"A Final Word."

And, as a last quotation, we print in full (with acknowledgments to our contemporary "The Electrician") a complete paragraph, entitled "A Final Word," which also appeared in the issue dated March 16th:

"We believe that television will develop along parallel lines with radio broadcasting. As we pointed out in these columns three weeks ago, there seems to be nothing to stand in the way of the ultimate achievement of television as a practical service to humanity, within a reasonable space of time, by one or other of the several systems which are at present being developed. We must, however, guard against permitting ourselves to be influenced unduly by the optimistic statements of those who, in their enthusiasm, see the ultimate goal of their experimental efforts long before it has become visible on the horizon. Every scientist who respects his reputation should take steps to ensure that what he puts on record regarding his scientific achievements shall not be distorted and exaggerated by others who may quote him. Even so far back as 1920 Mr. Baird made a statement to the Press that he anticipated that his 'televisors' would be available to the public before the end of 1927, and at the Radio Exhibition last year went so far as to exhibit a number of boxes labelled 'Baird Televisors.' Good publicity we agree, but in a form which can hardly be expected to inspire lasting confidence."

Nothing more need be said, except that we express the sincere hope that when next Mr. Baird and his advisers see fit to announce the details of future television experiments, they will bear in mind the advice given by "The Electrician"—which we, in all friendliness, and with a desire to see British Television development lead the world, heartily endorse.



The scene aboard the "Berengaria" when, it is claimed, an image was received from London via Television. Mr. Hutchinson of the Baird Television Development Co., Ltd., is on the extreme right.

THIS YEAR'S "CHITOS TWO"



THERE seems to be something almost magical about the name "Chitos" to most POPULAR WIRELESS readers, a fact which is not altogether surprising when one remembers how extraordinarily successful this highly-sensitive little set has proved in the hands of home constructors. Probably it is no exaggeration to say that it has done more than any other circuit to convince experimenters that real long-distance reception is actually possible with quite a simple set, and without using such ultra-freakish circuits as the Armstrong super-regenerative, Flewelling, and so on.

A "Chitos" set needs no introduction, for every "P.W." reader will at least have heard of this famous "P.W." circuit. Here we present a right-up-to-date two-valve version—a simple, inexpensive set which probably gives just as much in the way of results as it is possible with two valves.

By the "P.W." Research Department.

with coil sizes, etc., seems to get over this difficulty, and in general the new set seems to be in a fair way to achieve very wide popularity.

It is only natural, therefore, that we should receive many requests to publish a description of the procedure to be adopted when adding low-frequency amplification to this set, either as a separate unit or as a complete new design.

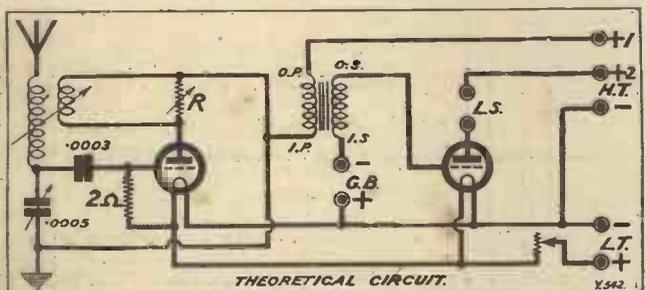
A special design has accordingly been produced with the addition of one low-frequency stage, which should meet the case quite well, since it will show the more experienced constructor how he can, if desired, add not only one but two stages.

In producing this special design we have kept in mind the requirements of those who may already possess the single-valve version and desire to convert it into a two-valve receiver, keeping as far as possible to the original scheme. As a matter of fact the work has been done by taking the original set, rearranging the lay-out of the parts on the baseboard slightly, and simply adding the necessary parts required to form the low-frequency stage. This has been done on the original panel and baseboard, since the extra space involved is not great, and the original lay-out was one in which a good deal of space was deliberately wasted in order to allow for various sizes of components, ease of construction, and so on.

Loud-Speaker Work.

Thus, you will find it is quite possible to convert your existing single-valve 1928 "Chitos" to the two-valve version, so adding the extra valve which you desire for working a loud speaker on the local station, 5 G B, and perhaps a few foreigners. All other stations within reach will, of course, come in very much more strongly on the headphones with the addition of the extra valve, so that you will no longer need to obtain such a critical reaction adjustment, but on the contrary will be able to use a little less reaction and thus be able to gain better signals without the wooliness associated

(Continued on next page.)



Special high sensitivity single-valve receivers certainly are fascinating, and the "Chitos" is a particularly good specimen of such a circuit, being almost free from the vices usually associated with them, and moreover, quite easily handled in most cases. True, there is usually some slight difficulty in finding just the right size of reaction coil for best results, but when that difficulty has been overcome, and it is not as a rule a very troublesome matter with one of the later "Chitos" designs, the set is practically as easy to operate as any other single-valve reaction set.

On Long Waves.

The recently-published 1928 version of this receiver has attracted considerable attention and seems to be proving very successful in readers' hands, although there have been one or two cases of difficulty in getting good results on the upper wave-band (5 X X and so on) since the "Chitos" circuit in general does not appear to be quite so effective here as on the ordinary broadcast range. A little experimenting

COMPONENTS REQUIRED.

- 1 Ebonite panel, 12 in. × 8 in. × ¼ in. (any good branded material).
- 1 Cabinet, 12 in. × 8 in. × 8 in. deep, complete with baseboard and brackets (Artercraft, Bond, Camco, Caxton, Makerimport, Pickett, Raymond, etc.).
- 1 L.F. transformer (Lissen in set. Any good make).
- 1 2-way coil holder with long handle (Lotus, or similar type).
- 1 .0005 mfd. variable condenser (Cydon in set. Any good make).
- 1 Plain or vernier dial (vernier advised).
- 1 .0003 mfd. fixed condenser (Clarke, Dubilier, Igranic, Lissen, Mullard, T.C.C., etc.).
- 1 Grid-leak holder and 2-meg. grid leak (Dubilier, Igranic, Lissen, Mullard, etc.).
- 1 Panel-mounting 6-ohm rheostat (G.E.C. in set. Any similar type, Igranic, Lissen, etc.).
- 2 Sprung valve holders (Benjamin, Bowyer-Lowe, B.T.H., Burndept, Burne-Jones, C.E. Precision, Lotus, Marconiphone, Pye, W.B., etc.).
- 1 Reaction control resistance (see text).
- 9 Indicating terminals, markings as per diagram (Belling-Lee, Clix coloured type, Eelex, Igranic, etc.).
- Quantity of Glazite, Junit or tinned copper wire and Systoflex.
- 2 Terminal strips.

THIS YEAR'S "CHITOS TWO"

(Continued from previous page.)

with the use of intensive reaction. Further, in searching for distant stations, there is less risk of oscillating, since you will be able to pick up weaker signals, and need not bring the detector so near to the edge of oscillation.

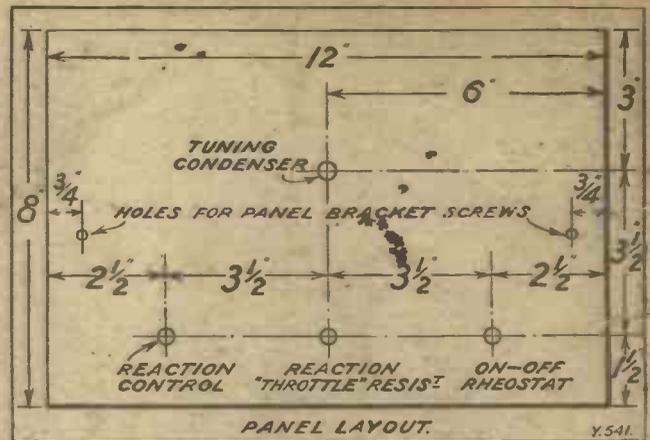
A Simple Circuit.

For the benefit of those readers who will be constructing this set as their first adventure in the "Chitos," it may perhaps be useful to explain that the arrangement is quite a simple one, consisting essentially of a series-tuned aerial circuit, with the tuning coil on the aerial side of the condenser instead of in the reverse position, which is the conventional one. The grid and filament of the valve are connected in effect across the tuning condenser instead of across the coil.

The earth connection, also, is a slightly unusual one, since instead of being taken direct to the filament, it is taken to a point on the anode circuit, for reasons connected

with the picking up of long-wave stations when they are not required, a point which will be well understood by those who have experimented with different forms of "Chitos," and noted the extreme annoyance of hearing high-speed automatic Morse superimposed on the shorter wave broadcasting station they are trying to receive. Plain magnetic reaction is used, controlled mainly by means of a swinging coil, and usually accompanied by some additional adjustment such as a variable grid condenser, variable grid leak, variable resistance in series with the reaction coil, and so on.

A glance at the circuit diagram will make all this clear, and you will see that the two-valve that we are now dealing with is simply the original 1928 circuit with the addition of a plain transformer-coupled L.F. stage, with the exception of just one



simple modification in the reaction circuit. It may be remembered that in the single-valve version a supplementary control of reaction is obtained by placing a variable resistance in series with the anode circuit, this resistance being of the type commonly employed for varying the voltages obtained from a mains eliminator. A suitable resistance, of course, is the "Bradleyohm" obtainable from Messrs. Rothermel Ltd.

(Continued on next page.)

POINT-TO-POINT CONNECTIONS.

Filament contacts on the valve holders V_1 and V_2 nearest to each other joined together, to one end of the grid-leak holder and to one side of the panel rheostat.

Other side of panel rheostat to the L.T. + terminal.

Remaining filament contact on the valve holder V_1 to the H.T. - and L.T. - terminals, to the G.B. + plug via a flexible lead and to the remaining filament contact on the valve holder V_2 .

Other side of grid-leak holder to the grid of V_1 , and to one side of the .0003 mfd. fixed condenser.

Remaining side of the .0003 mfd. fixed condenser to the fixed vanes of the .0005 mfd. variable condenser and to the plug of the fixed coil holder.

Socket of fixed coil holder to the aerial terminal.

Earth terminal to one side of the moving-coil holder via a flexible lead, to the moving vanes of the .0005 mfd. variable condenser, to one side of the reaction control resistance (marked "R" on diagrams), and to the "IP" of the L.F. transformer.

"OP" of the L.F. transformer to the H.T. + 1 terminal.

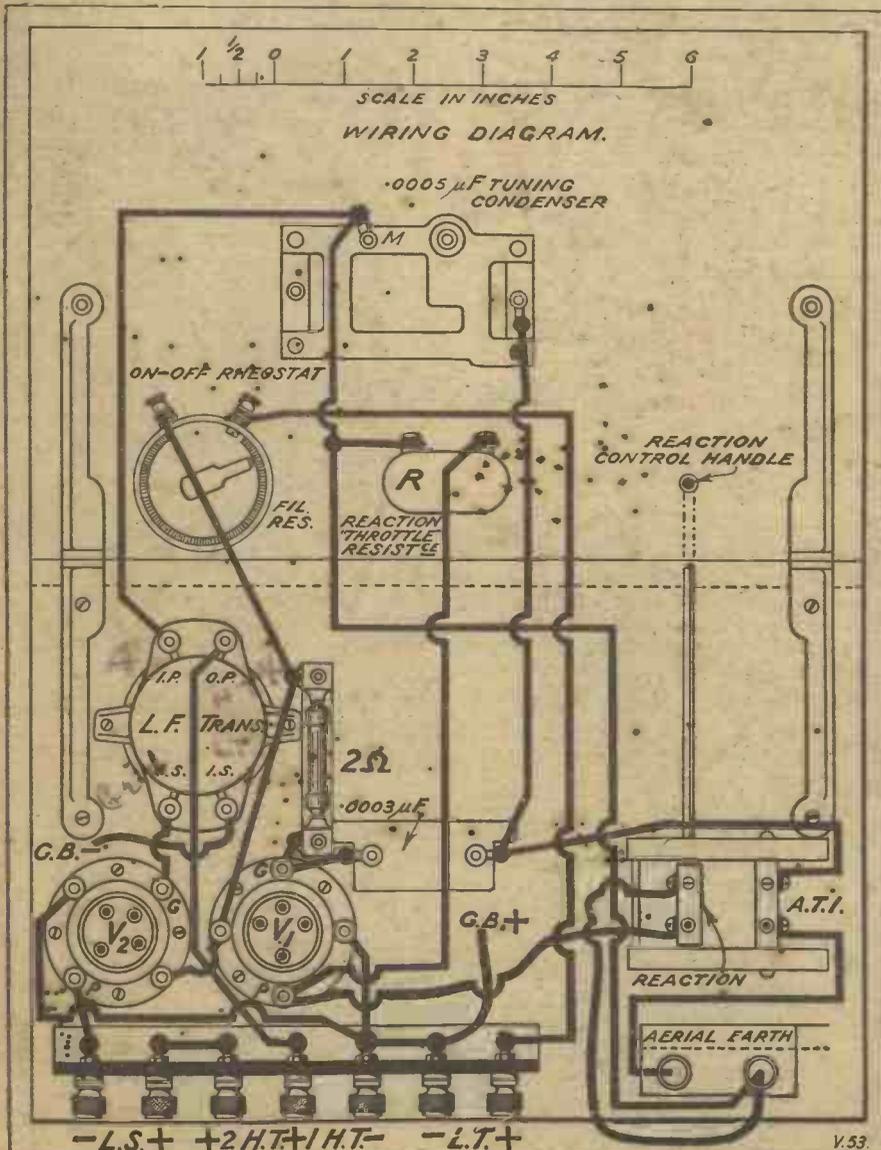
"OS" of transformer to the grid of V_2 .

"IS" to the G.B. - plug via a flexible lead.

Plate of V_1 to the remaining side of the moving-coil holder via a flexible lead and to the remaining side of the reaction control resistance "R."

Plate of V_2 to the L.S. - terminal. L.S. + terminal to the H.T. + 2 terminal. This completes the wiring.

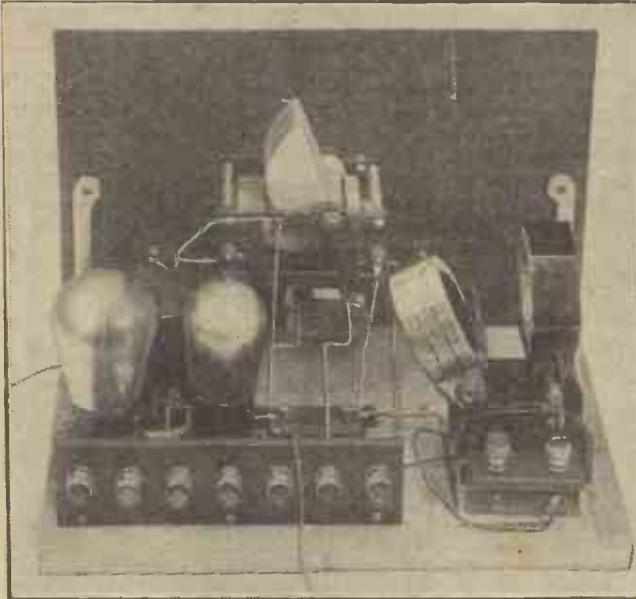
NOTE.—The moving-coil holder accommodates the reaction coil. If the set does not oscillate when the reaction coil is brought nearer to the aerial coil, and the reaction control resistance is screwed "out," try the effect of reversing the leads to the moving-coil holder.



THIS YEAR'S "CHITOS TWO."

(Continued from previous page.)

Messrs. Hamley Bros., and others. The effect of varying this resistance was really to alter the high tension applied to the detector valve within quite wide limits, provided that a suitable Bramleyohm or similar variable resistance was chosen. The



A back-of-panel view of the set taken immediately after it had passed the searching tests "on aerial" conducted by the "P.W." Research Dept.

actual value for this control is not at all critical and as long as you can obtain a variation from quite a low resistance up to perhaps 10,000 ohms it will serve the purpose. For example, the Bradleyohm type No. 5 E is quite suitable.

In the two-valve version it has been found better, in order to meet the requirements of the L.F. stage which follows, not to vary the H.T. on the detector valve in this way, but to connect the variable resistance instead directly in parallel with the reaction winding.

For this purpose the 1 E Bradleyohm is also suitable. Then, take a fairly large reaction coil, say a 75, (a 50 if the valve is one which oscillates readily), place this fairly close to the tuning coil, say only an inch or so away, and screw down the resistance until the set ceases to oscillate. Quite a wide control of reaction can then be obtained with the resistance only, and this will suffice for most tuning operations; but, of course, it can be supplemented by variations of coupling between the coils, since a two-coil holder is used.

Constructional Details.

The constructional details of the set will be followed quite easily from the wiring diagram and the photographs, and there is little which can be said which would help the constructor. It is a perfectly straightforward job of fastening down components and wiring up according to the diagrams, and it will probably be far more helpful to devote the remainder of our time to the considerations of practical operating details, since it is more often here that difficulties arise with these special circuits.

The detector valve should be one of the special H.F. or special detector types and, of course, you can use either the 2- or 6-volt type. Two-volters work quite well in this circuit, although, of course, if you want the very finest results obtainable, naturally you would use the 6-volt type. The economy of the 2-volters, on the other hand, is a very weighty point to some people. By the way, both the detector and the L.F. valve should be of the same filament voltage, since they are controlled by a common rheostat on the panel, which also serves the purpose of an on-and-off switch. For the second socket you will require a small power or L.F. valve, preferably the former, if you require good quality on the loud speaker, and you should be very careful to adjust the grid bias to its correct value according to the makers' instructions for the particular H.T. voltage which is being employed.

