POPULAR WIRELESS, April 6th, 1935.

REGISTERED AT THE G.P.O. AS A NEWSPAPER.

SPECIAL JUBILEE GIFT ISSUE!

Popular Wireless

AND TELEVISION TIMES

FIRST DETAILS OF THE NEW "P.W." VALVE

EVERY WEDNESDAY PRICE 3D.

No. 670.
Vol. XXVII.
April 6th, 1935.

SILVER KING

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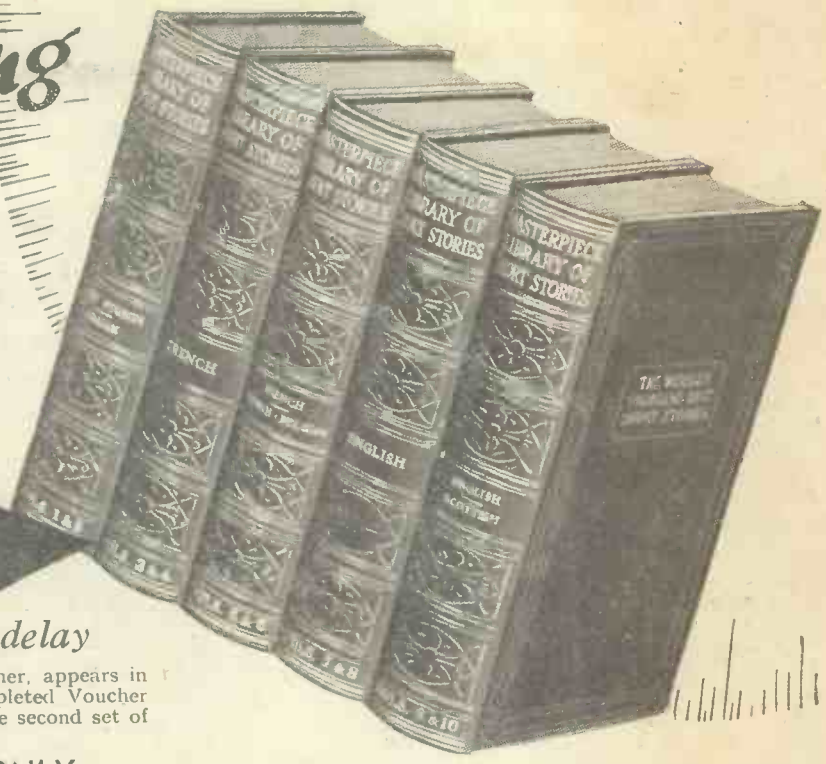

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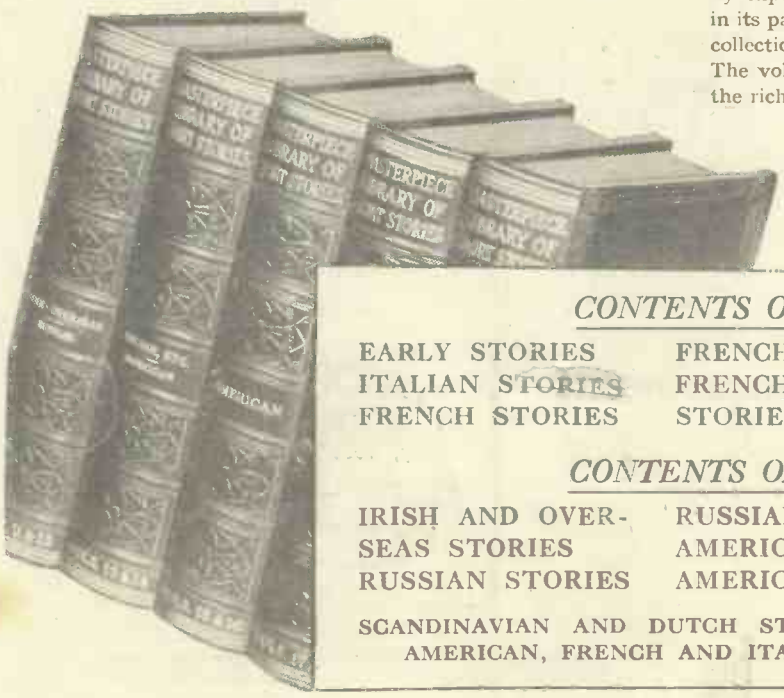

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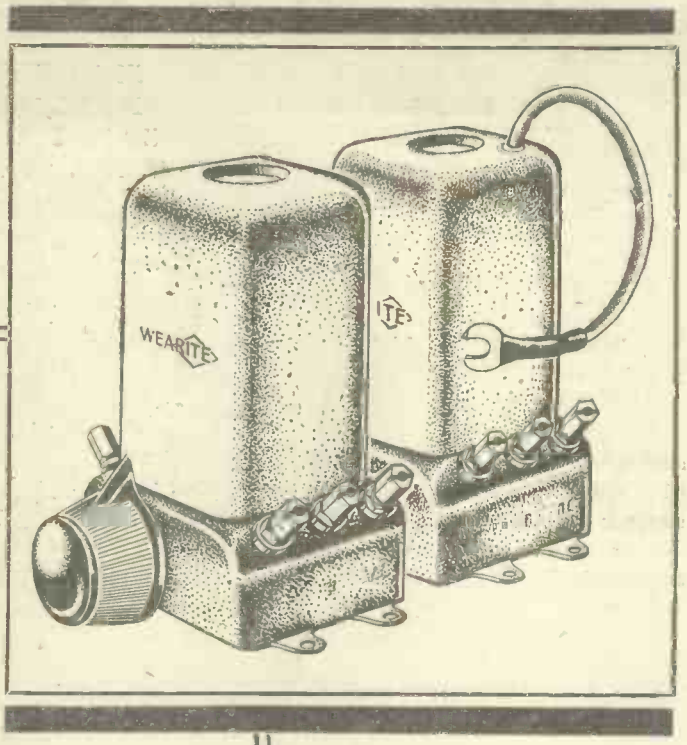

SPECIFIED *for the* SILVER KING JUBILEE RECEIVER

WEARITE

REGD. TRADE MARK

TYPES 'Q' and 'T' COILS

Selected by the designer of the "Silver King" these Wearite Coils represent a definite advance in Air-Core Coil design. Special stranded secondaries, a unique method of 'wave-form' winding on the long band, a new type of moulded bobbin, together ensure minimum losses throughout the whole range.

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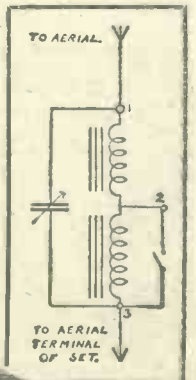

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BY APPOINTMENT

★ PROOF!

LETTER TO MR. W. J. FOX, "HIS MASTER'S VOICE" DEALER OF HIGH STREET, NEWBRIDGE, MONMOUTHSHIRE, FROM A CUSTOMER WHO PURCHASED A "HIS MASTER'S VOICE" FLUID-LIGHT FIVE. MODEL 442.

We do not claim that this popular radio receiver will regularly receive American stations, but this letter just shows how enthusiastic owners of "His Master's Voice" instruments are about the capabilities of radio receivers and radiogramophones which bear this famous trade mark. Model 442, with its fluid-light tuning, is one of the most popular of the Silver Jubilee Year "His Master's Voice" receivers. Write to "His Master's Voice" for technical details and full specification of this instrument and of the complete range of "His Master's Voice" "Silver Jubilee" Year Radio. Or call in at your local "His Master's Voice" dealer's, to-day.

(COPY)

Dear Sir,

We purchased Model 442 AC "His Master's Voice" Superhet Fluid-Light Five from you 2½ months ago, and I feel I would like to write and tell you how pleased we all are with the set. The volume is all that can be desired and the tone is really beautiful. That is the only way I can put it, the speaker or band actually sound as if they are in the room with us.

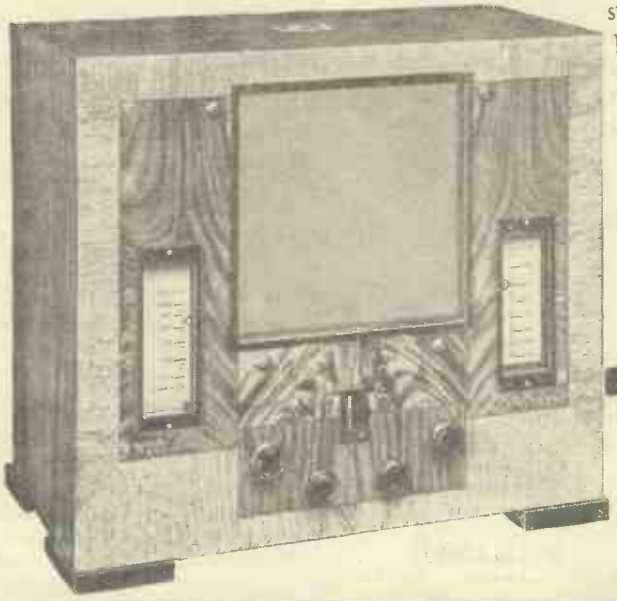
On both wave-bands there is no interference between stations, a fault in many sets. Moscow on the long waves can be got free of either Huizen or Radio Paris. The majority of sets I have heard are not capable of that.

I may say that my programmes are not confined to Europe, as practically every night, after 11 p.m., America has been coming in at quite good loudspeaker strength, and I have a log of 26 U.S.A. stations, 1 Canadian, 2 Mexican and 4 South American stations. On the 14th November at 1 a.m. I picked up KMOX, St. Louis, at full loudspeaker strength and heard a relay from Hollywood with such stars as El Brendel, Dick Powell, Ruby Keeler and Clark Gable broadcasting. St. Louis is 4,500 miles away. Eddie Cantor was on the air last night from WCAU, Philadelphia.

I am,

Yours faithfully,

(Signed) D. E. EVANS.



MODEL 442

SUPERHET
ALL-ELECTRIC
FLUID-LIGHT FIVE (AC)

13½ GNS.
(or by hire purchase)
(Price does not apply in I.F.S.)

* *Mr. Evans sent Mr. W. J. Fox a few weeks later a complete list of 35 U.S.A., Canadian, Mexican and South American stations he had received.*

"HIS MASTER'S VOICE"

SILVER JUBILEE YEAR RADIO

THE GRAMOPHONE COMPANY LIMITED, 98-108 CLERKENWELL ROAD, LONDON, E.C.1.

MANAGING EDITOR: N.F.EDWARDS. TECHNICAL EDITOR: G.V.DOWDING ASSOC. I.E.E

JUBILEE
RADIO SURPRISES
MINNEAPOLIS
TELEVISION

RADIO NOTES & NEWS

NEPTUNE'S WHISKERS
D.X. INTERFERENCE
IN THE EAST
TALKS RECORD

The "Silver King."

"HATS off" to the "P.W." Technical Hounds. Before I say another word this week I must pay tribute to their "Silver King," which had been kept secret under lock and key so long that it suddenly burst its bounds, with regal disdain, and started holding a Jubilee levee that nearly lifted the roof off Tallis House.

You will read all about this magnificent set on other pages this week, and form your own opinion of its merits. But if you want my opinion as one who has heard it I can tell you the plain unvarnished in three words—"It's a wow"!

The Genoa Experiments.

SINCE it was made known that Marconi's latest experiments dealt with micro-waves and television possibilities across the Atlantic there has been much surmise as to what was likely to emerge from his laboratory.

It is said—though this may be confirmed or contradicted by the time you read these words—that from his two hill-top stations near Genoa he has had amazing long-distance results with micro-waves. These waves were supposed to be "optical" in range, but, as was proved in "P.W.'s" Crystal Palace tests, they do sometimes manage to get beyond the horizon.

If Marconi has succeeded in "bending" them, to follow the earth's curvature, we shall be on the threshold of unlimited possibilities with the "ultra-shorts."

Surprising Broadcasts.

TO tune in your set and overhear something broadcast about yourself from a station hundreds of miles away is a strange experience. It recently happened to Mr. W. J. Smith, of Chester-le-Street, who was once a wireless operator. He was listening to some Morse one day when he heard two of his old pals and found that they were chatting about him!

I can vouch for the thrill in this, for it has happened to me twice on the short waves. And there was another surprising occasion, at the time when the B.B.C. used to review the technical journals each week and "P.W.'s" crystal sets were all the rage. One night the London announcer, after the news, solemnly began reading something which I recognised as my own writing!

I don't think it sent our sales up noticeably, but it certainly gave me quite a kick!

A Tragic Transmission.

COMMENTING on the recent death of "Dare-devil" John Tranum—hero of hundreds of parachute jumps—a Reading correspondent asks if I know of anybody who tuned in to the Danish broadcast and heard the airman's last words on March 7th.

I have not yet met anyone who did so, and I am glad that my set was not tuned in to Skamlebaek that afternoon, for the weak voice and long silence that followed must have given away to listeners the fact that something was tragically amiss.

The plane was about five miles up when apparently there was trouble with Tranum's oxygen supply, and it was too late to save his life when the pilot was able to bring the machine to the ground again.

IN THIS ISSUE

we present full details of the SILVER KING, the world's first all-wave two-channel set. (A preliminary description was given in "Popular Wireless" for March 9th.) This receiver incorporates an entirely new valve which has never yet been employed in any other design, factory built or home constructed.

SILVER KING is a "Popular Wireless" Jubilee Set, and we are proud to be able to present to home constructors such an outstanding development in reception technique during a year of such auspicious significance.

Build the SILVER KING and Beware of Imitations!

"P.W." LEADS AGAIN!

Poetic Thought.

WHEN the Vale Quartet, of Ryton, broadcast from the Newcastle studio early this year they were heard by a listener in far-off Minneapolis, U.S.A. Reception was so good that the 4,000-miles-away member of the audience sent some songs to each member of the Quartet in the hope that they will include them in their repertoire.

If the singers like Longfellow's works they will recall that the poet once had a similar experience after he had been practising archery:

"I breathed a song into the air:
It fell to earth, I knew not where."

Perhaps that, too, was in Minneapolis!

Count the Cost.

AN acquaintance of mine who came back from Germany on March 13th, the day before the Witzleben television transmissions were to begin, tells me that he heard there that the cost of a suitable receiver would be about £50. And he gathered, in mixing with business men, that the object of the service is not chiefly entertainment, but the dissemination of instructional and political matters.

I hope that time will prove he is mistaken, for if television in Germany is to be the handmaid of propaganda it stands a poor chance of popularity. Fancy paying £50 to be uplifted when you can enjoy yourself no end on about 3s. 6d.!

Downright Waves.

WISE guys who think they know all about radio waves will get a shock if they read the Proceedings of the Royal Society, in which D. F. Martyn and A. L. Green report on their experiments with waves reflected from the upper atmosphere.

Using vertical wire aerials, loops and various what-nots, these gentlemen, it is stated, have convinced themselves that "*the down-coming, elliptically polarised ray is often deviated laterally out of the plane of propagation.*"

This is a solemn thought, boys. You must beware of these lateral deviations, always eat plenty of green vegetables and never forget your deep-breathing exercises.

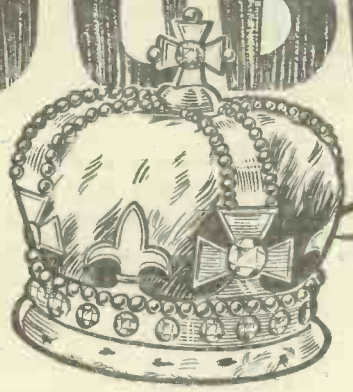
The Transatlantics.

THIS time of the year is supposed to be too spring-like for getting trans-atlantic programmes direct on ordinary sets, but some of my readers think nothing of that. When I recently expressed surprise because F. J. S., of Mill Hill, heard Buenos Aires I got a small shoal of letters about South American reception. And one Scottish enthusiast—Mr. W. Leithead—mentions that he was listening after midnight to a programme from W B Z, but found that L R 4 of South America made himself a nuisance by heterodyning the Yankee station!

Verily it's a small world, my masters, when a man can't listen in peace to a

(*Continued on page* 122.)

JUBILEE!



The Dawn of Broadcast

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

IN this issue of "P.W." you will find a full detailed account of an entirely new type of radio receiver. To say that this receiver is uncanny in its receptive powers is an under-statement. A great number of you no doubt will flatly refuse to believe, at any rate, at first, that such a receiver could be conceived and constructed, and will be inclined to agree with the old lady who declared, on first seeing a giraffe at the Zoo: "There ain't no sich animal!"

But you can take it from me, and I have had the privilege of studying and examining this new "Silver King" receiver, that, notwithstanding the amazing claims which are made for it, it fulfils every one of them up to the hilt. Perhaps I should say right away that the outstanding characteristic of this new set is that it is able to receive not only the *medium* and *long* broadcast waves, but also the *short* waves, and even the *ultra*-short waves, such as will be used in due course for television. That is a pretty good statement to start off with, and I think you will agree that once you have been able to digest that all the rest will come quite easy.

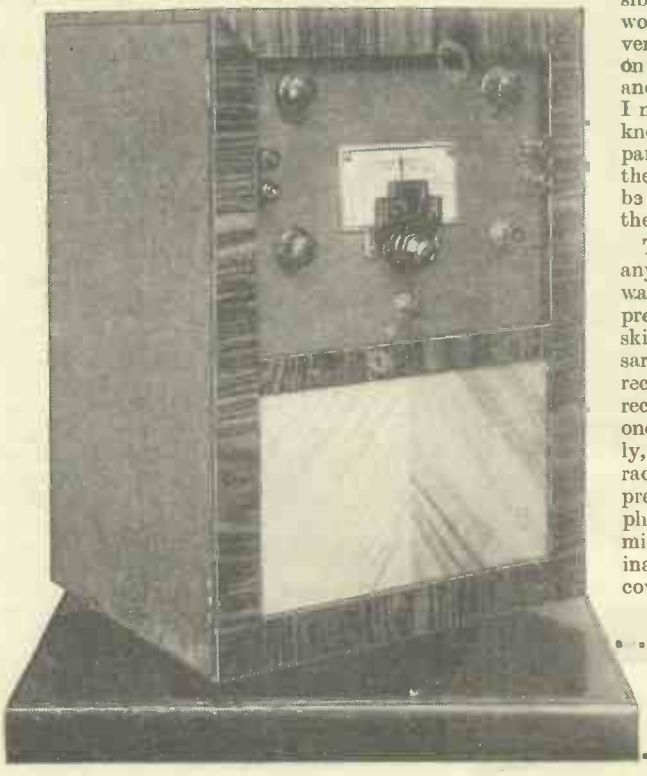
The short-wave part of the receiver has been the special care of Mr. G. T. Kelsey, who, as all readers of "P.W." know so well, has established a great reputation for himself, not only in this country, but in many other parts of the world, for his pioneer work in short-wave receiver design. Mr. K.D. Rogers has been responsible for the special valve work, which also has a very important bearing on the design and performance of the whole receiver. I mention these two well-known set designers in particular, but, of course, the set as a whole must be put to the credit of the entire "P.W." staff.

Those of you who have any experience of short-wave reception will appreciate the extraordinary skill which has been necessary to combine in a single receiver true two-channel reception which covers, one can say quite definitely, the entire range of radio wavelengths at present used for telephony transmission. I might go further, because, inasmuch as this set covers the ultra-short waves which are intended to be used for television sound transmission, it covers not only the entire gamut of *present*-day transmission, but also makes provision for what is yet in the *future*.

"SILVER KING"

An absolutely novel set conception which anyone, inexpensively and easily, can build and operate. A 1s. blue print is given free with this issue.

POWER AND PURITY FROM LOCAL & DISTANT STATIONS



Let me give you an example of what you can do with this amazing receiver. When it is installed in the home you may witness the extraordinary spectacle of one member or section of the family listening, by a loudspeaker, to broadcast reception in the ordinary way, say one of the B.B.C. or foreign stations, whilst at the *same* time, on the *same* set, with the *same* aerial and the *same* batteries, another member or section of the family will be listening (by headphones, or by loudspeaker in another room) to short-wave reception, perhaps from some distant part of the world. I admit frankly that it sounds like a leg-pull. But it isn't—it's a sober statement of fact.

A Real "All-Wave" Receiver.

We often hear tell of "all-wave" reception, but hitherto this term has been interpreted in rather a generous way. I do not think, however, there can be any doubt that the description "all-wave" applies, however, in very truth and in fact to the receiver which is described in the following pages.

When you have got accustomed to the idea of the astonishing performance of this

UNIQUE NEW RADIO VALVE—

a New Era Reception

"P.W.'s" HISTORIC ACHIEVEMENT

TWO-CHANNEL RECEPTION—ULTRA-SHORT, SHORT, MEDIUM AND LONG WAVES—AN ENTIRELY NEW VALVE—THE WHOLE CONSTITUTING A

TRIPLE TRIUMPH

FOR "POPULAR WIRELESS." OUR NEW SET HAS NO COUNTERPART IN ANY RADIO-SET CATALOGUE OR OTHER JOURNAL IN THE WORLD. IT PLACES THE BRITISH HOME CONSTRUCTOR IN AN UNIQUE POSITION OF TECHNICAL AND ENTERTAINMENT SUPERIORITY.

new set you may begin to have all sorts of doubts of minor points. You will probably wonder, for example, what the selectivity is like or whether there has been a sacrifice of sensitivity in order to achieve these extraordinary results. Well, I can tell you that the selectivity and the sensitivity are everything that can be desired, and the same applies to the quality of reproduction. The set is fully equal to anything that you could wish in all these respects, and, indeed, in all other respects throughout the entire range of its immense wavelength coverage.

Separating the Circuits.

These results have been obtained, in the main, by a special system for separating the short-wave circuits, the latter having separate controls. For instance, you might think that the tuning condenser or the reaction condenser had been pressed into service for all purposes, but this is not so; every part of the set has specially selected components.

When television comes on the air we shall have, as you know, the vision and the accompanying synchronised sound sent out on ultra-short waves (in the region of 6 to 7 metres), the two wavelengths being very slightly different. For a long time to come there will be lots of people who will be without television receivers, but with this new "Silver King" receiver they can go down to the ultra-short television wavelengths and enjoy the television sound broadcast even without the pictures.

You may think that the one would be no use without the other, but a considerable percentage of the sound broadcasts will be an entertainment in themselves, even without the accompanying vision. This, in itself, is something that has never before been attempted, much less achieved. Then, again, you have all heard that the television broadcasts will only be receivable over a distance of some 25 miles, but that limitation applies only to the vision, not to the accompanying sound. With the "P.W." "Silver King" receiver you will be able to receive the television synchronised sound at very much greater distances than this.

Added Entertainment.

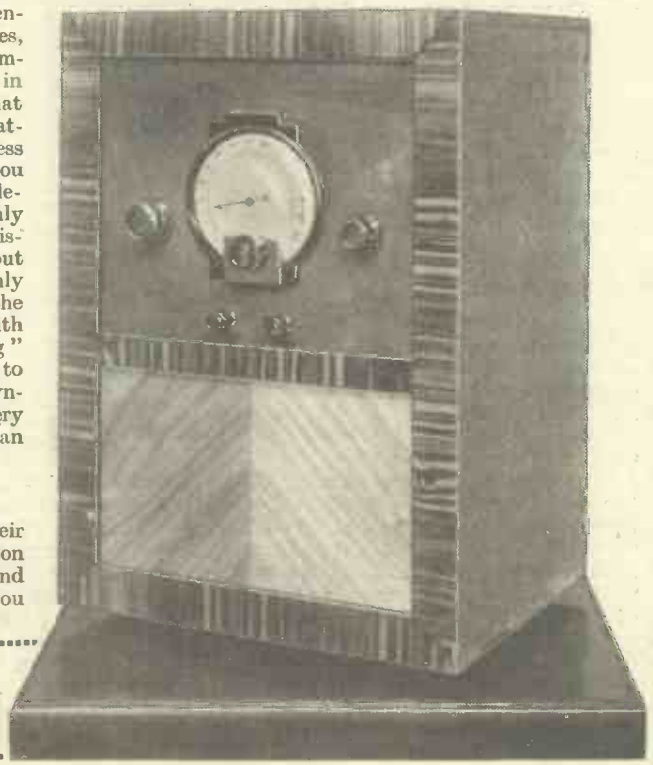
The B.B.C. will put their very best into the television stuff when it comes, and with this new receiver you will be able, if you wish, to *listen*-in, if not to *look*-in, to two hours of extra-special entertainment every night.

Inexpensive to Build.

The important question of cost has not been overlooked, and the "Silver King" is quite an inexpensive receiver to build, as well as being easy for the home constructor. It has already been predicted that it will give a great impetus to home construction. In spite of statements sometimes made to the contrary, there are vast numbers of keen home constructors throughout the country; what is lacking is not

(*Continued on page* 130.)

PROGRAMMES BROUGHT IN FROM ALL OVER THE WORLD



—MAKES ITS FIRST APPEARANCE

World-Wide Listening

A THOUSAND PROGRAMMES

BUILDERS of broadcast sets form a rather shifting public. There are more of them to-day than there were, say, seven or eight years ago, but I doubt very much if more than ten or so per cent of the "eight-year-olders" are still constructing.

On the other hand, the short-wave enthusiasts carry on year in and year out, and very few indeed seem to fall by the wayside. Our postbag still includes heaps of letters from "old-timers," and there is plenty of evidence to prove that "new-timers" come into the movement to stay.

The Cult is Ever Growing.

That is why the short-wave cult is ever growing; why, for instance, the "Kelsey 1935 Short-Wave Adaptor," recently described in POPULAR WIRELESS, has been the season's second-best seller—second only to the colossally successful S.T.600 (also a POPULAR WIRELESS set).

And the reason? Obviously because the short waves hold an immense amount of fascination and a great deal more interest than is to be found on the medium or long waves. In comparison these are frightfully parochial.

It is true that sometimes, with a bit of luck, an American medium-wave station can be tuned in on an ordinary set in the depths of the night; but for the most part a set able to tune in only the mediums and longs is confined to the reception of stations from just the one continent—Europe.

And a not too interesting continent for the British listener, for the most part, unless he is able to understand speech in several languages.

English-Speaking Stations Wanted.

Ask any half a dozen hardened listeners what stations they tune in. Perhaps all six will tell you that they only listen to the B.B.C. programmes. One or two might say that they tune in Luxembourg or Radio Normandie now and then. Clearly, foreign programmes as such cannot have a lasting grip, although every day there are those who newly join the ranks of construction and for a period delight in roaming round the European ether.

But it is the entertainment value of this which is low. There is some rattling good music to be heard from Berlin, Rome, etc., and there is also some jolly fine music on our B.B.C. wavelengths, which, moreover, is introduced in language the Britisher can understand.

Seemingly, then, it takes an English-speaking station to hold an English-speaking public, and there are only a handful of these to be heard on the medium or long waves outside the B.B.C. stations.

On the short waves, however, there are hundreds upon hundreds of English-speaking stations that can be picked up in this country on simple apparatus: American stations receivable at good loudspeaker strength, Australian stations, Canadian stations and so on.

Tune away from Britain on the medium waves and you as likely as not hear nothing but unintelligible speech or variety you cannot follow or plays you cannot understand. But get your hands on a short-wave dial and your reward may be the running commentary on a unique sporting event—cricket from Australia, boxing from America or some quick-fire variety in the attractive U.S. style. It is as though the B.B.C. itself has widened its horizon a hundredfold. You hear familiar speech, with refreshing new colloquialisms and such turns in the vaudeville manner that the B.B.C. could not afford to support.

So, you see, there is much more in this short-wave listening than the fireside travel of distant countries. There is the solid asset of almost unlimited entertainment. And it is this which holds the short-wave public.

In the first years of experience upon these adventurous wavebands there is no doubt that the "distance" appeal is very strong indeed. You get it in such an exciting manner.

There Are Many Pleasant Surprises.

For example, you hook up your short-wave apparatus and slowly turn the tuning dial and adjust the reaction. Almost immediately a station is heard rather faintly. You listen intently in an attempt to identify it. At last you manage to distinguish: "Dear friends and listeners in North America——"

"Ah!" you exclaim to yourself with satisfaction. "A Canadian station, no doubt." But later you find that it is Berlin. Still in Europe! You swing the dials, a bit peeved. Then you hit upon a very loud station indeed. "If Berlin were weak, then this must be Paris," you mutter to yourself, and pause only for confirmation of the conjecture.

Then to your astonishment you find you are on the other side of the Atlantic, perhaps the other side of the world!

Covering Thousands of Miles.

Your loud station may be New York, Nairobi or Sydney, and for a time you enjoy some first-class radio entertainment coming to you across thousands of miles of sea and land.

It is true that there may be a certain amount of interference and a certain amount of fading now and then. But there are hundreds, if not thousands, of stations to choose from, and the reward of a little searching can well be some loud, clear items which you would pay pounds to hear if there were no such thing as radio.

I well remember the terrific thrill I got from something I quite haphazardly came

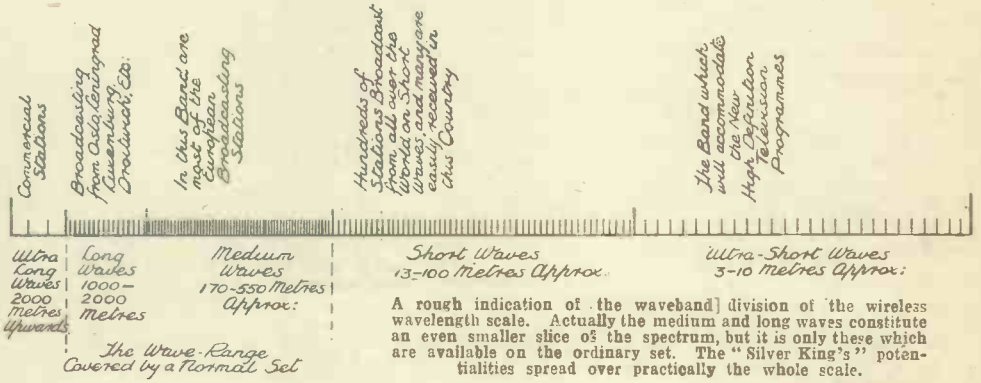
(*Continued on page* 129.)

ENTERTAINMENT FROM FIVE CONTINENTS!

Radio-programme items costing millions of pounds are broadcast on short waves every day from all over the world, and many of them are in English. Soon our own B.B.C. will be radiating new 7-metre programmes. All this wealth of wireless entertainment is unobtainable on any ordinary set, but with a "Silver King" you can share in its distribution and enter a new world of fascinating ether delights as described in this article

By G. V. DOWDING, Associate I.E.E.

HOW MANY DO YOU HEAR?



A rough indication of the waveband division of the wireless wavelength scale. Actually the medium and long waves constitute an even smaller slice of the spectrum, but it is only these which are available on the ordinary set. The "Silver King's" potentialities spread over practically the whole scale.

Two-Channel Reception

An Outstanding Radio Development

By G. T. KELSEY.

Using one aerial, one set of batteries and one receiver having only three valves, dual entertainment has been achieved in a manner that Dr. Roberts rightly describes as almost magical. "Silver King" is the precursor of a new home-radio movement which is bound to assume colossal popularity.

THERE will be few of you by now who are not familiar with the nature of the far-reaching developments which have culminated in the design of the "Silver King." But I'm going to start off by letting you into a little secret. Do you know that this remarkable set *very nearly didn't happen?* At least, not in *this* issue of "P.W."!

And the reason for that was simply and solely that those of us of the technical staff who have been privileged to have a hand in the birth of this best-ever "P.W." effort became so tremendously fascinated at being able to receive two totally different programmes at one and the same time that we very nearly overshot the press date!

I know that that sounds remarkably like a first-class leg-pull, but as a matter of absolute fact it just isn't. The "Silver King," without the slightest shadow of doubt, is one of the most fascinating sets that has ever been designed, and it is the only receiver of its kind in the world. Little wonder, therefore, that when we of the technical staff were called upon to give the design exhaustive tests preparatory to handing the set over to the draughtsman things became a trifle delayed.

Wonderfully Fascinating.

The truth of the matter is that we just could not tear ourselves away from it, and, headed by our enthusiastic Technical Editor, who literally had to be "shoved" (I use the word entirely respectfully) out of the way when somebody else wanted to get near it, we developed into a first-class gang of oil-burners—midnight oil-burners.

And that went on for days and nights while the chief draughtsman waited—patiently at first, and then, alas, expressive somewhat of his wartime nautical upbringing! But we soon cured him. We gave him a demonstration.

Well, this is all very light and airy, I know, and perhaps not exactly in keeping with an introduction to an epoch-making development. But this little exemplification of the ever-present human element, even amongst hard-baked technicians, just goes to show what two-channel reception does for one. It is a fact that it is simply irresistible, and, take it from me, the more experience you have of it the more you will want.

It is true that I have done a similar kind of thing before with two different receivers, two different sets of batteries and, in fact, with two of everything. There's nothing particularly new or clever in that. You can move a mountain if you have got enough machinery to lift it. But the "Silver King" is a very different pair of shoes.

When two entirely different programmes are coming simultaneously down the same aerial "spout"—so to speak—to be able successfully to isolate them completely in the output stages is an achievement which will inevitably have a very far-reaching effect upon the future technique of broadcast-receiver design.

Is it not, therefore, an occasion for great rejoicing that such a momentous development should have found its first outlet to the public—to the *home-constructing* public—through the medium of "P.W."?

Let us not underestimate the tremendous significance of this two-channel idea, both in relation to existing listening requirements and perhaps more particularly with an eye on the future.

Concerning Television Reception.

Television is coming. When or how is of little consequence at this juncture, but in whatever shape or form it does finally arrive it is going to have its drawbacks. And one of the foreshadowed drawbacks up to the present has been the necessity for two sets—one on which to receive the vision channel and the other for the reception of sound.

It is comforting to know that in the United States they have so far progressed in this matter of two-channel reception that they are now able to receive two ultra-short-wave programmes—note particularly, two *ultra-short-wave* programmes—simultaneously with an involved superhet arrangement using a mere twelve "toobes." Just fancy that! Twelve valves, and enough filter circuits to sink a battleship!

(*Continued on next page.*)

TWO PROGRAMMES SIMULTANEOUSLY!

While the man on the right is roaming the world's ether on short waves, the other can listen to uninterrupted reception from a station on the medium or long waves. All on the one set!

And we do something of a much more far-reaching character than that with only three valves. The American one—an all-electric design—must, with its twelve "toobes," literally soak up current, whereas ours—a battery receiver—takes a modest 8 or 9 milliamps in all!

But we must not try to run before we can walk. The television application of this unique two-channel system is only one of the many new phases of receiver design which are inaugurated by the perfection of the "Silver King."

An Irresistible Appeal.

The immediate future of this great development lies not so much in its television potentialities—at least, not yet—but in its irresistible appeal to every ordinary broadcast listener.

In order to assess in some measure the scope of appeal of this system from the point of view of the ordinary broadcast listener it will be time well spent just briefly to consider the present position.

There are the broadcast and long-wave bands. While perhaps not exactly the "old maids'" ether it is a fact that the programmes available on these bands are not the attractions that they were. That is due perhaps partly to the fact that familiarity is apt to breed contempt, but more particularly to the chaotic conditions prevailing at the present time—conditions which preclude of so many of the stations being received at real programme value.

Short-Wave Advantages.

The real enthusiast—the one to whom the reception of a hitherto unheard station gives a real thrill—is the one who comes off worst these days with an ordinary broadcast set. In increasing numbers the real enthusiasts are turning to short waves as the one and only satisfactory way of reaching out for something entirely new.

And by Jove they get it! They get it to such an extent that the ordinary broadcast set begins to take a back seat, and nothing short of a Gillie Potter or a Jack Payne party suffices to bring it back into use.

That's all very well. But most of us have our domestic problems to contend with. It's bad enough to turn your wife into a "wireless widow" without wanting also to borrow the aerial and earth and the batteries! And short waves are *so* tempting.

Thank goodness, the "husband-and-wife" set is at last an accomplished fact.

SILVER KING

TWO-CHANNEL RECEPTION

(Continued from previous page)

After all, ignoring for a moment the technical achievement of being able to receive two entirely different sets of programmes at once and independently, is not this "pleasing everybody" aspect the most vital of all from the domestic point of view?

Just turn it over in your mind. You can install the set in your "glory hole"—I expect you have got one like most of us—and then you can roam round the world to your heart's content without in any way interfering with the broadcast programme in another room—a broadcast programme that can be from any one of dozens of different stations! One receiver, one set of batteries and just a single aerial and earth. Is it not the most tempting receiver that has ever been described? *And it is available only to home constructors.*

As may well be imagined, this astonishing set didn't just happen on the spur of the moment. And were I to attempt to outline the history of its development I should require a complete issue of "P.W." all to myself, and a bit more besides. Early disappointments and set-backs were inevitable. But that is all part of the game, and he is no diehard who doesn't frown with suspicion upon the set that works first time, especially if, as in this case, the set is such a distinctive departure from accepted principles.

Interaction Completely Avoided.

After all, consider the magnitude of the problem. On the H.F. side there are two sets of coils—one for medium and long-wave reception and the other for short or ultra-short waves. Coils and their associated wires have "fields" when stations are being received, and these fields are capable of causing coupling over quite large distances.

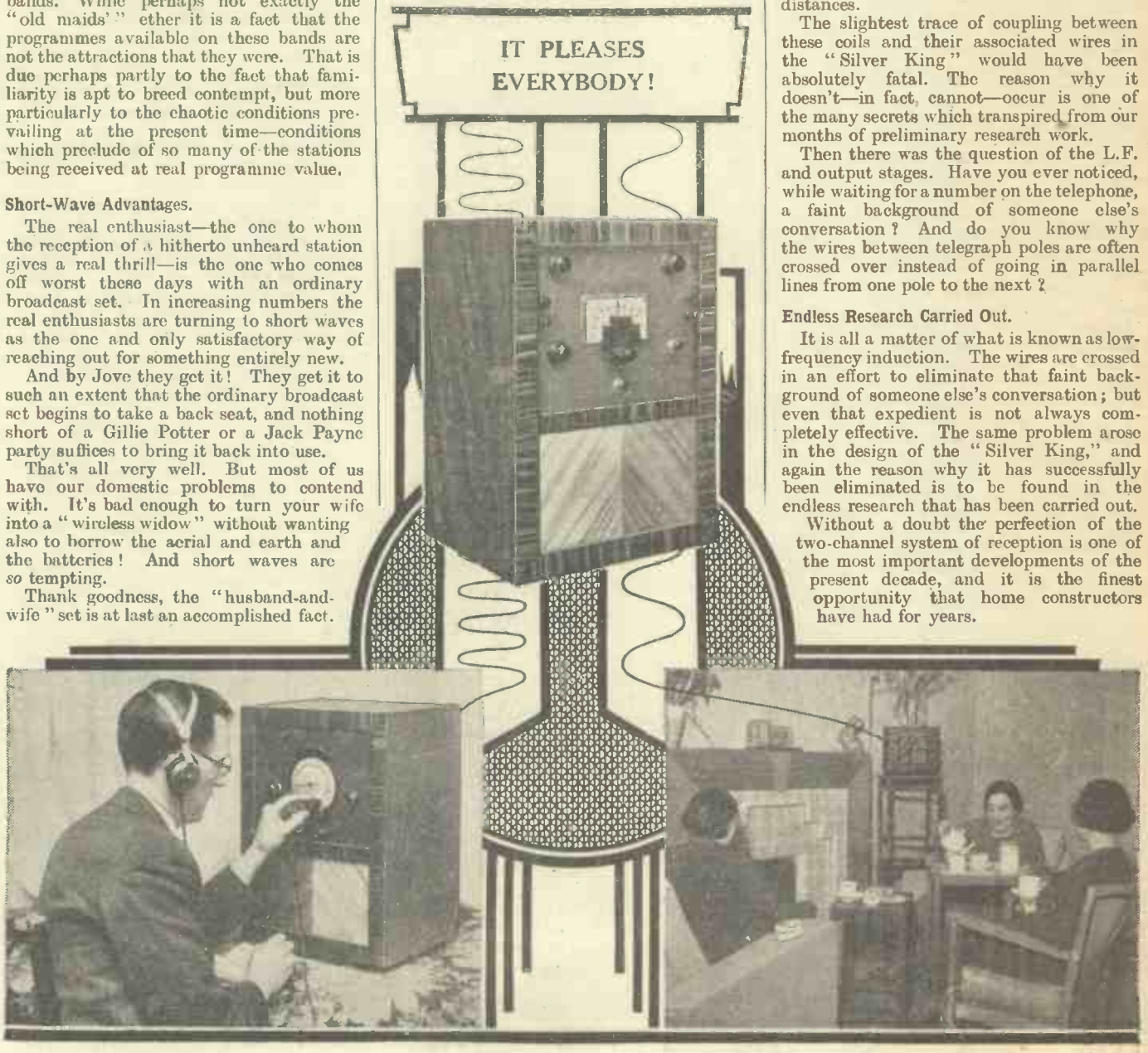
The slightest trace of coupling between these coils and their associated wires in the "Silver King" would have been absolutely fatal. The reason why it doesn't—in fact, cannot—occur is one of the many secrets which transpired from our months of preliminary research work.

Then there was the question of the L.F. and output stages. Have you ever noticed, while waiting for a number on the telephone, a faint background of someone else's conversation? And do you know why the wires between telegraph poles are often crossed over instead of going in parallel lines from one pole to the next?

Endless Research Carried Out.

It is all a matter of what is known as low-frequency induction. The wires are crossed in an effort to eliminate that faint background of someone else's conversation; but even that expedient is not always completely effective. The same problem arose in the design of the "Silver King," and again the reason why it has successfully been eliminated is to be found in the endless research that has been carried out.

Without a doubt the perfection of the two-channel system of reception is one of the most important developments of the present decade, and it is the finest opportunity that home constructors have had for years.



The P.W. Jubilee Valve

The whole basis of two-channel reception in the "Silver King" lies in the remarkable new electro-amplifier valve that has been specially designed for this receiver. The valve is the beginning of an entirely new technique.

By K. D. ROGERS.

DUAL-CHANNEL reception! Listening to either one or another waveband on a radio receiver is child's play; but it is a very different story when one wants to design a set that will receive any two prechosen wavebands *at one and the same time* and to reproduce them on two different loudspeakers or speaker and headphones.

That is what the POPULAR WIRELESS "Silver King" Jubilee receiver does. It gives you either one or other or BOTH of two wavebands and ushers in a completely new era of dual-channel reception. And

UNIQUE IN EVERY RESPECT

we shall hear a great deal about dual-channel reception when television comes along.

How does the "Silver King" do it? By virtue of a special valve that has been designed for the purpose and which accepts all the required channels at one and the same time and sorts them out, while simultaneously it amplifies the incoming impulses.

Suppose that you are going to listen to London on one waveband and to New York on another, and that you require the former on the loudspeaker for the amusement of the household, while you would like to listen to the latter in the quietness of your own room or den.

An extension speaker to the family will provide them with the music they require, while you will be free to tune in New York, or any other station that takes your fancy on the short waves, without in the least upsetting the enjoyment of the others. They will not know what you are doing, or even that you are doing anything.

Small Anode Current.

Only the one aerial is used, and the incoming energy is fed by appropriate circuits to the special valve, the J240. Here all sorts of things happen, some quite conventional and others completely unconventional.

For instance, high-frequency amplification by a new method is carried out with enormous effectiveness and an astonishing degree of economy. By the method adopted the anode current of the whole set is reduced considerably, and it is largely due to this development that the total current of only 8 milliamps is achieved without the need for any such thing as an economiser circuit and without impairing the efficiency in any way.

Well, we have H.F. amplification in that valve. Yes, and plenty of it, too. But the valve is not merely an H.F. amplifier. It is designed to carry out a number of operations, and can be used as a superhet mixer-oscillator, A.V.C. valve, multiple detector, L.F. amplifier and many other things.

Acts As Detector-Amplifier.

In the present set it is also acting as a detector-amplifier, dealing at the same time with colossal differences of frequency, and pushing out the rectified impulses down the correct external channels for feeding to the output circuits. And these impulses are amplified, too, not merely by the normal sort of amplification that is always provided by a triode detector, but with the far greater step-up that is associated with the pure low-frequency amplifier.

Two members of the "P.W." Research Department examine the first model of the new valve.

The valve has been kept wonderfully small when one considers what enormous tasks it has to carry out and the tremendous diversity of those tasks. And though it has nine pins and a top-cap terminal, the valve is not as formidable in use as its appearance would lead one to believe.

Naturally, care must be taken about the connections of those nine pins, and it is as well here to draw attention to the arrangement. There are two pins that are closer together than any other pair. These are the filament pins, and they are numbered *mentally* (not on the valve base) 4 and 5, the numbering being carried out in a clockwise direction.

Then the other seven pins are arranged as follows: Right opposite the two pins just mentioned is one that may be taken as the apex of the whole arrangement. This is number 9. The others are counted from the one on the right of this pin (number 1) right round again in clockwise order.

REVOLUTIONISES RECEPTION

Obviously, it is of the utmost importance that the connections to the valve be carried out correctly, otherwise not only will it not work as it should, but there is a possibility of damaging the valve. It is not a good thing, for instance, to get the high-tension positive on one of the grids. But if care is taken with the use of the valve there is no reason why any such mistake should be made.

But constructors should not make the mistake of imagining that the valve is a one-set valve. It is nothing of the sort. It can and will be used in a number of designs.

It is its flexibility that was one of the chief aims when it was being designed, for it was realised that not only must the dual-channel-reception principle be well and truly accomplished by the J240, but that the valve must also be capable of use in a whole horde of different types of circuits.

Very Carefully Tested.

That flexibility has been achieved, and Hivac, the enterprising firm who have manufactured the valve, are to be congratulated on turning out such a fine example of up-to-date design.

Furthermore, I understand that, they are taking unusually great care that no valve below standard shall reach the public. Every individual specimen is being rapidly tested, for the efficiency of the "Silver King" depends on the correct working of the Jubilee valve, and the makers are determined that no snags shall arise on their account.

It is a very worthy ideal, too, for the valve is not an easy one to make, and I welcome the rigidity with which tests are being carried out.

THE SECRET OF THE "SILVER KING'S" GREAT SUCCESS

SOME NOTES ON

THE SILVER KING COMPONENTS

The parts used in a receiver are responsible for the results obtained—so be guided by our advice on this page and ensure your complete satisfaction

THERE are certain types of sets for the home constructor with which the potential builder can take liberties in regard to the matter of components without fear of impairing the efficiency of the set.

May we make it quite clear at the outset that the "Silver King" very definitely does not fall into that category?

The most important thing to remember about this set when thinking in terms of the components is that it is something quite new, and that in consequence ordinary considerations do not apply.

We do not wish unduly to stress this question of components, and any tendency on our part so to do must be put down entirely to our desire to ensure for each one of you results comparable with our own.

It isn't just a question of sacrificing a modicum of efficiency by using perhaps an L.F. transformer or some other "stock line" that you happen to have by you. It is the serious danger of *introducing* unwanted coupling effects.

SUITABLE VALVES

Make	V_1	V_2	V_3 Small Power	Super-Power
Cossor	—	210H.F.	220P.A.	230X.P.
Hivac	J240	H.210	P.220	P.P.220
Marconi	—	H.L.2	L.P.2	P.2
Osram	—	H.L.2	L.P.2	P.2
362	—	H.L.2	L.P.2	P.2
Tungsram	—	H.R.210	L.P.220	S.P.220

The "Silver King" is first and foremost a two-channel set, and as such it is unique. But because of that fact there are two entirely different sets of programmes passing through the set at one and the same time, and if, anywhere in the chain from the aerial to the respective output arrangements, the slightest trace of coupling is introduced the effect upon results will be disastrous.

We Study Your Pocket.

Obviously, for us to have tried all sorts of different combinations of components, in order to have provided you with alternatives, would have been a phenomenal undertaking, and in any case the improvements which are continually taking place in the component world warrant the use of an entirely new set of parts for a set incorporating such revolutionary principles of reception as this one.

This appeal to you for once to forsake the junk box is not fanaticism on our part. It will have been obvious from our previous activities that our one concern is always, where possible, to study the pockets of our readers.

But the paramount consideration with any such far-reaching development as this one must always be *results*. Trust us to see that those results are obtained for as little expenditure on the part of the potential builder as possible. But do not, we implore you, seek still further to economise by making experiments. It will be false economy.

The components selected for use in the "Silver King" are, without exception, the cheapest ones that we could find to carry out the various functions efficiently but without fear of unreliability.

Two Sets In One.

To what extent we have succeeded may be gauged from adding together the total cost of components for a good modern three-valve broadcast receiver and for a highly efficient short-waver, and by comparing that total with the cost of the parts for the "Silver King."

The justifiable enthusiasm and optimism which permeate this issue of "P.W." as to the future of two-channel reception are founded upon the results which we have been able to achieve with the original set. You, too, will be able to share that enthusiasm and to translate it into terms of endless home entertainment if you adhere rigidly to the component specification given on this page.

We are as anxious as you will be yourself for you to obtain completely satisfactory results, for an army of satisfied constructors will do more to spread the news of this momentous development than anything we can write. That is why we have gone to such lengths to stress the importance of this component question.

Watch the Layout.

There is another point, apart altogether from electrical considerations. The success of this set is dependent in no small measure upon the actual layout. The use of components other than those specifically recommended may necessitate alterations in this respect, and there is no answering for what might happen in that case!

ACCESSORIES TO USE

Loudspeaker, W.B. "Stentorian."
1 pair Ericsson headphones.
1 G.E.C. 120-volt H.T. battery.
1 G.E.C. G.B. battery (to suit output valve).
1 Exide 2-volt accumulator.

The moral is obvious, and if you build strictly in accordance with the published specification you need not entertain the slightest fears.

In drawing to a conclusion these notes on components, it is opportune just briefly to refer to the question of accessories, although, as a matter of fact, the "extras" are to be dealt with at greater length in a subsequent issue.

Having regard to the specialised nature of the "Silver King" design, the constructor would be well advised to pay particular attention to voltages, valve types and to the other recommended accessories.

THE COMPONENTS EMPLOYED—THEIR TYPES AND THE MAKES

1 Formo 2-gang ·0005-mfd. variable condenser with dial.
1 Wearite 2-gang coil unit, type WLQ and WLT.
1 J.B. ·0002-mfd. solid dielectric differential-reaction condenser.
1 Bulgin standard screened H.F. choke, type H.F.8.
1 Varley L.F. transformer, "Nicore" II.
1 Polar-N.S.F. 10,000-ohm potentiometer.
2 Dubilier 2-mfd. fixed condensers, type BB.
2 T.C.C. 2-mfd. fixed condensers, type 50.
2 Graham Farish 30,000-ohm "Ohmite" resistances with horizontal holders.
1 Graham Farish 10,000-ohm "Ohmite" resistance with horizontal holder.
1 Clix 9-pin valve holder, chassis-mounting type, with screw terminals.
2 Benjamin 4-pin valve holders (Vibrolders).
1 Bulgin "Steatite" low-loss valve holder, type S.W.21.
2 Dubilier ·0002-mfd. fixed condensers, type 670.
1 Graham Farish 2-meg. "Ohmite" grid leak.
1 T.M.C.-Hydra ·25-mfd. fixed condenser, type 25.
1 Colvern set of 3 special short-wave coils.
1 Colvern special ultra-short-wave condenser.
1 Polar ·00016-mfd. type "E" short-wave condenser.
1 Formo "Snail" slow-motion drive for above.
1 Varley "Niclet" L.F. transformer.
1 J.B. ·0001-mfd. reaction condenser (Midget type).
1 Bulgin short-wave H.F. choke, type H.F.3.
2 Bulgin on-off switches, type S22.
1 Bulgin L.F. choke, type L.F. 20.
1 Dubilier ·002-mfd. fixed condenser, type 670.
1 Dubilier ·001-mfd. fixed condenser, type 670.
1 Erie 2 meg. grid leak.
6 Belling-Lee terminals, 7 wander-plugs and a wander fuse.
2 Belling-Lee accumulator spade terminals.
Peto-Scott cabinet, panels, screen, double-sided "Metaplex," etc.
Pix Invisible Aerial.

SILVER KING

The Set of the Century

FULL CONSTRUCTIONAL DETAILS

By K. D. ROGERS

★

THE "Silver King" is as unusual in its appearance as it is in its performance. But it is not difficult to construct in spite of its unusual layout.

As you will have noticed, the set is designed to swivel round so that either of the two panels can be got at in an instant, and the two channels are controlled by the adjustments made on those two panels, there being one panel for each channel.

Divided Into Two Sections.

Inside the set the two channels are merged inside the special Jubilee valve, the output of which is divided into the two sections that are kept apart by the vertical screen running right across the receiver.

At first sight this procedure makes the set look distinctly awkward to construct, but a short examination will make it clear that this difficulty is only apparent and is quite unreal. The "Silver King" is no more difficult to build than most ordinary battery sets, though there may be a little more wiring to carry out.

The usual under-chassis-wiring method of construction has been adopted, such things as the decoupling condensers and the resistances being tucked away below deck.

This not only keeps the upstairs portion as neat as possible, but it also makes for efficiency, there being two component-mounting surfaces instead of one and a corresponding shortness in connections. As a matter of fact, the "Silver King" is particularly rich in mounting surfaces, and this is one reason why such a high degree of efficiency is obtained. Most of the leads can be kept remarkably short, and while there are, inevitably, some long connections, these are mainly those in the filament or other circuits, such as H.T., G.B., or L.F. leads that do not matter being long.

THE APEX OF ACHIEVEMENT

★

TWO-CHANNEL LISTENING FOR ALL

★

There are two ways of going about the building of this receiver. One is to buy the panels, cabinet, screen and so forth, with the kit of parts for the set; and the other is to collect most of the parts and the necessary panels and screen, baseboard, etc., from different sources.

Simplifying The Construction.

The first is the easier, for by getting one of the various kits that are available, you can buy the panels ready drilled, and so greatly simplify the constructive work. If you get the parts from different shops you will probably not be able to get the panel ready drilled, and the screen, with its hole for the valve holder, all ready cut out, and you will have to do these jobs yourself.

Not that such an eventuality should put you off in any way: we mention the fact so that you may choose early, before you start collecting the parts, whether you will take the path of least resistance (and, some would say, least interest) or whether you will decide to build the whole thing up from what may be termed the raw materials.

Preparing The Screen.

Whichever you do, the fact remains that the screen is the first thing to be prepared, and it must be drilled in accordance with the diagram before any assembly of the set is attempted. The hole must be cut to clear comfortably the valve pins, and is easily done by a proper cutter, or else by drilling holes round the periphery and then knocking the joining pieces of metal out.

With the screen drilled it should be bent to shape, as per diagram. This bending is to enable a neat and firm fixing to the chassis to be obtained. The chassis consists of two pieces of baseboard, metal faced, mounted on runners, with the screen going through between the two. The screen is the full width of the baseboards while above them, but on going through it is bent so that it is the full width, less the thickness of the two runners.

After passing through or between (whichever way you like to look at it) the two baseboards the screen is screwed to the two runners, and this, plus the clamping provided by the pressing together of the ends of the two baseboards, keeps the screen perfectly rigid.

START BUILDING THIS REMARKABLE SET NOW!

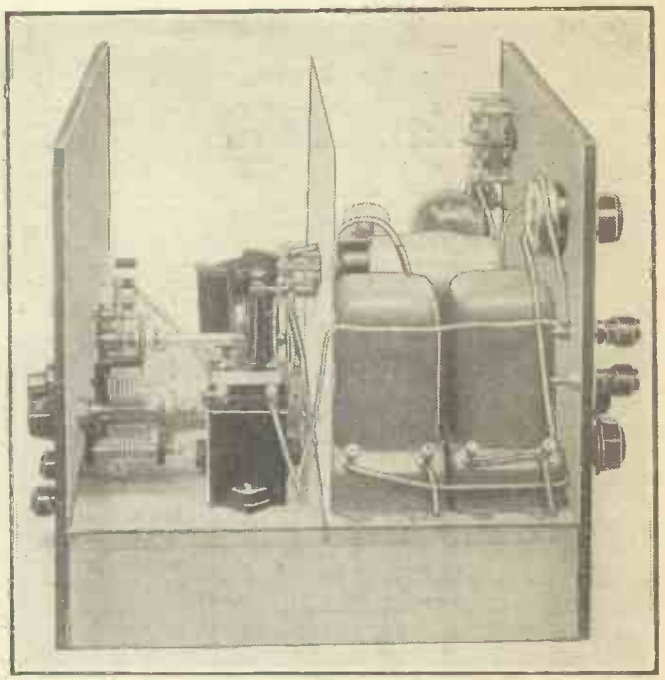
As the screen is mounted on (or in) the baseboards before the panels are fixed it does not matter which way it is placed in relation to the position of the hole for the valve holder. That is, there is not any back or front to the set as yet. But when the panels are fixed care must be taken to see that the panel for the broadcast section is on the right baseboard, so that, looking at the screen from that panel, the hole in the screen comes on the left.

Looking at the screen from the short-wave-panel side, the hole through the screen will come on the right, of course.

A Point to Note.

But before we come to the preparing and mounting of the panels there is a fair amount to be done to the set, and we merely mention this feature of the hole position relative to the panels because at this juncture, although the panels are not to be mounted, you have to decide which side of the baseboard is to be the short-wave side and which the broadcast section. And to do this you must, of course, decide where each panel is going to be fixed in relation to that hole in the screen.

That small but important point decided, you can go ahead with the mounting of the various parts above and below the baseboard and with the valve holder on the screen itself.

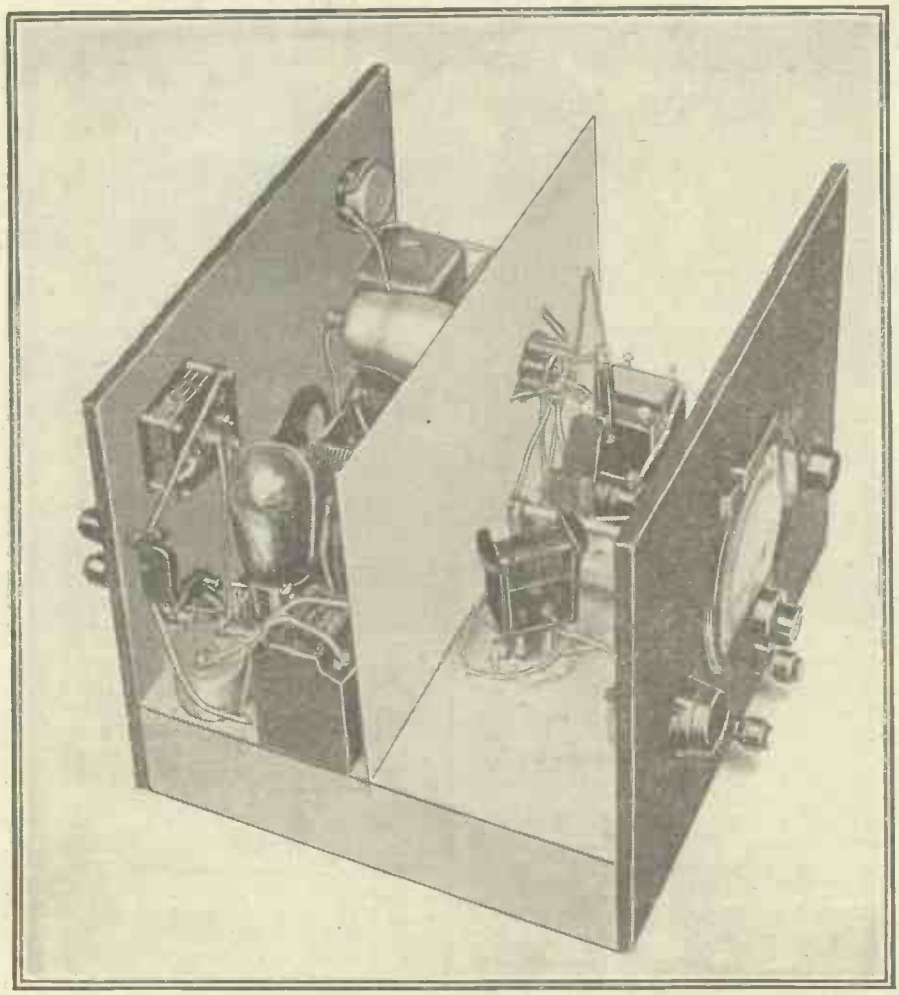


FOR SHORT WAVES

In this view of the "Silver King" we are looking down the short-wave section, with the "Niclet" transformer in the foreground.

Be careful to get this the right way round, too; the bottom (where the terminals are) should be on the side of the screen that faces the short-wave section of the set, the valve being plugged in on the broadcast side. If the holes in the screen have been accurately drilled, including those for the four bolts holding the valve holder, the orientation of the valve holder will almost be determined automatically, but care must be taken that the valve holder *is* correctly fixed in regard to the position of its pins.

THE SET WITH TWO PANELS—



The whole chassis is made of double-faced "Metaplex," while the panels are of wood with metallised inside surfaces.

It is not too easy to see from a drawing of the valve holder exactly how the pins are arranged, but if you look carefully at the component itself you will see that there are two pins that are closer together than any other two. These pins are those for the filament connections, and are numbered in our diagrams 4 and 5. You will not find any numbering on the valve holder itself, so that you will have to go by the "mental" numbering that we show on the diagrams.

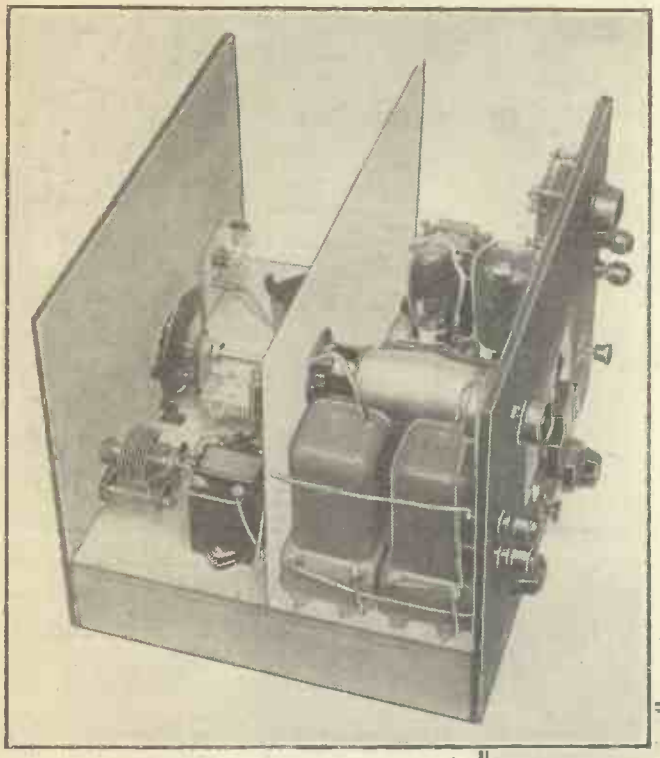
Numbering the Valve Pins.

It is not a bad plan to pencil the numbers on the valve holder or to stick little bits of paper on the pins, so that when you are wiring up you will be sure of the numbers without having to count round each time. But be careful that pencil marks do not cause any leakage paths between the pins.

Anyhow, whatever method you adopt you should carefully check all the connections from this description and from the blue print.

We have said that the two pins that are close together are the filament pins, and that they are numbered 4 and 5. But which is which? Take the valve holder with the pins towards you (that is, looking at it from the side on which you connect it—underneath, if you like to regard it that way) and place it so that the two pins that are closer together than any other two are at the bottom.

There will be one pin at the top (that is, at the apex of the "circle" made by the nine pins). That pin is No. 9. That fixes



those pins are arranged on the valve holder before you go any farther.

With the pin matter cleared up and the valve holder mounted on the screen you can go ahead with the completion of that part of the set that is not concerned with the panel connections. Fix the baseboard and under-baseboard components and wire up as many as you can, including the flex leads for the battery connections.

When you come to a lead that has to go to a panel component, fix the one end of it and leave a length of lead for the later connection to the panel when this is fixed in position. Do not attempt to tackle the panel fixing before you have the wires placed in position on the rest of the set, or you will find things very awkward to get at.

THE "BROADCAST" SIDE

Nearest the camera in this view are the two "Wearite" coils, the WLT on the left and the WLQ on the right. All three valves are plugged in on this side of the set.

Leads from the Aerial Terminal.

One point here we should, perhaps, emphasise. That lead from the aerial terminal does actually go to a dead end after passing through the screen. It is not a mistake in the diagram. One lead from the aerial terminal goes to the volume control on the panel (this lead you will be fixing later, we know, but you will want to fix the lead from the "anode" terminal of the short-wave coil holder, and will have found that it ends nowhere, being twisted round a lead from the aerial terminal that also ends nowhere).

The other lead from the aerial terminal is a long one, and goes to the dead end we have mentioned. The lead should be cut

—RECEIVES ON TWO CHANNELS

the rest of the pins. They are numbered from that No. 9 pin right round in a clockwise direction (that is, moving round to the right and starting next door to that top pin).

Thus No. 1 will be next to it on the right, and on going round you will come to No. 8 as being next to the top pin on its left. We are rather stressing this matter of the pins because it is possibly the most important part of the whole set. One false step here, and not only will you fail to get the set to work, but you may damage the Jubilee valve.

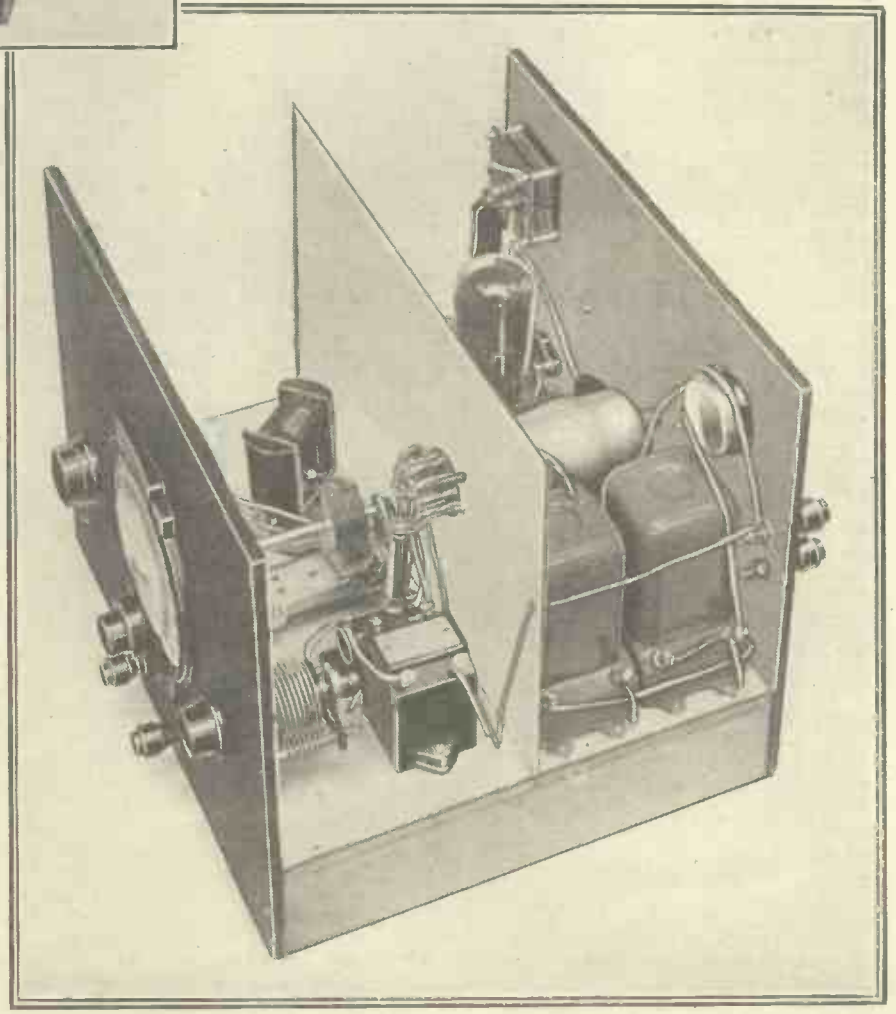
The Blue Print Key.

Now look at the blue print. You will see at the top a key to V1. This shows the valve holder viewed from the pin side, but turned round a quarter of a turn to the left, so that pin No. 9 comes "due west," as it were. Then the filament pins, Nos. 4 and 5, come "due east." That is how the valve holder is fixed in the screen, and it is important to see that it is fixed exactly in that way.

Those letters on the leads from the key of the valve holder are to help you trace them when referring to the wiring of the blue print. They have no other significance.

When you have got the valve-pin arrangement absolutely clear in your mind, but not before, you can proceed with the construction. But for goodness' sake do not rush on until you *have* got them clear.

If you do go wrong here, and there is no need to if you take care, you may be up against faults that will take weeks to clear up, for every one of those pins makes contact with a different electrode in the J240 valve, and you can imagine what a good time you would have sorting things out if you did not know which wire went to which pin. So make sure you know how



The short-wave tuning condenser is operated via a long-extension spindle which is integral in the construction of the component.

ONLY THREE VALVES ARE USED IN THE RECEIVER

roughly to length and passed through the screen, being twisted round the lead from the coil holder about half a dozen times, and left for connection to the aerial terminal (on the broadcast side) when the panel is fitted.

This twisting-round business is a means of forming a small-capacity coupling between the aerial and the short-wave section of the set.

Keep the Ends Separated.

But take care when twisting these leads that the ends are separated. The leads themselves will be of insulated wire, of course, the same wire as used for the rest of the set being satisfactory, but the ends where the wire itself may tend to protrude from its insulation must not come into contact. You must have two separated ends, as shown in the blue print.

At this point, too, we should say that the set when finished will be placed in its cabinet with the broadcast side on the side of the cabinet you insert the batteries. Actually the batteries are placed under the set in the cabinet, but you get at them on one side (or one "front," as you like), and that side is preferably the same side as the panel of the broadcast section of the set.

The reason for this is that the majority of the battery leads of the set come out from the broadcast side underneath the chassis, and only three are attached to the set on the short-wave side. In this respect the blue print is a little misleading. It shows the connection to the battery leads correctly, but it shows the whole of them coming down under the short-wave side of the set, the leads from the broadcast side passing the screen to reach the short-wave side.

It is better in practice so to place the set in the cabinet that only the three leads from the short-wave side pass across the under section of the screen, for then only three slots in the screen have to be made to allow the leads to pass.

If the set is placed the other way round relative to the battery compartment the number of slots in the screen would have to be greatly increased to allow a much larger number of battery leads to go across.

So at this juncture in the building of the set you should bear that fact in mind, and you can make the three necessary slots in the screen for the three leads. You can make three holes, if you prefer, and pass the leads through ready for the final connecting up in the cabinet.

Before we go on to the point-to-point wiring of the baseboard section of the set and wiring of the panels we would like to mention just one more point.

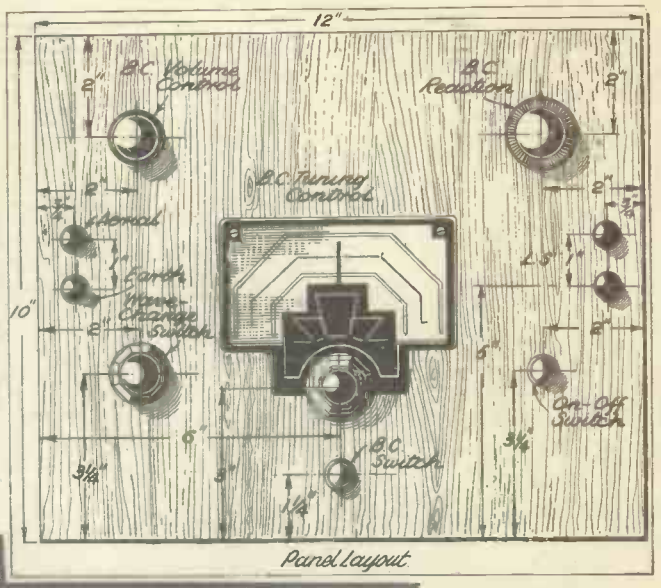
Note This Lead.

There is a lead that goes along by the screen from the filament of V2 to pin No. 5 on the nine-pin holder, passing through the screen to reach the latter connection and running behind the variable condenser on the way. Be careful that that lead does not get in the way of the trimmer at the rear of the condenser, for you will want to get at that trimming wheel later on when the set is being tested.

There are one or two contacts in the wiring of the short-wave side of the set that have to be soldered. Sorry, but it could not be helped, for it is essential in a set that is to go right down on the short-wave side that the connections be above suspicion, and, moreover, that the components themselves be just as much above suspicion.

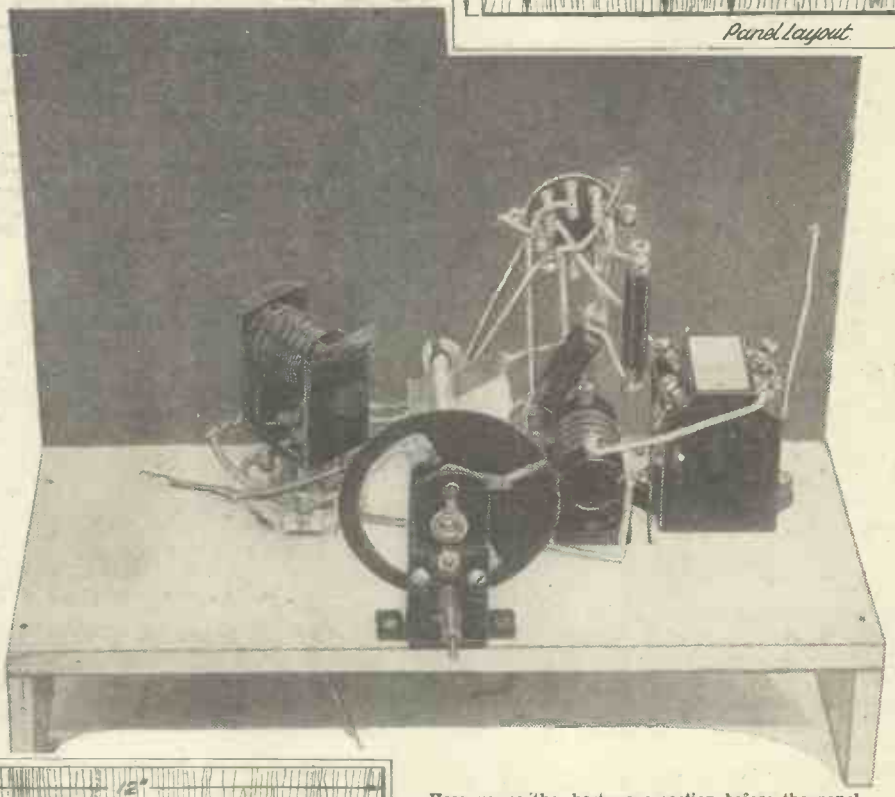
Terminals on short-wave components, especially condensers, are liable to increase the capacity unnecessarily and also are not always easy to arrange for without

(*Continued on page* 103.)