The high-tension voltage on the detector valve should really be found by a little experimenting, since it is naturally rather critical in a special circuit. Somewhere about 60 to 70 volts will usually be correct, since the "Chitos" seems to appreciate a rather higher value of H.T. than most other simple detector valve circuits. On the other valve, of course, it is a safe rule to apply as much H.T. as you can, up to the safe maximum rating of the valve which is being used, which is usually about 120 volts. If you want the best results, you should really make it a rule not to use less than

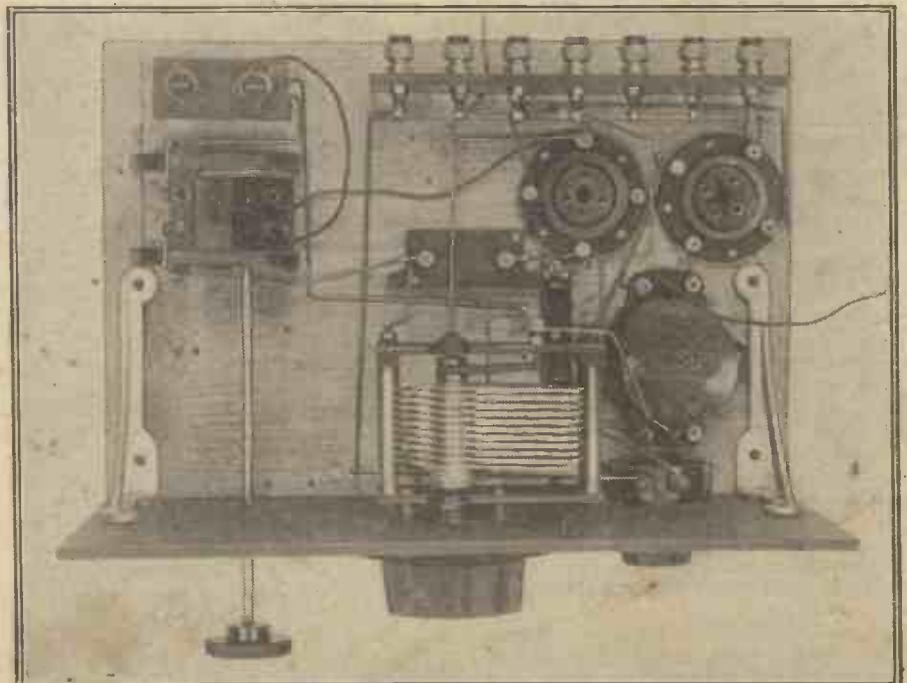
100 volts, although, of course, for head-phone work much lower voltages are adequate. A higher voltage is really called for, however, when you try to get really good quality on your loud speaker.

One of the most important points when dealing with a "Chitos" is to get your coil sizes correct, and you should provide a No. 50, 60, 75 and 100 for work on the shorter broadcast waves. In the aerial socket you usually require either the No. 75 or the 100, according to the range you are working on, that is to say, whether on the band of waves below 400 metres or the band above this figure. For reaction, a No. 50, 60, or 75, should be tried, and you will soon find the one which gives the best control over the whole tuning range. A little experimenting here will soon show you the best size to obtain really smooth reaction, not forgetting, of course, that different values of H.T. should be tried at the same time on the detector valve.

Long-Wave Coil Sizes.

For the longer waves you will require a fairly large size of coil in the aerial circuit, and may meet with a little difficulty in securing the best value. As in all series-tuned circuits, one coil does not give a very wide tuning range, therefore you may find it best to try more than one size until you get the best results. Usually a No. 200 will be correct, but you may need to try even a higher value than this, while a No. 150 will usually be correct for the reaction, although you may find it advisable to increase the value of H.T. on the detector valve a little when experimenting on the long waves.

These warnings are given when dealing with the long-wave band because it is gathered that readers report trouble with their "Chitos" receivers on the long waves, if trouble is reported at all. As a matter of fact, you are not likely to get any trouble with the 1928 version, with its special supplementary reaction control, which practically eliminates these difficulties.



One of the features of the famous "Chitos" circuit is that it makes the optimum use of reaction effects. The moving-coil holder, which can be seen above, and a variable resistance, are the essential reaction controls.

AN EASILY-MADE PLUG.

READERS of "P.W." who may have some old valves on hand with ebonite bases will find that excellent plugs for both electric light and wireless use can readily be made from them, as shown in photo. Two prongs should be cut away, and the ends of the flex bared and slipped inside the remaining two prongs until flush with the tips. A drop of solder is next placed on, which will hold the flex securely to the prongs.

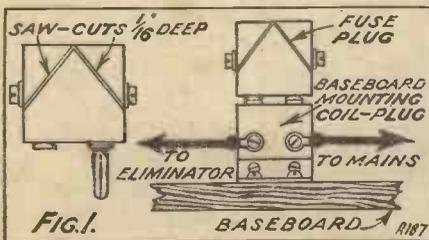


The simple device described in this page.

The solder should be gently rounded off with a fine file, so that the plug will slip smoothly into the socket. Finally the base of the plug is filled up inside with some melted sealing wax procured from an old dry battery. (This will prevent a possible short circuit between the flex and also give greater rigidity to the job.)

A PLUG-IN FUSE-HOLDER.

THE insertion of a fuse in series with the mains is a precaution which you should never neglect when you make up a battery eliminator. To avoid the risks attendant on short-circuits, you will do well to fit fuses which will carry the



current required with a margin of safety of, say, 25 per cent.

You can, of course, purchase fuse boxes for the purpose, but these are usually designed to hold fairly heavy gauge wire. Fuse wire to carry only small currents, 1 ampere or less, is delicate stuff to handle. If you want to put in fuses of this rating, you can easily make holders out of standard ebonite coil plugs.

In a coil plug make two cuts with a saw, about $\frac{1}{16}$ th-in. deep, as shown in Fig. 1. The cuts meet at the top of the plug. Fix one end of the fuse wire under the bolt

head on one side, putting a washer over the wire, screwing the bolt home until it only just grips the wire, or the latter will be damaged. Carry the wire round the V-shaped groove, and fix the other end under the second bolt head. See that there is enough tension on the wire to keep it in the groove.

If the fuse "blows," the wire will melt at the apex of the V, and the ends will be sure to separate. As the wire is in a groove, the holder can be handled without fear of damaging the wire. A baseboard-mounting coil plug, fixed in the eliminator unit, provides the means of plugging in the fuse.

USING THE "ANTIPODES ADAPTOR" ALONE.

FOLLOWING upon the publication of the "Antipodes Adaptor," in "P.W." No. 303, a query has been received asking if the unit can be used successfully on its own as a single-valve short-wave receiver. This happens to be quite a practical proposition, and since the subject is one likely to be of interest to other readers, details are given below for "adapting the Adaptor."

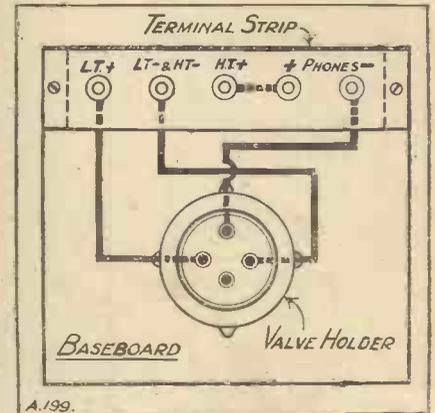
It will be remembered that in the original unit, the H.T. and L.T. supply was obtained from the set proper, and, therefore, to use it alone it is necessary to make some provision for the battery and 'phone connections.

The most simple and convenient method is to mount a valve holder and terminal

strip on a small piece of wood, connecting up as shown in the diagram. If it is desired to use a resistance in series with the filament, this should also be mounted on the baseboard and joined in series with the filament and L.T.

The plug from the unit can then be placed in the valve holder, and with the usual battery and 'phone connections made, the method of procedure becomes exactly similar to that described in the original article.

It should be understood, of course, that only under exceptional circumstances will the Australian stations be heard on the



single-valve arrangement, but there is every possibility of receiving some of the more powerful American stations.

For those who have made, or are making the unit, this small modification should be of interest, since it will enable the unit to be tested for oscillation, etc., before it is coupled to the amplifiers of the set.

AMERICAN VIEWS ON TELEVISION.

WE reproduce below an illuminating extract from a recent interview, granted by Dr. Lee de Forest—inventor of the three-electrode valve—to Mr. Hugo Gernsback, Editor of the "Radio News."

MR. GERNSBACK:

What are your views on television, in view of the past experiments by Baird of London, and by the research engineers of the American Telegraph & Telephone Corporation? Do you believe television attachments to radio sets a matter of the near future? If so, how soon?

DR. DE FOREST: I am quite naturally interested, and have inspected the work in television which has been carried on in this country, particularly that by the American Telegraph & Telephone Corporation. I must pay the highest possible tribute to the ingenuity and patient research which has made possible the system employed by the American Telegraph & Telephone Corporation. It is little less than a scientific miracle. Nevertheless, I know my views on television have been somewhat disappointing to those who wish to believe that in the next few years every one can have a mov-

ing-picture show at home, broadcast direct from his favourite theatre. Frankly, I cannot foresee such a millennium for the radio fan. Until some radically new discovery has been made in physics, some new principle or operation of which we to-day have no clear conception, television apparatus must continue to be extremely intricate, delicate, requiring the constant and most careful attention of highly-skilled experts, and be built and operated at very great cost. Until such a new discovery, therefore, I think we must limit our television expectations to an occasional demonstration under the auspices of one of the few great electrical engineering and manufacturing corporations. Television in the popular mind means radio broadcasts of distant scenes as they transpire.

"General Gullibility."

I have little patience with some of those whose names are associated with the history of this new development, who seem willing to impose on the gullibility which the public evinces whenever the word "Television" is used: A few years ago it was impossible to get anyone to believe in wireless telegraphy, and later in the possibilities of the wireless telephone. Of recent years, however, the progress in popular science has been so phenomenal that general gullibility, or willingness to accept any prediction along the lines of invention, takes the place of the scepticism which formerly made the work of pioneers so difficult.

I EXPECT that you, in common with most other radio enthusiasts, have two or three spare wireless parts which are not in use. Possibly a fixed condenser, or a potentiometer which came off your old set, or some old-fashioned plug-in coils of the type now out of favour.

Perhaps it has never occurred to you that in one or more of these parts there lies the possibility of better reception free of charge. Whatever the circuit you may be using, unless it is an ultra-modern and up-to-date one, it is probable that you can, by the parts taken from the junk box, effect an improvement in reception.



USING THOSE SPARE PARTS

By F. R. BIRD.

Some practical suggestions for improving reception free of cost.

tiometer winding will go to the L.T. negative lead and the other end to L.T. positive. By moving the slider the grid leak can then, in effect, be made to go to L.T. negative or positive, or to any intermediate point at will. It is amazing how weak signals can be "nursed" into strong ones by this simple alteration.

Finally, if you have some old large plug-in coils on hand, you may find that they would make a better choke than the H.F. choke itself.

Very often a plug-in coil of 200 or more turns can be put in place of the H.F. choke, and will give a far better control over reaction. This, again, is an improvement which will be more especially appreciated by the long-distance listener.

RADIO ITEMS OF INTEREST.

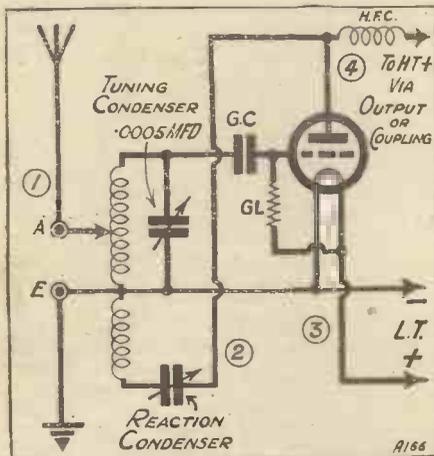
In the last nine months of 1927 the broadcasting revenue collected by the Post Office exceeded expenses by over £65,000.

The tuning-fork used by the B.B.C. to determine broadcasting wave-lengths was recently taken to Brussels by air liner to be compared with Europe's standard tuning fork.

Telephone subscribers in any part of this country can now call up and communicate with Canadian subscribers by means of the transatlantic telephone service, via Rugby.

The Malabar short-wave station, Dutch East Indies, is now broadcasting fairly regularly on Wednesdays, Fridays, and Saturdays, from 1 to 4 p.m. G.M.T., on a wave-length of 17.4 metres, with the call sign A N P.

The Cardiff Station holds the B.B.C. record for the minimum number of breakdowns during 1927.



As explained in this article, the numbers show where spare components can be used to improve an ordinary one-valve reaction detector.

Look, for instance, at the diagram given above, which shows the connections of a detector valve employing capacity-controlled reaction of the "Reinartz" type. This circuit, whether used as a single-valver or followed by one or more stages of low-frequency amplification, is undoubtedly the most popular arrangement of connections to-day.

Uses for Fixed Condensers.

Against certain of the leads are drawn figures, 1, 2, 3, 4, etc., and these numbers indicate the places where the junk-box is likely to be of use. Suppose, for instance, that you have on hand a small fixed condenser. If you have never tried the effect of connecting it in the aerial circuit at the point marked 1, you certainly should try it to-day, especially if you live fairly close to a broadcasting station. Very often a great improvement in selectivity results from this simple alteration, especially in cases where a low or badly-screened aerial is used.

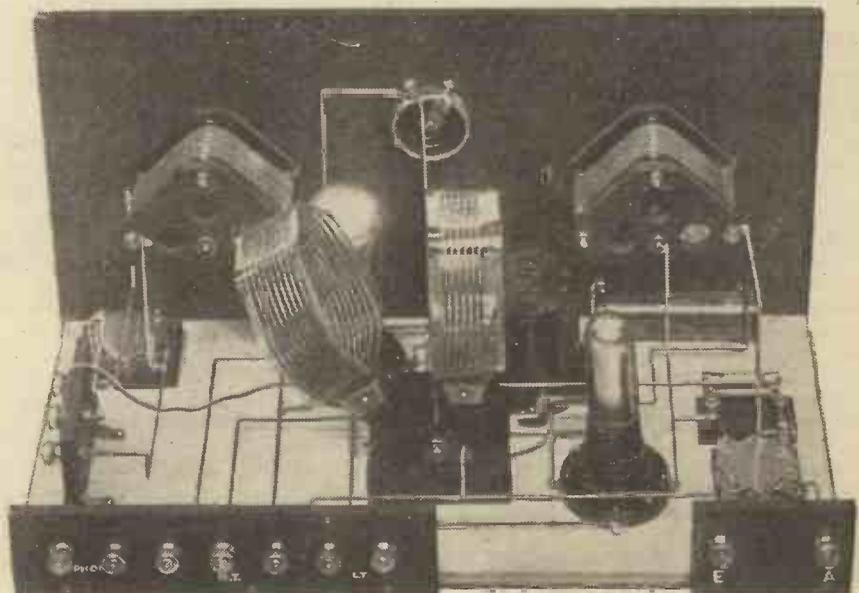
A .0001 or a .0002 mfd. fixed condenser would have been eminently suitable for the foregoing trouble, but if your condenser is a larger one, say .001 or .002 mfd., its effect upon selectivity would not be very marked. It might, however, do some very good work at the point marked 2 on the diagram. A glance at the diagram shows that one side of the reaction condenser is connected through the coil to L.T., and hence to H.T. negative, whilst

the other side is connected to the plate of the valve and via the choke to H.T. positive. In other words, this condenser is directly across the H.T. battery, and if its plates become a little bent, or a speck of dust falls upon them, the battery may short and damage itself, or certainly damage reception. If, however, the lead from condenser to plate of the valve is broken at the point marked 2, and the spare condenser is inserted there, this will act as a complete safeguard. The control of reaction is apparently unaffected, provided that the capacity of the fixed condenser inserted at the point 2 is a good deal larger than the variable condenser that controls reaction.

Increasing Sensitivity.

If you have a potentiometer on hand and you are interested in long-distance reception, you may be able to increase the DX range of your set considerably, by a slight alteration to the grid-leak connection. In some sets one end of the leak is taken to L.T. negative, and in others to the L.T. positive lead, and the connection that may be best for one valve may be bad for another one. If you have a potentiometer on hand and connect it across the L.T. lead at the point marked 3, you have a ready means of increasing the sensitivity of the set.

That end of the grid leak which is connected to the filament wiring should be disconnected from there and a lead taken instead from the grid leak to the slider of the potentiometer. One end of the poten-



The sensitivity of a set of this type can often be increased by a potentiometer, as explained above.

TECHNICAL NOTES.

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

USEFUL BATTERY INDICATORS

DOWN TO 6 METRES—"ACTION AT A DISTANCE," ETC.

Useful Battery Indicators.

I WAS talking some little time ago about indicators for showing the state of charge or discharge of the L.T. battery and in this connection I received a few days ago, from the Eagle Engineering Company, one of their Chakophone accumulator-capacity indicators which they have sent me for inspection and test. The instrument is about 2½ in. in diameter, and is made in two models, one a switchboard type ("baseboard type," as it would be called for wireless purposes) and the other a flush-fitting type (a "dashboard" type for motor cars, or "panel" type for wireless).

The instrument is, of course, in effect a voltmeter, but the dial, instead of indicating volts, indicates in three sections marked "low," "medium" and "full," these sections being differently coloured for ready identification. A small press-button switch is provided on the instrument, which is to be depressed when taking a reading: in the ordinary way, therefore, the instrument is not connected in circuit.

Closed Circuit Readings.

This little instrument has been thoroughly tried out and is not only very convenient in use but seems to be quite accurate and reliable. Of course, it has to be made in three models for 2-volt, 4-volt and 6-volt accumulator batteries and it is made in H.T. models for voltages of 60, 72, 90, 100, 120 and 150 volts.