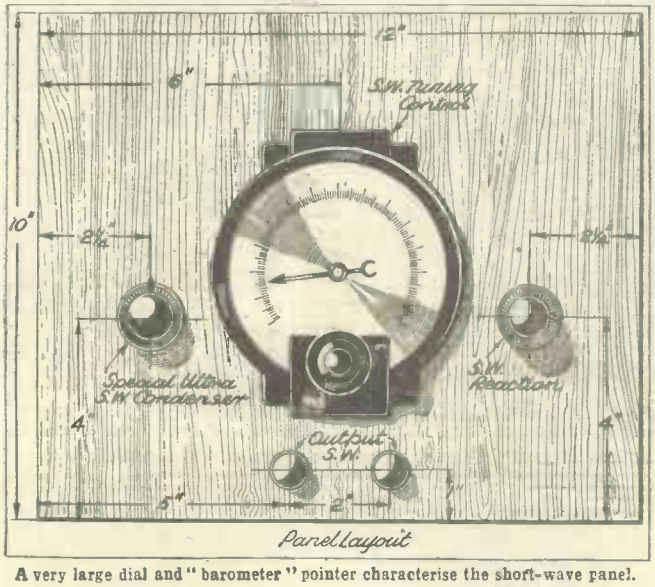


The panel-drilling dimensions of the broadcast side of the "Silver King." The panel is made of oak-faced ply-wood with a metallised back.

THE SHORT-WAVE SIDE

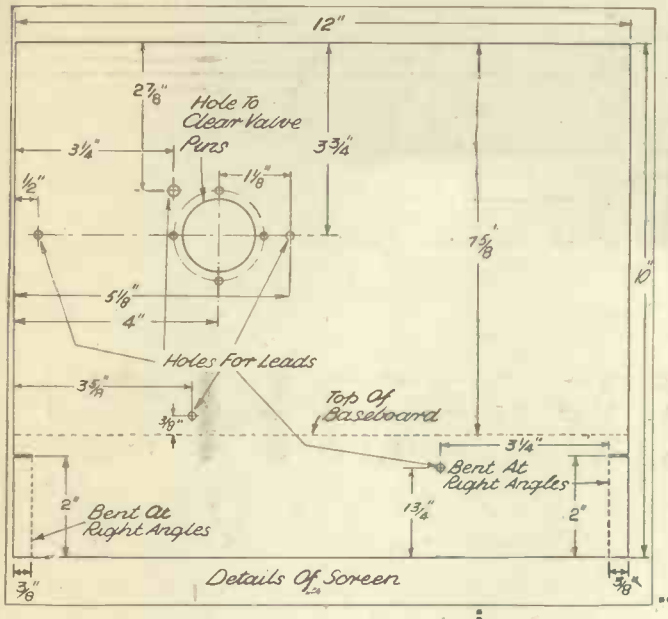


Here we see the short-wave section before the panel is fitted. Note how the leads are left ready for connection.



A very large dial and "barometer" pointer characterise the short-wave panel.

VERY SIMPLE TUNING



making the component bulky and liable to faulty connection. In this set the variable condenser on the panel and the tuning condenser for short waves are not fitted with terminals, for it is easier to get a neat, permanent joint by means of soldering, and the makers have wisely taken that choice.

Keeping the Size Down.

The coil holder can more easily be fitted with terminals, and so that has been done; and the reaction condenser, too, does not suffer by reason of the terminals that it has. But the tuning condenser especially would tend to become untidy and unnecessarily bulky if terminals were fitted, and the minimum capacity would also tend to be increased, a serious matter in a set that is to go down to really short wavelengths.

So we are afraid that you will have to solder these few points. Some of you will not mind in the least; and others, who dislike soldering, will find that it is not so bad as they imagine if care is taken to get the iron properly hot and clean and to tin the wires and the soldering tags before trying to make the connections. When you are used to soldering you will find that it is quicker to solder than to make a really tight joint with a terminal, especially if the terminal in question is one of the small things that are so often fitted to radio components.

The Baseboard Wiring.

Now, before we go any farther let us take in detail those leads that should be attached to the baseboard.

The exact order of the wires on the baseboard is not very important, but we suggest that you follow the order given here as being perhaps as easy to work to as any. And as regards wire, we recommend a good insulated type like "Quikon."

We will take those leads that keep to the top surface of the baseboard first. Connect C and E of the coil WLQ together and tuck a lead from C under the foot of the coil to make contact with the baseboard. Make sure that this is a good connection. Connect a length of lead to C sufficient to reach the volume control on the panel when this is fitted.

Connect VC of WLQ coil to the adjacent terminal on the variable condenser, and run a wire from that terminal through the hole in the screen near the nine-pin valve holder, and connect it to the pin number 9 on that holder. This lead is lettered J on the blue print.

Connect a length of wire to terminal A on the same coil unit ready for connection to the volume control on the panel.

Now go on to the second section of the coil unit, the WLT coil. Take a short lead from E terminal under the foot of the coil, and make sure that it makes good contact with the baseboard. Then connect together the terminal VC and the adjacent terminal on the variable condenser.

Finishing the Coil Connections.

Run a long lead from R on the WLT section round the coil unit, under the wave-change spindle and under the variable condenser spindle, leaving enough length to attach it later to the F1 terminal of the ·0002-mfd. reaction condenser. We have one more terminal on the coil to do, but we will leave that till we go to the underneath-baseboard leads.

We are still working in the same section of the set, namely, the broadcast section, and we now take a lead from the G terminal of V2 to a ·0002-mfd. condenser and also connect to the G terminal one of the wire ends of the Erie grid leak.

The other end of the grid leak we now connect to the filament terminal of V2 nearer the panel, and run a wire from this terminal to the next-door terminal on V3. This one, you will observe from the blue print, is also a filament terminal, the two valve holders having been placed together so that their filament terminals come into juxtaposition.

The V2 Grid Circuit.

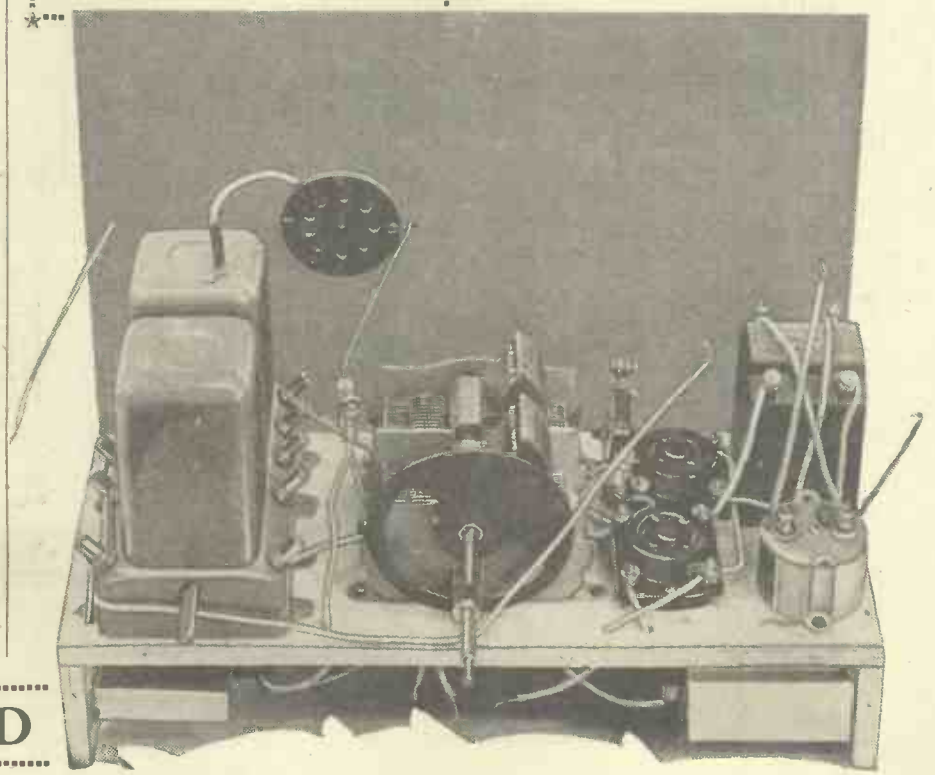
There is another wire from the filament terminal of V2 to consider, and that is the one that goes along behind the variable condenser close to the screen, and then goes through the hole in the screen and up to terminal 5 on the nine-pin holder (letter D in blue print). Do this lead next, but, as mentioned before, keep it well clear of the rear trimmer of the variable condenser.

There is now one terminal of the ·0002-

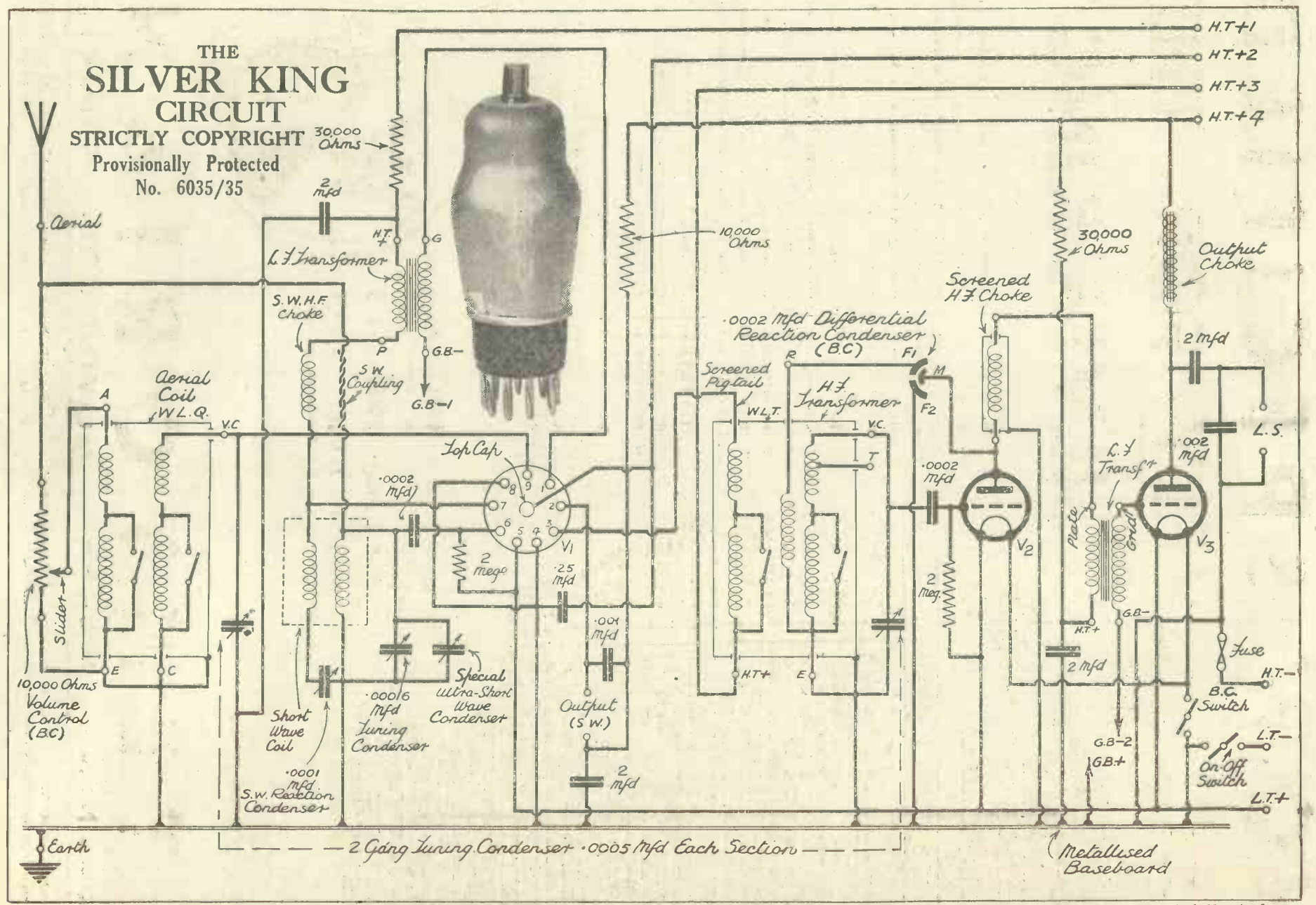
(*Continued on page* 107.)

THE METAL SCREEN

The centre division of the "Silver King" is one of the most important features of the design. It separates the two sections of the set and forms the mounting for the special Jubilee valve. Above you see a dimensioned drawing of the screen, while below is the sheet of metal in place in the set. The panel of the broadcast side has not yet been placed in position, so you can clearly see the components and wiring.



EASY TO BUILD



Here is the full theoretical circuit of the "Silver King," with a photograph of the special Jubilee valve. The numbering on the valve holder is carried out as for a chassis-mounting type, i.e. looking at the holder pins from below. The short-wave-coupling scheme is clearly shown in this diagram, and from it you will be able to understand the why and wherefore of those dead ends of wire that have been discussed in the accompanying article.

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The left side of the set as seen here is the broadcast side. The panels are: left, the broadcast panel, and right, the short-wave panel. The double-panel method of construction makes the set very easy to build.

(*Continued from page* 103.)

mfd. condenser on the G of V2 to be tackled, and a short lead is taken from this to the adjacent terminal of the variable condenser. This is a fixed-vane terminal, of course, and it electrically joins the grid condenser with the terminal VC on the WLT coil via the framework of the condenser.

Now let us finish the connections on V2. Take a lead from the remaining filament terminal on that valve holder to the remaining filament terminal on V3. Connect the A terminal on V2 to the nearer terminal on the screened H.F. choke.

The Short-Wave Side.

That completes V2. Now for V3. Without going below deck there is only one more lead that we can put on V3. This is to the "grid" terminal of the L.F. transformer. (This is the "Nicore" 11 type, by the way, so make sure that you have this one in this section of the set. The other transformer goes in the short-wave part on the other side of the screen.)

Now for the screened H.F. choke. Take a lead from the terminal which already has a lead from V2, ready for connection to the moving-vanes terminal of the differential reaction condenser. Then run a lead from the remaining terminal on the choke to the "plate" terminal of the L.F. transformer. Take a lead from the foot of the choke, making good contact with the metal baseboard, and leave a length sufficient for connection to the on-off switch when the panel is fitted.

Now let us go over to the other section of the set and do the "upstairs" wiring.

Start with the coil as before. This fits into a valve holder, so we will refer to the terminals as if they were for a valve. Thus the grid terminal must be connected by a lead running under the back of the short-wave variable condenser to the rear terminal on the short-wave H.F. choke.

Next connect a lead from the same terminal of the short-wave choke up to the nine-pin valve holder terminal 7. (This is letter B in blue print.)

Soldered to the Condenser.

Connect the filament terminal of the coil holder on the right of the grid terminal by a screw and washer to the metallising on the baseboard, and also run a wire from it along above the baseboard to the tuning condenser, and also take it up to terminal 8 on the nine-pin valve holder (letter A in blue print). The variable condenser connection is soldered, the insulation on this lead being scraped off at one point and the wire soldered to the rear soldering tag on the condenser.

Also run a lead from the same terminal on the coil holder ready for connection to the special ultra-short-wave condenser that is mounted on the panel.

Run a length of wire from the "anode" terminal of the coil holder round the back of the holder, ending after about six inches.

Round this wire twist another piece of wire of greater length, and run this wire under V1 and through the screen on the right of the set looking from the short-wave side right up to where the aerial terminal of the set will come when the panels are put in place. Leave the wire ready for connection to the acrial terminal later.

From the anode terminal of the coil holder also run two wires for soldering to the tuning condenser and the ultra-short-wave condenser on the short-wave panel (see blue print). The one to the tuning condenser can be soldered now.

Take a wire from the remaining filament terminal of the coil holder and run it along under the holder ready for connection to the fixed vanes of the ·0001-mfd. reaction condenser. This wire will also run under the tuning condenser.

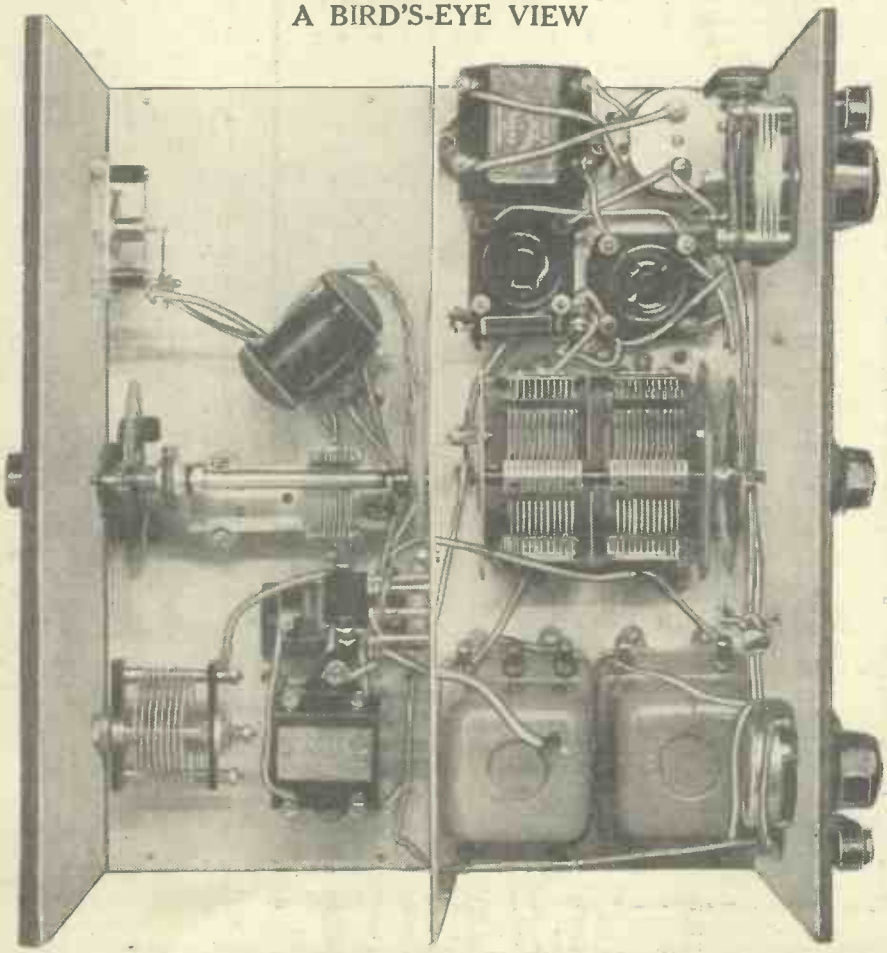
Join a wire from terminal 6 on the nine-pin holder (the wire is lettered C in blue print) to one end of a ·0002-mfd. fixed condenser, and thence to one end of a 2-meg. "Ohmite" grid leak. The other end of the grid leak is connected by the wire lettered E in the blue print to pin number 5 on the nine-pin valve holder. Connect remaining side of the ·0002-mfd. condenser to remaining F tag on tuning condenser by soldered lead.

"Upstairs" Wiring Completed.

Now connect the remaining terminal on the short-wave H.F. choke to the P terminal of the L.F. transformer. Connect the G terminal of this transformer by

(*Continued on next page.*)

A BIRD'S-EYE VIEW



Looking straight down on the complete receiver. The valves have been removed to show as much of the wiring as possible. It will be noted that there is not very much connecting to be done, and what there is is remarkably easy.

a lead marked H in the diagram to terminal 1 on the nine-pin valve holder V1.

Connect terminal 3 of V1 to the end of the screened pig-tail on the broadcast coil WLT, passing the lead through the hole in the screen near to the number 3 pin. This lead is lettered F in the wiring diagram. Connect together terminals 8 and 4 on the nine-pin valve holder.

Now we shall have to go underneath for the rest of the baseboard connections. Let us do those that run through from the top first, making the holes in the baseboard as we go on.

Under the Chassis.

Back to the broadcast side, then. There is a lead that should go from H.T.+ on the WLT coil to a wander-plug for H.T.+3. This lead is a piece of flex and runs through a hole (marked 11) in the baseboard close to the H.T.+ terminal on the coil.

There is also a lead through the baseboard near terminal VC of the WLQ coil. This has the valve-cap connector on the upper end, and makes contact with one side of the ·25-mfd. condenser on the underneath of the baseboard at the other end through hole 8. From that terminal on the ·25-mfd. condenser also connect a flex lead with wander-plug for H.T.+2.

Now, following on our original path in the matter of wiring, we come to V2 again. Here we find no leads to be connected, but next door, V3, still requires a flex lead to be run from the filament terminal through a hole (5) to the L.T.+ spade tag, while a return lead, twisted round this one, must come up through the same hole for L.T.−, joining to the unoccupied terminal on the on-off switch on the panel when that is placed in position.

At the moment we advise you to run this twisted flex through the baseboard connecting up the L.T. positive to the V3 valve holder, and placing both spade terminals on the wire at the underneath ends, leaving enough wire to reach the batteries and also for the L.T.− connection to go to the on-off switch

Bolted to Screen.

Now connect the terminal A of V3 via hole 4 in the baseboard to one terminal of the output choke, and thence take a lead to the adjacent terminal of the 2-mfd. condenser nearest the choke.

From terminal H.T.+ on the "Nicore" transformer take a lead through hole 3 to one side of the 2-mfd. condenser near the centre of the baseboard (underneath). This condenser is bolted to the screen, together with the condenser on the opposite side of the screen. (Other condensers are screwed to the baseboard or the wooden runners, but these two are bolted through the screen, as can be seen in the blue print.)

A lead also goes from that same terminal to one end of the holder for the adjacent 30,000-ohm resistance. While doing that resistance we advise you to take a lead from the other end of it to the free terminal on the output choke, and thence run a lead through the screen to the 10,000-ohm resistance. Also prepare and connect the flex lead that goes from this latter terminal of the choke to H.T.+4 wander-plug.

Now upstairs again. Take a lead from the G.B.−terminal of the "Nicore" transformer through hole 1 to the G.B.−2 plug. This lead is, of course, a flexible one.

We have omitted one connection from the V3 valve holder. That is the one that goes through hole 6, and it connects to the on-off switch on the panel marked B.C. Switch. Leave enough length for this, and pass the wire through the hole in the baseboard ready for use when the panel is fitted.

A wire can also be prepared for connection to the lower of the L.S. terminals on the panel and passed through hole 2 in the baseboard, being connected underneath to the free terminal of the 2-mfd. condenser that is close to the output choke.

That completes the wires on the broadcast side that come through holes, but before going to the other side of the screen let us finish those leads underneath that do *not* go above the under surface.

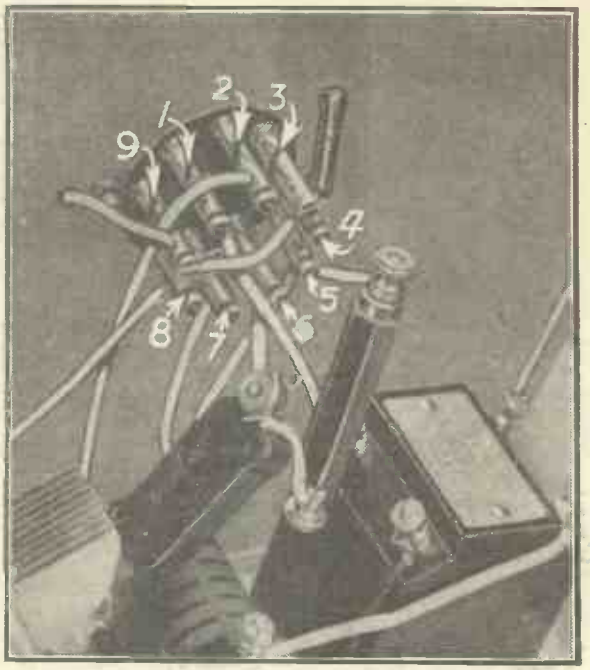
Connect the remaining terminal of the ·25-mfd. condenser to the metallising on the side of the runner by anchoring the wire under the foot of the condenser.

"Bonding" the Surfaces.

NOTE.—If the chassis is not purchased complete and made of "Metaplex"—i.e. if it is built from separate sheets of metal-covered baseboard, such as "Metaplex"—the runner just mentioned should have its surface bonded with the metal on the underside of the baseboard by means of a lead screwed down to both surfaces. Further, a bolt should be run through the baseboard and the bolt screwed firmly with a nut, so that top and bottom surfaces are bonded.

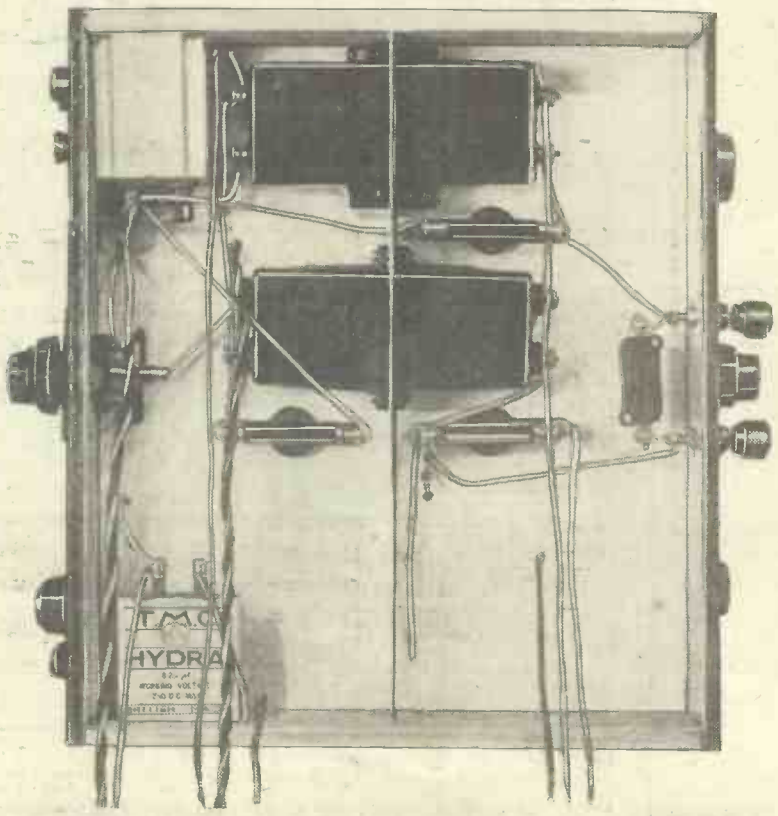
Connect a flex lead for the wander-fuse (H.T.—) and anchor it under a screw and washer, close against the place where the B.C. on-off switch will come when the panel is fitted, and take up a short lead from the screw in the baseboard to connect to the switch. Also run a lead ready for connection to the same terminal of this same switch from the

(Continued on page 134)



A close-up of the valve-holder connections. The pins are numbered here so that you can see how the holder is mounted—with the "apex" (No. 9) to the left.

UNDERNEATH THE CHASSIS



Here is the under-chassis wiring. Note how the two condensers near the centre are mounted. Unlike the others, they are not screwed down to the baseboard, but are bolted together through the screen.

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SILVER KING

KIT "A" CASH or C.O.D. CARR. PAID **£7:15:0**

These are the Parts the Author Used

		s.	d.
1	PETO-SCOTT ready-drilled polished walnut plywood broadcast panel, Metaplex reverse side, 12" × 10"	2	9
1	PETO-SCOTT ready-drilled polished walnut plywood short-wave panel, Metaplex reverse side, 12" × 10"	2	9
1	PETO-SCOTT ready-drilled aluminium screen, 11½" × 10"	2	9
1	PETO-SCOTT ready-drilled chassis, 12" × 10" with 2" runners, Metaplex all over	4	0
1	FORMO 2-gang ·0005-mfd. variable condenser, with dial	11	0
1	WEARITE 2-gang coil unit, WLQ and WLT	15	0
1	J.B. ·0002-mfd. differential reaction condenser	4	3
1	BULGIN H.F. choke, type H.F.8	2	3
1	VARLEY L.F. transformer, Nicore 2	11	6
1	POLAR N.S.F. 10,000 ohms potentiometer	5	6
2	DUBILIER 2-mfd. fixed condensers, type B.B.	7	0
2	T.C.C. 2-mfd. fixed condensers, type 50	7	0
4	GRAHAM FARISH 1½-watt Ohmites	6	0
3	GRAHAM FARISH resistance holders	1	6
1	CLIX 9-pin chassis mounting valve holder	1	3
2	BENJAMIN Vibrolder 4-pin valve holders	1	8
1	BULGIN "Steatite" low-loss valve holder	1	6
1	ERIE 2-meg. grid leak	1	0
1	T.M.C. Hydra ·25-mfd. fixed condenser, type 25	1	9
1	COLVERN set of 3 special short-wave coils	12	0
1	COLVERN special ultra short-wave condenser	3	9
1	POLAR ·00016-mfd. condenser, type "E"	5	0
1	FORMO "Snail" slow-motion drive	6	6
1	VARLEY Niclet L.F. transformer, 3·5 : 1	7	6
1	J.B. ·0001-mfd. Midget type reaction cond.	4	6
1	BULGIN short-wave H.F. choke, type H.F.3	2	6
2	BULGIN on/off switches, type S.22	2	6
1	BULGIN L.F. choke, type L.F.20	7	6
4	DUBILIER type 670 fixed condensers	4	6
7	BELLING-LEE Midget wander plugs	1	2
1	BELLING-LEE wander fuse, HT—	1	0
6	BELLING-LEE terminals	3	0
2	BELLING-LEE spades		4
	Connecting wire, screws, flex	2	6

Kit "A," Cash or C.O.D., Carr. Paid **£7 15 0**

Author's Kit of first specified parts for "Silver King" Receiver, including 2 Ready Drilled Polished Plywood Panels (Metaplex reverse sides), Ready Drilled Aluminium Screen and Metaplex Chassis, less Mains Unit, Valves, Cabinet, Speaker and Headphones.

OR YOURS FOR **12/6** DOWN *and 11 monthly payments of 14/3*

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KIT "C" As for Kit "A," but including valves and Peto-Scott "Silver King" Walnut Consolette cabinet, less cabinet turntable, mains unit, speaker and headphones. Cash or C.O.D. Carr. Paid £10 16 0, or 12 monthly payments of 19/9.

KIT "CS" As for Kit "A," but including valves, Peto-Scott "Silver King" consolette cabinet and W.B. Stentorian Senior speaker, less turntable, mains unit and headphones. Cash or C.O.D. Carriage Paid £12 18 0, or 12 monthly payments of 23/6.

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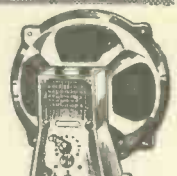
W.B. STENTORIAN SENIOR

SPECIFIED for the "SILVER KING"



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Mains Power for the SILVER KING

CAN I run it from the mains? That is a question which will be eagerly asked by a lot of people after reading all about two-channel reception and the all-wave potentialities of the "Silver King."

In quite a number of cases the matter of mains drive will be the final factor in a decision to build this POPULAR WIRELESS masterpiece and take advantage of the new development in radio reception. Fortunately, we are able to answer the question with a very definite "Yes," for the popularity of mains-run receivers was never far from our minds when working out the design of the "Silver King."

For those who have the mains available and who may like to employ a large output-power valve for the "Silver King" we have designed a special H.T. unit, preliminary details of which are given on this page.

BUILT WITH THESE PARTS

1 Heayberd mains transformer, type W42.
1 Westinghouse metal rectifier, type H.T.13.
1 B.T.S. 30-h. 60-m.a. L.F. choke.
1 T.M.C.-Hydra 8-mfd. fixed condenser, type 40.
1 T.C.C. 8-mfd. dry electrolytic condenser, type 902.
1 Dubilier 8-mfd. dry electrolytic condenser, type 902.
1 Dubilier 8-mfd. dry electrolytic condenser, type 0281.
2 T.C.C. 1-mfd. fixed condensers, type 50.
2 Erie 10,000-ohm potentiometers, linear type.
1 Erie 50,000-ohm potentiometer, linear type.
1 Graham Farish 30,000-ohm "Ohmite" resistance, 1½-watt type.
1 Graham Farish 20,000-ohm "Ohmite" resistance, 1½-watt type.
1 Belling-Lee twin fuseholder, type 1033.
1 Belling-Lee fused mains input connector, type 1114.
5 Belling-Lee indicating terminals, type B.
1 Peto-Scott electrolytic condenser bracket, double type.
1 Peto-Scott "Metaplex" baseboard, 10 in. × 8 in.
1 Peto-Scott ebonite panel, 10 in. × 7 in.
1 Coil B.R.G. "Quikon" connecting wire.
Flex, screws, etc.

A Specially Designed Unit.

The remarkably satisfactory results obtained from the receiver when working on an H.T. unit is really an achievement in itself when it is remembered that it operates on short waves as well as on the ordinary broadcast bands. Success in this connection is due to the inherent stability of the set itself and to the careful design which has gone into the special mains unit which is illustrated on this page.

Those who have tried it will fully appreciate the statement that mains units, even those which work perfectly on broadcast waves, can be completely unsatisfactory for short-wave purposes. Add to this the two-channel reception feature of the "Silver King" and you will fully understand why we have turned out a special unit to go with this receiver.

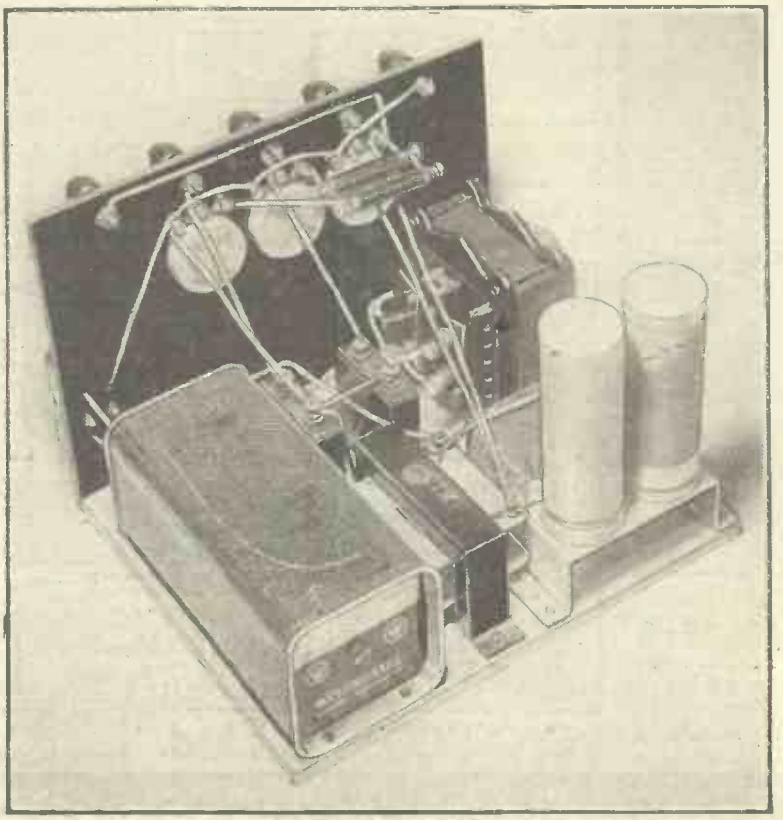
The use of phones on the short-wave channel makes the presence of even a small amount of hum a big problem. But it is a problem that has been fully and efficiently solved for you in the design of the "Silver King" mains unit.

An Important Point.

And now for another aspect of the unit. Just as you are advised to build this special unit for the set, so we advise you to keep exactly to the components specified for it in the list on this page. The one dead-sure way of ensuring that your results equal ours in every respect is to see that your outfit also is the exact equivalent of the original.

Don't be tempted to make any economy which may prove false. You are entering an entirely new realm of reception technique with an absolutely new receiver, so do the thing properly and make up the mains unit just as it will be described next week. We promise you it will repay you over and over again to do so.

THE COMPLETED UNIT



A metal rectifier is employed in the H.T. unit, and it can be seen to the left of this photograph. Note the three potentiometers on the panel for the variable H.T. taps.

We are holding the constructional details till our next issue, as we know your time will be fully occupied till then with the "Silver King" itself. But so that you will be ready to go ahead with the unit as soon as you get your copy of POPULAR WIRELESS next week we are giving the full list of parts necessary in this number.

Under the heading of "Suitable Valves", which you will find on another page of this issue, we have given alternative output types. Small-power valves and large-power valves (sometimes called super-power) are listed.

Getting a Bigger Output.

Normally, the former are to be recommended when the set is run from batteries, and it is with one of these in use that the total set consumption of about 8 milliamps has been calculated. The larger-power valves take more current, and incidentally require a bigger grid-bias battery.

But the bigger valves also make a much larger undistorted output available. While the smaller valves will give ample power for ordinary room strength, it is very nice to have the extra power available when the amount of current consumed is of no consequence. So those who intend to run the set from the special mains unit should choose their output valve from among the right-hand row.

Finally, a word or two about the L.T. supply. This is always obtained from a 2-volt accumulator. But this fact does not prevent the set from being run completely from the mains, because a trickle charger can be employed to see that the low tension is always up to scratch and to avoid the usual trouble of taking it to be charged.

Sometimes an Advantage.

As a matter of fact, there is much to recommend this method of running a receiver from the mains. There are many people who have adopted it because they claim they obtain a much more silent background this way. A suitable trickle charger was described in POPULAR WIRELESS for February 9th.

Readers who don't happen to have this issue by them can obtain a copy through their newsagent, or direct from: The Back Number Dept., Bear Alley, Farringdon Street, London, E.C.4. Price 4d. post free.

ON THE SHORT WAVES

Conducted by W.L.S.

YES, my readers, a vague title. No doubt you rather wonder what I'm getting at. But you will soon be enlightened if you resist the desire to turn over two pages rapidly and have patience with me.

During the past few weeks I have closely examined rather more than a score of short-wave receivers. The shapes and sizes of the receivers themselves varied between single-valvers in neat little six-inch cubes and multi-valvers occupying half the drawing-room table.

Diversity of Components.

What struck me most, however, was the extraordinary diversity of the components that people use when they're left to themselves to decide. The photograph on this page illustrates more or less what I mean.

Some people seem to have an extraordinary liking for massive components, and one object of this article is to endeavour to convert them. It's time that we settled down and used parts of sensible size. What could be nicer than that dinky little variable condenser, or what could be clumsier than the vast series-gap model towering over it?

The big chap would be excellent for use in a low-power transmitter, but to use it in a receiver would cramp one's style quite unnecessarily. I have just this moment finished building a new 5-metre receiver, and after several try-outs I have got it working really well. It uses two valves and is housed in a little metal box 12 in. by 6 in. by 6 in., and that's big by comparison with what it *might* be.

Very Compact.

There is a lot of spare space, and the detector circuit is very compact indeed. But this has only been done by carefully choosing small components throughout. The tuning condenser is of the series-gap type, but it is a midget. The coils each consist of four turns; diameter, half an inch.

The detector valve is one of the little Catkin-type H. L./2 K's, and the fixed condensers are of the popular "postage-stamp" type. The best of the whole thing is that it works far better than my elephantine affair which was illustrated about the time of the Crystal Palace tests.

Already I hear someone asking: "Why *should* we use small components? What do we gain by it?" Listen, then, my children.

The success of a short-wave receiver varies in direct proportion with the amount of stray wiring in it. This has been proved time and time again.

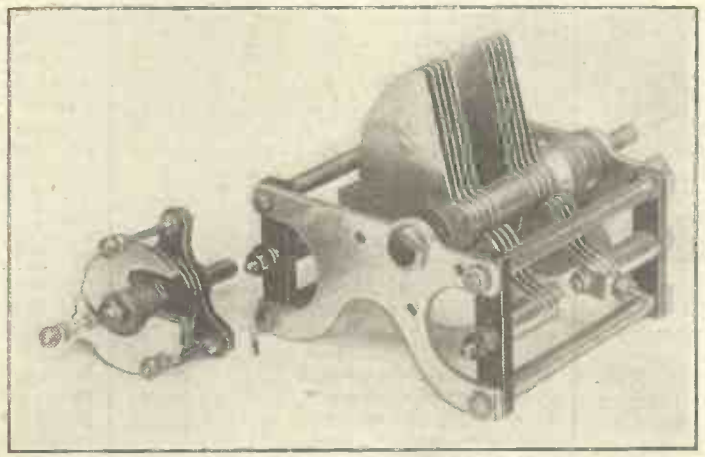
A condenser should be connected *directly* across the coil that it has to tune. The little chap in the photograph could be connected directly across the two appropriate terminals on a "valve-base" type of coil, and the total length of the wiring might not be more than two inches.

The big affair would necessitate far more: it would push the coils farther back into the set because of its extra depth; and to make up for that you would probably crowd them up against some other component in your desire to arrange a "compact" layout.

"SHAPES AND SIZES"

This week our popular short-wave expert has a few words to say about component sizes and their effect upon the efficiency of the set.

CONDENSERS OF SIMILAR CAPACITY



These two condensers have roughly similar capacities but, as W. L. S. points out, the smaller one will enable shorter and more compact wiring to be achieved.

Your tuned circuit—one condenser and one coil—should be *compact*. It should not spread half-way over the set. If your H.F. currents are confined to one neat little circuit they won't trouble you by crawling into corners where they don't belong.

Obviously, the most compact tuned circuit that one can devise is one that uses the smallest possible components. All right so far? Right, let's go on.

Next point—the overall size of the set. Suppose you have a set ten or twelve inches deep, with the earth terminal at the back and a metal panel at the front. Even if your earth lead is fairly long, that earth terminal is going to be nearer earth potential than your front panel.

Somewhere, somehow, there's got to be ten inches of conducting material between your panel and your earth terminal. That may give rise to the effect that I have met so often—a completely "dead" earth terminal and a horribly live front panel, complete with hand capacity, head capacity, foot capacity and all the ghastly lot.

A Metal Box is Good.

If you can substitute for your ten-inch baseboard affair a neat little metal box less than six inches deep you'll be that much better off. And I haven't touched on the aspect of appearance and general tidiness.

Don't go to the other extreme, though, and make a set small by crowding all the components together. The whole point of small components is that one can make a compact set *without* doing that.

Have you noticed the trend towards smaller components in the broadcast receiving world, too? Compare a modern three-gang ·0005 condenser with one of the yard-long things we used to buy! Compare a "Ferrocart" tuning unit with the old screened coils. Look at the small fixed condensers and wire-ended resistances that are obtainable nowadays.

Keep the Size Down.

Yes, it's all to the good, and it is real progress if it isn't taken too far. Don't be alarmed at the idea that I'm going to start perpetrating minute short-wavers that will hide behind a postcard. I shan't do anything of the sort. But I *shall* always work with compactness as one of the main objects in view, and I can tell you from personal experience that you will be well advised to copy this trend.

Our American friends have recently come out with a 5-metre receiver (using one of the new "Acorn" valves) that is not much bigger than two match boxes placed end to end. What is more, it works. Of course, one can do this sort of thing for 5-metre portable work where it's worth while, but there's not much point in trying to build home receivers of this diminutive size.

But in every short waver I advise you to keep the dimensions as small as possible within sensible limits.

ON THE SHORT WAVES.—*Page 2.*

Points from the POST-BAG

H. K. M., who is one of my sea-going readers, writes from Antwerp with some interesting ideas. He is annoyed about dials that one can't use for accurate calibration. "Being only too familiar with the sextant," he writes, "which reads to ten seconds of arc, and with the barometer which reads to 1-500th of an inch, it occurred to me that surely it must be possible to make a decent dial."

He encloses a sketch of his idea, which incorporates a fixed scale, a ten-degree vernier and a convex lens with which to read it. The ordinary slow motion gives a reduction of 100 : 1, and fixed to that there is a tangent screw, 72 turns of which equal one turn of the slow-motion knob.

A Likeable Dial.

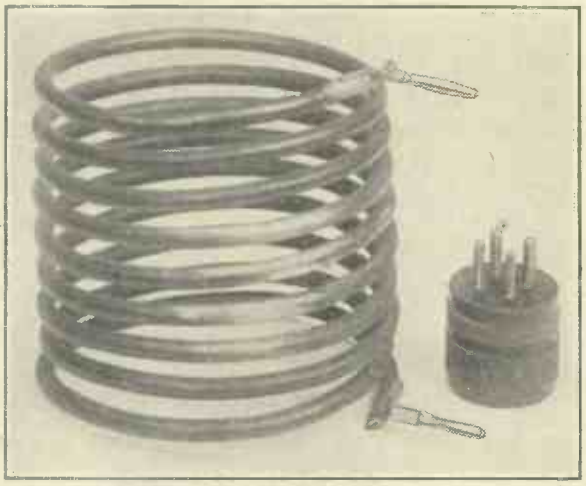
Certainly it seems an ideal dial, but it's rather questionable whether the average set holds its calibration well enough to justify it. The slightest trace of hand capacity would make the whole thing a waste of time. But I like it, all the same.

The next letter is from T. J. M., of Cape Town, who is a proud owner of "My Screen-Grid Four" and also of a single-valver of the "hot" variety. The latter gives him the proudest moments of his life when people refuse to believe that he can receive the whole world on it. He just switches on and shows them—a pretty sound way of doing it.

His log includes Manila, Rome, Zeesen, Paris, Daventry, Brussels, Bombay, Nairobi, Bandoeng, Rio de Janeiro and plenty of "Yanks." What more does one want with one valve in South Africa?

"Can anyone explain this?" I'm quoting G. A. R. (Huddersfield). "I had been tuned in to Barranquilla, H J 1 A B B, and had heard the announcements, when, without touching a thing, a voice said: 'That was the laugh of the kookaburra;

"THE SAME BUT DIFFERENT"



These two short-wave coils do not look as though they had anything in common, but they have. They both tune to the same wave-band.

V K 2 M E, 47, York Street, Sydney; we open our programme with——'; then came a clock striking, and a voice said: 'This is London calling; we are beginning transmission five with Ray Noble——'; then several voices appeared to be talking together, and after a while came the announcement that 'Maracaibo, Venezuela, 5,850 kc., is now finishing to-night's programme,' and *still* H J 1 A B B was going on.

Gramophone Records?

"Can you tell me what it all means? Surely I haven't got the Willies. If I have, my wife has too—she was listening all the time."

Goodness only knows, G. A. R., unless H J 1 A B B was giving a "round-the-world" programme on gramophone records or something of the sort. By the way, your H J 4 A B L is Manizales, Colombia, on 49·15 metres. Congrats on your thirteen consecutive weeks of V K 2 M E.

E. V. C. (Newton-le-Willows) has a two-valver that doesn't seem to bring in any D X, and wants to know how to convert it into a three. That's about the worst thing you could do, E. V. C. You certainly won't receive anything on three that you don't get on two, and as your set hasn't any "punch" there's obviously something very wrong with it.

Those Japanese Stations.

I can't give you any hints from your letter, as the coils you mention should cover all the wavebands. Have a good look over the circuit and wiring.

R. D. E. (Ware) says the address of all the Japanese stations whose calls begin with J V is Kokusai Denwa Kaisha, Ltd., Osaka Building, Kojimachiku, Tokio, Japan. Anyone feeling strong enough to write that on an envelope ought to be rewarded with a nice Q S L card.

MR. LESLIE W. ORTON tells me that the "surprise" meeting of the Anglo-American Radio and Television Society was a great success. Members turned up at Uxbridge from Stoke Newington, Reading, Ruislip, Eastcote and all over the place, and many of them had the thrill of handling a short-waver for the first time.

Stations tuned in at loudspeaker strengths included W 2 X A D, 2 X A F, 1 X A Z, 3 X A U, 2 X E, 8 X K and 3 X A L, besides a goodly number of locals.

A similar meeting is being held on April 17th, and all readers of "P.W." will be welcome. The rendezvous is "Kingsthorpe," Willowbank, Uxbridge.

R. D. E. (Ware) furnishes particulars of the following stations, all of which he has heard recently on the air. The better-known ones are omitted. P S H, Brazil, 29 metres; C T 2 A J, Azores, on 75 metres; Y V 6 R V, Valencia, Venezuela, 49 metres; T G F, Guatemala, 20 metres; C O H, Havana, 31 metres; C O C, ditto, 49 metres.

Others, in short, are: Y V 5 R M O, H J 1 A B B, H J 4 A B B, H J 4 A B E, P R A 8, Y V 3 R C (all South Americans), and H A S 3 and O E R 2—all on the 49-metre band.

"National Field Day."

The R. S. G. B. districts are getting ready for the annual week-end out, known as "National Field Day." Each district is responsible for erecting two transmitters, one working on 160 and 80 metres, the other on 40 and 20. Power is limited to 25 watts, aerials are restricted in height, no mains may be used and the station has to be a certain distance from any permanent buildings.

Procedure—work everything you can while the going's good, and appoint someone to amuse the visitors and keep them out of the operators' way.

The actual dates are June 1st and 2nd. Localities of stations will be published later.

Recent Reception Conditions.

Conditions for the past week have been very good—in patches. For a few hours at a stretch one has difficulty in finding any D X stations at good strength, and then things become normal once more.

I was interested to hear Halifax, V E 9 H X, on 49·1 metres, for the first time. He was putting over quite a good transmission, and it seems strange that I have never found him before. Another Canadian worth watching is V E 9 B J, St. John's, on 49·29.

There is a distinct lull in the reception of Central and South Americans, but occasionally some of the Colombians and Venezuelans come over very strongly. The North Americans are more consistent than they have been for some time past. W 8 X K on 19·72 continues to be the strongest of them all, the runner-up being W 3 X A L on 16·87.

The 49-metre Americans are never as irregular as those working on shorter waves, but one peculiar effect is noted. Out of seven or eight powerful stations there are rarely two consecutive nights on which the same one is the strongest of the bunch.

A Change of Call.

Even the owner of a rank bad set should succeed in getting them all by listening on seven or eight different nights!

Readers should note, also, that V P D (Suva, Fiji Islands) has changed his call sign to V P 1-A. He works on 22·75 metres, and is still a real "scalp." I have already referred to the Italian relays of J O A K, Tokio. The latter station may, however, be heard from Japan (via J V T) on 47·39 metres. J O A K is the call sign of a medium-wave station, but several of the short-wave Japs relay him. W. L. S.

Sensity Coils now ganged and matched!

For the first time in the history of radio, constructors are now offered ganged and matched coils with solo control of two wave-bands, radio-gramophone and filaments, the auxiliary switch being suitable for either mains or battery operated receivers. The coils are the popular Sensity Iron-cored coils made famous by their amazing performance in the "Raider."

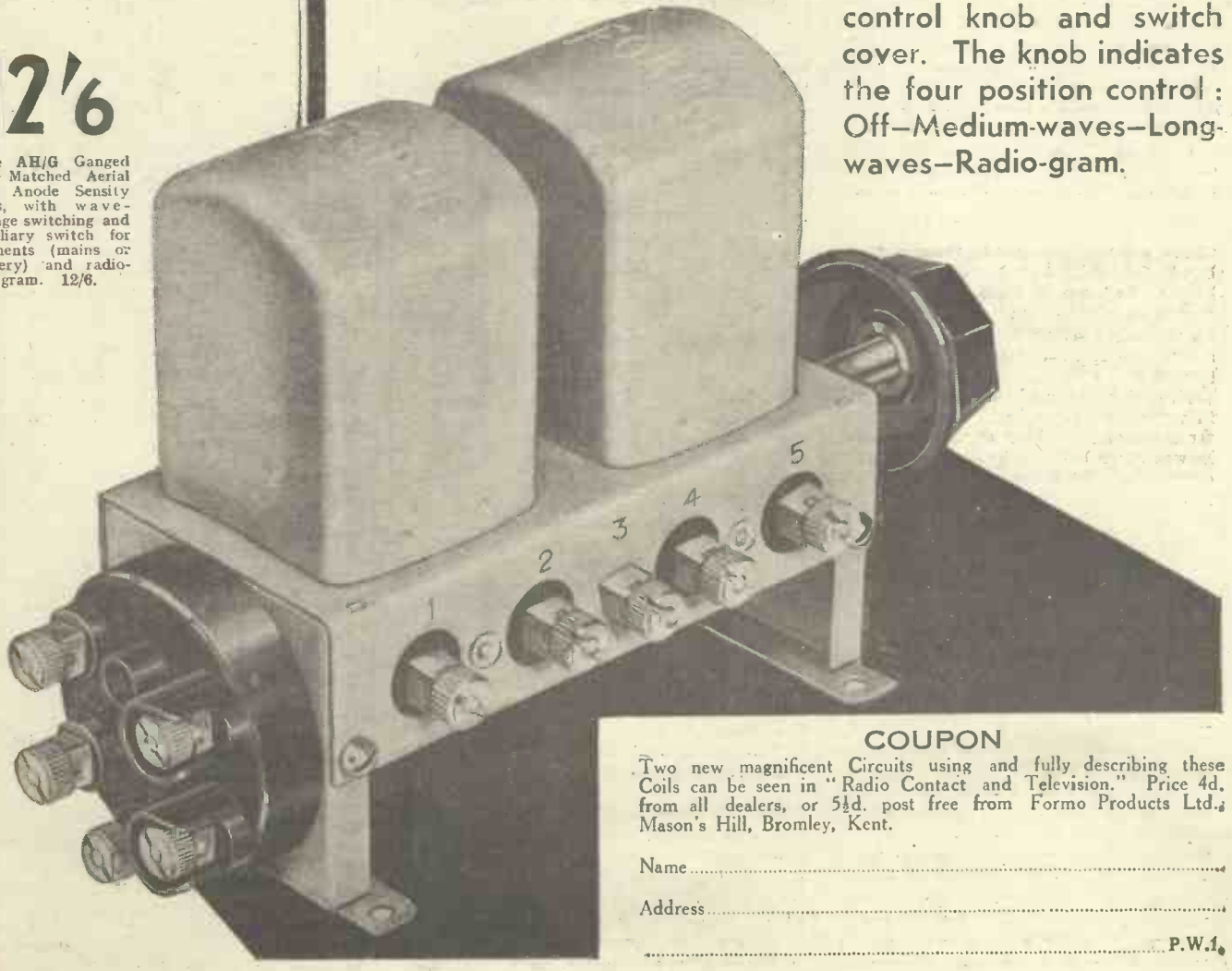
10/6

Type AH Ganged and Matched Aerial and Anode Sensity Coils, complete with wave-change switching only. 10/6

12/6

Type AH/G Ganged and Matched Aerial and Anode Sensity Coils, with wave-change switching and auxiliary switch for filaments (mains or battery) and radio-gram. 12/6.

The Base and Screening cans are finished in the Formo standard dreadnought grey with black bakelite four position control knob and switch cover. The knob indicates the four position control: Off—Medium-waves—Long-waves—Radio-gram.



COUPON

Two new magnificent Circuits using and fully describing these Coils can be seen in "Radio Contact and Television." Price 4d. from all dealers, or 5½d. post free from Formo Products Ltd., Mason's Hill, Bromley, Kent.

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With the EXPERIMENTER

"AN EYEFUL OF TUNING"

JUST a few thoughts this week on visual tuning. Well, on visual-tuning meters, if you like. For, I agree, all tuning is to some extent visual. It is visual in so far as you use your eye to adjust the pointer on the tuning scale. Yes, but it is your ear that tells you exactly where to stop.

Or it tries to. Poor old fallible ear, it does its best, but what a poor best that can be! The trouble is that the ear cannot easily detect moderate differences in volume.

When a sound is steadily increased in volume the average ear will go merrily on imagining nothing is happening for as much as a 25-per-cent increase.

Making Things Difficult.

Until visual-tuning devices came along we all tuned by ear. We have all guessed at what must be the exact tuning point. In the early days it was easier to guess than now, for tuning circuits with any claim to selectivity cut off sharply on each side of the carrier-wave.

With such a narrow spread of signal a quick flick of the tuning knob readily gave us the required check-up. It was not easy to miss the point, I mean.

The first cloud on the fair horizon of easy tuning loomed up dark and menacing when band-pass tuning became all the rage. No longer was there just one point of tuning. Instead, a definite spread was encouraged for each station's setting, with, of course, a sharp cut-off at the outer limits of the spread.

Even then the trouble was not serious, for in very truth those band-pass circuits fell far short of theoretical square-peakedness. It was more difficult to detect by ear the centre of the total dial-spread position—but not too difficult for most listeners.

Now we are in the automatic volume control era. By devious means the waning signal is held up. The effect is still further to increase the spread of any given signal about its carrier tuning point.

Your Ear Cannot Tell.

The ear simply will not do. It struggles hard to decide exactly which point of the available spread of signal is the centre point—but cannot because the difference in volume levels at the centre and the outer limits are not marked enough.

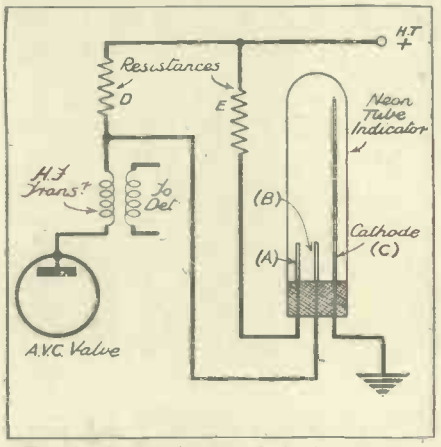
Everything would still be manageable if all listeners were what I might call pitch-conscious. In other words, susceptible to changes in the frequency gamut of the audible range. But, judging by Bill and his ilk, many listeners simply don't realise the difference between one pitch and another.

Take the other day. I went into the cottage to find him painfully mis-tuned on a foreigner. The symptoms of mis-tuning were obvious. For one thing, there was the very deuce of a sideband splash. Secondly, the quality was all high pitched, not at all sonorous, as I knew it ought to be on that particular set.

Why all this mess ? Quite simply because the makers of the set, in their sublime other-worldliness, had not fitted a visual-tuning device, although they must have known that, with such a good A.V.C. circuit, tuning would be hit and miss, with more miss than hit.

For good-quality reproduction and for maximum freedom from the sideband splash of adjacent stations it is, of course, essential to tune to the carrier-wave. Failure to do so—to find the exact point—means harsh tone and interference.

VISUAL INDICATION



How the visual-tuning neon device is connected to the A.V.C. valve circuit.

Visual tuning, when it works, is a fine solution. The trouble is that it does not always work—not for all stations, anyway. Some visual indicators respond only to strong signals, remaining unaffected by the weak majority.

Neon lights, shadow bands and so on all work on the same fundamental idea, although talking to amateurs of average "savvy" I must say the idea seems to be rather hazily grasped.

The "Controlled" Valve.

You know, of course, that a set with automatic volume control increases the negative bias on the grid of the controlled high-frequency valve whenever a signal is actually tuned in. The result is that the anode current of the controlled valve drops—a sympathetic change with signal strength.

It is this current change that provides the motive power, so to speak, of visual-tuning devices. As a rule, you will find, the indicator is actuated by the voltage drop resulting from a resistance placed in the anode circuit of the controlled valve.

Sensitive Device Needed.

The snag is that, except in very big sets, the total change of voltage across the resistance produced by tuning in a signal is quite small, so that unless the indicator is very sensitive it just won't take any notice of the incoming signal.

From my experiments I should be inclined to plump for the neon-tube type of indicator, although I must say that in certain big sets the shadow-band type of indicator gives a dead-beat and entirely positive indication. The neon-lamp indicator has the advantage, from the amateur's point of view, that it works with a fairly modest voltage change. It gives a large change of illumination for a small change of voltage, in other words.

Perhaps I shall not be wasting your time if I explain exactly how the neon-lamp type of indicator works. Look, then, at the circuit. It shows a neon-lamp indicator in the anode circuit of a sufficiently well-controlled high-frequency valve.

There are two small anodes marked A and B, and a long cathode element C going right up the tube. One anode supplies a starting or "priming" voltage to the tube, while the other carries the voltage variations developed by the valve across its anode resistance.

How the Circuit Works.

The value of the resistance E is chosen to apply the correct priming voltage to the anode A, and that starts a small arc between the anode A and the cathode C. This cathode is then in a very sensitive condition, and will cause the surrounding gas to glow when the voltage on the second anode B is increased.

Now this second anode's voltage depends on the incoming signal. When there is no signal the controlled valve's bias will be at a minimum and anode current at a maximum. There will thus be a big drop of voltage across the resistance D in its anode circuit. The actual voltage applied to the anode B through the resistance D will therefore be appreciably lower than the maximum high-tension voltage at the top end of D.

As soon as a signal comes in, though, the A.V.C. bias will increase, the anode current of the controlled valve will decrease and so will the voltage drop across the resistance D. In turn this means that the voltage applied

(*Continued on page* 130.)

THOSE MORNING PROGRAMMES

Latest News From the "Big House"

By BARRY KENT

NOW here is a real secret for you. The B.B.C. is very negative about breakfast-time programmes; it would have us think that this extension is neither possible nor desirable. Well, this is all "my eye." And what is more, we are going to have our breakfast music next autumn. The extension is a long time overdue, and the B.B.C. missed a grand chance of extra popularity by giving way with such bad grace.

* * *

This Jubilee Year.

And here is some more good news—this time without qualification. We already knew that the B.B.C. was to make a great effort with special programmes in May and June. It has now been decided to continue the effort throughout the whole year, the slogan being Jubilee Year. Reserves of money will be brought into use to attract the greatest stars, and there will be a real peak programme at least once a week. That's the stuff!

* * *

Clearing Out Amateurs and Foreigners.

Have you noticed the B.B.C. programmes getting more British? Well, they should be. I sat the other day with a B.B.C. official busy revising lists of "live" artists and instrumentalists. He was cutting out foreigners and amateurs; Americans were the foreigners to suffer chiefly.

* * *

Jack Payne's Jubilee Effort.

Jack Payne tells me that he has composed a special number that will be broadcast for the first time during his programme which will be relayed from Brighton on Accession Day, Monday, May 6th. The number is entitled "Let Us Sing Unto Their Majesties." It promises to be one of the hits of 1935.

* * *

Guarding the "Big House."

When I went round the other day to see the Press people at Broadcasting House, although I had an appointment, I was asked to wait an hour, during which the most mysterious palavering went on *sotto voce* from the reception desk. I was then accompanied to the Press office by two boys, both of whom waited outside the door to escort me afterwards.

During my exit I encountered one of the producers and stopped to exchange greetings with him. He was obviously embarrassed, leaped back from me as though I had the plague, explaining hurriedly that he did not have permission to speak to me or any other journalist that day. So I asked him what else he was giving up during Lent. Ye gods! What is the place coming to? Why is the Press regarded with such suspicion?

* * *

Training Broadcasters.

The B.B.C. looks like becoming quite a happy training ground for broadcasters. First there was Gerald Beadle, who went to be station director at Durban, South Africa. Then Eric Dunstan organised the first broadcasting service in India. Now Lionel Fielden is off to be head of Indian broadcasting for five years. The Irish Free State has been coveting the service of Maurice Gorham; and now somebody is wanted in South Africa to apply Sir John Reith's reorganisation plan.

* * *

B.B.C. Chairmanship.

Speculation continues about this desirable £3,000-a-year-plus-expenses job. Odds are now favouring Lord Selsdon for the post. He, as Sir William Mitchell-Thomson, was P.M.G. during the critical period of the foundation of the B.B.C. under Government control. The Government are anxious that the next Chairman should be very active.

* * *

Why Gloomy Talks?

They are all "het up" at the "Big House" about gloom in the talks. There has been some pretty outspoken criticism inside the building on this point. It is felt that there is much too much talk about the desperate features of unemployment, for example, and not nearly enough about the comforting features of employment.

People think that there is a strain of misanthropy in all the talks work. I do not listen myself to talks, and I cannot say to what extent this is justified, but it looks as if there is something in it.

* * *

B.B.C. Troubles.

Wales, Newcastle and Nottingham—these are the three places that will give the B.B.C. trouble with the Government committee of inquiry into broadcasting which Sir Kingsley Wood is now framing—that is, unless the B.B.C. gets busy at once and puts matters right in the three areas concerned.

Newcastle wants more local programmes; Nottingham wants a broadcasting office and studio in the city; and Wales wants to be on its own as a Region. The B.B.C. doesn't seem to be able to make up its mind about any of these problems.

HEARD OVER THE AIR

MANTOVANI, whose Tipica Orchestra is a popular feature of the B.B.C. programmes.

FRIDAY NIGHT VARIETY

Likely to be more successful even than Saturday Night Shows—says our Broadcasting Critic.

FRIDAY night Variety is an experiment that must have delighted thousands. It may even be discovered yet that Friday and not Saturday night is the ideal night for Variety and Music-Hall. People do like to go out on a Saturday night. And as we know that they do go out, there is perhaps little doubt that a bigger audience this time listened to the Friday night show than to the usual Saturday night one. And this in spite of the huge disparity between the two bills.

Really speaking, Friday's performance wasn't Variety at all in the true sense of the word. It was a Don Sesta Guest Night, with Don seemingly unaware of the fact, judging from his unenthusiastic tones. In fact, the whole show sounded unenthusiastic.

* * *

It was a treat to hear Mr. Flotsam and Mr. Jetsam again. Their stuff is clever, their lines carefully put together and polished. Their tunes are good. That little thing of theirs called "Backstage Mice" was a gem. And what a delightful little tune it was set to! Flotsam and Jetsam don't need an audience to the same extent as many Variety artists do. There's an all-sufficing excellence about their stuff that sustains them.

* * *

"Last Voyage," by Edward and Theodosia Thompson, appreciably strengthened the argument in favour of more and more historical plays. History being the monopoly of no country or of any one era, there is no limit to the variety of historical plays that could be written.

It seems the fashion at present to introduce as indispensable to the historical play a scene that is excessively poignant or emotional. We had it this time when Capt. Kemys returned aboard to the cabin where Sir Walter Raleigh lay sick of a fever, with the news of the failure of the expedition and the death of young Raleigh. This was very moving. And to a greater extent at the end of the play when Sir Walter bade farewell to Lady Raleigh.

Not Everybody's Meat.

You cannot blame a man or woman for disliking these intensely emotional scenes, even to the point of refusing to listen to them. Authors of these plays are well advised to note that intense emotionalism, while it may appeal to many listeners, won't be listened to at any price by others. If emotionalism has to come into the play, contrive to put it in at the end. To put it at the beginning may mean a reduced audience for the rest of the play.

* * *

Milton Rosmer as Sir Walter conveyed a fine impression of that great adventurer. While I am not certain what I expected James I to be like, it is true that J. Hubert Leslie's portrayal of that monarch quite upset any preconceived

(*Continued on page* 128.)

TELEVISION

START 5-METRE RECEPTION NOW!

Five-metre reception is very similar to seven, on which we expect to get the new high-definition transmissions; and there is plenty to hear on five metres. So why not start receiving on this band and get experience on the "ultra shorts" as suggested on this page?

By L. H. THOMAS.

TELEVISION and ultra-short waves, by common consent, are becoming inseparably linked together in the minds of radio enthusiasts, and I make that my excuse for dealing under this heading with the subject of ultra-short-wave detector circuits.

The would-be "looker" (or whatever he may call himself) is hardly well advised at the present time to invest a lot of money in cathode-ray tubes and time-base outfits, which may or may not be suitable for use by the time the transmissions start.

The "Split-Hartley" Circuit.

He can, however, at a negligible outlay carry out experiments with the *radio* side of an ultra-short-wave television receiver, and to help him to get started I am dealing this week with a suitable detector circuit.

Most people who try to get their ordinary short-wave receivers down to 7 or 5 metres are met with an ignominious failure. Generally speaking, the layout is not quite good enough. They will get down there, no doubt, but will they oscillate? No, that's another matter entirely.

The conventional tuned-grid detector circuit is not a particularly good oscillator at those very high frequencies, and it is significant that for the last two years the "Split-Hartley" arrangement has been the accepted circuit for 5-metre reception.

What's good for "5" will certainly be good for "7," and I recommend readers to build up a little detector stage on the lines shown in the two sketches.

No Grid Condenser.

From the theoretical diagram on this page you will see that the circuit bears quite a close resemblance to the conventional short-wave detector arrangement. The chief differences are that the whole coil, from grid to anode, is tuned and that no grid condenser is used, the grid leak being applied in series with the coil at the low-potential end.

This circuit is a very ready oscillator, and it also possesses the great merit of being so perfectly balanced that a really charming layout can be devised for it.

Fig. 2 (on page 120) shows the essentials of the detector stage. The coils are wired straight across the variable condenser C_1, with the fixed condenser C_2 in between them. The grid leak R_1 is shown going from the low-potential end of the grid coil to a filament terminal.

The low-potential end of the anode coil goes off to the phones via the H.F. choke, which, by the way, is of special construction. About 24 turns of fine wire should be wound on an ebonite rod of about $\frac{3}{8}$-in. diameter. The turns should be spaced by two or three diameters of the wire. My own choke is wound in such a way that the winding is nearly 3 in. long.

It can be supported in the wiring quite neatly. The whole coil assembly is really made rigid by the fixed condenser, and should be well up in the air, the valve holder likewise being mounted an inch or more above the baseboard. The neutralising condenser for aerial coupling must be of the type that has quite a small minimum capacity, and that, too, should be mounted off the baseboard.

The turn numbers I have shown are correct for the 5-metre band, where there is considerable activity among the amateur transmitters. Five-turn coils will take you to 7 metres, in which region the future television transmissions will probably take place; but there *is* something to listen to on "5" and practically nothing on "7."

Reaction is controlled by means of a 50,000-ohm resistance in series with the phones. The fixed condenser C_2 is in the position normally occupied in a short-wave receiver by the reaction condenser. In this case it cannot be used for reaction control, because it has almost as much effect upon the tuning of the circuit as the variable condenser itself.

Effective Reaction Control.

Resistance control is perfectly effective, and if your resistance happens to be a little on the noisy side simply connect a 1-mfd. condenser across it. That should quieten the worst specimen.

Now when we come to the reception of real television we shall not, of course, be able to use reaction on our detector. What we shall do actually is to use a circuit like this as our beat-note oscillator, and the detector will simply have a tuned-grid circuit, its plate feeding straight into the I.F. amplifier.

The most important thing for the present is for the home constructor to get well into the work that he *can* do. A little time spent now on familiarising yourself with the general behaviour and "atmosphere" of ultra-short-wave working will stand you in good stead later on.

Small Obstacles Surmounted.

It is significant, by the way, that amateurs using the minutest of transmitters on 5 metres find no difficulty in surmounting the Crystal Palace hill. Regular contacts between Norwood and Bromley are taking place, and also two-way work between Dulwich and Shortlands and Beckenham. In each of these cases the Crystal Palace stands squarely in the path of the signals.

If this can be done with a power of 1 or 2 watts on 5 metres it doesn't look as though 10 kilowatts on 7 metres is going to be baffled by small obstacles. I am most anxious to hear from readers who are obtaining good results on any of these 5-metre amateur transmissions, and will gladly notify them of week-end "field-day" activities when such come to my notice.

Get Ready for Television.

A few thousand receivers like that shown in Fig. 1, especially if converted into super-regenerative types (about which I will speak later), could do an enormous amount of work that would be useful to the cause of television later on. At a later date I will be dealing with the various stages of a complete superhet suitable for "vision" reception. Simultaneously, no doubt, other people will be dealing with cathode-ray tubes and their operation, so that there should be no difficulty, when the time comes, in constructing a complete "high-def." receiver comparable with a commercial one.

Remember that however complicated a complete ultra-short-wave television receiver may turn out to be, it will always be the first detector stage that is, so to speak, the "keystone" of the set. You simply *must* get the signal-frequency part of the receiver going well before you can hope for good results. Get down to it now.

A CIRCUIT FOR FIVE METRES

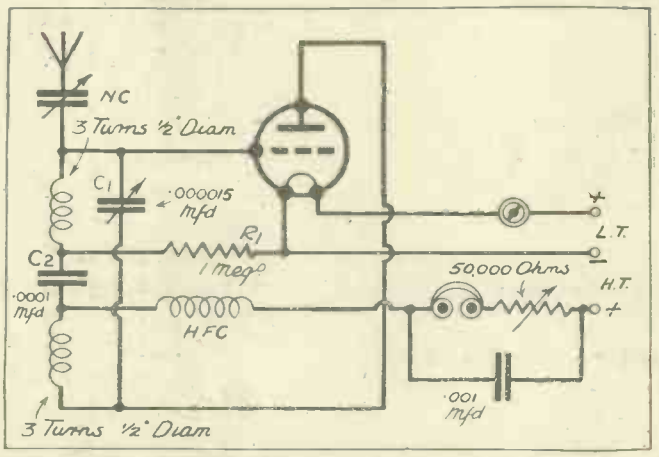


Fig. 1. A useful circuit on which to become acquainted with the ultra-short waves. The practical arrangement of its essential components is given in Fig. 2 on page 120.

WHEN CIRCUITS FAIL TO GANG

Some helpful advice on an important aspect of modern receivers which can make or mar the results obtained.

By H. A. RAMPTON

A GANGED circuit is one of the most complicated parts of a modern set. Small wonder, therefore, that if care is not taken with the design of a circuit and the choice of components the results are unsatisfactory.