In taking a reading of the battery it is desirable not to take the reading on open circuit, but to throw in an average load—this may be done by the simple process of switching on the valves of the set: the reading obtained at normal load gives a much better idea of the working condition of the battery. If a trickle-charger is used in conjunction with the battery the indicator will be found very useful in avoiding overcharging. An incidental advantage of this instrument is that it is not polarised and, therefore, it does not matter which way round the battery leads are connected to the instrument terminals.

Depends on S.G. of Acid.

The accuracy of the reading and the calibration is stated to be correct so long as the charge rate and acid density specified on the battery are adhered to.

I can recommend this instrument as being really a very useful little accessory indeed.

By the way, in case you should change your battery to one of a different voltage (whether H.T. or L.T.) the makers of the instrument have an arrangement whereby you can send back the instrument and receive another one of the required voltage on payment of a small charge for the exchange.

Down to 6 Metres.

The General Electric Company of America have been carrying out some extraordinary experiments with high-frequency currents, in their famous laboratory at Schenectady, and they sent me an account of these tests a week or two ago. Everyone knows that with high-frequency oscillatory currents it is possible to obtain something approximating to "action at a distance," and the effects which are described in the General Electric Report really amount to a number

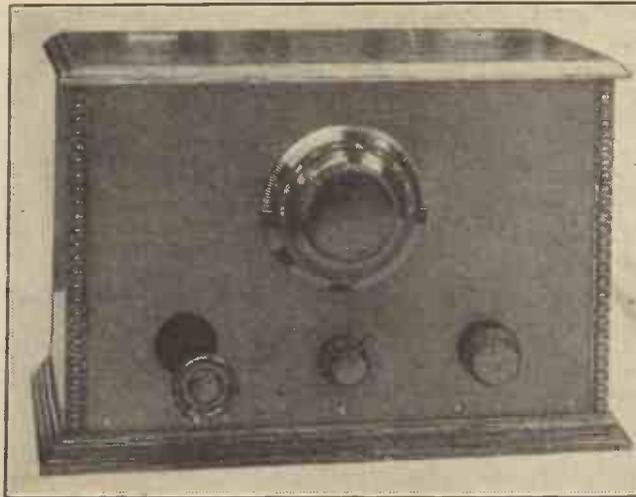
of curious instances of these high-frequency influence effects. An incandescent lamp taken from its carton for the first time lights to full brilliancy without wires or socket when brought within a few feet of the H.F. circuit operated by the new high-frequency valve.

"Action at a Distance."

A copper bar lying on the floor blisters the hand that picks it up, although the metal itself is cold. A neon tube glows brilliantly when merely touched by a spectator, meters in adjacent rooms run wild, and measuring instruments are twisted or broken so that all accurate scientific work in the immediate vicinity is impossible. Investigators coming close to the new apparatus suddenly feel a comfortable warm glow "reminiscent of prohibited stimulants" (as the Report says):

"This 6-metre valve has nothing new in principle," said one of the engineers engaged in its development. "Very short radio

(Continued on page 306.)



This is a front-of-pane view of THIS YEAR'S "CHITOS" TWO, which is fully described elsewhere in this issue. The original "Chitos" receiver was described exclusively in "P.W." and attained phenomenal success as a simple and effective distance-getter.

NEWS FROM SAVOY HILL.

FROM OUR OWN CORRESPONDENTS.

ANOTHER WELSH ROW

POLITICS BY RADIO—B.R.D.A. REVISED, ETC.

Another Welsh Row.

IT was understood that the B.B.C. had squared their troubles with the Welsh, especially since the establishment of the National Orchestra of Wales under broadcasting auspices. But apparently a special commission of the Welsh, appointed to keep an eye on broadcasting, has been informed that the B.B.C. propose to do away with the regular series of relays of Welsh programmes on 5 X X. So the fat is in the fire again. The Welsh were particularly proud of the 5 X X relays, partly because of their Continental range. It is believed that Mr. Lloyd George himself proposes to take a hand in the renewed struggle.

Politics by Radio: A B.B.C. Dilemma.

Having secured permission to put out controversy *carte blanche*, Savoy Hill is

encountering difficulties in execution. To begin with, there are the negotiations with the Parties. It is believed that Labour is the keenest to get a chance at the "mike"; whereas there are signs of reluctance on the part both of Conservatives and of Liberals. The latter have asked the B.B.C. to outline fully its plans for the development of controversy on the political side. But the B.B.C. is wisely non-committal except for the initial experiments. Therefore it is just possible that some of the Parties may not take advantage of the opportunity now offered.

B.R.D.A. Revised.

The proposal to do for radio what the Electrical Development Association has done for the electrical industry has just been revived, this time from the trade angle, and

(Continued on page 304.)

NOTHING so much mars the appearance and often the efficiency of a set as poor soldering. Either this is due to carelessness or insufficient knowledge, but in each case the finished receiver in appearance and efficiency will in no way equal the set in which soldering has been really well carried out.

Soldering may seem a simple job, but if real efficiency is to be acquired in the art of doing it properly there are certain methods of procedure which must be followed for the best results. Having once mastered these few points there is nothing much in it.

Considered theoretically soldering is a method of obtaining a homogeneous and complete metallic contact between any two surfaces of metal. For this a "flux" is necessary, its purpose being to make *chemically* clean the surfaces of the metals to be joined, over which the molten solder will then "run," effectively welding the two together. The action of a flux is to dissolve the thin layer of oxides and sulphides present on the metal to be soldered, and unless this film is removed the solder will not unite with the metals to be soldered, however hot the iron.

The Main Requirements.

The basic requirements for a good soldered joint are, therefore, a flux to clean the metal surfaces, and a clean "iron" with which to apply to them sufficient molten solder to flow over the joint and form a strong connection when cold.

Now, success in soldering depends to a great extent upon using the right size of iron, the right flux and the right solder. It is very easy to use the wrong thing for any of these so that the choice of materials is important.

There are several varieties of solder, which are an alloy of lead and tin. The greater the proportion of tin in the solder, the lower its melting point with an increase in softness. Some kinds of solder are too hard and others too soft. The best material for wireless purposes contains about two parts of tin to one of lead. It is bright in appearance and when a stick of it is bent near the ear a faint crackling noise, the "cry of tin," should be heard. This solder melts easily, runs well and makes a good joint. It is best obtained in thin sticks, as in this form less heat will be absorbed from the iron when melting it. Resin-cored solder is preferred by some constructors, as this combines flux and solder, although all joints must be scraped clean before soldering is successful with this material.

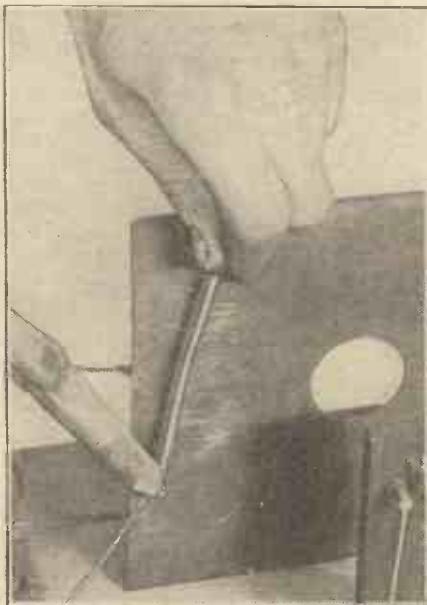
Choosing an Iron.

In regard to "irons," the larger the copper bit, the longer will it hold its heat. For the heaviest work required in wireless work, the copper bit should not be larger than about $\frac{3}{4}$ in. diameter by 3 in. in length. For the major portion of the work a smaller iron having a bit up to $\frac{1}{2}$ in. by 2 in. is very useful as it gets hot quickly and retains its heat long enough to make several joints. A smaller hatchet iron is also extremely useful for delicate work.



 "There are certain methods of procedure which must be followed for best results."
 An article of value to all set-builders.
 By L. FRENCH.

Now, before commencing a soldering job, the iron, whether it has been used before or not, should be well cleaned and tinned. The four faces of the bit should be filed bright with an old file specially kept for cleaning irons. This removes surface dirt. The iron is then heated and again brightened up with the file as quickly as possible, rubbed with flux and then with a stick of solder, when the four faces will be nicely tinned all over. The iron is then wiped with a rag to remove flux and surplus solder. After



The solder should be placed in contact with the iron and the metals to be soldered, when a big joint is to be made.

reheating, and another rub of solder the iron is ready for work.

In cleaning the iron the application of flux can be made by dipping momentarily in a saturated solution of zinc chloride ("killed spirits"), rubbing on resin or a patent flux, or by rubbing the iron on a block of sal-ammoniac. The latter method is best, but gives rise to a certain amount

of fumes. In my opinion, other than sal-ammoniac, the best material is a patent flux such as the well-known "Fluxite."

Before leaving the subject of the iron, the method of heating is important. Whatever the source of heat an iron should never be allowed to get red hot. For this reason a gas flame gives the best regulation of heat, while such a flame does not tarnish the iron like a coal or coke fire. The temperature of the iron can be judged from the colour of the flame which will become tinged with a vivid green as the copper bit nears red heat. The iron will not be hot enough until

a trace of green appears. Alternatively the tinned surface can be watched. If the iron is overheated this will become very dull. Overheating an iron means that the process of cleaning and tinning must be done all over again.

Use Gas or Electricity.

Heating an iron in a coal fire is not very satisfactory, but where there is no alternative a cylindrical wrapping of thin sheet iron or tinplate should be made about 6 in. long and slightly larger in diameter than the iron. This cylinder is placed in the fire, and the bit inserted in the centre of this sheath. This prevents the iron, to a great extent, from becoming tarnished, although overheating must be carefully guarded against.

When a mains supply is available an electrically-heated iron is a very useful thing to have, while it is not expensive to run. It is both clean, and convenient, while it can be kept continuously at the right temperature and will not over heat.

When the receiver comes to the bench for soldering up, all contacts and connections should have been previously cleaned up as described in the section on wiring. Now have near you the gas flame if convenient, iron, solder, flux, a clean rag and a pair of pliers. All being ready all soldering tags should first of all be tinned. A light smear of flux and a touch with a hot tinned iron will do this, any excess of flux being wiped off immediately with a clean, soft rag.

Preparation Important.

Then put two or three wires in position and solder up with one heating of the iron, which should carry enough solder on its nose for half a dozen joints. If the wire has been prepared, as described previously, no flux should be necessary. Should the solder not run cleanly, the merest trace of Fluxite may be applied to the joint, and after soldering wiped off before cold. To make a proper joint the solder must run like water over the metal.

Soldering is an easy job if all these preparations have been made, as one can go right through the receiver without any lengthy pauses in between to fit wires and struggle with joints that won't "run" The essential preparations are to cut and fix in position all or nearly all the wiring. Then tin all tags and contacts, and a touch with a hot iron at each joint completes the job.

"SECRET FORCES" AND TELEVISION.

The Editor, POPULAR WIRELESS.

Dear Sir,—You say that my statement, "It is necessary for the public to know of these two secret and powerful groups which are playing ducks and drakes with the fortunes of television," calls for explanation; you shall have it.

I repeat that there are these forces—hardly definitely organised, but present nevertheless—and they are secret to the public who do not know of them. The editorial standpoint of POPULAR WIRELESS might be classed with the opposing force, but on the extreme edge of it, and nearest to truth. I am wholly in praise of the £1,000 challenge offered by POPULAR WIRELESS.

Those who form the most dangerous part of the opposing force, and whom I condemn almost as strongly as the benighted members of the other force who damn Baird with exaggerated praise, are very largely noted men of science. One is Herr Aigner, in Vienna, whom I have found ready to argue mathematically and at great length that television can never come; and I am afraid that another is my friend Professor Arthur Korn, the photography pioneer. There are others in Great Britain and America. Seldom have these men investigated television sufficiently to realise the possibilities of surprise achievements, and because they have done excellent work with X-rays, or in some branch of radio, their words are marked with awe.

I have, already, Mr. Editor, read and enjoyed the contributions to POPULAR WIRELESS you suggest I should read. I will not agree with you that all known systems will never achieve popular television, though it is unlikely that they will.

In my lecture I was simply trying to leave the same impression as you consistently try to give—that the public should wait for proof before believing any exuberant statement about television.

Faithfully,

WILLIAM J. BRITAIN.

THE "FILADYNE" CIRCUIT.

The Editor, POPULAR WIRELESS.

Dear Sir,—I am writing you with regard to the results I have obtained when using a one-valve "Filadyne" circuit.

The local station (Stoke) is about one mile distant. From this station I get results good enough to give fair loud-speaker strength. With the use of tappings on the aerial coil I can cover from about 200 metres to 550 metres, and between these ranges I have heard about twenty-four different stations. When the two-valve circuit appeared in "Modern Wireless," with choke coupling to the second valve, I made it up, using a transformer with its primary burnt out as a choke. On the night I completed the set I received three American stations, but I listened to one, W G Y, 370.5 metres, so as to take notes of the programme. I have now received confirmation of this programme in the form of a card reading: "The General Electric Company acknowledges with thanks your communication reporting reception of a recent programme. Your comments are of distinct value as practical contributions to the success of this

CORRESPONDENCE

"SECRET FORCES" AND TELEVISION

THE "FILADYNE" CIRCUIT—THE WORD "ELIMINATOR."

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

company's broadcasting and planning of its programmes."

(Signature at bottom) "P. M. Crosier."

I should like you to print these results in your excellent paper for guidance of others interested in the "Filadyne."

Yours truly,

Stoke-on-Trent.

R. W. C.

THE "ANTIPODES ADAPTOR."

The Editor, POPULAR WIRELESS.

Dear Sir,—It may interest you to know that using the "Antipodes Adaptor" (described in "P.W." March 24th, 1923), in conjunction with the "Mullard Master Three," I have managed to hear 3 L O (Melbourne, Australia). Most of the usual Americans have also been received during the past week. The only alterations to the "Adaptor" were the omission of the H.F. choke (as the Climax choke in the "Master Three" goes equally well down to the low waves), and the substitution of the "Sydney" Two coil, loosely coupled to an aerial coil of 5 turns of 32 D.C.C. wound and tied together in hank form. The method of mounting the coil is the same as in the "Sydney" Two, with the aerial coil sliding over the former.

Thanking you for such an easy and quick "Adaptor" for broadcast to short waves.

Yours truly,

Waddon, Surrey.

A. D. M. WEBB.

THE WORD "ELIMINATOR."

The Editor, POPULAR WIRELESS.

Dear Sir,—With reference to the letter you publish from BM/CPH regarding the use of the word "Eliminator," in reference to apparatus which enables electric current to be taken from the mains for use with wireless sets, we should like to point out to him that, as pioneers in the manufacture of this class of apparatus, the expression "Eliminator"

has never appeared in our public announcements or pamphlets.

We, in fact, originated the expression, "High-Tension Supply Unit," and throughout the trade and by a very large public this expression is generally used.

Yours faithfully,

F. J. HAUGHTON,
Publicity Manager,
Phillips Lamps, Ltd.

145, Charing Cross Road, London, W.C.2.

PROGRAMMES ON 'PHONES.

The Editor, POPULAR WIRELESS.

Dear Sir,—Glancing through your issue of March 17th. I note remarks re H. A. B.'s programme on 'phones only, and H. B. G., of Derby's, suggestion. I do not disbelieve H. A. B. for a moment, as I had a like experience as far back as November or December, 1926.

The following may maintain the interest in this particular phenomena.

After completion of multi-valve set and commencing test in upstairs room on indoor aerial, I donned 'phones, plugged in, and received signals crystal strength before switching on any batteries; after removing coils, valves, grid leak, L.T. and H.T., and disconnecting condensers, signals still persisted. On finding I was able to receive with one 'phone tag laid on wiring, and holding the other tag between fingers, I walked over to mantelpiece and received 2 L O news bulletin from a brass candlestick (after disconnecting set, aerial, earth, etc.); also from a 1-in. nail in wall and various other things including the brass keyhole plate on a wardrobe door in another room.

After experimenting for a few weeks, I found signals could only be cut out by opening main switch; this was apparently induction from the mains, and so long as current was flowing in the house, signals were received.

Amplification was tried, but, beyond a slight increase on earthing one tag, when using telephones, nothing but a powerful hum from the speaker resulted, when trying direct from the mains through condensers and chokes, etc., anything metallic gave signals; the bulk of metal had no effect on strength of signals, a small tack or a brass fender, strength remained the same. I was inclined to the belief that someone on this supply, 240 volts D.C., is using mains for wireless battery power. On one occasion I received 5 G B off this famous tin tack, clear as a bell, crystal strength. All these facts conjured up visions of local power stations receiving broadcast, and distributing "light music" to its consumers for a small extra fee, a loud speaker plugged into the wall was rather simple.

I should like it to be clearly understood that these results were obtained without the existence of a wireless set of any description, in the room, this being purposely removed during experiments.

A satisfactory explanation of this phenomenon of induction and rectification without the usual apparatus would be welcome, and I think the publication of these facts would create a sudden mysterious activity among your many readers.

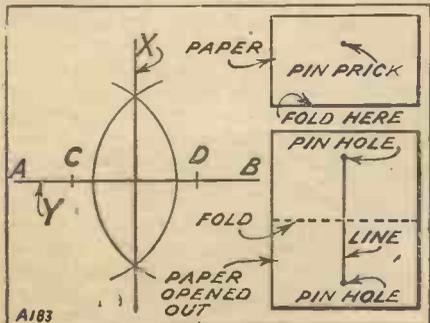
Yours faithfully,

S. G. CROWDER, G.I.E.E., M.I.Inst.E.

Harrow.

TRUE "SQUARES."

TRUE right angles or "squares" are very important when marking out panels, etc. The geometrical method of drafting a "square" direct on to material with pen or needle scribing compasses is shown diagrammatically. A-B represents one side of the right angle. Arcs are then struck with compasses at C and D at any point along the line, A-B. The line X is drawn through the points at which the arcs intersect, which results in the line Y being at true right angles to line X.



Temporary paper "squares" may quickly be made by folding a sheet of paper in half and placing a pin prick anywhere on the folded paper. Open the paper out and draw a line from one pin hole to the other. The result, when cut out, is a handy "square," formed by the line drawn and the line of fold made in the paper. Such a method may be used for cutting a permanent "set square" in celluloid or wood, the paper cut out being first used as a marking-out template.

H. B.

BROADCAST BREVITIES.

The number of hours worked by the London Station, 2 L O, during 1927 was 3,562.

During last year the total working time of all B.B.C. stations was 65,299 hours, 22 minutes.

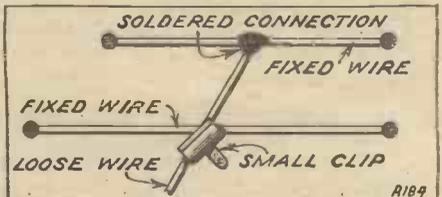
A recent talk on marmalade brought the B.B.C. no less than 1,500 applications for a recipe.

It is feared that Indian broadcast "piracy" is on the increase.

TEMPORARY CONNECTIONS.

WHEN re-wiring a set in which all the connections are soldered, it is often found that it is only necessary to disconnect one end of a particular wire. This leaves the wire in question loosely dangling from the other end. With a soldered joint it is highly probably that it will break off when it is desired that it should remain intact.

A simple method of obviating this is shown in the diagram, which is intended to represent a panel where alterations are



being made. The wire which is left disconnected at one end temporarily is secured to one of the fixed wires by means of a small clip, until the constructor is ready to fix the loose end. This simple little device will save a certain amount of time and work. H. B.

DURING the last few years there have been so many alterations in the designs of receivers that, judged by the present standards, sets which were regarded not so very long ago as being the last word in efficiency, are now looked upon as more or less obsolete, or, at any rate, rather old-fashioned. To build a completely new set is naturally an expensive matter, and to many people the idea of keeping an old set indefinitely fails to appeal, and so they are unable to decide as to the better course to adopt. To sell a set which is over two years old entails a heavy loss, as the depreciation on all types of wireless apparatus is far greater than on any other item in the household effects.



 Bringing your set up to date.
 From A "P.W." READER.

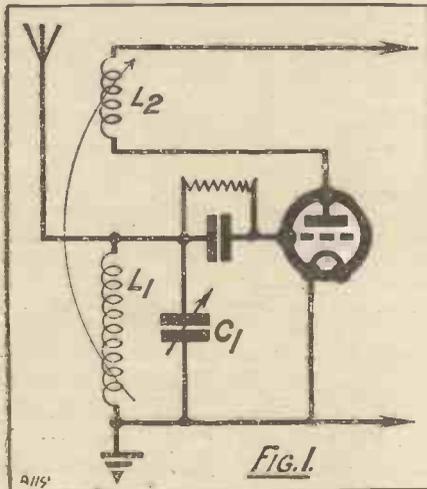
The theoretical connections of the detector circuit are bound to be fundamentally similar to those shown in Fig. 1, in which L_1 is the A.T.I., C_1 the A.T.C., and L_2 the reaction coil.

To alter this so that it conforms with the circuit shown in Fig. 2 is not going to be at all difficult. In the first place, the two-way coil holder is removed, and two single-coil holders substituted. These are to be not less than $1\frac{1}{2}$ in. apart, and must be placed so that the plug of one is opposite the socket of the other.

Improving Tuning.

There are at present on the market specially constructed double-coil holders having interchangeable plugs and sockets, for the purpose. An additional variable condenser will be required for reaction control, and this is another component that has been specially developed; if the set is slightly cramped, and there is not a great deal of panel space for mounting a normal size condenser, these small reaction condensers will, in one form or another, be found to serve quite as well.

It will be seen that a centre-tapped coil is used in the aerial circuit; this, for quite a small outlay, will materially improve the selectivity of the set, in fact, with this or the "X" type coil, tuning is sufficiently sharp to warrant the fitting of a slow-motion dial to the A.T.C. The other coil, L_3 , is an H.F. choke, which may be either a special component, a large coil, for instance, one



The alterations which are required to bring a set of the type under discussion into line with the trend of modern design will not prove so formidable as one would at first suppose. In many of these receivers the L.F. side of the set is quite capable of giving a tone and purity which will compare very favourably with the average up-to-date equipment if a good loud speaker and modern valves are employed.

Common Troubles.

The trouble will usually be found in the tuning and reaction circuits, which may not be sufficiently sensitive or selective to tune-in and hold the stations which should be heard on any really efficient set having two or more valves, in these days of powerful broadcasting. This is particularly noticeable in the case of magnetic reaction circuits having the moving coils mounted externally; as soon as the hand is moved away from the handle of the coil holder, the station, if it has had to be tuned with any degree of fineness, will often fade out, owing to a slight hand capacity, which may also affect the tuning of the variable condenser.

This sort of thing is apt to pall very quickly, and leads eventually to an apathetic attitude towards wireless, becoming responsible finally for the set being permanently tuned to the local station.

We will suppose, first of all, that the set to be altered is a straight three-valver, employing magnetic reaction; the two-way coil holder is mounted on the baseboard.

not less than No. 250, or may be made by the constructor. It is advisable to employ one or other of the first two mentioned, as an H.F. choke to be efficient must have a low self-capacity, and this factor receives due consideration both in the design of the commercial product and in tuning coils.

If it is decided to use a plug-in coil for the purpose, mount it as far from the other coils as possible, and, if space will allow, at right angles to them; this will guard against any interaction which might otherwise occur. The foregoing remarks must not be taken too literally, or to mean that the coil is to be placed at the other end of the baseboard, as this would necessitate an unduly long lead to the coil from the

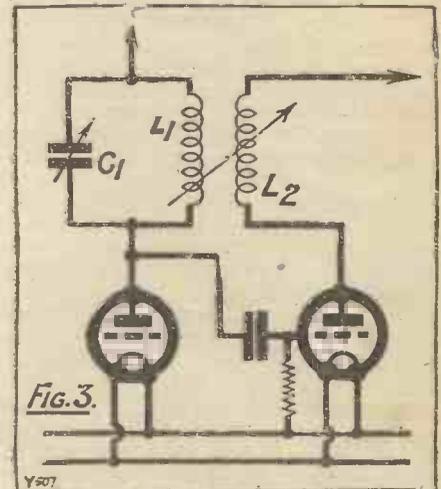


plate of the detector valve, and would do more harm than good.

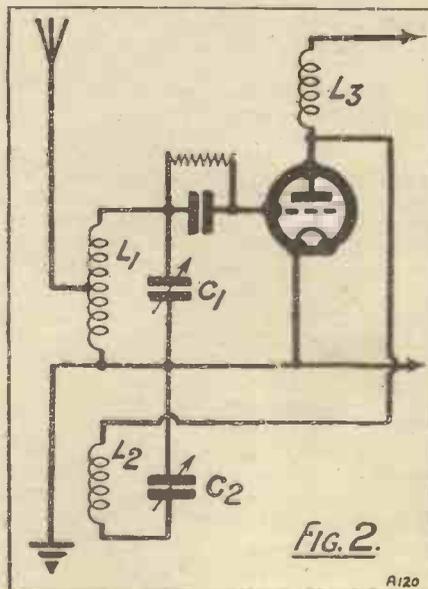
When wiring up to the circuit given in Fig. 2 see that the moving plates of the two variable condensers are connected together and to earth, for by this means tuning is more certain, as hand capacity is reduced to an almost negligible amount. The lead which is taken to the centre tap on the A.T.I. is of flex, and should be fitted with a spade terminal to facilitate connection, and to prevent fraying of the end, which would mean renewing the lead after a little use.

The H.F. Side.

It will be seen that there is nothing difficult in altering a set in which the detector is the first valve, and to effect similar improvements with an H.F. stage is not much more so. In Fig. 3 is given the anode and reaction circuit of a straight H.F. stage with reaction on the anode coil; the aerial circuit is not included, as that needs no comment, and does not immediately concern us.

The alterations are very similar to those already described for the plain detector as far as the actual components and wiring are concerned, but with the H.F. stage there are one or two little points which call for rather more attention. In the first place there are two H.F. chokes, one in the plate circuit of each valve, and as this is the case there will be no room to have plug-in coils for the purpose.

(Continued on next page.)



MOVING WITH THE TIMES.

(Continued from previous page.)

The two-way coil holder is replaced by two fixed coil holders, and an extra condenser is required for reaction control as before described. There is also a fixed condenser (C_3) of .0003 mfd. capacity connected between the plate of the H.F. valve and the tuned grid circuit, which is to prevent the H.T. short-circuiting through the grid coil to L.T. negative.

Transformer Coupling.

A centre-tapped coil in the aerial circuit will improve the selectivity considerably, and ensuring that the moving plates of the A.T.C. are connected to earth will minimise hand capacity; with the alterations carried out as suggested the moving plates of the three condensers may be joined and earthed by one lead. As previously mentioned, the H.F. chokes should be kept away from the tuning coils, but as this time the commercial product must be employed, this will not cause much trouble.

If transformer coupling is used with reaction on the A.T.I. as shown in Fig. 5, there will have to be quite a re-shuffle of the components to bring the set into line with Fig. 6. Both the two-way coil holder and the H.F. transformer will have to be removed, the former replaced by a single-coil holder, the latter by two mounted as described.

Two H.F. chokes are required, also the .0003 fixed condenser (C_4), and reaction condenser as shown in the diagram. The same suggestions concerning the mounting of the coils and chokes, earthing the moving plates of the variable condensers, and so forth, are all equally applicable, and should be carefully noted.

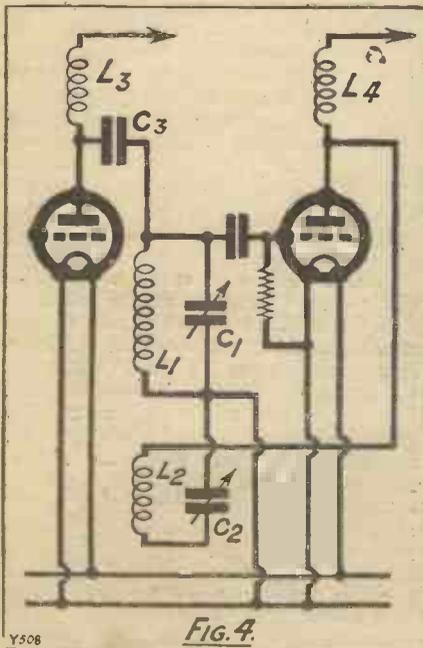


FIG. 4.

The coils for use when the alterations have been carried out will be as follows: in Fig. 2: L_1 —60 centre-tapped, L_2 —40-50;

in Fig. 4: L_1 —60, L_2 —40-60; in Fig. 6: L_1 —60 centre-tapped, L_2 —60, L_3 —40-60. The size of the reaction coil may be varied to obtain best results, and will depend on the capacity of the condenser used in conjunction with it.

Another advantage would be to employ a split-primary transformer in Fig. 5 and to use a neutralising condenser, the reaction being altered to conform with the type used in Fig. 6, and acting on the secondary winding of the H.F. transformer. Split-secondary neutralisation could be employed in Fig. 4 if desired, the split-secondary coil, of course, being the grid coil of the H.F. valve.

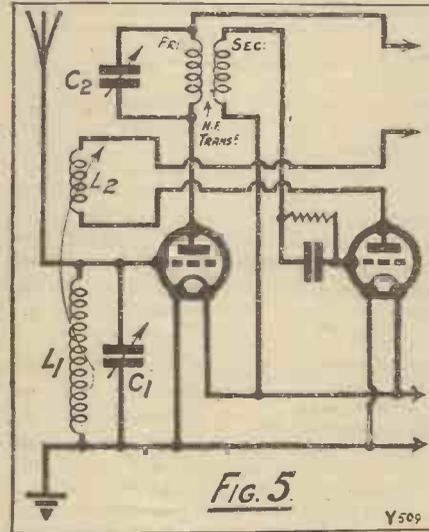


FIG. 5.

"PRACTICAL TELEVISION."

A book by E. T. Larner, with a foreword by J. L. Baird, has just been published by Ernest Benn, Ltd., at 10s. 6d. net.

MR. LARNER rightly believes in striking whilst the iron is hot, and his book is, on the whole, a praiseworthy attempt to instruct the general public in a subject on which there is at present undoubtedly more widespread interest and, may it be said, optimism, than first-hand knowledge.

More than two-thirds of the letterpress is devoted to a survey of the various systems that have preceded the advent of true television, which the author generously attributes to Mr. J. L. Baird. He does, however, make casual reference to the experiments carried out by the American Telephone and Telegraph Company in the early part of 1927, though he fails to emphasize their achievement in covering a distance of over 20 miles by true "wireless," or radio vision methods.

Pioneer Work.

Further, he states that the apparatus used by the American Company was a modification of that used by Mr. Baird, though it would surely be fairer to point out that, so far as the analysing and synthesising methods were concerned, both

are derived from a common and earlier stock of knowledge.

The earlier portions of the book give a fairly exhaustive and detailed account of the pioneer work done by such well-known workers in the art of still-picture transmission as Bain, Korn, The Bell Telephone Laboratories, Ranger, and others.

Special chapters are devoted to the selenium cell, to the development of the photo-electric effect, and to the optical theory of the formation of images.

In the field of television proper, or the transmission of moving-picture effects, either by wire or through the ether, a summary is given of the work carried out in this direction by Belin, Holweek, Mihaly, Jenkins, and Alexanderson.

"Disappointing."

The last chapters are devoted to a description of the Baird Televisor. It must be said that they add little to descriptions already published in the technical press, apart from the description of a new "optical lever" device, which apparently increases the speed of the exploring pencil of light at the expense of light-intensity. At first sight, this merely appears to be a question of robbing Peter to pay Paul.

From the point of view of disclosing the latest technical improvements in the Baird Televisor, or of enlightening the public as to the scientific principles which distinguish the Televisor from other systems of picture transmission, Mr. Larner's book must, frankly, be deemed disappointing.

SEXTON O'CONNOR.

BATTERY BREVITIES.

A coating of petroleum jelly or vaseline will prevent accumulator terminals from becoming corroded.

If your accumulator terminals are coated with a green deposit, this may be removed by a solution of ordinary washing soda.

The paste inside the ordinary flash-lamp battery is highly destructive, so it should not be allowed to come into contact with carpets, etc.

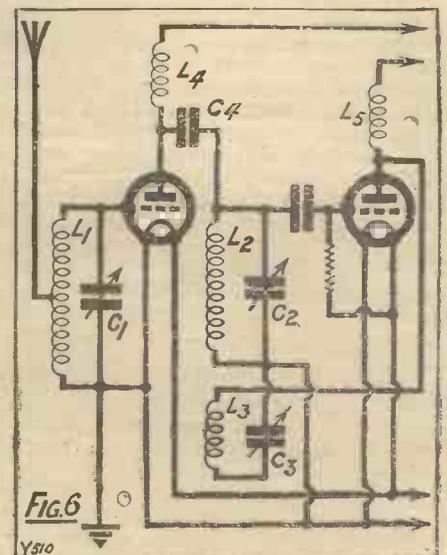


FIG. 6.



VALVE VARIATIONS

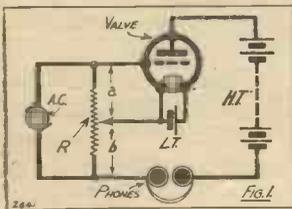
WHEN you go into a shop and buy a particular valve which is rated by the makers as having an impedance of, say, 20,000 ohms and an amplification factor of 20, you probably have a pretty definite idea that when you put it into your set, no matter under what conditions it may be working, its impedance will be 20,000 ohms and its amplification will still be 20.

There is, however, another characteristic of the valve which is known as its mutual conductance, which is merely a complicated way of describing the slope of the grid volts-anode current characteristic, which has an important influence on the functioning of the valve. The valve is, however, one of the most variable of things, and the only thing about it that remains anywhere near constant is its amplification factor.

The Amplification Factor.

In view of the fact that this article is going to describe how valves vary we had better take one of the most important factors first, that is the amplification factor of the valve, and see whether this remains reasonably constant under varying conditions.

There are several different ways in which the amplification factor of a valve may be obtained. A simple method is shown in Fig. 1, where a valve is under test. R is a potentiometer, and an alternating current is impressed on the circuit as shown.



The slider of the potentiometer (which must of course have a resistance suitable for the purpose for which it is used) should be moved until a point is found at which no sound is heard in the telephones.

The amplification factor of the valve will then be equal to $\frac{B}{A}$. In cases where no source of A.C. is available, another form of the circuit is shown in Fig. 2. Three meters are required for the purpose of this test, two voltmeters and a milliammeter.

Simple Measurement Scheme.

The amplification factor is obtained by noting the change in anode current per grid volt change and then finding what change in anode voltage has to be made in order to produce the same change in anode current.

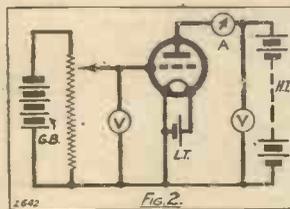
This then gives us the amplification factor, or put in another way, the change in grid volts required to produce a given

An interesting discourse on the characteristics of valves which will help you to choose your "tubes" correctly and make the most of every stage of your set.

By C. P. ALLINSON, A.M.I.R.E.

change in anode current divided into the change in anode volts which will produce the same change in anode current will give the amplification factor of the valve.

Now what are the variable factors in this circuit? The most obvious ones, of course,



are the high tension and grid bias, but there is a third variable which is the filament potential of the valve itself. We can measure the amplification factor of the valve under all kinds of varying conditions, and we will find that there is but little change in its numerical value.