First of all it is essential to study the instructions enclosed with the component, particularly in reference to the coils. Of course, if you follow a published design there is no need to do this, and if you have kept implicitly to the layout everything ought to be O.K.

Adjusting the Trimmers.

But if you have arranged the design yourself, and have used reasonably efficient ganged condensers, and coils intended for ganging, it is only a matter of experiment to get rid of any trouble that crops up.

Now, before we examine causes of bad ganging it is important to assure ourselves that ganging has been carried out, or rather attempted, in the correct manner.

The trimmers for matching the condensers are naturally in parallel with those condensers. Since their capacity is so small with respect to the tuning condensers themselves it is obvious that the trimmers are mainly effective when the capacity of the tuning condensers is least. This is, of course, when the vanes are full out.

It should be remembered, therefore, that these trimmers are practically only effective at the low end of the dial reading. In consequence no attempt should be made to adjust them at the other end of the scale.

Let us assume you have a three-gang condenser tuning a band-pass filter and an intervalve coil, and each section is fitted with a trimmer.

The first thing is to screw down all the trimmers so that they are at maximum capacity, and then undo them again, but *by equal amounts*. Do not let them up so far that the variable vane of the trimmer fails to follow the movement of the adjusting screw.

You can undo one of them first to see exactly how far it will go.

Tune in a station at about 20 or 30 degrees and adjust the trimmers.

The Tap on the Coil.

The adjustment of these depends on the valves used, as well as upon other conditions, so alteration of valves is liable to upset the ganging.

In no circumstances should you touch the trimmers at the top of the scale.

If you find that alteration of a certain trimming condenser improves conditions, but somehow it seems to need more adjustment than is possible, this is an indication that one of the other circuits has too much stray capacity across it and needs balancing.

In such cases use should always be made of any tapping on the intervalve coil. Either the anode should go to the top of the coil and the grid to the tapping or the other way round. If you already use the tapping it is worth while to try the other method of connection. You should also fit a good-class valve holder, preferably one of the anti-capacity type, and shorten up the wiring if possible.

Band-pass Troubles.

On the other hand, if bad results are obtained all over the scale it is an indication that the coils are not accurately matched.

Bad selectivity in a band-pass filter is generally due to lack of screening between the coils. But, in those cases where the manufacturer states that further screening is not necessary, the trouble may be traced to the coupling condenser in the filter, for which a good one of low resistance should be used.

If results are bad on the short waves only it is fairly obvious that the cause of the trouble will be found to be the wave-change switch. The contacts should therefore be carefully cleaned.

Occasionally you may find that reaction on the long waves is at fault, and a remedy can often be found by connecting a resistance of about 500 ohms between the reaction condenser and the reaction coil.

TELEVISION.—*Continued.*

TELEVISION JOTTINGS

ALTHOUGH it seems certain that London will have a high-definition television service in operation in the autumn, there is considerable speculation as to the date on which it may be truly said that a *national* service has been completed.

It is estimated that ten stations will cover more than 50 per cent of the population, but can such a service be called "national"? I doubt it. I have received anxious letters from readers in other large towns inquiring whether I have any news about the next towns to be chosen after the London service is complete.

No doubt the municipal authorities of the greater cities are already trying to stake claims. Anyway, it is definitely stated that Manchester will be the first of the provincial towns to enjoy high-definition television.

A New French System.

From something I heard over the air from a French amateur I am given to understand that a completely new system of television is being tried out in France under conditions of the utmost secrecy (as usual). The one thing that doesn't appear to be secret is that 30-line scanning is being used.

If this is true surely the only merit of the system can be cheapness. I have often thought that 30-line transmissions could be made under conditions of extreme simplicity for commercial purposes in which no higher definition was necessary.

High-definition television is going to be absolutely essential for the purposes of entertainment, but one can see possibilities for 30-line transmissions in other fields.

A SYMMETRICAL LAYOUT

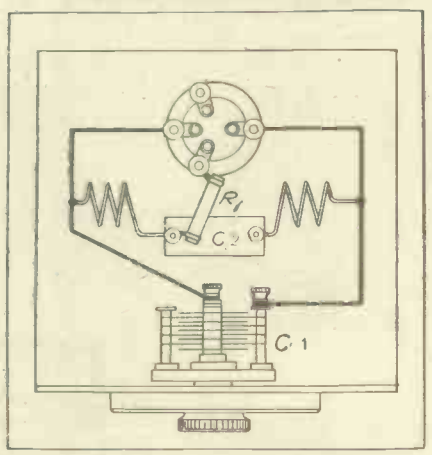


Fig. 2. How the coils and condensers of the simple circuit on page 118 should be arranged. Note the extremely short wiring.

Television by Land-line.

The announcement that a new type of cable which will handle the high frequencies necessary for television has been perfected is of tremendous importance. Were such a cable not available every television transmitter in this country (when the scheme is completed) might have to produce its own programmes on the spot, since they will almost undoubtedly be out of range of one another as far as ultra-short waves are concerned.

More Giant Tubes.

Our good friend the cathode-ray tube is swelling to enormous dimensions. Every month one hears that such and such a firm has produced "the largest C.R. tube in the world," and the latest rumours concern one that will give a picture eighteen inches square without magnification by optical means.

A tube of this character must have a screen diameter of about twenty-eight inches. Its length is probably a mere yard or so.

Meanwhile, the very fact that we hear little of the mechanical scanning systems probably means that they are being quietly developed to cope with the proposed 240-line transmissions.

The view is held in some quarters that the increase from 180 to 240 lines will prove to be the last straw that breaks the camel's back. Surely, though, if a system hitherto used for 30 lines can be made practicable for 180 the extra 60 lines are not going to administer the *coup de grâce* altogether.

Where Shall We Stop?

This, however, brings up the question whether 240 lines will be regarded as sufficiently good in a few years' time. The electron camera is capable of handling 400 lines with ease, and we even hear of 800-line television in the U.S.A. This, almost definitely, *would* be getting beyond the range of mechanical methods. **L. H. T.**

RADIO NOTES AND NEWS

(*Continued from page* 89.)

station 3,000 miles away because another programme from South America claims his ear!

Background for Crooners.

INFORMATION received from New York is to the effect that crooners are bestirring themselves to find some new thing to offer to the mike. One enterprising songster has hit upon a novel and logical line. Instead of crooning about his mother *in absentia*, he materialises the old lady before the mike in the form of an actress with a sweet, old-time voice. They chat about the good old days ("You remember, Ma, my first pair of long pants?"), and at suitable intervals he can then burst into song about The Old Home or The Day That I Left School.

Coal-black mammies, natives of Tennessee and Kentucky Folk should soon be in great demand.

Jubilee Broadcasting.

THERE is a multitude of interesting rumours going round about the forthcoming Jubilee broadcasts.

Whatever may materialise, it seems certain that we are in for some super-programmes. A quite astonishing interest is being taken in our Empire hook-ups by radio listeners of the U.S.A., and I expect there will be extensive relaying.

Incidentally, it may interest you to know that I am still receiving appreciative remarks about the Christmas Day message from Sandringham—it appears to have gone straight to the hearts of the democratic citizens of America. And the curious thing is that they refer to the King not as "The King of Britain," but simply as "The King"—just as we do! Only radio could have made that possible.

Where Wireless Scores Again.

CABLES & WIRELESS, Ltd., which controls Britain's overseas communications, has recently been gathering some curious information about the bed of the ocean. In constant wireless touch with cable ships all over the world it gets to know immediately of undersea earthquakes, submarine currents, and all the vagaries of the sea-floor.

One of the most remarkable of recent discoveries has been the presence of an underground river, which discharges into the bed of the Mediterranean, ten miles from land. Recently bushes and branches, of North African origin, were found entwined round the cable, 6,600 feet down. There is nothing on shore to account for this river, but the cable has been broken ten times in succession near the spot, which is off the coast of Algeria.

Wireless may not be perfect, as yet, but it scores over the cables in its freedom from trouble due to vegetation caught up in Father Neptune's whiskers!

Radio Sesame.

OUR old friend, the opening of garage doors by wireless, is in the news again. An inquisitive but cautious reader wants to know if it is true that the apparatus for this has been marketed, and, if so, what I think of it.

So far as the marketing goes, I believe that the necessary apparatus was on sale in the U.S.A. some eighteen months ago, though I never heard of much sale for it.

What I think of it is best expressed in the words of that versatile pen-pusher, the late W. Shakespeare: "Much ado about nothing."

Cars already have too many buttons to push and gadgets to go wrong, I think. Who wants to complicate matters by adding a door opener?

If I always drove a car up to a garage that was invariably waterlogged and slippery and infested with venomous snakes in the undergrowth I might be glad to save myself the trouble of opening the gates. But until that day comes I shall drive up, tootle joyfully, and if nobody comes get out as usual!

Saving Sidebands.

TRAVELLERS to Holland will understand my meaning when I say, in all charity, that the Dutch are a notably frugal race—waste not, want not, and a penny saved is a penny earned.

(*Continued on page* 124.)

RADIO NOTES AND NEWS

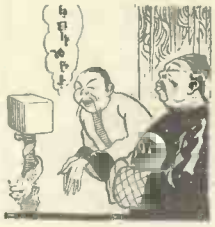
(*Continued from page* 122).

No surprise, then, will be occasioned by the latest escapade of the Dutch Government radio service, which by ingenious wangling has succeeded in achieving single-sideband telephony working with the Dutch East Indies.

Learned papers have been written setting forth the technical advantages of this method. But I cannot help thinking that the real motive power behind this achievement was not so much pure science as pure economy—"Why should we send *two* sidebands all the way to the East Indies when one can be made to serve? Tell me that, Mynheer."

Microphone Politeness.

THEY say that when a Chinese announcer introduces a notability to the microphone about half the time allotted is taken up by the flowery verbal preamble rendered necessary by Oriental etiquette.



In Egypt they are less formal, but nevertheless they do the thing in style. How's this for a sample?

"The talented vocalist will enchant his listeners with his celestial notes, to the accompaniment of divers instruments played by accomplished artists of the eminent singer's own selection."

I wonder what the carefully selected and accomplished artists would say if some breezy jazz merchant addressed them jovially as "The Boys"?

BROADCASTING TOPICALITIES

Regional listeners are to have the opportunity on April 8th of hearing a "Coo-Coo-Noodle Club Program," one of which was broadcast every Friday night over the Canadian network for seven years. This was one of the most popular programmes broadcast in Canada, and Big Bill Campbell, who plays the part of Bill, is presenting this hour of humour.

* * *

Campbell believes that he created a record by presenting a "Coo-Coo-Noodle Program" on June 3rd, 1933, to 26,000 people assembled in an outdoor theatre at Sunnyside Beach at Toronto, the largest theatre of its kind in America. A microphone and loudspeaker equipment were used for broadcasting the programme to this immense audience.

* * *

Speeches by Walter Hammond (the famous Gloucestershire and England all-rounder), the Rev. F. H. Gillingham and B. H. Lyon will be relayed to Western listeners during the Annual Dinner of the Gloucestershire County Cricket Club on April 12th.

Viennese Record.

LISTENERS who have heard the broadcast English lessons from Vienna will be interested to know that Professor W. MacCallum, who gives the talks, has just broadcast his thousandth!

Professor MacCallum is Reader in English at Vienna University, and he started his broadcasts in March, 1925.

In the ten years he has received about 30,000 letters of appreciation from Vienna's listeners, and made a host of friends there for himself and for the English tongue.

Many a diplomat has achieved a big reputation for a smaller accomplishment.

In Brief.

MRS. ROOSEVELT, wife of the President of the U.S.A., is giving a series of broadcasts for a fee of about £8,000, the money to go to destitute families in Virginia.

* * *

New stations planned this year for the Far East include 10-kilowatters for Vladivostok and Khabarovsk.

Arctic Note.

IN connection with the wireless equipment for the forthcoming Research Expedition which is to explore North-East Land a story about a previous Arctic adventure has come to light.

The yarn goes that when the assembled multitude of penguins heard the Expedition's loudspeaker giving a concert they stood in tense silence while the music came over. And the moment it finished they all shuffled excitedly and burst into a tumult of yelps and barks.

Daily the same thing happened—jabber and chatter before and after the music, but a silent and appreciative audience all the while it was on. If this is true, Walt Disney was right: "There's nothing so peculiar as a penguin, unless it's you and me."

ARIEL.

FOR YOUR RADIOGRAM

Details of a new high Fidelity gramophone needle introduced by H.M.V.

ALTHOUGH it is very small in dimensions, the needle you use with your pick-up is an extremely important item and can do a great deal to the reproduction. In view of this fact it is rather strange that there appears to have been no notable needle development for many years.

Indeed, it is stated that it is at least ten years since any really outstanding needle development occurred. But now H.M.V. have produced a needle especially to deal with the modern improvements to be found in present-day radiogramophones.

This new needle is known as the High-Fidelity long-playing needle, and one of its main features is that it is capable of handling the higher frequencies with much greater effectiveness.

Tremendous Pressure on the Point.

This desirable feature is in great part achieved by its wear-resisting properties. The pressure on the point of a gramophone needle is equal to about five tons per square inch, and this pressure is maintained over a playing track of 200 yards or more in length for every record played.

The new H.M.V. High-Fidelity needle can play up to some sixty record sides, and that corresponds with a track length of five miles or so.

Very special manufacturing processes are involved in the making of these needles. After the steel has been shaped a minute film of chromium is applied to the tip. And in order to ensure that each point is perfectly formed a close examination before and after the chromium is applied is made.

NEXT WEEK
MORE ABOUT
THE SILVER KING
Don't miss your copy of "P.W."

The tip of the needle is placed under a microscope arrangement, so that it is magnified to the extent of 400 times, and is in fact brought up to something of the size of an ordinary pocket watch.

This examination would at once reveal any fault either in the finished needle or in the unplated steel.

It has often been suggested that wear must occur somewhere when a record is played, and that if it isn't the needle which wears down, then the record itself must be worn in the reproducing process.

This is not accurate. Actually there can be more record wear with a soft needle than with a hard one. The hardness of the steel used in the new H.M.V. needle and the chromium plating do in fact minimise record wear, for the needle point rides cleanly in the grooves and does not tend to bed down and injure the walls.

Valuable for Automatic Record Changers.

Of course, there must be a certain amount of wear in the needle after it has been used many times, and for this reason it is recommended that it should not be removed and replaced in the pick-up, and that once fitted it should stay in position until it is discarded.

It will be unnecessary for us to point out the other advantages of using a long-playing needle and that it saves the need of constantly stopping to change needles when playing through a group of records. And, of course, for automatic record-changing instruments this type of needle is quite essential.

They do not cost any more either, for a packet of the new H.M.V. long-playing High Fidelities cost only 1s. for a packet of ten, and it must be remembered that each needle will play both sides of from 15 to 30 records.

They are needles which are quite suitable for all normal pick-ups.

RADIOTORIAL

The Editor will be pleased to consider articles and photographs dealing with all radio subjects, but cannot accept responsibility for manuscripts or photos. Every care will be taken to return MSS. not accepted for publication. A stamped, addressed envelope must be sent with every article.

All Editorial communications should be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

All inquiries concerning advertising rates, etc., to be addressed to the Advertisement Offices, John Carpenter House, John Carpenter Street, London, E.C.4.

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 reception. 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 specialties described may be the subjects 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

THE DIODE'S RESISTANCE.

H. H. (Welling).—"In the never-ending search for perfect quality I have been hooking up some of the diode circuits, and have had promising and interesting results. But I wish you would tell me what the purpose of the resistance ('load resistance') is, for although I have proved it to be necessary, I should have thought the less resistance there the better."

By passing the rectified current through a resistance you can get from across the resistance the voltages necessary to operate the following valve. That is the purpose of the resistance—to provide a load impedance, for coupling.

TESTING FOR D.C. MAINS POLARITY.

A. E. A. G. (Bolton).—"In the glass-of-salty-water test for D.C. mains polarity, where the bared leads are placed opposite one another, with a lamp wired in one of them, is it the negative that bubbles? Or the positive?"

They will both give off bubbles. But the number of bubbles from one lead will be far in excess of that from the other.

The lead which has the greater number of bubbles is that attached to the negative main.

SHIFTING THE TUNING SCALE FOR ACCURATE READINGS.

S. F. P. (Newcastle).—"You have given me so many good hints that I must give you one to pass on to others who, like myself, may be using illuminated dials without knowing they are adjustable. At least, mine has proved to be, and it has taken me twelve months to find that out!

"It is fixed by three screws, and I took it off to make a new mark on it, for altered wavelength. When I put it back I found that the holes were so much bigger than the screws which fit into them that the whole scale can be tilted round within the limits of the extra size given by the hole spaces round the screws.

"So if the screws are put in *lightly* at first, and a station is tuned in, the scale can then be shifted until it is *exactly* on the station's name before the screws are finally tightened."

We are glad to pass this hint on, because it may be helpful to readers whose sets are so fitted, and who have not noticed the fact, nor the references we have made to it in the past in "P.W."

Although this is not an ordinary Question and Answer, it outlines a minor problem, and gives the solution, so it is not out of place in these columns. And, incidentally, S. F. P.'s letter affords a fine example of the good old help-the-other-chap spirit among "P.W." readers, to which we have so often paid tribute.

THE CONDENSER IN THE EARTH LEAD.

S. R. (Margate).—"By chance I have discovered that a troublesome hum which interfered with my reception (D.C. mains set) can be greatly reduced by removing the usual 1-mfd. condenser from the earth lead and using a ·001 mfd. there instead. I have never heard of this before. Is it an unknown effect?"

It is by no means unknown. Since the insulation effect is identical in both cases the difference is due to the fact that at low (hum) frequencies the impedance of the smaller condenser—which is very high compared with the impedance of the larger condenser—serves to bar the interference, which must therefore be entering the set via the earth lead.

WHERE DO THESE GO?

JOE TERMINI, the well-known American somnolent melodist, reaches the last stage in the construction of his Cossor Melody Maker.

TESTING WITH LOUDSPEAKER AND BATTERY.

J. P. (Blackheath, S.E.3).—"The test which you gave for finding dud condensers has proved so easy to understand and use that I hope you can give a similar description of finding a faulty component by using only a loudspeaker and battery."

To test whether there is a broken wire or a continuous connection between two points by means of battery and loudspeaker, you first connect one loudspeaker terminal to the battery. Two flex leads should then be prepared as test leads.

The ideal plan is to fit sharp metal prods to both wires at one end of the length of flex; and also to provide wooden handles or other stout insulators that will keep the hands well away from the current-carrying wires when the tests are being made.

At the other end of the flex one wire goes to the remaining loudspeaker terminal and the other flex wire to the remaining battery terminal.

(A "flashlamp" battery is sometimes good enough for testing purposes, but a 15-volt bias battery is better. Alternatively, about that voltage can be tapped off from an H.T. battery; an old one will do for this.)

If the business ends of the test leads are now touched together a loud double click will be heard in the loudspeaker—one click as the leads come together and another click as they separate again.

This double click denotes the two leads are first making contact and then breaking it. And this same double-clicking effect will take place when the

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RADIOTORIAL QUESTIONS & ANSWERS

(Continued from previous page.)

current is passed from one test lead to the other through a winding such as a choke or a resistance.

So the test takes the form of "clicking through" any component or wiring that is suspected of a break, to see whether or not there is the correct pathway for the test current through it.

Absence of the double click is positive evidence that there is a break between the two points which are touched by the test leads.

For example, to test an H.F. choke the leads are touched on its terminals, and the presence or absence of the clicks will show that there is either continuity through it, or a break in this component.

Similar tests may be made with valve holders, to show whether the terminals are making contact with their respective sockets; and whether the terminals which should be insulated from each other are insulated or are making improper contact.

L.F. transformer windings of all types, fixed and variable resistances and chokes are all easily tested on these lines, but electrolytic condensers cannot be tested by the battery-and-loudspeaker method.

In the case of potentiometers the leads should first be connected to the outer terminals; and then to one outer terminal and to the slider, the knob being turned to various positions. (Faulty contact at any point in the slider's travel will be denoted by loud clicks at that point when the current is interrupted by the bad contact existing there.)

Although the clicks will occur when high resistances are being used, they will then be quieter, owing to the reduction of the current passing.

It is important to remember that the more obscure faults and intermittent bad contacts may not show up by this method; but it is reliable for all ordinary checking, though care must be taken to disconnect any component under test from others that might cause confusion by providing parallel circuits along which the test current could pass.

NO REACTION AT HIGHER WAVELENGTHS.

A. E. W. L. (Barnet).—"As the H.T. battery was running down too quickly I put a fixed condenser between the reaction terminal of the coil unit and the reaction condenser, thinking there might be leakage there. (It is a mica-type condenser I use for the reaction.)

"The battery seems to be lasting all right this time, but I do not get reaction at the top of the tuning now. It was O.K. before. What can I do to bring it back?

"I have put up H.T. as far as possible, with some improvement, but not sufficient to give reaction right at the top of dial."

The fixed condenser you added was too small. Replace it by one of considerably larger capacity and you should get the full reaction effects back again.

Anything in the ·00's range will be suitable, or failing that try a ·0005 or thereabouts; but if you use a value much lower than this the reaction range is liable to restriction in the way of which you complain.

"LONDON IS TOO LOUD."

S. F. N. (Wembley).—"London is too loud for comfort at all times, so can I fit a local-distance switch of some kind? The set is an A.C. mains job, of 4-valve superhet type, which is all enclosed except for sockets for the A and E plugs and L.S. plugs and sockets."

Yes. The type of set does not matter, and all you need is access to the A and E sockets. Join A to one side of a resistance (50 or 100 ohms will be about right), and join E to one side of the new on-off switch. Then connect the vacant terminals on these components together, and you can bring your resistance in circuit by switching "on" or restore the original connections by switching "off," this latter being the "distance" position.

The lower the resistance value employed the greater will be the reduction in strength when the "local" switch is on.

HAND CAPACITY.

R. V. (Liverpool).—"When I take my hand away from the tuning condenser the set goes very low. It can't be the aerial or earth, as I have tested them both.

"I have changed the terminals on the condenser and tested the circuit. I tried another tuning condenser, but the hand capacity is still the same.

"What else can I try?"

If it is not the condenser itself which combines with your hand to form a capacity effect it must be some of the wiring connected to the same part of the circuit as the condenser.

For example, if there is a long wire passing near the panel from one of the condenser terminals to a grid condenser, a hand-capacity effect can often be obtained by placing the hand too near that wire; and in such an instance the trouble would not respond to the usual cure, which consists of changing condenser connections.

So look over the set with this in mind, and remove from the vicinity of the tuning dial any component or wiring which may be carrying H.F. currents. When this has been done the approach of the hand should make no difference to tuning.

CURING PLOPPINESS AND OVERLAP.

F. R. W. (Gloucester).—"Since the 'S.T.' sets opened my eyes to the immense potentialities of reaction, properly applied, I have experimented with it in a number of circuits. And I must confess that it sometimes beats me now!

"Smooth control is, of course, the whole secret of success with reaction-boosted reception—but what can you do for a plop that *will* plop even when a potentiometer is used across the grid leak's return wire to filament wiring? I have had one of those!

"And, apart from plopping, I still get a lag or over-lap sometimes which I cannot account for.

"All the following have been tried, though in most sets one of them, or several in combination, gives a cure:

(*a*) New H.F. choke, or two in series.
(*b*) 400-ohm potentiometer across L.T., and detector-grid-return wire to the slider.
(*c*) Alterations to H.T. + on detector plate. I have found this very important, especially when a mains unit is employed.
(*d*) Differential type of condenser, not two-terminal or tuning type.

"Is there anything else that affects reaction control?"

We assume that you are using a properly designed coil unit to obtain the reaction coupling, for, if not,

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(*Continued from previous page.*)

fierce and ploppy reaction—or else insufficient reaction—is likely to occur. (And even when the coil unit is O.K. it can be affected by being mounted carelessly, and without sufficient spacing from other components and wiring.)

You do not say anything about decoupling—except by implication—but this is an important factor in obtaining smooth control.

The resistance used may sometimes be increased in value with advantage, and it is nearly always possible to find at least a little extra "sweetness" of control when the capacity of the decoupling condenser has been largely increased.

If a differential reaction condenser is used it is sometimes—only sometimes—advantageous to connect one side of a ·0001-mfd. fixed condenser to the moving vanes and the other side of the fixed condenser to that set of the differential's vanes which is permanently earthed.

Finally, there is the preceding valve to think about, if one is used. Unless the S.G. stage is stable you are liable to get all sorts of queer reaction effects at the detector, even when all the other foregoing points have received attention.

SELECTIVITY ON THE LONG WAVES.

G. G. (Barmouth).—"The selectivity is perfectly satisfactory in that I do not get one station's programme butting in on that of another; but all the same, there is a point about selectivity which puzzles me. It is in connection with the long-wave tuning.

"On this waveband (long) I get all the stations spreading over several degrees on the dial—Droitwich, for instance, seems to be quite as well tuned in on the 55-degree mark as on the 60. And none of the other long-wavers is particular, as to a degree or two, where it comes in.

"On medium waves it is quite different, and every single station is very sharply concentrated to its own tiny section of the dial. Why this difference?

"As I said above, there is no actual interference to spoil results, but it does not seem right for long waves to be spread out like this when medium waves are so sharp."

What you have noticed is quite common—you will find on most sets that the long-wave tuning adjustment can be set approximately without affecting the performance of the set; but the medium-wave setting has to be accurate or the quality or selectivity (or both) suffers.

The reason is that the tuning on the medium waves covers a much greater range of frequencies than that on the long waves. (It is this fact that enables us to "crowd" four or five times as many broadcasting stations on to the medium waves as the long waves can accommodate.)

FRIDAY NIGHT VARIETY

(*Continued from page* 116.)

notions I may have had of him. I certainly imagined James I a less broad and more regal personality. There was too much broadness about Hubert Leslie's James I, and I was a bit puzzled how he could beget quite as refined a son as Henry Prince of Wales.

* * *

There were rare fire and dash about "The Story of the Waltz." Whatever the young folk of to-day think of the waltz—and some of them have expressed their views in no uncertain terms—it is well to remember that old and middle-aged listeners generally have sentimental reasons for recalling this one-time popular dance, and it is going to live a long time yet.

A Little Too Fast.

I think John Watt has been seen to more advantage than in "Meet Mickey Mouse." There was just a little too much rush and bustle about it all. The slightest reduction in the pace might have made all the difference between annoyance and complete appreciation.

* * *

The question of speeding up also brings to mind S. R. Littlewood's talk on the theatre. When he began the series his rate of delivery was A1. Of late he has been hurried and clearly has too much to say in the brief time allotted him. It does seem a pity that one of the "star" turns should be somewhat spoiled for the want of a few more minutes.

I did a thing this week that I have never done before. I switched Henry Hall off. Only the day before I had heard him play a study in rhythm called "The Dance of the 21st Century." I could not stand this a second time.

* * *

Well done, Meredith! I mean Meredith Wilson, of San Francisco, and his band. Apart from a speciality type of music which he styles "Chiffon Jazz," I like his brand of dance music because he is less frilly than most of his contemporaries. The tune is never obliterated. I like his tempos much better than I do Henry Hall's, for instance. If you hear Meredith Wilson (in a Five Hours Back programme) play "When My Ship Comes In," you would agree that Henry Hall's version of it is quite a dirge.

For ripeness of age I should say that that dance tune, "Dark Town Strutters Ball" is without a rival. It was all the rage in America in 1917. Meredith Wilson dished it up as a "Chiffon Jazz" number.

C. B.

AT THE IDEAL HOME EXHIBITION

A 1911 H.M.V. gramophone which was used by Caruso. It can be seen at the Ideal Home Exhibition at Olympia, where The Gramophone Co. is showing the progress of the gramophone during the Jubilee years.

WORLD-WIDE LISTENING

(*Continued from page 92.*)

upon on the short waves some few years ago. I had gone to the set to do a little knob-twiddling the while I finished a cigarette. I had been out late.

After roaming around a few stations, noting the conditions, I suddenly arrived at a strong carrier. Resolving same, I discovered myself listening to the beginning of a running commentary from the ringside in America of the famous Tunney-Dempsey world-championship bout. It was being sent out by K D K A, I think.

As Clear As The Local.

Anyway, I heard the whole of it as clearly as though it were from the London station. Barely any fading and hardly any static. Gosh! I can still remember how I seemed to be transported in a flash to the Madison Square Garden, and sat there enthralled until the fight was all over. The commentator really was magnificent and made you see every move and sense the whole atmosphere of the show.

You want to stumble into a broadcast like that on these fascinating short waves to get the real thrill of them. Maybe not all would have been gripped like I was by a boxing match; but there are other things, thousands of them pouring into the ether from English-speaking stations, and they are all more or less on tap for owners of short-wave receivers.

Glance at the diagram on page 92. It shows in a compressed form how the radio waves are divided. What a relatively tiny portion of the spectrum is occupied by medium and long-wave transmitters! Yet this is all the ordinary set can handle.

Vast Entertainment Potentialities.

But our Jubilee receiver, the "Silver King," spreads itself over the whole gamut, and surely but little imagination is needed to appreciate the entertainment potentialities opening up before it.

One of these days the set which cannot tune in short waves will be a back number. Already more and more listeners are discovering the delights of world-wide radio on short waves, and once they go "down there" they will find the cramping mediums and longs are not enough, and they have then joined the short-wave band for good!

THE "B.C.L. TWO."

Dear Sirs,—About a fortnight ago I started to build your new short-wave set, the "B.C.L." Two. I am glad to say it goes excellently. Last week I received America twice (W 8 X A L) on 49·5 metres, and on Sunday I received Sydney (V K 2 M E) on 31·28 metres. It was quite loud enough for the loud-speaker. I have received plenty of other stations—for example: Zeesen, Rome, Jeloy, etc.

I should like to congratulate you on such a splendid design, and as this is the first set I have made I am very pleased with it. I am only thirteen.

Yours truly,
G. TUMNER,

135, Dymchurch Road,
Hythe, Kent.

A REMARKABLE "ONE."

Dear Sirs,—Last week I built the one-valve set as published in issue December 22nd, 1934. I used recommended components except old pair of earphones and ·0005 variable condenser that I had by me, and the results were excellent.

On Sunday night from 8 p.m. to 8.15 p.m. I logged twenty-eight stations, all verified on a five-valve superhet.

Allow me to contratulate you on such an excellent set at such a price and so few components.

Yours faithfully,
G. ALLEN,

297, Hook Road, Epsom, Surrey.

THE COLVERN VALVE SCREEN

THE efficiency of modern coils, valves and other components is such that high degrees of amplification are possible with relatively simple sets. But this is not an unmixed blessing, for wherever there is great amplification considerable precautions against instability have to be taken.

The instability is caused by unwanted feed-back effects, maybe through either inductive or capacity coupling. The anode and grid circuits of a screened-grid or H.F. pentode valve are fruitful sources of this, and so care should be taken to ensure that they are electrically well separated.

This is facilitated by the individual screening which is to be found incorporated in the designs of many present-day components; but these shields and screens seldom are sufficiently effective, or, rather, wide enough in their scope, to render all the sets in which they are included entirely immune from the trouble.

Even when the layout of the set has been skilfully devised and certain of the leads themselves screened there is still a possibility of trouble if the H.F. valve remains unshielded.

Instability due to the use of an unscreened H.F. valve occurs much more often than many readers might think. It is indeed almost always advisable to play safe and employ screened H.F. valves, especially in the mains type of receivers.

As a matter of fact, in these valve screening becomes almost essential. Besides instability, we have hum in these to deal with. And an unscreened valve is a wide-open door to hum. Not only the H.F. valve or valves, but the detector valve ought to be of the screened type in the vast majority of cases.

But it is not necessary to lay aside your present unscreened valves and buy new ones should you be considering the need of "tube shielding." You can add a valve screen very easily to any existing valve.

Messrs. Colvern, Ltd, of 150, King's Cross Road, London, W.C.1, sell an admirable valve screen for the very modest price of ninepence.

It is made of copper gauze so woven that it at once takes up the shape of the valve upon which the device is fitted. There is an insulating ring at the top enabling the valve terminal to pass through.

At the bottom of the screen is an insulated lead with a small ring terminal, and this is, of course, for connecting the screen to the cathode of the valve.

This efficient copper gauze valve screen has an insulating ring at the top for the valve terminal to pass through.

The Colvern Valve Screen is a useful and convenient article for which there is a definite demand. There must be tens of thousands of set users who could employ one or more with great advantage, but the trouble is that many will not realise that the instability effects or the hum they are being troubled with could easily be cured with the aid of this ninepenny gadget.

WITH THE EXPERIMENTER

(Continued from page 114.)

to anode B will go up—nearly to that of the high-tension supply when the signal is at its maximum. As soon as anode B's voltage goes up the tube discharges up the cathode C—and the height of the discharge will depend on the strength of the signal, being highest at the resonant point, dropping on each side of it.

Ways of Mounting the Tube.

Well, that is a rough-and-ready idea of how the glow tube works, but it needs a good control valve to get the best from the discharge. The question of how to mount the tube is also interesting. Some makers fix it end-on, so that the top of the tube is seen through a tiny hole. Others mount the tube vertically, so that the "climbing-light" effect is obtained.

If mounted end-on the indication is simply one of varying brilliance. If vertical you see the light climbing for quite weak signals and growing brighter for the very strong ones.

Whichever way the tube is used you certainly do get an eyeful when a signal is tuned in. And that is *so* much more certain, I assure you, than the tearful little earful so many of you are no doubt putting up with at the moment.

"The Experimenter"

JUBILEE!—The Dawn of a New Era in Broadcast Reception

(Continued from page 91.)

the enthusiasm on the part of the amateurs, but something really new and intriguing for them to work on. This "Silver King" receiver fills the gap. It has been described as the broadcast receiver, *plus* short waves, *plus* television sound channels, all in the one instrument, and I think that this is a very compact and in no way exaggerated description of it.

Only Three Valves Used.

I have given you, I hope, a preliminary idea of its amazing powers and prepared you for reading on the other pages, the detailed description of its construction and capabilities. I have not yet, however, mentioned what is perhaps the most extraordinary thing of all, and that is that these results are obtained with *only three valves.* If I go on in this strain some of you will throw up the sponge and refuse to read any further, so I hasten to say that the three valves are not just ordinary valves; one of them is an entirely new valve which has never been on the market before, and it has been specially made for this set. It is very appropriately called the Jubilee valve, and I think that the set itself might well be called the Jubilee set.

Before you become incapable of any further surprise and pass out I will give you just one more when I tell you that this special "P.W." valve, instead of eating current, as you might expect, uses considerably less H.T. power than many ordinary valves. It is here that K. D. Rogers' genius comes in, for he has so arranged things that the H.T. consumption in this valve is *only a milliamp or so;* the whole set only consumes some 7 to 8 milliamps.

I hope I have now prepared you for what is coming, and so, as the newspaper serials say, "you can now read on."

FREEING THE ELECTRON

An explanation of why electrons are forced from the filament of a valve when it is heated by the L.T. current.

By J. C. JEVONS.

WE know that in any electrical conductor there is a constant interchange of free electrons between the atoms. They flit here and there across the space separating one atom from another, and under the influence of an applied E.M.F. "drift" in mass formation towards the positive pole, their movement in bulk forming the electric current.

When a conductor, such as the filament of a valve, is heated the atoms are thrown into more violent agitation and the "dance" of the free electrons is speeded up. Richardson, who was one of the first to investigate the matter in detail, considered that the "emission" of free electrons from a heated wire is more or less on all fours with the gradual escape of vapour or steam from a pan of water as it is gradually raised to the boiling point.

Rapidly Increased Velocity.

At ordinary temperatures the electrons inside a conductor do not possess sufficient velocity to force their way through the outer skin of the conductor. So long as they remain in the interior the atomic forces of attraction are counterbalanced, and each electron is pulled this way as much as that. But as soon as a free electron gets near the surface it is no longer surrounded on all sides. Instead there is an unbalanced force which tends to pull it back again.

When a filament is heated up by an applied current the movement of the free molecules is accelerated, until some of them reach a critical velocity in the neighbourhood of two or three thousand miles a second.

When this happens they start to evaporate in bulk through the "skin" of the wire, and so pass through the valve as an electron stream. For a given voltage on the plate of the valve the rate of filament emission increases with the temperature of the wire, up to a saturation point not far removed from that at which the metal itself begins to melt. In the case of a pure tungsten wire it can be run at a temperature in the neighbourhood of 2,000° C. for hundreds of hours.

The Dull Emitter.

So much for the "old" bright emitter—hot-filament type of valve. The modern dull emitter uses a filament which has been prepared in one or other of two ways. It is either a thoriated-tungsten wire or an oxide-coated one.

Although from one point of view the transition from bright to dull emitter seems a comparatively simple step, yet the exact way in which the dull-emitter filament acts to release more electrons at a lower temperature still remains something of a mystery.

In the case of the thoriated-tungsten filament it is thought that the action is due to a layer of thorium—one atom thick—which continually diffuses or "seeps" from the interior up to the surface of the

(*Continued on next page.*)

FREEING THE ELECTRON

(Continued from previous page.)

tungsten wire. The atoms travel through what are called "grain boundaries" in the substance of the wire, and when they reach the surface spread out over the top.

Maximum emission occurs when the tungsten wire is little more than half covered by the thorium layer. It is probably caused by intense local interaction between the thorium and tungsten atoms, in the course of which both lose part of their free electrons. These go to swell the stream through the valve.

In course of time the small content of thorium gradually evaporates and the filament then "loses emission." This does not normally occur until after two or three thousand working hours. It is, however, fatal to overheat a thoriated-tungsten wire, because at a temperature above 1,600° C. the contained thorium flashes off in a second or so, and the filament will then only operate as a bright emitter.

Half-way to "Cold" Valve.

The dull emitter can be regarded, in a sense, as a half-way step towards the long-sought ideal of the "cold" valve—that is, a valve capable of producing a continual stream of electrons without the application of any heat to the filament. A near approach to the true "cold" emitter has been made by using a film of the rare metal cæsium laid on a surface of cæsium oxide, deposited in turn on a silver core.

This gives off a copious emission of electrons at a temperature not much above that of boiling water. Having got so far, it is possible that we shall arrive, finally, at a combination which will emit plenty of electrons at ordinary room temperature.

Oxide-coated filaments are usually prepared by coating nickel or tungsten wire with a paste of barium and calcium oxides, or carbonates or nitrates, and then heating the covered wire to a high temperature. It is supposed that during the heating process some of the barium or calcium compound is reduced to the pure metal, and is absorbed in this state by the wire core—in much the same way as thorium penetrates into a tungsten wire.

A Very Thin Layer.

The action of the oxide-coated filament when heated is very similar to that of a thoriated wire. The generally accepted view is that those atoms of metallic barium which are absorbed by the wire core gradually diffuse to the surface of the wire and then spread out over it. The layer so formed is only one atom thick, and it acts in a manner not yet thoroughly understood, to "clear the way" for electrons liberated from the oxide layer immediately beneath.

The emission therefore depends in part upon the formation of an outside layer of monatomic barium, and in part upon the action of other free barium left in the oxide layer.

HOW TO AVOID INSTABILITY

Some diverse and informative jottings about interesting aspects of radio.

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

WHEN you are using a set with, say, only a couple of stages you are hardly likely to get instability; but the more stages you use as a rule the greater the liability there is of instability cropping up. This means that with a multi-valve set, especially in these days, you have to be constantly on your guard against instability and have to be prepared to introduce means for counteracting it.

It is generally convenient to distinguish between high-frequency instability and low-frequency instability, the former occurring in H.F. stages and the latter in the L.F. You can take it as a general rule that instability is due to pulsations in the anode circuit of a valve being communicated to the grid circuit of a preceding stage. The communication of anode pulsations to the grid of a *succeeding* stage is, of course, quite normal; but when the energy gets feeding back to a previous stage you have a sort of "vicious circle," and this is what sets up unstable conditions.

Controlled Reaction.

In the case of reaction, using a leaky-grid detector, this in a sense is instability, but it is controlled and is applied for a definite purpose.

As to the causes of high-frequency instability this may be due to the capacity between grid leads or leads to the tuning condenser causing coupling between the grid and anode circuits of one or more valves. It may also be caused by coupling between coils where there is insufficient screening; or, again, another cause is the lack of sufficient high-frequency decoupling.

Decoupling.

There are various ways in which these troubles can be overcome, but it would take too long to go into them all; one of these which most frequently does the trick is to put in by-pass condensers where necessary and decoupling resistances in the anode and screening-grid H.T. leads. Needless to say, these condensers should be non-inductive, and for the capacity you can try ·1 mfd. For the resistances a suitable value will generally be about 1,000 ohms.

Variable-Mu Hint.

A point to remember when using variable-mu valves in the H.F. stages of the battery type is that the grid-bias feed should be decoupled, and this is more particularly the case when there are two high-frequency

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HOW TO AVOID INSTABILITY

(Continued from previous page.)

stages. You can do this by putting in a resistance between the slider of the volume control potentiometer and the terminal of the grid coil, this resistance being, say, 50,000 ohms. The condenser which goes between the grid-coil terminal and earth will function as the decoupling condenser.

Of course, I assume that you have already taken all ordinary precautions with regard to the introduction of suitable screens. If not this should be attended to even before any of the above-mentioned dodges are tried. It is obvious that you can hardly expect circuit dodges to suffice without the use of proper screens.

Frequency Changers.

You hear a good deal these days about the octode frequency-changing valve, and several readers seem to be in some doubt as to the construction of this valve and how it functions. As its name implies, it has eight electrodes, but it is on the same lines as the seven-electrode or heptode valve; the section of the valve which acts as the mixer or first detector is a pentode valve instead of being a tetrode. Broadly, you may say that its advantage in this respect is similar to the advantage of the H.F. pentode type of valve over the screened-grid type.

The Octode.

In the octode (as well as in the heptode) the coupling is brought about by means of the electron stream, and consequently it is not necessary to use any external coupling, such as any injector coil, or other external coupling between the mixer section of the valve and the oscillator. In case the term may be new to you this type of coupling by means of the electron stream is known as "electronic coupling." It is, of course, quite different from ordinary orthodox forms of coupling.

A Loudspeaker Story.

I suppose there is no radio component in which greater or more numerous changes and developments have been made than the loudspeaker. Those of you who have been in the radio game for the past few years will easily be able to recall all sorts, shapes and sizes of loudspeakers, and scarcely a month goes by—certainly never an annual season—without we have a group of new types of loudspeaker reproducer.

The L.F. and Acoustical Side.

One of the best-known authorities in this field is Dr. N. W. McLachlan, who has been very closely associated with loudspeaker development for a number of years. He has published many papers on loudspeaker research, and now from his pen comes a very handy volume, "Elements of Loudspeaker Practice" (Oxford University Press, 5s.), in which he tells in popular language the whole story of the loudspeaker from its earliest days, as long as thirty years ago.

He deals not only with the loudspeaker instrument itself, but also with power-valve circuits and acoustical effects due to placing loudspeakers in different surroundings and so on. The book is packed with interesting and valuable technical information, and you will be well advised to get a copy.

SILVER KING: The Set of the Century.

(*Continued from page* 108.)

remaining terminal of the 2-mfd condenser that is mounted on the screen.

Now we can go to the other section of the set. As before, we will take the leads that go through the baseboard first.

From the nine-pin valve holder terminal 2 (wire G) we have to run a lead through hole 7 to one short-wave output terminal, and as this is not yet in position we must leave a length of wire suitable for the purpose, ready passed through the hole. (The slots or holes through the screen for battery leads should be cut now, if not already done, and the wires passed through. Holes are better than slots, of course.

From H.T.+ terminal on the L.F. transformer in the short-wave section of the set we run a lead through hole 10 to one end of the second 30,000-ohm resistance, and thence to the nearer terminal of the adjacent 2-mfd. condenser.

The other side of this condenser is connected by a flex lead to a wander-plug for G B+. and also by a stiff wire to the further terminal of the other 2-mfd. condenser on the same side of the screen. From this terminal goes a wire under the foot of the condenser to make contact with the metal surface of the baseboard.

Chassis Wiring Completed.

Connect the remaining terminal on this second 2-mfd condenser to the remaining terminal on the 10,000-ohm resistance holder, and also connect a length of wire on this terminal for connection to one output terminal on the panel.

From the remaining terminal of the 30,000-ohm resistance holder on the short-wave side of the set run a flex lead to the H.T. +1 wander-plug.

There is one more lead to put on. This is the flex that runs from the G.B.—1 plug through the hole 9 to the G.B.—terminal on the L.F. transformer on the short-wave side of the set. That, apart from connections that are made on the panels themselves and the final connecting up of the loose ends, so to speak, completes the wiring of the set.

With the baseboard components mounted and wired we may proceed to the panel. There are few parts here, and it will not take long to mount them and to connect them to the leads that are waiting for them.

Some Important Points.

There are, however, one or two points regarding the panels that we should refer to. These panels are made of metallised wood, or wood covered with metal foil. In either case it is essential to remember that this foil is to be earthed, and that care must be taken what touches and what does not touch the foil. Here, again, if the chassis is not bought completely made of "Metaplex" the panel surfaces should be bonded with the chassis by means of short lengths of wire

The earth terminal can be fixed on the panel with the fixing nut screwed hard down on the metal. That is all to the good. The same applies to the upper of the two L.S. terminals. But in the cases of the aerial and the other L.S. terminal, and of the short-wave output terminals on the other panel, the metallising or foil must be scraped or cut away so that the terminals and their fixing nuts are completely clear of the metal.

There is no need for the metal round the spindles of any of the components to be cut away, for if the right parts are used those meeting them have insulated spindles incorporated in their design. In the case

(*Continued on next page.*)

IN NEXT WEEK'S "P.W."

there will be further details concerning our great new two-channel receiver under the heading

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SILVER KING: The Set of the Century.

(Continued from previous page.)

of the ·0001-mfd. reaction condenser the clamping of the condenser to the metal panel acts as the earth connection to the moving vanes.

If you are doing all the drilling of the panels yourself you will find that the large sections that have to be cut out in most sets for escutcheons are delightfully absent in the "Silver King." The two tuning condensers are mounted almost by single-hole mounting methods, and it is the easiest thing in the world to fix them and their escutcheons.

These latter need fixing bolts through the panels, it is true, but this is not nearly the bother that the ordinary type of full-vision dial causes when the larger hole in the panel to allow the pointer to move has to be cut out.

After each panel has been drilled for the components we should offer it to the baseboard concerned and mark the holes for the screwing of the panel to the chassis. These then can be drilled, and the rest of the panel procedure is perfectly straightforward.

The Panel Connections.

Some of the wiring on the panels can be done before they are placed in position, and it is a good plan to do that. For instance, the wire from the aerial terminal to the volume control can be put on. This will have to be soldered at the volume control end, and we hope that you will take really good care to see that the aerial terminal does not touch the metal covering of the panel at any point.

As we have said before, the earth terminal *must* touch it and make good contact with the metal in order for a good earth connection to be obtained. We stress this because it is most important.

The ·002-mfd. condenser can be connected across the L.S. terminals now, and the wire from the upper terminal taken to the F2 terminal of the ·0002-mfd. reaction condenser. That is all that can be done to the broadcast panel before it is fitted into place.

From Panels to Chassis.

The short-wave panel has nothing except the connecting of the ·001-mfd. condenser across the output terminals to be done.

It is a good plan to tin any contacts on any of the components on either panel at this juncture, so that they are all ready for the soldering of the leads that have to be connected from the components on the baseboard.

When the panels are ready for attaching, place them aside while you tin the ends of the leads on the baseboard that have been left for connection to those components where soldering is required.

Then take the broadcast panel, place it in position loosely and connect up the wires to the volume control, the on-off switch, the B.C. switch under the baseboard, the reaction condenser and the long lead to the aerial terminal. Then screw the panel in position and the job is done. It is best not to screw the panel in position until the connections have been made, as it is much easier to have the panel in a more or less movable condition rather than a rigid affair that cannot be moved a fraction of an inch.

The short-wave panel can be done now, but before you go on to this make sure you have not forgotten that little lead between the B.C. switch and the screw on the metal baseboard holding the H.T.—lead. If you forget this you will not get the set to work.

The End of Construction.

The short-wave panel should have the leads to the output terminals connected first, and then it should be rigidly screwed in position. The reason for this is that except for the one long and easily fitted lead to the reaction condenser there are only soldered connections left to make, and for these absolute panel rigidity is an advantage, for as they are short-wave leads they should be drawn as tight as possible and cut short. There should be no slack wire in these connections, though a little slack does not matter on the broadcast side.

So connect up the reaction and then solder the variable condenser leads, and the whole of the wiring of the set is complete.

It is not our intention to deal with the first tests of the "Silver King" in this article. That will come later, with the details for trimming and handling.

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ELIMINATORS.—Regentone Eliminators, 1935 Series. Brand new and boxed. Type W.5a for A/C Mains, 200/250 v. Complete with Trickle Charger for 2, 4 or 6-volt accumulators, 39/6 (List 75/-). Type W1a (less Trickle Charger) to carry 30 milliamps, 33/- (List 67/6). Type W1C (less Trickle Charger), 30/-.

CONDENSERS.—Plessy Four-Gang Condensers with Oscillator Section for Superhet. Fully screened with trimmers, 7/3 each. Lotus 3-Gang 0·0005, 11/-; 2-Gang 0·0005, 7/3. All Lotus Condensers are Brand New. Fully Screened with trimmers, complete with Dials, escutcheons, etc.

COILS.—Igranic Superhet 4-Coil set (1 osc. 2 I.F. with pig tails and 1 I.F. plain), 9/- per set (List 50/-). Varley Constant Square Peak Coils B.P.5, with all accessories, 2/3. Telsen Twin-matched Coils : Type W.287, screened with switch, 7/9 (List 17/-). Triple-matched Screened Type W.288, with switch, 10/9. Telsen Twin Coil Unit, Type W.478, 12/6. Type W.477, 17/6. All Brand New and Boxed.

PICK-UPS.—Marconi Model K.25, 21/- (List 32/6).

TELSEN.—3-Valve Battery Sets. Model S93, complete with three Mazda Valves, 30/- (List 75/-). Contained in exquisite Bakelite Cabinet.

MISCELLANEOUS.—Westinghouse Metal Rectifiers, Type H.T.8, 8/9. Biflo Static Cut-outs, definitely eliminate all interference, 2/3. Lewcos Spaghetti Resistances, all capacities, new and boxed, 1/6 per dozen assorted. Telsen Short-wave Chokes, H.F. Screened, 1/9. Telsen Binocular H.F. Chokes, 2/-. Telsen ACE L.F. Transformers, 3-1 and 5-1, 2/9. Deemark Dual Range Coils, with circuits, 2/-.

STOCK-TAKING PARCELS.—We have gathered at our Mail Order Dept. a large quantity of odd lines from our branches. It is impossible to list these articles individually. We are offering them in lots at 5/- per parcel. Each parcel contains components to the value of at least 20/-, and include Switches, Fixed Condensers, Transformers, Resistances, Coils, etc., etc. Every article is of present-day use in Radio. Telsen and Ready Radio Circuits numbering 10 different circuits are included in each parcel, 5/- per parcel.

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SOUTHERN RADIO, 323, Euston Road, London, N.W.1. Near Warren Street Tube. 'Phone : Museum 6324.

HOMECONSTRUCTORS' Receivers modernised, serviced. Diagrams supplied, modernised. Stamped envelope details.—Radio Service Bureau, 9a, Shepherd's Bush Road, Hammersmith, London.

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CASH PRICE £6-12-6 OR 10/- WITH ORDER

WE SAVE YOU A DIRECT 10%.

COMPLETE SATISFACTION OR MONEY REFUNDED.

All coils, tuning condensers, etc., exactly as specified. 100% Results Guaranteed.

KIT A Components, complete sealed Kit, exact to specified values, and all sundries.
PRICE £6/12/6 or 10/- WITH ORDER.

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PRICE £8/5/0 or 12 6 WITH ORDER.

KIT C As Kit B, with Cabinet. **PRICE £9/9/0 or 15/- WITH ORDER.**

COMPLETED RECEIVER. Wired and aerial tested. **PRICE £10/10/0 or 17/- WITH ORDER.**

ACCESSORIES.—Loudspeaker W.B. "Stentorian" Standard (P.M. S2) **32/6.** Headphones : Western Electric Special Light-weight **£1/1/0.** Ericssons Special Light-weight **12/6.** Exide 120 volt H.T. battery **11/-.** 60 a.h. accumulators **7/10.**

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G. M. KIT SERVICE, London East Central Trading Co. 23, Bartholomew Close, London, E.C.1

Telephone : NATional 7473.

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while stocks last, to every purchaser of one of our new low-priced British-made Chassis. Guaranteed 12 months. All-steel-grey sprayed Chassis. Finest components throughout. Wired and aerial-tested, complete with valves. Chassis secure a 4-pole unit. A.C. Chassis a moving-coil speaker. Every speaker brand-new, guaranteed perfect.

BATTERY MODELS.

G.M. 3-VALVE CHASSIS. Super-power output. P.M. Straight-line scale marked in wavelengths. 27/6.

G.M. SUPER THREE. Double-tuned circuit. Radiophone, 2-gang. Shielded matched coils. Pick-up sockets. 35/-.

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Enclose 3d. stamps to-day. Will save you pounds.

LONDON EAST CENTRAL TRADING CO. (DEPT. P.W. 407), 23, BARTHOLOMEW CLOSE, E.C.1.

See also our advertisement, previous column.

VAUXHALL. Magnavox permanent-magnet speakers, universal for Class B power, pentode or push-pull. 7-in. cone, 16/6 ; 10-in. cone, 22/-.

VAUXHALL. Magnavox energised types, 2,300 or 6,500, 10-in. cone, 22/- ; 7-in. cone, 15/3. All brand new, complete with hum-bucking coils, state power or pentode. Other speakers. Send for particulars.

VAUXHALL. New Lists just issued. 3,000 Bargains. New goods. Limited number available free.

VAUXHALL. Immediate delivery of all goods advertised in previous issues.

VAUXHALL-UTILITIES, 163a, Strand, London, W.C.2. Over Dennys the Booksellers. Temple Bar 9338.

BANKRUPT BARGAINS. List Free. 3 v. kit, 15/-. S.T.600 kit with specified coils, condenser, etc., £3. Telsen 3 v. sets with Mazdas, 27/6. Celestion PPM/W. M.C., 16/6. Regentone 30 m.a. eliminators, 30/-. Telsen W.347, 28/6. Drummer A.C. 5 v., 14 gn. 1935 Superhets, 7 gns. 1935 Amplion D.C. Radiogram, 15 gns. Bandpass D.C. 3 pentode sets, £5 15s. ; ditto Superhets, £6 15s. Write for quotes. Butlin, 143B, Preston Road, Brighton.

UNOBTAINABLE ELSEWHERE. We supply any new Receiver on Easy Terms, making a good allowance on your old goods. We pay the deposit and first instalments according to the allowance. Components and Peto-Scott Kits supplied for cash or part-exchange.—R. Wigfield, Furlong Road, Goldthorpe, Yorks.

CLARION VALVES.—All brand new ; battery types, 2-volt, H.F.2, L.F.2, L.P.2, 1/9 ; 1 Super-power, PP2, 2/6 ; screens and pentodes, 3/9 ; A.C. Mains, 4-volt 1-amp., general purpose, 3/3 ; power, 4/- ; screens and pentodes, 4/6 ; full-wave rectifiers, 3/6 ; postage paid, cash with order, or C.O.D. over 10/-.—Clarion Valves, Dept. 5, 885, Tyburn Road, Erdington, Birmingham.

WE can supply complete Kits of specified components for the A.C. S.T.600 at a competitive price.

ALL other goods advertised in last week's issue still available.

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LOUD SPEAKERS REPAIRED, 4/-. Blue Spot a Speciality. Transformers and Headphones, 4/-. Eliminators, Mains Transformers and Moving Coils quoted for. 24-Hour Service. Trade Discount. Clerkenwell 9069.—E. Mason, 44, East Road, London, N.1.

SPOT CASH for Components, Sets, &c.—Economic Radio, 96/98, South Lambeth Road, S.W.8.

G.P.O. ENGINEERING DEPT. (No experience required.) Commencing £4 per week. Age 17–23. Excellent prospects. Free details of Entrance Exam. from **B.I.E.T.** (Dept. 568), 31, Oxford Street, W.1.

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500 GLADIOLI, first size, 4–5 inch circ., in 10 named vars., and 10 double Begonias, for only 10/- (C.O.D. 6d. extra). 300 Gladioli and 10 Double Begonias for only 7/- (C.O.D. 6d. extra). Carriage and duty free to destination.—P. Walraven, Stationsweg, Hillegom, Holland.

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500 GLADIOLI, 3½–4 inch circ., in 10 named vars. ; 100 Montbretias, 100 Anemones, 100 Ranunculus, 100 Clover of Happiness, 10 Lilies, for only 10/-. Carriage and duty paid to destination (C.O.D. 6d. extra).—P. Walraven, Stationsweg, Hillegom, Holland.

A New Masterpiece — in Price & Performance

Will it operate on A.C. and D.C. mains?	**Certainly. It is a Universal set suitable for mains of 200 to 250 volts**
How many valves?	**Four, including rectifier**
Does it get many foreign stations?	**It is an 'All-Europe' receiver, charted by station-name to give 38 stations. Many others should be received**
Is it easy to tune?	**Simplicity itself—just one-knob station-by-name tuning**
The cabinet is very handsome!	**Yes! It is magnificently moulded, and there are two finishes, figured walnut or black and chromium**
Has it a moving-coil speaker?	**Yes, with a natural tone and very generous output**
Can one purchase on easy terms?	**Certainly. Initial payment of 14/6d and 12 monthly payments of the same amount—or approximately 3/6d per week**

AND THE PRICE? **8 GNS.**

MODEL AD36. Walnut finish 8 gns.
Black and Chromium, as Illustrated, 10/6 extra.

Ask your Radio or Motor Dealer for particulars of Ekco Car Radio.

EKCO Radio

TO E. K. COLE LTD., DEPT. A.15, EKCO WORKS, SOUTHEND-ON-SEA. Please send me free illustrated literature.

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POPULAR WIRELESS, April 13th, 1935.

REGISTERED AT THE G.P.O. AS A NEWSPAPER.

WHEN TALKIES WILL BE BROADCAST

Popular Wireless

AND TELEVISION TIMES

LINING UP THIS TELEVISION
★ ★
ON THE SHORT WAVES
★ ★
PRACTICAL TIPS FOR ALL
ETC., ETC.

EVERY WEDNESDAY PRICE 3D

No. 671.
Vol. XXVII.
April 13th, 1935.

SILVER KING

in Action

More about Our Great Two-Channel Set

COSSOR

UNIVERSAL RECEIVER

for D.C. or A.C. Mains

There is now no longer reason to tolerate out-of-date radio just because your supply may be changed or you may be moving. This new Cossor Universal Receiver gives outstanding performance off either D.C. or A.C. Incorporating the famous 'Super-Ferrodyne' developments — and every worth while radio feature —you are assured *NOW* of even greater selectivity—even wider range, whatever your supply. Ask your Dealer for a demonstration —or send coupon.

A BRIEF SPECIFICATION: With 4 Cossor Valves, Var.-mu H.F. Screened Pent., H.F. Pent. Det., Super-Power Output and Rect. Super-Selective Iron-cored coils. Single knob dual-pointer tuning, full-vision scale in wavelengths, illuminated according to waveband in use. Combined "on-off," wavelength change and pick-up switch. Selectivity and volume control. 8 in. Permanent Magnet M.C. Speaker. Provision for pick-up and for extension Speaker. For D.C. 200/250 volts (adjustable) and A.C. 200/250 volts (adjustable), 50 to 100 cycles.

Prices do not apply in I.F.S.

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Hire Purchase Terms: 20/- deposit and 11 monthly payments of 16/6.

VARIABLE-MU H.F. PENTODE IN H.F. STAGE

H.F. PENTODE DETECTOR

SUPER-SELECTIVE IRON-CORED COILS

SUPER POWER OUTPUT

SINGLE KNOB TUNING

FULL VISION SCALE ILLUMINATED ACCORDING TO WAVE BAND IN USE

Super-Ferrodyne MODEL 369

THIS COUPON BRINGS FULL DETAILS

Please send me free of charge, literature giving full particulars of the new Cossor Universal Receiver Model 369.

L.137

To A. C. COSSOR, LTD., Melody Dept., Highbury Grove, London, N.5.

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P.W. 13/4/35.

6660 CA

POPULAR WIRELESS AND TELEVISION TIMES

MANAGING EDITOR: N. F. EDWARDS. TECHNICAL EDITOR: G. V. DOWDING ASSOC. I.E.E.

VALUABLE RECORDS
DISTANT RECEPTION
THE NEW HILVERSUM
A REAL MAN

RADIO NOTES & NEWS

EARLY BIRDS
BEAM BUSINESS
CHARGED AERIALS
A SOUTHERN GIANT

Kilowatt Progress.

OUR old friend Mr. A. R. Burrows—the "Uncle Arthur" of 2 L O and crystal-set days—has been looking up some interesting statistics in his office. He is Secretary-General of the U.I.R. and Director of the International Broadcasting Office, and his records show that ten years ago Europe had about fifty transmitting stations using a total of about 60 kilowatts.

To-day Europe has well over three hundred stations, and the combined kilowatts figure is about 5,150. *There are twenty-seven stations now working which each use as much power as all the stations in Europe put together used in* 1925 *!*

A Sound Idea.

THE collection by the B.B.C. of recorded famous voices—in the form of gramophone cylinders, discs and Blattnerphone tapes—is going to make a Sound Gallery that will vie in interest with anything yet found in the Tate or National Art Galleries.

Since all famous men now gravitate, sooner or later, to the microphone, this and succeeding generations will be well represented. The records available of famous men of the past include Caruso, the first Lord Tennyson, Mr. Asquith explaining his famous Budget of 1908 and so forth.

Posterity will benefit from all this, but I rejoice the more because of the excellent material already gathered for "actuality" broadcasts of past events. Leslie Baily has shown us, in the "Scrapbook" series, how good such entertainment can be.

"Peanut Vendor."

THE cheerful ditty named above crept into my notes a little while back in connection with the reception on medium waves of an Australian station, assumed to be 2 K Y.

Truth will out; and now it transpires that the item in question came, not from 2 K Y, but from 2 U E.

This latter is a 3-kilowatt station situated in Sydney, N.S.W. And the identification of this remarkable reception came via a New Zealand chap who, living in the same hemisphere, knows both 2 K Y and 2 U E quite intimately.

I mention the matter again because of my duty as a scribe and my gratitude to the Vigilante of New Zealand.

Hollands—for Strength.

I SAY! Have you heard the new Hilversum?

The other night I stumbled on him, apparently exercising a new transmitter, and, believe me, that boy has lungs.

Hilversum is a station for which I cherish an affection. I like his quaint habit of having his time different from everybody else. By striking eight bells at 7.40 a.m. he has more than once enabled me to eat my second egg for breakfast and then catch my train in comfort—a very friendly action, for I am a hearty eater after the night's fast.

If the newcomer reaches your aerials with the punch that he imparted to mine you must rise with me and drink to his good health. "Heil, Hilversum!"

In Brief.

THE Physical Society has awarded the twelfth Duddell Medal to Dr. W. Ewart Williams, of King's College, London. His work in optical design has been applied to directional aerial systems for transmitters in the U.S.A.—to the great benefit of short-wave enthusiasts.

* * *

Work has begun on the new Radio Suisse Romande (Sottens), which is due on the air in the autumn.

A Romantic Career.

WHEN Michael Idvorsky Pupin, the son of a Serbian peasant, landed as an emigrant in New York in 1874 he had only five cents in his pocket. When he died on March 12th he had distinguished himself at Columbia University, at Cambridge and in Berlin with inventions that helped to revolutionise long-distance communications.

Although unconcerned about money, he made a million dollars out of the Pupin coil alone; it is invaluable for long-distance telephony.

For twenty-five years Dr. Pupin was Professor of Electro-Mechanics at Columbia University; and to win through to his ambition he had been everything—farm hand, odd man and wrestling instructor to fellow students. "This was a man!"

"As You Were."

REMOVING my sombrero, I make a deep bow to Señor E. D. A. Garcia, of Mexico, in acknowledgment of the laugh he has given me.

(*Continued on next page*)

FOR YOUR SUMMER HOLIDAYS

How are you going to spend your holidays this year? The scheme inaugurated by the railway companies, in which you go from place to place in a special camping coach, using the coach as your temporary home during the tour, is likely to be very popular. Here is a glimpse of the inside of one of the camping coaches which the Southern Railway are showing at various stations. The radio set is the well-known H.M.V. portable.

THE G.P.O.'s WONDERFUL RADIO BARGAIN

The good señor announced to his astonished listeners a revolutionary statement. His station's microphone would in future be *open to all*, he said—to strumming musicians, singers, lecturers, toe dancers and heel tappers: all, all were welcome.

Short-rationed flies discerning a honey pot could not have responded more eagerly than the local virtuosos. . . . And what did they find?

They found Señor E. D. A. Garcia, polite, suave as ever, explaining that there was just one leetle formality. Each applicant had to demonstrate, by a preliminary test or two, that he had the necessary "microphone manner."

And, pondering this matter on the piazza, the sad-eyed artists came to the conclusion that Señor Garcia had led them, each and all, right up the garden. And all unwittingly they had performed that complicated military evolution known as "As you were"!

Early Birds.

SEVERAL correspondents have recently commented upon the unexpectedly good reception that is possible round about breakfast time. They say that little stations, normally too faint and too far off to be heard, can then be roped in quite easily. And sure enough, when I tried the other morning, I heard a surprising number of unfamiliar voices on medium waves.

One lady announcer, speaking an unknown language, kept chuckling to herself so captivatingly that I almost missed my train trying to make out who she was. The wavelength was just below Fécamp's, strength moderate, sex appeal terrific!

This romantic episode, however, is as nothing compared to a feat by W. L., of Hawick, who tells me he has received K N X, Hollywood, at 7 a.m., in daylight, on a four-valver! Who can beat that?

The Amazing Beams.

HAVING looked over a report on Britain's beam wireless service, I am feeling a little dizzy. Was there ever such a snip in history as the P.O. got when they took over the beam?

The Marconi Co.'s claims for the system were so confident, and the P.O.'s caution was so marked, that an unprecedented contract was drawn up. The company were to erect four stations, to work with Canada, Australia, India and South Africa; price for all four stations, £165,000. If they wouldn't work under certain long and rigorous tests the deal was to be off.

It is now a matter of history that those beams exceeded all expectations. So the P.O. bought them, and the four stations cost, with sites, land-lines and etceteras, less than £250,000; now the P.O. *leases them for that amount per annum* to Cables & Wireless, Ltd. One hundred per cent per annum, and *no* risk!

Plying Pliers.

WIRE snipping seems to be an infecticus complaint, for European broadcasting has suffered on several occasions from outbreaks of interrupted programmes due to the clandestine cutting of cables or telephone wires. And it often happens that no sooner does one station mend its broken connection than another, many miles away, gets similar trouble.

Not long ago Sottens was nipped off right in the middle of a word by some unknown clipper; and only two days later an Athlone broadcast was decapitated in the same manner. Protesting linesmen are soon busy setting out on bicycles to find the breaks and put them right. But nobody knows why the wire wreckers, unknown to each other, always seem to get their queer ideas at the same time.

BROADCASTING TOPICALITIES

On April 29th National listeners will hear speeches by the Earl of Athlone and Mr. H. F. Wade, captain of the South African cricket team, relayed from a luncheon to welcome the team at the Hotel Victoria.

* * *

The Covent Garden season of grand opera opens on April 29th, when the B.B.C. will relay Act 2 of "Lohengrin."

* * *

Western listeners who are still undecided where to go for Easter will welcome the suggestions which will be given in a programme entitled "Holiday!" on April 17th.

* * *

On April 20th Northern Rugby enthusiasts will hear a running commentary by John Graham on the Rugby League match between Bradford Northern and St. Helen's "Recs." The relay will take place from the Odsal Stadium, Bradford.

* * *

On April 20th Scottish Soccer fans will have the opportunity of listening to an eye-witness account of the Scottish Cup Final by P. Stanley Eley.

Stirring Call.

MAY I ask my friends the Hon. Sec., the Social Organiser, the Publicity Representative and other radio-news distributors to assist me in keeping my hair on?

'Tis well nigh impossible at present, because some of you fellows will send me your choicest bits of news *too late for publication*.

Give me time, tarry not, catch the post and I will do my best to make known your news to fellow readers. But do not keep back your hottest news till it is cold, I beg you, or I have to say to you what the printer has just phoned to me—"Sorry, mister. Too bloomin' late."

In Serious Vein.

HERE'S a letter, before Easter, from a modern Ajax who boasts—*boasts*, mark you—that he gets crackles from his aerial condenser and a "sharp tingling spark" on touching it in thundery weather.

Every year my blood runs cold when this sort of thing is reported. For I know it is definitely dangerous to monkey about with a charged aerial.

Without being a scaremonger I like to face facts, even in these cheerful columns. And it is a fact that this drawing-sparks-off-the-aerial business is foolish. I once saw a chap laid out by touching a charged aerial; and since then I have always earthed mine before thunderstorms or kept right away from it if the storm is too near.

Wireless is as safe a hobby as one could wish for, but you've got to be reasonable. And playing about with charged aerials is about as reasonable as looking for spilt petrol with a lighted candle.

Bedtime Criticism.

WE all know that one man's pound of steak is another man's dose of prussic acid. But what is one to do with a man like G. W., of Epsom? He writes from a sick bed, after gastritis, and we can safely infer that it was an abominable attack, for G. W. has listened to a full day's programme from London Regional and has found no single redeeming feature. Nary a one.

He heard the morning concerts and lunch-time music—they were punk. He heard the afternoon session from A to Z—it was foul. At teatime he listened to the hollow mockery of light music, and found it neither light nor musical. But, settling himself back upon the pillows, G. W. continued undaunted to the bitter end. "The twelve strokes from Big Ben," he writes, "were the best part of the whole programme, for they signified the end."

There is, however, one redeeming feature to all this—a revealing postscript. In feminine handwriting, it is evidently the work of Mrs. G. W., who says: "Thank goodness he seems better to-day!" Only just six words—but what volumes they tell us!

Down South.

WHETHER it is owing to the political situation, or to the seismographic situation, or just to a craze for wireless I cannot say, but New Zealand is going to get itself a super-station. It is to be the most powerful in the Southern Hemisphere.

The site is to be near Wellington, and the normal working power 60 kilowatts or so. Officially, the reason for proposing such a high-powered station is its use in national emergency. Unofficially, it will be a source of great pride to the wearers of Wellington boots.

ARIEL.

INSTALLING YOUR SILVER KING

It is a particularly straightforward task to install your "Silver King," the "Popular Wireless" "new-era" receiver, and it will be found extremely easy with the aid of these detailed instructions. By G. T. KELSEY

THE "Silver King" is launched! And in that simple statement is conveyed the tidings of an event which has stirred the home-constructor movement as no set has ever done. From Land's End to John o' Groats evidence is hourly pouring into our office of an absolutely unprecedented wave of enthusiasm on the part of that vast army of "P.W." readers who have an almost uncanny aptitude for knowing when they are on a good thing.

Letters are arriving from almost every town, village and hamlet in the country, and at the time of writing the set, as far as the general public is concerned, is still not a week old. What a magnificent tribute to the common sense and progressiveness of that favoured section of the community, the home constructors, that they should so speedily and so enthusiastically have appreciated the tremendous advantages of all-wave two-channel reception!

Absolutely Exclusive.

Two programmes at once, but completely independently. Radio entertainment for the whole household at one and the same time. Something new, something unique. The only design of its kind in the whole wide world. And available *absolutely exclusively* to those go-ahead folk, the home-constructing readers of "P.W."

Just for how long "P.W.'s" constructing public will be placed at such a tremendous advantage it is difficult to foretell, for already there are indications that ere long others will be seeking to "cash in" on our preserves. But we are unperturbed. Imitation is the sincerest form of flattery, and our satisfaction rests in the knowledge that we are first, and that thereby our readers are once again placed in the position of being ahead of all others.

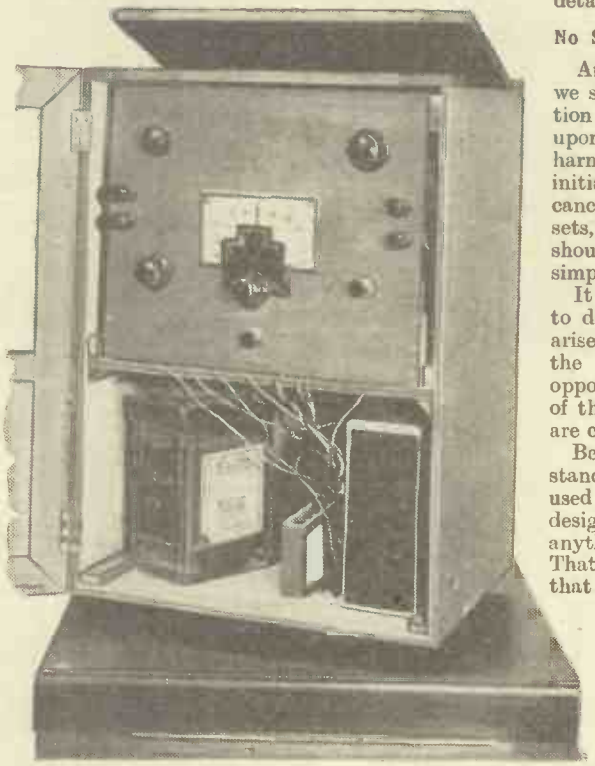
The First Set.

The principles incorporated in the "Silver King" are logic, not magic, and in consequence the time is bound to come when two-channel reception will be a universally accepted practice. The requirements for television reception, apart from the other manifold advantages of the system, will see to that. It is, therefore, a safe conjecture that those readers of "P.W." who have built, or who are building, the "Silver King" will once again be pioneers, as they have so often been in the past.

All the more power to them! The radio of to-day is built up upon the pioneering efforts of the home constructors, and it looks very much at this juncture as though the television of to-morrow will follow the same process of evolution. But there is one important distinction. The pioneering efforts of the early days of radio were essentially experimental. There is nothing experimental about the "Silver King."

Although it is the very first set of its kind, and a set, moreover, which is destined to make radio history, it represents the very last word in up-to-date radio practice. So that in building this set the advantage lies not just in the distinction of being a pioneer, but in possessing an instrument with far greater scope for home entertainment than any that has ever been available before.

HOW THE BATTERIES FIT IN



There is ample room in the compartment below the chassis for all three batteries—H.T., G.B. and L.T.

Little wonder that so many of our readers have already embarked upon the construction of this set with such utter confidence. The knowledge that the set itself is built with an eye to the future as well as to the present is something unique in these days of such rapid advancement.

And the great joy of it is that it is an "everybody's" set in almost every respect. It is easy to operate, it serves everybody at once and it is remarkably economical in use. But so that there shall be absolutely no possible chance of anybody going wrong, and having regard to the fact that the design is such a major departure from convention, it will be our endeavour in this and forthcoming issues of "P.W." to explain every single point in the greatest detail.

No Special Aerial Required.

And what more appropriate note could we strike this week than that of the question of installation? So very much depends upon everything working in complete harmony with this set that the question of initial adjustment is of far greater significance than is the case with most ordinary sets, and once everything is working as it should, then operation becomes a very simple matter.

It is our intention in this present article to deal with every point that is likely to arise in connection with the installation of the "Silver King," and it is perhaps opportune to start off with the requirements of the set in so far as the aerial and earth are concerned.

Because of the widely differing circumstances under which the set is likely to be used we have purposely sought in the design to do away with the necessity for anything special in the way of aerials. That should not be interpreted as meaning that you can use any old piece of wire, for it is a fact that the more efficient your aerial the more satisfactory will be your results.

The Earth Connection.

But those of you with aerials of average efficiency need not contemplate any alterations, for the considerations of length and effective height which apply to ordinary sets hold good for the "Silver King." You would, however, be well advised to pay particular attention to the efficiency of your earth lead, for a poor earth can introduce all manner of unwanted effects. Keep it as short as possible, and if a direct earth connection is not available, then take

(*Continued on next page.*)

PREPARING FOR TWO-CHANNEL RECEPTION

INSTALLING YOUR "SILVER KING"

(Continued from previous page.)

particular care to see that the join between the earth lead and water pipe, or whatever it is that you use, is sound electrically.

The type of H.T. battery most suited to the requirements of the set will depend almost entirely upon the valve that you use in the output stage. In our list of recommended valves you will notice that we give both ordinary output and super-power types for use in the last position, and it is up to you to decide which you will use.

The Output.

For most ordinary domestic purposes a valve of the small-power output type will answer the purpose, in which case a standard-capacity H.T. battery will be the most economical one to buy. In cases where a super-power type of output valve is used, however, an H.T. battery of the super-capacity rating—say about 15 m/a. maximum permissible discharge—will be the most suitable. Incidentally, if you do use one of these larger types of batteries it is important to note that not all of the makes will go into the space available inside the cabinet, and you must therefore check up on size.

There is another point about the H.T. battery—and this applies irrespective of type—and that is that it must be tapped at intervals of not more than 9 volts. One hundred and twenty volts in all is the maximum required for the successful operation of the set.

Just one further word in passing to those of you who intend using an existing battery. Do not hope for success from a battery that has seen better days. If it is nearing the end of its useful life you would be well advised to cast it aside, for high resistances in the battery itself (due to old age) are likely to introduce unwanted coupling effects between the two channels, although every effort has been made to guard against this in the design by the use of proper decoupling.

The size of the G.B. battery most suited to your particular requirements will again depend upon the valve that you are using in the output stage. For a small-power type of output valve a 4½ or 9-volt battery will answer the purpose, but otherwise a 16½-volt unit will be required.

The capacity of the L.T. accumulator is relatively unimportant except from the point of view of frequency of charging. But if it is to fit into the cabinet then it must not exceed 8¼ in. in height and 4 in. in width one way. Having regard to the fact that the total L.T. consumption of the set will probably be in excess of half an ampere, the best plan will be to use the largest capacity accumulator possible commensurate with physical-size limitations.

In the cabinet supplied by the Peto-Scott Company—and may we say in passing that it is eminently suitable for this set on account of its turntable base?—one of the fronts is hinged to permit of the insertion of the chassis.

Inserting the Chassis.

There is a right and wrong way of doing this, and for convenience, when making the necessary connections to the batteries, it is desirable that the chassis should be inserted in such a way that the hinged front covers the "broadcast" panel.

In connection with the battery leads you will notice that there are three on the short-wave side of the centre screen, and these should be brought through grooves or holes in the screen to the "broadcast" side before the chassis is inserted in the cabinet. Bring them through the screen at one end, and not just haphazardly, for it is desirable as far as possible to keep them away from the broadcast components.

These leads, together with the ones which come from the "broadcast" side, should be taken down to the batteries through grooves in the edge of the platform on which the set stands in the cabinet. By the way, be careful to label them all up correctly before you proceed very far, for confusion here may have disastrous consequences.

It will also be best to insert the valves before you finally put the set in the cabinet, for it is not easy to get at the 9-pin holder when the whole box of tricks is assembled.

For your convenience the special Jubilee valve is provided with an arrow on the base between the filament pins, and these two pins correspond with pins 4 and 5 on the actual valve holder.

With regard to the other two valves, the H.L. type should be inserted in the holder nearest the screen, while the small-power or super-power output valve, as the case may be, should be inserted in the remaining holder.

H.T. Voltages.

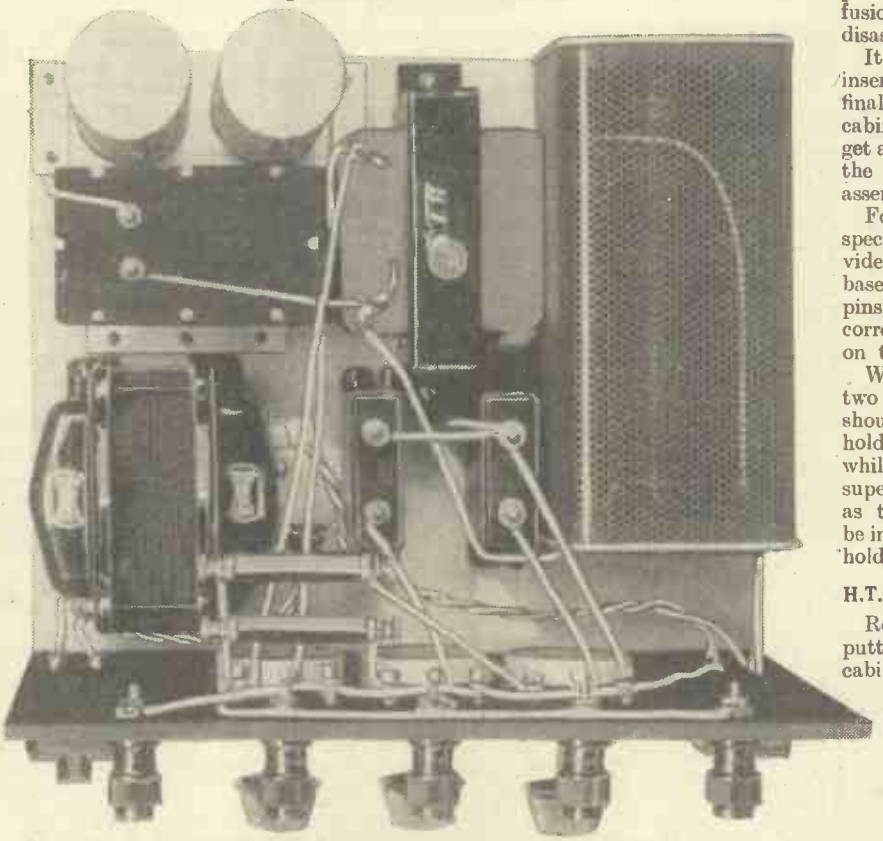
Remember when you are putting the set into the cabinet that the valves are in position, and that in consequence the L.T. leads must not dangle about in the neighbourhood of the H.T. battery. A wise precaution is to see that the L.T. switches are at the off position, but perhaps the best plan of all is not to put the batteries into the cabinet until the set is in position. You can then take care to see that the leads are out of harm's way.

The H.T. voltages required for the most successful results are not particularly critical, but for maximum efficiency a little experimentation in this connection is strongly to be recommended. As a guide when starting off it may be helpful to you to know that we used 60 volts for H.T. plus 1, 24 volts for H.T. plus 2, 36 volts for H.T. plus 3 and the maximum tapping (120 volts) for H.T. plus 4.

But it should be emphasised that, with the exception of H.T. plus 4, these figures

(Continued on next page.)

FOR MAINS POWER



When using the special mains unit described on other pages of this issue—for H.T., the four terminals on it are wired up in place of the four wander-plugs which otherwise go to the high-tension battery.

SUITABLE VALVES

Make	V_1	V_2	V_3 Small Power	V_3 Super-Power
Cossor	—	210H.F.	220P.A.	230X.P.
Hivac	J240	H.210	P.220	P.P.220
Marconi	—	H.L.2	L.P.2	P.2
Osram	—	H.L.2	L.P.2	P.2
362	—	H.L.2	L.P.2	P.2
Tungsram	—	H.R.210	L.P.220	S.P.220

THE ACCESSORIES

Loudspeaker, W.B. "Stentorian."
1 pair Ericsson headphones.
1 G.E.C. 120-volt H.T. battery.
1 G.E.C. G.B. battery (to suit output valve).
1 Exide 2-volt accumulator.

INSTALLING YOUR "SILVER KING"

(*Continued from previous page.*)

will not necessarily apply in every case, and slight increases to, or slight decreases from, the figures given may enable you to arrive at the ideal for your own particular set of circumstances. For best results it should only be found necessary to vary H.T. plus 2 and H.T. plus 3 within narrow limits, but H.T. plus 1 may have to be anything from 36 to 72 volts. But more will be said about this in the articles next week.

The correct position for the grid-bias minus 2 wander-plug for your particular case will also depend almost entirely upon the type of valve you are using for the output, although it may be taken that 1½ volts will suffice for G.B. minus 1 in practically every instance.

The V3 Bias.

To give you some idea of the bias that will be required for G.B. minus 2 it is fairly safe to say that from 3 to 6 volts negative will be found to be necessary for a small-power type of output valve, but it is probable that super-power output will call for the use of a much higher voltage, possibly from 12 to 15 volts.

The best guide as to the correct bias to use is the leaflet which you will find inside the actual valve box, and which gives detailed information on this subject.

With regard to the output arrangements it will have been clear from previous articles on the "Silver King" that the idea is to connect a loudspeaker to the "broadcast" L.S. terminals and a pair of headphones to the short-wave side. May we make it clear at this juncture that it will not always be necessary to use phones on the short-wave side, and that it will often be possible to use a speaker on some of the more powerful short-wave stations if desired?

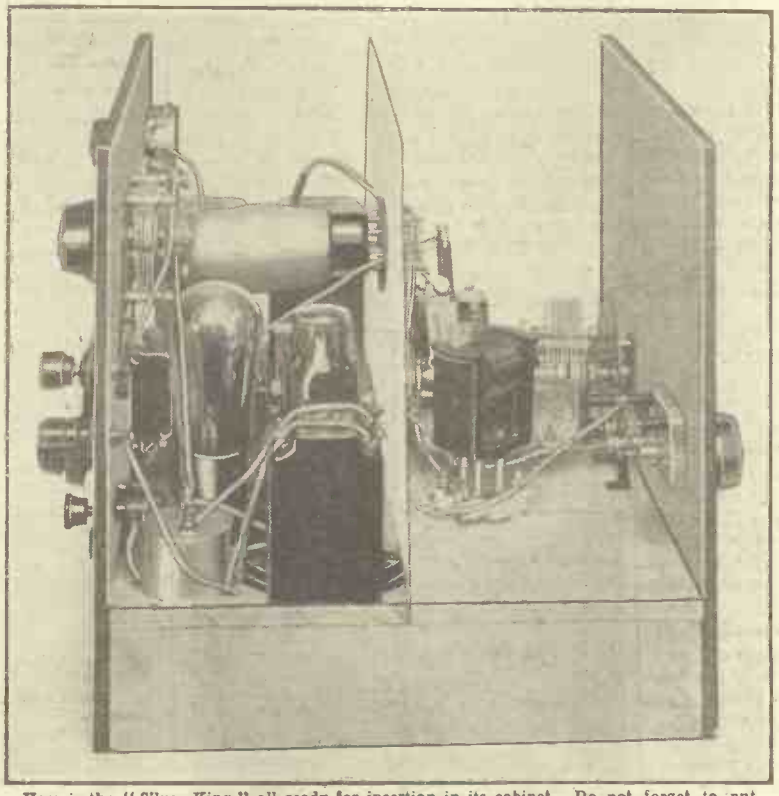
The speaker for the broadcast side should be of a reasonably sensitive permanent-magnet moving-coil type—the W.B. "Stentorian" being ideal on account of the facility with which it can be matched up to any output arrangement. It is also important that the phones for the short-wave side should be sensitive, and, unless an output transformer of suitable characteristics is employed, they must be of the high-resistance type.

The extension leads to carry the broadcast programmes to the speaker in another room should preferably be carried out with twin-flex wire, and endeavour to keep them as far away from the aerial lead-in and earth wire as possible.

One more word: If you use the H.T. mains unit you will have to reckon something round about 150 volts for the anode of the output valve, so that the bias will have to be adjusted accordingly.

And now, with the set installed, you can switch on and get a first taste of the "Silver King" in action. It will not at the moment give you the very best results, perhaps, for we still have to trim the condenser and do one or two other minor adjustments. Next week we shall tell you more about it so that you will be able to get the very finest results of which this remarkable two-channel receiver is capable.

THE FINISHED RECEIVER



Here is the "Silver King," all ready for insertion in its cabinet. Do not forget to put the cap for the top of the "Jubilee" valve in place.

Plenty of Stations.

But we have said enough to enable you to work it, and to get surprisingly good results, too. The set is easy to tune, as you will find, and it will be all to the good for you to get a little practice in the bare handling of the receiver before we deal with such points as will crop up in a description of the finer aspects of its operation.

On the broadcast side you will get many stations without the need for trimming the internal trimmer on the variable condenser, for you have the little knob on the front of the set, concentric with the main tuning knob, and this will assist in getting the stations well into tune. But more of this next week, when we shall tell you how to trim the set to still further increase its action.

Do not, however, criticise the set from the results you will now be able to get. You will do even better when the final details are attended to; but between now and next week you will be able to enjoy many hours of fascinating listening.

THE COMPONENTS EMPLOYED—THEIR TYPES AND THE MAKES

1 Formo 2-gang ·0005-mfd. variable condenser with dial.
1 Wearite 2-gang coil unit, type WLQ and WLT.
1 J.B. ·0002-mfd. solid dielectric differential-reaction condenser.
1 Bulgin standard screened H.F. choke, type H.F.8.
1 Varley L.F. transformer, "Nicore" II.
1 Polar-N.S.F. 10,000-ohm potentiometer.
2 Dubilier 2-mfd. fixed condensers, type BB.
2 T.C.C. 2-mfd. fixed condensers, type 50.
2 Graham Farish 30,000-ohm "Ohmite" resistances with horizontal holders.
1 Graham Farish 10,000-ohm "Ohmite" resistance with horizontal holder.
1 Clix 9-pin valve holder, chassis-mounting type, with screw terminals.
2 Benjamin 4-pin valve holders (Vibrolders).
1 Bulgin "Steatite" low-loss valve holder, type S.W.21.
2 Dubilier ·0002-mfd. fixed condensers, type 670.
1 Graham Farish 2-meg. "Ohmite" grid leak.
1 T.M.C.-Hydra ·25-mfd. fixed condenser, type 25.
1 Colvern set of 3 special short-wave coils.
1 Colvern special ultra-short-wave condenser.
1 Polar ·00016-mfd. type "E" short-wave condenser.
1 Formo "Snail" slow-motion drive for above.
1 Varley "Niclet" L.F. transformer.
1 J.B. ·0001-mfd. reaction condenser (Midget type).
1 Bulgin short-wave H.F. choke, type H.F.3.
2 Bulgin on-off switches, type S22.
1 Bulgin L.F. choke, type L.F. 20.
1 Dubilier ·002-mfd. fixed condenser, type 670.
1 Dubilier ·001-mfd. fixed condenser, type 670.
1 Erie 2 meg. grid leak.
6 Belling-Lee terminals, 7 wander-plugs and a wander-fuse.
2 Belling-Lee accumulator spade terminals.
Peto-Scott cabinet, panels, screen, double-sided "Metaplex," etc.
Pix Invisible Aerial.

B.B.C. SUMMER DRAMA

News and Views from the "Big House"

By BARRY KENT

I HAD to rub my eyes when I heard the B.B.C. radio drama plans for July this year. Summer is usually very much the off season for serious dramatic effort at the "Big House." This Jubilee year, however, Mr. Gielgud and his crew are going all out. The month will open "dramatically" with a production of "The Importance of Being Earnest."

In the second week there will be a Sir Thomas More production feature and a single full-length performance of "Hassan." These will be followed later in the month by a revival of "The Mulberry Bush" and a Battle of Sedgmoor reconstruction feature. "Through the Looking Glass" and "The Lost Horizon" will wind up the month. Altogether, a splendid schedule, I think.

* * *

Cecil Lewis's Come-back.

I met Cecil Lewis in a corridor of the "Big House" the other day. I had not seen him for about eight years. Then he was Director of Programmes at Savoy Hill. Now, after several big successes in films, he has returned to his first love, in the same bright, active way as before. For the early part of the year he busied himself with the "News of Yesterday" fortnightly Sunday evening feature which has proved so popular.

Having got this well established, Cecil handed it over to Professor Coatman, of the News Department. Now Cecil is preparing a big "Hotel" programme for the second week in May. He is living at the Savoy to get his material. It will be the radio sequel to, or counterpart of, the film "Grand Hotel." How appropriate to build it round the Savoy, which has always been closely associated with British broadcasting!

* * *

Those New Board Appointments.

Most of the prophets (including even yours truly) were pretty far out in their guesses about the new B.B.C. Governors. Here is the "low-down." Lord Bridgeman was made Chairman because the Government had been getting "the wind up" about B.B.C. talks. Mr. H. A. L. Fisher was added to placate Liberal and "left" opinion that might otherwise have attacked Lord Bridgeman's appointment on party political grounds.

In any case listeners may rest assured that these two distinguished gentlemen will do their utmost to serve the public faithfully in their new capacities as Governors of the B.B.C.

* * *

Women Announcers.

Mrs. Hamilton tells me she has not changed her mind about women announcers. She was never satisfied with the abandonment of the experiment last year, and she raises the matter from time to time. And now she is going to press it more strongly than ever. I wonder what will happen. Roger Eckersley is supposed to be about the only senior executive who agrees with Mrs. Hamilton on this subject. My money is still against women announcers this year, anyway.

* * *

Professor Coatman.

Professor Coatman has now settled down as News Editor of the B.B.C. He is popular with the staff, and his many outside connections are particularly useful to broadcasting. Professor Coatman is pledged to the service of the British Empire. You can tell this by noticing how Imperial items are featured in the News Bulletins nowadays.

* * *

The "Spares" Arrive.

Wonder of wonders! After two years' searching the B.B.C. administrators have found three or four likely young men whom they have taken on without specific jobs. They will pick up the business by working as juniors in various departments. I have not met any of these fortunate youths, but from what I have heard they are mostly "Eton and Balliol"; also there are no women. I wonder why.

CHARLES TOVEY, composer of popular songs, accompanies one of his own records played on a Cossor radiogram.

* * *

"Spit and Polish."

Whenever I go round Broadcasting House these days I am impressed by the feverish activity of the "spit-and-polish brigade." By this I mean the preparations that are being made to clean up the place for the Government inquiry later this year. The tidiness urge is not only material. Organisation is being lined up, and so on. Even the P.M.G. is interested. He went round there the other day and was told all about it. I hear he was much impressed.

* * *

Those Publications.

The wildest rumours are circulating within the B.B.C. about the future of the publications. I happen to know the facts of the present situation. The Business Manager, Mr. Goldsmith, and his chief assistant, Mr. Dunbar, have worked out a scheme to separate the handling of publications from the administration of the broadcasting service. The Board of Governors are thinking about it; but they are unlikely to take any decision until after the Government inquiry. In fact, this specific problem is already on the agenda of the Government Committee.

* * *

Honours for B.B.C. Staff.

I hear that eight B.B.C. names have been submitted for inclusion in the special Jubilee Honours. As I do not want to damage their chances I shall not give these names yet.

ON THE AIR

Candid comments by our Broadcasting Critic about recent programmes.

"CHARLEMAGNE" had all the bellowing and bawling of the typical sea-story. But it was a very presentable production, thanks to the vigorous acting of Sam Livesey in the title part and to the fascinating accents of Yvette Darnac, who played the only female part in the cast, Rose Val. How Miss Darnac reminded one of Yvonne Arnaud! It might have been she. And in saying this much I could give no higher praise.

* * *

The play wasn't well constructed. Indeed, one felt it difficult to justify Charlemagne's claim to the lofty position he held on the island. Perhaps this was the fault of the cutting. We had to assume his indispensability. I hadn't seen the film. Doubtless listeners who had, unconsciously drew on their memory for supplying the deficiencies. I liked the music of "Charlemagne," especially the way it was used for creating the atmosphere.

* * *

"The Six of Us" that followed provided a lively contrast. Nothing was held up here, item following item without a second's pause. This is as it should be. I prefer their rhythms to their harmonies, which are much too weird for my liking. Fortunately, I knew none of the numbers that were sung, so I couldn't estimate the extent of the liberties taken with the tunes. I hate to hear familiar tunes distorted. The balance of the concerted numbers wasn't perfect either, and occasionally there was a harshness that offended the ear.

* * *

The "Anonymous Variety Show No. 4" was an unexpected treat. The best item, I thought, was the first—that Tan Tantivy hunting song. It isn't the sort of tune we often get. Jeanne de Casalis gave a new lease of life to Mrs. Feather in an exquisitely funny episode. Stanelli as a composer placed me in the dilemma of not knowing whether he intended us to take him seriously or not. In the end I concluded that he did, because of the extreme length of his composition.

An Extremely Clever Mimic.

Personally, I prefer him on his Hornchestra, though I would welcome a change from that "I want to be happy" number. Keith Wilbur is an extremely clever animal and instrumental mimic. He well deserved the applause he got. Nosmo King must appear more regularly, for we don't hear nearly as much of him as we ought. John Watt compered efficiently.

* * *

Just as "Charlemagne" first saw the light of day as a film, so I think "For a Twelve Month and a Day" might sooner or later be seen on the screen or—who knows?—on the stage. Its music is certainly good enough for either, and credit is due to Mark H. Lubbock for this. But there would have to be something considerably better

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LINING UP this TELEVISION

by Alan Hunter

WHEN broadcasting got going to the extent of needing a land-line link between London and provincial centres the B.B.C. was faced with a pretty problem. Post Office lines hitherto carrying speech frequencies up to only 2,500 cycles were suddenly called upon to handle music frequencies of anything up to 8,000 cycles.

A big jump, certainly. For mere intelligibility the standard lines were perfectly satisfactory. For broadcasting, with its immeasurably higher demand of an approach to realism in speech and music, such lines were palpably inadequate.

A Very Big Step.

It was not long before the Post Office improved the frequency range of the lines rented to the B.B.C. To-day the main trunk lines interconnecting the whole of the "S.B." system carry practically all the frequencies it is desired to broadcast.

Now comes television. Again the Post Office is up against something of a problem. The step from speech to music lines was big enough, but is insignificant beside the enormous step from music to television lines.

Think for a moment what television demands. Assuming the Television Committee has its way, we shall be dealing with pictures of 240 lines and 25 frames per second, meaning a frequency range of 1½ megacycles.

From 8,000 to 1,500,000 cycles! No mean step, is it? Yet it is a step that will have to be taken—and quickly, too—if a real television network is to grow up. Before even two stations, say in London and Manchester, can be linked for a simultaneous television programme the most prodigious step in telephone history must be taken.

Those Overhead Wires.

Before we look into the immediate possibilities of any such development we might as well hark back a moment to what happened when broadcasting itself began. It has some bearing, you will see, on what may happen, now that television has again forced the pace.

We started off with a nation-wide network of overhead lines. At the dawn of broadcasting some ten years ago practically all main trunks throughout this country were overhead wires. Hardly any need to ask why; their relative cheapness compared with buried cable is obvious.

Then, too, the overhead wire had a good deal technically to be said for it, especially for the transmission of ordinary speech. Over hundreds of miles there was very little loss or frequency distortion. A line of, say, 400 miles could be continuous, without intermediate repeaters or any apparatus of that kind. Simple balancing at each end made such a line perfectly satisfactory for intelligible speech.

We are talking now of ordinary telephone speech, you understand. Even with broadcasting these overhead lines could be made good for carrying up to 5,000 cycles.

★

An interesting description of some of the difficulties which present themselves in the simultaneous broadcasting of television programmes by land-line. But such problems are made to be overcome, and our contributor discusses one possible method that might be used.

★

Suitable "doctoring" at each end extended the range quite easily.

Overhead lines suffered from the enormous disadvantage of being unreliable. They were at the mercy of every kind of bad weather. At best this meant an increase in line noise of a dozen and one varieties familiar to every long-distance telephone user—even to-day. At worst the lines might collapse, breaking down communication entirely.

Buried cable was inevitable. Gradually the main overhead lines were replaced with the latest type of cable, providing an almost complete assurance of service continuity.

All the same, this great gain was not lightly bought. Although providing great advantages in reliability under all weather conditions, and although proof against nearly all forms of noise, buried cable filched a vast amount of power on the way. At the same time the frequency distortion was very heavy.

To overcome these two great drawbacks two devices were developed. At frequent intervals along the cable—every mile or so, in fact—some kind of "loading" was introduced. This frequent but light loading had the effect of improving the frequency response all the way.

Frequent Repeater Points.

To make up for the loss of signal strength a special type of valve amplifier, called a repeater in Post Office parlance, was inserted at about every forty miles. With the loading and repeatering the buried cable was then able to handle frequencies up to 8,000 cycles. These are the channels available at the moment for all normal simultaneous broadcasting in this country.

Most of them have indeed been available for some years past. Quite a feather in the Post Office's cap when one reads—as I did the other day—that America has only just begun to make use of such high-quality lines for broadcasting circuits. We have the advantage, of course, of relatively short distances, but even so it is good to know that we are keeping our end up.

By taking you through the development stages of the present high-quality music lines I hope I have shown you that the next step is quite formidable. At least, if we adhere to present technique.

A New Type of Cable.

But shall we? Not necessarily, I gather. Let me explain that at the present time a telephone cable from, say, London to Manchester consists of a great number of insulated wires all bunched together in one cable, repeaters being inserted at forty-mile intervals into each of the constituent wires.

Suppose that instead of all those bunched-up wires we have just one wire inside a metal tube, the core acting as one lead and the tube as the return. The thickness of the outer tube will act as a shield, so that there will be no field outside it. Noise level will be extremely low. Performance will be rather like that of the old open wire—without the noise.

Such a cable, with much more frequent repeatering than at present, every ten miles, perhaps, might

(*Continued on page 180.*)

TELEVISION PIONEER

Mr. J. L. Baird, the well-known chief of the Baird Television Company, with one of his latest receivers. Apart from the screen, it is not very different in appearance from the normal radio set.

WHEN TALKIES WILL BE BROADCAST

A famous film star looks far into the future when television talkies will be as common as radio dramas, and has a few things to say on the possible effect on the cinema trade.

By EDWARD G. ROBINSON

ONLY a few years ago it was commonly said that plays could not be broadcast satisfactorily. The doubters argued that the personality of the actors could not be conveyed by sound alone; that the gestures, looks and make-up were indispensable to adequate dramatic effect.

Now, however, all sorts of plays have been successfully "put on the air." Shakespeare and Noel Coward alike can be broadcast with dramatic completeness. Famous actors and actresses, many of whom began by refusing to enter a broadcasting studio, have almost all tried the new vehicle for drama and been thoroughly satisfied with it.

Limit Not Yet Reached.

Even so we have by no means reached the limit of successful broadcasting of dramatic art. Indeed, as I see things play broadcasting is in its childhood. The approach of television is swinging up the curtain on a new era in the world of entertainment.

It will not be long now before talkies will be broadcast in every country of the world.

More and more film actors agree that this is the only logical outcome of the marriage of radio and Hollywood. The world wants to see its film idols, but at present only a limited section of the earth's population can satisfy the wish.

Perhaps you haven't time to go to the cinema when a particular "release" happens to be in your town. Possibly it never comes to your town, if that town is a small one, or if you live in a country where the cinema is less universally followed than it is in England, France or the United States.

There are a dozen reasons why you may miss a picture you specially want to see. But there is not one sound reason why any film fan—no matter whether he lives in China, Timbuctoo or Quaghorn City, Pa.—should be denied such a pleasure once the talkies can be broadcast.

It is not my opinion alone, but that of many great thinkers such as H. G. Wells, and Professor Low, that within a few years every new house that is built will be provided with a blank wall in at least one of the sitting-rooms. This wall will be for the reception of televised talkies; there will also be an apparatus for reproducing voices and sounds.

A Vision of The Future.

In fact, we shall be able to sit comfortably by our own firesides, switch on the new mechanism and have talkies produced for our personal benefit. And not just ordinary talkies. The talkies of those days will be presented in three dimensions instead of appearing to be shown on a flat surface; there will be all the illusion of depth and detail that a stereoscope can give, and also, I expect, natural colours as well.

It has been said that this sort of thing will affect cinema receipts. I do not think so. Radio plays have not harmed theatres or cinemas, so why should televised films?

On the contrary, I am sure that such talkies will bring more and more people to see talkies in the cinemas proper. Of course, there will have to be a system of pre-release and general release just as at present, but after that films will probably be rented to the broadcasting corporations for general production from time to time.

Thus it will be possible, as at present, to see the latest talkies at the cinema. But for those who then miss them these films will not be lost. In time they will be broadcast in perfect detail of picture and sound. Fans who enjoyed the first version will be able to enjoy it all over again.

Then the art of the talking picture will be truly universal. Shepherds on the hills will be able to set a portable radio going in their little huts and get magnificent entertainment to lighten their lonely hours.

Frontiersmen, soldiers on foreign service, sailors at sea, invalids who are confined to the house, countrymen in solitary parts of the world—all will be able to enjoy "going to the pictures" as fully as if they lived next door to the most luxurious cinema in London or New York.

In the less civilised parts of the earth there must still be millions of people who have never seen a talkie. Perhaps there are still a few such even in Europe and North America.

The time is coming when the new art will be carried to them, too. Talkies, radio and television in unison will open a new era for the world.

IN "FIVE STAR FINAL"

The famous film star Edward G. Robinson, who writes the article on this page, as he appeared in the First National production entitled "Five Star Final."

I believe that schools as well as houses will soon be built with walls suitable for the projection of radio talkies upon them. For the cinema has an enormous educational value to children as well as grown-ups. Many schools already use radio for educational purposes; many more will do so when pictures as well as sounds can be conveyed perfectly through the ether.

More talkies, both educational and entertaining, will be needed then than are made at present. With a wider public, and a public which will speedily acquire the taste for cinemas proper as well as for radio talkies at home, more and more pictures will have to be made to meet the new demands.

World-Wide Talent.

Not only will England and America be kept busy producing talkies, but centres will grow up in many other countries for the same purpose. In fact, radio talkies will do completely, in the end, what ordinary pictures have not so far been able to do. They will gather in talent from every nation under the sun and offer it in visual and audible form to the world at large.

China, Chile, Iceland and Central Africa will produce their Garbos and their Arlisses. Settings for pictures will be used from the marvellous scenic panoramas of the Arctic Circle and the Amazon jungles.

Yes, I think the broadcasting of talkies will be to universal benefit.

C.Q.D.

Looking back to an event that had a great effect on radio progress.

SUNDAY next, April 14th, sees the twenty-third anniversary of the Titanic disaster in 1912. It was this tragedy, perhaps more than anything else, which led to a stiffening up of the regulations regarding the watch kept by sea-going vessels carrying wireless gear.

The Titanic, a new White Star liner, was on her maiden voyage to New York, when she suddenly struck an iceberg at 11.40 p.m. When, half an hour afterwards, it was realised how serious the damage was, the Marconi operator sent out the C.Q.D., the distress call in use at that time before the universal adoption of the letters S.O.S., and continued sending until 2.17 a.m. on the morning of the 15th.

Strict Regulations.

It was four hours before the Carpathia, who had received the call when 70 miles away, could come up and help in the rescue of the 703 persons who had taken to the boats. Meanwhile, another vessel, herself stationary on account of ice, had been within a few miles of the Titanic since about 10.30, but her wireless gear was shut down and she did not hear the calls for help, or many more lives could have been saved.

To-day the Board of Trade regulations ensure that all vessels carrying more than a certain number of passengers shall keep a continuous watch by wireless, and for smaller vessels alarm gear is available which rings a bell when a distress call is received, even if no operator is listening.

Perhaps the greatest boon of wireless has been the improved safety of life and property at sea which it has brought to the extent that now less lives are lost in a year on the sea than in a day on the roads of Great Britain

A. S. R.

ON THE SHORT WAVES

Conducted by W.L.S.

AT RANDOM

Our short-wave expert takes a breather this week to deal with a few varied items of general interest.

NOW and then I *must* have a breathing space to talk about all the thousand and one little questions that keep cropping up. Hence these occasional "At Random" pages. This time I have so many different things on my mind that it's difficult to know just where to start.

Let's talk about the "B.C.L." Two for a bit. The officer in charge of queries tells me that that set has introduced more novices to short-wave work than anything else that "P.W." has recently published, so I suppose it's natural that he should have had a lot of queries about it.

Hand-Capacity Troubles.

The one significant thing is that the only trouble anyone seems to be encountering with it is hand capacity. Now, if all these good people who are flummoxed by this trouble had only been reading this short-wave section for the past year the Query Department would have had less work to do.

As it is they and I have to keep repeating the various scraps of advice that I am always giving. Hand capacity is a trouble that *every* newcomer to the short waves seems to encounter, however fool-proof the set that he starts off with. It is probably just because the short waves *are* new to him that it happens.

He makes all sorts of little bloomers that he won't make when he's had a little more experience, and they're nearly all minute details of wiring and layout. The only advice I can give to anyone with really severe hand capacity on the "B.C.L." Two is to take it out in the back garden, stand it on the lawn, drive an earth tube in the ground about two inches from the earth terminal and see if it *still* does it.

If it does the wiring must be very bad indeed. If it doesn't, then it should perform perfectly well indoors without any earth connection. The idea of leaving off the earth as a cure for hand capacity doesn't seem to occur to the short-wave novice.

Within the next few weeks I shall be dealing with every conceivable aspect of this trouble, so let's change the subject now.

Cleaning-up the Mains.

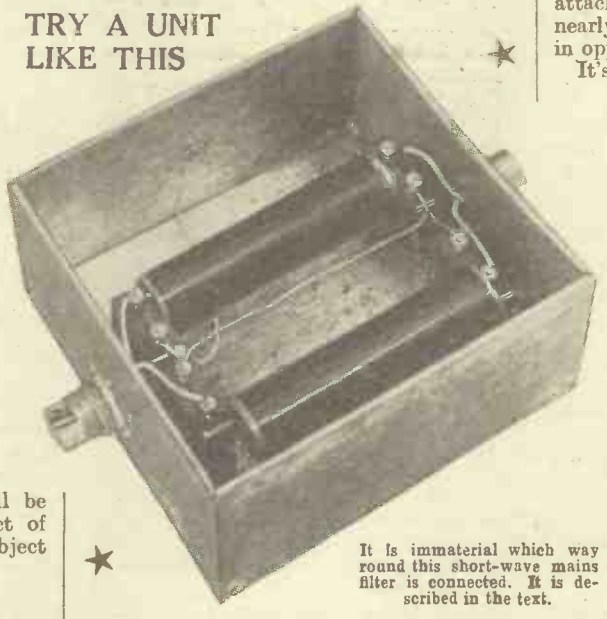
Mains! How many of you have experienced trouble in running a short-waver from a mains unit? I have discovered that the treatment inside the biscuit box illustrated on this page is often a help when the mains are bad.

It is a filter circuit for placing between the mains and the mains input to the eliminator. It consists of two hefty H.F. chokes wound on longish formers with about sixty turns of 24-gauge wire and two pairs of 1-mfd. condensers. You can see the wiring from the photograph.

It is perfectly symmetrical; that is to say, it doesn't matter which end goes to the mains and which to the mains unit. The centre-point of each pair of condensers is connected to the box, and that in turn is earthed through a ·01 mica condenser.

There are several different kinds of hum in a really bad A.C.-operated short-waver. One is just a general background, and is almost invariably due to inefficient smoothing. Another is "modulation hum," which turns pure C.W. signals into ripply ones and makes pure carrier-waves sound raspy. The latter is generally cured by the connection of a pair of ·01 condensers from the anodes of the rectifier to the positive H.T. (in other words, the rectifier heater).

TRY A UNIT LIKE THIS



It is immaterial which way round this short-wave mains filter is connected. It is described in the text.

The purpose of the biscuit-box filter is to eliminate the various scratchy noises that seem to be transmitted along the mains from dirty switch contacts and power leaks of all kinds, and it certainly makes a good job of it.

Now for aerials. Did you know that the length of your aerial can have an enormous bearing upon whether or not you suffer from hand capacity? That is just a hint, and I will deal fully with the subject later. You might try a different length of aerial, though, especially if you are one of the sufferers who have written to the Query Department about the "B.C.L." Two.

Another point about aerials: they are often more directional than you imagine. If you are one of those people who can always get Sydney, but never receive the Americans well, a change in the direction of your aerial is indicated.

Different Aerials.

Never mind about putting up masts or anything like that. Try an indoor one or even an outside one a few feet high. Anything will do for a test, preferably at right angles to your other aerial.

I have also met cases where one aerial will bring in a certain set of stations, while one of a different length (even if pointing in the same direction) will bring in quite a different crowd.

A biggish horizontal dipole will give interesting results, too. All you want is an aerial-coupling coil that is not earthed at either end. To its two extremes you attach two similar lengths of wire, both as nearly horizontal as possible and pointing in opposite directions.

It's not always easy to put up a thing of this kind, but if you can run one length inside the house and take the other straight out into the garden you will at least have something to test on.

For the very short waves you could, doubtless, run a couple of wires along the wall of the house (kept at least a foot away by wooden posts or insulators). I can promise you that you'll get some very freakish results on certain stations with an arrangement of this kind.

Those Weak Stations.

Lastly, let's come back to the important question of *operating*. If you get poor results nowadays it's about five to one that it's *you*, not the set, that's to blame. Newcomers to the short waves usually have no idea whatever of the delicacy of touch that is necessary for really fine searching.

Neither do they appreciate the importance of listening to very weak signals. Nearly all the interesting stations are weak when you first get them. It's only by playing about until you make them stronger that you'll ever get them.

A whole article on operating seems indicated. I must see about it.

ON THE SHORT WAVES (*Continued from previous page.*)

WHAT READERS ARE SAYING

CONDITIONS appear to have been pretty good lately. R. D. E., my super-reliable correspondent with the multiplicity of valves, reports the following: O A X 4 D, Lima, Peru, on 51·9 metres; T I–G P E, Costa Rica; Y V 6 R V, Valencia, on 46 metres; H J 1 A B B, H J 4 A B E and all the other Colombians.

On the vexed question of verifications R. D. E. says, quite rightly, that it's not worth while writing to the strong stations that everybody gets with a crystal set. British amateurs, for instance, are beginning to tire of local reports, and commercials like the Rocky Point group just haven't the time to waste on answering them.

R. D. E. hears all continents practically every day, and advances this as an argument against developing too much of a "build-and-scrap" complex.

A "World Map."

Will those readers who wanted a "World Map" please take note of the suggestion from D. P. W. (Rhondda) that they should write to Mr. W. W. Warner, 56, East Grove Road, St. Leonards, Exeter, forwarding two pence? They will receive for that princely sum (including postage) an excellent map issued by the I. D. A.

Wanted: particulars of a radio club in the Eastbourne district. If such there be there is a ready-made member in Mr. Alvin Pryor, 16, Enys Road. The said A. P. confides to me that he likes superhet adaptors followed by big sets.

C. C. P. (St. Annes) is using the "B.C.L." Two and deriving H.T. from an eliminator with two fixed voltages—150 and 60. The 60-volt tapping is not good enough for the detector. Well, C. C. P., it's easy enough to drop the 150-volt tapping through a variable resistance, isn't it? By-pass the set end of the resistance to earth with a 2 mfd. condenser, and there you are.

H. N. (Edgbaston) is a recent convert to short waves, again with the "B.C.L." Two, and among his scalps is Lobito, Lourenço Marques (C R 6 A A) on the 31-metre band. All his D X seems to be on 31 metres and very little on the 49 band. Do I know why? Search me, but I don't! Sorry, H. N.; I know I'm not very helpful, but I really haven't an idea.

W. L. (Thames Ditton) wants to convert *his* "B.C.L." Two for A.C. valves. Yes, W. L.—quite simple, and the valves you suggest are O.K. No, I'm not a superman; I get up early in the mornings to hear Sydney just because I *like* it. (And, anyway, I have to take the dog out by 8 a.m. or I don't get any peace for the rest of the morning!) Certainly I agree with you that he's just as good after a comforting lunch.

C. T. (Grimsby) reports conditions as fairly good, and comments on the splendid strength of the Brazilian station P R F 5. His set (yes, you've guessed it!) is a "B.C.L." Two. Tell me, readers, are there any of you left who use anything else? I had no idea that the disease had spread so quickly.

P. G. D. (Newquay) inquires as to the whereabouts of W 3 K I, W 2 H H Q, W 8 D B C, W 3 B B O and W 2 D V. All American amateur phones, of course, but I can't give their full addresses here. I mention them because they're all particularly good ones. The best I receive myself, though, are W 2 Z C at Little Silver and W 8 G L Y, whose Q R A I've forgotten. P. G. D. also reports the Canadian amateur V E 1 E I on phone.

The "B.C.L." Two Again.

"Almost Fed-Up" (Cambuslang) inquires plaintively how much longer he's got to wait for an A.C. version of the "B.C.L." Two. Well, A. F.-U., I've described the conversion of any set for mains. Can't you apply the principles to the "B.C.L." Two? I really don't seem to have time nowadays for building sets.

H. M. S. (Westward Ho!) asks me to "amplify" remarks on portable short-wavers with frame aerials. Sorry, H. M. S., I don't know much about them except for 5-metre work, where your anode coil makes a good frame aerial if you use a single large-diameter turn.

W. L. S.

A SUCCESSFUL MEETING

Members of the Anglo-American Radio and Television Society enjoy themselves at a recent meeting of the West Middlesex and East Bucks Branch.

Round the Records

PRACTICALLY every month the gramophone-record makers provide us with something of a curiosity in a recording. Sometimes the novelty is merely an advertising sensation and not really good as an entertainment, and sometimes it is worth hearing for itself alone.

This month quite an unique idea has been carried out by Decca in *Malola* and *Home Again*. This is a record with a story behind it. You will remember those great hits "Ramona," "Monterey," and more recently "Little Man, You've Had a Busy Day." They were composed by America's leading lady dance-number writer, Mabel Wayne. She has been over here and has just returned to the States.

While she was here Collie Knox, the popular Radio Editor of the "Daily Mail," heard Mabel Wayne playing her two latest numbers, the titles on this record. He commenced to hum them through, then he sang them, with the result that Mabel asked if he would consider the making of a record of the two of them, she playing and he singing.

Knox agreed to do this, and then, quite by chance (so they say), Ambrose happened to look in and said he would play a violin obligato to the numbers if they were going to record them, just for fun. And so it was fixed that the numbers should be recorded, and Decca were approached on the matter. Next day they went down to the studios, and the result is now available to the public at 1s. The record is F 5481. It is a good story, isn't it?

A New Bing Crosby Recording.

Once again Bing Crosby has made his best recording. Sorry if I sound cynical about it, but he has made so many good ones that it is getting increasingly difficult to pick out his best. The gramophone people seem to know, however, and unhesitatingly say that *It's Easy to Remember* is his finest.

The number comes from Crosby's latest film, "Mississippi," with *Swanee River* on the other side (of the record, not of the film). It is said that Crosby is not likely to surpass his rendering of this number, and I am informed officially that it is a masterpiece. What do you think, all you Crosby fans? Can he beat it?

I have not said much lately about the Octacros records that are made by Syncrophone, Ltd., mainly for cinema work, but which are, I believe, available for general public use by application to J. C. Curwen, Ltd.

The standard of the recordings under the Octacros head is rapidly improving, and the harshness which characterised the first discs is much reduced.

Recent numbers are *Things Are Looking Up* and *Savoy Irish Medley*, by Tommy Kinsman and his band (1141), the English Singers quartet on 1129 singing *Come, Lasses and Lads*, with *Widdicombe Fair* on the other side. A third record gives a selection from *Rigoletto* and one from *Faust* on the Compton organ, played by Leslie James (1120), while a fourth is the glorious pairing of the Mendelssohn *Wedding March* with Chopin's *Funeral March*. Was it coincidence or malice aforethought that accounted for this, or was it just a mischievous dig at the married men? Anyhow, there you are, the two marches on 1118.

And Syncrophone have had another little joke. Not with the public, I think, but with me, at any rate. I have had records numbers 1139 and 1138 (serial numbers 5511, 5513 and 5510 and 5512 respectively). The records are by Tommy Kinsman, and are fox-trot recordings. The titles of the numbers on 1139 are *Object of My Affection* and *You Bring Out the Savage in Me*, while those on 1138 are *Object of My Affection* and *You Bring Out the Savage in Me*.

Curious, isn't it? They have turned out two sets of labels for the same disc. I have never known that happen before. I have had records with the same title on both sides, and two different tunes on the record, only one of which agreed with the title; I have had records where neither tune agreed with the title, but I have never before had a disc that has been duplicated under the same titles but different serial and record numbers. Ah, well!

Do you like the bagpipes? To hear, I mean, not to act as the ornaments on the baronial walls. My Scottish readers will, of course, even in some cases if it is only because they think that they must support the national instrument of their country. Equally, Irish readers will enthuse about them, for are they not the original national instrument of the Emerald Isle?

Anyhow, all pipers and friends of pipers must hear H.M.V. B 8292. It is a record played by the pipes and drums of the 2nd Battalion Scots Guards. But that is not all; the item is the composition by H.R.H. the Prince of Wales, who has long made a study of the bagpipes and wrote this piece, *Mallorca*, for them.

As a Sassenach I am not qualified to judge either the music or the playing. I leave it to my Scots (and Irish) friends, who ken summat aboot it.

Gracie Fields' Latest.

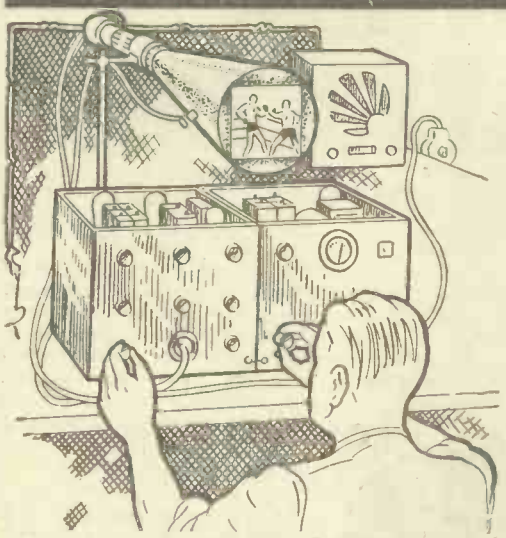
But, though I am not a Lancastrian, I do know something about that great heroine of the stage, Gracie Fields. I am one of her fans (not that that worries her one way or the other), and I always welcome a Gracie record.

And here is one that has just come out. A comedy side, *You Haven't Altered a Bit*, and a serious side (as usual), *Born to be a Clown*. As good as ever, and well worth getting. H.M.V. B 8298.

I was at the little ceremony when Gracie Fields pressed her millionth record at the H.M.V. factory. That was some two years or so ago. She must be approaching another million mark, I should think; her sales are always very high, and I hope she will again celebrate the occasion. I liked the Lancashire "do" afterwards, too.

K. D. R.

TELEVISION IS YOUR OPPORTUNITY!



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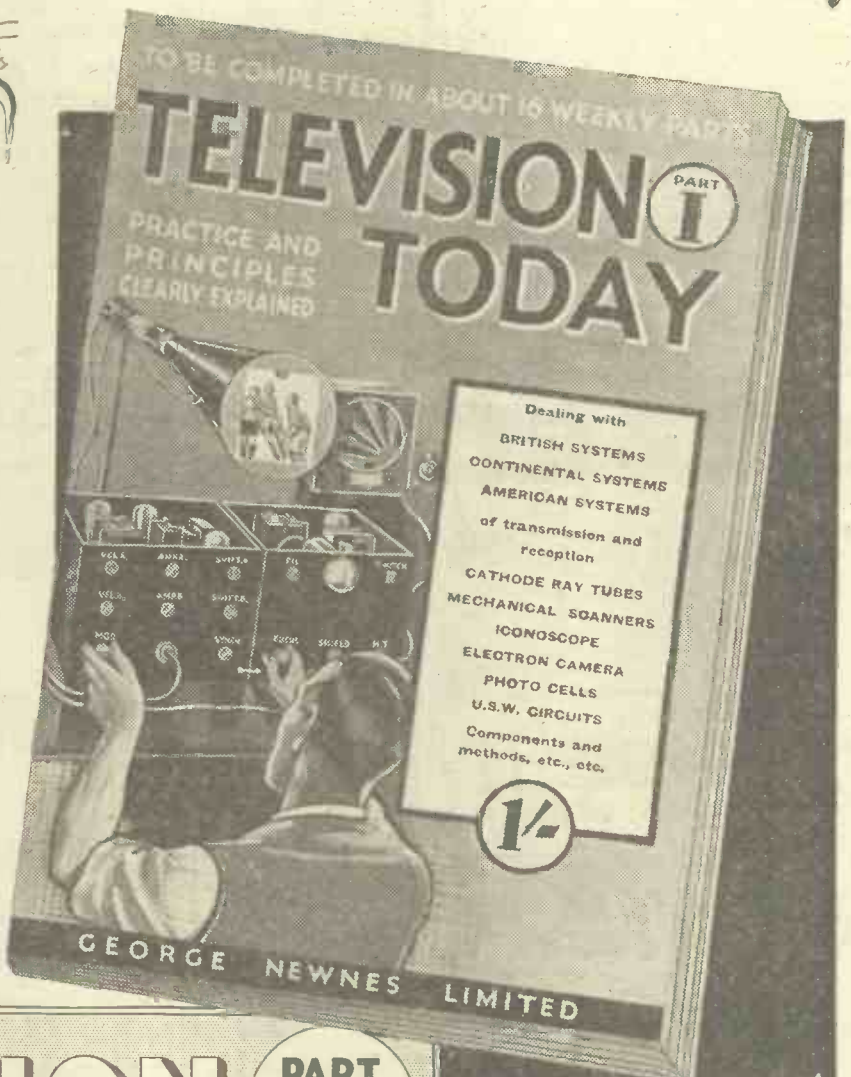

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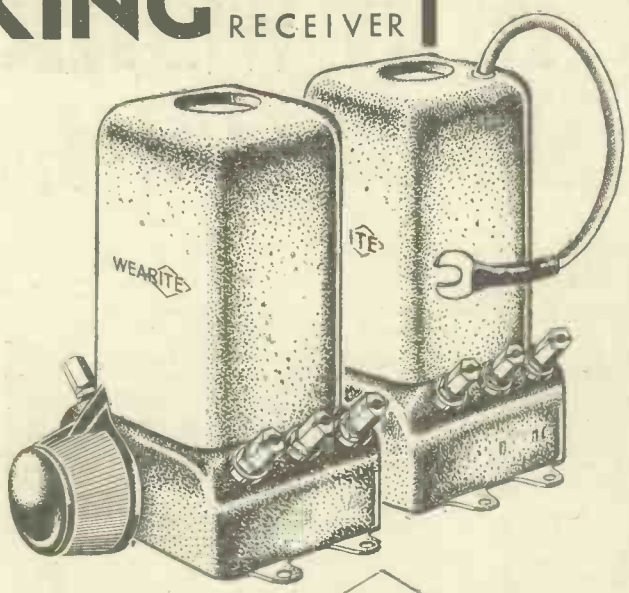

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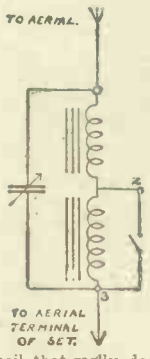

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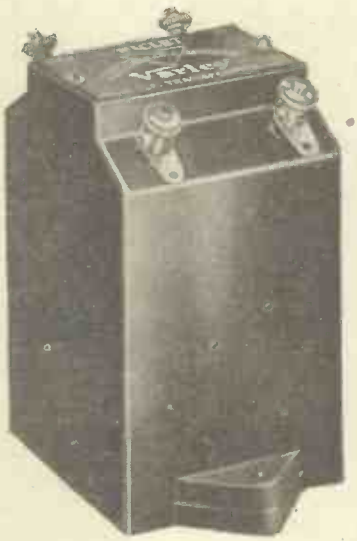


(ON LEFT)

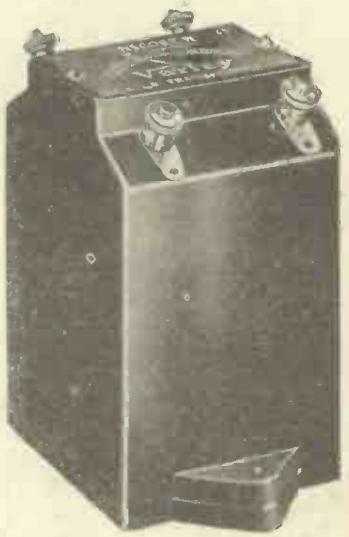
NICLET L.F. TRANSFORMER

LIST No. DP21. **7/6**

(ON RIGHT)

NICORE II L.F. TRANSFORMER

LIST No. DP2. **11/6**



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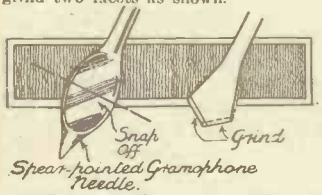
RECOMMENDED WRINKLES

GRAMOPHONE-NEEDLE DRILLS.

EFFICIENT ⅛-in. drills may be made in two minutes out of spear-pointed old gramophone needles. With a pair of pliers snap off the point in the widest part (see sketch), then grind two facets as shown.



Drills made in this way are particularly good because of the high-grade steel used in gramophone needles.

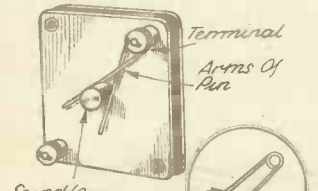
For boring short holes they are equal, if properly ground, to twist drills, and, for very hard material, are superior, owing to the quality of the steel in them.

They need a three-jaw chuck, as fitted to hand-drills, to hold them.

THOSE PIGTAILS

HERE is a quick and sound way of effecting a repair to a condenser with a broken pigtail connection :

Remove the broken pigtail completely. Now take an ordinary safety pin and break off the head so that the two arms of the pin are approximately equal in length. The "loop" of the pin is then placed over the terminal to which one end of the pigtail has been



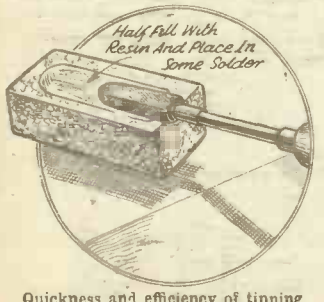
This is a repair which can be effected in a very short space of time.

secured. Before tightening down the screw cross the arms of the pin and slip them over the central spindle of the condenser.

The accompanying diagram may be of some assistance in elucidating the point.

A TINNING TIP.

I AM a plumber, and I find this wrinkle very useful, clean and easy in soldering wireless receivers : Get a soft yellow brick, half fill up the hollow with resin, place in some solder and



Quickness and efficiency of tinning are provided by this scheme.

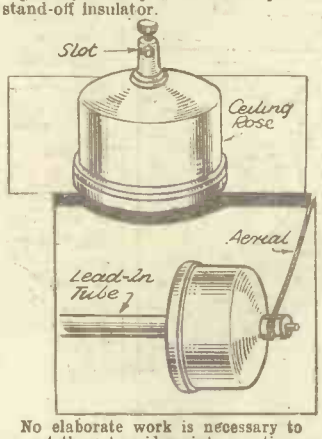
rub in the copper bit. It will tin it and clean it at the same time, and enable anyone to do soldering with success.

BUSHES FOR METAL PANELS.

WHEN working on metal, such as aluminium, one often wants to insulate some part, such as a condenser spindle, and on several occasions, not having the proper ebonite bush to hand, I thought of the idea of using the ebonite cap off the top of a tube of tooth paste or shaving cream. If one of these caps is cleaned and thoroughly dried and then drilled through the centre to the required size, afterwards filing flat so that it fits flush against the metal, it will be found to make an excellent bush.

CEILING-ROSE INSULATORS.

STAND-OFF insulators for short-wave work or for high-voltage components can be made from ceiling roses in the following manner : Remove top and screw base in position. Insert a heavy terminal in the cap and screw up sufficiently tight without breaking the porcelain. Screw the two sections together, and you have a perfect stand-off insulator.



No elaborate work is necessary to put these two ideas into practice.

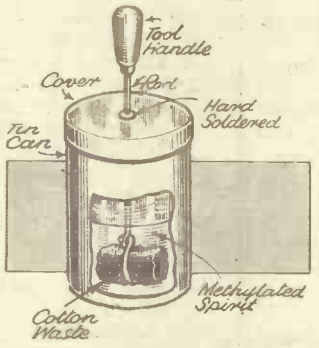
The ceiling roses may also be used as anchoring points for aerial down-leads. Assemble as before, but use a "telephone" type terminal with a slot cut as shown in the diagram. Attach this to a wooden arm and you have a good down-lead support. This can also be used for supporting the aerial wire inside the house.

Finally, a lead-in may be improved by placing the cap of the ceiling rose over the end of the lead-in tube (see diagram). This keeps the tube dry in wet weather and tends to eliminated leakage due to dampness.

OUTDOORS SOLDERING.

WHAT amateur has not tried to solder an aerial, a lead-in or other wire outdoors in windy weather ? Using a blow-lamp or soldering iron is almost impossible, but here is a way to get round it :

Get a piece of stiff wire about a foot long and drive one end into a wooden tool-handle. Then bunch up a ball of cotton waste, or even an old rag, and, after thrusting the wire through a hole in the centre of a tin-can cover, twist



The time taken to prepare this apparatus will soon be repaid.

it around the ball. Solder the wire in the cover hole and fit the cover on the can. Fill the can half-full of methylated spirit and your soldering torch is ready.

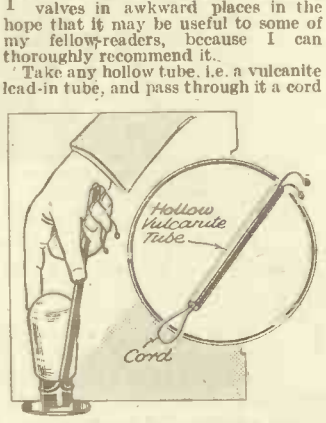
Soldering is done by covering the joint to be soldered with flux and then lighting the torch and holding it under the joint, at the same time holding the stick of solder on the joint and in the flame. It takes a pretty high wind to disturb the flame, and a good soldering job can be done under the most adverse conditions.

A shield of canvas or an old umbrella will, of course, help when the wind is particularly vicious. Before replacing the torch in the methylated spirit container the flame should be doused out.

REMOVING AWKWARD VALVES.

I PASS on this wrinkle for removing valves in awkward places in the hope that it may be useful to some of my fellow-readers, because I can thoroughly recommend it.

Take any hollow tube, i.e. a vulcanite lead-in tube, and pass through it a cord



An ingenious gadget that many will appreciate.

which forms a loop at one end (as in sketch). To pull out valve, pass loop over top of valve down to the vulcanite bottom, pull loop tight and press tube lightly against valve with first finger and pull gently.

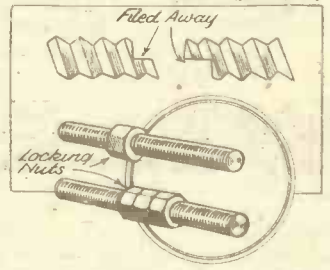
METAL-BASEBOARD COVERING.

I HAVE found that ordinary perforated zinc is ideal for metal baseboards, especially in the case of the "B.C.L." Two, which I am at present building.

I find it very convenient, because there are no holes to bore or punch, which simplifies the building of the set. I find it both labour-saving and cheap to buy. It can be bought at sixpence for a piece 18 inches square.

JOINING SCREWED RODS.

ON several occasions in the past I have had to join two pieces of screwed rod together for extension handles of pick-up switches, etc., and finding the usual method (joining by



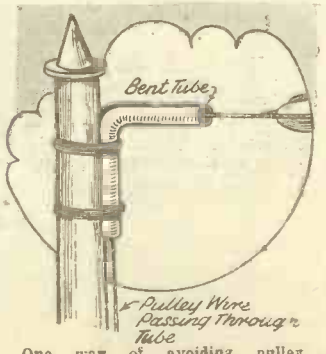
An improved method of joining threaded rod.

screwing the end of each rod into either side of a "long" nut) liable to work loose very easily, I evolved the following :

For an eighth of an inch from the end of either rod the metal is filed away. It is then fitted together and a nut screwed over the joint.

AN AERIAL-PULLEY SUBSTITUTE.

A GREAT drawback to the usual wheel pulley for an aerial is that the aerial wire is apt to come off the wheel and become wedged. A more efficient arrangement is to obtain a bent piece of steel tubing (a piece of old cycle handle-bar will do excellently). Fix this to the mast or pole, as shown in the sketch below. The halyard can be threaded through the tube, and the aerial can then be pulled up or down without any fear of becoming wedged, as in the case of the usual wheel pulley.



One way of avoiding pulley troubles.

ONE GUINEA FOR THE BEST WRINKLE!

Readers are invited to send a short description, with sketch, of any original and practical radio idea. Each week £1 1s. will be paid for the best Wrinkle from a reader, and others published will be paid for at our usual rates.

Each hint must be on a separate piece of paper, written on one side of the page. Address your hints to the Technical Editor, "Popular Wireless," Tallis House, Tallis Street, E.C.4, marking the envelope "Recommended Wrinkles."

Will readers please note that the Editor cannot, in any circumstances, guarantee to return rejected Wrinkles, and that payment for published hints is not made until ten days after they appear ?

The best contribution in our last selection of Wrinkles, published on March 23rd, was sent by Mr. H. Jones, 19, Centaur Road, Coventry.

HOW I BEGAN.—No. 5

RONALD FRANKAU

The famous entertainer tells "P.W.'s" Special Correspondent how he started his broadcasting career.

HELLO! Yes, this is Ronald Frankau. Oh, an interview? Yes, let's get right ahead. All my life I've loved telephoning, and even to-day, if I had paid the subscription for last quarter in the flat which I have rented on the hire-purchase system, I should never write a letter.

As a matter of fact, I have always thought that this extravagent form of communication, which I indulged in even as a schoolboy, was my best training for the microphone. On the whole, theatrical training is useless, since personality lies mostly in the eyes and smile, and the technique of stage work is in the knowledge of how and when to use these features.

Business Experience First.

On the telephone (as on the microphone) the personality has got to be entirely in the voice. Until I heard a gramophone record of myself and saw "talkies" I had no idea what I sounded like to somebody else. Now I realise that I am booked for the B.B.C. for what I write!

Another three minutes? Of course; I haven't started yet.

You'd better know something about my early days. After leaving Eton I went to a business school to prepare for going into my father's business. But all the time I had a terrible longing to go on the stage. I mentioned this to my mother (she, by the way, was "Frank Danby," the author of many well-known books) and she told me that she was here to further her son's wishes, not to hinder them. But at the same time she thought it would be as well to get some business experience, as it would be a rarity to find an actor who knew anything at all about business. So back I went to business, studying music at the same time.

Eventually, after a visit to Canada, I got permission to try for a job on the stage if I could get it without using the family name or influence. So I got an audition at Daly's Theatre in the name of "Frank Ronalds," and finally secured a contract for the chorus.

Started in the War.

Then came the war, when I organised several concert parties and shows in France and Mesopotamia. So that's how it all started.

I've had some amusing times, too. I remember one tour when I was bringing a company back from South Africa by way of the East Coast. After playing in Nairobi we went up country for a week, playing each night in a different "one-horse" town." Britishers used to come for miles and miles to see what was probably the first show they had seen for years. Things were not always too good with us, and we had to accept the word of hotel proprietors as to whose cheques we could safely take. On our journeys from town to town we used to sleep on the train, and one morning, after a very good show the previous night, I was awakened very early by a native boy who handed me an envelope. In this I found a pound note and the following letter: "I don't like to think of a good show going away with a bad cheque."

Let's get back to broadcasting. May I take the opportunity of thanking all my past friends and acquaintances who are now my enemies through my having read over to them the thousands of words I have hopefully written? They have been awfully nice, but have avoided me afterwards. Actually there is no test of how a thing is going to go over; no rehearsal, even in the studio itself, will even vaguely tell you how

HERE HE IS

A character study of the famous entertainer who has always been so popular a microphone personality.

the largest audience in the world—and the most mixed—is going to "take the stuff."

However, these things are forgotten—the trouble and worry of writing one's material, even the fee—when one stands before the microphone with "ten minutes to do." The staff of the B.B.C. help you to forget. Here are no hard theatrical managers or agents, but a bunch of smiling friends who offer the microphone to you as your secretary does the telephone. "Your number, sir."

Studio Audience Does Not Help.

That's how it was when it all started—and that's how it still is to-day. We have a studio audience. Shall I smile at it? Shall I play to it? Standing a little farther back, shall I speak and sing louder and ask for the plaudits of the forty—or shall I telephone to the million?

I'm afraid they don't help me, these people in the studio. Most of my friends say they get inspiration from them; they like to hear their laughs. To me they belong to a different world. They are concrete human forms. They're not even interested in me. They're not even looking at me, but at the lights and the announcers (the announcers are *so* good-looking), at the whole paraphernalia, doors slowly closing and opening, admitting or exuding more great men and women. I prefer to phone in private.

I have learnt it by heart, yet I have those shaking papers in my hand. I might even forget! I might advertise something! I might swear! I might even mention divorce! Awful thought! I'd better read it. It's been well censored. I'm announced. We're off!

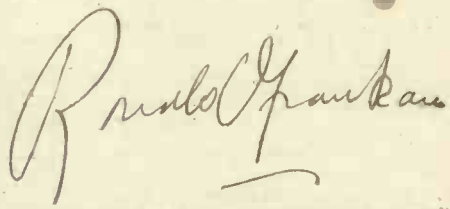
Yes, another three minutes, please.

"I Wouldn't Miss It."

It's all over. Somebody is whispering something awfully nice. He doesn't mean it; he says it to everyone. So I creep away with my small cheque to bus, taxi or bar, feeling like a hunted criminal because I said "or" instead of "and"—and it all sounded so dull to me. They'll never book me again! My fan mail will drop to half a dozen letters and two nasty, anonymous postcards. And the Embankment is so near and tempting.

Another contract a few days later. Good! I wasn't so bad after all. That's really the only way you can tell. Oh for a real criticism in the daily papers! Still, we've another contract, another five weeks' worry, ten minutes' hell and the finest publicity in the world.

No, I wouldn't have missed it for anything. You asked me how I started. Well, I've told you what it's like now, and I feel that I've only just started, anyway. May it go on for years and years!



REFRESH YOUR MEMORY

"THIS little book is not intended to be a course of radio engineering, but to give an explanatory account of the more useful circuits with their relevant formulæ; and it is hoped that it provides sufficient information to refresh the memory."

I am quoting from the preface of "Definitions and Formulæ for Students," published by Sir Isaac Pitman & Sons, Ltd. There are lots of things one can get for sixpence these days; sometimes they look a lot and sometimes their value is more intrinsic than apparent. But there is no doubt about the value of this sixpenny book to all those interested in the theory and practice of radio—to the home constructor or to the experimenter.

It is divided into two approximately equal sections, the first dealing with definitions and the second with formulæ and circuits. The circuits are in the nature of basic circuits dealing with the various uses of valves.

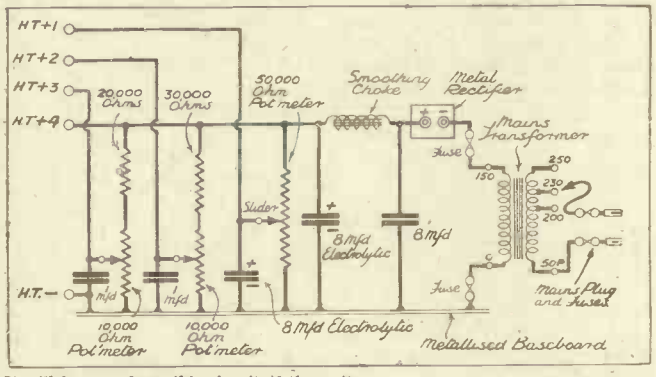
The formulæ cover such useful items as the construction of coils, wire tables and decibel considerations. **A. S. C.**

The SILVER KING Mains Unit

Specially designed for the "Silver King," this unit enables those with A.C. mains to run this epoch-making design without H.T. batteries. Its construction is fully described on the following pages

By A. S. CLARK.

HOW THE FOUR OUTPUTS ARE ARRANGED



It will be seen from this circuit of the unit that the three variable taps are provided with current via potentiometers.

LAST week we briefly introduced readers to the special H.T. mains unit for those who desire to run their "Silver King" from the mains. The word "special" was used with all due consideration, for this unit is certainly something out of the ordinary.

Both as regards appearance and circuit there are features which put this design a stage above the ordinary run. Several times it has been described as looking like a cathode-ray-tube time base! The reason for this is probably the row of three potentiometers for varying the voltage outputs of three of the four H.T. taps.

These potentiometers enable voltages varying over a considerable range to be obtained for the H.T. + 1, H.T. + 2 and H.T. + 3 tappings on the set. Thus adjustment is instantly available for obtaining the very best working conditions in each particular case.

A Valuable Feature.

The fact that they are potentiometer taps is also a valuable feature, because this helps to keep the voltages which they supply steady, irrespective of variations in the current drawn from them.

A glance at the theoretical diagram will immediately reveal other interesting features to the "circuit wise." For instance, each of these three taps is provided with its own by-pass condenser, so that all possibility of unwanted coupling in the unit is avoided.

In series with the potentiometers supplying the H.T. + 2 and H.T. + 3 taps there are fixed resistances. These prevent the voltages supplied by these taps ever being above the maximum desirable. Also they enable a finer control of voltage to be obtained, because if the potentiometers were directly across the plus and minus "bus-bar" points only a part of their resistance element would be useful.

In the case of the H.T. + 1 tap quite a high voltage may be desirable, so no fixed resistance is to be found in this instance. The H.T. + 4 tap, which supplies the power valve, and therefore requires to give the maximum voltage, is connected directly to the smoothing choke.

And now perhaps we ought to explain the presence of two twin fuses on the panel of the unit. The fuses on the left are in the mains circuit, and the plug to which the leads from the mains are attached fits into the top of the fuse mount.

A good feature of these fuse holders is that when the cover is removed to change a fuse the fuse cartridges themselves come away with the cover. Thus they can be changed with perfect safety, there being no chance whatever of shocks and it being immaterial whether the mains are switched off or not.

Protection Against Shorts.

The object of these two fuses is to protect the house fuses. Should anything go wrong in the unit they will blow before the house fuses, and thus they avoid the inconvenience of any rooms being thrown into darkness.

The two other fuses are on the secondary side of the mains transformer, one being connected in each lead from this winding. Their chief purpose is to protect the rectifier, which is of the Westinghouse metal type, should the output of the unit be shorted, a state of affairs that would result in a very heavy current through the rectifier, which is designed to carry normally 25 milliamps.

Radio fuses are designed to carry their rated current continuously and to blow apparently instantly at approximately 50 per cent overload. This point must be remembered when buying the fuses for your "Silver King" mains unit.

Different current ratings are available for these fuses, and we recommend those rated as 100-milliamp fuses. Since this is no more than the current taken by any one valve in the set, these fuses will also protect the valve filaments.