It has been found, indeed, that with a high-tension voltage as low as only 2 volts, the amplification factor obtained has been substantially the same as that given when 120 volts H.T. was employed. Of course, if the grid of the valve is made positive, a reduction in the amplification obtainable is experienced in practice. This is, of course, due to the damping introduced into the circuits associated with the valve.

With modern dull emitters this can be very high indeed, a positive potential of 2 or 3 volts being sufficient to pass anything up to 60 or 70 microamps in grid current.

What happens, however, when we place a load in the plate circuit of the valve? This may be an impedance such as the primary of an L.F. transformer or a pair of headphones or a resistance as used in resistance-capacity coupling.

In the case of an impedance, assuming that its reactance is much greater than its resistance, we shall find that the actual amplification factor under working conditions will be slightly

less than the theoretical amplification factor obtained by use of one of the circuits given. The difference, however, will not be great, and the amplification obtained may be between 90 and 95 per cent of the theoretical factor.

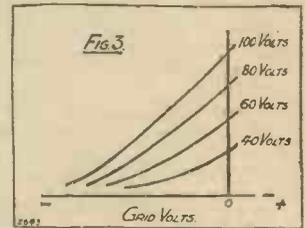
In the case of a resistance, however, it is by no means unusual to find that an actual amplification of only 50 or 60 per cent of the theoretical amplification factor of the valve is to be obtained, though when working under the most favourable conditions it is possible to get a far higher percentage than this, up to 80 or 85 per cent.

High Value Anode Resistances.

This is one of the facts which is so highly in favour of the use of the new and very high values of anode resistances such as are frequently used, i.e. in the neighbourhood of 2 megohms, in that a far larger percentage of the theoretical amplification of the valve is obtainable than with the more usual value of resistance in the neighbourhood of 100,000 ohms.

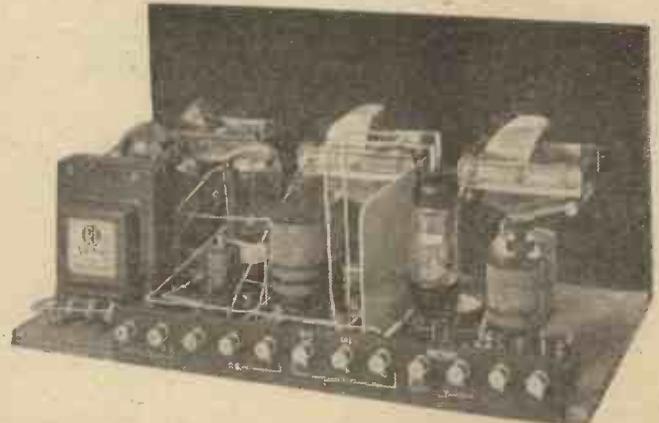
In the case of an H.F. valve, by suitably

designing the H.F. transformer used to couple it to the next valve we can get almost the full amplification factor of the valve when



working under ideal conditions. It is not usual in a receiver, however, owing to damping, stray capacity effects, stray fields and unwanted coupling of this description, for us to get anything like this

(Continued on next page.)



The peculiarity of the new screened-grid H.F. valve, one of which is shown in the above photo, is that it has a very high amplification factor, but its impedance is also of a high order.

VALVE VARIATIONS.

(Continued from previous page.)

figure. This is not actually the fault of the valve, but is a defect which is inherent to any circuit and is imposed by the practical requirements of each particular circuit.

The two factors which generally govern the choice of a valve by a purchaser are

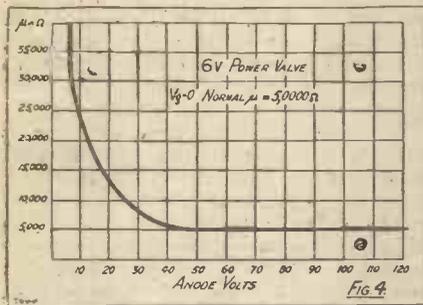


FIG. 4.

the amplification factor and the impedance, to say nothing of the price. This, however, is a factor which is quite outside our control, unfortunately. We have briefly considered what happens to the amplification factor under varying conditions, let us now see what happens to the impedance.

To talk about the impedance of a valve is not quite strictly correct, a more suitable

instance, we shall find that its impedance actually may be in the neighbourhood of 25,000 or 26,000 ohms, and that as we raise the high-tension voltage at which we measure the impedance of the valve we find that the impedance drops and drops until at the normal H.T. voltage of 100, or say 120 volts, depending on the valve which we are measuring, it is found that the impedance will now come down to the rated value.

Let us increase the value of H.T., however, and see what happens. Even a change of 10 volts upwards shows a difference, and when we get up to 150 or 160 volts H.T. we find that the impedance of the valve drops from 20,000 to perhaps 18,000 or 17,000 ohms. The curve shown in Fig. 4 illustrates the variation in impedance with anode voltage in the case of a 6-volt power valve.

It would therefore appear that we have a ready means of altering the impedance of a valve by altering the value of the H.T. supply. Unfortunately, it is not quite so simple as this, for by changing the value of H.T. we also change the slope or mutual conductance of the valve.

Effect of Grid Potential.

Now the over-all efficiency of a valve is a function of the amplification factor and the slope, and if you reduce the slope of a valve you reduce its over-all efficiency, so that by reducing the H.T. applied to the anode of a valve in order to bring up its impedance we reduce, at the same time, its efficiency, because we have reduced its slope.

Fig. 3 shows a number of characteristic curves taken at various values of H.T. Although I have somewhat exaggerated what actually occurs it will be found in practice that the slope of the curve is increased as the H.T. is increased. It will further be seen from this figure that the slope of the valve varies with the grid potential, especially when we come on to the curved portion of the characteristic, where a small variation of grid voltage makes a large difference in the slope of the curve.

What difference does the grid voltage have on the impedance of the valve? On making measurements we find that it has a very important influence

that as we make the grid more and more negative the impedance of the valve gradually rises. If, however, we make the grid positive, then the impedance drops very rapidly, but this is not a condition under which we work in actual practice, except in the case of the detector valve when using leaky grid condenser rectification. Fig. 5 shows exactly how the impedance of a valve varies with the grid potential.

Filament Temperature.

Another thing which affects the impedance of a valve is the filament temperature, and it is found that as the filament current is gradually reduced the impedance rapidly rises, while the slope gets less, though the amplification factor hardly changes. Actually the change in amplification factor is so small as to be negligible. Fig. 6 shows

how the impedance of a valve is affected by the filament voltage.

One point which we have not yet considered is the variation of the amplification factor of a valve with the grid potential. From the readings I obtained under these conditions I found that the greatest variation in the amplification factor was obtained by varying the grid potential of the valve, but even then the variation was not more than 10 per cent.

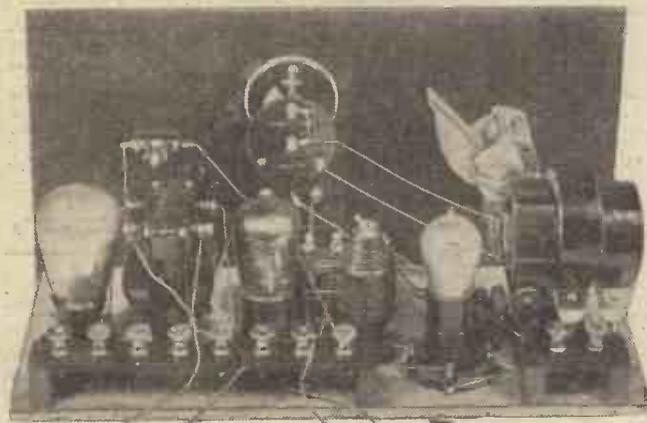
In Fig. 7 I have plotted the amplification factor of a valve against grid-bias voltage, and it will be seen curiously enough that the maximum amplification factor is given at zero grid volts. When the grid of a valve is made either positive or negative there is a slight drop in amplification factor, the greatest drop being experienced when the grid becomes positive.

We therefore see that under practical working conditions, when the grid becomes positive, not only does the amplification of the circuit as a whole fall off owing to the damping introduced by the grid current, but also the amplification factor of the valve itself is reduced owing to the positive potential on the grid.

In Detector Circuits.

With the usual grid condenser and 2-megohm leak connected to low-tension positive detector circuit the impedance of the valve may drop to a half or even a third of its rated impedance.

When, however, anode-bend rectification is used, then the impedance of the valve increases very greatly and may rise to a value of two or three times the normal impedance of the valve. This shows the importance of choosing correct valves.



A point worth noting is that the physical shape or dimensions of a valve afford no indication as to its purpose. The big valve seen above could be of an H.F. type and capable of handling but small inputs, while one of the smaller valves might well be of the super-power class.

and accurate term of description being the "differential A.C. resistance." Let us imagine, however, a conversation between two wireless amateurs who are talking about valve impedance and substitute the phrase "differential A.C. resistance" for "impedance" in each case throughout the conversation and we should soon see what a cumbersome term this is.

How "Impedance" Varies.

The impedance of a valve is obtained from the anode-volts anode-current curve, i.e. the change in anode current plotted against the change in anode volts.

Taking a valve which has a normal impedance of 20,000 ohms and measuring this at a plate voltage of about 20 volts for

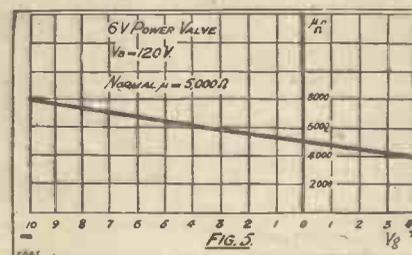


FIG. 5.

again on this already extremely variable factor. Keeping the anode voltage fixed and starting at zero grid volts we find

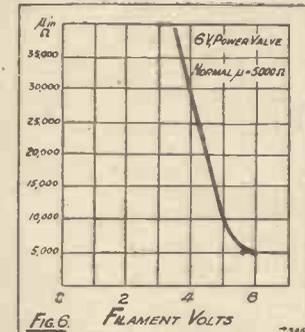


FIG. 6.

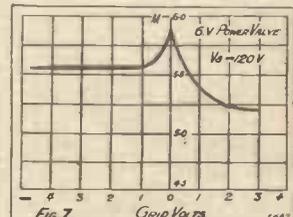


FIG. 7.

Build this two-valve amplifier with

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BROADCASTING TOPICS.

Licence Figures Still Rising—The Regional Scheme—"Rugby"—
The Radio Parasite."

By THE EDITOR.

WHATEVER may be the general opinion about the quality of the B.B.C. programmes, the number of receiving licences issued by the Post Office continues to increase. According to the latest figures the number of licences in force has risen at the rate of over a thousand a day, and by the end of February the total was 2,451,051, which represents an increase of about 33,000 as compared to the January figure. Since December, there have been 95,000 new licences issued.

If we calculate at the rate of three or four listeners for each wireless set, it will be seen that there is a listening audience in the country of very nearly 10,000,000.

The B.B.C., consequently, will be receiving during the twelve months ending March next a bigger grant than they received last year. It is estimated that they will receive £880,000, which exceeds the figure for the current financial year by £75,000. These figures have been issued in the estimates of the Revenue Department.

Licence Figures Still Rising.

The Post Office deducts 12½ per cent from the gross income received from wireless licences. This 12½ per cent is supposed to cover the cost of the collection of licence fees, etc. When this has been done, the B.B.C. receive 90 per cent of the balance as regards the first million licences, 80 per cent of the second, and 70 per cent of the third million.

All this points to a steady increase in the popularity of broadcasting, and it is certainly a very good answer to those critics who maintain that the B.B.C. is losing ground, and that interest in broadcasting is waning. It has been suggested, however, that as there have been more than a thousand prosecutions of listeners who have failed to take out licences, this has had the effect of making many pirates come to heel as regards paying their licence fees. There may be something in this, but it is doubtful whether it really explains the fact that licences during the last three months have shown a rise at the rate of over a thousand a day.

Renewed inquiries at the B.B.C. with regard to the Regional Scheme have again been met with the reply that the Post Office has not yet given permission for the scheme to be proceeded with. It is now two or three years since the Regional Scheme was first suggested, and the general impression, as has been pointed out in these columns before, is that although the scheme is very fine on paper, it does not seem to lend itself to practical fulfilment.

The Regional Scheme.

Anyway, the only definite sign is 5 G B, and listeners are wondering more and more whether the full Regional Scheme is ever likely to mature. It must be admitted that the B.B.C. has strained every nerve in this direction, but for some reason or other the Post Office seems to be more than usually slow in the matter.

It was suggested the other day that as the Post Office station at Rugby is certainly not paying its way, some sort of an arrangement might be arrived at with the authorities for Rugby to devote part of its time to broadcasting. It is interesting to note, by the way, that POPULAR WIRELESS, some time ago now, published an article entitled: "Rugby, The Radio Parasite," suggesting that even before the station was completed it would be out of date, for in the modern trend in transmission design was in the direction of short-wave beam stations.

Rugby—The Radio Parasite.

Rugby, these days, seems to be making more use of short waves on low power. The station is capable of utilising a power of something like 800 kilowatts, but despite the inauguration of transatlantic telephone services and the transmission of official Press bulletins, etc., there is no doubt that Rugby is not being overworked, and that when it does transmit it makes more and more use of short waves, as any listener can test for himself if he listens in on the short waves when Rugby is transmitting.

Rugby seems to be proving itself more

impression is that a good deal of difficulty exists in producing complete freedom from hum. Never having had trouble in this direction myself, I find it difficult to give advice on the subject. As a general rule, however, I certainly say that there should be no need to go to such extremes as screening the set or earthing the valve bases. Probably the golden rule is to keep the leads in the detector circuit as short as possible, and to keep the coils well away from any house wiring or transformers in use on the eliminator.

Semi-Vertical Aerials.

A semi-vertical aerial that I have in use at present seems to be giving excellent results on really long-distance stations. By arranging an inverted L type, I can obtain a length of over 100 ft., but the available 70 ft. of "semi-vertical," i.e. straight up from the window to the top of the mast, gives better results altogether, both from reception and transmission points of view. Probably location has a good deal to do with it.

Incidentally, those who are situated near main roads now find trouble arising on 23 metres that was never experienced on 45 and 90 metres. I am, of course, referring to bus and car magnetos. Not until a few days back did I realise what an appalling clatter exists in such localities! A friend finds it practically impossible to receive 2 X A D on 21 metres for more than ten consecutive minutes, or even less, on account of this trouble. It is difficult indeed to suggest a remedy in cases like this, other than screening the whole set in a copper box and earthing it. Even this does not always produce a complete cure.

The B.B.C.'s Chance.

2 X A D, by the way, has improved again lately, and if you have been neglecting your 20-metre coils, return to them at once while conditions are good. He sometimes comes in at 10.30 to 11 p.m. at almost unbelievable strength, and one has quite the impression of listening to a powerful local station. No fading is noticed at all, and if the B.B.C. ever had an opportunity of a really impressive relay, it is here now.



One of the features of the new wireless station which serves the Croydon Aerodrome is a very complete and efficient earthing system. The connecting wires shown in the above photo are joined to a large buried earth ring which surrounds the station.

and more a white elephant, for, despite a recent reduction in the transatlantic telephone charges, it is still very much underworked in this direction.

SHORT-WAVE NOTES.

By W. L. S.

MY recent notes on eliminators have brought me some correspondence on the subject from short-wave fans in various parts of the country, and the general

Ten Metres.

The "ultra-super-short waves" are now undergoing startling developments. Not until this year has transatlantic work been carried out on 10 metres, but it has now been accomplished four or five times, and the 10-metre wave, after the initial trouble in getting down there, seems fairly consistent. I am not forecasting the growth of broadcasting stations on 10 metres; but, after all, the whole spectrum of short wave-lengths has been brought into use very slowly, and "a bit at a time," and there is no possible reason why the 10-metre band should not ultimately prove the pick of the whole band.

Thro' the long drawn
 aisle and fretted vault
 the pealing anthem
 swells the note of
 praise

Cathedral choristers with selected voices—from some famous edifice—let them sing to you. Let their voices come to you clear and loud. For this you must have smoothness of current for your valves, and nothing is smoother than the current of a Lissen battery. There is no ripple in it, there is no noise. It is free from hum. It yields power in abundance, and the power lasts. For there is a new process and new chemical combination embodied in the Lissen battery which is known only to Lissen.

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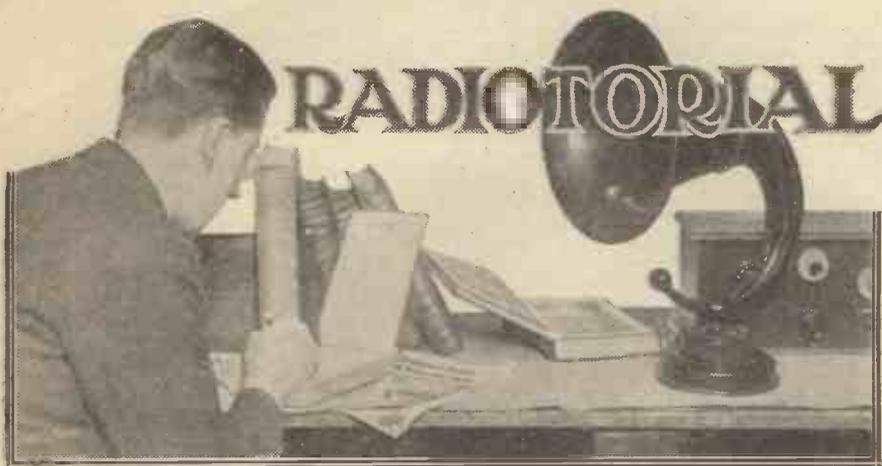
For economical power, for good power, for the best kind of power, for radio use a Lissen battery. You can buy it from any one of 10,000 radio dealers. Ask for a Lissen and show plainly by the way you ask that you mean to take no other.