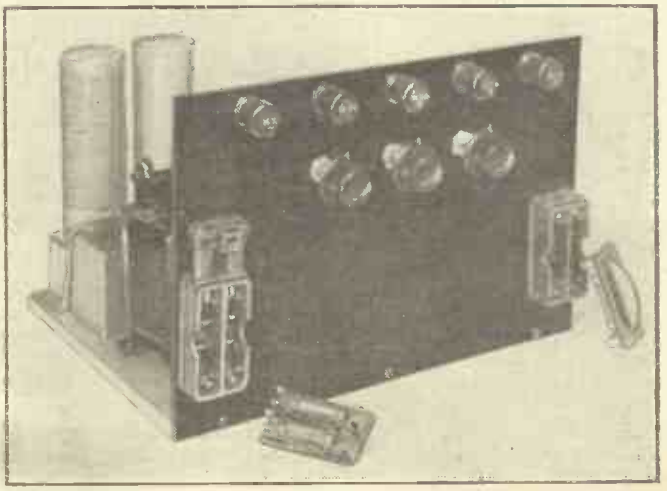
If a short occurred which put the

(*Continued on next page.*)

BUILT WITH THESE PARTS

1 Heayberd mains transformer, type W42.
1 Westinghouse metal rectifier, type H.T.13.
1 B.T.S. 30-h. 60-m.a. L.F. choke.
1 T.M.C.-Hydra 8-mfd. fixed condenser, type 40.
1 T.C.C. 8-mfd. dry electrolytic condenser, type 902.
1 Dubilier 8-mfd. dry electrolytic condenser, type 9281.
2 T.C.C. 1-mfd. fixed condensers, type 50.
2 Erie 10,000-ohm potentiometers, linear type.
1 Erie 50,000-ohm potentiometer, linear type.
1 Graham Farish 30,000-ohm "Ohmite" resistance, 1½-watt type.
1 Graham Farish 20,000-ohm "Ohmite" resistance, 1½-watt type.
1 Belling-Lee twin fuseholder, type 1033.
1 Belling-Lee fused mains input connector, type 1114.
5 Belling-Lee indicating terminals, type B.
1 Peto-Scott electrolytic condenser bracket, double type.
1 Peto-Scott "Metaplex" baseboard, 10 in × 8 in.
1 Peto-Scott ebonite panel, 10 in. × 7 in.
1 Coil B.R.G. "Quikon" connecting wire.
Flex, screws, etc.

TWO TWIN FUSES



The fuses on the unit give ample protection from all points of view

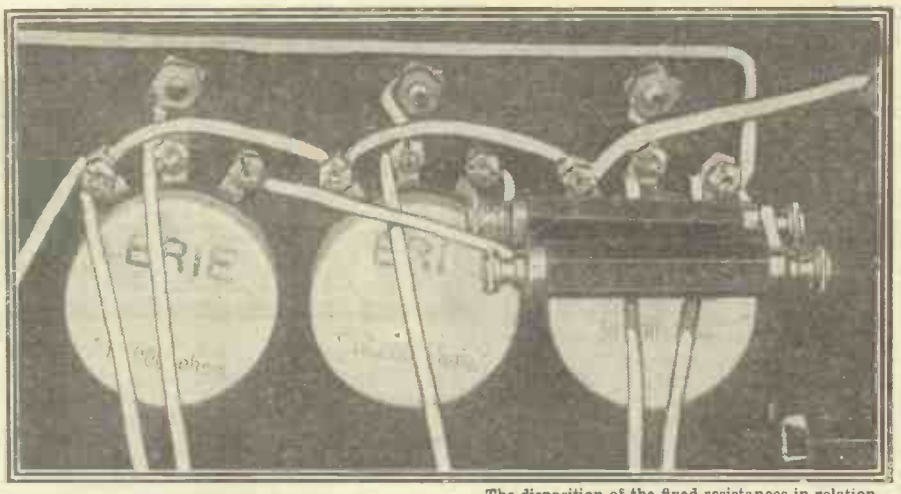
THE SILVER KING MAINS UNIT

(Continued from previous page.)

L.T. circuit across the H.T. supply, or if the H.T. was accidentally connected to the L.T. terminals when switched on, the fuses would prevent harm to emission even if only one valve was in place in the set.

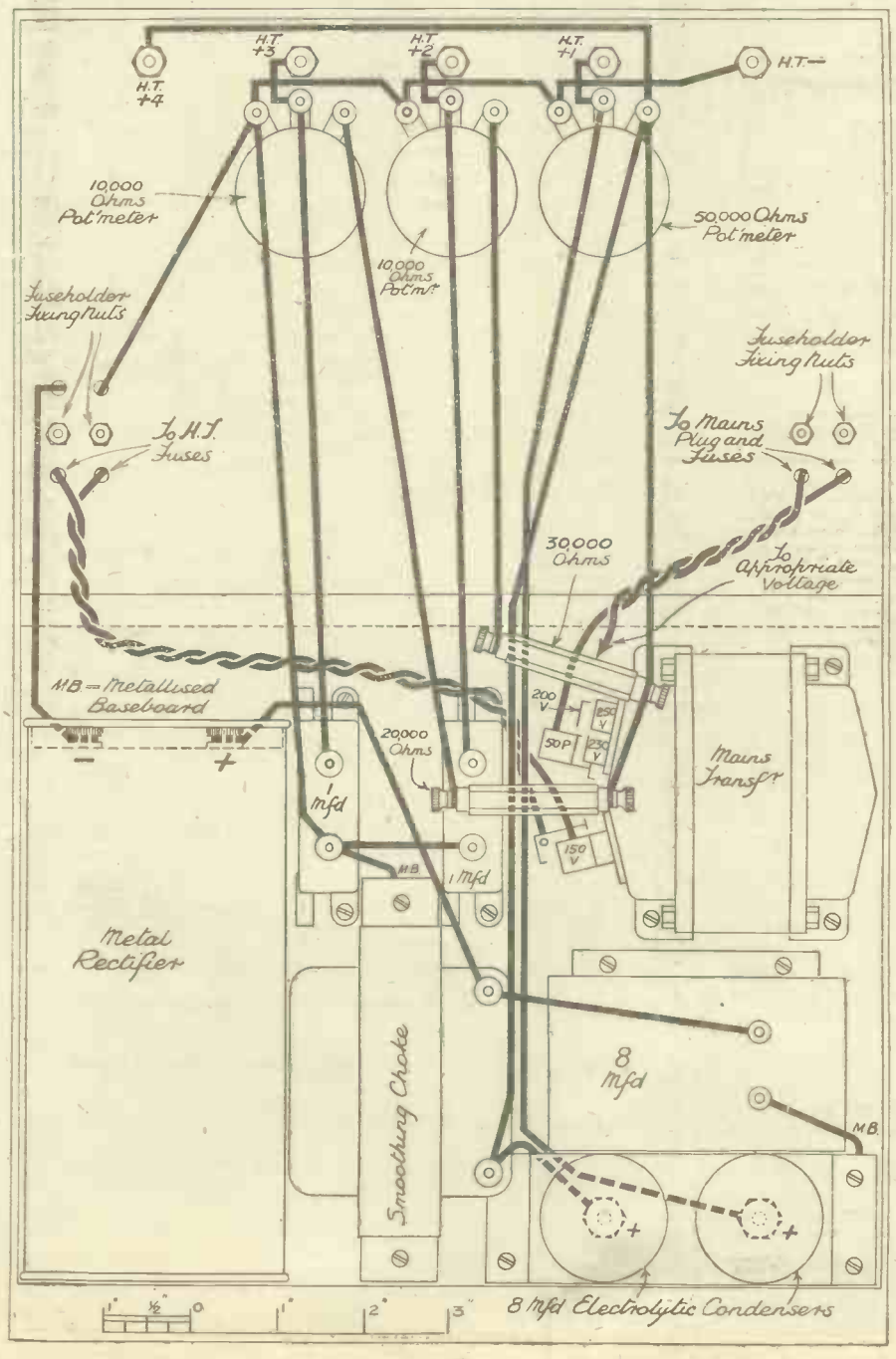
The output of the rectifier is 150 volts at 25 milliamps, so that there is ample power to run any of the larger-power valves mentioned in the list on page 140. This rectifier, by the way, is of the half-wave type.

The unit has been designed so that it will fit into the battery compartment of the "Silver King" cabinet instead of an H.T. battery, and consequently it was not considered necessary to provide it with a metal cover. But anyone who does not use an all-in cabinet for the "Silver King," and who so desires, could easily construct a suitable cover for the unit, although there is little likelihood of anyone receiving much of a shock due to the low output voltage.



The disposition of the fixed resistances in relation to the potentiometers is made very clear in this photograph.

THE COMPLETE WIRING



fit into the battery compartment of the "Silver King" cabinet instead of an H.T. battery, and consequently it was not considered necessary to provide it with a metal cover. But anyone who does not use an all-in cabinet for the "Silver King," and who so desires, could easily construct a suitable cover for the unit, although there is little likelihood of anyone receiving much of a shock due to the low output voltage.

If your unit is constructed as the original there will be no points joined to the mains, which are bare and can come into contact with the hands. The input plug and fuses are insulated; insulated wire is employed to join the fuses to the mains transformer; and special insulated connections are present on the transformer itself.

The baseboard is of "Metaplex," and two of the components have one side joined to this. These points are marked "M.B." on the wiring diagram. The negative sides of the two electrolytic condensers are also joined via their special metal bracket to the baseboard.

Connecting up the Electrolytics.

It is most important that these condensers should be wired the correct way, and this is ensured by their being mounted on the metal bracket that automatically makes contact with the baseboard. Note that the 8-mfd. condenser joined to the rectifier is not of the electrolytic type, which would not be so suitable in this position as one of the ordinary kind.

See that the potentiometers are wired up exactly as in the diagram, or you might get them working backwards. That is to say, the voltage on the variable taps might increase as the knobs were turned in an anti-clockwise direction, which is not the logical direction for an increase. The centre terminals are, of course, the slider contacts.

There are four sockets on the mains side of the transformer and two plugs attached to the leads from the mains to plug into them. One of these is always used in the socket marked 50P, this referring to the frequency of the electric supply.

(Continued on page 154.)

There is actually little wiring to be done, and it is all shown in this diagram. The twisted leads should be of good quality mains flex.

THE SILVER KING MAINS UNIT

(*Continued from page 152.*)

The other plug goes into one of the remaining three sockets. These are marked 200, 230 and 250 volts, and the one which is the nearest to the exact voltage of your mains is employed.

So far as connecting the unit up to the set is concerned, the output tappings should be treated just like the taps on a battery. As already indicated, the voltages of the first three taps can be varied by means of the potentiometers. The knob immediately below any one of the three variable tappings controls the voltage from that tap. This is the logical arrangement and will prevent any confusion when making adjustments.

The operation of the on-off and B.C. switches on the set is not affected in any way by the use of the mains unit. The unit itself has to be controlled by the switch on the mains socket to which it is fitted or by removing the mains plug itself.

Whilst the current consumed by the mains unit when the filaments are switched off is very small it is sufficient to warrant disconnecting the unit. It is, perhaps, as well to disconnect the H.T. unit from the mains before switching off the set. Similarly, it is also as well to switch the set on before plugging in the unit.

A Point Worth Noting.

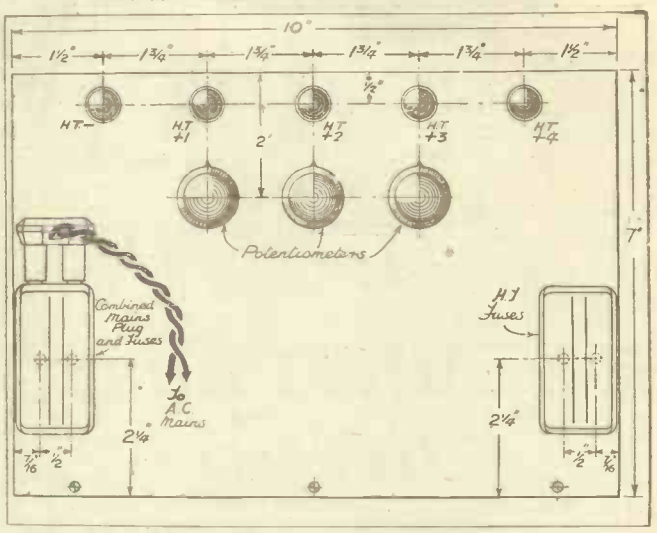
It is not likely that you will experience any troubles if you do not adopt this order of things. But the point is that it tends to prevent a sudden rise of voltage, thus at the same time tends to preclude all possibility of damaged components. So it's as well to be sure.

Perhaps it hardly requires mentioning (but it will certainly do no harm to do so) that the dry rectifier must be connected up the same way round as the diagram. If you get it reversed you will have one positive tap and four negative, and that will not give you particularly good results!

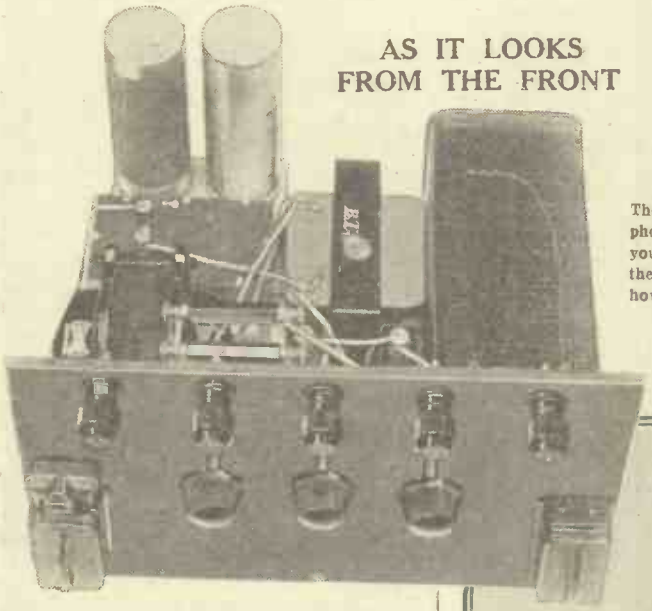
By the way, just a word about the value of the fuses in the mains-fuse box. It does not matter much what the blowing value of these is so long as it is less than that of the house fuses.

Once the unit is finished and connected up to the set it will go on working without any attention whatsoever.

HOW THE PANEL IS DRILLED



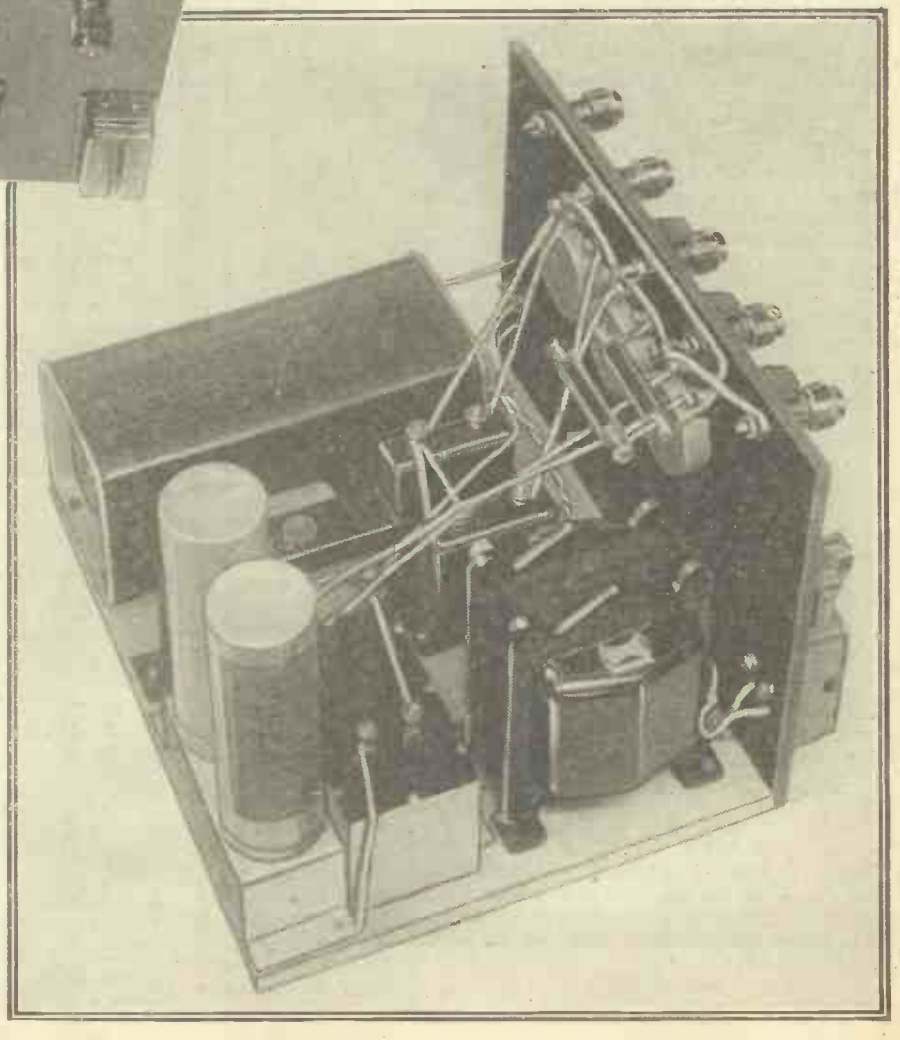
AS IT LOOKS FROM THE FRONT



The diagram above and the photograph to the left tell you all about the front of the unit—how it looks and how the holes are spaced.

And that brings us to the end of the various points which needed covering. Not that they were in any way obscure or made the construction of the unit difficult, but because we wanted to ensure that everyone adding this unit to his "Silver King" should be sure of perfect results right from the start.

READY TO SUPPLY SILENT POWER



TELEVISION

COVERING WIDE-FREQUENCY BANDS

How the wide-frequency bands necessary for high definition are covered is explained in this article, and practical information on the subject is offered.

THE way in which television technique and ultra-short waves will keep interlocking with each other is most annoying. I seem to have devoted a lot of space, under the heading of "Television," to the design of an ultra-short-wave receiver, and it is quite unavoidable that this should be so.

This week, moreover, we have reached the really critical point in the television receiver, after which I promise to get back to bona fide television once more.

Obviously, the television receiver is going to differ from any other receiver yet made in one important respect—the enormous band-width covered by the H.F. and I.F. side of the circuit.

An Essential.

Never before has it been desirable (let alone *essential*!) to construct a receiver with such flat tuning that its H.F. resonance curve is over a million cycles wide! Such a receiver, operated on the broadcast band, would have to accept everything between 300 metres and 30,000 metres without rejecting anything between those frequencies.

Our television receiver, working on about 8 metres, has got to give a similar band-width, but, of course, it is a much easier proposition on those very high frequencies, since the width of the resonance curve will be quite a small percentage of the actual frequencies we are dealing with.

The technicians used to tell us that the resonance curve of a single-tuned circuit had a width equal to about 10 per cent of the frequency on which it was working. That is to say, a single-tuned circuit somewhere round about the middle of the broadcast (medium-wave) band might have a curve about 90 kc. in width.

Likewise one working on 7½ metres (40,000 kc.) would have one about 4,000 kc. in width—substantially greater than the 1,000 kc. that we have set our hearts on for television purposes.

Several Stages Required.

Unfortunately for us, though, a single-tuned circuit won't be the least good to us. We can't get any amplification to speak of from *one* tuned circuit—we want a whole collection of them. Each additional circuit will increase the selectivity, which is just what we *don't* want!

The accepted practice, just at present, appears to be something like this: Make a superhet of your ultra-short-wave receiver, using a very high intermediate frequency, such as 8,000 kc. (37·5 metres). You *must* use quite a lot of tuned circuits, so, as a single good one would give you a band-width of about 800 kc. only, all those you use have got to be pretty bad ones!

A "WIDE-TUNE" STAGE

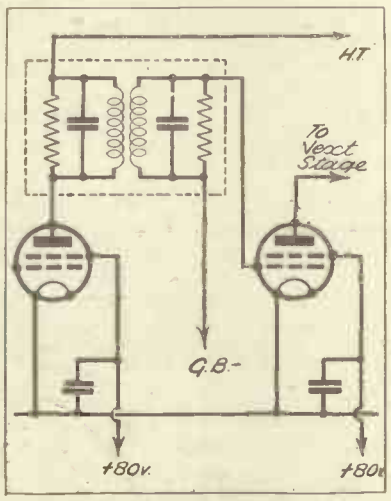


Fig. 1. How intermediate valves can be arranged to give tuning which covers a wide-frequency band.

A combination of flat circuits and band-pass technique will give you something of the right shape. Suitable circuits may be devised as in Figs. 1 and 2. On a 2-in. former you have two 8-turn coils with moderately tight coupling. Each of them has a ·0001 condenser and a ·1-megohm resistance in parallel with it.

Three Units.

It may be advisable to use a small "trimmer" condenser in place of the fixed ·0001, but that will be largely a matter for experiment. Three of these units should give you all the amplification you require—that is to say, *two* I.F. stages, using screen-grid or H.F. pentode valves. At least one of the I.F. units should be tunable.

The unfortunate part of it is that there is very little on which the average man can test his short-wave television set, once he has finished the construction. There are occasional transmissions from the Baird and E.M.I. headquarters, but unless one has really finished the whole job and has a cathode-ray tube and time-base equipment it is impossible to judge whether the receiver is going to do the job or not.

You may take it from me, however, that there is not the slightest difficulty in lining up two or three I.F. stages of the type outlined, and that there isn't the slightest risk of instability, simply because the circuits are all so absolutely poor (from the efficiency point of view).

The second detector must be linear, and anode-bend rectification will probably be used. If the cathode-ray tube is fed direct from that valve you won't have much to worry about. If, however, you have to use L.F., then you'll certainly have another problem in front of you.

Contrary to the reports published in some quarters, ordinary resistance coupling will *not* give you a band-width of the order you require. Special circuits are being developed which will do so, and they won't be difficult to build or to adjust.

When you've got to the right-hand end of your receiver, so to speak, you are about to break into all the other problems, which are, if anything, less to do with radio than anything you will yet have tackled. The setting up of a complete double-time-base unit to give your correct scanning frequencies is not, after all, a radio matter at all.

Not Really Complicated.

It is pure electrical technique, and, as such, mostly a matter of Ohm's Law and common sense. Look back at the simplified time-base circuit that I showed in the March 16th issue (p. 13), and don't get all hot and bothered because those you have seen appear to use pentodes and diodes all over the place.

The whole business is perfectly easy to understand, and the manufacturers will be producing complete time-base kits by the time you are ready to invest in the parts.

Don't forget, too, that even if the mechanical scanning systems win through you are still going to need just as complicated a receiver, because the "band-width" problem remains unaltered.

There *are* indications that two new mechanical systems will be very much in evidence by the autumn; but whether they are going to be simpler or less costly than the cathode-ray gear is a doubtful point.

Prices may come down after television services have been going for a while, when the demand for television receivers has increased. But with the colossal amount of experiment that has been done it is too much to expect low-priced high-definition receivers straightaway.

Still, the home constructor has a glorious time before him if he takes the trouble to understand the fundamentals of television reception and spend a while experimenting.

THE PRACTICAL DESIGN

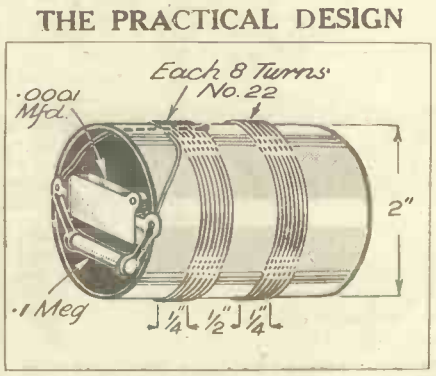


Fig. 2. The fixed condensers and resistances can conveniently be mounted at the ends of the coil former.

TELEVISION.— *(Continued from previous page.)*

TELEVISION JOTTINGS

INTERESTING details of new scanning systems seem to creep into the technical Press of Europe with great regularity. We don't hear of any of them in this country, for the reason that most of the inventions originate in France and Germany.

Are we falling behind in this particular branch of research? A reader points out, for instance, that he has heard of a fairly simple scheme which would make a mirror drum adaptable for 240-line, 25-picture transmissions. An ordinary 30-mirror drum is followed, in series, so to speak, by a second drum with four or eight mirrors, the latter being geared to the 30-mirror drum in such a way that 240-line scanning is possible.

Then what about the old arrangement of two vibrating mirrors at right angles? That was used with huge success for a German demonstration witnessed by a friend of mine. He tells me that a 240-line picture the size of a postcard was projected by means of an ordinary 24-watt headlamp bulb.

The fact of the matter, probably, is that many of these schemes are being perfected under "hush-hush" conditions, and that they will all burst out simultaneously just when we begin to think that the cathode-ray tube is emerging victorious.

The Site of the First Station.

I have just learned that the Television Advisory Committee has decided that the first television transmitting station is to be at Alexandra Palace. This decision was made after full consideration had been given to the claims of three other sites, viz., Crystal Palace, Highgate, and Hampstead Heath.

Alexandra Palace has four towers, each rising 145 feet above the building, and will adequately provide all the accommodation necessary. Moreover, the skating-rink and race-course at Alexandra Palace will be useful for the preliminary "outside" television broadcasts.

Being situated in South London myself, and in a fairly low-lying part at that, I am naturally not overjoyed to hear that the only London transmitter is going to be north of the river.

Presumably the northerners would have felt precisely the same way about the Crystal Palace had it been chosen as the final site for the high-definition television transmitter.

Cheap Receivers Again!

Rumours reach us from every quarter that complete television receivers selling at less than £25 will be available as soon as the transmissions commence. I can't help feeling that it is another case of the wish being father to the thought, but I hope it's true, all the same!

A real "de-luxe" receiver is certainly going to cost every penny of £60 at first, and many of them will undoubtedly be more expensive than that.

Progress in Germany.

It seems to be the tendency in Germany for a television transmitter to be erected on commanding ground some distance from the city it is intended to serve. We have all heard of the experiments from the summit of the Brocken.

One of the advantages claimed for this system is that the use of a directional aerial is possible, and that the overall "wastage" of power is less than when an omni-directional aerial in the centre of the city is used.

Television and the Films.

All this talk about rivalry between television and the films strikes me as being unusually fatuous, and will probably end in the same way as those early disputes about "radio versus the gramophone." One will surely help the other in precisely the same way. Full-length films, surely, will not attain a huge degree of popularity for viewing on a home screen. A "trailer" by television, though, might easily send people flocking to the nearest cinema. News items and cartoons would be ideal for television purposes.

L. H. T.

BROADCASTING RESEARCH

We understand that the building illustrated on page 32 of our March 23rd issue is not now used by the B.B.C. for research work. Although it has been used for this purpose in the past, it is now the Headquarters of The National Union of Printing, Bookbinding and Paper Workers. The ex-convent used by the B.B.C., and referred to in the article, is a short distance away.

THE LINK BETWEEN

Trade items of interest to all readers.

By G. T. KELSEY.

THE absence during the last month or so of these notes from "P.W." has broken the continuity of a series of weekly trade topicalities which lasted for nearly two years. And during that time absolutely nothing was allowed to stand in the way of "Link Between."

You may gauge from that with what intent we of the technical staff have concentrated upon the design and production of a set worthy in every way of the historic occasion of His Majesty's Silver Jubilee. For that was the only reason for the break.

Now the cat is out of the bag—or might I, with all due modesty, say that the rabbit is out of the hat?—and I am able once again to get back into the old order of things. Well, much as I, in common with my colleagues, have enjoyed the period just past, I'm glad once more to get back to "Link" because I like it!

And although, during the next week or so, I've got a bit of catching up to do, I hope by then once more to be in a position to give you the "low-down" in advance of all the important activities around the trade. I want, too, to reintroduce our post-card literature idea as soon as I have had just a few more days to go through the mass of stuff that has accumulated while I have been "two-channeling." Anyway, look out for "Link"! I'm on your side, and if I can help you by letting you know in advance of anticipated price fluctuations, etc., you may rest assured that I shall do so.

Highbury Now at Cossor's!

What a lot of things can happen in a little time! I think one of the very last topics to be discussed in these notes before the break was the news that the enormous extension to the Cossor factory was almost completed.

And now I hear that it has been working absolutely to capacity for some time. How time flies! And how contours change! One used to talk about Cossor's being at Highbury, but now I think it would be much nearer the truth to talk about Highbury being at Cossor's. For this new factory is the fifth one that this enterprising firm has erected at Highbury, and all five factories are working to the limit. The Arsenal ground, I gather, is safe for the time being, at any rate!

All of which goes to prove that the listening public these days is showing great wisdom in the choice of apparatus. I say that with feeling, for I was down at Highbury recently, and if only you "P.W.-ites" could see with what extreme precision Cossor products are made and with what thoroughness each item is tested before it leaves the works you would never entertain the slightest dubiety about anything bearing the Cossor trade mark.

I suppose I am asking to be shot at dawn if I venture on to television. But I cannot help thinking that a firm with such vast experience of cathode-ray tube work will almost certainly have some surprises in store when the time comes. We shall see! (I'm sorry; that isn't meant to be a pun.)

For G.E.C. Set Owners.

Picking more or less at random from the pile of stuff which is waiting to be dealt with in this column, I have just come across an important news item from the G.E.C.

It is to the effect that revised station registers incorporating the changes in the wavelengths of certain of the B.B.C. stations (the ones which came into operation on February 17th) are now ready.

Various types are available to suit the different sets in the range, but the cost in all cases is 2s. 6d. Consult your local G.E.C. dealer for further details, or write direct to the General Electric Company at Magnet House, Kingsway, London, W.C.2.

Colvern Coil Unit.

Since going to press with the last issue of "P.W.," an opportunity has occurred for our technical folk to give the "once-over" to the coil unit which has been produced by Messrs. Colvern for the "Silver King" receiver.

They tell me—and I pass it on for your guidance—that the Colvern two-gang unit is entirely satisfactory in the set, and that it can be employed, if desired, without alteration to the blue print.

The demand for "Silver King" components is great even now, and there is no telling what may happen by this time next week at the present rate of increase in popularity. I think it is always as well, therefore, to pass on news of approved alternatives.

The price of the Colvern "Silver King" two-gang coil unit is 15s., and it is available through the usual retail channels.

RADIOTORIAL

The Editor will be pleased to consider articles and photographs dealing with all radio subjects, but cannot accept responsibility for manuscripts or photos. Every care will be taken to return MSS. not accepted for publication. A stamped, addressed envelope must be sent with every article.

All Editorial communications should be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

All inquiries concerning advertising rates, etc., to be addressed to the Advertisement Offices, John Carpenter House, John Carpenter Street, London, E.C.4.

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 reception. 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 specialties described may be the subjects 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

WHEN THE GRID-BIAS RESISTANCE BREAKS DOWN.

S. E. B. (Hull).—"What would you have done if the L.F. valve's resistance (for self-biasing) had broken down, with insufferable crackles, at eleven o'clock on Saturday evening? No wireless for the whole of Sunday!

"Thinking it over, it seemed to me I might get out of the jam by using a grid-bias battery which I knew I could get the loan of. So I tried it, but no adjustment of the G.B. would reduce the milliammeter reading to a reasonable figure, so I had to give it up.

"Evidently I had got something wrong, as my bias seemed to make it worse instead of better. Can a battery be used instead of the usual resistance?"

Yes, and it is very simple to install if the resistor is wired next to the cathode terminal of the valve holder as usual.

All that is required is to remove the resistance and place the battery between the two connections instead. But what is important—and this is probably where you went wrong—is to give the cathode a *positive* bias.

You probably joined the grid-bias battery's positive end to the earthed or "filament" wiring, as is usual; and then tried to get bias by taking the cathode lead to one of the remaining (negative) battery sockets. That would be quite wrong.

In such a self-biasing set the grid is already connected to the earth wiring, and to make the grid relatively negative the resistor is used to put a *positive* bias on the cathode.

So that is what you should have done with the battery—take its negative end to earth and tap off the requisite number of *positive* volts to the cathode. A better method, of course, is to insert the bias in the grid lead and to earth the cathode.

DEMONSTRATING PERSISTENCE OF VISION.

A. M. C. (Ibstock).—"What is the 'caged-bird' experiment for showing persistence of vision?

"In trying to grasp the processes involved in television I read that 'this familiar experiment' illustrates the phenomenon perfectly. But the experiment is not 'familiar' to me, so can you say how it is carried out?"

All you need for the experiment is a small white card of, say, three inches by two. It must be thickish and quite stiff.

Draw or paste on one side of it a picture of a bird—one of those cigarette pictures of British birds will do nicely if you cut round the outline—and it is better to choose a bird which is on a perch than one in flight or on the ground, since the perch helps the illusion.

On the back of the card draw a series of parallel lines down the card in a framework, and a few cross lines to represent the wires of one side of a square birdcage. Finally, pierce two small holes near the opposite edges of the card, in line with the centre, and thread a piece of string through each, so that the card can be spun round when the strings are held taut.

You see the idea? Normally, you can look either at the cage with no bird imprisoned there; or else at the bird with no cage.

If, however you twirl the card the bird appears to be inside the cage, because by the persistence of vision both images are being retained by the eye and blended.

CURING DEAD SPOTS IN TUNING.

D. F. (Lanark).—"The one-valve short-waver is perfectly satisfactory, and I have had many American programmes with it. But from 12 to 16 on the dial and from about 65 to 68 I cannot get oscillation.

"Reaction appears to make no difference here, though there is 'plenty in hand' above and below. How do I overcome that?"

Insert a small-capacity variable condenser in the aerial lead. You will find that this condenser can be left set to some intermediate position during ordinary tuning without affecting results. But when you get a dead spot readjust the new condenser, and you will find reaction is then obtainable.

HALL ACOUSTICS AND ROOM ACOUSTICS.

H. T. (Chippenham).—"It is well known that certain concert halls are specially suited to certain types of music, owing to the hall acoustics. Does the same apply to rooms and loudspeakers? And would not this explain why the same set sounds differently in different rooms?"

Yes, the room in which a loudspeaker is heard will always modify, to some extent, the reproduction; just as the hall in which the original is being played may noticeably affect the sounds reaching the microphone.

Of the total sound reaching the ear a certain proportion is reflected from walls, etc. And that is why the relative position of loudspeaker in the room, and position of the person listening to the loudspeaker, can with advantage be chosen carefully if the listener has a critical ear for music.

SOME EXAMPLES OF OHM'S LAW.

W. L. D. (Cambridge).—"I see so many references to Ohm's Law that I am almost ashamed to say I do not fully understand it. Will you therefore be so good as to work out a few examples to show how it may be applied to practical problems?

(*Continued on next page.*)

RADIOTORIAL QUESTIONS & ANSWERS

(Continued from previous page.)

"The problem I have in mind particularly is how to measure the D.C. resistance of an H.F. choke when the voltage across it is known."

There are three ways of expressing Ohm's Law, given below.

(*a*) $E = I \times R$

(*b*) $I = \frac{E}{R}$

(*c*) $R = \frac{E}{I}$

where E = Volts; I = Amps.; and R = Ohms.

From (*a*) we can find voltage, where the amps. and ohms are known.

From (*b*) we can find current (in amps.) where the voltage and ohms are known.

From (*c*) we can find resistance (in ohms) where the voltage and current are known.

FIRST EXAMPLE, OF (*a*).

Q. How many volts are across a resistance of 50 ohms when 25 milliamps are flowing through it?

A. 25 milliamps is equal to ·025 amps. So E (volts) equals ·025 × 50. *Result*, 1·25 *volts*.

SECOND EXAMPLE, OF (*b*).

Q. How much current would pass through a loudspeaker winding of 2,000 ohms if connected across a 2-volt accumulator?

A. From (*b*) we know that current $I = \frac{E}{R}$

So in this example the working is $\frac{2}{2{,}000} = ·001$ (or 1/1,000th) amp. *Result*, 1 *milliamp.*

THIRD EXAMPLE, OF (*c*).

Q. What is the D.C. resistance of an L.F. choke which passes 20 milliamps when 10 volts are connected across it?

A. From (*c*) we know the resistance $R = \frac{E}{I}$

So in this example the working is $\frac{10}{·02}$ (Note that 20 milliamps is equal to ·02 amp.)

Result, 500 *ohms.*

The foregoing show the three variations of Ohm's Law in practice. There are innumerable ways of restating and wangling the formulæ to meet special requirements, but they are all extensions or alternative applications of the foregoing, which give all the essentials of Ohm's Law.

YOUR SET'S APPEARANCE

An attractive cabinet design for home-constructors.

TO many constructors a radio set is little but a conglomeration of components fixed to a panel and baseboard. Some do go so far as to provide a kind of soap-box casing to keep out the dust and prevent others from piling books, etc., on the working parts of the arrangement.

A few use proper cabinets. We know that it can be only a relatively few who do this from comparative figures which we have been given in confidence by certain sections of the industry.

We do not think that there is a lack of "cabinet consciousness" among constructors as a whole or that they are in general lacking in æsthetic taste. We believe that there is a demand for good cabinets, but that the supply has not been universally available at prices within reach of average pockets.

There have been good cabinets on the market, but many of them at prices not far short of the prices of complete sets. At the other end of the scale there has been no shortage of cheap cabinets, but the less said about at least a big proportion of these the better.

In view of all this it is welcome news that Messrs. Graham Farish, Ltd., of Mason's Hill, Bromley, Kent, have decided to produce one or two designs of cabinets for, as they say, "the housing of all types of receivers."

A PLEASING DESIGN

A Graham Farish cabinet suitable for accommodating a receiver of the three-valve type together with a loudspeaker.

They have sent us one of them. It costs only 25s., and is a most attractive production.

It provides accommodation for a set of the H.F.-det.-L.F. type and a loudspeaker. A useful baseboard chassis of wood on which the set can be built is provided, and this can be seen lying at the side of the cabinet in the accompanying photograph.

A tasteful, gold-coloured gauze is fixed behind the loudspeaker fret, and the pleasing design of this, too, can be seen in the photo. You will also note the delightful lined inlay which sweeps right through it and across the front of the whole cabinet.

There is ebony-finish pedestalling under which are small but effective felt pads, so that the cabinet can stand upon a polished table without scratching it.

The woodwork is very solid and substantial, and the corner pieces are screwed as well as glued. We should imagine that neither damp nor heat could affect this Graham Farish cabinet harmfully. It is an artistically designed and well-executed piece of work, and we can unhesitatingly recommend it to our readers.

£100 FOR VEGETABLE MARROWS.

Seeds FREE!

THOSE who buy this week's POPULAR GARDENING (now on sale—2d.) will also receive a large packet of Vegetable Marrow seeds—FREE!

Apart from the ordinary value of the choice produce that can be raised, big money prizes are offered by POPULAR GARDENING for the heaviest Marrows grown from the free seeds; you are just as likely to win as anyone else! Get POPULAR GARDENING now, make sure of your FREE SEEDS, and read how to cultivate a really record-breaking prize-winner!

A GOOD VALVE HOLDER

LECTRO LINX, LTD., of 79a, Rochester Row, London, S.W.1, have sent us one of their new 7-pin "Airsprung" Chassis-Mounting Valve Holders of the anti-microphonic type. The price of this most interesting component is 1s. 4d. There is a model without terminals which retails at 1s. 1d.

The design of this Clix "Airsprung" valve holder is extremely ingenious. There are three discs of tough but resilient bakelised material, which are clamped together, but spaced by means of small washers of the same material, so that there is a considerable air space between them.

The sockets pass through clearance holes in the one disc and are fixed to the centre disc. Now this centre disc is thinner than the outer discs, and is, therefore, quite springy. Each socket can be bent over to quite an extent in any direction, and the result of this is that the pins of a valve are at once easily accommodated, even should one or more of them be slightly faulty.

As a matter of fact, we haven't encountered a valve holder which takes its valve with greater smoothness. And the valve is as freely removable.

This ingenious anti-microphonic valve holder retails at 1s. 4d. with terminals.

The sockets themselves are cunningly slit in a spiral fashion, to ensure perfect contacts.

When a valve is in position in this Clix "Airsprung" valve holder the anti-microphonic properties of the component are at once evident, for now the sockets as a whole "float" on that springy centre disc. It is not an easy matter to achieve good "springing" with a chassis type of holder, but Lectro Linx have effected it in a manner which is very effective indeed.

There are holes in the top disc aligned with the sockets through which the valve pins pass, and so there is that necessary "sinkage" for the prevention of accidental contacting between the pins and wrong sockets.

Such is the expert economy of the design of this outstanding valve holder that the metal-clamping pieces are also used to take the screws for mounting the holder on to the chassis.

The terminals adopt the forms of small screws in the ends of the sockets, there being holes through the diameters of these for the connecting wires. The screws are milled and slotted.

Altogether, as can well be appreciated, this "Airsprung" Chassis-Mounting Valve Holder is a component which bears evidence of a considerable amount of thoughtful design. The article may be small in physical dimensions, but nevertheless it represents as good an example of advanced radio engineering as is to be found anywhere.

LINING UP THIS TELEVISION

(*Continued from page* 143.)

actually carry up to 1½ megacycles. Indeed, with frequent repeatering there is, apparently, no limit to the width of the frequency band it will carry. The limit is economic, not technical.

A figure of £500 per mile has been mentioned for such a cable, together with the impression that this is an enormous expenditure. Actually it is very little more, if any, than buried cable costs.

So, you see, there is a cable waiting for television. Whether it is practicable to lay it down immediately I cannot say. As the B.B.C. only rents its cable from the P.O. the Post Office would naturally have to consider whether it would see its money back.

From the economic point of view I can say this. The cable would carry an enormous number of speech channels. Assuming good speech needs a frequency band of 200 to 3,000 cycles, you can work out for yourself what the very minimum number of channels would be over a band-width of 1½ megacycles.

It might even be argued that the new arrangement would work out cheaper than the present multi-repeater system. Only one repeater would be needed at each point, so that, even assuming the repeatering were done every ten miles, an immense amount of apparatus would be saved.

The technique for telephone communication would resolve itself into a kind of wired wireless, high-frequency carriers handling each group of speech bands.

It may well be that the demands of television will revolutionise the technique of telephone communication. Instead of hundreds of bunched-up wires and hundreds of repeaters, the telephone cable of the future may consist of just one concentric tubular arrangement of core and shield.

These to carry, by radio frequencies, either hundreds of channels of good speech or just one channel of high-definition television.

No one can say yet when the first television channel will be laid down. Our present Postmaster-General is so fully alive to all the possibilities that I am hopeful a start will soon be made.

ON THE AIR

(*Continued from page* 142.)

than that libretto. That was the big fly in the ointment of this radio production.

It is true, of course, that a screen play can get away with a shallow libretto, because there are other compensations. The glow and the glitter of the settings often make ample amends for other deficiencies. But since, in radio productions, there aren't such visual compensations I would have thought that writers and lyricists would have better catered for the ear. With our eyes put out of use we employ our ears to a much greater extent. Indeed, we can only use our ears, and we quickly spot weaknesses in the lines.

My one grouse against these musical plays is the poorness of the libretto. Consequently, I feel they will never compare favourably with the other modes of presenting these plays until they offer a libretto so superior, say, to the film play's as to compensate for that lack of visual appeal proper to the film but denied the radio play.

* * *

I like the second News Bulletin of a Saturday night. There's something substantial about it. Especially do I like the expert talks interpolated between the news items.

* * *

Perhaps the most invigorating of recent talks was G. O. Nickalls' on the Boat Race; and the most difficult one, from the speaker's point of view, I should say, was the Welsh padre's, who was given a quarter of an hour for two centuries of Methodism.

C. B.

J.B. CONDENSER TYPES.

WE have been asked by the makers of J.B. condensers to call attention to a slight mistake which occurred in their advertisement in the last issue of "P.W."

The .0002 differential reaction condenser which was specified for the "Silver King" and which was listed in their announcement as an air dielectric type at 4s. 6d., is actually a condenser of the solid dielectric type, and the price is 3d. cheaper.

This does not affect our component list, which was correct.

RANDOM TECHNICALITIES

Mains-Interference Suppressors—Calibrated Dials — Those Time Signals.

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

THE old question of whether the prevention of interference from electrical machinery and so on should be provided for by means of suppressors on the receiver itself or on the offending machinery was raised again recently in a speech made by the chief Post Office engineer of the Midland district. According to the reports of his speech, he suggested that interference suppressors should be standardised on commercially built radio receivers.

Some people would cross swords with him on this point and maintain that it is the duty of the electrical-supply companies and manufacturers of electrical apparatus to see that these do not radiate interference, which is immediately picked up on wireless sets.

Manufacturers' Responsibility.

There is a good deal to be said on both sides. Inasmuch as the use of radio receivers is now so widespread, there is no doubt that radio listeners represent, if not the whole, certainly a very large percentage of the general public, and for that reason alone are entitled to a very great measure of consideration.

Personally, I think it would be very nice if manufacturers and users of electrical appliances of all sorts could be got to make them "interference free," so to speak. But I think that the answer is really supplied by the technical side of the case. It seems to me that it is virtually impossible to expect anything in the nature of a complete solution on this side of the matter, and I think it is far better that the receiving set itself should be rendered as free as possible from the reception of outside interference.

Some Excellent Suppressors.

A great deal of research work has been done along these lines lately, and there are now on the market several excellent interference suppressors of different kinds which can be guaranteed to cut out all ordinary types of interference. It is only in a small percentage of cases that the interference is so serious or of such a character that it cannot be obviated by one or other of the available devices.

There seems little doubt that pretty soon all commercially built receivers, more particularly mains sets, will be specially protected from interference brought in over the mains supply or over the aerial.

Dial Marking.

For some time past set manufacturers have been endeavouring to simplify the reception of stations by marking the dials with the stations instead of calibrating them in the ordinary way—or marking the station names *in addition* to the calibration. This is all very nice, and if it worked out exactly according to plan it would

(*Continued on next page.*)

RANDOM TECHNICALITIES

(Continued from previous page.)

undoubtedly be the simplest and most obvious way of making station selection easy. But unfortunately it is apt to be rather misleading, especially in a very selective receiver such as the superhet. For one thing—and this applies even if the dial is calibrated in wavelengths or frequencies—some stations do not keep strictly to their reputed wavelengths.

Variations in Components.

For another thing, you may get variations in the actual components in the set, and when you come to trimming the condensers this is apt to upset any sort of calibration of the dial.

As I have said, this applies generally to what you might call "mass-produced" sets; but if you go to high-priced, individually calibrated receivers, then it is possible for all the vagaries of the set to be allowed for in the calibration. Even then I do not know that the method is absolutely as reliable as one might wish.

Simplified Tuning Arrangements.

A good deal of work has been done along these lines, because of the very great advantage of a simplified tuning arrangement. Very large numbers of sets are now sold to users who are entirely uninitiated technically and who wish only to receive the broadcast entertainment and have not the smallest interest in the technical side of their receivers. For them anything that makes station-getting automatic is a great boon.

Is Permeability Tuning the Solution?

But there are so many things in the set which can vary, even though ever so slightly, that the problem of the simplified tuning dial is by no means an easy one. Once the dial is calibrated, in whatever form, the calibration can only remain correct so long as nothing changes inside the set. Some people pin their faith to developments of the principle of permeability tuning. This certainly seems to have great possibilities and is an important step forward. It remains to be seen whether refinements in the application of the principle will give us the fixed and invariable type of simplified station selection which is so much wanted.

Superhet Coils.

An interesting addition to the range of superhet coils has lately been made by the Wearite people with their W.S.A., W.S.G. and W.S.O. types, the first two being a band-pass combination, while the last one serves as oscillator. These are air-cored coils and have a wavechange switch incorporated, the coils being completely screened. They are mounted on separate base plates, and a particular feature which is claimed for them is the accurate matching. Another interesting feature is that a preliminary high-frequency stage can be added by using a further coil, type W.S.H.F., and a specially long switch-operating spindle.

Those Time Signals.

I wonder how many of you use the Greenwich time-signal pips on the wireless for keeping your clocks accurate. I expect a good many readers now possess the synchronous electric clocks; these are automatically kept right by running in step with the frequency of the alternating-current electric-supply mains. I know from friends in the business that the sale and popularity of these clocks are increasing enormously. I can well understand it, and so will you if you install one.

You don't know what it is to worry about the time when you have a synchronous electric clock. It gives you absolutely Greenwich time all the time. I have been using these clocks at home and also in my office for a long time now, and they are undoubtedly a complete solution of the time-keeping problem. It is very interesting to watch the clock when it is getting just about time for the Greenwich pips to come through. It is almost uncanny how, at the exact moment that the clock hand comes on the hour, the radio gives out the signal. You would imagine that the signal was controlled by your clock, the agreement is so precise.

Are Your Mains Time Controlled?

One of the leading firms in this field is, of course, the Ferranti Company, and all the clocks which I have are supplied by this firm, who also make separate "movements" which you can fit into any favourite clock case that you may have.

If you want to be free for ever from all the little petty vexations of inaccurate timekeepers, take my advice and get a synchronous electric clock. But you must ascertain first of all that your electric supply is A.C., and also that it is what is called "time controlled": this you can find out from your supply company.

Short-Wave Reception.

I said something recently about the increasing popularity of short-wave reception, and I see that in America they reckon that as many as eight million homes are equipped with so-called "all-wave" receivers, which allow of reception of entertainment from foreign as well as local stations. Unlike many other innovations that have caught the public fancy for only a short time, short-wave radio reception has proved that it has something to offer radio listeners that is not obtainable in any other way, and that is what they call in America "armchair adventure."

An excellent description of what is meant by "armchair adventure" is given as follows: "Nearly everyone has at some time or other experienced the longing to travel, to see the world, to search out for himself the strange and little-known parts of the earth. Short-wave radio satisfies this longing to a degree. It takes the listener over aerial highways to new and interesting countries across the seas, whilst by foreign transmissions he becomes acquainted with the folklore, the music and the principal places of interest in almost all countries of the world."

New S.-W. Service.

Talking about short waves reminds me that the new ultra-short-wave service set up by the Post Office between Belfast and Portpatrick, as recently mentioned by Ariel, has proved very successful. Hitherto there has been an increasing pressure of traffic on the long-distance telephone lines between Great Britain and Ireland, and this

(Continued on next page.)

RANDOM TECHNICALITIES

(Continued from previous page.)

new ultra-short-wave service will take a large proportion of the burden.

You may remember that ultra-short-wave services across comparatively short distances, such as across the Bristol Channel, have already proved the practicability and the value of this type of communication.

In view of the success achieved and the practical knowledge which has been gained in the working of these services, it is proposed now to try similar arrangements between Great Britain and the Continent.

THE SPREAD-BURY EARTH ROD

IF we had to choose between a good aerial and a bad earth and a bad aerial and a good earth we should select the latter combination. There is a common belief that the purpose of both these things is the same, but this is not strictly true.

It is the job of the aerial to pick up stations, and it is the job of the earth to help the aerial to do that. But the earth connection has an additional task. The phrase which most expressively describes this is an Americanism, "Tying the set to the ground."

In many instances instability and even hum are experienced when an inefficient earth is employed. We encountered a very curious case of this only a week or two ago.

The set in question was a quite straightforward mains outfit, but it developed a peculiar burbling every time a hand was approached near the panel. There was also loud hum all the time and fierce instability.

No doubt there were faults in the design of the set. No set should act in such an abnormal way, even with a bad earth. But in this instance a change over to a good earth connection at once resulted in complete freedom from all the trouble.

Theoretically, the original earth ought to have been quite effective. At least, upon superficial inspection one would have arrived at that impression. There was a fairly long earth lead, it is true, but it was composed of thick, low-resistance wire.

The Spread-Bury Earth Rod has six limbs which spread out upon being hammered into the ground. Thus the effect of six separate earth rods is obtained.

And this wire ran to a buried earth, though of exactly what type no one seemed to know. So probably the fault was at that point, the most vital of all.

If it is possible to arrange a buried earth without a very long length of connecting wire this ought to be done, because there is nothing better. There are many devices for ensuring good ground contact, but of them all we consider the new Spread-Bury Earth Rod to be one of the most effective we have had an opportunity of examining.

It is ingeniously simple, too, though quite novel in design and construction. It is solidly constructed throughout of copper, which is a metal that has electrical advantages and is also able to withstand corrosive effects.

This Spread-Bury is like a huge split pin having six pointed "limbs." When it is hammered into the ground, in accordance with the instructions (a simple task), the six separate contacts spread out radially, and thus the effect of six earth rods is obtained. And inasmuch as they naturally tend to search out and pierce the softer parts of the soil in a quite automatic manner—probing into its interstices, as it were—a highly efficient earth connection is obtained as a matter of course.

At the top of the device is a large screw and washer, with which it is an easy matter to connect the earth lead securely.

The price of the Spread-Bury Earth Rod is 3s., and the majority of listeners and constructors should find it a good investment, giving them ample returns in greater stability and more stations.

MISCELLANEOUS ADVERTISEMENTS

3d. per Word

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Minimum Charge 3/-

Remittance must accompany order.

Advertisements for these columns are accepted up to first post WEDNESDAY MORNING for following week's issue.

Radio components and accessories advertised in these columns at below list price do not carry manufacturers' guarantee.

The Proprietors have the right to refuse or withdraw advertisements at their discretion.

Postal orders, in payment for advertisements, should be made payable to the Amalgamated Press, Ltd., and crossed.

All communications should be addressed to:—Advertisement Department, "Popular Wireless," John Carpenter House, John Carpenter Street, London, E.C.4.

PEARL & PEARL

190, Bishopsgate, London, E.C.2. All the following Bargains, guaranteed new goods. Cash or C.O.D. Carriage Paid in British Isles.

SPECIAL. Telsen Radiomag (Latest Edition), 64 pages. 4 Full size Blue Prints for the "Economy Three." "Short-wave Three."

"Super Four" Battery receivers, and a "Quality 3-valve Amplifier." Full constructional details, many other articles of interest, sent Post Paid for 6d., or, **FREE** to all purchasers of goods during April.

TELSEN Chokes. Coils. Condensers, etc., all at Special Reduced Prices. List "P" on request.

RECEIVERS. Burgoyne 3-valve. List, £6/10/0. Our Price, £3/18/6.

CONDENSERS. Lotus 2-gang. List 14/-, Our Price, 6/11. 3 gang: List 21/-. Our Price, 10/9.

COILS. Lincoln Stewart; iron core; List, 6/6. Our Price, 2/6.

RADIOPAK. Superhet model. List, £3/15/0. Our Price, 29/6.

SPEAKERS. Lotus permanent magnet m/c: List, 27/6: Our Price, 14/11.

SHORT-WAVE Adaptors, B.T.S., 52/6 complete.

GRAMO-MOTORS, Collaro, electric. List, £2/10/0. Our Price, 36/-. or with Pick-up, 13/- extra.

TRANSFORMERS. Lotus, 3-1 and 5-1; List, 5/6. Our Price, 3/6.

CABINETS from 4/11 each; carriage forward.

FOR details of above Bargains see our advertisements during March.

All Mail Orders Direct to

PEARL & PEARL,
190, Bishopsgate, London, E.C.2.
Telephone: Bishopsgate 1212.

WOBURN RADIO OFFER FOLLOWING BARGAINS:

KIT A.—Cadmium-plated chassis, ex-Murphy, Radiophone 2-gang ·0005 semi-screened midget condenser, Radiophone dial with dual lights, and oxidised bronze escutcheon, marked in degrees and wavelengths, and four valve holders, 10/-.

KIT B.—As above, but with Radiophone 3-gang, 12/6.

KIT C.—As Kit A, but including 2 Lucerne iron-cored coils, 14/6d.

KIT D.—As Kit B, but with two Lucerne iron-cored canned coils, 16/6d.

WESTINGHOUSE Rectifiers, manufacturers' type, H.T.8 and 9, 8/11d. Few only, L.T.2, 4/6d. Western Electric Microphones, 2/3d. Microphone transformers for use with same, ratio 100/1, 2/3d. Formo 1-mfd., 1,000-v. test, 1/-, 2-mfd., 1/3d. Tubular, ·01, ·1, ·02, 6d. Dubilier dry electrolytics, 8-mfd., 500-v., 2/10d. T.C.C. 6-mfd., 50-v., 6d. T.C.C. 25-mfd., 25-v.; 50-mfd., 12-v., 1/3d. Chassis valve holders, 4/5-pin, 1/3d. half doz. Erie resistors, all values, 6d.

TRADE LIST now ready, enclose trade heading and stamp.

WOBURN RADIO CO., 9, Sandland St., W.C.1. Holborn 7289. First turning on right up Red Lion St., from Holborn.

LOUD SPEAKERS REPAIRED, 4/-. Blue Spot a Speciality. Transformers and Headphones, 4/-. Eliminators, Mains Transformers and Moving Coils quoted for. 24-Hour Service. Trade Discount. Clerkenwell 9069.—E. Mason, 44, East Road, London, N.1.

EXPERIMENTER'S OPPORTUNITY. Parcels containing Wireless Components, 40/- value, for 5/6d., Carriage 1/-.—Taylor's, Radio House, Macaulay Street, Huddersfield.

PREMIER SUPPLY STORES ANNOUNCE a City Branch at 165 and 165a, Fleet St., E.C. (next door to Anderton's Hotel), for the convenience of callers; post orders and callers to High St., Clapham.

OFFER the Following Manufacturers' Surplus New Goods at a Fraction of the Original Cost; all goods guaranteed perfect; carriage paid over 5/-, under 5/- postage 6d. extra. I.F.S. and abroad, carriage extra. Orders under 5/- cannot be sent C.O.D. Please send for Illustrated Catalogue, post free.

ELIMINATOR Kits, including transformer choke, Westinghouse metal rectifier, condensers, resistances, and diagram, 120v. 20 m.a., 20/-; trickle charger, 8/- extra: 150v. 30 milliamps, with 4v. 2-4 amps C.T., L.T., 25/-; trickle charger, 6/6 extra: 250v. 60 milliamps, with 4v. 3-5 amps. C.T., L.T., 10/-; 300v. 60 m.a., with 4v. 3-5 amps., 37/6; 200v. 50 m.a., with 4v. 3-5 amps. L.T., 27/6.

PREMIER Chokes, 40 milliamps, 25 hys., 4/-; 65 milliamps, 30 hys., 5/6; 150 milliamps, 30 hys., 10/6; 60 milliamps, 80 hys., 2,500 ohms, 5/6; 25 milliamps, 20 hys., 2/9.

PREMIER L.T. Charger Kits, consisting of Premier transformer and Westinghouse rectifier, input 200-250v. A.C., output 8v. ½ amp., 14/6; 8v. 1 amp., 17/6; 6v. 2 amp., 27/6; 30v. 1 amp., 37/6; 2v. ½ amp., 11/-.

EDISON BELL Double-Spring Gramophone Motors, complete with turntable and all fittings, a really sound job, 15/-.

SPECIAL OFFER. Kolster-Brandes (shop-soiled) 2-valve Battery Pup, with self-contained speaker, Valves and Batteries, 27/6.

RELIABLE Intervalve Transformers, 2/-; multi-ratio output transformers, 2/6; Microphone transformers, 50-1 and 100-1, 2/6; 1-1 or 2-1 Output Transformers. 2/6.

SPECIAL OFFER. Huge Purchase of 2-gang Screened Coils with switching, 4 separate bands covering 12 to 2,000 metres. Suitable for screened-grid-det. type receiver, 12/6. With circuit.

0-1 MILLIAMMETERS. Best British make, Bakelite cased, 2½ diameter, 18/6; 3½ diameter, 22/6; Westinghouse rectifier for same, 12/6 extra.

RELIABLE Canned Coils and Circuit accurately matched, dual-range, iron-cored, 2/11 each.

UTILITY 3-gang condensers, ·0005, fully screened, with trimmers, ball-bearing, straight or superhet, 6/9 complete; with illuminated disc drive, 7/11, the best 3-gang available.

U.S.A. Electrolytic Condensers, 4, 8, or 12 mfd., 550 volt peak working, 1/9.

SPECIAL OFFER. Complete stock of World-famous Continental Valve Manufacturer.

4-VOLT mains types, A.C.H.L., A.C.L., A.C.P. Directly-heated Pentode, H.F. Pentode, 4/6. 350-volt Rectifier, Indirectly-heated Pentode, 5/6.

2-VOLT Battery Types, H.F. Detector, L.F., 2/6. Power, Low consumption power, Super power, 2/9. Screen-grid, Variable-mu screened-grid, 5/-.

A LARGE Selection of Pedestal, table and radiogram cabinets, by best manufacturers, at a fraction of original cost. Send for list.

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Telephone: Macaulay 2188.
Nearest station: Clapham North, Underground.

SOUTHERN RADIO'S WIRELESS BARGAINS:

SPEAKERS.—Blue Spot Permanent Magnet Speakers. Universal Transformers for Power, Super-Power, Pentode, Class B. Brand new 1935 series. Type 99P.M., 30/-. 45 P.M., 24/-. 32 P.M., 45/-. All sealed cartons.

CONDENSERS.—Plessy Four-Gang Condensers with Oscillator Section for Superhet. Fully screened with trimmers, 7/3 each. Lotus 3-Gang 0·0005, 11/-; 2-Gang 0·0005, 7/3. All Lotus Condensers are Brand New. Fully Screened with trimmers, complete with Dials, escutcheons, etc.

COILS.—Igranic Superhet 4-Coil set (1 osc. 2 I.F. with pig tails and 1 I.F. plain), 9/- per set (List 50/-). Varley Constant Square Peak Coils B.P.5, with all accessories, 2/3. Telsen Twin-matched Coils: Type W.287, screened with switch, 7/9. (List 17/-). Triple-matched Screened Type W.288, with switch, 10/9. Telsen Twin Coil Unit. Type W.478, 12/6. Type W.477, 17/6. All Brand New and Boxed.

PICK-UPS.—Marconi Model K.25, 21/- (List 32/6).

STOCK-TAKING PARCELS.—We have gathered at our Mail Order Dept. a large quantity of odd lines from our branches. It is impossible to list these articles individually. We are offering them in lots at 5/- per parcel. Each parcel contains components to the value of at least 20/-, and include Switches, Fixed Condensers, Transformers, Resistances, Coils, etc., etc. Every article is of present-day use in Radio. Telsen and Ready Radio Circuits numbering 10 different circuits are included in each parcel, 5/- per parcel.

THOUSANDS OF BARGAINS AT OUR VARIOUS BRANCHES.—All goods guaranteed and sent post paid. Branches at 46, Lisle Street, W.C.2; 271-275, High Road, Willesden Green, N.W.10. All Mail Orders to: 323, Euston Road, London, N.W.1.

SOUTHERN RADIO, 323, Euston Road, London, N.W.1. Near Warren Street Tube. 'Phone: Museum 6324.

SPOT CASH for Components, Sets, &c.—Economic Radio, 96/98, South Lambeth Road, S.W.8.

OLYMPIA MAIL ORDER SERVICE

RADIO'S BIGGEST BARGAINS.

All Goods offered are guaranteed unused. In Maker's original carton and in perfect condition, and naturally carry our Money-back or satisfaction guarantee.

TELSEN RECEIVERS: 1935 6-Valve A.C. Superhet Receiver. All the latest improvements embodied. List price 14 Guineas. Our price 10 Guineas.

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TELSEN All-Electric A.C. Superhet Radiogram. Model 3550/R.G. This superb Instrument is only available to the limited few who make early application. List price 24 Guineas. Ours 16 Guineas.

CLOCK-FACE Tuning Dial. The most handsome Tuning Dial manufactured. Mother-of-Pearl Scale. Chromium Escutcheon size 5 ins. x 4 ins. List price 15/6d. Our price 8/6d.

ATLAS P.M. Moving-Coil Speaker. Suitable for Power, Pentode or Push-Pull. List price 42/-. Special price 12/11d. Early application for this astonishing bargain recommended, as stocks are rapidly becoming exhausted.

TELSEN COILS: Single-Screened Iron-Cored Coils. Suitable for Aerial or Anode (List 8/6d.), 4/6d. Iron-Cored Scd. Twin-Ganged Coil Unit. Suitable for all circuits (List 19/6d.), 12/6d. Iron-Cored Triple-Ganged Coil Unit (List 30/-), 21/6d. Triple Scd. Iron-Cored Coil Unit Superhet Type (List 30/-), 21/6d. Dual-Range Aerial Coil. List No. 76 with selectivity device (List 7/6d.), 4/-. H.F. Aerial Transf. Coil. List W 154 (List 5/6d.), 3/11d.

TELSEN COMPONENTS. Bakelite Tuning Conds. ·0005 (List 2/6d.), 1/6d. Scd. Binoc. All-wave H.F. Choke (List 5/6d.), 3/6d. Standard Scd. H.F. Choke (List 3/6d.), 2/3d. 4-pt. Switches (List 1/6d.), 9d. Ace Transf. 3-1 or 5-1 (List 5/6d.), 2/11d. Class B Output Transf. (List 10/6d.), 3/6d. Class B Driver Transf. 1·5-1 or 1-1 (List 10/6d.), 3/3d.

BRITISH RADIOPHONE. Latest Shielded type ·0005 3-Ganged Cond., each section fitted with trimmers (List price 15/6d.). Our price 7/6d.

LOTUS P.M. Moving Coil Speakers. Output Transf. having 10 ratios. Suitable for any type of output Valve (List 27/6d.). Our price 15/9d.

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TERMS.—Cash with Order or C.O.D.

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BIRMINGHAM RADIOMART,

SPECIALISTS IN SHORT-WAVE AND QUALITY COMPONENTS AT LOWEST PRICES.

Our stock is much too large to itemise here: From a soldering tag to a superhet we can supply everything, and what is more you won't be "Caught"! Send 1½d. stamp for our latest **MARCH CATALOGUE.** No firm has larger stocks or is cheaper than

THE SQUARE DEALERS,

BIRMINGHAM RADIOMART,
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DEGALLIERS, the firm for ultra short-wave receivers. **EVERY** Set in Sealed Carton, no rejects; under British guarantee, money refunded if dissatisfied; no misrepresentation of wavelengths; all short-wave receivers guaranteed to get the Americas, Australia, etc. We stock every type of set to suit every pocket, ranging from midget superhets (note, these are not T.R.F. and therefore infinitely more selective); 190-550, 1,000-2,000 at £4/5/0, to a De Luxe table model at £25, spanning the world in four wavebands. **SEND** Stamped Envelope for Beautifully Illustrated List; callers welcomed at any time; every article marked in plain figures.

DEGALLIERS MOTOR and RADIO SUPPLY CO., 20, Polygon Mews South, Porchester Place, Edgware Rd., Marble Arch, London, W.2. Paddington 2745.

THE following unused Set Manufacturers' Surplus: all goods guaranteed perfect; immediate delivery.

ERIE resistors, 1-watt type, 7d.; 2-watt type, 1/2. Marconi K19 pick-ups, 22/6.

WESTINGHOUSE rectifiers, HT8, 9/6; HT9, HT10, LT4, LT5, 11/-. Regentone transformers for HT8 or HT9 with 4-v.-4a. L.T. winding, 7/6.

MAINS transformers, 350-0-350v., 60 m.a., 4v.-4a., 4v.-2a., 12/6. Eliminators, outputs, 150v., 25 m.a., S.G. and detector. A.C. type with Westinghouse rectifiers, 25/-. D.C. type, 12/6. Collaro gramophone motors, 100-250v. A.C., 34/-.

ROTOROHM volume controls with switch, 2/6. B.T.H. pick-up tone arms, 3/-.

MAGNAVOX speakers, complete with humbucking coils, output transformers, etc., 152 (9-in. cone), 22/6; 154 (7-in. cone), 15/9. All with 2,500 or 6,500 ohm fields. Magnavox PM254, 18/-. Carriage paid, cash with order or C.O.D.

WE can supply complete Kits of specified components for the A.C. S.T.600 at a competitive price.

WARD, 46, Farringdon Street, London, E.C.4. Telephone: Holborn 9703.

Masterpiece Library of Short Stories 5

Printed in Great Britain and published every Wednesday by the Proprietors, THE AMALGAMATED PRESS, LTD., The Fleetway House, Farringdon Street, London, E.C.4. Advertisement Offices: John Carpenter House, John Carpenter Street, London, E.C.4. Registered for transmission by Canadian Magazine Post. Subscription Rates: Inland and Canada, 17/4 per annum. Abroad (except Canada), 19/6 per annum. Sole Agents for Australia and New Zealand: Messrs. Gordon & Gotch, Ltd.; and for South Africa: Central News Agency, Ltd. Saturday, April 13th, 1935.

S.S.

Please be sure to mention "Popular Wireless" when communicating with Advertisers. THANKS!

POPULAR WIRELESS, April 20th, 1935. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

SOME INTERESTING NEW VALVES (SEE PAGE 174)

Popular Wireless

AND TELEVISION TIMES

TIDYING UP THE REGIONAL SCHEME
★ ★
BARRY KENT CALLING
★ ★
WITH THE EXPERIMENTER
ETC., ETC.

EVERY WEDNESDAY PRICE 3D

No. 672.
Vol. XXVII.
April 20th, 1935.

TOURING EUROPE ON THE SILVER KING

POPULAR WIRELESS AND TELEVISION TIMES

MANAGING EDITOR: N. F. EDWARDS. TECHNICAL EDITOR: G. V. DOWDING ASSOC. I.E.E

"CHASE THE ACE"
"SENT-TO-RUIN"
DEUTSCHLAND
MORE TELEVISION

RADIO NOTES & NEWS

COLOURLESS SPEECH
RADIO FAN MAIL
BROADCAST HOWLERS
THOSE TEA-THINGS

News from Overseas.

POSSESSING a keen sense of humour, as well as a good long-distance set, F. L., of Oxford, has been having a game which he calls a "kind of radio 'Chase the Ace.'"

His idea is to wait until some British name comes prominently into the news, and then chase it in foreign news bulletins. And he gets some amusing results!

Sir John Simon and Mr. Eden were meat and drink to F. L. They turned up, he says, as "Sir Simon John," "Sir Simon," "Sir John Simmon" and "Lord Eden," among other aliases.

Very frivolous, all this, for a Man of Oxenford. But I pass it on because F. L. says you'll love it if you know your European announcers.

H.M.S. Centurion.

THE good ship Centurion, fleet target ship and radio robot, is in the news again. She is surely the strangest vessel in the Navy, for her gun turrets have all gone, and during firing exercises the stately old battleship steams about and steers without a soul on board, directed only by wireless from a specially equipped destroyer.

Naval ratings on other vessels are always sympathetic to the men of the Centurion, because it is no joke to have to abandon your floating home at short notice while other monsters of the deep shoot at it!

Marine humorists have aptly rechristened the old battleship "Sent-to-ruin"; but despite all efforts to sink her the Centurion still refuses to fulfil the prophecy.

Speak Easy.

WHEN I am told that the Speke Aerodrome, Liverpool, is to be equipped with the latest wireless-approach beacon I am naturally interested. For this type of beacon lays down an invisible pathway for aircraft, so that an aeroplane approaching in fog or mist can be kept on its correct course by radio.

Speke Aerodrome is to work on 820 and 900 metres; and it is still more interesting to know that Speke will be able to speak. A natty refinement permits the main beacon to be used for telegraphic or telephonic communication in emergencies. A good idea, this, highly approved by the sky pilots.

Radio Coincidences.

NO doubt you have heard some queer radio coincidences in your time. Can you beat this one, reported by Mr. A. E. Rose, of Breedon Street, Long Eaton?

He says:

"Sunday afternoon, March 17th, I was listening on the short waves to a religious sermon from Pittsburg, U.S.A. (15,210 kc.), with selectivity at nil, the unmodulated carrier-wave from Zeeson (15,200 kc.) being heard in the background.

"The American preacher had just said: '. . . and a voice coming from heaven shall be heard, saying . . .' when immediately, at terrific strength, a powerful voice bawled out in German: 'Attention! Attention! Here is Deutschland!'

"A new land of the chosen? Or Hitler achieved a crown?"

VERY ATTRACTIVE

This is the Cossor Radiogram Model 536, costing only 16 guineas. It is an all-electric receiver for A.C. mains, has a mains-energised moving-coil speaker and super-selective iron-cored coils on the H.F. side.

Seven Millions!

AS I write, somewhere a voice is calling for a wireless licence; and when the P.O. clerk has handed it over in exchange for the customary "half a bar" the total number of such licences in force in this country will have reached the seven-million mark.

Seven millions! Perhaps the papers will have announced it by the time this number of "P.W." graces the bookstalls. And if so I invite you to ponder on that very comfortable figure, 7,000,000.

Between us we listeners will then find £3,500,000 *per annum*—getting on for £10,000 a day, Sundays, week-days, Shrove Tuesdays and all. Every time the licence figures are announced by the P.O. I wonder how ever we find the money. Financial heroes, that's what we are.

Television Renaissance.

WHEN Herr Hadamovsky, Director-General of German broadcasting, opened the world's first high-definition television service on March 22nd he stirred up development all round. In Rome it was decided to reopen the experimental station that had closed last year and carry on with researches at Turin. In Helsinki it is hoped to start up a service in the autumn, and a Soviet engineer is claiming to have discovered a very promising system for the U.S.S.R. Yes, things seem to be moving.

Radio Queen.

QUEENSLAND is claiming the youngest licensed wireless operator in the British Empire in the person of Miss Madeline Mackenzie.

Madeline lives at Wynnum, near Brisbane, and she celebrated her twelfth birthday by swatting up the Morse code and the theory and practice of short-wave wireless.

When she went up for the amateur operator's efficiency ticket she sailed through the tests, getting 98 per cent full marks for sending and 96 per cent for receiving. She proved she could accept distress messages and knew the general rules for procedure in handling messages over the air as well as anybody.

So Madeline now has her very own transmitting station, and if you hear it, under the call sign V K 4 Y L, raise your hat to the little radio queen of Queensland.

(*Continued on next page.*)

INTERFERENCE CAUSED BY AN ANNOUNCER'S SHIRT

Talk on Talk.

THE many admirers of S. P. B. Mais would have liked to hear him debating recently with a professor of Columbia University on the speaking of American-English. Broadcast in the States by the N.B.C., the debate contained some lively passages, for "S. P. B." is apt to say what he thinks and surprise people.

He certainly surprised the Americans when he said to them: "I find myself going to the movies, not because I expect to find any æsthetic entertainment in the show, but solely, *solely* as a change from the minced, slipshod, colourless speech of my own countrymen. . . . That is why, night after night, I go, not to gaze on the face of Myrna Loy (though that's pretty good), but to hear her speak and to listen to the wisecracks of William Powell."

You can trust Mais to find a new angle on any subject, and I thank him for this fine excuse to go and renew my screen acquaintance with Myrna Loy.

Radio and Politics.

THAT broadcasting is a political force to be reckoned with is the firm belief of President Roosevelt. He proved it, to his cost, when Father Coughlin broadcast a talk that brought over 70,000 adverse telegrams to U.S. senators, resulting in a defeat of the presidentially approved measure to support American participation in a world Court.

Father Coughlin is a chain broadcaster who was unknown ten years ago, but is now a power in the land. He pays about £2,800 weekly for time on the air, and his postbag is the heaviest of any individual in the U.S.A.

He keeps a staff of 145 typists busy, for as many as 1,250,000 letters have resulted from a single broadcast!

His wireless listeners are never asked for funds, but their voluntary aid has enabled him to build a new church costing £200,000.

Radio Station Given Away.

REVERTING to my recent note on "Radio Marconi"—a station named as a graceful compliment—a correspondent wants to know whether there is a record of any fully fledged broadcasting station ever having been "presented, not only in name, but in fact, to a celebrity."

My hat! What a question!

Determined not to be caught on the hop by this, I turned up my files and found that a perfectly good 3-kw. broadcasting station was presented to the Queen of Bulgaria by the City of Rome, back in 1933.

Don't ask me the wavelength or the name of the announcer, because I don't know them. I consider that I have now done my duty in discovering that at least one station has, like a blushing bride, been given away.

Good News for W.O.'s.

IT was good news to hear from W. S., who is a senior wireless operator on a liner, that the 1932 reduction in pay of wireless men at sea has been partially restored.

The agreement reached provides for a quarter of the pay cut then imposed to be cancelled. And the salary figures quoted by W. S. make me hope that it will not be too long before shipping bucks up and the other three-quarters of the reduction in pay can be restored.

However amusing wireless may be as a hobby, it is a hard profession to follow, with long hours and heavy responsibilities.

NEW B.B.C. FEATURE

The B.B.C. announces the introduction of a new Light Entertainment feature on May 7th called the "Red Sarafan." This feature will be Russian, and an entirely new orchestra is being formed under the direction of Emilio Colombo, formerly court violinist to the late Tsar of Russia. Before the war Emilio Colombo was a leading figure in the entertainment world of St. Petersburg.

* * *

Russian gipsy music is entirely different from the music of the Hungarian and Rumanian gipsies. Years ago in Russia, before the theatre, the opera and the ballet existed in an organised form, Russians looked to the gipsies for their entertainment. The Russian gipsies hailed from Bessarabia, which, previous to the war, was part of Russia. As far as St. Petersburg was concerned, they settled in the Isles of Neva, and by their skill created a musical and theatrical tradition which eventually gave rise to the Russian theatre, opera and ballet.

* * *

A small Cossack choir will support the orchestra, and various Russian artists will from time to time pass through the "Red Sarafan." As far as possible the atmosphere will be reminiscent of a fashionable restaurant in the St. Petersburg pre-war days. The feature, which will be in the programme approximately every three weeks, will be directed by the Marquis Vivien de Chateaubrun.

Let us pause to salute our friends afloat, to wish them well and to thank them for keeping off our wavelengths so much better nowadays.

Critical Appreciation.

STEPPING aside from formality at a dinner of the Critics' Circle in London, Mr. Stuart Hibberd, the Chief Announcer of the B.B.C., recently recalled some amusing microphone slips.

On one occasion an announcer, reporting the havoc created by an eruption of Vesuvius, made the surprising statement that the sides of the mountain were covered with streams of lager.

Another slip occurred when the motor-cycles and sidecars used by mobile police were changed for small two-seaters. When imparting this news to the public the announcer stated airily: "The police are changing their combinations this winter."

What's that Crackle?

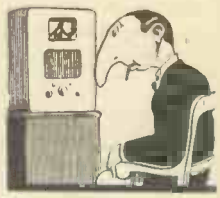
ENGINEERS in the control-room often have their little worries, of which we listeners know nothing. Here's a true story of a problem of crackles.

These particular crackles began when the announcer was reading the first news. The control engineer, hastily checking this and that, decided that the crackles must be originating at the microphone; so he doffed his phones, stole down to the studio and investigated. Nothing wrong there—just the chief announcer quietly reading the news.

Back in the control-room, the engineer listened again, and suddenly the same queer crackles returned. This would never do, of course; so down to the studio once more goes the engineer, and this time he spotted the cause. It was the announcer's gleaming evening-dress shirt-front! And solemnly the entry was made in the official log: Date, time and "News Bulletin: Interference caused by announcer's shirt."

Look You!

IN an incautious moment I asked not long ago for suggestions to describe one who looks in to television and the apparatus employed. Every post since has brought me shudders!



I have absolutely refused to consider "Telephant"; but one chap wants me to back "Ingazer," and another suggests that "Telspector" would be a good word.

"Radi-ogler" is another dreadful label proposed in all seriousness; while yet another correspondent considers that for a really snappy and popular term we ought to select "Audobserver."

If television does not rise superior to these suggested names it will be gruesome entertainment indeed.

Radio Reporting.

LET us all wish Mr. Eric Maschwitz success on his trip to Budapest. He is going to try to arrange for on-the-spot sound pictures to be transmitted to this country, with the idea of taking listeners on vivid acoustic visits, first to Budapest and then to other famous cities.

This is a promising line, but nothing prearranged will ever be so good as those occasional accidental broadcasts that sometimes slip through.

Did you hear the voice on the Regional some weeks ago, for example? Right in the middle of some music somebody exclaimed: "*There are a lot of tea-cups and things all over the place down here. They ought to be cleared up. I suppose they belong to Mr. Fletcher.*"

It might be difficult, but it would be highly interesting to hear more of life's "Mr. Fletchers" placed on the air by accident.

ARIEL.

TOURING EUROPE on the SILVER KING

By K. D. ROGERS.

Marvellous results in the way of station getting are possible with this unique dual-channel receiver if it is handled and adjusted properly. Here we tell you some more about the operating of the set, with directions for trimming and the best use of the controls on the broadcast side. Elsewhere in this issue the short-wave section is discussed.

WELL, how did you get on last week? I expect you found a good many stations on your "Silver King," although the set was not properly trimmed. Or perhaps you trimmed it up without waiting for our directions this week.

Anyhow, if you did trim it, it will be advisable for you to check up by reading the following article; and if you did not trim, here are the details that will tell you how to do so.

Elsewhere in this issue you will be told how to go about the handling of the short-wave side of the "Silver King," but here we are going to limit ourselves to the broadcast reception aspect of the set.

If you had two sets of hands and two sets of ears you could practise on both sides of the set at once, checking the trimming of the broadcast side and listening for short-wavers on the other; or, lacking these physiological extras, you could call in a radio-minded friend to work on one side while you dealt with the other, something after the style of the various photographs which illustrate these articles.

Each Section Isolated.

In these you can see the "Silver King" being tested under dual conditions, both broadcast and short-wave sections being operated at once on the same aerial; and it is a fact that all sorts of adjustments on one side can be carried out without upsetting the operation of the other. It is most uncanny how isolated each section of the receiver is from the other, even though both are in action together.

Without two sets of ears and hands, and without calling in a friend to help, we must perforce test one side of the set at a time, so here's to the broadcast section. You were told last week how to connect up the set, batteries (and mains unit, if you use one), loudspeaker, aerial and earth, so we will take it that you have all these things connected and the set is ready in its cabinet for the test.

The first thing to do is to trim the variable condenser, and this is a particularly easy task. There is one internal trimmer, the wheel at the back of the condenser, and one external one, the concentric knob on the condenser tuning control.

Set this latter at a midway point—that is, half-way round from the almost full turn to the left or right. Then, with a piece of wood, preferably sharpened like a broad screwdriver, turn the wheel at the back of the condenser fully to the right (that is, turn it clockwise, looking from the front of the set), and then turn it the other way about a turn.

Now you can switch on the set and listen for a station or two. You will probably find the medium-wave local stations are easiest to tune in, but remember that for this you want to have the volume-control knob turned fully to the right.

When you have found the local (by the way, the medium position on the wave-change knob is with the knob turned to the right—that is, with the spot on the knob at "two o'clock), try tuning down lower on the scale to see if you can find a station with constant strength (not fading) at about 20 degrees or even lower.

If you can, and if the station is a strong one, move on to a weaker one. Then, with the weak station tuned in, we can commence trimming operations. If you cannot find a constant station that is weak use a strong one and turn the volume control "down."

All this time the centre knob on the tuning of the set is left set at its middle position. Keep it so adjusted and commence to turn the wheel at the back of the condenser to the right (clockwise, looking from the front) very slowly, readjusting to get the loudest results on the condenser tuning as you do so.

The Peak Point.

You should reach a point where any movement of the wheel will reduce the strength of the station, and then you will have reached a peak point in the tuning. Now increase reaction and retrim, when you will find the peak point is even more sharply marked.

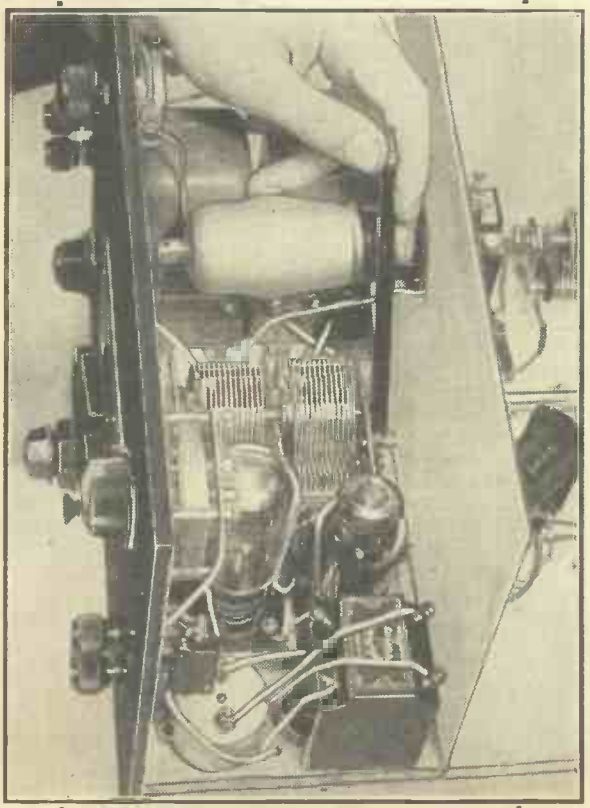
At this point you should just give a test to the concentric-knob trimmer on the panel, and you will find that this cannot be moved either one way or the other without upsetting the tuning and making the strength less.

You are now in trim on that one station, and you should check up your trimming on another station further up the dial. Tune in the station you choose, and we should choose a weak one that requires some reaction. Then you will find that the best point of strength is one that will give you a setting on the concentric knob somewhere near the middle-point adjustment.

In other words, you will be able to "trim the station in" on the concentric

(*Continued on next page.*)

THE REAR TRIMMER



CORRECT ADJUSTMENT IS ESSENTIAL if the receiver is to give the extremely high performance for which it was designed, and care must be taken that the trimming of the variable condenser on the broadcast side is properly carried out. The photograph shows the position of the rear trimming wheel, which has to be rotated while the set is in operation by means of a length of wooden rod, preferably shaped at one end like a screwdriver blade. Remember that the wheel "screws up" to *decrease* trimming capacity, unlike most condenser designs which demand a right-handed screw action to increase the capacity of the trimmers.

TOURING EUROPE ON THE SILVER KING

(*Continued from previous page.*)

knob and so adjust it for maximum strength that you have "play" on either side of the best position. Turning the panel trimmer in either direction from this point will decrease the strength. If you find that the best strength is obtained with the panel trimmer hard over to one side or the other you have not got the set properly trimmed and should start the process over again.

The trimming knob in the centre of the tuning knob will be found to be quite sharp in its action on tuning, and when searching for a station should always be set in the centre of its path of control. Then, when the station has been tuned in to the best effect, the concentric knob is adjusted to bring the last ounce out of the reception.

That is all there is to the trimming of the "Silver King." It is absurdly easy, and just to get the feel of things tune up and down the medium and long wave-bands from zero to maximum and back again. Don't worry about identifying any of the stations; just have a rapid tour round to get the feel of the set, remembering about that last touch up on the trimmer on the panel.

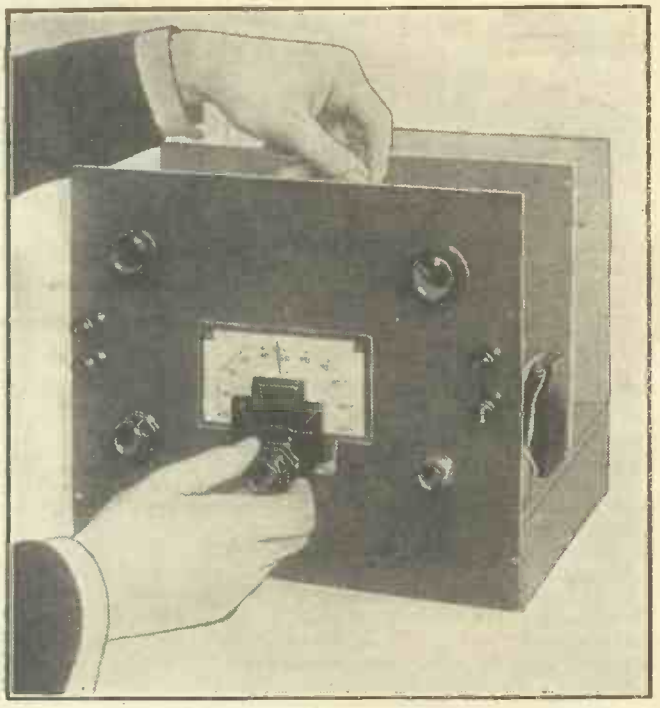
H.T. Voltages.

Got all that right? Good. Now let us see if we have the voltages on the H.T. absolutely at their best. The H.T. + 4 and H.T. + 1 voltage taps are not critical. The former is for the V1, V2 and V3 valves, and should be quite high. H.T. + 1 tap does not concern us now, for it is a short-wave adjustment. So all we have to worry about is the H.T. + 2 and H.T. + 3.

Start off at the voltages mentioned last week, and move them up and down slightly till you get best results. Do this test on a weak station, and expect to find that the H.T. + 3 tap is the one that show the most alteration in strength for change in voltage.

If you use the mains unit you will find this adjustment particularly easy, for it is done by means of the appropriate potentiometer knobs on the panel of the unit.

A word here might be said about those who wish to use a large output valve to get the greatest power possible for their loud-speaker reproduction of the locals, and who do not want to, or cannot, use the mains unit. A big output valve will run away with a fair amount of H.T. current, and users of one will be advised to incorporate an economiser unit in the set in some convenient place (on the side of the cabinet, for instance).



CHECKING THE TUNING.

How to test the trimming by rocking the centre knob of the variable condenser to see if the tuning peak comes in the middle of the trimmer's travel.

Such an economiser as the Benjamin "Autocontrola" will do very well, and the makers give instructions for fitting it that are easy to understand.

This does not really affect the *operation* of the set, except that it will necessitate the alteration of the grid-bias setting for G.B.—2, and this will have to be increased to the maximum possible consistent with satisfactory results.

On-Off Switch Positions.

You can add an economiser with the small type of output valve if you wish, thereby reducing the anode current below even the low figure of 8 milliamps.

Remember that for the reception of short waves only—that is, no broadcasting—the on-off switch on the right of the broadcast panel has to be used, and the other switch can be left pushed in. For broadcasting *both* switches must be out.

As we are concerned only with the broadcast side of the set we must have both switches out all the time we are listening.

Reaction (top right-hand knob) will not be necessary for a large number of stations, but when searching it is a good plan to keep just a little reaction in, to help in the picking up of distant transmissions. When they are found a little more reaction can be added if desired, or, conversely, the reaction can be reduced.

Always keep the volume control hard over to the right when touring Europe in search of radio fare, the volume being reduced if it is found that the station is too loud.

In this volume control is also to be found another very useful aid to reception besides the control of strength. This is selectivity. Not that the volume control by itself can provide greater or less selectivity, but its use in conjunction with the reaction can make a very great difference to the ease with which stations can be separated.

If you encounter a fairly strong station that is interfered with by another station try the effect of cutting down the strength of the desired station by means of the volume control and bringing it up again with the reaction. This will enable you to get very much sharper tuning, and at the same time will not cause overloading, as would the use of reaction on a strong input to the set.

An Aid to Selectivity.

Most people do not use reaction enough for the provision of selectivity, and by not so doing miss a very great deal of the possibilities of which modern well-designed sets are capable.

The "Silver King" is a set that is designed to give as easy a handling as possible consistent with good results, and it forms a good example of the type of set where reaction should be pressed into service in the quest for the utmost selectivity when conditions are difficult.

Such use of reaction is definitely not an acknowledgment of any failure or lack of the provision of adequate selectivity in the set. Reaction is incorporated to be *used*, not merely as an ornament to balance the

(*Continued on page* 182.)

TWO-CHANNEL SEARCHING

This picture illustrates an interesting characteristic of the "Silver King." The listener on the left is searching the European ether on the medium waves, while the listener on the right tours the world on short waves.

With the EXPERIMENTER

"GET ON THE PHONE"

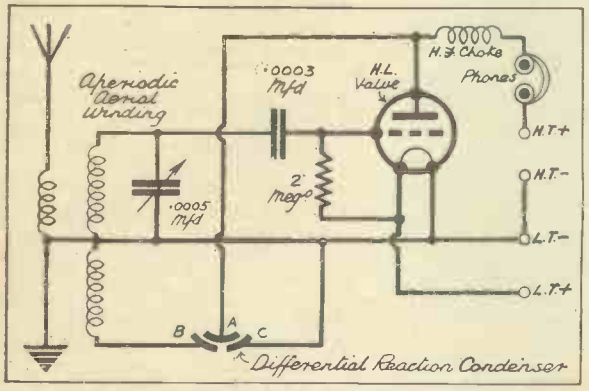
"THE trouble with you chaps is, of course, you're utterly spoilt," I sighed, as my "gang" regaled themselves with cheese biscuits, old ale and the latest automatic record changer sent down to me for test.

"How come, Rastus?" burbled the irrepressible Bill, winking at the others—and I sensed a baiting. At which I reminded them, not without a certain smug satisfaction, of the "good old days" when I used to sit with headphones glued to my head for the faint sound of Morse time signals from Nauen in Germany.

"The ether seemed, in those days, to be filled with magic. Every sound was a thrill. Every faint rustling a premonition of greater thrills to come. It would do you chaps good to listen for a bit on a pair of headphones, instead of coming round here playing interminable gramophone records on the automatic changer."

That did it. The challenge was taken up. Bunny, of all people, decided to make a one-valver and listen on phones. Which meant I had to draw out a circuit and help assemble the bits and pieces.

A SIMPLE SINGLE-VALVER



This is the circuit referred to by "The Experimenter." It is a straightforward single-valve arrangement, and the differential condenser has been lettered A, B and C for purposes of explanation.

"Bits" from the Junk Box.

It was quite an amusing business, as a matter of fact. Especially as I decided I would make use only of such bits and pieces as I could find in and around the junk box.

I am going to draw a veil over the ensuing hour or two. It is surprising what a lot of things can go wrong even with a one-valver. Everything went wrong with this one. Nor was I helped by the ribaldry of my intended converts.

The diagram shows the main outline of the circuit. I have not bothered to show the dual-range arrangement—it was simply a two-point shorting switch for the larger part of the winding. A small iron-core coil was used, with an aperiodic aerial winding for added selectivity.

My first trouble was squawky reaction. It worked well enough on the medium waves but horribly badly on the long. I suspected the little screened high-frequency choke of not "doing its stuff," but even a big hefty choke in its place did not help.

Then I realised I had forgotten something I am always telling others about. I had put the choke in the anode lead to divert the high-frequency part of the anode current through the reaction winding—but I had not provided any alternative path for this current to leak to earth when the reaction was at low settings.

The Differential Condenser.

That is why I put in the differential condenser you now see in the diagram. "It gives us a constant high-frequency by-pass to earth," I explained to Bunny, who was watching me, but he looked rather blank.

So I just lettered the three parts of the differential condenser: B and C for the two sets of fixed plates; A for the common moving plates. I explained that, at the anode of the detector valve, we had a high-frequency current stopped from going on into the phones by the high-frequency choke. These currents were eager to get somewhere—and I wanted them either to produce reaction or to scuttle to earth at low-reaction settings, out of harm's way.

When I wanted reaction these currents would go from A to B and so to earth through the reaction winding. When, on the other hand, reaction was not needed A would be moved away from B, so there would be no path to earth that way.

At the same time, though, A would be moving towards C—in fact, the moving plates would enmesh with the C fixed plates to exactly the same extent they unmeshed with fixed plates B. But C was connected directly to earth, so that there was a clear A to C path to earth every time reaction was reduced.

Anyway, quite apart from the theory of the thing, it worked. With the differential in circuit all sign of squawk on long waves vanished. It was then I had a chance to see whether the sensitivity was up to scratch. I thought not. Stations seemed thin, lacking in any pretence at "body."

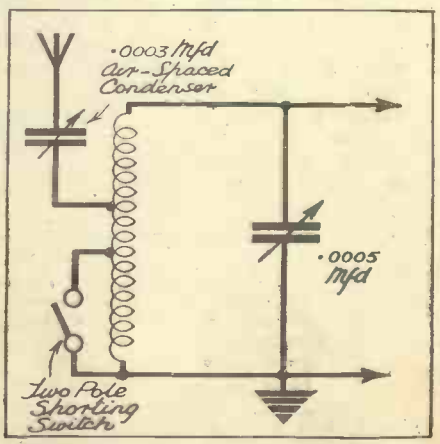
I suspected my aerial circuit, my detector valve, my phones. Having tried five different valves, I came to the conclusion they made incredibly little difference—so I stuck to a good old H.L. type. As for the phones, they were only moderately good. This we proved by a decided step-up in volume when we "borrowed" a brand-new pair from Bob's stores.

Improving the Aerial Circuit.

That left the aerial circuit still under suspicion. I had a feeling the circuit was a bit too selective. Certainly there was no interference between even the high-power foreigners. The coil was a diminutive affair in a small aluminium can. What I did not like was the aperiodic winding. I had a feeling that, for a one-valver, it was far from ideal.

One of the snags about dual-range coils—if you intend to stick to a simple make-and-break switch external to the coil, I mean—is that the aerial coupling changes as you go from one range to another. An aperiodic right for medium is wrong for long.

USING A DIRECT TAP



In this scheme the aerial is tapped directly on to the tuned winding, the series aerial condenser providing the necessary control of selectivity.

Similarly, a tap on the coil giving good selectivity on medium will be rather poor for the long.

As a compromise—for a one-valver, anyway—I have found that it is hard to beat a tapped coil with a series ·0003-microfarad air-spaced variable condenser. The smaller diagram shows the idea.

(*Continued on page* 188.)

BARRY KENT CALLING

Broadcasting News & Views

Good News in the West.

THE Welsh are winning. That is the good news for Easter. What Sir John Reith has told the Welsh M.P.'s means the end of the combined West Region of the B.B.C. There are to be two equal headquarters—for Wales at Cardiff; for the West Country at Bristol.

There will be Welsh announcers and a Welsh-speaking programme director at Cardiff. This news will be equally welcome in Devon and Cornwall, which have complained of an overdose of Welsh in their Regional material.

* * *

Sir John's Holiday.

Sir John Reith has gone on holiday, his first for ten years. All the periods of absence in this time which were called holidays were really occasions of specially concentrated work. When Sir John returns he will tackle the big reorganisation problem entailed by the departure of Col. Dawnay in the autumn.

Admiral Sir Charles Carpendale is beginning to yearn for the rest to which his service now entitles him, so the Director-General will soon have to replace his two senior subordinates. Competition for the jobs is naturally keen.

* * *

Morning Programmes.

During the big week of Jubilee celebrations, May 6th to 12th, the B.B.C. will radiate programmes from 9.30 in the morning for the purpose of entertaining the crowds in the streets who will listen to public-address distribution. But this is the real thin edge of the wedge of early morning programmes.

I prophesy that the public reaction to these programmes will be so definite that the B.B.C. will find reasons for starting an early morning programme service earlier than late autumn, which is the present plan.

* * *

Practical Jokes with Ventilators.

The ventilation system of the B.B.C. provides conditioned air throughout the tower studios—or is supposed to! But lately some artists have been having fun disconnecting the thermostats. One rehearsal had to be abandoned from threatened suffocation! An inquiry has been ordered.

* * *

"Arrangements" of Old Music.

When I was in the Music Department at Broadcasting House the other day I heard an interesting account of a problem which is unusually hard to solve. This concerns the proper rendering of old music. It has been complained that under some of the broadcasting "arrangements" old music is being given with the wrong instruments.

The answer is that this is sometimes the only way to make the old music acceptable to modern listeners. The struggle is violently engaged!

* * *

"200 Years of Downing Street."

One of the peaks of B.B.C. effort in June will be a feature programme attempting a word picture of the famous "No. 10" since it became the official residence of the Prime Ministers of England. Disraeli, Gladstone and both Pitts will be characterised.

* * *

Another Empire Drive.

The B.B.C. has decided to erect new transmitting apparatus for the short-wave Empire service. These plans have been kept very hush-hush, but there is no harm now in mentioning them, because they are well ahead. The effect will be to give Britain a much bigger lead then she now enjoys in the world battle of the short waves.

I wish they would buck up the programmes also. The material is there, but it is not put over with enough snap and zest. They want some more he-men from the wide-open spaces in the Empire department of the B.B.C.

* * *

Those Stairs Again.

Some months ago an office boy slipped and injured his arm on the stairs at Broadcasting House. Then measures were taken so to treat the surface of the steps as to make accidents of the kind less likely. But I saw with my own eyes two senior officials land unceremoniously the other day, despite the precautions. Both took their fall with characteristic good humour.

* * *

The B.B.C. Restaurant.

Apparently the B.B.C. restaurant is not as popular as it was. Anyway, Mr. Norman, the Vice-Chairman of the Governors, doesn't think much of it. The criticism is not of the food or service, but rather of the stuffiness and unattractiveness of the room itself. I hear that as a result of Mr. Norman's views the restaurant will be moved before long to one of the new houses being reconstructed in Portland Place.

* * *

Private Affairs of Staff.

There was a time—and not so long ago, either—when the management of the B.B.C. considered it had responsibility for the private morals and views of its staff. This led to a lot of awkward inquisition and was deeply resented. Recently there has been a marked change, and rumour associates Lord Bridgeman, the new Chairman, with the change.

I gather that now a member of the B.B.C. staff can do and think pretty much as he likes outside the office, provided he avoids public scandal. This does not necessarily mean an outburst of announcers' carousals or night-club parties of broadcasting executives and pundits!

HEARD OVER THE AIR

GEORGE BARCLAY, the vocalist whom you will have heard singing with Charlie Kunz's popular Casani Club dance orchestra.

THE NEW TALKS

"The Series is going to be good," says our Broadcasting Critic.

I FIND it very interesting dipping into the list of the new series of talks now begun. The preliminary notices of these and their titles didn't sound so attractive as usual; but the proof of the pudding is in the eating. In a week or two we shall be able to give a verdict, and I anticipate a favourable one.

* * *

The scientists who gave that excellent series last session called "Science in the Making" are here again in a new series, which I am bound to say sounds the most attractive of the lot. I always thought "Science in the Making" was an unfortunate title. It had a frightening ring about it, and I am sure that listeners were scared of it. What they lost through their fears!

"Filming Plants and Animals" (this session's title) is a fascinating title. Up to the time of writing Julian Huxley has given the introductory talk. It confirmed my opinion that the series was going to be good. It is. Julian Huxley had a lot of interesting things to say about nature films and filming—the technical difficulties and the mistaken conceptions of nature filming, the recording of impressions of the naturalist, the writer and the photographer, the dissimilarity of these recordings and the educational value of the nature film.

He finished by making a plea and offering a suggestion for a better distribution of these films, and for better opportunities for the public to see them. Altogether an excellent talk, and I look forward to the rest with pleasure.

* * *

"Freedom," too, sounds attractive. Sir Ernest Benn, who opened the series, was emphatic about the abject slavery of the individual to-day, and the facilities enjoyed by the politicians to impose fresh restraints almost *ad lib.* That was, he said, the one charge he had to make against modern politics.

Sir Ernest, in the course of his brilliant talk, said things that should provide a whole column of "Sayings of the Week." What about this for an example? "There is no economic liberty, except the liberty to starve." The speaker made out a very strong case for freedom. His argument was convincing.

(*Continued on page* 185.)

ON THE SHORT WAVES

Conducted by W.L.S.

THE amateur transmitter has always been a friend of mine, and I'm delighted to see him making such good use of his time lately. There is more evidence of real experimental work than there has been for many moons. In this country most of the real work may be divided under two heads—problems connected with telephony transmission and ultra-short waves.

In between these two headings I suppose a certain amount of useful work *is* being done by the DX fiends, but I think it's mostly confined to the collection of Q S L cards for papering the walls.

Harking Back.

Let us look at the developments in amateur telephony first of all. Can any of my readers remember some of the efforts of 1923 or even 1922? There were a few amateurs who put out telephony of "B.B.C. quality," but they could almost be counted on the fingers. The rest—well, the less said the better.

Real Class A modulation in those days was something to marvel at. The common herd seemed to prefer "mike-in-the-earth-lead" methods. To-day it is regarded as a crime to transmit telephony on an unstable carrier-wave. Ninety per cent of the amateurs in this country use crystal control, and the remaining 10 per cent usually have quite high-quality signals, but don't use telephony.

In certain near-by European countries they haven't progressed beyond the 1922 standard—in fact, they have probably fallen back a bit from it. Listen to the so-called "speech" that pollutes the 40-metre band at any time of night or day, and you'll agree with me. Just why some people never grow up is a problem that has always baffled me.

A High Standard.

We can proudly say, however, that the standard of operating—both code and phone—maintained in this country is an example to the amateurs of the whole world. The high power telephony stations are using systems of modulation that are right up to the minute, and probably, in many cases, the only part of the gear that is inferior to B.B.C. practice is the microphone itself.

I want to make you all listen to amateur telephony and find out for yourselves how good most of it is. The best time, undoubtedly, is Sunday morning, whether you listen on the 160-, 80- or 40-metre bands.

Now let's turn to the ultra-shorts for a while. Here, again, most of the work is carried out on telephony, but we aren't so particular about high quality. The majority of the problems concern the H.F. side of the transmitter, and once one can get some sort of a signal through the only thing left is to pump the greatest possible amount of speech into it, so long as it is still intelligible!

What is being done on 5 metres is this: A good many amateurs have "fixed" stations—operating from their homes, that is, as well as portables. The work carried out from fixed stations consists mostly of two-way contacts with another fixed station over long periods, each operator doing all that he can to improve his signal strength at the other end.

This is valuable work, for screening and general local conditions remain unchanged, and an increase in strength at the far end means a definite improvement to the transmitter.

The portables use very low power, and are often taken in cars to high spots in the surrounding country. The way in which 30 or 40 miles can be covered with 1 or 2 watts is amazing. I have sat on the top of a hill and talked with a man on another hill 35 miles away with just as great reliability as one can obtain on the telephone. This with an input of 1·6 watts and a transmitter that one can comfortably carry about in one hand!

In America, though, 5 metres is definitely going out of fashion. Long-distance contacts on 2½ and 1¼ metres are the order of the day, and one very important discovery has been made. Atmospheric conditions have a marked effect on signals on these wavelengths. Further, the conditions that make for successful transmission on 5 metres don't necessarily favour 2½ metres.

Improved Receivers.

Two and a half metres has not proved more difficult than 5; on the contrary, contacts have often been more successful on the shorter wavelength.

Receivers are improving, too. I have given up the receiver I used last year in favour of something much more simple—a super-regenerator which uses no separate quenching valve, and no bulky long-wave coils to provide the quench frequency.

True, I have "acquired" (that sounds better than "cribbed") the idea from someone else, but there's no sense in sticking to your own receiver when you have come across something better, is there?

Aerials, too, are the subject of much experimental work. I find that a special type of di-pole with a simple reflector behind it gives far better results than my outside aerial, although the effective height is at least 30 ft. less. Complete beam arrays are being used in the States, and these are naturally ideal for communication between two fixed points. Generally, however, the amateur is not interested in this type of work, and wants to talk to as many different stations as he can find.

The Tuned Circuit.

One of the things that is in for a revolution is the tuned circuit as we know it now. Long parallel lines, instead of a compact coil-and-condenser assembly, are out of the question on the longer wavelengths, but they are being used more and more on the very short waves, because they become a workable size.

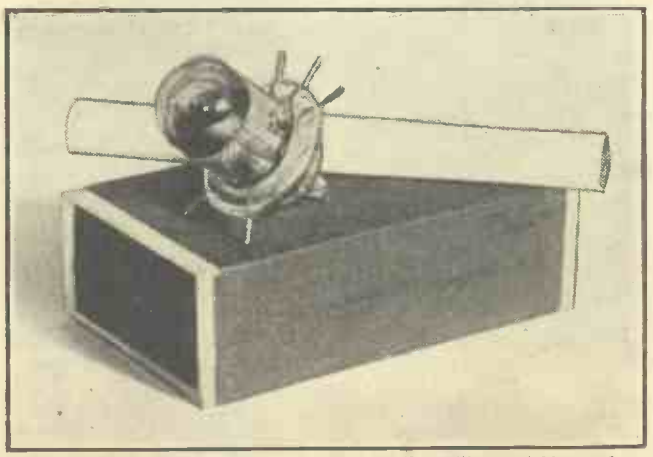
I have seen a 5-metre receiver that incorporates neither a variable condenser nor a coil of any kind.

Yes, the amateur has a wonderful field open to him now, and I'm glad to see that he is showing signs of rising to the occasion.

AMATEUR ACTIVITY

Don't ignore the amateur bands on the short waves. As W. L. S. writes, there is much interesting work being done on them, and the transmissions are well worth listening to.

A DIMINUTIVE VALVE



This picture of an "Acorn" valve, taken together with a matchbox and a cigarette, gives a true impression of the diminutive size of these special ultra-short-wave valves.

ON THE SHORT WAVES.—*Page 2.*

Points from the POST-BAG

G. W. G. (Ipswich) is worried about R. W. R. (Southport) and his gain of "minus two" with an H.F. stage. He says that he has been using untuned stages for some time, and has never had any difficulty with them, except that he finds the anode choke somewhat critical.

He points out (quite rightly, in my opinion) that if one gets a dead spot in the tuning when a "buffer" stage is in use, the said dead spot is invariably due to choke resonance.

G. W. G. also comments on the fact that few people appear to get W 1 X A Z well. I've frequently noticed this, and can't understand it. He has a decided punch here, and I think the fact of the matter is that many people who hear him mistake him for W 2 X A F on his nearby wavelength.

Thanks for your enclosure, G. W. G. Who'd have thought it? For the benefit of readers, it is a description, in a periodical, of a short-wave set tuned by ·0005 solid-dielectric tuning condensers. What a hope!

Poor Conditions?

W. M. (Bolton) listened on the single-valver from March 21st–24th, and only logged seven stations, with only one American among them. Can anyone look back in his log and see if conditions were very bad over that period? I wasn't on the air at all during that week.

K. B. (Bournemouth) forwards an interesting log, including a lot of North Americans that most people don't seem to report. He is trying to keep a long-period log on W 1 X A L, a station that no one else is covering, to my knowledge.

H. W. (Batley) has an annoying bout of threshold howl that won't yield to treatment. He never seems able to get smooth reaction with any type of circuit! In view of all the different things he has tried I feel inclined to suggest valves as the trouble. Can you try some other types, H. W.? Or perhaps it's dud batteries?

Cure for Instability.

E. J. E. (Alresford) mentions a cure for instability that might be worth trying. Connect the moving plates of the tuning and reaction condensers to the nearest points on a metallised baseboard, instead of connecting them together (directly) and earthing the junction wire. (In parentheses let me say that I invariably do *both*—i.e join the two, and also earth each one.)

All these little tricks are worth trying, although there's probably only one of them that will materially help each individual sufferer!

T. J. S., my correspondent in Ontario, forwards an interesting cutting from a local paper. It states that investigators at Cambridge, Mass., have discovered a relationship between the temperature of the air and the distances covered by ultra-short waves. Signals are heard over greater distances under conditions known as "temperature inversion," i.e. on occasions when a warm layer of air exists above a cold one.

One or two readers, including E. P. (Kentish Town), complain of hand capacity with the "B.C.L." Two. I think wiring must be the root of the trouble, but it's very difficult to say. All my attempts to *produce* hand capacity on the original set failed completely. I had it in other people's houses (yes, on the third floor, too!) with and without earths, and it was always stable.

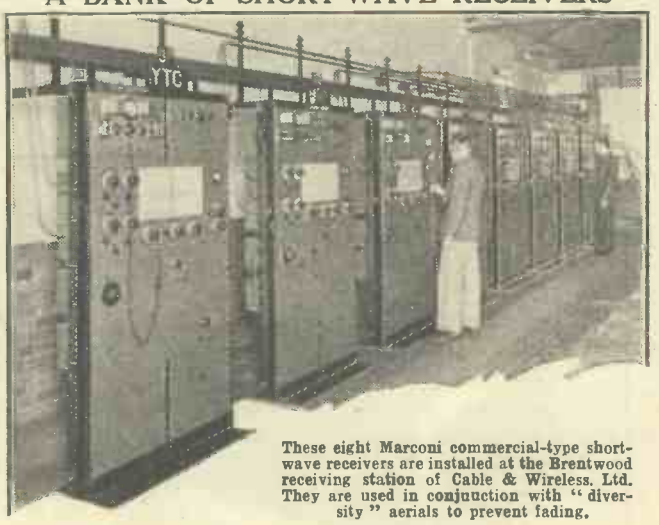
Try a Plain Wood Panel.

It might be worth while to try a plain wooden panel instead of the "Metaplex," taking direct earth-return connections from the tuning and reaction condensers to the "Plymax" baseboard.

R. D. E. (Ware) finds that the V P 6 station he mentioned previously was V P 6 Y B, an amateur in Barbados, and, incidentally, one that I know very well from 20-metre contacts. He uses 80 watts on 41 metres, and puts quite good speech into R. D. E.'s loudspeaker.

R. H. G. (St. Leonards) aspires to an artificial-aerial transmitting licence, and is worried about modulation systems. He wants to know how much power would be required to modulate an input of 2 watts. Theoretically, 8 or 10 would be required. No, you don't need to use crystal control for artificial-aerial work.

A BANK OF SHORT-WAVE RECEIVERS



These eight Marconi commercial-type short-wave receivers are installed at the Brentwood receiving station of Cable & Wireless, Ltd. They are used in conjunction with "diversity" aerials to prevent fading.

F. T. H. (Bognor Regis) wants to know if any amateurs are active on 5 metres. Well, there are plenty in South London at present, but I doubt whether there is anyone within working range of you, F. T. H. Regarding your ·00015 tuning condenser, I should think you want to slip another "nought" in before you can do much with it.

Will anyone in the Bognor district who is interested in short waves please get into touch with Mr. F. T. Hill, "Gasden," Victoria Drive? Thanks.

CONDITIONS continue to vary a little, but they are, in the main, good. The 20-metre amateur band is still the "high spot," and all continents can be heard every day with the greatest of ease. Perhaps a rough time-table would be useful. The times are taken from my own log for a few days recently: 07.00, Japan and Hawaii; 08.00, Australia (irregular); 09.00-11.00, New Zealand; 11.00-20.00, America (*and* how!, as they say); 14.00–16.00, India, Dutch East Indies and Far East; 16.00–19.00, South Africa; 20.00–23,00, South America. (All times are G.M.T.)

Apart from "20," the most interesting band is still the 49-metre broadcast wave. The others are better, from the point of view of signal strength, but they seem to suffer from lack of stations.

Have You Heard These?

The 49-metre band suffers from the opposite—congestion. But late at night, when the Europeans have faded down a bit, it is intensely interesting.

How many readers have heard the following stations, all between 50 and 46 metres? They have all been coming through during the past few nights: Panama City, H P 5 B; Pernambuco, P R A 8; Bogota, H J 3 A B I; Bogota, H J N; La Paz, C P 5; Cartagena, H J 1 A B E; Santiago, Cuba, C O 9 G C; Lima, O A X 4 B.

Bound Brook, W 3 X A L, on 16·87 metres, may now be heard on Mondays, Wednesdays and Saturdays from 8 p.m. till 9 p.m., in addition to his usual afternoon schedule (2 p.m. till 5 p.m.).

Fredericton, New Brunswick (V E 9 A S) is a new Canadian reported on 46·7 metres. It is an experimental station with no regular schedule.

More reports are to hand about Suva, Fiji (V P 1 A on 22·9 metres). Z H J and Z H I (Penang and Singapore respectively) are also being heard occasionally, but both are extremely elusive. These last three stations would certainly be real "finds," as they all use low power.

The "Japs" are still very active, among the best being J V T on 44·44 metres and J V F on 19·2 metres. Judging by the way Japanese amateurs come over in the early mornings on 20 metres, a regular Japanese broadcast would be an easy affair to receive.

New Europeans.

Several new Europeans are on the air, including C T 1 G Q, Portugal, on 24 metres, and C T 2 A J, Azores, at the bottom end of the 80-metre amateur band.

The various high-power Italian commercial phone stations also seem to go in for a good bit of broadcast relaying, particularly from Japan.

Readers who have asked me for the wavelengths used by shipping might note the following official bands: 33·93 to 36·58 metres; 22·5 to 24·3 metres; 16·85 to 18·27 metres.

These bands are sometimes used for Morse, sometimes for telephony. When one hears a musical programme on these bands it is usually a special programme transmitted to a ship from a coastal station.

U.S. police stations, on 129 and 172 metres, continue to make themselves heard over here, which is rather amazing in view of the fact that they are mostly rated at 50 watts.

W. L. S.

TIDYING UP the Regional Scheme

WITH the opening of the Droitwich high-power National transmitter you might imagine the B.B.C. engineers were due for something like a breather. On the contrary, they are now devoting their tireless energies to a general tidying up of the so-called Regional scheme.

Droitwich, you must understand, makes only the National programme safe for democracy. The alternative programme of Regional interest is by no means as universally enjoyed.

There are still wide-open spaces in the Regional programme service. It is to fill these that B.B.C. engineering efforts are now turning. So that when the new work is finished hardly any populated part of these islands will lack at least two available programmes.

The relative slowness of the consolidation of the Regional scheme is due, quite simply, to lack of available capital, as well as to the fact that the engineering staff can tackle only a certain amount of development work at any given time.

A Question of Cash.

Mostly, though, the hold-up in the filling of those wide-open spaces is lack of "ready." Not that this is surprising when one reads in the eighth annual report that of the total licence revenue of £3,369,000 the B.B.C. received only £1,597,285. Or, in figures much more strikingly simplified, only 4s. 9d. of each ten-shilling licence fee.

From even a casual look at the B.B.C.'s balance sheet it is obvious that any future capital expenditure must be met out of revenue. Thus the development work of any given year must mark time with available income. This to some extent accounts for the otherwise inexplicable slowness in giving badly served areas a fair hearing.

Anyway, Droitwich is out of the way, and other work is beginning to take shape. For example, the roof is going on the building at Lisburn, where the Northern Ireland Regional is being installed. The machinery is also being fitted. A special one-mast aerial has gone up—an aerial designed to counteract near fading, by the way.

> "There are still wide-open spaces in the Regional programme service. It is to fill these that B.B.C. engineering efforts are now turning," says Alan Hunter in this interesting article on the future energies of the B.B.C.

If the Lisburn type of aerial succeeds in extending the non-fading service area of the Northern Ireland Regional there may be hope of reconstruction at older Regional centres. I have always maintained that we do not spend enough on our aerial systems. Perhaps Lisburn will show the B.B.C. that modern anti-near-fading practice is worth while—as the Germans would seem already to have proved.

Activities in Scotland.

At Burghead, on the south side of the Moray Firth, the B.B.C. is already digging the foundations of what will one day become the North Scottish Regional. This, like the Northern Ireland Regional, will have the B.B.C.'s standard power of 50 kilowatts and will serve the populated parts of the highlands. At present all they can get up there is Droitwich, and even that has been fading.

While this decisive work is going on preliminary skirmishing can be observed in other parts of the country. Polar diagrams are at the moment being studied to decide which is the best site for the North Eastern Regional. A site some twelve to fifteen miles inland from Newcastle will probably be chosen. Indeed, for all I know the B.B.C. is at this time secretly negotiating on a chosen site.

The mobile transmitter van that plays such an important part in locating suitable transmitter sites has moved away from the North and may now be found somewhere at the back of Plymouth. On the high ground behind Plymouth the B.B.C. is seeking out a place to erect a 5-kilowatt transmitter.

This will be the first of the medium-powered Regional relays. Others are planned for North Wales, for East Anglia and for the South of England. The object of these stations is to give listeners on the fringes of existing Regionals a composite Regional programme.

The exact location of the North Wales relay has not been decided, although a studio is being fitted up at Bangor. The East Anglian relay will probably be somewhere in the Norwich district, while the Southern relay may eventually be erected in the Southampton area. None of these stations will be actually in the towns. They will be put up a few miles outside the centres of population designed to be covered.

The "Little Nationals."

At one time we all thought—and so did the B.B.C.—the coming of the new Regional stations and relays was contingent upon the shutting down of the "little Nationals." Now that the three medium-wave stations—North, West and London Nationals—have found it possible to work on a common wavelength there is little chance of the original plan being carried out.

One effect of the retention of these Nationals seems to have been rather overlooked. The power of 50 kilowatts cannot now be raised, as was intended, to the permissible limit of the Lucerne Plan. The idea was that the Diesel engines now serving the twin transmitters would be retained when the Nationals were shut down, thus providing extra power to push up the transmitters

(*Continued on page* 182.)

WILL IT PREVENT FADING?

The special anti-fading aerial in course of construction at the Northern Ireland Regional station at Lisburn. The effects of this aerial will be watched with interest, and, if successful, may lead to modifications of existing aerial systems.

REMARKABLY SMALL. One of the Hivac Midget valves.

THE LATEST VALVES

Very few weeks elapse without some new valve or other being released, and below are some notes about a selection of the most outstanding that have made recent appearances.

By K. D. ROGERS.

THE most outstanding valve that has been released this year is the "P.W." Jubilee valve, the Hivac J240, and of this you have read quite a lot in the last few issues of POPULAR WIRELESS.

But other valves of extremely interesting characteristics have also been produced by the various manufacturers, and, in fact, during the past month or so I have been having a sort of field day among the different types. Some are of particular interest, and on this page I want to tell you a little about the most outstanding models.

New Indirectly-Heated Pentode.

First let us take an output type that has appeared in the lists of three makers more or less simultaneously. It is of what might be called the A.C.2Pen. class, the valve made famous by Mazda, and is known as the N41 in the Marconi and Osram ranges and the Pen.4VB in the Mullard range.

It is a very steep-slope indirectly-heated output valve with a 7-pin base. It has a mutual conductance of round about 10 m/a. per volt. The impedance is only about 20,000 ohms, so that the amplification factor is in the neighbourhood of 200.

Naturally, such a valve has a short grid base, and, in fact, the average grid swing is between 3 and 4 volts, but for that input the valve gives an undistorted output of round about 4 watts! It is certainly an excellent valve. The price is 18s. 6d.

With a valve of this calibre a three-valve A.C. set can be made to give astonishing power and sensitivity. As a matter of fact, such a set has just been published in our sister journal "Wireless," and is a good example of the great possibilities that are opened up by the new steep-slope pentode.

A couple of Osram N41 output pentodes.

Another valve of interest to set builders—this time battery-set makers—is the Mullard Octode. Hitherto valves of this type have only been available in the A.C. and Universal (A.C./D.C.) ranges. It is, therefore, good news that an Octode frequency-changer, suitable for use in battery-operated receivers, has just been released under the type number of FC2.

The filament consumption of the new valve is only 0·125 amp. at 2·0 volts, and under optimum working conditions the total high-tension consumption is approximately 3 m/a. This low consumption not only assists in the design of really economical battery superhets, but reduces valve noise to a minimum.

A Valve With Six Grids.

In addition to the filament and anode there are six grids, one within the other. The filament and the two grids nearest to it operate as the local heterodyne oscillator; the next grid is a high-potential screen. Next comes the control grid, followed by the usual auxiliary grid and suppressor grid, forming a variable-mu pentode mixer. No external coils are required to couple the oscillator and mixer portions, the coupling being "electronic."

One of the advantages of this Octode is that, owing to the functions of oscillator and mixer being separated by the screen, A.V.C. can be applied to the pentode mixer portion. The very effective attenuation of 40 db. can be obtained with a bias of approximately 10·0 volts applied to the control grid.

The FC2 is fitted with the standard seven-pin base, and the control grid is connected to the top cap. It is supplied with metallised bulb only. The list price has been fixed at 18s. 6d.

The Hivac Midget Range.

And now, last, but not least—except in size—the new Hivac Midget range. As you can see in the photographs, these valves are almost unbelievably small, and yet they are big enough to carry out a really "he-valve's" job.

The new Mullard Pen. 4VB, a steep-slope output A.C. pentode.

As a matter of fact, I know of one amateur transmitter who is using one of these valves as detector on a five-valve receiver with wonderful results.

The valve is the design of Mr. Stephen P. de Laszlo, Managing Director of the High-Vacuum Valve Co., Ltd., and opens up a new field of possibilities for compact receivers.

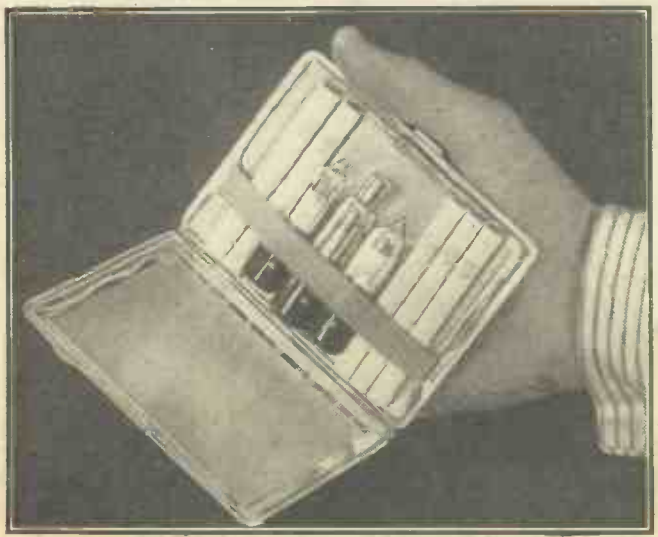
Though the maximum anode potential is round 100 volts, the valves will work excellently well below that voltage, and the filament current of ·06 amp. at 2 volts is well within the powers of a 3-volt dry battery to supply.

The screen-grid Midget valve—type XSG—has an impedance of 600,000 ohms and an amplification factor of 360.

The detector is the XD, and this has an impedance of 27,000 ohms, with an amplification factor of 16. The third valve of this Lilliputian range is the XL, an L.F. valve of 14,000 ohms impedance and amplification factor of 12. This valve has higher efficiency factors than the other two, and is suitable not only as an L.F. amplifier but as an anode-bend or power-grid detector.

I am told by the makers that during the first few months the Midget valves have been subjected to severe tests in most difficult conditions by a Government department, and they have given every satisfaction.

TINY BUT EFFICIENT



A COMPLETESET of valves tucked into an ordinary cigarette case. They are the Hivac Midget detector, S.G. and L.F. types.

The "FERRO-MAINS" THREE

A straightforward A.C. mains receiver incorporating the most up-to-date developments in radio set design. It is simple to build and is fully described in the May number of "Wireless and Television Review."

OTHER FEATURES IN THIS ISSUE INCLUDE:

The "One-Point-Five"
(Obtaining Maximum Results)
by
JOHN SCOTT-TAGGART,
M.I.E.E., F.Inst.P., Fel.I.R.E.

+

The Tune That Haunts My Memory
by
HARRY ROY

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TELEVISION

DIFFERENCES AND DIFFICULTIES

There are many misconceptions abroad about the present state of television and its problems, and an endeavour to clear up some of the more outstanding of these misunderstandings is made in this article.

By L. H. THOMAS.

ALTHOUGH television has been in the public eye so tremendously for the last few months, it is obvious that there is a great deal of misconception about high-definition transmissions and the use of the ultra-short waves.

Under an "alias" I have recently attended meetings of several television societies, and have been amazed at the muddled ideas that supposedly well-informed people still harbour.

Let us devote a page to straightening some of them up, for until that is done it's no earthly good going into minute details about 240-line receivers. First of all, what precisely is the point in the use of a much larger number of scanning lines?

The Cause of the Crinkles.

A glance at the two diagrams on this page should make that obvious. The "A" that has apparently "gone all crinkly," as a friend put it, is a representation of what a fairly large letter "A" with 30-line scanning would look like. I have drawn it with 30-line *horizontal* scanning, although the present transmissions from London National use vertical scanning.

Hold it far enough away from you and you will be able to see a letter "A" without any noticeable "step effect." But you won't have to get very close to it to see the imperfections.

Remember now that that letter occupies practically the whole screen. Were it to be made much smaller, so as to be one of several letters in a word, the "steps" would not become smaller in proportion; they would remain the same size. In other words, if that "A" were reduced to about one-eighth of its present size it would be quite difficult to distinguish what letter it was meant to be.

The reason for the steps? Well, just that a scanning line *is* a scanning line, and that where the end of the "light" portion occurs you will have a vertical division between light and shade, even if your subject happens to be sloping at that point. True, it will be hazy, but that makes things worse rather than better.

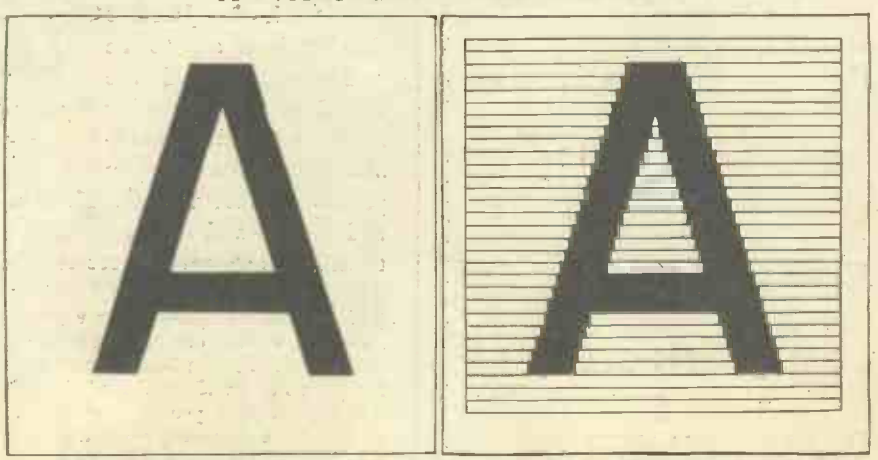
Now, if we increase our scanning to 60 lines it follows that a letter "A" of half the size will be reproduced with equal definition. With 240 lines a letter of one-eighth of the size will look exactly like the "A" in Fig. 1, proportionally reduced in size, steps and all. A full-sized "A" will look almost like Fig. 2, with no step-effect visible.

I have been talking about a simple geometrical shape to make things more straightforward. The effect of multiplying the scanning lines by eight will, of course, be even more marked when we come to the television of moving figures.

Everyone who has looked-in to the present 30-line transmissions will agree that only the close-ups and the captions are *really* effective. Groups of smaller figures in the background are a change and a novelty, but no one can really make out what they're all about, especially if they move fast.

Well, with 240-line scanning it is quite possible to transmit small "crowd scenes." One film that I saw televised with 180 lines had a scene of this kind, and it was almost possible to recognise the faces of actors in the far background; 240 lines will handle almost anything that people will want to see in their own homes.

A VALUABLE COMPARISON



The right hand (Fig. 1) of these two letters shows how the edges of a letter "A" are broken by 30-line scanning. High-definition television would render the letter more like it is seen on the left in Fig. 2.

Now, where are the snags? Most important, of course, is the fact that 240-line transmission, in the present state of the art, is quite impracticable for the medium broadcast band. A single station would spread from 150 to 2,000 metres at a conservative estimate. Why? Simply because the modulation has to extend to such tremendously high frequencies that the sidebands will occupy that enormous width on either side of the carrier-wave.

The ultra-short waves—which, after all, were not discovered so *very* long ago—provide a solution. Down there we have an enormous amount of unoccupied space. Quite apart from that, the design of a receiver which will give the necessary broad tuning becomes a much simpler matter than it would on the broadcast bands.

Disadvantages? Yes; the range is very limited. But does that matter? I don't think it does. Long-distance television transmissions would inevitably be badly hashed up by interference, and a number of transmitters, each with a fairly limited range, are likely to give a much better service.

Down to 2½ Metres?

The main trouble, undoubtedly, will be man-made interference, but I am of the opinion that this will be overcome by using a much shorter wavelength than those at present under consideration.

Already the amateur transmitters are finding that they can cover longer distances with greater reliability on 2½ metres than they can on 5 metres. In the U.S.A. a transmission on 1½ metres has covered nearly 100 miles. I shouldn't be surprised to find that the television band eventually settles down between 2½ and 5 metres.

The next point that some people seem to be hazy about is this: "If you can receive 30-line transmissions so effectively with a scanning disc, what's the trouble about 240? It only means a disc with eight times as many holes." Ah, but does it? Eight times as many holes, it's true, but for the same size disc each will have to be of one-eighth of the diameter of the holes in the 30-line disc; in other words, one sixty-fourth of the area. How much light is going to get through that?

And, don't forget, the picture area will also be reduced to one sixty-fourth of what we have been used to. Direct viewing would therefore be merely ridiculous, and projection through the disc would become a prime necessity.

The whole thing hinges on one question: Would such an accurately cut disc, together with a complicated optical system and a high-intensity spotlight, give results comparable with cathode-ray equipment? And would it cost any less? Many of the big brains are hard at work on that problem.

The SILVER KING ON SHORT WAVES

By G. T. KELSEY

The whole world at your command! That's what the short-wave side of the "Silver King" means to you if you follow carefully the simple details about operation contained in this article.

JUDGING from correspondence which has arrived at our offices already, it is obvious that a very great number of "P.W." readers are building, or have built, our Jubilee masterpiece—the "Silver King." And although it is a fact that the interest in short-wave reception has been steadily increasing for a long time now, it is reasonable to suppose that a considerable number of "Silver King" constructors will, through the medium of this all-embracing design, be tackling short-wave reception for the very first time.

Well, they are in for a treat!

Short-wave reception these days, with the recent phenomenal increase both in the number of stations and in the powers employed for transmission, is a tremendously fascinating pastime, and you may discredit for the moment the fact that I am by nature biased heavily in favour of it.

Nothing Tricky.

My observations are based simply and solely upon the results which I have been able to achieve with the short-wave side of the "Silver King"—results which every one of you should be able to emulate *if only you go the right way about it.*

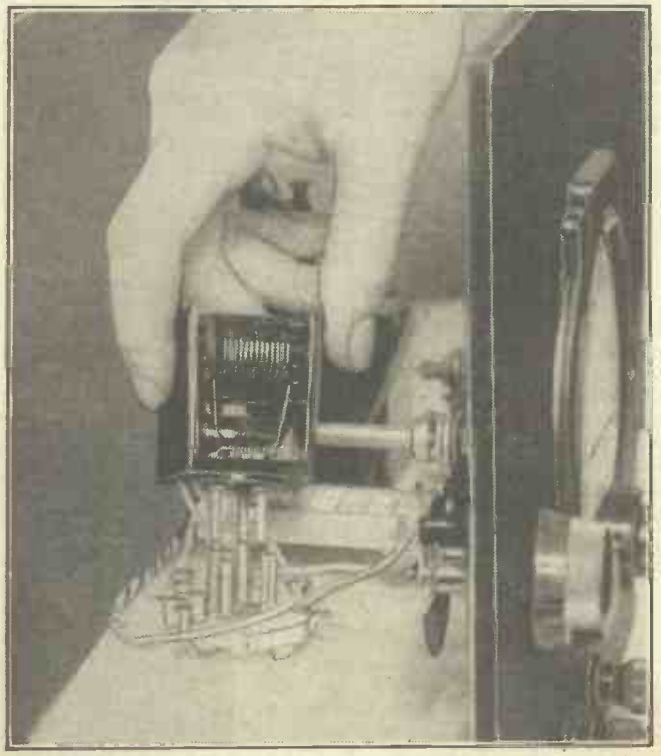
Now I do not want you to deduce from that that there is anything tricky about it. That most certainly is not the case, for in the design of this two-channel wonder set (yes, I really think that about it) particular regard has been paid to the question of simplicity of operation, not only on short waves, but on broadcast and long waves as well.

But do try to remember—particularly if you have not previously tackled short-wave reception—that the whole secret of success lies not primarily with the set, but in the way that you go about it. Short-wave reception on any set is a very different proposition from reception on the normal broadcast bands, and that inherent difference cannot be altered by any amount of juggling with the design itself.

I am afraid you will find me rather a stickler over the matter of operation, for therein, in my opinion, lies the reason why so many would-be enthusiasts fail to get complete satisfaction. Oh, yes, people *do* fail to get satisfaction! If only you could read just a tiny percentage of my daily post in which potential short-wave listeners tell me that their sets or adaptors are not working correctly because they can only hear Morse! It's rather like saying that your broadcast set will only receive speech—and not music—from the local station.

Many, many times I have taken these so-called faulty sets and adaptors home just to convince the doubtful listener (and, perhaps, myself!), only to find upon connecting them up that they work entirely satisfactorily. Believe it or not, when I return them eventually to their owners it is no uncommon experience to learn that "they are no better than they were before." Phew! No wonder the manufacturers can only employ nimble-fingered girl operatives for the delicate operations in the production of radio apparatus! We men, so they say, are far too clumsy.

CHANGING THE WAVEBAND



A surprisingly large range of short waves is covered by the "Silver King," and the band is changed simply by changing one plug-in unit. This is done through the lid of the cabinet, and does not interfere with medium- or long-wave reception in the least.

But we needn't be. If only we remember that short-wave reception is very far removed from plunging a fork into a soggy chunk of clay, then all will be well. And it is because I am so particularly anxious for you all to succeed with the short-wave facilities of your "Silver King" receivers that I am stressing—perhaps even unduly—the need for special treatment of the short-wave controls.

Just one simple comparison will, I feel, finally ram home—and forgive my persistence—this matter of short-wave procedure, and then we will get straight down to business.

This comparison, by the way, is not new—I have made it many times in these columns—but it is one of the only ways, in my opinion, of demonstrating in an understandable way the essential difference between ordinary broadcast and short-wave reception.

For reasons which we need not enter into here it is desirable for broadcast stations to be separated from each other by a little band of frequencies not less than 9 kilocycles wide. In other words, between 200 metres, corresponding to 1,500 kilocycles, and 600 metres, which is 500 kilocycles, there is room on this basis for 111 stations. How do we arrive at it? Well, 500 from 1,500 divided by 9 approximately equals 111. Do you get the idea?

Right. Now for the comparison. One of the coils which is supplied with the Colvern set of three covers the band from 23 to 54 metres. Suppose, to keep to round figures, we call it from 20 to 50 metres. Then between 20 metres (15,000 kilocycles) and 50 metres (6,000 kilocycles) there is room for 9,000 divided by 9 stations. 1,000 stations!

Just imagine that. 1,000 stations between 20 and 50 metres and only 111 between 200 and 600 metres. Of course, there are not 1,000 stations between 20 and 50 metres, or anything like that number. But the mere fact that there is room for them is all that need concern us, for that brings us right down to brass tacks.

Keep Slow.

It's the fact that there is room for practically ten times as many stations on the short-wave dial as there is on the broadcast dial that is the all-important factor, for it means that the short-wave dial must in consequence be moved *at least ten times more slowly.*

Once you have grasped that the rest is going to be very straightforward, for apart from the question of proper reaction control, there is nothing else to it. Tune very, very slowly, and you will be able to find stations as easily

(Continued on next page.)

THE SILVER KING ON SHORT WAVES

(*Continued from previous page.*)

as falling off a table. Tune relatively quickly, and you will join those would-be enthusiasts whose sets "will only receive Morse."

I am afraid I have gone to some length to explain the need for slow rotation of the tuning dial, but I am a great believer in logic, and if there is a reason that can be advanced which enables the listener to understand what is happening, then it makes it so much more simple to get the point home.

When carrying out tests on the broadcast side, with someone listening at the same time on short waves, don't stand near the aerial lead as depicted here. This may affect the short-wave tuning.

But now I want to go carefully into the other matters affecting the successful use of the "Silver King" on short waves, and the first of these is the question of proper reaction control.

We cannot easily deal with all three coils at once, and in any case what applies to one applies more or less to the other two, so suppose we start off with the middle coil; that is to say, the one that tunes from 23 to 54 metres.

The Reaction Control.

Having inserted the coil and assuming, of course, that your phones are already connected, set the short-wave tuning condenser to zero and switch on. For this first test I suggest that you plug H.T. plus 1 lead into a tapping on the H.T. battery at somewhere about 60 volts.

Now slowly advance the reaction condenser (the small control on the right) until the set commences to oscillate. Perhaps the most descriptive way of indicating when the oscillating condition has been reached is to say that it will sound like a heavy breathing noise, although, as a matter of fact, you will not have much doubt about it from the very noticeable increase in the liveliness of the set.

The great point about this change from the non-oscillating to the oscillating condition is that it *must* be absolutely smooth. In other words, there must not be the slightest semblance of a "plop" when the change takes place, and if a "ploppy" change does occur, then you must reduce the voltage on H.T. plus 1 until you get rid of it.

But it is not very likely that you will get "ploppiness" with only 60 volts on H.T. plus 1, and if you reduce the voltage much below this figure you may find it difficult to get the set to oscillate higher up the band.

Providing the reaction is quite smooth, you can start right away to receive stations, and the procedure should be as follows:

HERE IS A POINT TO WATCH WHEN MAKING ADJUSTMENTS

Remembering what has been said about slow tuning, very gradually advance the main tuning control from zero with the reaction condenser set in such a position that the set is just, but *only* just, oscillating. You should not have to move it (the main tuning control) very far before you hear a station, and this will be heralded by a whistle or, if you like, by a carrier whistle.

To resolve this whistle reduce the setting of the reaction condenser until the set just stops oscillating, at the same time, perhaps, slightly readjusting the main tuning control, and you should then hear the station. This may sound a difficult operation, but it is really quite straightforward and is, in fact, very little different from receiving a distant station on the broadcast band with any set in which reaction is employed, except perhaps that in the case of short waves it is a rather more delicate operation.

The setting of the reaction condenser to maintain the "just-oscillating" condition so very necessary when searching will unfortunately not remain constant throughout the range of the main tuning dial, and it will in consequence require to be readjusted every few degrees.

But to become really adept at short-wave reception is a two-handed job, anyway, and if you get into the knack of working both the reaction control and the main tuning knob simultaneously you will rapidly become proficient.

By the way, the small ultra-short-wave condenser to the left of the main tuning control is intended primarily for 7- and 8-metre work, of which I shall have more to say later. But since it is in parallel with the main tuning condenser it can usefully be employed as a vernier tuning control on the ordinary short wavelengths. But try to do without it if you can, for it does tend to complicate calibration of the set.

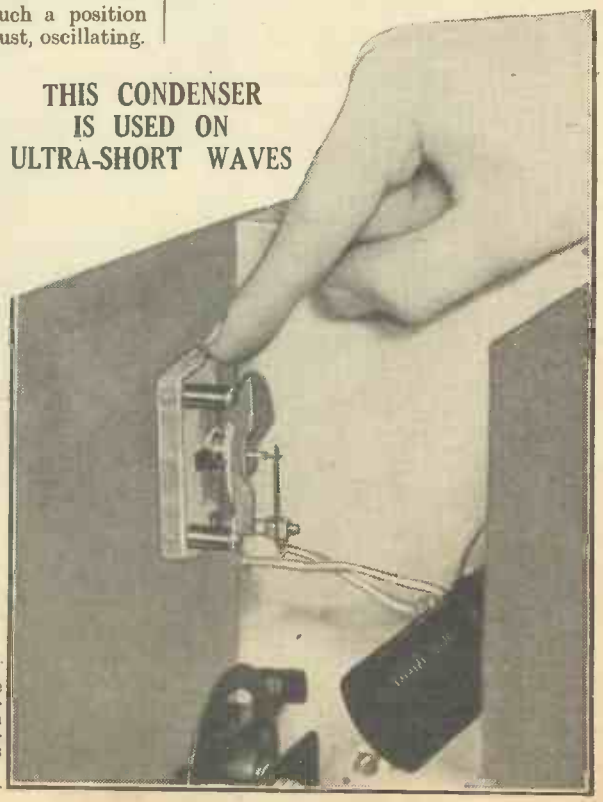
If It Will Not Oscillate.

Since so much depends upon reaction on these short wavelengths, it would perhaps be as well to say just a few words about no reaction and the best way of overcoming the difficulty.

The absence of reaction, assuming that you have wired the set up correctly, will probably be found to be due (a) to insufficient H.T. voltage on the H.T. plus 1 lead, or (b) to the degree of aerial coupling.

The cure for the first probable cause of the trouble will be obvious. With regard to the second the degree of aerial coupling is governed by the two twisted wires, and by untwisting these for a few turns the coupling will be decreased. But keep them as twisted-up as you can consistent with the attainment of reaction, for the tighter the coupling within reason the better will be results generally.

THIS CONDENSER IS USED ON ULTRA-SHORT WAVES



On the ultra-short waveband the ordinary short-wave tuning condenser is used in conjunction with the special ultra-short-wave condenser to which the finger is pointing in the illustration.

THE SILVER KING ON SHORT WAVES

(*Continued from previous page.*)

As you probably know already from literature supplied with the short-wave coils or from advertisements, the ranges of the three coils which comprise the "Silver King" set are from 14 to 30 with the U.S.1, from 23 to 54 with the U.S.2, and from 42 to 100 with the U.S.3.

Stations in all three ranges these days are so very prolific that it is virtually impossible to give you anything but a very hazy idea of what you can expect to receive with each coil.

The best way, therefore, to go about it is to obtain an authentic and up-to-date list of the short-wave stations at present on the air, and then, by means of one or two "key" stations to plot a rough tuning curve for each coil. As a matter of fact, even without the tuning curves, it is not a difficult matter to determine the identity of stations for practically every one of the important ones announced in several languages, including our own. And anyway, the most sought-after short-wave stations are either in our own dominions and colonies or are American, so that the language difficulty doesn't arise.

Stations To Check On.

But if you do want to prepare tuning curves for your coils—and I must admit that they are very useful—then for your "key" stations I suggest that you use such well-known (and easily found) transmitters as Zeesen, Moscow, Schenectady, Pittsburg and, of course, our own Empire transmitters.

For your guidance, the following station call-signs and wavelengths will be found helpful as "sign-posts."

Zeesen works under five different call-signs, and these are D J B on 19·74 metres, D J D on 25·49 metres, D J A on 31·38 metres, D J N on 31·45 metres, and D J C on 49·83 metres. In the case of Moscow, the call-sign is the same for both their stations—R W 59—but the wavelengths are 25 and 50 metres.

Pittsburg (Pennsylvania, U.S.A.), the call-sign of which station is W 8 X K, has four different wavelengths—13·93 metres (you may *just* get it on the U.S.1 coil), 19·72 metres, 25·27 metres and 48·86 metres—but they are rarely used simultaneously. The wavelength is usually changed according to the time of day.

The same thing applies to our own Empire transmitters, of which there are eleven so far as wavelengths and call-signs are concerned. Let us consider six of them. There is G S F on 19·82 metres, G S E on 25·29 metres, G S D on 25·53 metres, G S C on 31·32 metres, G S B no 31·55 metres and G S A on 49·59 metres.

These are all stations that can be relied upon from the point of view of calibration, and as a general rule they are very easy to receive.

There is just one more point in connection with the short-wave side of the "Silver King" to which I want to refer, although strictly speaking it concerns the future rather more than the present so far as stations are concerned.

Getting Ready For Television.

Television is not here yet, although it is possible occasionally to pick up the experimental programmes which are now being radiated. For this purpose, a special coil is obtainable from Messrs. Colvern, and it is arranged to plug into the existing coil base in the set.

But those of you who do feel disposed to try experimentally the seven-metre band should note particularly that what I said at the outset of this article concerning slow operation requires amplifying by about 20 times down here! That is where the special ultra-short-wave vernier condenser comes into it, and it should be used in conjunction with the main tuning control.

NEXT WEEK

THE SILVER KING AT HOME

Working the Two-Channel Set in the home of an ordinary listener.

If you tune carefully, and are patient, there is no reason at all why you should not hear what is going on, but do remember that the programmes are only on spasmodically—mainly during the daytime—and that, in consequence, it is very definitely a case of "if at first, etc." I must confess that these last remarks are really intended for listeners in the London and home counties area, although the present experimental programmes have been heard over surprisingly long distances having regard to the known characteristics of these ultra-short waves.

Anyway, I wish you luck! There are great times ahead!

TWO SEPARATE SETS IN ONE

Mr. G. T. Kelsey is here seen inserting a short-wave coil in the "Silver King," as explained on page 177, while the broadcast side is actually working.

"YOU LISTEN TO THIS"

Mr. K. D. Rogers, on the left, and Mr. G. T. Kelsey exchange programmes. One is coming through on the medium waves and the other is from a short-wave station. Phones were used in both cases merely to permit preliminary adjustments to be made at the same time and in the same room.

APPARATUS WE HAVE TESTED

Full details of a useful mains device and some valuable testing accessories for use with measuring equipment.

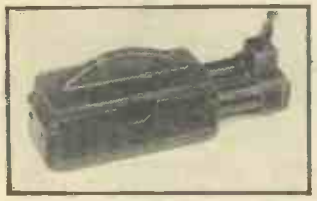
USEFUL MAINS DEVICE.

CONSTRUCTORS of mains apparatus should take particular note of the Belling-Lee Fused Mains Input Connector. This useful device combines the functions of both a double fuse and a connector.

It is for fitting to either a mains set or unit or other such apparatus. The fuses are in the lid, and this can easily be removed merely by pulling it out. Thus, if and when it is necessary to change a fuse, there cannot be the slightest possibility of getting a shock.

The removal of the lid with the fuses would obviously disconnect the mains, even if these had inadvertently been left on. In any case, they, the fuses and their clips, have to be removed in this manner even merely to examine them.