60 volts (reads 66v.)	7/11
100 volts (reads 108v.)	12/11
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4½ volt Pocket Battery	5d.

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

QUESTIONS AND ANSWERS.

DISTORTION.

R. C. C. (Accrington, Lancs).—"I have heard a lot about distortion, and I have heard plenty of it, goodness knows. But although there are plenty of high-brow explanations, such as H.F. leakage in L.F. circuits, and so on, there seems to be very little practical information as to where one is to look for distortion in a set. I mean to say, is it the grid leak, or is it the coil, or what?"

The following are the commonest causes of distortion:

(a) Too much reaction, i.e. reaction coil with too many turns of wire, or reaction condenser of too high a capacity.

(b) One or more of the batteries running down.

(c) The use of unsuitable valves, such as a detector valve used for the last stage, in a loud-speaker set.

(d) Incorrect voltages of either the H.T., L.T., or grid-bias batteries.

(e) The use of a grid leak of unsuitable value.

In addition, sets which employ neutrodyne condensers are often guilty of distortion if the setting of the condenser is not accurate.

SHORT-WAVE ABBREVIATIONS.

"OLD SOLDIER" (Coventry, Warwickshire).—"What I did in the Great War, daddy, was to sit underground, and take short messages from an aeroplane which was spotting for a gun battery! And being able to read Morse I now get as much fun out of short-wave amateur signals and other Morse signalling as I do out of broadcasting. I am trying to learn all the abbreviations, and although I have a list (starting with 'QRA—What is the name of your station,' etc.), there are several signals for which I am unable to find a meaning. Can you tell me, for instance, what QSSS means, and QSS?"

By common consent the letters QSS mean "fading signals." So if they are followed by a query it means "Are my signals fading?" And the group QSS without a query means "your signals are fading." QSSS means "Are my signals swinging?" whilst QSSS without a query means "Your signals are swinging."

HOW DOES THE VALVE WORK?

S. G. (Biggleswade, Beds.).—"What makes the valve work? Why do we always connect an aerial to it, and why do we tune between

"P.W." TECHNICAL QUERY DEPARTMENT

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

Full details, including a revised scale of charges, can be obtained direct from the Technical Query Dept., "Popular Wireless," Tallis House, Tallis Street, London, E.C.4.

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

grid and filament with the coil and condenser? In fact, what does really happen inside a valve?"

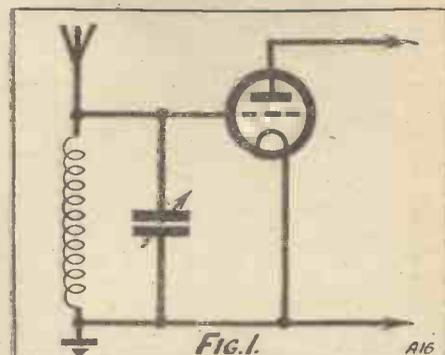
You have raised some very big questions here, S. G., and although it is impossible to reply at all fully, we hope that the accompanying diagram will help to make clear the operation of a valve. In the diagram, the essential parts of a tuning circuit and the electrodes of a valve are shown, and no doubt you will recognise these quite readily; only the essential connections are shown.

To understand how the valve works we must imagine that its filament is glowing, and that particles of negative electricity (called electrons) are constantly leaving the filament and flying across the valve to the plate. To do this they have to pass the grid. Many millions of electrons are making this journey when the valve is in operation.

This steady current is made to pass through the telephones, and if the aerial and tuning circuits are properly connected to the valve, the current flowing

through the telephones will be so modified that it will reproduce the broadcasting which is being tuned in.

How this happens can be understood when it is realised that the grid is placed in a strategic position to intercept the current that is flowing from filament



to plate, and to modify or alter its volume. (See Fig. 1.) When we connect up the H.T. battery, we make the filament of the valve negative and the plate of the valve positive.

Voltage Variations.

If we leave the grid circuit unconnected it will exercise practically no effect on the stream flowing between negative and positive across the valve; but if we charge the grid with electricity it will have a very marked effect upon the current stream flowing across here. Probably you remember that negative repels negative and that positive repels positive. If, therefore, we make a grid negative enough it will repel all the negatives from the filament and force them back, so that they cannot pass over to the plate terminal at all, and thus we shall cut off the supply to the telephones. If we make the grid a little negative, we should cut off the supply to a small degree, and if we impart constant small charges to the grid we should constantly modify the plate current accordingly.

Now, when a tuned circuit is connected, as shown in the diagram between the filament and grid of the valve, current flowing in the aerial-earth circuit will set up voltages across this portion of the circuit, and these voltages will vary exactly as the currents flowing in the aerial vary. In other words, the other waves flowing in the aerial will tend to produce voltage variations between grid and filament of the valve.

Now, voltage variations between grid and filament of the valve result in current variations between filament and the plate of the valve (that is to say, plate variations in the telephone circuit), and it is these plate current variations in the telephone circuit that operate the telephones by causing corresponding magnetic impulses that pull and push the diaphragm in such a way, and with such a frequency that the speech-frequency, which was a characteristic of the received wave, is reproduced in the telephones.

There are, of course, many other aspects which affect reception, but this is a very brief statement of the reason underlying the various connections to the valve.

THE HUMMING BIRD.

E. J. T. (Richmond, Surrey).—"When I bought it, my idea was to get a sort of 'Melody Maker'; instead of that I got a humming bird. It is powerful all right, and I can hear the programmes all right—but, oh boy, the hum! As soon as I switch on there is a hum and a drone like ten thousand aeroplane engines!"

"I called in a friend who thinks he knows a lot about wireless, but I have come to the conclusion that he does not know so much as I thought he did, for all he could suggest was that it was the electric light! The set hummed and hummed, and my friend hummed and ha-ed, and altogether I am fed up to the teeth with it—and him, too! Do you think it is the electric light, and, if so, can you tell why it still goes on when all the lights are switched off? And can you suggest how I can make this humming bird into a proper songster that will make a noise that is worth listening to?"

You can soon find out whether it is something in the set itself or in the position of it, because if the set is all right it would work O.K. on another aerial where good results are being enjoyed at present. Why not try it on your friend's aerial and earth to decide this point?

If it works well there—and we expect it will—we expect that you can make it work well at home, too, by a little attention to the aerial and earth connections. Possibly, as at present arranged, your lead-in comes close to some of the electric wiring in the house.

(Continued on next page.)

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

Or, if the lead-in is O.K., perhaps the earth wire, on its journey to the earth terminal or to the buried earth or water tap, passes close to the house wiring.

You must keep these wires—indeed, all the wires to and from the set—as far as possible from the electric light wiring, remembering that the latter may be concealed in the walls of the house. We should, first of all, disconnect the aerial and see if the humming is just as bad. If so, probably the earth lead is to blame. Test this by reconnecting the aerial and disconnecting the earth lead; and, finally, you could shift the set itself to see what effect this made upon the humming. In this way you should soon be able to trace where the interference is coming from, and by rearranging the wire suitably you should completely overcome it.

THE "ALL-PROGRAMME" THREE.

L.S. Reading (Berks). "I am going to build the 'All-Programme' Three, which was recently described in 'P.W.' What 6-volt valves should I use for it?"

For the first and second valve sockets you should have valves of fairly high impedance and high-amplification factor. For these positions valves with an impedance of, say, 30,000 ohms are O.K., the second valve having a slight negative grid bias of, say, 1½ or 3 volts. For the last stage you will require a super-power valve or, at least, a good power valve, several good examples of the former being obtainable in the 6-volt class.

CALCULATING FILAMENT RESISTANCE VALUES.

"CAPACITY CHARLIE" (Rugby, Warwickshire).—"I have a 6-volt accumulator, and I want to use 2-volt valves with it. How can I calculate what should be the value of the resistance in series with the 2-volt valves? I must know this because the last valve in the set is a 6-volt power valve, and I have not a 2-volt valve of this class; but I have several variable rheostats on hand which I could

insert into the leads of the valves in which I want to use 2-volters. What I am puzzled about is to know how many ohms to put in them. Can you tell me, so that I can work it out for various valves?"

In such a case the resistance of the rheostat, or of the fixed resistor, which is necessary with a valve that should be run from a lower voltage than that of the accumulator, can easily be calculated by a slight modification of the ordinary Ohms law formula.

Ohms law says that if the volts are divided by the current in amperes, the answer will be the resistance in ohms; in other words,

$$R = \frac{V}{C}$$

If we call the correct consumption of the 2-volt valve C, and if we subtract the voltage at which the 2-volt valve should operate from the voltage of the accumulator and call this figure E, then the required resistance R in ohms will be equivalent to E divided by C. For instance, supposing that we are going to use a 6-volt accumulator with a valve which is rated to take .25 ampere filament current at 1.8 volts, we can use the above formula as follows:

To determine E we take 1.8 volts from 6 volts, and the answer is 4.2 volts. This gives us E, and C is the rated current consumption of the valve—i.e. 25 amperes. To find R we divide C into E and, in this case, the answer is 16.8.

In other words, if a 6-volt accumulator is to be employed instead of 1.8 volts, an additional resistance of 16.8 ohms will be necessary in the circuit. Any other resistances can be worked out in the same manner.

TELEVISION.

E. J. (Leystonstone).—"I want a real good television set. Where can I get one?"

We rather suspect you are trying to pull our leg, E. J.; but, in any case, real television sets are not yet available to the public. If they were available, their cost would be absolutely prohibitive. And, finally, there is no immediate prospect of a television service starting, so that, even if you got the set, there is nothing to see!

OSCILLATION WITHOUT HOWLING.

M. L. (Amersham Common, Bucks).—"It is a two-valve set. And my neighbour complains that when I switch it on I take away

all his reception. And he says I can be prosecuted for oscillating. But my set does not howl at all, and, once it is switched on, I leave it alone. And never readjust it until the end of the performance, when I switch it off again. Is it possible for the set to oscillate without my being aware of it?"

It is possible for the set to oscillate without it making this condition known to its owner by means of howls or squeals, as an oscillating set often only squeals or whistles or chirps when its tuning dial is being adjusted.

If the tuning dial is not adjusted whilst it is oscillating it is quite possible that there will be no chirp, whistle, etc., but nevertheless the owner should be able to tell whether it is oscillating, because the quality is generally decidedly poor, speech inevitably being indistinct, and the music being rather harsh.

If your set has a knob or handle marked "increase," or "strengthen," or "reaction," it is possible that this has become knocked out of position, and consequently the set is oscillating all the time the set is in use and upsetting your neighbour's reception.

On the other hand, it is quite possible for a set which is not oscillating to have a marked effect upon a neighbour's receiver if the two aeriels happen to run very close to one another. Even sets which cannot possibly oscillate, such as crystal sets, can have a marked effect upon one another in this way, owing to interaction across the space between the two aeriels.

The only remedy is to increase this space as far as possible. In other words, to separate the two aeriels, not merely getting them the greatest distance apart but, if possible, making one cross underneath or above the other, and run at an angle to it instead of running parallel with it. If the aeriels must run in the same direction, i.e. perhaps both north and south, it will be advantageous to have one aerial pretty high and the other pretty low, so that the distance between them is at a maximum.

If you have a friend who has had a little experience in wireless, he can easily tell you whether your set is oscillating or not from a brief inspection of it, or you can make a rough-and-ready test for yourself, by wetting your finger and tapping the aerial terminal with it when the set is in action.

If, then, you can hear very loud clicks corresponding in the telephones or loud speaker, it is probable that you are using a little too much reaction and either oscillating or getting very near to it; but if the tapping is inaudible, or only just audible, you

(Continued on page 302.)

APPARATUS TESTED

NEW OLDHAM ACCUMULATOR—DUAL RHEOSTATS, SIX-PIN COIL BASES—DUBILIER K.C. CONDENSER, etc., etc.

Traders and manufacturers are invited to submit wireless sets and components to the "P.W." Technical Department for test. All tests are carried out with strict impartiality in the "P.W." testing-room, under the supervision of the Technical Editor, and the general reader is asked to note that this weekly article is also intended to provide a reliable and unbiased guide as to what to buy and what to avoid.—EDITOR.

NEW OLDHAM ACCUMULATOR.

IT is owing to the fact that the modern valve is of such an economical nature that there is always a possibility that the average accumulator does not receive the care and attention it needs. A three-valve receiver may require only .3 amp. L.T., and elementary arithmetic shows that with a battery having an ampere-hour capacity of 30, some 100 hours or so of running can be attained before re-charging

becomes essential. But most accumulators need to be attended to at least once a month if their lives are to be usefully long.

The Oldham people have, however, produced an accumulator specially suitable for slow discharge work, but which can be quickly charged. It, therefore, fulfils modern requirements and is just the battery the average listener having a three or more valve set, using modern dull-emitters, needs.

This new Oldham is known as the U. V. D., and is of a particularly robust character. Of paramount importance in its design are the strong laminated plates—a feature which did much to enhance the popularity of the original and smaller Oldham slow-discharge cell. Also, it has a thick glass case, an item which will appeal to the amateur who has had trouble with the celluloid distortion, cracking, and consequent leakage which occurs with some of the cheaper cells cased in this material after but a few months of service.

The Oldham people have also produced a patent skeleton type of carrier for their new cell. This fits under a moulded shoulder in the glass case of the battery. It can be fitted or removed very readily, and cannot possibly become misplaced. The use of this carrier eliminates one more accumulator snag—i.e. that of carrying it with something which acid will not readily destroy.

Messrs. Oldham have solved a number of incidental battery problems with the introduction of the above devices, and we feel sure readers will accord these items a hearty welcome. The U. V. D. cell is rather large for its capacity, but in view of its robustness it can be forgiven for that.

DUAL RHEOSTATS.

The Burndep Wireless, Ltd., recently sent us one of their Dual Rheostats and one of their Super-dual Rheostats. The former provides the ranges of zero to 5 and zero to 30 ohms, and the latter zero to 10 and zero to 60 ohms. The general design of both these components is the same, and their prices are 5s. each. Each is

(Continued on next page.)

APPARATUS TESTED.

(Continued from previous page.)

supplied complete with aluminium scale and polished black bakelite pointer knob.

We notice that the two resistance ranges on each rheostat are styled "dull" and "bright," words which will have little significance to the modern listener now that the old bright emitter is, to all intents and purposes, obsolete. These Burndept rheostats are designed for single-hole panel mounting and are well-made. Their actions are smooth, although definitely positive throughout the whole range of movement.

It is interesting to note that the Burndept people supply high-resistance rheostats which can also be used as potentiometers. At 5s. there is one having a resistance of 250 ohms which will carry 15 amp. Another of these potentiometer-rheostats is stated to be the highest wire-wound variable resistance made. It has a resistance of 2,000 ohms, and can carry 50 milliamps. It is mainly intended as an eliminator voltage control. Its price is 7s.

A CORRECTION.

In an advertisement which appeared in our issue of April 7th (page 236) concerning the 4-electrode valves manufactured by Anely Products, 36, Hindman's Road, E. Dulwich, London, S.E.22, a printer's error occurred. The first sentence in the body of the advertisement should have read:—"The wonderful new valves for

your set, which only require half the usual H.T. yet give better selectivity and purer reproduction."

SIX-PIN COIL BASES.

We recently received samples of new coil bases from Messrs. Cason Mouldings. They each measure 2 1/4 in. by 2 1/4 in., and have the standard arrangement of sockets. Terminals and soldering tags are supplied, and the contacts are sunk in order to render it impossible for the coil to short the H.T. by inserting it incorrectly. A novel feature is that the contacts are in the form of phosphor-bronze coil springs, these being extended underneath the base to form continuous contact to the terminals. The base is a very clean moulding and its insulation quality high. The price of this new Cason six-pin coil base is 1s. 6d., and it appears to us to be cheap.

SPRING CLIPS.

We recently published a photograph of a group of spring clips. This accompanied an article dealing with the uses of these little accessories. In drawing attention to the fact that the majority of the spring clips illustrated are of foreign manufacture Messrs. Ward & Goldstone, Ltd., of Manchester, submit three samples of their own British-made clips. Two of these are of large size, and are lead-covered. These are accumulator battery-charging clips which greatly facilitate battery-board connections at charging stations. The smaller sizes are brightly nickelled, and can be used for coil tapping connections, and the other purposes indicated in the

above-mentioned article. These Goltone clips are very well made and quite cheap, and we are sure readers will give them preference to those of foreign manufacture.

THE "HOBBIES THREE."

Messrs. Hobbies, Ltd., of Dereham, Norfolk, recently sent us full particulars of the "Hobbies Three," an attractive design recently introduced by them. It appears to be a good, straightforward detector, and two low-frequency set, having the attractive feature that it will tune to both the ordinary and the long waves without coil changes. The full description of this set is contained in the March issue of "Hobbies."

DUBILIER K. C. CONDENSER.

Through an oversight in the Printing Department a paragraph was omitted from the Dubilier page advertisement which appeared in our April 7th issue.

The paragraph, one which emphasised the advantages of the DUBILIER K.C. CONDENSER, was as follows:

"How delightful to be always certain of your station—to be able to tune in whatever station you desire with no time wasted in undecided searching."

This component undoubtedly fulfils all that the makers claim for it, and is excellent value for money. At 12s. it is supplied complete with a large knob and nicely engraved 4-in. dial. The vanes are of hard brass, and the whole structure of the component reflects excellent design and finish. The slow-motion drive is as good as any we have examined in any condenser of any price.