There is the further advantage that it is an extremely simple task to change either or both of the fuses, for the lid carrying them can be taken over



The Belling-Lee twin-fuse unit with incorporated mains plug.

to the light, and there is none of that poking about in a dark corner that so often makes fuse-changing a tiresome job.

A neat plug is supplied for the mains lead, from which, too, it is impossible to get a shock, should the plug be left detached while joined to live mains. The bare pins are on the body of the Fused Mains Input Connector, the "dead" side of the connection.

The connector is a 5-ampere fitting, and it has 1-ampere fuses in it. These are the standard Belling-Lee type, and so replacements are available all over the country.

It is a well-designed and cleanly manufactured article, particularly distinctive on account of its excellent bakelite mouldings. It is pleasing to note that art and electrical efficiency can go hand in hand.

There are many obvious forms which could have been adopted for the plug section of the connector, for example, but that which has been given to it has both originality and character. The accompanying photograph is necessarily rather small, but it is quite large and clear enough to show the attractive lines of this plug.

Many constructors may not consider the appearance of a small piece of apparatus such as a mains connector is of any importance, but we are sure that there will be just as many more who will be grateful to Messrs. Belling & Lee for reminding us in such a pleasingly pointed manner that small articles of electrical utility need not stop short at utility!

The price of the Belling-Lee Fused Mains Input Connector is 3s. 6d., complete with fuses, and we regard that as a low price in the circumstances. Obviously, it is called a Fused Mains Connector because it is a mains connector fitted with fuses; but the term "Fused Mains" is surely one that in its more generally accepted sense could not be applied to this very excellent safeguarding device in either theory or practice!

AVO TESTING ACCESSORIES.

ALL constructors and experimenters will find the kit of testing accessories made by the Automatic Coil Winder & Electrical Equipment Co., Winder House, Douglas Street, London, S.W.1, of great use. A meter, however good, is incomplete without prods and clips enabling it quickly to be joined up to those points across which the tests are to be made.

It is true that sometimes a couple of pieces of wire will suffice, but that is not enough for many tests, particularly those whose very nature demands rapid connection and disconnection of the meter.

In the Avo Kit of Testing Accessories is found everything necessary for making expeditious use of a meter.

There are no less than three pairs of insulated flexible test rods—there being a positive (red) and negative (black) prod in each pair. The lengths are 2½ in., 5 in. and 7 in. One positive and one negative test prod holder is supplied, and these can easily be fitted to the leads of any meter.

The kit also includes two nickel-plated spring clips which can be fitted to these holders.

Other items in the kit are: two three-inch connecting leads each having a crocodile clip and a spade tag; one six-inch shorting link fitted with spade tags, one six-inch crocodile clip connector and one twelve-

These Avo testing prods and clips considerably enhance the value of a test meter.

inch crocodile clip connector. These connectors are particularly useful items, consisting as they do of well-insulated flexible wires with crocodile clips at their ends. It is easy to think of a dozen and one jobs for which uses could be found for these items quite apart from the many testing purposes to which they can be put.

The Avo Testing Accessories cost only 2s. 6d. the full kit. They have been produced primarily for use in connection with the famous Avometer and the AvoMinor group of testing instruments, although, as we have indicated, they are equally adaptable to any other types of meter.

The kit is extremely good value for money, and we are informed that the reason why it has been possible to sell them at such a low price is that they are issued at a very small profit as an advertisement for the "Avo" instruments. "P.W." readers should grasp the opportunity of participating in this bargain offer.

TELEVISION "SHORTS"

Some topical items of general interest.

CONCERNING my remarks last week about a scanning system using two vibrating mirrors, I am asked whether I was thinking of the "Pries" system. No, but I had overlooked the latter. It uses one mirror only, but that vibrates simultaneously in two planes. The system is said to be capable of operating up to 240 lines.

Wild rumours continue to fly round. On one hand we hear that the initial transmissions will be carried out with 180-line scanning; on the other that 480 lines and 50 pictures per second will be the standard! The latter strikes me as pure bunk; the former doubtful. The Baird Company has already given its first public demonstration of 240-line television, and the general opinion seems to be that it *is* noticeably superior to the 180-line results.

25 or 50 Pictures?

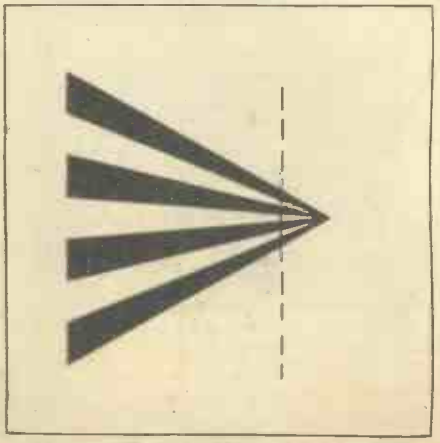
Coming back to this "50-pictures-per-second" rumour, what could be the point of it? They don't need to run at more than 25 in the cinemas, and goodness knows that films are devoid of flicker these days. If certain prominent people in the trade could find where these rumours are originated there would be a spot of bother in that neighbourhood.

Television, for some reason, seems to have acquired far more enemies than broadcasting did in the early days. You hear wiseacres on every side doing their best to "crab" it, generally long before they themselves know the first thing about it. When you've got a genuine grievance you're doing a public service (sometimes) by making it known; but when you have to make up your own synthethic grievance first things must surely be in a bad way.

A "deep-sea" television camera has already been perfected in readiness for possible broadcasts from the ocean bed! This has probably evolved from a device invented many years ago, which gave low-definition scanning and was intended to be lowered from a ship's bows, giving, in the chart-room, a moving picture of objects ahead, under the water-level.

What's next? A stratosphere camera?

AN EXCELLENT TEST



The 30-line television test card for checking the high frequencies. Separate lines should be visible from the left up to the dotted line.

New systems of colour television are also being talked about, but I certainly can't see at the moment how colours are going to be reproduced on the screen of the cathode-ray tube. Considering how long the films have remained black and white, I don't think there will be any urgent demand for colour television for quite a long time.

The B.B.C. Television Staff.

Mr. Gerald Cock, the B.B.C.'s Director of Television, is losing no time in investigating the types of programme that will be suitable for early transmissions. The B.B.C. has of course, been acquiring valuable television technique during the reign of the 30-line transmissions, but this will naturally be vastly expanded when the "high-def." transmissions start.

30-line television certainly cramps your style, but it must be good training in the art of making much out of little!

Rumour also has it that the B.B.C.'s television studios and staff will be housed in a separate building which is at present the subject of negotiations. "B.H." is known to be too small for the present activities of the B.B.C., and the new television will certainly take up a considerable amount of space, which won't diminish as the years roll on.

From America comes the news that ultra-short waves are still being improved in reliability and range. The latest reports talk about 300 miles on 5 metres, 150 on 2½ and more than 100 on 1¼! The real micro-waves are limited in range, but, to compensate for this, may be sent round corners and even up staircases and along landings by means of suitable reflectors.

Micro-waves are going to be invaluable as "links" between television transmitter and television camera.

L. H. T.

HOW THEY BEGAN

This is the sixth article in an exclusive series dealing with broadcasting artists. In it Kenneth Western tells the story of the famous pair to

OUR SPECIAL CORRESPONDENT

THE POPULAR WESTERN BROTHERS.

YOU'D better let me speak for both of us. George is so argumentative, and he'd get the facts wrong, anyhow.

It doesn't signify where or when we were born (or why, for that matter), but I'd better tell you that we aren't actually brothers. We are cousins, if you must know, you cads, but we're both Westerns—and we're both in the early thirties, not having got through more than a mere dozen or so old school ties.

George will tell you that he was "something in the City," while I was in the Civil Service (which covers everything, from a postman to the Prime Minister's private secretary, so you can draw your own conclusions), when we first started entertaining together. We both used to carry on our jobs during the day and do odd spots of work in the evening.

Started as Song Writers.

As a matter of fact, we really started together as song writers. The first thing we did was to write a revue for Archie de Bear at the Vaudeville Theatre, called "Vaudeville Vanities." Believe it or not, it ran for several months, probably because of Bobby Howes, who sang a song of ours called "Is it British?" (never heard that one before, have you?)

Then we started getting engagements at the Palladium for Sunday League concerts, and always appeared together with songs at the piano. At this time George was with the famous Roosters Concert Party and I was entertaining occasionally on my own. It was in 1926 that we really joined forces and did a proper turn which went down so well that we were offered a whole box of "dates"!

Then we wrote a radio revue, also round about 1926, called "Out of the Hat." We were asked to appear in this with Mabel Constanduros, although this was not actually our first broadcast, as I first appeared before the microphone nearly eleven years ago, while George beat me to it by a few months.

Back to the Microphone.

As I couldn't be separated from George for long I joined the Roosters too, but in 1928 we had so many requests to appear on our own that we started cabaret work and were away from the microphone two or three years.

We inflicted our efforts on the Piccadilly Hotel for three months (we had been booked for a week), and then went and did the same thing at the Café de Paris. But it was a turn we did at the Café Anglais which brought us back to broadcasting.

A B.B.C. chap who was there came up to us and said: "Why don't you fellows broadcast?" Which was all very amusing, as we had broadcast quite a lot before. But we didn't think it was at all a bad idea, so we started all over again as the Western Brothers, and have been at it ever since.

How do we work? Well, as a rule George writes the music and I do the words, although, as a matter of fact, George often manages to come in with a good impromptu joke. He has a gift for finding them out of the blue.

Broadcasting just happens to suit our style of work and it's great fun, but what we enjoy most are the parties we sing at in Mayfair and the hunt balls we are asked to up and down the country, where we always manage to pull their legs in the true public-school spirit!

By the way, we have had the honour of appearing on several occasions before the Prince of Wales; his favourite song of ours is "Play the game, you cads!"

I don't think we have ever been late for a broadcast, but we've had some jolly near squeaks. That's why we took up flying. During the summer we sing at places all round the coast, and it's a bit of a help being able to jump into our plane after a morning's recording in London and be at the other end of England for a show in the evening.

Topical Treatment.

The songs we enjoyed writing most were "Wearing his Old School Tie," "Amazing Whoopee," "It was too terribly marvellous." As all these songs lend themselves to topical treatment we often have a bright idea about Belisha beacons or the political situation in the taxi on the way to Broadcasting House, and so another verse is added to the song as you hear it in the evening.

What do we do in our spare time? Cads like us don't have any spare time—but when we do we play golf. George is fairly good; I'm fairly bad. But the language is about equal.

A GRAHAM FARISH VALVE HOLDER

THERE have been several modifications of the plain pillar type of terminal, though we are bound to say that this had a long run before that happened. And we hesitate to imagine the dimensions of the volume of bad language they must have occasioned in their time!

Theoretically, no doubt, the simple terminal conception appeared satisfactory enough to its originators. There were the three straightforward sections, as it were: the threaded rod with a neatly bevelled platform in the centre, a milled nut for one end and a securing nut to hold the terminal in place on a panel or terminal strip at the other end.

To hold a wire, all you have to do (theoretically) is to loop the wire round the terminal stem and screw down the milled nut. But if you don't make a tight, closed loop, as often as not the wire slips farther and farther out as you screw down, until it comes right off. And even when at last you have it properly secured that happy state lasts but a little while.

The imperceptible mechanical vibrations occurring in all sets and, in fact, in all articles, and the tiny contractions and expansions of the metal of which the terminal is made, and which are caused by temperature changes, inevitably result in a slight loosening.

An Excellent Terminal Design.

This is bound to be followed by a complete loosening in due course in view of the nature of the design. And when it is necessary to secure several wires under the one terminal——. It is then that that neat bevelling is found to be a very serious practical disadvantage.

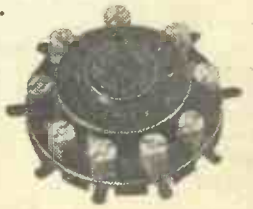
We have said that there are several modifications of the ordinary and not very satisfactory plain type of terminal. One of the most satisfactory of them all is to be found on the Graham Farish components.

The Graham Farish terminal embodies a square, castellated base. The ends of the leads fall into these castellations and cannot come off. When two or three wires have to be taken to the same terminal the scheme can be appreciated at its full value.

The terminal head is milled for finger tightening, and is slotted to enable a screwdriver to be employed for final tightening.

This splendid terminal is, of course, to be found on the Graham Farish nine-pin valve holder which figures in the accompanying photo. The advantages of having a reliable and easy-to-handle terminal on such a component are obvious. The size of the component and the number of terminals required make it quite impossible to separate the terminals by more than a certain amount.

We must hasten to add that the separation is adequate in every way—particularly as such a neat and effective design of terminal is used.



In this Graham Farish valve holder the contacts are carefully designed to ensure sound electrical contact and easy fitting of the valve.

In other respects, too, the valve holder is a first-class piece of apparatus. The moulding is clean and of high-grade material, closely sculpted for loss reduction, and the contacts are of hard, springy material which ensures good electrical contact and an easy fitting of the valve.

They are also well sunk so as to render it impossible for there to be accidental shorts between the wrong valve legs should a user attempt to put a valve in the wrong way round; a feat which, by the way, cannot be accomplished, however hard you try!

Yes, it certainly is a very good valve holder, and Messrs. Graham Farish are to be congratulated for being able to manufacture such fine stuff for sale at prices well within the reach of all of us.

TIDYING UP THE REGIONAL SCHEME

(Continued from page 173.)

from 50 to 70 kilowatts. It is true that, when the Regionals were projected, a power of 50 kilowatts was considered more than ample to cover the intended service areas. What is equally true is that since the first of our Regionals came into existence the Lucerne Plan has authorised powers considerably higher than 50 kilowatts—and foreigners are taking advantage of that fact when they put up new transmitters.

Power Increases Needed.

All our main Regionals could use up to 100 kilowatts and still come within the scope of the Lucerne Plan. Wavelengths down to 272·7 metres may carry up to this maximum. Our lowest wavelength Regional — the Midland — is on 296·2 metres.

As an example of how our present maximum of 50 kilowatts—beyond which, as I say, it is almost impossible to go without great structural alteration — may be rendered impotent by higher-powered ether neighbours, take North Regional.

Just above him is Cologne, which now transmits on a full 100 kilowatts. Below is Sottens, which, although on only 25 kilowatts at present, threatens to come somewhere near the Lucerne maximum very soon. Listeners near the fringe of North Regional's service area are already complaining of a background of Cologne — inevitable on all but highly selective sets unless North Regional can step up its power.

Loss of Service Area.

And so with the other Regionals. As time goes on each of our proud 50-kilowatters will be humbled by 100-kilowatt-wavelength neighbours, with a corresponding loss of effective service area.

My reason for digressing like this is to show that, even when all the gap filling has been done, the B.B.C.'s work will not be absolutely complete. They will then have to tackle the reconstruction of the existing stations.

Farsightedness has not been too strong a point in B.B.C. development. It is easy to be wise after the event, though, and I for one am not suggesting the B.B.C. ought to have taken on clairvoyant powers before attempting to build any of their present transmitters.

The Empire Transmitters.

Finance is as much the nigger in the woodpile as anything. With Daventry's Empire transmitters, for example, the B.B.C. definitely had to cope with the most meagre resources. Now that they are going to erect new transmitting apparatus we must not chide them for not putting up higher-powered short-wavers to begin with. The Empire service has established itself, has earned the right to a larger financial consideration.

Aerials are being re-erected all the time at Daventry. The whole layout of the Empire service is by no means in its final form. The B.B.C. is alive to the competition of foreign short-wave stations, but suffers from the disadvantage of having to cover a much wider part of the globe's surface with one transmission than is so with any other broadcasting organisation.

Studio Improvements.

So far we have thought only of transmitters. Allied to them are a host of projected or recently completed studios. At Maida Vale, to take one example, four new studios are going up alongside the recently opened large orchestral studio.

In the near future the skating rink will house two more studios for orchestral broadcasts, a general-purpose studio and—at last—a specially designed studio for the B.B.C. dance band.

At Edinburgh a new talks studio is being fitted up, while at Manchester, Birmingham, Cardiff and Bristol suites of studios have only just come into operation.

Lastly, the very headquarters of broadcasting—the "Big House" in Portland Place—is itself already much too small. A bridge has just been built to span the existing House with the smaller houses in Portland Place taken over to accommodate the ever-expanding services.

Demolition work on these old Regency houses will shortly begin. The B.B.C. plans to double the present size of Broadcasting House. It is not generally realised that the corridors at the northern end of the building come to an abrupt stop, the implication being that one day they will continue to run right along through the extension.

Television will probably have some effect on the design of the new half of Broadcasting House. It seems to be generally admitted that another studio tower will be erected at the centre. Plans are already in preparation, but naturally nothing definite has yet been decided.

And so it goes on, this broadcasting. Expanding all the time. With so much urgent development work waiting to be done the B.B.C. must be thankful that licences continue to creep up. At the same time the Governors must register many a sigh of regret when they allow themselves to imagine what wonders could be performed with the other 5s. 3d. of each ten-shilling licence.

NOISES OFF: THE OLD STAGE COACH

B.B.C. EFFECTS (No. 3). Six assistants are required for reproducing the sounds made by one of the old stage coaches. The clatter of horses' hoofs is produced with the aid of the multisurfaced table in the foreground, and the jingling of bells with the help of a pair of child's reins. Other noises are produced by rolling a brick in a barrel, the shaking of a thunder sheet and the turning of a ratchet wheel.

TOURING EUROPE ON THE SILVER KING

(Continued from page 168.)

panel, and judicious use of reaction is a thing that shows the expert operator, not the novice.

Gone are the days when we were told not to oscillate. Such sets as the "Silver King," where oscillation on the broadcast band will not even upset the short-wave side of the set, do not cause the slightest interference with one's neighbours, even if reaction is pushed to the limit. So use this really wonderful development of the valve—it will mean a great deal to you not only in assistance in the getting of stations, but also in the cutting out of those that you do not require.

When Conditions Are Difficult.

So set out on your tour of Europe with the intention of using a modicum of reaction for station getting where required, and also of using reaction in conjunction with the volume control for the separation of the various programmes when conditions are difficult. And who has managed to tour the whole waveband within the past few years without finding conditions difficult in more than a few places on the scale?

It would be easy in this article to give you a list of the stations that you should hear. It would be even easier to give you a list of those you are not so likely to hear; this latter list would be so much shorter. But such a column of names as the former, or the few wavelengths of the latter, would not help one jot in the handling of the set, which, after all, is what you are concerned with.

If you cannot handle the "Silver King" on the broadcast side you are not likely to hear many stations. If you can operate it properly you should hear scores. So read the few remarks in the foregoing carefully while you have the set actually operating in front of you. Try the effects of each knob singly and note how far you can go in each case.

A Final Hint.

Especially note the effect of the trimming knob that is placed so conveniently in the centre of the main tuning control. Unless you get the knack of handling this you will never get anything like the best out of the set.

And now we will leave you, sure in the knowledge that ere long you will be touring Europe at will, picking up this or that station to add to a bag that will rapidly increase in size.

RADIOTORIAL

The Editor will be pleased to consider articles and photographs dealing with all radio subjects, but cannot accept responsibility for manuscripts or photos. Every care will be taken to return MSS. not accepted for publication. A stamped, addressed envelope must be sent with every article.

All Editorial communications should be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

All inquiries concerning advertising rates, etc., to be addressed to the Advertisement Offices, John Carpenter House, John Carpenter Street, London, E.C.4.

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 reception. 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 specialties described may be the subjects 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

CHARGING ON THE CAR.

C. W. G. (Waterford).—"As I am out on the road constantly in my car I want to use the car battery to charge my wireless accumulator. I am told I can do this by wiring one of the car bulbs in the lead to the radio battery and then keeping it switched in till the battery has been charged.

"The dashboard has a pair of sockets for an inspection lamp, so this is where I shall take the connection from. But the leads are inaccessible and difficult to trace, so what I wish to know is, can I find which is positive and which negative by the usual methods?"

We have not tried the suggested arrangement for accumulator charging, but it appears quite feasible, provided you get the connections in the correct charging position—positive of battery to positive charging point.

Any of the usual polarity tests will be applicable to determine which socket is positive and which negative.

If you use the salty-water test make sure that the water really is "salty" and hold the two leads fairly near each other.

"AN UNEXPECTED IMPROVEMENT IN SIGNAL STRENGTH."

R. C. N. (Seven Sisters Road, N.4).—"Re your answer to T. G. G. (Edgware), 'An Unexpected Improvement in Signal Strength,' March 23rd 'P.W.,' would you be so kind as to help me by giving me the diagram of his layout?"

The scheme adopted by T. G. G. is so simple that it can be described in a few words, and a diagram is unnecessary.

Originally the set had its aerial terminal connected to the aerial lead and its earth terminal to the earth lead. This is how it was altered:

First, an extra tuned circuit was constructed, consisting of an ordinary dual-range tuning coil, with a ·0005-mfd. tuning condenser connected across the E and G terminals in the ordinary way. (The coil was mounted on a small baseboard, attached to a 3½-inch square panel, on which the tuning condenser was mounted.)

The combined coil and tuning condenser thus form a selectivity unit, which is placed near the aerial terminal of the set. The aerial lead is taken off the set's aerial terminal and is placed on the corresponding (A) terminal of the new selectivity unit.

The earth (E) terminal of the new unit is joined by a short wire to the set's earth terminal.

The G terminal of the new unit must now be joined to the set's A terminal, but a *small* fixed condenser must be inserted in this lead.

For this purpose a small neutralising-type condenser is ideal; but, failing that, two insulated leads can be twisted together for an inch or so, thus forming a "condenser," the capacity of which will depend upon the length of the twisted part of the leads.

When in use the extra tuning coudenser must be adjusted, as well as the main tuning condenser on the set. If the correct degree of selectivity is not at first obtained the coupling can be altered by the usual method on one or both coils; and also by altering the capacity of the small condenser in the lead to the set's aerial terminal from the unit.

Almost any degree of selectivity can be secured in this manner; but the capacity of the little condenser in the lead to the set A terminal must be really *small* to get great sharpness of tuning on a set that was originally unselective

VALUE OF THE VOLUME CONTROL FOR PICK-UP.

R. G. A. (Henley-on-Thames).—"What is the best value of resistance for a potentiometer to be used for controlling the volume from a gramophone pick-up? The pick-up is to be inserted in the detector-grid circuit, and the two following valves are L.F. and power types."

There is no general rule for a "best" value, since the amount of resistance required depends upon the characteristics of the particular pick-up which is to be employed.

You will find that the manufacturers of any given pick-up recommend what resistance potentiometer should be used with their product—and the golden rule is to follow the manufacturer's recommendation.

IN "TWENTY-FIVE YEARS A KING"

One of the H.M.V. High-Fidelity radiograms featured in a scene from the Pathé film "Twenty-Five Years a King." This film will be released to coincide with the Jubilee celebrations.

ELECTRICAL CENTRE TAP FOR MAINS TRANSFORMER.

R. D. B. (Brighton).—"I have got my good old A.C. Three in action again, but on these mains I get what I never had before—a distinct hum, very noticeable in the intervals of speech, etc., though not spoiling actual reception of music. I have been looking it over, and think the centre-tapped transformer may be the cause.

"Some of your later designs have used a potentiometer-slider connection for the "filament" return instead of a centre terminal. It would appear to be easy to alter. Would this be likely to reduce the hum?"

It would be worth trying, as it is done so easily—all that is required is to wire the special mains potentiometer (or "hum-dinger") across the filament winding of the transformer, and transfer the set centre-tap connection to the slider terminal, adjusting this as necessary. No connection goes to the centre tap of the transformer winding.

Very often this is a complete cure, and there is every hope in your case, because the set's smoothing, etc., has already been proved to be adequate when other conditions are right.

WHICH HAS THE LOWEST MINIMUM CAPACITY?

W. O. L. (Cardington).—"Is there an easy way of telling which of several variable condensers has the lowest minimum capacity?

"I had to choose one of a batch of ·0005's the other day, all different makes; and for the job I had in hand it would have been best to use the one with the lowest minimum capacity. I hadn't got a wavemeter, but there were plenty of coils, etc., lying about and a one-valve short-wave set.

"It occurred to me at the time that I ought to be able to compare those minimum capacities with the help of oscillations from the short-wave set. But I could not see how it should be done.

"What would have been the right way?"

There were several courses open to you. One simple method would have been to fit up an absorption wavemeter, which, as you probably know, consists only of a short-wave coil connected across a tuning condenser. If the arrangement is placed near the grid circuit of a gently oscillating short-wave set it will stop the set oscillating when adjusted to be exactly in tune with the set.

By varying its distance from the set (altering the coupling) this type of wavemeter can be made very sensitive and sharp, and in that condition it would have suited your purpose nicely.

Stopping the Set Oscillating.

You could have made the short-wave set oscillate gently, and arranged the wavemeter so that the oscillations could be stopped at will by bringing the wavemeter's condenser into tune with the set's.

Then you could have connected the condensers to be tested, one by one, across the wavemeter condenser. Although set to "zero," each would have added an extra capacity.

The first effect of adding an extra capacity across that of the wavemeter condenser would be to throw the wavemeter out of tune—indicated by the set commencing to oscillate again.

This could be corrected instantly by reducing the setting of the wavemeter condenser, to bring the circuits exactly into tune again. You could have made a note of the new condenser reading, and then proceeded to test the next condenser.

When you disconnect the first one the set begins to oscillate again, which you stop by going back to the original setting on the wavemeter's condenser. Then you join up the second condenser to be tested. The effect is to cause the oscillations to commence again.

As before, you can stop them by re-tuning on the wavemeter condenser. *The extent to which you have to re-tune each time is an indication of the amount of added capacity.*

All you need have done, therefore, was to find which of the batch of ·0005's affected the wavemeter setting least when connected across it.

You could have compared the whole lot in a few minutes by this method, and it is very exact, since the resetting of the condenser on the wavemeter indicates exactly how the different capacities compare with one another.

You will appreciate the importance, however, of using the same (short) leads each time to connect the condenser under test to the wavemeter condenser; and, of course, the wavemeter itself must be kept in a fixed position relative to the short-waver.

If these simple precautions are taken an absorption wavemeter can be made to give an excellent comparison of small capacities when there is no test transmitter available.

The simplest plan of all, of course, is to wait until a steady programme can be tuned in, and then add the test capacities to the set tuning capacity, re-tuning on that instead. But unfortunately the station generally stops or fades out, so the improvised wavemeter is better.

USING A MILLIAMMETER FOR TESTING.

G. W. M. (Lowestoft).—"It is a four-valve set, Screened Grid, Detector, L.F. and Power. I got it at a knock-down price from a chap going abroad, and the range and quality are just what I wanted.

"In the H.T. negative lead there is a milliammeter connected, and he told me I

(*Continued on next page.*)

RADIOTORIAL QUESTIONS & ANSWERS

(Continued from previous page.)

could use this for testing and keeping the set in proper condition.

"Unfortunately, I do not know anything about taking measurements, though, of course, it is easy enough to read what the needle shows. Would you explain what is the method of using a milliammeter on this kind of set?

"What I have in mind is not so much telling when a battery needs replacing—my ear for distortion is pretty keen—but finding any leak of H.T. that may develop and telling from the milliammeter's reading what part of the set has gone wrong, if this is possible."

When a milliammeter is connected in the negative H.T. lead it indicates all the current that flows to anodes and screens from the H.T. battery. And if it is a sensitive instrument it thus keeps a watch on every valve and affords an invaluable check on what is going on inside the set.

The first rule is to know exactly how much current each valve takes. Then keep watch to see that this figure is not departed from.

The figures supplied by the valve makers will show the correct H.T. consumption at the various G.B. and H.T. voltages; and when these are totalled together you get the normal working current.

So check up, if you can, from the valve makers' literature, and make a note of the correct H.T. consumption for each valve. To verify this, remove three of the valves and ascertain whether the remaining one gives the appropriate reading.

A Typical Example.

For example, if the power valve is supposed to take 15 milliamps with the H.T. and G.B. that you are applying, take out the other valves, and the milliammeter should read 15. If the L.F. valve is supposed to give, say, 3 milliamps, insert this valve next, and check that the reading rises to 18 milliamps, and so on.

This record of correct currents for every and all valves will be found invaluable in fault-tracing, since a quick test can be made at any subsequent time, and if any valve is showing a discrepancy you have a clear indication of the part of the circuit in which the fault lies.

You will appreciate, when compiling your list of normal working plate currents, that changes of H.T. and of G.B. affect the current passing to any valve. This being so, the current indications of the milliammeter automatically check grid bias and high-tension supplies, since variations there will immediately lead to current variations.

In addition to this general check on all voltage supplies, the milliammeter can be made to watch for defective insulation.

When you have switched off for the night look occasionally to see if there is a reading on the instrument. Its needle should, of course, drop right to zero reading when the filament switch is in the off position; but if a condenser breaks down or some similar fault develops, the reading may not drop right back to 0 as it should.

Many milliammeter owners forget that this simple check on H.T. leakage is always available to them.

INSULATED AERIAL WIRE.

J. H. S. (Ilfracombe).—"Arising out of your reply re aerial wire in the March 30th issue to L. W. T., you point out that copper wire with no protective covering corrodes by contact with the salt atmosphere in coastal districts.

"I would like you to say whether this corrosion has any detrimental effect on reception of signals. I have heard it argued that, as the signal current is supposed to travel on the surface of the wire to the set, then the corrosion must cause a certain amount of resistance to the current, which would not be desirable.

"On the other hand, it is pointed out that the action of the current is sudden and instantaneous, that a trifle of chemical change on the copper surface could have no influence whatever on the quality and strength of reception. Which of these views is correct?"

From the point of view of extra resistance the effect of corrosion on the surface of the wire is negligible. As you know, the aerial wire can be thickly and smoothly coated with a first-class insulating material, without making any appreciable difference to the results obtainable.

The engineer's view about such corrosion is that it will be no more harmful electrically than any other poor conductor (or even insulator) surrounding the aerial; but that it will weaken the wire, from the *mechanical* point of view, and render necessary more frequent renewals. So he uses a coating of insulation to preserve the wire.

THE NEW TALKS

(Continued from page 170.)

The "Fol de Rols" were fortunate to have the opportunity to announce themselves so widely on the air before their seaside season begins. There is good variety in their bill. There is cleverness, too, and a refinement that isn't to be found in all concert parties. Naturally, we heard only a fragment of their repertoire. They are famous for that sort of concerted item represented this year by "Love's Sweet Dream in a Teashop" and "Old Lovesongs are Through." The songs and duets are tuneful. The sketches are amusing, though the comedy generally isn't too sparkling. But this will be remedied when the comedians have a live audience to play to.

* * *

I have never been one to decry women at the mike. And I feel less disposed than ever to do so after hearing Mlle. Marcelle Baguer read those extracts from French literature. Even had I been unable to understand the Racine, Molière and de Musset she read, I still think I would have enjoyed the readings because of the feeling and the vigour Mlle. Baguer put into them.

* * *

A friend of mine complains that 8 p.m. is the hour when the B.B.C. ceases to present anything worth listening to. So at that hour he switches off the wireless and turns on the gramophone.

I don't altogether agree with this opinion, though I will admit that the Dotty Ditties, Best Sellers No. 6, Four Fools in Fantasy night wasn't the best evening programme the B.B.C. has ever put on. The last named, I thought, was sheer rubbish. Too many skits on Children's Hour fare—not a bit funny. It is amazing that so many writers should think this is such a good subject for humour.

* * *

The snag about the Best Sellers programme is that the promoters forget that we are already sick of most of the numbers they put on. No. 6 programme contained eight numbers, all of which we had heard scores of times before. Apart from "Easter Parade," there wasn't one I wanted to hear again. Had it not been for the fact that Brian Lawrence was singing I would have switched off long before I did. But it is a pleasing change to hear these songs sung rather than crooned.

* * *

The Italian Ballet Music could have saved the evening if it had come earlier. 10.20 is too late for universal listening. Perhaps Italian Ballet Music isn't thought to be for universal listening. Still, it looked interesting enough to tempt me to sit up for it. And I am glad I did. It *was* interesting.

C. B.

THE LINK BETWEEN

Trade items of interest to all readers.

By G. T. KELSEY.

MANY moons ago I was rash enough to predict that this year would see a great increase in sets for universal mains operation. I say "rash enough" advisedly, for ordinarily it doesn't do to anticipate the future of anything to do with radio. But the idea of receivers which can be operated on either A.C. or D.C. mains without alteration appeared to me to be such a logical development in the "all-electric" field that it seemed a pretty safe conjecture.

And it certainly looks, at the moment, as though that prophecy will be fulfilled. Already this year many new "universal" designs have appeared, and I should not be at all surprised by "Show" time to see a very great increase in the numbers available.

But all this activity in connection with the design and production of A.C.-D.C. sets doesn't tend to make it any easier for the listener, at least not when it comes to choosing a new set. Apart from all other considerations, he is at once faced with the problem of deciding whether there is any advantage to be gained from forsaking the conventional all-electric one-type-of-supply-only kind of instrument in favour of a design that can be used universally.

And that is where I am expected to give advice!

Well, I am afraid it is utterly impossible to lay down any hard and fast rules, because it does depend so very much in the first instance upon individual requirements.

In a general sort of way it may be assumed that there is no vital difference technically, and, in consequence, the only important factors which should be allowed to influence the potential buyer are (a) the prospect of removal to another district, and (b) the likelihood of the existing electric supply being changed.

Apart from these points, the decision can be left entirely to performance-commensurate-with-price considerations. And as far as I can see, that is where the universal designs are likely to have the advantage. The universal instruments which have been released this year have all been high-performance low-price sets with a vengeance, and perhaps the most outstanding example is the new Ekco Model "AD 36."

I haven't the faintest idea how the manufacturers have succeeded in producing this set—a most attractive A.C.-D.C. model—at the extraordinarily low price of 8 guineas. But there you are, Ekco's always were enterprising, and all that need concern us is that such a bargain *is* available!

* * *

New Marconi Valve.

Readers of "P.W." who are interested in automatic gain control superhets will be glad to know that enterprising Marconiphone have just released a new double-diode-pentode valve, which is to be known as the "DN41."

With most ordinary A.V.C. superhet circuits, the de-modulator, the A.V.C. rectifier and, usually, a triode L.F. amplifier, are all included in the one envelope, and this double-diode-triode, as it is called, is followed in circuit by the output valve.

With the new Marconi DN41, a separate output valve is unnecessary, since it is included in the three-in-one tube. As a matter of fact, the pentode incorporated is of the high-slope type, having characteristics similar to the recently released Marconi N41.

But I am afraid I am trespassing upon Mr. Rogers' preserves. He's our valve expert, and he will be telling you all about the merits of the valve technically. It's my job just to tell you that such a valve exists, and in passing to commend Marconiphone for having produced it. The price, by the way, is one guinea.

* * *

A Praiseworthy Idea.

While in the mood for back-patting, I feel it is my duty to call attention to the excellent work that is being done by Messrs. Kolster-Brandes in the great cause of interference-free reception. It is hardly necessary for me to stress the importance of the "Rejectostat" system, for which K.-B.'s were originally responsible, but now, as a result of recent developments, it is possible to work up to a thousand sets simultaneously from the same aerial, and to ensure that each and every one of them will be to all intents and purposes free from interference due to man-made static.

It is hardly likely, I know, that any "P.W." readers will be anxious to work a thousand sets from one aerial, but think of the immense advantage where blocks of flats, hotels, etc., are concerned.

Community static rejection on such a grand scale as this is an achievement upon which K.-B. are deserving of hearty congratulations.

RANDOM TECHNICALITIES

Jottings of interest to all readers.

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

Renting Your Radio.

THE principle of renting radio sets and various appurtenances thereof seems to be growing in popularity. I hear that the people who rent radio sets are doing increasing business, largely, no doubt, because they undertake to service the set in every way and take complete charge of its maintenance, all you have to do being to switch on and off.

For a long time past it has been possible to rent your L.T. batteries, these being periodically exchanged by the renters. Latterly the practice has grown up of renting also H.T. batteries, and just recently one of the leading battery people, Messrs. Block Batteries, Limited, have gone right into the high-tension rental scheme with both feet.

Service and Maintenance.

The batteries supplied are their well-known "block" batteries, contained in moulded bakelite cases, the standard size being 60 volts, with tappings at 40 volts and 20 volts, but, of course, two of these will give anything up to 120 volts. A customer pays little more per week than he does in the ordinary way for dry batteries, whilst the voltage is fully maintained throughout.

If you are interested in having your H.T. accumulator on the rental system maintained by the supplier, just in the same way as L.T., you should communicate with your local dealer, who probably has the scheme installed, or, if not, direct with Block Batteries, Limited, By-Pass Road, Barking, London.

The Pentode Case.

I dare say you know that there has been a big law case recently between The Philco Radio Corporation of Great Britain, on the one hand, and the Mullard Valve Company, on the other hand. The case has become known as the "pentode case," since the Mullard Company were claiming that one of their patents dealing with pentode valves had been infringed by the other company.

It is rather interesting to note that one of the claims in the patent related to a valve having at least three auxiliary electrodes between cathode and anode, and the problem with which the valve was concerned was that of eliminating the effect of secondary electrons. The case may possibly yet go to the House of Lords, and may be added to the list of "celebrated causes" which have arisen from time to time in the valve field since broadcasting started.

A Battery Clock.

It is always a job to know how your low-tension accumulators are getting on—whether they are fully charged or only half-charged, what the state of the acid is and so on.

For quite a long time past there have been various attempts to introduce automatic indicators; in fact, indicators of

(*Continued on next page.*)

RANDOM TECHNICALITIES

(*Continued from previous page.*)

sorts date back, to my own knowledge, to the time when broadcasting first started, but it is only lately that they seem to have been developed and taken up by the best-known battery manufacturers.

Just lately a very neat and effective form of indicator has been adopted by the Oldham people, manufacturers of the famous Oldham batteries, who have introduced what they call a "capacity clock." This gives a positive and accurate reading at all stages of charge or discharge and shows you whether the accumulator is "full," "half" or "low."

Lead Tellurium Plates.

It depends upon an entirely new principle and is claimed to be absolutely reliable and efficient. An indicator is incorporated actually in the cell itself, and has for all the world the general appearance of a clock face, the indications being visible at a glance.

Talking about Oldham batteries, by the way, you may know that they have just introduced a new type of plate known as the tellurium-lead plate. These plates are said to be so superior to ordinary lead plates and so dependable that the introduction of them has enabled the Oldham people to give a long period of insured life for their batteries.

The Home Constructor.

Some people say that the popularity of home construction of receiving sets is not so great now as it was a few years back owing to the considerable all-round reduction in prices of commercially built receivers. I do not know how this may be, but it seems to me that there must be a very large amount of home construction of sets still going on, and certainly present-day prices of components very greatly help towards popularising home set-building. When you think that a low-frequency coupling transformer of first-rate quality can now be obtained at half to one-third of the price which prevailed seven or eight years ago you realise what the change in prices amounts to.

Now's the Time for Set Builders.

There never was a time when things were made so easy for home set-builders, or indeed when they could, for a relatively small outlay, produce such an efficient set as to-day. In the old days we paid through the nose for all our components, and when we had finished we had a receiver which simply would not bear comparison with one that could be produced to-day for something like half the price.

Push-pull Pentodes.

Those of you who use pentode valves in push-pull arrangements are no doubt well aware that the two valves should be as nearly matched as possible. If there is any appreciable error in the matching you are liable to get a greater or less degree of distortion. For the best effects with a push-pull output stage you should have the same amount of current passing through each half of the primary of the output transformer. This means that the magnetising effect on the core of the transformer will be reduced to zero because one half will exactly counteract the other.

In practice, of course, it is never possible to get two pentode valves which are exactly the same and which pass the same anode current, so that really you have to rely upon some method of adjustment.

Voltage on Priming Grids.

This can be done by connecting the priming grids of the pentodes to the terminals of a suitable potentiometer, the slider being connected to H.T. You will see at once that the relation between the voltage on the one priming grid and that on the other depends upon the position of the slider of this potentiometer, and by shifting the slider so you can increase the voltage of one priming grid and at the same time reduce that of the other.

In this way you have a convenient method of adjusting the anode current of the valves so as to get them equal. A suitable value for the total resistance of the potentiometer element, by the way, is about 5,000 ohms.

A Power-Output Point.

I have often found that people get a little confused about the question of the power output of a set. They think that if an output valve of a certain fairly large maximum power is used, therefore that amount of power will be delivered to the set. This does not follow at all, and, anyhow, if the maximum power of the valve is to be delivered it follows that the corresponding amount of input must be supplied to the valve.

As a matter of fact, you may sometimes do better with an output valve of lower power rather than one of higher power if the input to the valve is not sufficient to work it at full pressure, so to speak. Perhaps I may make this clearer by giving actual figures.

Maximum Undistorted Output.

Suppose the input to the last valve is sufficient to properly load a valve of 1 watt undistorted power, then you will do much better with that valve than you would with an output valve of, say, 2 or 3 watts. There are various reasons for this, one of them being that with these larger output

(*Continued on next page.*)

RANDOM TECHNICALITIES

(*Continued from previous page.*)

valves the amplification is generally rather small. A valve giving an undistorted output of, say, 4 watts may have an amplification factor of 10, whilst one giving twice this output may only have an amplification factor of 3 or 4. The second valve will obviously require something like twice as much input as the first one in order to give the same amount of output.

A further point which is often not very clear, unless you think about it carefully, is that the maximum undistorted output specified for a particular valve refers to the loudest passages of sound which it handles. Since these occur comparatively seldom, the valve will, for the most part, be working at only a fraction of its maximum undistorted output—perhaps half or even less.

Prices of Television Receivers.

When the P.M.G.'s Television Report came out it was freely stated that a television receiver of the commercially-built type would cost somewhere between £50 and £80. A good deal has been heard lately about a television receiver which will be put on the market to cost only some £25 to £30. I presume this latter is for receiving television only, whereas no doubt the figure of £50 to £80 is for a combined receiver and radiogram.

At any rate, even at the higher prices mentioned, the television set would compare quite favourably with radio receivers when broadcasting first started, and if the prices of television receivers come down when mass-production gets into full swing, as they did with radio receivers, there seems little doubt that within a relatively short time it will be possible to get complete combined television and sound for the present-day price of a good broadcast set.

Another Comparison.

There is also the important question to be considered of the home construction of television receivers. Some people think that they will be much too complicated and difficult for the ordinary home constructo to tackle, as he did radio sets. As a matter of fact this view will, I think, prove to be quite wrong.

There is nothing very much more serious in the making of a television receiver than in the making of a modern radio set.

ADVERTISER'S CORRECTION

We are asked to publish the following corrections to the advertisement of the International Radio Bureau which appeared in our April 6th issue on page 128. The price of the Peto Scott Strucktakit containing two panels, screen and Metaplex Baseboard only, is 12/-, and the other items are given free with complete kit only. Also, four valves were listed in error instead of three, and the prices are:—one set of three valves with ordinary power, £1 13 6, or alternatively, one set of three valves with super power, £1 18 6.

WITH THE EXPERIMENTER

(*Continued from page* 169.)

A slight adjustment on the series condenser will make up for any discrepancies of coupling when switching from one tuning range to the other. The variation of the aerial-coupling circuit gives a fine control of selectivity—especially if the series condenser is worked in conjunction with the reaction.

If two adjacent stations are jammed, just reduce the input by decreasing the capacity of the series condenser, making up for the loss of signal strength by an increase in reaction.

Europe to-day is a wonderful playground for a one-valver. The ether seems strangely quiet and well behaved when you eavesdrop on a pair of phones. Against a dead-silent background the announcers strike a strangely intimate note.

I often wonder whether headphone reception, given another chance, would not "catch on." It has, anyway, one tremendous advantage. You can listen without disturbing other people. To the late dance music, for example, in bed.

I am thinking of squeezing up the one-valver into a small case, so that it can form an emergency outfit for the car. With a casually slung bit of wire hanging from a handy tree it ought to bring in plenty of stuff during the glorious outings ahead.

I'll keep you posted about its wanderings.

"The Experimenter"

Masterpiece Library of Short Stories 6

Printed in Great Britain and published every Wednesday by the Proprietors, THE AMALGAMATED PRESS, LTD., The Fleetway House, Farringdon Street, London, E.C.4. Advertisement Offices: John Carpenter House, John Carpenter Street, London, E.C.4. Registered for transmission by Canadian Magazine Post. Subscription Rates: Inland and Abroad, 17/4 per annum. Abroad (except Canada), 19/6 per annum. Sole Agents for Australia and New Zealand; Messrs. Gordon & Gotch, Ltd.; and for South Africa; Central News Agency, Ltd. Saturday, April 20th, 1935.

S.S.

OLYMPIA MAIL ORDER SERVICE

RADIO'S BIGGEST BARGAINS.

All Goods offered are guaranteed unused. In Maker's original carton and in perfect condition, and naturally carry our Money-back or satisfaction guarantee.

TELSEN RECEIVERS : 1935 6-Valve A.C. Superhet Receiver. All the latest improvements embodied. List price 14 Guineas. Our price 10 Guineas. Battery Model of the above is available complete with Batteries at the same price.

TELSEN All-Electric A.C. Superhet Radiogram. Model 3550/R.G. This superb instrument is only available to the limited few who make early application. List price 24 Guineas. Ours 16 Guineas.

CLOCK-FACE Tuning Dial. The most handsome Tuning Dial manufactured. Mother-of-Pearl Scale. Chromium Escutcheon size 5 ins. x 4 ins. List price 15/6d. Our price 8/6d.

ATLAS P.M. Moving-Coil Speaker. Suitable for Power, Pentode or Push-Pull. List price 42/-. Special price 12/11d. Early application for this astonishing bargain recommended, as stocks are rapidly becoming exhausted.

TELSEN COILS : Single-Screened Iron-Cored Coils. Suitable for Aerial or Anode (List 8/6d.), 4/6d. Iron-Cored Scd. Twin-Ganged Coil Unit. Suitable for all circuits (List 19/6d.), 12/6d. Iron-Cored Triple-Ganged Coil Unit (List 30/-), 21/6d. Triple Scd. Iron-Cored Coil Unit Superhet Type (List 30/-), 21/6d. Dual-Range Aerial Coil. List No. 76 with selectivity device (List 7/6d.), 4/-. H.F. Aerial Transf. Coil. List W 154 (List 5/6d.), 3/11d.

TELSEN COMPONENTS. Bakelite Tuning Conds. '0005 (List 2/6d.), 1/6d. Scd. Binoc. All-wave H.F. Choke (List 5/6d.), 3/6d. Standard Scd. H.F. Choke (List 3/6d.), 2/3d. 4-pt. Switches (List 1/6d.), 9d. Ace Transf. 3-1 or 5-1 (List 5/6d.), 2/11d. Class B Output Transf. (List 10/6d.), 3/6d. Class B Driver Transf. 1·5-1 or 1-1 (List 10/6d.), 3/3d.

BRITISH RADIOPHONE. Latest Shielded type. '0005 3-Ganged Cond., each section fitted with trimmers (List price 15/6d.). Our price 7/6d.

LOTUS P.M. Moving-Coil Speakers. Output Transf. having 10 ratios. Suitable for any type of output Valve (List 27/6d.). Our price 15/9d.

WRITE for Illustrated Lists Post free. Please mention this paper when replying.

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Mail Order Dept., 49a, Shudehill, Manchester.
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BRANCHES in all Principal Towns.

"SWIFT SERVICE" RADIO.
PROMPT DELIVERY AND SATISFACTION GUARANTEED.

BURGOYNE Class B 3-valve battery model (complete with all valves, batteries, accumulator and Magnavox M/C loudspeaker). Ready for use (£6 10-0), £3 15 0.

SEND TO US FOR ALL YOUR RADIO REQUIREMENTS.

FIRST SPECIFIED Kits can be supplied for all "Popular Wireless" circuits, including Pilot, Author, etc.

SEND 1½d. stamp for our Real Bargain Lists.

ALL goods advertised in last week's issue are still available.

THE SWIFT SERVICE & SUPPLY CO. (P. 104), 3, FEATHERSTONE BUILDINGS, HIGH HOLBORN, LONDON, W.C.1. 'Phone : HOLborn 1336.

SOUTHERN RADIO'S WIRELESS BARGAINS.

CALLERS at our various shops are assured of an immense saving in their radio purchases.

THOUSANDS OF BARGAINS in Receivers, Valves, Mains Equipment and all classes of Components.

BRANCHES at 46, Lisle Street, W.C.2 ; 271/275, High Road, Willesden Green, N.W.10.

All Mail Orders to 323, Euston Road, N.W.1.

SOUTHERN RADIO, 323, Euston Road, London, N.W.1 (near Warren Street Tube). 'Phone : Museum 6324.

VAUXHALL. Magnavox permanent-magnet speakers, universal for Class B power, pentode or push-pull 7-in. cone, 16/6 ; 10-in. cone, 22/-.

VAUXHALL. Magnavox energised types, 2,500 or 6,500, 10-in. cone, 22/- ; 7-in. cone, 15/3. All brand new, complete with hum-bucking coils, state power or pentode. Other speakers. Send for particulars.

VAUXHALL. New Lists just issued, 3,000 Bargains. New goods. Limited number available free.

VAUXHALL. Immediate delivery of all goods advertised in previous issues.

VAUXHALL-UTILITIES, 163a, Strand, London, W.C.2. Over Dennys the Booksellers, Temple Bar 9338.

SPOT CASH for Components, Sets, &c.—Economic Radio, 96/98, South London Road, S.W.8.

---

500 GLADIOLI, first size, 4–5 inch circ., in 10 named vars., and 10 double Begonias, for only 10/- (C.O.D. 6d. extra). 300 Gladioli and 10 Double Begonias for only 7/- (C.O.D. 6d. extra). Carriage and duty free to destination.—P. Walraven, Stationsweg, Hillegom, Holland.

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500 GLADIOLI, 3½–4 inch circ., in 10 named vars. ; 100 Montbretias, 100 Anemones, 100 Ranunculus, 100 Clover of Happiness, 10 Lilies, for only 10/-. Carriage and duty paid to destination (C.O.D. 6d. extra).—P. Walraven, Stationsweg, Hillegom, Holland.

UTILITY SALES. The "Færitone" Short-Wave two with 3 sets of coil ready made, 55/- ; separate component lists of prices with diagram, 6d.

10,000 New Dario valves to clear. Detector H.F., L.F., 2/6 ; Power, 3/6 ; S.G., Pen., 5/6 ; Triotron, all types, 3/- ; Power, 4/- ; S.G. Pen., 6/6.

DARIO 4-Volt Valves. Super H.F., Detector, R.C. L.F., 1/3.

CELESTION 45/- list 7" Permanent Magnet, universal transformer, 17/6. Ditto, Lotus, 14/6. Cash with order, 24 hours service carriage paid.

FÆRITONE RADIO, Færitone Corner, 57, Praed Street, London, Paddington 0251.

UNOBTAINABLE ELSEWHERE. We supply any new Receiver on Easy Terms, making a good allowance on your old goods. We pay the deposit and first instalments according to the allowance. Components and Peto-Scott Kits supplied for Cash or part-exchange.—R. Wigfield, Furlong Road, Goldthorpe, Yorks.

PREMIER SUPPLY STORES (Dept. P.A.), 20-22, High Street, Clapham, S.W.4.

ALL BARGAINS advertised last week still available. Send for illustrated list.

WE can supply complete Kits of specified components for the A.C. S.T.600 at a competitive price.

ALL other goods advertised in last week's issue still available.

WARD, 46, Farringdon Street, London, E.C.4. Telephone : Holborn 9703.

SPEAKER repairs, new cones, coils and centres fitted, 5/-. Complete rewinding service, mains transformers, etc. Work guaranteed.—Write Dept. X, Weedon P.L.R. Co., 80, Lonsdale Avenue, London, E.6. (Maryland 1782.)

WANTED FOR CASH. Second-hand Wireless Parts, Sets, etc. Exchanges. Bring or send.—University Radio, Ltd., 142, Drummond St., London, N.W.1. Nr. Euston Station (L.M.S.). Phone : Museum 3810.

RADIO CRYSTALS. The famous "NEUTRON" Crystals, 1/- per tin : the oldest and best. Obtainable from : V. Zeitlin & Sons, Ltd., 141, Theobald's Road, London, W.C.1 ; Expert Radio Service, 266, High Street, Stratford, E.15 ; Real Radio Service, 61, Cannon Street, E.C.4 ; Maxim Stores, Ltd., 7a, Tothill Street, Victoria, S.W.1 ; etc., etc.

1,000 GLADIOLI, first size, 4–5 inch circ., in 10 named vars., and 10 Gloxinias, for only 20/- ; half lot, 10/-. Carriage and duty paid to destination (C.O.D. 6d. extra).—The First Hillegom Bulb Nurseries, Hillegom, Holland.

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500 LARGE FLOWERING GLADIOLI, in 10 best named varieties, and 25 Begonias, for only 8/- Carriage and duty paid to destination (C.O.D. 6d. extra).—The First Hillegom Bulb Nurseries, Hillegom, Holland.

BIRMINGHAM RADIOMART

SPECIALISTS IN SHORT-WAVE AND QUALITY COMPONENTS AT LOWEST PRICES.

Our stock is much too large to itemise here : From a soldering tag to a superhet we can supply everything, and what is more you won't be "Caught"! Send 1½d. stamp for our latest **MARCH CATALOGUE.** No firm has larger stocks or is cheaper than

THE SQUARE DEALERS,

BIRMINGHAM RADIOMART,
19, John Bright Street, Birmingham.

PLEASE be sure to mention "POPULAR WIRELESS" when communicating with Advertisers. THANKS!

THE JUBILEE "RADIO GOLD-MINE"

For every reader of "Popular Wireless." The Gold-Mine Stores offers you through this medium the world's finest selection of surplus and clearance radio goods obtainable. Our world-famous "RADIO GOLD-MINE" has reached every corner of the earth. This amazing medium has brought the same message of goodwill and big selection of unprecedented values everywhere, both to private customers and to traders throughout the British Isles, and almost every foreign country.

The "RADIO GOLD-MINE" from everywhere brings the same unstinted praise. Many of our customers writing us have mentioned it is the only surplus catalogue which has enabled them to see before they buy just what they are ordering. That is exactly what we have always endeavoured to do through the "RADIO GOLD-MINE." **It is a catalogue unique among catalogues, fully illustrated,** yet always being revised week by week, always up to date with **bargains in every branch of wireless, home construction.**

The enlarged Jubilee number of "THE RADIO GOLD-MINE" is now ready. Produced in four colour sections for easy reference, it represents the largest assortment of radio bargains ever placed before the public.

Every reader of POPULAR WIRELESS should have a copy of the Jubilee "RADIO GOLD-MINE" always at hand. You cannot realise its worth until you have a copy, when you will quickly appreciate the full truth of our advice.—You cannot afford to be without the "RADIO GOLD-MINE," the biggest money-saver and money-maker in radio to-day.

A FEW OF THE CONTENTS.—Home-Construction Kits—One-valver, **5/11.** Straight **III, 10/6.** All Pentode **III, 35/-.** Short-wave adaptor, **10/6.** Superhet **4, 59/6** (or 6/- down). Superhet all-wave 4, **72/6** (or 7/- down), and 25 other kits—battery and mains versions. Also S.T.600, **57/6** (or 5/- down). The Silver King, **£6/12/6** (or 10/- down). "Wireless World" A.C. short-wave adaptor, **£6/17/6** (or **15/-** monthly)

ASSEMBLED AERIAL TESTED CHASSIS.—Metal chassis construction. Finest quality components and workmanship **complete with valves.** Three-valver, 27/6. S.W. Adaptor, 15/-. S.-Wave III 30/-. 4-valve A.C. All Pentode, **£4/19/6** (or **10/6** monthly). 4-valve A.C. Superhet, **£5/19/6** (or **12/6** monthly), and other models, including 16-valve 5 wavebands 9-2, 400 metres, A.C. chassis 29 Gns. (or **75/-** down).

Components, Accessories and Sundries of every description, including Coils. Radiophone Superhet, **1/3**, 3/9 complete set. D.R. **7d.** Iron-cored, **1/11.** S.W. coils, **1/11. Variable Condensers,** all sizes and types. Slow motion, from **2/11.** Reaction, **7d.** Radiophone 2x '0005 Midget, 6/6. 3-gang, **7/10.** Differentials, **11d. Fixed Condensers.** Tubular, all sizes, '00004-'001, **3½d.,** etc. 1 mfd., **11d.** 2-mfd., **1/4.** Electrolytics, 8-mfd., 4-mfd., 2/4.

Wirewound Resistances, all sizes, **2½d.**

Volume controls, 1/11. Transformers and chokes, every type. L.F. from **1/11.** L.F. chokes, 2/2, 350-0-350 mains transformers, 8/6. H.T.8, 7/6. **Rectifiers :** Metal, from **7/11. Microphones,** Western Electric, **1/11,** Stand models, **6/11.** Ribbon Velocity, 7 Gns. (or 7/- down). Condenser, 6 Gns. (or 6/- down).

Pick-ups from **10/6. Cadmium steel chassis, 1/6.** Volt meters, **1/4.** Soldering irons, **2/11. Speakers :** Rola from **17/6.** Magnavox, **10/6.** Blue Spot from 25/-. W.B., **16/6.** 12-in. Auditorium, 55/- (or 5/- down), etc., etc. **Accumulators :** non-spill from **2/6.** 60 ah. double plates, **7/10** etc. **Cabinets :** Full range from 7/6. Radiogram, **29/6. Valves :** 2 v., from **1/11.** A.C. from 5/6.—Just a few selections from the many hundreds of bargains contained in the Jubilee number of "THE RADIO GOLD-MINE."

Also contained are full particulars of our

AMAZING FREE SPEAKER OFFER

whereby 1,000 speakers are being given away absolutely free as an introductory offer with every order for our new assembled and aerial tested chassis (listed above).

Also, of our new

HIRE PURCHASE TERMS

which are available on all aggregate orders of £5 and over, and also on many under this figure.

SEND 3d. STAMPS TO-DAY, to cover part cost and secure by return your copy of the Jubilee "RADIO GOLD-MINE."

London East Central Trading Co. (Dept. P.J.100), 23, Bartholomew Close, London, E.C.1.

Demonstration Rooms : 24, Aldersgate St., E.C.1.

Telephone all depts. : National 7473.

Terms : Over 10/- post free. **£2** carriage paid.

CASH OR C.O.D.

ORDER FORM

The Advertisement Manager, "Popular Wireless,"
John Carpenter House, Whitefriars, London, E.C.4.

Please insert our/my advertisement in "Popular Wireless" for..... insertions at a charge of £ s. d. per insertion. Remittance herewith.

Signed.....

Address .....

Date..... .....

POPULAR WIRELESS, April 27th, 1935.

REGISTERED AT THE G.P.O. AS A NEWSPAPER.

THE SILVER KING AT HOME

Popular Wireless

AND TELEVISION TIMES

SHORT-WAVE HINTS
★ ★
SPECIAL TELEVISION ARTICLES
★ ★
BARRY KENT CALLING
ETC., ETC.

EVERY WEDNESDAY PRICE 3D

No. 673.
Vol. XXVII.
April 27th, 1935.

IS YOUR SET WORKING PROPERLY?

Special Testing Articles for All Inside

POPULAR WIRELESS AND TELEVISION TIMES

MANAGING EDITOR: N.F.EDWARDS. TECHNICAL EDITOR: G.V.DOWDING ASSOC. I.E.E

CHURCH NEWS
WHO IS HE?
THE "A.B.C."
POWER INCREASES

RADIO NOTES & NEWS

ULTRA-SHORT WAVES
SPEEDY WORK
INDIAN RADIO
LICENCE FIGURES

Radio Normandie.

SO our old friend Radio Normandie has given up his wavelength to Eiffel Tower.

Originally known as Fécamp, the Radio Normandie station gained much favour by his lively mannerisms and his habit of industriously working when the B.B.C. slept. But then the French brought out their Ferrie Plan of Regional stations and reduced Radio Normandie's power to a mere ghost of its former self. Whereat many a listener in this country cussed long and loud.

Now Eiffel Tower, forsaking the long waves at last, has trimmed his wavelength to 206 metres and sat himself down with every appearance of staying there indefinitely. Radio Normandie has shifted to 269·5 metres.

The French Regional Scheme.

JULY should see the completion of the French Regional Scheme, and I beg our cross-Channel neighbours' pardon for the doubts I have expressed in the past about the said completion. At one time it seemed they never would straighten out their radio tangles, but with Eiffel Tower duly performing, as promised, on the medium waves things are looking up.

Before May Day we shall have Murat-Toulouse testing on 120 kilowatts, Lyons on 90 and Lille on 60. We extend the glad hand to these new vocalists and hope they will visit our aerials at their earliest opportunity.

Vatican Changes.

I HAVE been asked to announce that H V J, the Vatican short-wave station, is discontinuing its 10 a.m. transmissions. Church news will be broadcast in English on Tuesdays from 4.30 to 4.45 p.m. and again from 8 to 8.15 p.m.

The earlier of these transmissions will be on a wavelength of 19·84 metres and the latter on 50·26 metres.

On Sundays and holidays there will be only one broadcast, in Latin and French, at 10 a.m. This will be radiated on the 50·26-metre wavelength.

Another Mystery Station.

IT seems a long time since we had a mystery station to wonder about, but a Scarborough reader tells me that he has found one just below 1,200 metres.

It is not usually very strong, he says, but it is definitely a trier. It comes on, starts a promising piece of music and then suddenly—*cluck!*—is gone. The carrier generally stays put, and if you have patience you may be rewarded with a second unfinished symphony, my correspondent says.

He asks: "Who is this dodger?" My own theory is that it may be Trömso, who was supposed to be interested in 1,186 metres. But I shall be glad to hear from anyone knowing who the newcomer is.

ON OTHER PAGES

Have a Guess.

IF you were asked to guess how many permanent telephone-wire extensions are necessary from Broadcasting House to "outside" points—such as Greenwich (for the pips), Big Ben, St. Martin-in-the-Fields, hotels for dance music and so forth—what would you say?

THE F.A. CUP FINAL

G. F. ALLISON, the well-known secretary-manager of Arsenal F.C., will give his usual running commentary on the F.A. Cup Final at Wembley on Saturday, April 27th. The finalists are Sheffield Wednesday and West Bromwich Albion.

My own guess was between fifty and one hundred, for I know what an enormous business this is. But even so I was far below the mark, and the number turns out to be well over two hundred!

Surprising, isn't it?

A New Motala.

LONG-WAVE listeners may like to know that our old friend Motala is coming into the limelight again. At one time he was a prime favourite with British listeners, but—like so many new stations—he seemed to suffer a kind of tiredness after a while, and only the old-timers will remember how good he used to be on occasions. Now the engineers have been reconstructing the transmitter, which is to come on the air with 150 kilowatts for tests and Swedish (ether) drill.

Listen for him after 10 p.m. on 1,389 metres.

South Africa's Decision.

TO advertise or not to advertise? That is the question that has been troubling for a long while those responsible for broadcasting in South Africa. Sir John Reith's advice as to the best system was sought by General Hertzog, and now I see that the Government of South Africa has decided to adopt the recommendations made by Sir John.

A Bill will be introduced into the House of Assembly during the next session, and when the African Broadcasting Co.'s term expires in March, 1937, a public corporation, similar to the B.B.C., will take over.

Its initials will be A.B.C., but its task will not be as easy as that.

Swiss Roll Up.

WHEN Switzerland increased the power of Beromunster there was no intention of wasting this power on avalanches, mountain tops and glaciers. No, sir. The idea was to get more licences and so *increase the finances* available.

Carefully checking up the result, Switzerland finds it a most gratifying one, so in the autumn off we go again. It is to be Sottens this time, and instead of providing a mere 50 kilowatts as first planned the power will be raised to 100 kilowatts.

In addition, Sottens has provided itself with a new team of musicians—you may have heard their opening session on April 12th. They are to be known as the Radio-Suisse Romande Orchestra.

(*Continued on next page.*)

A TRANSMITTER BUILT INTO A CAKE-TIN!

Swings and Roundabouts.

THE American Radio Relay League—to whom be praise!—has been lifting up its eyes unto the hills in connection with ultra-short waves. For test purposes a laboratory has been established on a hill-top near Hartford, Conn., and the results from this have been enlightening.

It has been found that conditions on 5 metres appear to contradict those on 2½ metres—if one wavelength is poor the other is good, and vice versa. So the A.R.R.L. is trying a dual transmitter and receiver, and blending the results on both wavelengths on the good old principle of what-you-lose-on-the-swings-you-gain-on-the-roundabouts.

We shall be interested to hear more of this.

Ether Police in Japan.

THOSE sleuth vans of the G.P.O.—which periodically trail round the country to chase up the naughty amateur transmitters and pirates who have omitted to take out wireless licences—are very smart and all that. But they are less than the dust compared with Tokio's latest.

The Japanese authorities have voted yen 100,000—which is about £10,000!—for the purpose of putting up a special station that will keep a constant look-out on Japan's ether. Any dashing and dotting that is not official will be ruthlessly pursued and pounced on. It will be a bold spirit indeed who incurs the wrath of Tokio's 'tec station.

Wedding Bells.

CONGRATULATIONS to Mr. Stephen Williams, chief English announcer at Luxembourg, on his marriage. His bride is Ute, second daughter of Professor Erich and Frau Eischler, of Wiesbaden.

Mr. Williams was formerly English announcer at Fécamp and at Radio Paris. His voice, now one of the best known in this country, has won him a host of well wishers. He is, I believe, the son of the Vicar of St. Martin's, West Acton.

Changee for Changee.

OF the making of books there is no end. They are not all of equal worth, however, says Mr. J. W. Goldring, of 30, Queen's Road, Woodstock, Cape Town, for he reports the safe arrival of "that glorious book of all books, the 'Book of Practical Radio,' by John Scott-Taggart."

Having secured this work, Mr. Goldring's one idea is to acquire its companion volume, "The Manual of Modern Radio," by the same author. A set of back numbers of "P.W." from March 10th, 1934, to October 20th, 1934, he offers in exchange, so I mention the matter for the benefit of South African readers who may need some or all of those numbers.

Recurring Radio Agen.

EXCUSE me for reverting once again to the subject of Radio Agen, but he seems so determined to live up to my prognostications that I must mention his latest.

He recently broadcast more than one hundred official communiqués on the subject of the misplaced H_2O in his vicinity. And this despite the fact that on several occasions he broke down or got technically hitched owing to collapse of the aerial.

It will take more than the rain, torrents and floods of France, however, to damp the ardour of a chap like Radio Agen!

BROADCASTING BREVITIES

Following the success of the "Scrapbook" programmes, Leslie Baily and Charles Brewer are now busily preparing another one. This time the programme will deal with 1905 and production is scheduled for June.

* * *

Jenny Howard is returning to the microphone on Saturday of this week (April 27th), when she will broadcast in "Music-Hall" with Percy King. Jenny Howard is the girl who became famous at the Shoreditch Music Hall in 1928, when, having nothing else to do, she produced a music-hall act, and by the end of the week was booked solidly at the leading music-halls of the world for five years.

* * *

Coventry Hippodrome Orchestra, relayed from the theatre on May 10th, will be heard at lunch-time in a Midland programme representing twenty-five years of melody. The programme includes numbers from pre-war operas like "Merrie England," war-time tunes and popular music of the post-war years.

* * *

The second "Quayside Nights" programme will be heard by Western listeners on April 30th, when Padstow will be visited. This is the day before the famous Padstow Hobby Horse goes its rounds, and the microphone will meet some of the people who take part in the ceremony.

Speedy Work.

READING about other people's boodle is not my idea of Blue Heaven; but in the course of my duties I bar nothing, and so it was I came across "Lloyd's Bank Monthly Review." Lord Inverforth had contributed an article on cables and wireless, in which he referred to the new "Via Imperial" service between Shorter's Court, E.C., and Wall Street, New York. This article says it is nowadays possible for a business man in his London office to communicate with his Wall Street broker and get a reply *in under two minutes.*

True. As gospel. But let me say this. Long before B.B.C. days the cable companies used to equal or beat that performance for a limited number of their clients.

Yes, sir. Fair's fair. And there's many an old cable man who will back me up in my defence of the thin sea-bed line.

Good News.

NOW that the first Indian village broadcasting scheme has been inaugurated from Peshawar there is prospect of a vast new market for radio apparatus. I have this on the authority of the Senior Trade Commissioner in India, who reports that that country "is on the eve of very great expansion in wireless broadcasting and will provide a rapidly increasing market for receiving sets."

There is, however, one snag, for he goes on to say: "Dutch and American manufacturers are showing the greatest activity, yet so far there has been little attempt on the part of United Kingdom manufacturers" to produce the set suitable for India's needs. I mention this in duty bound, for India's lack of sets may be the British tradesman's entrance to better days.

Cake-Tin Station.

TO most of us the sight of an ordinary sixpenny cake tin is of no importance.

But to Mr. Thomas A. Blanchard—of Reading, Pasadena, U.S.A.—it was an inspiration.

He had been looking everywhere for an ideal home for a baby transmitter he was constructing, and when he saw that cake tin a great peace fell upon him, for here was a container of much promise. He mounted tiny batteries, midget switches and skeleton components; and they fitted like fingers into a glove.

Now he can carry his "station" about in his hand, for the cake tin is only seven inches long and weighs less than two pounds—the world's smallest wireless transmitter.

It works like a charm. And Thomas says he is very glad he took it in hand.

Celestial Discord.

THAT China has taken to broadcasting with enthusiasm may be gathered from the fact that there are now estimated to be ninety-two broadcasting stations in the Celestial Empire. The most powerful is X G O A at Nanking.

The Japanese authorities, however, not to be outdone, have erected a still more powerful transmitter at Hsinking.

And now, it seems, there is to be established a special "interfering station" in South Manchuria, and wise men of the East are talking about a war in the ether. So dignified old Asia has her troubles, just the same as adventurous young Europe!

European Radio Lead.

BRITAIN'S long lead in broadcasting is shown to be threatened by the latest figures. The B.B.C. is highly delighted to be able to report 806,810 new licences taken out last year, but Germany can show a better figure—1,090,314, to be precise. Are we destined, I wonder, to lose our place at the head of the table?

ARIEL.

SET-MAKING SAFEGUARDS

In the design of first-class radio receivers hundreds of measurements are necessary, from such obvious requirements as coil-wavelength ranges to more obscure factors like stage gains and frequency response.

No true designer considers his set fully efficient unless he has subjected it to the most stringent tests, some of which are described in this informative article.

By F. Wiltshire

IN the design and production of the modern radio receiver, measurement naturally plays a very important part. Rightly has it been said: "To measure is to know." And accurate knowledge is the corner stone on which all modern receiver design is built. In a radio factory the measurements to be made naturally fall into two classes: those made during the progress of a design for the instrument and those made in connection with the production of the type of instrument, which latter would normally be grouped in the phrase "factory testing."

What Measurement Does.

The idea of measurement is to determine what a given piece of apparatus will do under certain defined conditions, and the accuracy with which the measurement can be made is fixed firstly by the accuracy with which the defined operating conditions can be set and secondly by the accuracy with which the behaviour of the apparatus under test can be observed.

Now, with electrical quantities the operating conditions generally involve a current, a voltage and the associated magnetic and electro-static effects. Correspondingly, most measurements are made in terms of a current or a voltage. We must have complete control over current and voltage, therefore, before accurate measurement can be made.

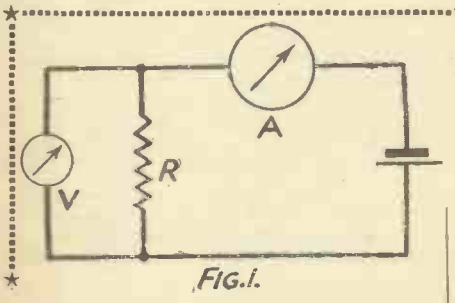


FIG. 1.

The units in which these two quantities are measured have been defined by international agreement, and standards are maintained at the various national laboratories throughout the world. These units, however, are based on mathematical considerations, and even were our standards destroyed it would still be possible to develop afresh an exactly equivalent collection.

Consider a circuit consisting of a plain resistance, through which current is driven from a battery. The product of the current I and the resistance R enables one to determine accurately the voltage V between the ends of the resistance. This fundamental law was discovered by Ohm, and is expressed by $V = I R$. For simple circuits such as that shown in Fig. 1 this relationship holds for direct current and for alternating current up to frequencies of about 1,000 cycles per second.

With frequencies higher than this the actual mechanical design of the resistance, the disposition of the leads, etc., and the construction of the meters employed come into play, and with high frequencies we may say that our simple circuit has taken on the form shown in Fig. 2. The voltmeter will not necessarily be reading the true voltage across the resistance R, and the ammeter reading will include such errors as the current flowing due to the earth capacity of the meter itself and of the resistance.

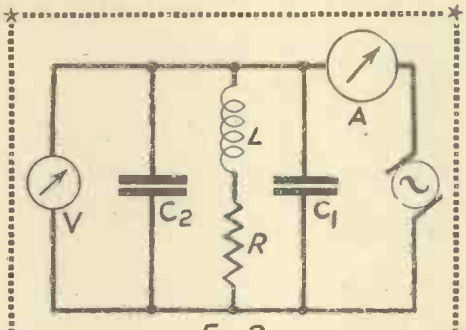


FIG. 2.

Fig. 1 shows a circuit in which the fundamental Ohm's Law holds good both for direct current and for A.C., up to about 1,000 cycles per second. With higher frequencies the design of the measuring device must be taken into account, and we find that Fig. 1 has taken on the form of Fig. 2. The simplest method of dealing with capacity measurements is shown in Fig. 3, which is suitable for capacities above ·05 mfd. where rough indications of values are desired.

Thus, although some of the quantities we wish to measure at radio frequencies are fundamentally the same as in the case of D.C. measurements, the direct methods employed must be modified somewhat to accommodate the special conditions arising. It is necessary, therefore, to consider what degree of accuracy is required in any given measurement. How near need our measurements be to the accuracy of the international standards to be of service to us?

Uncertainty That Does Not Matter.