MAKE YOUR OWN CONE SPEAKER

As described by the Technical Staff of "The Wireless Magazine"

—Page 21, February, 1928. Using the NEW WONDER

PROFIT BY THE HAPPY EXPERIENCE OF THOUSANDS of listeners who have been astonished with the wonderful results obtained by using the "Nightingale" Cone Unit Speaker with the "Cossor Melody Maker" and the "Mullard Master Three."

The enormous success of the "Nightingale" Cone Unit has been won on merit—because when used with these famous Sets and with other 3, 4, 5, 6, or 7-valve Receivers the results show amazing value for money and demonstrate the superiority of "Bullphone" Loud Speaker Units.

Test the truth of this for yourself. Send for a "Nightingale" Cone Unit to-day—NOW. Our guarantee is your security for ten years of perfect enjoyment. Volume and purity of tone equal anything you have ever heard—and the cost is only 15/-.

SATISFACTION GUARANTEED OR MONEY REFUNDED.

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Price only **15/-**
Complete with full constructional details.

Guaranteed to give results equal to the most expensive Loud Speakers yet made.



AS FITTED TO OUR CABINET-CONE SPEAKER

BULLPHONE DOUBLE PAPER CONE **2/-**
Postage 3d extra
as fitted to our own Speakers.

BULLPHONE NIGHTINGALE GRAMOPHONE ATTACHMENT

Reduced from 32/6 to 15/- solely as an advertisement for the famous Bullphone Nightingale Loud Speakers. Cobalt magnet guaranteed for all time.

Instantly converts your own Gramophone into a full power Loud Speaker, giving a wealth of pure, undistorted volume which must be heard to be believed.



With 4-inch Diaphragm.

15/-
Post Free.

THE NEW IDEA

Wireless all over the house from your **COSSOR Melody Maker**



INCREASE the enjoyment and comfort of good reception. Don't have a good set and restrict it to one room. Reception from your Cossor Melody Maker can take place in every room in the house—independently—simultaneously—and without interference, if you fit a Lotus Remote Control.

You can wire two rooms yourself in half-an-hour at a cost of a few shillings. Ask your retailer for a free blueprint or send a postcard to the makers.

Recommended by the designers of the Cossor Melody Maker.

For your Melody Maker you need:
 1 Lotus L.T. and H.T. Relay, 2 Filament Control, 2 Wall Jacks, 2 Jack Plugs, 21 yds 4-strand wire, 30-40 similar outfit but for set using L.T. Accumulator and H.T. Eliminator, 45-
 This wires two rooms. Each additional room, 7/6 extra.

LOTUS REMOTE CONTROLS

Made by the makers of the famous Lotus Buoyancy Valve Holders, Lotus Vernier Coil Holders, and Lotus Jacks, Switches and Plugs.

GARNETT, WHITELEY & Co., Ltd.
 Lotus Works,
 Broadgreen Road, Liverpool

Causton.

"I CAN GET AMERICA ANY NIGHT!"

— writes A.A.

"..... I have been using 3 of your Ediswan Valves for a considerable period, and they are still good. In a short wave set using one as a detector, I can get America any night."

(Signed) A. A.

Results prove that Ediswan make the best valves for best results. Daily, there's a postbag of tributes to the extraordinary powers of selectivity of Ediswan Valves, their crystal clarity of reproduction, rich full volume and long life.

Double the value of your set by fitting Ediswan Valves to-day!

EDISWAN VALVES

**CLEAREST · STRONGEST
 LAST THE LONGEST**

A type for every purpose.

THE EDISON SWAN ELECTRIC CO., LIMITED,
 123/5, QUEEN VICTORIA STREET LONDON, E.C.4.



RADIOTORIAL QUESTIONS AND ANSWERS.

(Continued from page 299.)

can be pretty sure that your set is not oscillating and that any interference it is causing is due to the fact that the aerials are too close together.

THE CAPACITY OF AN ACCUMULATOR.

S. P. R. (Harlesden, London, N.W.).—“What is meant by the capacity of an accumulator?”

The capacity of an accumulator has nothing whatever to do with “capacity” in the sense that we use the term applied to condensers. What is meant is the accumulator’s capacity to give up a certain amount of electricity.

An accumulator is designed to produce a certain current, and this is reckoned in amperes; and it will give this current for a certain time, which is reckoned in hours. The product of these two factors is called the “ampere-hour-capacity” of that accumulator.

For instance, if the actual capacity of an accumulator is 40 ampere hours, it means that this accumulator will give 1 ampere of current for 40 hours. Similarly it would give half an ampere for approximately 80 hours, or it would give 2 amperes for 20 hours, before recharging became necessary.

So we see that the ampere-hour capacity of an accumulator can be regarded as a convenient method of finding how long it would last if it gives a certain current, or conversely how many hours it will take to discharge it, if the discharge is at a certain rate.

A good idea of the number of hours an accumulator will last without recharging can be obtained merely by adding together the current consumption of all the valves in the set; then divide this figure into the actual ampere-hour capacity of the accumulator and the answer will be the number of hours that it will last (approximately). It is important to note that this applies to the *actual* ampere-hour capacity of the accumulator and not to the “ignition” rating, which is generally about twice that of the actual ampere-hour capacity.

THE “COSSOR MELODY MAKER.”

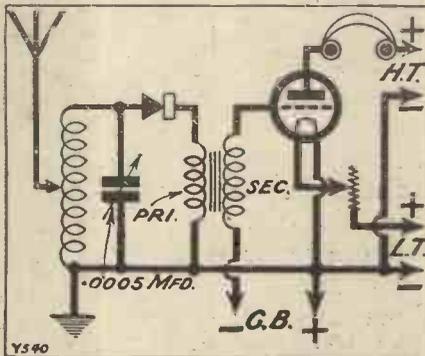
P. W. D. (Wantage, Herts).—“Where can I obtain the issue of MODERN WIRELESS describing how to operate the ‘Cossor Melody Maker’?”

The article in question appeared in the March issue of “Modern Wireless,” and back numbers of this journal (and of “The Wireless Constructor” and POPULAR WIRELESS), can be obtained from the Back Number Department, Amalgamated Press, Ltd., Bear Alley, Farringdon Street, London, E.C.4.

THE “ANTIPODES ADAPTOR.”

F. H. J. (Abertillery, Mon.).—“I have read the article called ‘The “Antipodes Adaptor”’ in ‘P.W.’ No. 303, and I would very much like to make this adaptor, for as it happens, I have most of the components on

CRYSTAL AND 1 L.F.



The correct connections for a Crystal and 1 L.F. receiver are shown above.

In last week’s “What is Wrong?” diagram the transformer windings were reversed, and the crystal was not placed (with the transformer) across the oscillatory circuit; another “error” was made in the grid-bias connections, which were shown reversed.

hand. The set that I now have is a ‘Cossor Melody Maker,’ so would your mind telling me if the ‘Antipodes Adaptor’ would work all right with this?”

The “Antipodes Adaptor” is designed for use with any ordinary set, provided it has one or more low-frequency amplifying stages. In your case, the set named has one detector and two L.F. stages, so it is perfectly O.K. to use the adaptor with this.

All that you have to do is to plug the “Antipodes Adaptor” into the detector valve—that is to say the first valve, in this particular set. For the benefit of other readers who would like to make up the “Antipodes Adaptor,” it may be as well to explain that this easily-constructed gadget is readily plugged into the detector-valve socket on any ordinary set enabling it to tune on the shorter waves and even to pick up Australia direct.

It is important to note that the “Antipodes Adaptor” plugs into the detector valve so that the signals which it picks up are detected in the ordinary way, and then amplified by the low-frequency stages of the set. The fact that in certain sets there may be high-frequency valves in front of the detector is quite immaterial, and will not affect the operation of the “Antipodes Adaptor” in any way. All you have to do with it is to plug it into the detector stage of the set and listen to the short-wave programmes on the loud speaker.

CORRECT GRID BIAS.

“RULE OF THUMB” (Market Harborough, Leicester).—“Some time ago in ‘P.W.’ I remember seeing a rule for the calculation of grid bias. It had something to do with the amplification of the valve if I remember rightly, and as it is impossible to remember the correct grid bias for all the different valves one comes across, I should be very glad if you would tell me what this rule is.”

Although the rule does not pretend to be absolutely accurate, it will serve as a useful guide in applying an approximately correct grid-bias voltage to any valve. The rule is to multiply the amplification factor of the valve by 2, and divide this figure into the high-tension voltage required by the particular valve.

Suppose, for instance, that a valve which happens to have an amplification factor of 8 is being used,

(Continued on page 304.)

The CRYSTO-BAR

50/-
POST FREE



Wireless Receiver—an epoch-making New Wilson achievement—is an up-to-date Crystal Set combined with the Microphone Bar Amplifier.

It will make wireless cheaper and better for you. Only one or two inexpensive dry cells of 1½ volts required to give loud speaker results equal to a two-valve set.

NO VALVES. NO ACCUMULATORS. NO HIGH-TENSION BATTERIES.

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“AMPLIVOX”

NON-VALVE CRYSTAL SET LOUD SPEAKER

Prov. Patent No. 7908/27.

Microphone Amplifier and Loud Speaker combined in One Instrument.

Can be worked from any Crystal Set, or single Valve Set, by the aid of one or two Dry Cells of 1½ volts each, or one 2-volt Accumulator Cell.

Easy to Adjust. Nothing to get out of order. **NO OTHER ACCESSORIES** of any kind required.



£3

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Price from 2/6



5 Capacity ranges, and each in Baseboard and Panel models.

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Phone: Hampstead 1787.

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FOR USE AS

Neutralising Condenser
Aerial Condenser
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Tone Control Condenser, etc.

A sound variable condenser which fills a long-felt want. Specially designed to take the place of the hitherto generally used Fixed Condenser.

BUY FORMO HANDBOOK. Practical Circuits Blueprints of two sets, etc., 1/-.

NOW ON SALE

WIRELESS CONSTRUCTOR ENVELOPES

Envelope No. 1.—THE “RADIANO” THREE. A famous loud-speaker set which you can build in an hour or two—no soldering and a wide range of components to choose from.

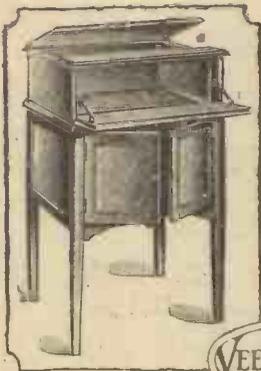
Envelope No. 2.—THE “CONCERT” FOUR. Made of standard parts, all easily obtainable, this is a highly-sensitive long-distance set, giving powerful reproduction of wonderful quality, on 3 or 4 valves.

In these envelopes you will find every detail of the set simply explained, photographic reproductions and diagrams are included, as well as a full-size Blue Print.

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No set is too good for a cabinet by V. C. Bond, and any good set is worthy of one.

Our wireless cabinets are designed and produced in our own workshops by the combined skill of wireless experts and experienced craftsmen. They are stylish because of their careful design, and efficient because of their sound construction.

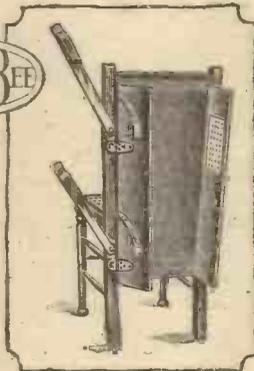
Your set deserves a VEE CEE BEE Cabinet, whether of our own design or made to your special requirements.



Pride of Person is important, too, and here there is another V. C. Bond production at your service. This combined bedroom chair and trouser-press is a distinctive piece of furniture, besides being the servant of your appearance.

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ORIGINAL PRIZE-WINNING "BECOL" LOW LOSS FORMER, No. 5. 3 inch diam, overall.

Insist on a BeCOL Low Loss Former, the Former "with a reputation," incorporated in sets that have taken four first prizes and gold medal, a proof of their superiority. Supplied in cut lengths, 3 in., 4 in., 6 in., packed in cartons, and standard lengths of 3 ft.

Standard Size panels supplied in three finishes, Black polished, Black Mat, and Grain polished, carefully packed in attractive cartons. Every panel and piece of ebonite guaranteed and made by British hands.

Specify



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products



Apply for particulars of our new foot-proof 4 and 6 contact Former with bases ready for winding, directions and fully illustrated booklet, Price 6d.

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BRAINS!

RADIO Valves are the brains of your Wireless Receiver.

When you buy a new set look to the Valves. In nine cases out of ten you will find that they are Six-Sixty Valves—first-class Valves that are fitted as standard by Britain's leading set manufacturers.

Fit a new set of Six-Sixty's in your existing set. We need not tell you to notice the difference; it will be obvious at once.

Six-Sixty Valves are non-microphonic, are matched valve with valve, and give perfect electrical balance.

There is no Radio Valve like Six-Sixty, and no other Radio Valve is as good.

We publish a booklet that will plainly tell you why. Ask for a copy at the nearest radio shop, or write direct to us

All types and voltages, from 10/6.

USE ONLY



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NO VALVE LIKE IT

HIGH TENSION

Aspire to heights of perfect purity of tone from A.C. Mains by building yourself the remarkable

"ECONOMIST H.T. UNIT"

with SUPRECISION components, as recommended in Mr. L. H. Thomas's article, "Popular Wireless," April 14th.

Here is the circuit :

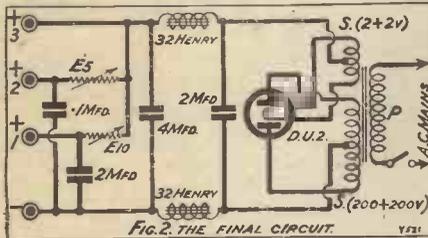


FIG. 2. THE FINAL CIRCUIT.

These the famous components :

- SUPRECISION Power Transformer No. 703 17/6
- SUPRECISION Double Power Choke No. 751 14/-
- Bradleyohm Resistance ES, 9/6; E10, 9/6
- Condensers, 4 mf. 6/9; 2 mf. (2), 8/-; 1 mf. 1/9
- Mullard DU2 Valve or Philips No. 506 22/6

Please mention voltage and periodicity of A.C. Mains when ordering. Particulars free on request of SUPRECISION Eliminator Components, OVER-NIGHT Battery Chargers, and high resistance SUPRECISION Measuring Instruments, from

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THE RELIABILITY WIRELESS GUIDE No. 999

FREE UPON REQUEST

VOLT METER
Reliable Instrument 3/6.
Double Scale
Type 0-5 v. and 0-120 v.
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BATTERY TESTER
3-Cell 3-Beam Type
Tells immediately full or empty.

J. H. TAYLOR & CO.
4, RADIO HOUSE, MACAULAY ST., HUDDERSFIELD.
Only 3/6. Vent Plug Type. 1/6

SHORT WAVE ON YOUR MULLARD MASTER 3

Just plug in and hear on your loud speaker stations on 20 to 40 or 40 to 80 metres. Kindly state range required when ordering. EACH 9/6

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Large capacity 40/8. Small capacity 16/8.
40 cell batteries with case. NO EXTRA CHARGE PAID.
SILVER PLATING SOLUTION 6d. Sample bottle, post free.
Send 1ld. for sale list, 6d. a cell, 1/- full range o samples.
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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 302.)

and it is required to find how much grid bias should be given when 160 volts are applied to the plate of the valve. The rule given above says that twice the amplification factor (equals 10), divided into the high-tension voltage 160 gives the answer 10. This then is approximately the grid-bias voltage required by a valve having these characteristics.

THE EFFECT OF DAYLIGHT.

F. T. (Watlington, Oxon).—"I built the set in February thinking I should be able to hear the B.B.C. programmes only. To my astonishment I have listened in to station after station on the Continent, and every evening since I have put the set up I have had hours and hours of enjoyment from it."

"But this is what is puzzling me. One of the very first foreign stations that I got on the set was at 5 o'clock in the afternoon, and just at first I could count on one or more foreign stations round about tea-time. But just lately I have had to wait till 7 o'clock before I could pick up anything at all worth listening to from the Continent, and it now seems as though reception only gets better and better as the hour gets later and later. Why cannot I receive in the early evening like I used to?"

Long-distance wireless reception is never so good in daylight as it is in darkness, and for this reason, the winter evenings are far better for receiving long-distance programmes than the summer evenings. It is because the days are lengthening that you have been getting out of touch with the continental stations until a comparatively late hour.

You will find that during the summer evenings it may be as late as half-past nine before you are able to get a continental station, but as soon as the autumn days come round again and the darkness sets in earlier you will be able to pick up the continental stations early in the evening once more.

HIGH-TENSION VOLTAGE.

S. E. B. (Bolton, Yorks).—"The power valve is marked 60 to 120 volts for plate voltage, and what I would like to know is will it go just as well on 60 as it will 120, and if so, why use 120? If it will not, why give '60' as a voltage when it only works properly at 120?"

It is always an advantage to give the valve the full plate voltage which it is capable of standing—in this case 120 volts. If this voltage is applied with the correct grid bias, better reproduction will be obtained than when 60 volts is applied, even though the grid bias is altered accordingly.

The reason that the two voltages are given instead of only the maximum voltage is simply a question of £.s.d. It is not everybody who can afford to pay for a 120-volt battery so as to get the best possible reproduction, so the manufacturers of the valve give the lower figure as well to show that the battery may be as low as 60 volts and still get reasonably good results.

Anything below the lower figure will give unsatisfactory results, and anything above 120 volts will tend to shorten the life of the valve. So that the golden rule is to use the maximum plate voltage as given by the makers of the valve if possible, and if this cannot be done to get as near that figure as circumstances permit.

GRAMOPHONE PICK-UPS.

"COLUMBIA" (Enfield Town).—"The gramophone is an old timer, but I kept it because it is portable and could be relied on to kick up plenty of noise. I am wondering whether it is advisable to get a pick-up for use with it, because it is an old instrument and the quality it gives does not compare with my wireless set. Would the fact that it is a boxed-in portable be against it?"

With the gramophone pick-up the most important part of the reproduction is done by the wireless set, and if you have a good set you can rely upon really good gramophone-radio reproduction. All that you need from the gramophone is a good motor with no obvious mechanical weakness. If the gramophone will take care of the turning of the record all right, you can be sure that the pick-up and the wireless set will take care of the programmes. We should certainly buy a pick-up in the circumstances, and we expect that you will be more than satisfied both with the volume and the quality

NEWS FROM SAVOY HILL.

(Continued from page 288.)

therefore, with more prospects of success than formerly, when the initiative was with the B.B.C. Indeed, there seems to be quite a good chance of the scheme maturing in time for next season's business. Mr. Lynas, of Graham Amplion, Ltd., is a moving spirit.

Regional Delays.

There is undoubtedly extreme tension between the Post Office and the B.B.C. on the subject of the Regional Scheme. The Post Office makes Fabius Maximus Cunctator look like a sure Derby winner. But still the B.B.C. declines to break cover, and take the public fully into its confidence. If the deadlock is unrelieved for another month or so, it will be too late for the B.B.C. to escape sharing the censure that will descend on the Post Office. It is high time that there was some frank publicity about the Regional Scheme.

"Machines."

Highly interesting developments are expected in connection with the final rejection by the B.B.C. of the play which Captain Reginald Berkeley was specially commissioned to write and which was rejected the first time because it was alleged to be politically controversial.

Sir Thomas Beecham and the B.B.C.

Now that the Imperial Opera League scheme is hung up, speculation is reviving about Sir Thomas Beecham's future. Despite former fulminations against radio, Sir Thomas is understood to have modified his views lately. Stranger things have happened than that Sir Thomas should become a B.B.C. conductor. Such a move, if practicable, would be universally acclaimed not only as a wise and self-sacrificing one on the part of Sir Thomas Beecham, but also as a triumph of reconciling statesmanship at Savoy Hill.

The Return of De Groot.

Listeners will learn with satisfaction that De Groot and the Piccadilly Hotel Orchestra are returning to the wireless programmes. It will be recalled that difficulties arose in 1926 between De Groot and the B.B.C. as a result of which his broadcasts from the Piccadilly Hotel ceased during October of that year.

Last year he gave one broadcast, this being in December, when his performance was relayed from the Casino, Porthcawl, and broadcast from the Cardiff and Swansea Stations prior to his departure on an American tour. It is understood that negotiations between the famous violinist, the Piccadilly Hotel, and the B.B.C. have now reached a satisfactory conclusion and De Groot and his Trio are giving a Studio performance from London and other Stations on Saturday, April 28th.

"Duffy" at Plymouth.

A special performance of "Duffy," a Cornish comedy in dialect by R. Moreton Nance, is to be performed by a cast of four Cornish artistes in the Plymouth Studio on Friday, May 4th. The production will be supervised by a member of the Head Office staff and will be broadcast from London and other stations.

Mellow Tone -in keeping with its age-old design

SOMEHOW you are not surprised when you first hear the richly mellow tone of the **Brown Sphinx Loud Speaker**. It is because its age-old design has led you to expect it. There is something about the Sphinx that inspires you to believe its reproduction will not belie its proud design. You are happy, when you hear it, that your confidence has not been misplaced. And if, perchance, as you listen, you should shut your eyes, you will be so intrigued by the reality of its reproduction that you will have no difficulty in imagining the artist in your very room. The price you pay for this living instrument is £12. 10s.



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Wholesale Depots
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PRICES, without Dial or Knob :

SQUARE LAW
'00007 mfd. ... 13/6
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LOG LAW (as shown)
'0003 mfd. ... 15/-
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For the "Log-Law" Condensers, printed wave-length scales, range 150-3,000 metres, can be obtained for use with closed circuits.

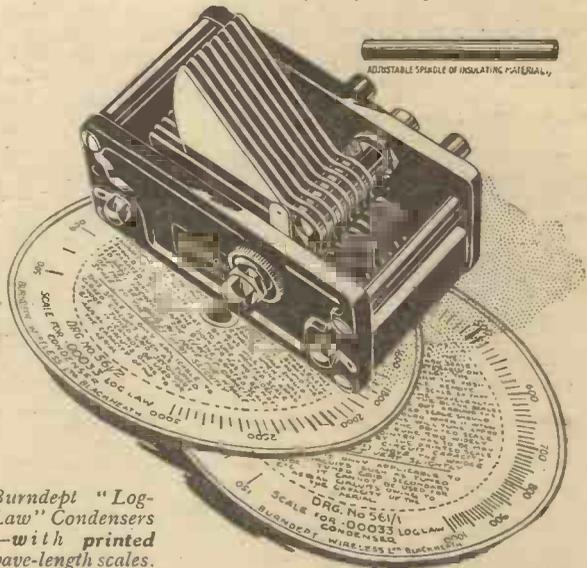
Price, 1/6 per set.

1.—These Condensers are the only type made with an insulated spindle and a metal earth-shield—features which ensure absolute freedom from hand-capacity and increased signal-strength. In an "all mains" receiver the insulated spindles remove the danger of shocks when operating the condensers.

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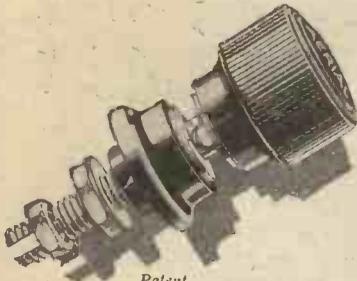


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Type "B" illustrated, sold in an attractive carton carrying a year's guarantee. Price 9d. each.

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Illustrated catalogue free on request.

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New Prices: Jars, 1/3. Sacs, 1/2. Zincs, 11d. Sample doz. (18 volts), complete with bands and electrolyte, 4/3, post 9d. Sample unit, 6d. 16-page booklet free. Bargain list free. AMPLIFIERS: 1-valve, 19/-; 2-valve, 30/-. 2-valve ALL-STATION SET, £4.-P. TAYLOR, 57, Studley Rd., Stockwell, London

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7x 6, 1/3	9x 6, 1/7
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EASY TERMS

WOOLDRIDGE RADIO CO. LIMITED.
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TECHNICAL NOTES.

(Continued from page 288.)

waves have always been easy to produce at low power. Also very high power has for some time been available at the longer wave-lengths. This is the first time, however, that we have been able to combine the two, so as to get relatively large power outputs on the short wave-lengths."

Simplified Control.

A very interesting little invention, which comes from Germany, is an electric cable containing two wires which are normally insulated from one another, but which can be brought into electrical contact by simply pinching the cable between the fingers. This is provided for by weaving the wires into a loose braid, the wires being, however, separated by an elastic non-conductor. This cable has the obvious advantage that it does away with the necessity for push-button or press-contacts at fixed points.

Abolishes Switches.

Not only is the expense of providing and installing these push-buttons avoided, but the cable can be operated by simply gripping it at any point along its entire length. It is found very handy for bell-ringing and such-like signalling purposes, whilst for radio it is provided with a series of special loose clips which may be clipped on in such a way that they are merely retained or, alternatively, in a way to grip the cable and maintain contact between the wires. This simple device, therefore, is equivalent to a movable switch which may be operated at any point, and it is useful for remote control of radio receivers.

Are Short Waves Reliable?

How reliable are short waves? Everyone marvels at the ease with which amateurs communicate with fellow enthusiasts over enormous distances with almost incredibly small input powers. It is undeniably thrilling to take from the lamp-socket a power of no more than a quarter of that required to heat an electric iron and to feed it into a comparatively simple apparatus from which it emerges as H.F. energy with which we ask a man in South Africa how the weather is there? It is one of the marvels of our time that two people in the quietness and security of their homes, but separated by thousands of miles, can interchange ideas instantaneously and so extremely economically.

Skip Distances.

The General Electric Company of America have been carrying out systematic experiments to discover just how reliable short waves are. It seems to be fairly well established that 10 metres (about 30,000 kc.) is about the shortest useful wave-length for most ordinary purposes. Below about 20 metres the waves travel better in daylight, whilst above that wave-length night time seems to be the best. Below about 45 metres, curious "skip distances" occur, producing regions beyond which signals may be heard, but within which they are inaudible.

The General Electric experiments have shown, that the 32.79 metre wave is of little use for short distances, but a power output

(Continued on page 308.)

FILL IN THIS VALVE COUPON!

My difficulty with valves is

My circuit is

I want your valve experts

FREE OF CHARGE

to settle my valve difficulties by the New "OCTOPUS" Balanced Valve Service.

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Do not confuse



with cheap valves! They are BRITISH made. Lowest consumption. Maximum power and distance. Guaranteed. Money returned without question if dissatisfied.

H.F., R.C., L.F. 2 & 4 POWER
DETECTOR VOLT
5/6 POST FREE **8/-**

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From No. 25 1/- to No. 500 4/-

DX SHORT-WAVE SET

4 Coils Nos. 3, 5, 7, 9 .. 7/6

"P.W." Test Report, March 10:—"The fact that one of the first stations tuned in was 3 L O of Australia is ample proof that the coils are efficient."

If unable to obtain send P.O. 7/6.
DX COILS LTD., LONDON, E.8.

HEADPHONES REPAIRED 4/-

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

Discount for Trade. Clerkenwell 1795.
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Cross-wound in four balanced sections, giving low self-capacity, constant impedance, small external field. Windings fully protected. Mounted on Bakelite base. Greatly improves the Cossor "Melody Maker" when connected in place of wire No. 26. Also when used in "3.20 Express" and other circuits. Write for particulars, stating requirements for coil drive Loud Speakers.

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 The ideal efficient and economical appliance for home charging H.T. Accumulators from A.C. Lighting Mains.
 Complete, ready for use **21/-**
 With Ammeter (as illustrated), 12/6 extra.
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 To operate successfully from Direct or A.C. Mains.
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 Wound with additional turns ensuring wider range of stations.
 Reduced Price **4/6**
 Every "Cossor Melody Maker" will give far superior results with "NECROLAC" Aerial. From all First-class Stores—or Direct.
REFUSE SUBSTITUTES.
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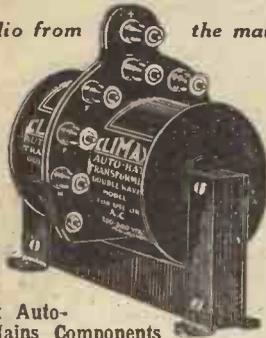
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35/-

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For H.T. Units 10/3

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20,000 ohms or 10,000 ohms with ten tapings ... 5/-

The first home constructors' H.T. Supply Unit was built with Climax Auto-Bat Components ... the first mains receiver was possible only with Climax products.

The Climax Auto-Bat Transformer is double wound and carefully insulated to withstand the high pressure of electric light mains without risk of damage to the receiving set, or of disturbance to the electric lighting system. The Climax Auto-Bat Transformer is very robust and exceptionally powerful.

Two anode windings and two filament windings are provided for double rectification.

The overall filament voltage on load 1.9 volts, and currents up to 1.5 amperes can be obtained.

The mains winding of the transformer is tapped to suit different main voltages.

Complete lists upon application from any radio dealer or direct to:-

CLIMAX

A YEAR AHEAD

CLIMAX RADIO ELECTRIC Ltd.,
Quill Works, Putney, London, S.W.15

TECHNICAL NOTES.

(Continued from page 306.)

of 500 watts on 65.16 metres (4,500 kc.) will transmit commercial day-time signals up to 100 miles.

A Radio Pioneer Honoured.

Readers who take an interest in radio doings in the United States will be familiar with the name of Mr. Frank Conrad, Chief Engineer of the U.S. Westinghouse and Electric Manufacturing Company, and a world-famous pioneer in the field of radio broadcasting, and they will be interested to know that Mr. Conrad has just been awarded the Degree of Doctor of Science by the University of Pittsburg.

His principal inventions relate to electrical measuring instruments, relay systems, current and voltage regulators, mercury-vapour rectifiers, and automobile starting, lighting and ignition appliances. In addition to being Chief Engineer of the Westinghouse Company since 1921, Dr. Conrad is also a very well-known consulting engineer, and his opinion is sought on all manner of electrical engineering problems.

Grid "Suppressors."

A new series of exceptionally low-range "metallised" resistors is announced by the International Resistance Company, of Philadelphia. The main application of these low-value units will be as grid "suppressors" in the stabilisation of high-frequency circuits. Lately there has been a marked interest shown in this simple method of stabilising the usual H.F. amplifier by the automatic control of the feed-back action, particularly at the higher frequencies. This method makes for extreme selectivity and minimum anode current tax upon batteries, together with more or less automatic operation as compared with other methods. The present receiver, using one of the older stabilising methods making for broad tuning, may be readily equipped with these grid "suppressors." This device is inserted between the grid lead and the grid terminal of the H.F. valve in each H.F. stage.

These metallised resistors are obtainable in values as low as 100 to 800 ohms and intermediate steps to meet the precise grid-suppressing requirements of all H.F. valves and circuits.

Batteries Popular for Short Wave.

Many readers may have wondered why, in circuit-diagrams for short-wave receivers, high-tension batteries rather than H.T. eliminators are designated as a source of plate-supply. There is a good reason for this, as is indicated by some interesting tests made recently.

In the first place, a short-wave receiver is almost invariably of the regenerative type. It is designed on the low-loss principle (which, in short-wave reception, really means something) and consequently is extremely sensitive and must be capable of maintaining the most critical adjustments. If it is used in conjunction with an eliminator, the unsuppressed A.C. hum, which might pass entirely unnoticed in the ordinary broadcast receiver, becomes pronounced and grows in intensity as the reaction is tightened.

Furthermore, an absolutely stable anode-current supply is vital to success in short-wave reception.

THE ROLLS-ROYCE OF RADIO IS THE DIX-ONEMETER

The High Grade Radio Tester. Low price. High value. Worth £10. Instrument, 55/- Multipliers, 6/6 each. Radio Test Booklet. All Radio Users need one.



The ACONEMETER. Model VAC.3. In Case. Is a new Model measuring Alternating Current, a 3-range instrument reading 0-150 v., 0-300 v., and 0-600 v. Price, inclusive of case, 75/-, 1,500 volt Multipliers, 44/- extra. Get our New 72-Page Catalogue.

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Eton Primary H.T. Battery P.1. Porous Pot Cells, S1 and S2 Sac Cells. All complete

	1-cell	6-cell	12-cell	30-cell
P.1	6d.	3/3	5/9	14/-
S.1	6d.	3/-	5/3	12/-
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PRICE
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From all Dealers



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It is perfectly constructed and has the greatest range of capacity, viz.: 2/38 mufds. The control is delightfully smooth and uniform increase or decrease is obtained with each turn of the knob. It is dust and damp-proof and cannot short. Suitable for either Panel or Baseboard mounting.

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WATES UNIVERSAL TEST METER

Milliammeter, 0-36 Milliamps
Voltmeter, 0-6 and 0-120 Volts
Think of the advantage of this instrument. You can test your receiver for distortion. Find H.T. consumption. Test voltage of H.T. and L.T. Batteries. Accurate. Dependable. High Resistance.

Full particulars on request.
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POST 3d.
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The WHITELINE VALVE HOLDER

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This Cabinet, soundly constructed of Oak, and equipped with Baseboard Runners, Fall Front, Hinged Top, polished rich Jacobean, 45/- for panels up to 18" wide. Also made to accommodate any popular set.

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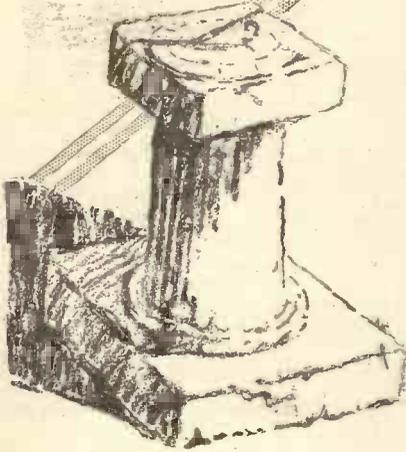
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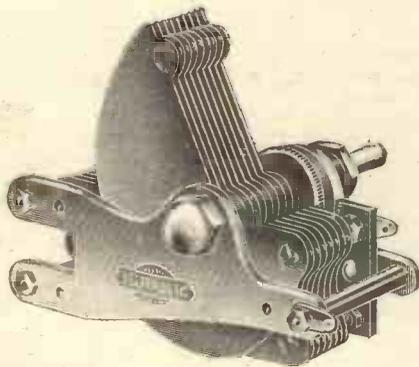


T.C.C. CONDENSERS IN THE GREEN CASES

Specified for the
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"MELODY MAKER"

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CA 2567



Permanent Accuracy

Van's positively spaced and rigidly braced by an ingenious locking bar method give to the Igranic "Lokvane" Variable Condenser a feature possessed by no other at the price—permanent accuracy. Stations always come in at the same dial reading, provided the rest of the circuit remains constant. The same locking bar feature explains its remarkably reasonable price. It enables rapid assembly while still maintaining the highest possible standard of precision.

The Igranic "Lokvane" Variable Condenser

offers more easy, accurate tuning features than many condensers at twice the price. List No. R.85 gives full particulars.

PRICES.

00015 mfd.	8/6
0003 "	9/6
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SPECIAL OFFER OF OAK WIRELESS CABINETS

Do not put a fine piece of work into a fourth-rate box.

After spending time, money and energy in putting together a fine set it surely deserves to have a good home.

Instal a
"LANGMORE"
and be proud
of your set.

These cabinets are made in the following sizes:—

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All are fitted with binged top, heavy baseboard, etc., and a tray underneath gives accommodation for batteries. London made. Highly finished in Jacobean style.



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This FILAMENT

The Valve with
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Filament improves
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