The following example gives an idea of the type of uncertainty which can arise without much harm being done. An ordinary 2-volt accumulator will deliver current, provided its voltage does not fall much below 1·9 volts. Between 1·9 and 2·4 volts the accumulator may be relied upon to deliver a reasonble current into a load.

If, now, we measure the voltage of the accumulator with a voltmeter having an accuracy of within 3 per cent—which, by the way, would be a very low-grade meter—and see that the reading is 2·2 volts, we know that the cell is fit to be used. To determine the actual voltage more accurately would be unnecessary, although the meter could be checked in comparison with a sub-standard, the error of which would be known from calibration against standard sources of voltage and from comparison with standard meters.

The Simplest Measurement.

Probably the simplest measurement required in the design of a receiver is that of D.C. resistance for anode resistances, grid leaks, etc., and this is done in an ordinary Wheatstone bridge network. Various meters have been marketed capable of handling this measurement, one of the simplest and most accurate being the Avometer.

Tests made with alternating current cover a very wide field, the simplest being perhaps the straightforward measurement of inductance and capacity. As regards capacity it is necessary to be able to measure values from one micro-microfarad (1 mmfd.) up to ten microfarads (10 mfd.). Perhaps the simplest method of doing this employs a circuit similar to that shown in Fig. 3. The alternating current through the condenser is measured on an A.C. ammeter in series with the condenser and a known source of A.C. voltage.

Then, assuming the condenser to be

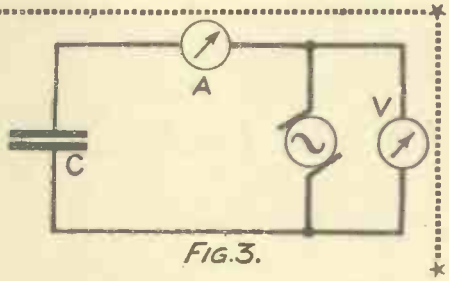


FIG. 3.

purely a capacity, its value is given by:

$$C = \frac{I}{E\omega}$$

where I is current measured on the meter, E is the R.M.S. voltage of the supply of frequency f and where $\omega = 2\pi f$.

The above method is applicable only for values above about 0·05 microfarad and should only be used for rapid approximate determinations.

Fig. 4 shows the circuit used for the accurate measurement of capacities between 1 micro-microfarad and 1,000 micro-microfarads. It may be used at high radio frequencies and is as accurate as the calibration of the variable condenser C_1.

The method consists in resonating the tuned circuit L_1C_1 with the valve oscillator circuit in its neighbourhood. Add the condenser under test in parallel with C_1 and

(Continued on next page.)

DETERMINING SELECTIVITY AND SENSITIVITY

(*Continued from previous page.*)

reduce C_1 until the circuit is again in tune. Then the difference between the settings of C_1 gives value of the added capacity C.

As regards measurements of inductances, these must all be done at the appropriate frequency. Thus, transformer coils, chokes, etc., are measured on a low-frequency A.C. bridge—capable of handling D.C. polarising current where any component under test is likely to carry it. Components for use in low-frequency amplifiers are generally measured at 800 cycles, and where necessary the change in inductance over the frequency range 50–10,000 cycles is determined and plotted as a graph.

In the radio-frequency measurement of tuning inductances, etc., much more attention has to be paid to possible sources of error. The range to be covered is from 10 microhenries to 0·1 henry, the lower range 10–3,000 microhenries being covered by tuning inductances and intermediate-frequency coils and the upper range by anode chokes, etc., which must be measured at radio frequencies to ensure that no resonances in the normal wavebands occur due to their self-capacity.

Dealing With Tuned Circuits.

A circuit commonly used in the measurement of H.F. resistance, both for coils and condensers, is shown in Fig. 5. The measuring part of the circuit consists of a tuned-anode, grid-coupled oscillator having two meters in its anode circuit, one reading from 0–10 ma. to show the main anode current and the other a 0–1 ma. meter "backed off" as shown. The function of this second meter is to indicate accurately the occurrence of the peak anode current at resonance. A tuned circuit L_1 C_1 is approached to the oscillator and coupled to coil A. It is tuned to resonance with the oscillator, and the load taken is indicated as an increase in the anode current registering

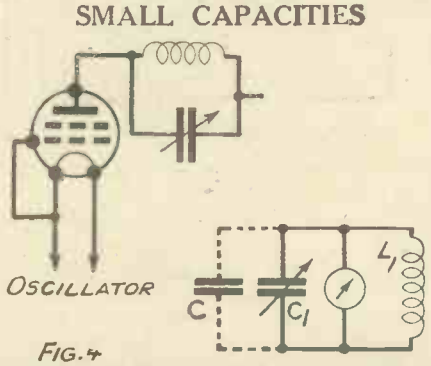


FIG. 4

For measurements of capacities between 1 mmfd. and 1,000 mmfd. the circuit indicated above is found very useful.

on the meter M. The arrangement is sufficiently sensitive to indicate a change from the resonance setting of 0·3 mmfd. in condenser C_1. The use of such an arrangement, therefore, as an accurate wavemeter is obvious. To measure the H.F. resistance of a circuit such as C_2L_2, which may be a coil and condenser actually in position in a receiver, two leads are connected from it across C_1. C_2 is adjusted until the whole circuit is again in resonance, as indicated by a maximum reading on the meter M, which reading will be somewhat lower than that obtained when L_1C_1 alone is in resonance.

On disconnecting the leads from L_2C_2 the reading of M will again rise to its old resonance value, and a non-inductive resistance is inserted in series with L_1C_1 to bring the value back to the depressed value obtained with the compound circuit L_1C_1, L_2C_2. If the value of unnecessary resistance be R, the dynamic resistance of the L_2C_2 circuit is given by the formula:

$$Z = \frac{1}{R\,(C_2\,\omega)^2}$$

It will be seen that this method is applicable to the measurement of the inductance of coils actually in position in the receiver and even enclosed in screening cans.

The foregoing covers the more important

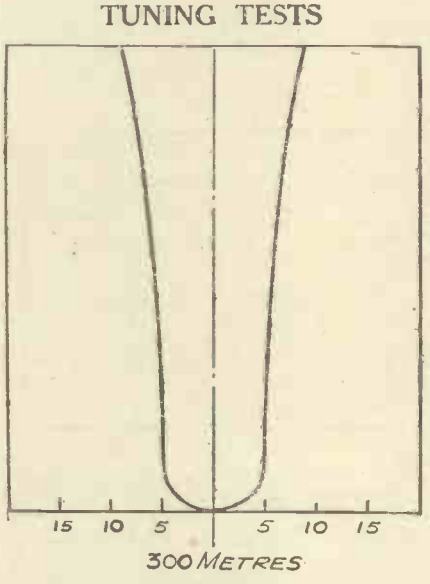


FIG. 6.

This curve denotes the amount of modulated signal required on either side of the 300-metre tuning point in order to register a given output voltage from the set. By this means the selectivity of the receiver is measured.

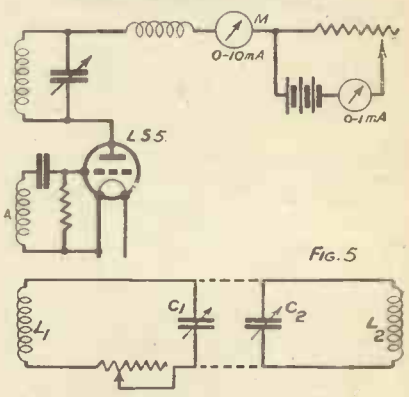
of the electrical tests involved in the design of a receiver. We come now to the measurements to be made on the receiver after it has been assembled from the several tested components.

Preliminary Adjustments.

Firstly, tuned circuits must be ganged, and in the case of superheterodyne receivers the intermediate-frequency transformers must also be set accurately to the intermediate frequency. The receiver should then be tested with actual broadcast transmission. To specify its radio performance the following measurements should then be made:

(1) *Sensitivity.*

At several points on each waveband the number of microvolts input to the receiver necessary to give an acoustic output into the loudspeaker of .50 milliwatts should be determined. In the case of high-powered receivers the input necessary to give an output of 500 milliwatts should be taken. Plotted on a graph, these measurements give an idea of how the sensitivity of the receiver varies over the two wavebands. The level of the acoustic output is, just for convenience, set at 50 or 500 milliwatts. Similarly, convenience must be adopted



H.F. resistance of circuits is a feature of set construction that needs measurement. The scheme shown above is often used in this regard.

for the nature of the radio-frequency input, and a convenient arrangement is to have the signal modulated by a note of 400 cycles to a depth of 40 per cent.

(2) *Selectivity.*

This measurement really involves the determination of the overall resonance curve of a receiver when set at some predetermined tuning position. For convenience this position may be taken on the medium waveband at 300 metres (1,000 kilocycles); on the long waveband 1,500 metres (200 kilocycles). We actually would measure the amount of modulated signal necessary to give the standard acoustic output of 50 or 500 milliwatts on either side of that to which the tuning of the receiver is set. In general, these measurements will give a curve somewhat as shown in Fig. 6, from which may be determined the amount of unwanted signal which may be tolerated without causing serious interference.

(3) *Overall Fidelity.*

With the receiver tuned to the two wavelengths mentioned above the electrical acoustic output is measured for the frequency range 50–6,000 cycles per second. It is important here to maintain the percentage modulation constant of, say, 40 per cent.

(4) *Linearity.*

At various tuning positions the acoustic output is measured for successive values of input signal voltages. This determines that the receiver will handle a wide range of signal strengths and also shows the point at which overloading tends to occur.

The apparatus used for these tests should consist of a suitable radio-frequency oscillator effectively screened and giving a controlled output between one and 500,000 microvolts, able to be modulated to any desired percentage and at any frequency.

TESTING YOUR SET

Nothing Happens At All!

THERE'S nothing at all coming through! Certainly the worst state of affairs so far as reception is concerned, but by no means the worst when tracing the trouble.

As a matter of fact, it is usually considerably simpler to find the cause of complete absence of results than to spot the cause of some obscure trouble such as intermittent crackling or a lack of reception from distant stations.

In the one case you have something tangible to deal with, while in the other the symptoms may be the combined effect of a number of deficiencies all adding together to give the net result of poor reception. In this article we are to be concerned with receivers that will not give results from a single station, not even the local.

Gradual Loss of Volume.

The first thing to take into consideration is whether results have suddenly disappeared or whether they have gradually become weaker and weaker until they have vanished altogether. If it is your own set which you have in front of you, you will have this information.

If it is a friend's set you are "servicing" you can probably find out by a few inquiries. But when the information is not available it simply means you will not be able to go to work so definitely and may have to make a few more tests before locating the fault.

ARE THERE TWO VOLTS?

Checking the voltage of the L.T. battery. This should be done with the set switched on, so that there is a current drain on the battery.

In this issue of "Popular Wireless" we are publishing three special articles on set testing. They are separate articles, but should be read in conjunction with each other. Here is the first, dealing with the tracing of the cause of a set's complete refusal to emit a sound.

By A. S. CLARK.

First of all we will deal with the case in which results have gradually deteriorated until they have become nil.

In nearly all instances you can pretty safely suspect the batteries, either H.T. or L.T. And naturally, having suspected them, the next thing to do is to test them.

The obvious method is to check them over with a voltmeter. So long as the H.T. gives anything like two-thirds of its nominal voltage and the L.T. is reading *two* volts you should get some results.

If the L.T. is below 1·8 volts on open circuit that's your trouble all right. An alternative way of checking up the batteries' culpability, if you have a kind friend who can lend you his batteries, is the simple one of substitution.

The batteries proving O.K., what do we do next? So far as I can think, there is only one other item likely to cause the gradual diminution of results to zero, and it is not *extremely* likely to be the cause at that.

It is the aerial. Especially is this possibility open when the aerial wire passes near a metal gutter, has several joints or employs a rubber-covered flexible lead-in.

A Temporary Aerial.

The best test here is to substitute a roughly erected indoor aerial and try it in place of the normal aerial. Almost any length of wire slung across the room will serve the purpose, but when trying the set on it remember that stations may be difficult to find by comparison with the old aerial when it was working properly.

And now we will turn to those cases in which reception suddenly ceased. Even if results gradually departed and you have tried the preceding two suggestions, just carry on with the following ones.

The most likely thing to have "gone west" suddenly is one of the valves. These you can test, so far as their filaments are concerned, in the simple manner illustrated in one of the photographs on this page.

One valve at a time is tested, and the connections are as follows: Join one filament to the negative terminal of the accumulator and the other filament to the negative contact of a voltmeter. (In the case of a dual-range instrument the low-voltage scale is the one to be employed.)

The other contact of the meter is joined to the positive of the accumulator. As soon as this last connection is made the voltmeter will read if the valve's filament is intact. The voltage will be a little less than two, the actual amount depending on the current taken by the meter and the particular type of valve under test.

Continuity Troubles.

There are other troubles that might have suddenly cropped up in the valve, but they are not likely unless it has been dropped. A further test for valves is dealt with in another set-testing article in this issue.

By now, if we have not yet found a fault, we are beginning to get near to the solution. True, we have not mentioned such things

CHECK THE FILAMENT

Using a voltmeter to test the continuity of the valve filament.

as a battery not connected, or an aerial lead left off, or perhaps a valve missing from the set, these things do happen sometimes—yes, even to experts—but we must assume that you have checked these before embarking on an orgy of fault finding.

So now we come to a not unlikely trouble—a complete break in the continuity of some connection. This may be due to dirt, loose contacts or to a mechanical break in one of the flex leads.

Points where such trouble might occur coincide with the points mentioned in the article on page 195, where intermittent connection leading to crackles can take place. Also the method of checking over these points is the same.

The pushing of plugs or "woggling" of leads and valves will most likely make the

(*Continued on page* 211.)

BARRY KENT CALLING

Broadcasting News & Views

PROFESSOR HAROLD TEMPERLEY and Laurence Gilliam are much together these days at Broadcasting House, putting the finishing touches to the King's programme on the evening of Monday, May 6th. There has been a lot of adjustment with the relays from abroad; but these are now lined up, and the programme has real promise of creating a bigger thrill than even the Christmas Day broadcasts of recent years.

The King is taking his accustomed interest in all the arrangements, and has made valuable suggestions about the word-picture of the twenty-five years of his reign that will lead up to his own broadcast. Incidentally, it is worth noting that in a list of the world's best broadcasters recently compiled in America King George and President Roosevelt are grouped together at the top.

* * *

John Snagge's Promotion.

John Snagge is a broadcaster who deserves to get on much faster than he has. He began in the B.B.C. as chief assistant to J. C. Clarke, director of the relay station at Stoke-on-Trent. Then he came to London as an announcer. From this he joined Gerald Cock as third-in-command. In that capacity he has done a tremendous lot of first-class work. He is clearly eligible for a bigger job before long. Mr. Snagge is the son of the eminent judge, Sir Mordaunt Snagge.

* * *

Public Performances by the B.B.C.

The opposition to public performances by the B.B.C. orchestras is rapidly growing and promises to be a main bone of contention when the Government inquiry on broadcasting gets started. Most of the organisations of the musical world are combining to try to get the Committee to recommend the abandonment of all such public performances after 1936.

The argument is that public performance for paying audiences is unfair competition with outside concerns and causes distress and unemployment among musicians and artists generally. To this the B.B.C. reply is that unless its main orchestra performs in public under normal concert conditions its work is bound to deteriorate. And it cannot perform in public under normal conditions unless the audiences pay for admission.

* * *

Hours of Work.

I hear that Sir John Reith has been concerning himself about the hours of work of certain sections of staff in the B.B.C. From my own knowledge of conditions there I am surprised it has taken so long for the problem to reach the ears of the Director-General. It is notorious that for years there has been grave overstrain imposed on the programme builders and announcers. Also the whole service is understaffed.

Now that Sir John has taken up the matter personally one hopes that something will be done about it. More is involved than the comfort and efficiency of the staff; there would be a general improvement in the standard of programme output, and this is where we are all interested.

A DANCE-BAND RELAY

MAURICE WINNICK, whose orchestra relayed from the San Marco Restaurant is a popular broadcast feature.

Money for Programmes.

Mr. Roger Eckersley, Director of Entertainment of the B.B.C., proposes to create a special reserve fund, out of which he will be able to employ one star-turn artist a week throughout the year in addition to the ordinary arrangements. The figure suggested is £50,000, which would yield about £1,000 a week.

This would attract the world's best artists. But the snag will be that there are not enough to go round. I doubt if there are more than twenty or twenty-four artists of this supreme calibre in the world.

* * *

New Rule at the "Big House."

There is much amused gossip about the new rule at the Big House to control the handing out of alcoholic refreshment to distinguished speakers and visitors. The practice is being frowned upon and restricted. Every proposal of the kind has to be made in writing at least a week in advance, and is then the subject of special investigation by a committee over which Sir Charles Carpendale presides. In cases of doubt the proposal is referred to the Board of Governors.

Anyway, whatever happens about programmes, we can feel assured that there will be no drunken orgies on B.B.C. premises!

* * *

Programme Timing.

I hear that Mr. Noel Ashbridge, the Chief Engineer of the B.B.C., has asked Sir John Reith to give orders to the Programme Departments to make the National and Regional programmes begin and end at the same times. If this were arranged, then technical distribution would be much easier.

Relay and sub-stations of the British system would be able to dovetail and mix programmes from either Regional or National, and there would be no overlapping. But the Programme Departments don't like the idea a little bit. They say that it will upset all their pet schemes of presentation. Sir John is said to be impressed by Mr. Ashbridge's arguments; so we may hear more of the proposal before long.

"THE RIVALS"

"At reasonable speed Sheridan's comedy would have been a great success," says our Broadcasting Critic in his candid comments on recent programmes.

IT is patent that Peter Creswell realises the devastating effect on a play of a tardy dialogue. He isn't quite so aware, perhaps, that a play can be equally ruined by a dialogue proceeding at race-horse speed. Did you ever hear a dialogue speed so much as in "The Rivals," unless it is some of the earlier Sunday Shakespeare productions? I have complained before of the reckless speed of Sunday plays. The speed of "The Rivals" justifies something more than ordinary complaint.

* * *

At reasonable speed Sheridan's comedy would have been a great success. The dialect affected by some of the players was West Country to perfection, but their anxiety to avoid that split-second pause between individual lines just spoilt the whole effect. It was all very disappointing in view of the many good points about the production, and especially the casting. For instance, George Holloway was a delightful Bob Acres (I have never heard a better—he conformed exactly to my conception of the character). Baliol Holloway, too, pleased me as Sir Anthony and Fred O'Donovan as Sir Lucius.

The servant folk were unusually good, and the women. Indeed, all the characters were good. As I said above, "The Rivals" on this Sunday evening could have been a great success, and would have been but for that absurd race against time.

An Ardent Naturalist.

The three talks by Canon C. E. Raven, now concluded, on "Christ's Power in History," remind me that the canon might be incorporated into another and totally different series of this session, viz. "Nature Films and Filming." But, on second thoughts, films and filming isn't quite the right description of Canon Raven's hobby. It is rather Nature photographs and photography.

Canon Raven is a great naturalist and expert Nature photographer. I am told he has a remarkable collection of pictures, all the more remarkable because they were taken by inexpensive cameras and at a price not to be compared with that paid by photographers engaged in the film industry.

* * *

Listeners who are fond of that pins-and-needles instrument the harpsichord must have enjoyed Boris Ord's week in the Foundations series. Personally, I can't stand the harpsichord as a solo instrument. I like to hear it in Bach music with other instruments, and then only when it isn't allowed to dominate the whole.

(*Continued on page* 210.)

TESTING YOUR SET

SPLUTTERS CRACKLES and HUM!

Too often is "noisy" reception experienced by set owners. Sometimes it is caused by external sources such as vacuum cleaners or trams, and external remedies have to be used. But not infrequently the seat of the trouble is in the set itself. This article deals with points in the average receiver that may give rise to either or all of the troubles mentioned above.

By K. D. ROGERS.

DOES your set crackle? Does it splutter? Do you get an annoying hum? Few of us, unfortunately, are without the experience of one or more of those delightful faults in our radio receivers.

But that fact does not make them any the more welcome, or, I should say, less welcome. The first thing we set about to do on hearing the tell-tale splutters or fizz that denote trouble brewing, or realise that at the background of the reproduction there is an unwanted hum, is to find out what is causing it, in an endeavour to get rid of the trouble as soon as possible.

And it is not always an easy task, believe me. I spent the best part of two years fighting a mains ripple from mercury-vapour-rectified A.C. mains. And at the end of that time I had only just scraped home: it was not a triumphant banishment of all noise, but rather a reduction to "reasonable limits."

A Wide Field of Search.

But I divert. What we are concerned with here is the noise that makes itself felt, or rather heard, in the set that previously has been devoid of such manifestation. That is a far different thing from the noise that is inherent in the design from its birth. The former denotes that something has *gone* wrong, and the latter that there is something initially wrong either in a component or in the design itself.

The trouble with fault finding in radio is that there are so many things that may give the same fault, and also there are so many faults that may be caused by the same thing.

Thus in a battery set a fixed condenser in certain positions may cause crackle, spluttering, hum, distortion or even loss of signals. In fact, it may take in the whole of the faults that are mentioned in the three set-testing articles in this issue of POPULAR WIRELESS.

We have, however, tried to keep the articles separate, and though we cannot here deal with the troubles at all conclusively we have tried to give a fair idea of where to look for the faults.

Look to Connections First.

Loose connections are the most frequent causes of crackles and splutters, and in some cases of mains-set hum. This latter will usually involve parts of the smoothing or decoupling circuits, where a disconnection may remove much required smoothing and thus allow hum to make itself heard.

In battery and mains sets crackles and splutters should first be looked for in connections. Wobble the valves and tap the set while it is working and see if you can trace the seat of the trouble that way. Be careful you do not get a shock when dealing with the mains set, however.

Battery plugs, even the leads themselves, should not be exempt from suspicion. Poor loudspeaker connections are frequently a cause of noise, and it must not be forgotten that a piece of flex with a break inside it may defy the fault finder for hours.

So if your set splutters or crackles wobble everything you can safely get your hands on.

Remove the Aerial and Earth.

And do not forget the aerial and earth leads in your tests. Try the set without these. If the noise stops, even when reaction is applied, you can be fairly sure it is in the aerial and earth leads or else picked up externally by one or other of them.

Remember that a detector with plenty of reaction will be a wonderful help when checking. Reaction will emphasise a fault that is caused in a stage preceding the detector or in the detector itself.

If the crackle is loud, removal of the valves one by one may help to trace the seat of the trouble. In the case of a battery set, of course, all the batteries should be tested in the manner described in the article on distortion.

Have a good look at those contacts to earth, especially where screws hold wires down to copper foil or to "Metaplex" on the baseboard. Corrosion between wire and screw or between screw and baseboard may cause a poor contact that might give rise to noisy reception.

The Substitution of Valves.

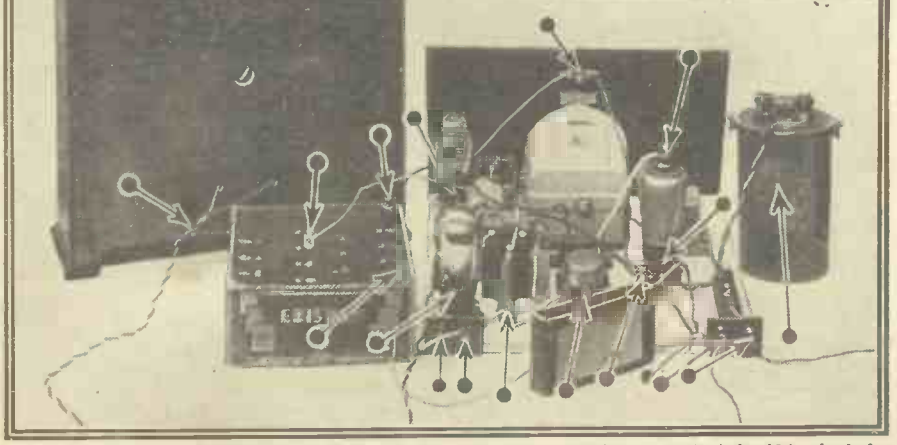
In mains sets a valve with leaky cathode-to-heater insulation may upset the apple cart, and it will often take a long time to find the cause of the trouble. If you can substitute valves it is a good plan, even in a battery set, to do so after the more ordinary tests of contacts have been made.

A milliammeter placed in the anode circuits of the valves one by one may help if the noise is spasmodic. You may see a kick when the noise occurs.

Our old friend the potentiometer is not above causing a bit of trouble sometimes, so do not forget that worthy piece of apparatus when running over the likely causes of the noise. If the potentiometer is suspected try it with a voltmeter and suitable voltage from the H.T. battery,

(*Continued on page* 211.)

SOME OF THE POINTS THAT SHOULD BE CHECKED



The arrows are reminders of points in the circuit of a typical three-valve battery set that should be checked for poor contact or broken wires. Speaker leads and connections, battery plugs, valve holders, switch contacts, the set terminals and many other points should all be looked over when hunting for the cause of spluttering or crackling.

WITH THE EXPERIMENTER

"A FUSE IN TIME..."

Says the writer of this article, may save a great deal of expense. He urges everyone to make more use of these easily fitted valve safeguards.

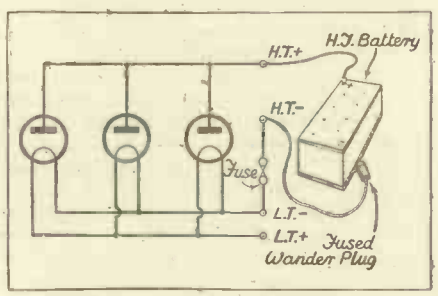
TAKE fuses, now. Simple little things, I should say. So would many of you. Back of some minds, though, is a nasty feeling all is not known about fuses that should be.

One reader, full of hope for my future (bless him!) and praise for my human touch, asks me "to deal with fuses." So, as I said at the beginning, let's take fuses.

I am not so sure I know much about them myself. What exactly is a fuse? Something that obligingly burns out when too great a current begins—for one reason or another—to flow through the circuit in which the fuse has been placed.

Like a Cut-out Switch.

If you look upon a circuit as an endless chain the fuse is the weakest link in it. Intentionally the weakest. That is the point, I think. The fuse is a sort of vulnerable cut-out switch. Once it has melted or burnt out the chain will be broken.



So far from an excess current flowing, no current at all will flow.

Elementary, my dear Watson? Well, perhaps. We might just as well start simply, even if we do work up to more complicated things. Now, suppose we take an example. A circuit consisting of, say, a low-tension accumulator and the filament of a valve.

Normally the current flowing round such a circuit might be ·1 ampere. Two things would determine that. First, the voltage of the accumulator. Secondly, the resistance of the filament. From our old friend Ohm's Law we know that the current equals the voltage divided by the resistance. That is to say, two volts divided by 20 ohms equals ·1 ampere.

Effect of Increased Voltage.

From this very easy sum you can see that if the voltage is increased in any way the current flowing through the resistance will increase. For you will be, in effect, dividing that 20 ohms into a higher and higher figure.

Suppose, by accident, you put the high-tension battery of 120 volts across the filament. What would be the current flowing through the filament resistance of 20 ohms? It would appear, from Ohm's Law, to be 120 volts divided by 20 ohms, or 6 amperes. You know perfectly well that Ohm's Law would not get a chance to work long in that case—simply because the filament would burn out.

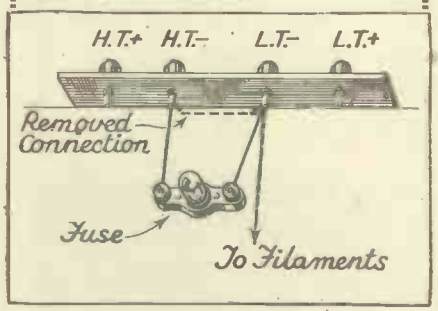
So long as only the accumulator is across the filament nothing can go wrong. Therefore you do not need a fuse in the low-tension circuit at all. It is the high-tension circuit needing some kind of fusing.

What sort of thing must this fuse consist of? It must obviously "blow" at a current flow not higher than the filament of the valve can safely pass. It must break the accidentally formed circuit of high tension before the filament is put under any strain.

At the same time, as it is going into the high-tension circuit as a permanent fixture, it must be able to pass—without blowing—the normal high-tension current needed by the anodes of the valves. It is not much use putting in such a fine fuse that it blows or shrivels up at the slightest provocation.

SAVING YOUR VALVES

How to fit fuses in your receiver. The left-hand diagram shows the position of the H.T.—fuse and the lower sketch depicts a bulb fuse ready fitted on the baseboard. The third diagram indicates the use of a grid-bias fuse as well as one in the negative H.T. lead.



And that is where good fusing comes in. Many people imagine that the right idea is to put in a fuse that will blow when the normal current needs of the circuit in which it is connected are even slightly exceeded. Actually this is only half the story.

What we have to worry about is the other circuit—the filament circuit. That is the circuit whose current maximum we must take note of when deciding on the best size of fuse.

We must arrange that our weak link breaks before the normal filament current is reached. Then it will not matter if the high-tension battery does accidentally become connected across the filament. Before Ohm's Law can operate to increase the current the fuse will burn out.

At the same time, under the normal working of the set, when the fuse is simply lying idle in the high-tension circuit, it will be robust enough to stand up to slight excesses of high-tension current without for ever blowing up.

Fortunately, it is fairly easy to strike a balance. The total filament current of even a small set far exceeds the very largest total anode current. Even a big set takes no more for its anodes than thousandths of an ampere, whereas the filaments take tenths of an ampere.

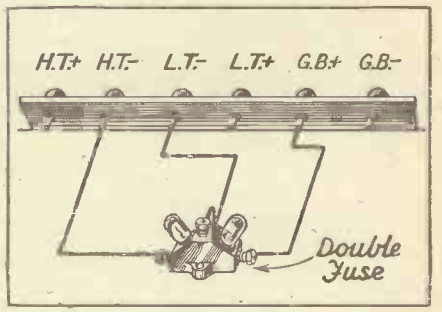
Some fuses provide a sort of baretter action. That is to say, as the normal current is exceeded they tend to shoot up in resistance as the wire gets hot, and this rise in resistance, of course, reduces the circuit's total current in accordance with Ohm's Law.

Where to Insert a Fuse.

Most of us make use of flashlamp-bulb-type or cartridge fuses. In a good make, such as the Bulgin, the flashlamp type glow before they blow—and it is often possible to nip any trouble in the bud.

The right place to insert a fuse to protect the filaments is between high- and low-tension negative. Simply remove the wire joining these two terminals and put in the fuse in its place. It will protect the filaments *and* the high-tension battery.

Look at the diagram. Supposing the high-tension positive lead from its battery is, in a moment of madness, connected to the low-tension positive terminal—quite an



easy thing to do, actually. The high-tension battery will then be right across the filaments—but the fuse in the negative high-tension lead will save the situation. It will burn out before the normal filament current is reached.

Suppose in another moment of madness—assuming the fuse has been replaced—high-tension positive lead from its battery is taken to low-tension negative. Without the fuse there would be a dead short—and probably one ruined high-tension battery. The fuse will blow and again save many times the cost of the little weak link itself.

The Wander-Plug Type.

I am rather in favour of fused wander-plugs. But that is because I am particularly mad. You will see that if both high-tension leads from their battery are taken to both low-tension terminals the fuse between high- and low-tension terminals fails to prevent a Brock's benefit. A fuse in the actual high-tension negative lead would stop that—and so save the cost of a complete new set of valves.

By all means have a fuse at every point. They are cheap enough, goodness knows. For example, many of our modern sets with variable-mu valves use pretty high grid-bias supplies—quite high enough to

(*Continued on page* 209.)

TELEVISION

DUAL SETS FOR VISION AND SOUND

An explanation of how one input circuit and one tuning control can be made to handle the wavebands required by sound and vision transmissions in high-def. television.

By L. H. THOMAS.

REMARKS from personal acquaintances, as well as letters from readers, make it evident to me that there is a good deal of misapprehension about the new television receivers. People seem to think that they are going to be tremendously complex, freakish and difficult to operate.

It is a pity that this idea has ever gained ground, for it is a long way from the truth. Admittedly, the complete receiver looks a bit of a beast on paper; but, unlike many circuits, it is, if anything, simpler when rigged up in practice.

I have already dealt separately with most of the essential sections of a receiver for vision only. The aerial system, the ultra-short-wave detector, the flat-tuning I.F. amplifier—all have come in for a few words.

How it is Arranged.

What seems to baffle people more than anything, however, is the fact that a single receiver, with one control, can be made to receive both sound and vision programmes. Anyone with a clear understanding of the superheterodyne principle ought to find the dual receiver quite easy to follow, and I have drawn as complete a reproduction of it as I can manage in simplified form.

Just for the purposes of argument let us imagine that the vision transmission is being put out on 40,000 kc. (7·5 metres) and the sound on 38,000 kc. (just a fraction below 8 metres).

If we tune a local oscillator to a frequency of 32,000 kc. (just over 9 metres) it will produce a beat with each incoming signal. These beat frequencies will obviously be 6,000 kc. for sound and 8,000 for vision.

(Ere going further I must point out that the tuning of the input circuits before the first detectors must be sufficiently flat to embrace both transmissions.)

From now on the circuit is split into two. There are two separate first detectors, still flatly tuned. At least, the vision detector must be—the other doesn't really matter. Each is followed by an I.F. amplifier, and it is here that the real distinction between the 6-megacycle and the 8-megacycle channels is made. The vision amplifier must be capable of giving quite a high degree of amplification without introducing sharp tuning; the sound amplifier, again, doesn't matter very much.

Almost Two Receivers.

The former will consist, probably, of two or three stages on the lines of those that I described a fortnight ago, while the latter may be an ordinary, conventional I.F. amplifier giving high gain in a single stage.

Next we come to the second detectors. That associated with the vision circuit will probably feed directly into the cathode-ray tube, although it will be followed by a tuned amplifier for the synchronising signal.

The second detector and L.F. amplifier operating on the "sound" channel will both follow ordinary receiving practice.

By now you are probably asking whether I really imagine this to be one receiver for two channels! As a matter of fact, I don't. It *is* almost two complete receivers, but the local oscillator, input circuits and aerial are common to them both. There is, therefore, only one tuning control.

After the "split" we may consider the circuit as consisting, on the one hand, of a very straightforward superhet, such as anyone might use for short-wave work; and, on the other, of a specially developed set giving an enormously wide acceptance and amplification up to extremely high frequencies.

Note that the arrangement suggested gives us the higher I.F. of the two for the vision channel. This is desirable, since it is easier to obtain the correct band-width on 8 megacycles than it is on 6. It is suggested in some quarters that the band covered by the local oscillator should actually be at a *higher* frequency than that of the incoming signal. I see absolutely no advantage in that, and it would reverse the I.F.'s, giving us vision on a lower frequency than sound.

Furthermore, the tuning and circuit arrangement of the beat-note oscillator itself would be unnecessarily tricky. Which reminds me that I haven't yet said very much about these oscillators.

Obviously, in a way, the local oscillator is the critical point of the whole circuit. If that's unstable and wobbles everything after it will wobble. It comes so early in the circuit, too, that "everything after it" means practically the whole receiver!

Our little problem here, then, is to construct an oscillator, operating on a wavelength below 10 metres, that is really stable. The solution is our old friend the electron-coupled circuit. I don't propose to deal with it in detail here; sufficient to say that amateur transmitters are using it as a substitute for crystal control, and that they find the loss in stability almost unnoticeable.

Details of Construction.

The ordinary Hartley circuit, though a ready oscillator, is an extremely poor specimen in one way—its frequency varies badly with variations in L.T. and H.T. voltages. Admittedly the latter shouldn't vary, but they just *do*. Therefore it is essential to use a circuit that is more or less independent of the supply voltages.

The electron-coupled oscillator is one; and special circuits like the "Hoffman," with a very high-capacity/inductance ratio, supply the rest of the field.

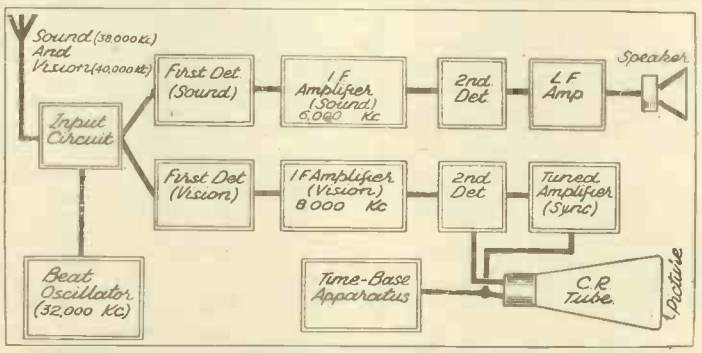
Rigid construction of coils and condensers is essential, and modern practice suggests that fixed condensers in the ultra-short-wave part of the circuit should be of the air-dielectric type.

Finally, that little box labelled "input circuit"—what's in that? Candidly, I don't know, but I should imagine that if you prised it open you would just find an H.F. choke! As I said earlier on, it must be flat enough to receive both channels, and it is not until our beat-note oscillator has done its stuff and converted them into two definite signals that we can "split" the receiver and deal with them separately.

A commercial receiver constructed on these principles has been demonstrated, and is believed to possess a band-width, on the vision channel, of 1,200,000 cycles, and on the sound channel of 50,000 cycles or more. The total number of valves employed (excluding power-pack and time-base unit) was ten, but a more expensive model used twelve.

But it is early yet to be dogmatic regarding the number of valves that will have to be used, especially as at the time of writing we don't know what wavelengths are to be used nor the numbers of lines or frames in the pictures to be transmitted. All is still very hush-hush.

A SECTIONALISED PLAN OF A COMPLETE SET



This diagram shows the various items and their functions in a dual receiver for sound and vision channels of a television outfit.

RESISTANCES IN PARALLEL

A new angle on an old subject which throws it up in a much simpler light.

EVERYBODY has seen the definition of the effective resistance of several resistances in parallel—namely, that it is equal to the reciprocal of the sum of the reciprocals of the individual resistance values. But it is by no means everyone who can work out the answer from this bit of technical jargon.

For those who have a simple working knowledge of Ohm's Law are often "sunk" when they want to know what single resistance would equal resistances of, say, 500, 150 and 250 ohms, all joined up in parallel. These will appreciate the following way of arriving at the answer, which only presupposes the simplest knowledge of the famous Ohm's Law and of arithmetic.

A Clearer Method.

Incidentally, it is a method which gives a much clearer insight into the reasons behind the working than is the case with the reciprocal method. What one does is to choose an arbitrary voltage of a convenient figure, find the current which it would force independently through each resistance, then add up the total current and find what single resistance would allow this current to flow when our arbitrary voltage is applied to it. The result is the answer we want, and all we have had to do is to work out four simple Ohm's Law calculations.

Here is an example: Suppose the resistances we want to parallel are 5, 10 and 15 ohms each. We choose, say, 50 for our arbitrary voltage, because it is a figure into which they all happen to divide nicely.

As you know, the current according to Ohm's Law is the voltage divided by the resistance. So in the case of the 5-ohm resistance we get 10 amps. (50 divided by 5). The 10-ohm and the 25-ohm resistances give us 5 and 2 amps. respectively.

Choose a Suitable Voltage.

Adding the three currents together, we get 17 amps. (namely 10 + 5 + 2). Our final calculation now is to find the resistance when current and voltage are known. For this Ohm's Law requires us to divide voltage (50 volts) by current (17 amps.). And 50 divided by 17 is 3, as near as matters. So 3 ohms is the equivalent single resistance to our three different resistances in parallel.

It takes much longer to describe than to work out, as you will find when you try a few examples. For simplicity always choose a voltage, if possible, into which all the resistance values will divide easily.

This figure, in effect, is the lowest common denominator of all three figures, a factor which normally is found when working on the reciprocal method. As a matter of fact, we here have a link which shows the connection between the two methods, and why they both give the same answer.

A. S. C.

A HANDY LAMP-MOUNTING FOR EXPERIMENTS

IF you go in a good deal for photo-electric experimenting it is always decidedly advantageous to have a readily movable mounting for the electric bulb which provides the source of illumination.

A very serviceable mounting for the above purpose will be seen in the photograph. All it consists of is a wooden block on which has been mounted two substantial terminals and a lampholder.

A light source so provided can be moved about easily in accordance with the requirements of any particular experiment. For cheapness of construction and for purely experimental use it is unexcelled.

MADE IN A MOMENT

A wooden switch block, two terminals and a batten holder are used in this useful lamp mount.

J. F. S.

TELEVISION.—(*Continued.*)

TELEVISION JOTTINGS

EXPERIMENTS that may have an enormous effect upon the future of television are being carried out with ultra-short-wave transmitters in many parts of the world. It appears that all our ideas about the quasi-optical behaviour of these waves are going to be upset before long. The relatively poor ranges covered, it is argued, are mostly accounted for by inefficiency of the transmitter and receiver.

In California there is a broadcasting station on 6·5 metres which has a reliable range of nearly 60 miles—and that is not over flat country. It is received in one locality, to reach which the transmissions have to pass through several miles of solid rock. (This, mind you, is what we are told. I can't see why the waves shouldn't find it easier to pass over the top.)

Important Experiments.

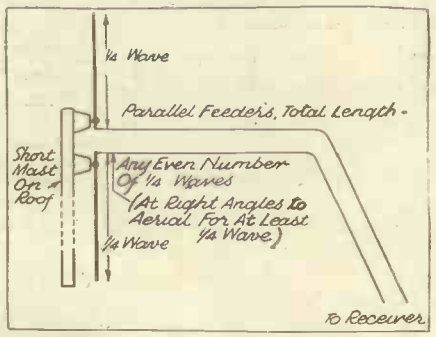
This leads me on to a very important series of experiments carried out by British amateurs on the 5-metre band. "A" has a directional transmitting aerial, and is in regular contact with "B." Between them is a very high hill—much higher than the ground on which either of them is situated.

"A" knows "B's" direction exactly, having drawn it out on a map and transferred it to the floor of his room. He points his directional aerial at "B"—in other words, straight at the intervening hill—and "B" doesn't get him at all.

He now swivels the aerial until it is pointing, so to speak, at the "corner" of the hill—the first point at which the height has fallen off substantially. "B" now receives him perfectly.

Now, of course, a more scientifically minded person than myself would probably laugh heartily if I suggested that this might prove that "A's" transmission was creeping round the corner of the hill instead of going over the top. I'll leave the rest of the argument to Ariel's "technical hounds."

FOR THE "ULTRA-SHORTS"



All the important factors of an efficient aerial for ultra-short-wave reception are given in this diagram. Note that the feeders should have a definite length.

Before leaving it I have another little spoke to put in. How can our one-time argument about "quasi-optical" waves hold good now that we have established the fact that the so-called micro-waves have just as great a range as the ordinary ultra-short waves?

A society meeting that I attended a few nights ago was rather interesting. Television was the subject under discussion, but the particular point that evoked the most heated argument was this: "Do we *want* our pictures on a large screen or shall we prefer small, clear pictures of the size obtainable with a small C.R. tube?"

A Small Picture Preferred.

A show of hands proved that those present were overwhelmingly in favour of the latter. The reason? Chiefly that they felt that a projected picture on a portable screen would savour more of home movies than of television, and that the loss of detail would detract from one's enjoyment more than the increased size would add to it.

One or two readers seem to be a little alarmed at having to play with rather high voltages for cathode-ray tube work, and ask whether it will not be dangerous for the home constructor. The answer to this is, of course, that it *could* be if he went the wrong way about it, but that there's no excuse for his doing so.

Don't Catch Hold Of It.

The transformers that will supply the high voltage for the tube will probably have regulation curves like the wall of a house—that is to say, as soon as a little current is drawn from the secondaries the voltage will fall right away.

Anyhow, the easiest way to avoid even the initial kick is this—*don't* catch hold of it. Why should you? There's no excuse for carelessness, even if you know the results aren't going to be fatal or even dangerous.

L. H. T.

Just as in ordinary broadcasting, a control engineer has to keep a check on the pictures transmitted. This photo comes from the German Witzleben station.

GERMANY STARTS TELEVISION

Some details about the new German regular 180-line service which is being transmitted on ultra-short waves.

THE German Broadcasting Company officially opened an experimental high-definition television service for the general public on March 22nd, 1935. Vision (180 lines, 25 frames per second) is broadcast on 6·700 metres, the accompanying sound on 6·985 metres from the Berlin-Witzleben radio tower (Funkturm). The two ultra-short-wave transmitters each has a power of 16-kw. anode dissipation in the last stage. Modulation is obtained along cables from the Broadcasting House in Berlin, which is a few hundred yards distant. A second cable connects the German Post Office television laboratories to the ultra-short-wave transmitters as well.

Programmes consist of excerpts from news reels and of one complete entertainment film. Programmes are changed once a week. The German Broadcasting Company intend providing their own news reels, to be changed every day and to be broadcast under the title "Mirror of the Day."

Special Van.

A special light sound-recording van has been obtained, together with a truck containing the necessary lighting equipment for making sound films in the interior of buildings. These "Mirror-of-the-Day" news reels are to be taken, processed in the normal manner and televised at the beginning of each evening's programme.

It will be remembered that at the last radio exhibition the German Broadcasting Company had on view a television reporter van which, by means of the intermediate-film system, made it possible to televise events which had previously been filmed within 30 seconds of their happening. This van will be used more extensively in the summer, and important events will be broadcast during the daytime and repeated in the evening.

A suitable television studio where electrical-scanning apparatus will be installed has already been provided at the Berlin Broadcasting House. At the present moment, however, this type of apparatus for televising scenes directly has not reached the practical stage, and therefore the German broadcasters intend concentrating on films.

Last summer the German Post Office were able to receive the television images broadcast from Berlin on the Brocken, the highest mountain in the Harz, about a hundred miles from Berlin. The success of this experiment proved that ultra-short waves have more than the so-called optical range. On the other hand, it also paved the way for modulating a second ultra-short-wave television transmitter to be placed on the Brocken mountain by wireless link from Berlin.

A transportable twin ultra-short-wave transmitter was immediately ordered and will shortly be delivered. It will first be placed on the summit of the Brocken mountain, and if tests prove successful a permanent installation will follow. The transportable ultra-short-wave high-power transmitting equipment will then move from place to place in Germany, and the sites for the proposed 25 transmitters will thus be ascertained.

Are 240 Lines Enough?

Telefunken and the German Post Office laboratories are at present concentrating on the production of electrical scanning for 360 and more pictures. A well-known German television expert, however, is of the opinion that, for all practical purposes, 240 lines will be sufficient at the moment, as otherwise television receiving apparatus would become too costly and too cumbersome for home use, especially as the added benefit derived from a 360-line picture as compared to one of 240 lines is comparatively small. Incidentally, mechanical scanning is still possible up to 240 lines. **A. A. G.**

AMPLION FUSES

Important considerations that should be borne in mind when choosing fuses for your set.

IN these days of multi-pin valves and their need for different H.T. positive taps the fuse becomes an even more vital component. With only the one H.T. plus to short accidentally, either through its lead or through a faulty component, the protection of a fuse is still most advisable. When there are two or more H.T. pluses, then it is asking for trouble not to have at least one fuse in circuit.

So far we have been considering only the battery set; in a mains set fuses are, of course, always included, and form as desirable a feature of the design as the variable condensers or coils.

But we wonder what the average constructor knows about fuses. He is, no doubt, fully aware of the fact that a fuse is a device which breaks down when a large current passes through it, and so breaks the circuit in which it is in series; but we suspect that that is about all he knows, unless he is a very regular reader of "P.W."

The Various Ratings.

Fuses have ratings in current values. The standard range of fuses for radio receivers, mains units, etc., is 60, 100, 150, 250, 500, 750 milliamperes; 1, 1½, 2, 3 amperes. Taking one of these at random, what is a fuse rated at, say, 1 amp. supposed to do?

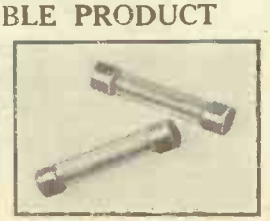
It is supposed to carry any current up to 1 amp. It should be able to carry the full 1 amp. for an indefinite period. But it should fuse ("burn out") practically instantaneously if the current were to rise 50 per cent (that is, to 1½ amps. in this case) or over.

In choosing a fuse it does not do to work too close to the rating. That is to say, if it is known that 60 m/a. is flowing from a mains unit, then a fuse rated at 60 m/a. is *not* the one to employ.

Consideration must be given not only to the constant current which is likely to be flowing in the circuit, but also to the surges which are liable to occur. In a mains unit or set circuit there may be surges representing nearly as much as twice the average constant-current flow.

These surges are not dangerous, for they are generally of but momentary duration, but they have long enough existences to "blow" efficient fuses. In selecting a fuse, then, it is the usual practice to consider the apparatus it has to protect and the currents which are likely to do it harm rather than to work in bare coverages of the constant current flowing in the circuits in which the fuse is to be included.

A RELIABLE PRODUCT



Two of the Amplion cartridge-type fuses which retail at 6d. and are available in many current carrying capacities.

If this way of going about it were more widely adopted we fancy we should not hear of so many constructors who complain that their fuses are always blowing!

But when fuses having ratings of double or so the current values they normally pass are used it is most advisable that they should be reliable. Just because a fuse is labelled "100 m/a.," that is no guarantee at all that it will blow in the proverbial flash should the current through it rise to 150 m/a.

High Standard of Efficiency.

We remember with amusement that we once found ourselves inadvertently using a 60 m/a. fuse for a circuit carrying just over 100 m/a. It took that 100 m/a. quite imperturbably.

As a matter of fact, it took a whole ampere, and still did not fuse, for we tried it as an experiment! A faulty fuse like that would give one a false sense of security. It therefore behoves the constructor to choose his fuses with discrimination, particularly as a fuse cannot be tested. At least, it can be tested by running a current through it and noting at what value it burns out. But it is then useless.

What can be done is to rely upon the reputation of the manufacturer. It is, therefore, good news that Messrs. Amplion have now added fuses to their increasing range of radio productions.

We have always held the highest regard for Amplion products, having found them to maintain a uniformly high standard of efficiency and reliability.

The Amplion fuses are of the cartridge type, and are available in all the usual values from 60 m/a. to 3 amps. They retail at 6d. each. We have been able to test a number of them, and find that they give an immediate collapse within the limit of overload that marks the effective fuse.

We have no hesitation in recommending them to our readers as being entirely trustworthy.

The SILVER KING At Home

An interesting account of the "Silver King" in the home of an ordinary listener, in which some valuable tips on its "housing" and operation are given.

By A. S. CLARK

THE "Silver King" attracted a considerable amount of attention, enthroned on the back seat of my sports car, as I drove away from Tallis House at a not-more-than-thirty crawl. But it was quite comfortable, I assure you, being preserved from all shocks by numerous thick rugs.

And where was I taking it? Well, it was going to an "At-Home" which a friend of mine—an ordinary listener—was holding for it. The whole idea came about in the following manner.

I met my friend on the train one morning when I happened to catch an earlier connection than usual. He had a copy of POPULAR WIRELESS under his arm, and told me he had been reading all about the "Silver King," and that he had got all enthusiastic about it and had been trying to imagine it in his own home.

"The Laboratory Background."

This, he said, he had found a little difficult because of "the laboratory background that all of you fellows are bound to have in your minds, even when you take a set home to the suburbs for test." Of course, he was wrong, for we always bear exact home conditions in mind when designing a set and simulate them exactly for purposes of testing.

As a matter of fact, I felt sure he fully appreciated this, and am still convinced it was all part of a scheme to enable him to try at first hand the original of this great masterpiece of new reception technique. Anyway, I immediately offered to get hold of his majesty and bring him down one night to my friend's house, realising that others of our readers would be interested in an account of the "Silver King" in the home of an ordinary listener.

And so, after wending my way along the Embankment and out towards a suburb in south-west London, I eventually arrived at my friend's house. "Where will you have it?" I asked in the vernacular of the usual deliverer of goods.

In Position.

The front room was suggested, as the family generally used the back room and could there take part in the tests by listening to programmes on the broadcast waves by means of the extension loudspeaker, the while we hunted round the ether on short waves.

While looking round for a "home" of some sort or the other for the set we found the ideal thing—so much so that it is worth describing for the benefit of others who construct the "Silver King."

The dual nature of the "Silver King" precludes pushing it back into a corner like the ordinary sort of set. At the same time there is no need to have it out in the middle of the room in order to get at both sides, for the cabinet is provided with a turntable base.

The table on which the set was stood is illustrated in one of the photographs accompanying this article. I don't quite know what it was originally intended for, but it had a square top and was about the same height as an ordinary radiogram cabinet.

The beauty of it was that it could be pushed squarely into the corner with the set standing in the middle of it, and just allow room for the set to be swung round without the corners hitting the walls. Put scientifically, one would say that the length of the diagonal, taken from a plan of the set, was about an inch shorter than the length of a side of the square formed by the table top.

Having satisfactorily placed the receiver, I settled down comfortably by the fire in an armchair and left my friend to connect up. This, with the aid of the articles in POPULAR WIRELESS, gave him no trouble, but he spent a long time examining the special design of the "Silver King" before getting down to it.

What most fascinated him was the way the set was divided into two entirely independent sections—sections which nevertheless made use of the same valve.

"Marvellous!" was his comment as he closed down the lid. "I never even dreamed that it was possible to design such an entirely unique receiver. Particularly when one was beginning to think that receiver technique had reached its limit of development."

But we have become quite used to such tributes, and I am afraid I was a bit off-handed in the way I suggested we should "get on with the washing." Anyway, there was a bit of an old-fashioned look before the remark: "Righto! Where do we start?"

A Preliminary Trial.

We proceeded as follows, myself giving most of the instructions and my friend doing most of the work! Still, exchange is no robbery, I believe.

We moved the set near the door and brought the extension loudspeaker down from upstairs, connecting it up with a short piece of wire just on the other side of the door. This is perhaps the ideal arrangement for preliminary tests.

Someone can listen on the loudspeaker and check up results, while another person operates the set and tries out the short-wave side on phones. The presence of the door prevents the sounds from the speaker interfering too much with phone reception, while at the same time permitting the convenient exchange of observations between the two listeners.

No Interference.

It certainly was not necessary to open the door to hear whether the set was working; as a matter of fact, the medium and long-wave reproduction had to be volume controlled a bit to prevent it penetrating one door and one pair of tightly clamped phones. But the door soon opened. My friend was not content to stay outside with the speaker; he wanted to see what was going on.

He said he wondered whether I had returned to my comfortable seat by the fire, as he had heard nothing to indicate that I was listening on short waves. But that, of

(Continued on next page.)

CARRYING OUT THE FIRST TEST

For the first try-out of the set it is a good idea to arrange the speaker and the receiver near to a door but on opposite sides, as illustrated by this photograph. It is then an easy matter for the listeners on both sides to compare notes.

THE SILVER KING AT HOME

(Continued from previous page.)

course, was just as things should be, I assured him with a smile.

"Now let's give them some music in the other room!" he exclaimed, beginning to get somewhat excited. (He nearly strangled the cat and almost hanged himself in his rush to get the extension wires run through.)

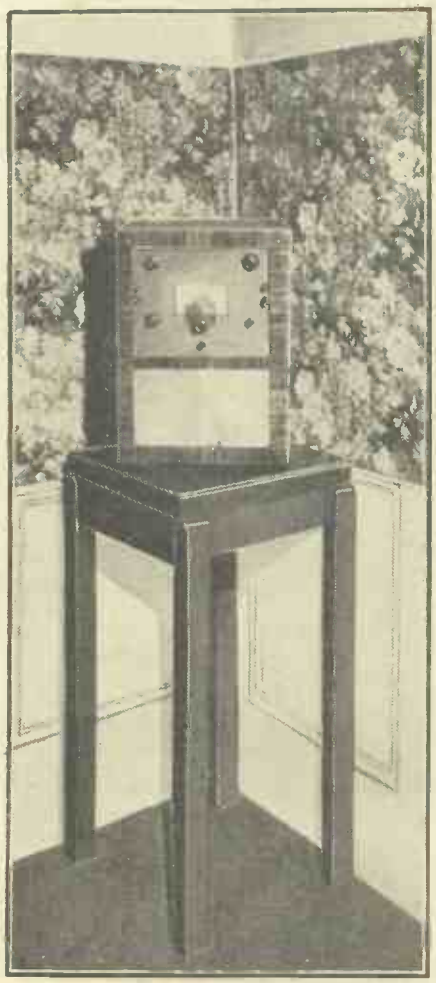
However, tragedy was averted and the family settled in to enjoy a spot of variety. We returned to the front room to see how America was coming over.

Changing the Programme.

My certainty that we should get some station with a nasal-toned announcer seemed to amuse my friend. But that, after all, was rather natural, since this was his first experience of the short waves.

I won't bore you with the details of his first experiences of real DX. Those of you who have tried short waves will know all the thrills of the first world tour by radio, and to those who yet have to experience them I would merely say that they must be "heard to be believed."

IDEAL "HOUSING"



A small square table such as the above will enable the set to be fitted nicely into the corner of a room and yet leave it free to be rotated on its turntable.

Actually, we heard three different continents and succeeded in getting something on each of the three coils. So engrossed did we both become that we did not notice how time was flying by until the door burst open and Muriel asked us to see if we could get some jazz, as the variety programme had finished.

"I'll go and get the loudspeaker," said my friend

"No, don't bother," I interjected, reaching out a detaining hand. "If you've got a resistance we can use the telephones."

I think it would be as well if I describe exactly what we did, for many others who build the "Silver King" will like to adopt the same scheme.

PICKING OUT THEIR LOCALITIES

Added interest attaches to short-wave listening when there are two of you and one locates the stations' positions on a globe of the world. This brings home in full the amazing distances which can be covered in short-wave reception.

We first found a resistance of 50,000 ohms (almost any value between this and, say, 100,000 ohms should work) and, removing the phones from the short-wave side, joined one lead to one end of the resistance. That left us with two ends—the other phone lead and the remaining wire end to the resistance.

These two ends we joined across the loudspeaker terminals, leaving the extension wires in place. We could then tune the medium and long waves by listening on the phones. The object of the resistance, by the way, is simply to reduce the volume in the headphones and protect the ear-drums.

We soon found strains of a tango, and a chorus of shouts from the other room bidding us to "leave it at that" and not to fiddle any more left no doubt of its meeting with approval.

Two Extra Terminals.

The best way to arrange the phone resistance is to mount a couple of terminals on a piece of wood, as shown in the sketch on the next page. A short length of twin flex goes in the side of the mount, one wire being joined to one terminal direct and the other going to the second terminal via the resistance.

The small wooden case is screwed to the side of the "Silver King" cabinet and the flex leads joined up to the loudspeaker terminals. They can be left in position permanently, only being removed when it is desired to open the front of the cabinet.

When the phones are wanted for "check" purposes they are simply removed from the phone terminals and joined across the pair of new terminals.

But to return to our "At-Home" business. It was just at this point in the proceedings that my friend asked a question I knew he had been itching to ask for some time. He wanted to know whether I was going to trust our masterpiece to his hands "just for one complete day," as he put it.

When I told him I intended calling for it the evening of the following day he was quite bucked—just like a schoolboy who hears he is to have a long-wished-for treat. I couldn't possibly leave it longer, because, although we have several models made up, the original is always in special demand at our laboratories for demonstration, both the trade representatives and other demonstrators always asking to hear the "original."

"Let me take over the controls," requested my friend, "so that I can get thoroughly used to them while you are here to guide me. I expect I shall be up the greater part of the night, while you are snoring between the sheets, seeing how many stations I can log during my short ownership of this magic box."

America on the Speaker.

I didn't tell him that I should also be up for a bit when I got home, getting this article ready for the printer. But I did tell him that, even with his inexperience of the short waves, he would need precious little coaching in handling the controls of the "Silver King."

After a turn or two of the short-wave tuning condenser, during which I explained to him the trick of careful, slow tuning, which Mr. Kelsey told you all about last week, he soon got the "hang" of things.

I resumed my seat by the fire, only to be called upon after a few minutes to "come and listen to this American; he's jolly strong."

As I donned the phones my friend exclaimed: "I'll go and get the loudspeaker!" I did not stop him this time; there's nothing quite so impressive to the ordinary listener as hearing an American clearly on the loudspeaker.

And hear this one clearly we assuredly did. In fact, the rest of the family joined

(Continued on next page.)

THE SILVER KING AT HOME

(*Continued from previous page.*)

us in the front room to see what all the fuss was about. Explanations naturally had to follow, and Muriel had to have a special demonstration all to herself, with the phones in operation, before we could convince her that this new set would receive two different programmes at the same time without getting them muddled up.

Doing two things at once with such perfection was almost beyond the grasp of her womanly psychology. Ted (that's my friend's name) was most annoyed and was almost rude to her.

"What About a Pick-Up?"

But I think it was only another of his ruses, this time to get rid of everybody so that we could have the set to ourselves again. Be that as it may, he was soon running round the world's ether again, and that was how I left him, bidding him not to get up, as I was quite sure I could let myself out.

I had hardly reached the door before I was called back again.

"By the way," my friend said, "can I work my pick-up on this set?"

I assured him that it was possible, for there is nothing which a mere ordinary receiver can do which the "Silver King" cannot also emulate.

"I wondered," my friend added, "because there are no special terminals for the connections."

"That," I explained, "is simply because the majority of people who use a radio set these days do not worry about connecting up a pick-up with its separate turntable. They find that all the entertainment they want can be obtained from the ether, and this is particularly true of the 'Silver King.'

"Those who desire a pick-up can easily arrange terminals, and also a switch if they prefer switching." I explained how it could be done, and for the benefit of constructors who want to play gramophone records on the set I will go over the connections here.

Easily Arranged.

The simplest way is to wire up two flex leads, one to the grid terminal of the V2 valve holder and the other to 1½ volts negative on the grid-bias battery. The lead joined to the grid terminal should be brought through the baseboard via a hole near to this terminal.

The two terminals to which the flex leads are taken can now be conveniently mounted on the side of the cabinet just below the L.F. transformer next to the V2 valve holder.

When working on the pick-up the breakthrough of radio reproduction can be avoided by setting the volume control, which is a potentiometer working on the aerial circuit, at zero. That is, simply turn it full left.

This control will naturally have no effect on the volume at which the records are played. The latter should be adjusted by means of a potentiometer-type volume control wired across the pick-up itself in the usual way. The best place to mount it is on the motor-boards.

If it is desired to use a complete change-over for radio to gram. a single-pole push-pull switch is wired into circuit in the usual manner. Probably the best place to mount the switch would be under the baseboard on a small bracket, so that it comes immediately below the V2 valve holder.

An extension rod for controlling it will be required, and this can be arranged to come out at the side of the cabinet near the two pick-up terminals, which can conveniently be in the same position for the arrangement already described.

Connecting the Switch.

The alterations to the wiring are quite simple. First of all disconnect the lead from the grid of V2 to the ·0002-mfd. fixed condenser.

Then drill two holes in the baseboard and take wires through them from the grid terminal of this valve holder and from the now unconnected end of the ·0002 mfd. fixed condenser.

The lead from the grid terminal is connected to the common contact of the switch and the lead from the ·0002-mfd. condenser to one of the outer contacts. The remaining switch contact has to be joined to one of the pick-up terminals, the other one of which goes to the grid-bias battery as before.

It takes much longer to write all this down than it took to explain it verbally to my friend with the set in front of us, but I think you will find it quite clear.

"I don't suppose, to tell you the truth," my friend remarked after my explanations, "that I shall find any time to spare for playing records. I shall be too busy on dual-channel reception, which is so wonderfully new to me compared with the everyday occurrence of record reproduction."

"I Am Really Amazed."

"Oh, well," I said, "I'll leave it to you." And with that I bid him adieu for the second time.

But this time he accompanied me to the door, remembering, perhaps, a new umbrella or something on the hall-stand.

His final remarks concerned the receiver.

"If you want to tell your readers what I think of the 'Silver King,'" he said, "tell them that I am really amazed that anything so entirely new and different could be imbued into the technique of radio reception. It adds a fascination that is entirely different from anything that I have previously experienced. And as for the performance—well, I can't imagine any three-valver that could give better results."

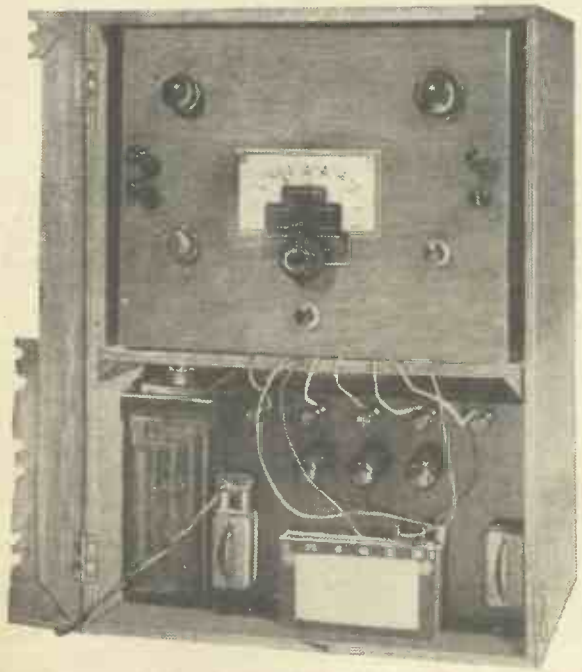
I thanked him and hurried away, repeating his words in my mind so that I should eventually be able to record them faithfully.

This I have done; and I am sure every reader who has himself built the "Silver King" will completely endorse my friend's opinion. To others I would say: "See you don't miss this wonderful experience."

"SIDE-TONE" RECEPTION

By means of a resistance and pair of terminals you can use the short-wave phones for tuning in the medium and long-wave side of the receiver. The practical details of the scheme are shown above.

WHEN THE MAINS ARE USED



If the "Silver King" mains unit is employed it fits in place of the H.T. battery. A notch or hole should be made in the cabinet to lead out the mains flex.

ON THE SHORT WAVES

Conducted by W.L.S.

SOONER or later every newcomer to the ranks of short-wave listeners makes an unpleasant discovery. Briefly, it is this: that he continually encounters little troubles that the "old hand" never seems to have with him at all..

As a matter of fact, the "old hand" has them just the same; but he knows how to deal with them all, and they don't worry him in the slightest. The poor old novice, though, walks right into it every time.

Let me give the "poor old novice" a little help in the way of a few practical hints. It's not an easy job, because I can call myself an old hand by now, having had twelve years of it, and I find it hard to visualise the novice's feelings or even to imagine the troubles that he may meet.

First, though, let us talk about our old, old friend Hand Capacity—without doubt the cause of more grey hairs than any other short-wave trouble. He is distinctly a

ELIMINATING "HEAD CAPACITY"

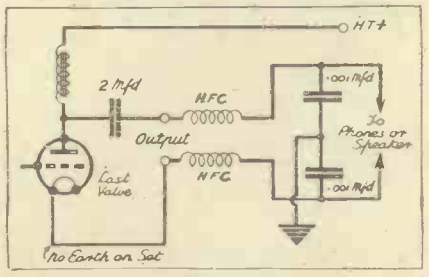


Fig. 1: The theoretical arrangement of the suggested choke-filter scheme.

Nasty Man. He lurks in all sorts of corners and pounces on the unsuspecting at the most opportune moment.

Why is he so much more in evidence on short waves? Well, there are several reasons. But before we discuss them I must point out one thing that isn't generally understood.

An Interesting Comparison.

Imagine a broadcast receiver tuned to London Regional whose frequency is in the neighbourhood of 800 kc. Suppose this receiver has a series of tuned circuits whose frequency "stays put" to the tune of one part in 10,000. In other words, it may be unstable to such an extent that a hand extended towards the tuning control changes the frequency by that amount.

On 1,000 kc. (300 metres) that would only be one-tenth of a kilocycle—100 cycles—which no one would notice at all. On 800 kc., of course, it would only be 80 cycles.

Now think of a short-waver working on 20 metres (15,000 kc.) with the same degree

TAMING THE SHORT-WAVER

Some practical hints on eliminating unwanted capacity effects.

of stability (or instability!). The same percentage drift of frequency would cause a movement of 1,500 cycles, which is *quite* a lot, and would almost be sufficient to lose a sharply tuned signal.

There, in a nutshell, you have the chief cause of the bother. You can build a broadcast set that isn't a model of stability, but you'll never notice the trouble. Build a short-waver, though, that is, relatively speaking, just as good, and you'll have plenty to worry about.

Next I must point out that it isn't easy to build a short-waver with even the same stability as that rather bad broadcast receiver we were talking about. You have to be very particular with your layout and wiring. You must use a metal-covered baseboard, your earth must be discarded altogether if the lead to it is too long and your aerial must be a suitable length.

Phones Cured—Then What?

Even if your dials are free from hand capacity you will probably find that you have chased it up the headphone leads, in consequence of which you lose your station if you grab the phone cords or waggle your head. All of this, of course, is due to high frequency in the wrong place. Keep it out, and you won't be bothered any more. Figs. 1 and 2 show you how to.

Use choke-filter output, insert a short-wave H.F. choke in each phone lead and connect two ·001 condensers across the remote side of the chokes, earthing the centre connection. Sufferers from live phone leads will find this a positive cure for their trouble—BUT! (Yes, there's always a *but*, and this is quite a big one.)

You will now find that the H.F., having been excluded from its happy haunt up the phone cords, has probably gone back to the tuning dials again.

Why, you may ask, do I recommend a scheme that sends the H.F. back to a place where it's even more inconvenient than when it's playing about with the phone cords? Well, it is essential that we should close *one* circuit to it at a time. It's no good trying to cure hand capacity until you have prevented it from turning into "head capacity." *Now* you can really go ahead and tame it.

Here are my suggestions. Of course, I am assuming that both the tuning condenser and the reaction condenser have their moving plates earthed. Perhaps they are on a metal panel. Is the panel "live"? Do you get a click and a change of tuning when you touch it? And, if so, does the same effect take place when you touch the earth terminal at the *back* of the set?

A Poor Layout is Indicated.

If your earth terminal is O.K., but the panel live, then you must have a very poor layout. Go through it systematically and shorten all the H.F. leads, especially the earth returns. If, on the other hand, the earth terminal is just as live as the front panel you must work on another line. Remove the aerial; are conditions the same without it? If they aren't try either a very small series condenser or a different length of aerial.

If they *are* the same with or without the aerial, then (pardon me!) it's a rotten set. A short-waver that is live all over with neither the earth nor the aerial connected is absolutely hopeless.

Shorten your leads some more; look to your tuned circuit especially and put your coil nearer to its condenser, seeing that both sides are directly connected with short, thick wires.

THE FILTER CONNECTIONS

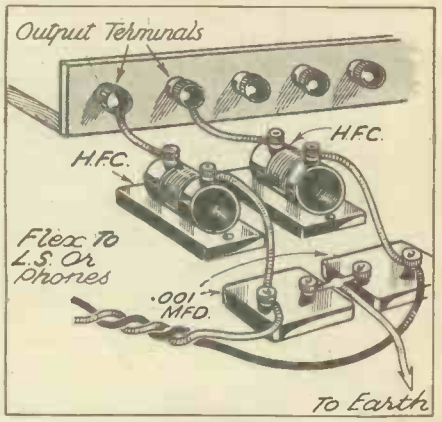


Fig. 2: How the choke-filter output in Fig. 1 is wired up.

But I don't anticipate that your set is as hopeless as all that. Probably it is perfectly tame without the aerial on. If it's the aerial that causes all the trouble it's a hundred to one that you are trying to couple it too tightly. Use inductive coupling, and loose at that, if you possibly can.

If you must use capacity coupling find the smallest condenser you can put your hands on, make it smaller still by tearing plates out of it and couple the aerial through that!

ON THE SHORT WAVES *(Continued from page 204).*

WHAT READERS ARE SAYING

H. G., of Ealing, wants to meet D. P., of that same district, who recently figured in these notes. Will D. P. please make himself known to Mr. H. Gibson, 1, Noel House, The Park, W.5 ?

T. W. (Edinburgh) wants to make sure of the form in which reports on amateur transmissions should be made. He says: "I understand that some special code is used." Well, T. W., one generally reports signals as "Q S A 5, R 6, T 9" or something of that sort. For the full explanation of the three codes refer to "Radiotorial" on page 77 of the March 30th issue.

The Telephony Code.

Instead of the "T" (tone) code there is an "F" code for telephony. I won't give it in full, but you can take it that "F 9" means "B.B.C. quality," "F 8" means excellent, "F 7" very good and so on. "F 1"—well, work it out for yourself.

T. W. also inquires whether coils wound on old valve bases, with the turns touching, are any good for short waves. Yes, T. W., provided the wire is insulated! I have often used that type myself, and I don't think you'll notice any loss of efficiency.

J. W. P. (N. 6) admits that he isn't capable of laying out a circuit from a theoretical diagram. He was very attracted by the push-pull detector circuit that I described recently, but his attempts have ended in a real "jigsaw layout." He says: "I am sure you will laugh at this—even *I* can now—but the only answer to this jigsaw is the *real* layout. If you can imagine this tangled wreck you will be only too pleased to oblige."

Just persevere with it, J. W. P., and you'll get it right. The valves you mention should be excellent; and the circuit, when properly laid out, is likewise. A symmetrical layout *is* difficult to get, I know.

I seem to possess a fatal attraction for chief engineers and wireless operators who sail the seven seas. A. B. is one of the latter class, and he writes from the region of Lourenço Marques. He now has a Chinese copy of the "B.C.L." Two, having bought some of the necessary parts at Cape Town, but it's not so good. He has to put 70 volts on the screen of the detector to make it oscillate!

Valve Trouble Probable.

Goodness me, A. B., what *have* you done? Mine was absolutely uncontrollable long before I got to that voltage, and I always used 22½ or thereabouts. I think you must have a dud valve. The coils you mention should be O.K. with almost any length of aerial, but it's sometimes advisable to use a preset condenser in the aeriallead as well.

J. W. H. (Llandudno) wants a modernised version of the "H.A.C." Three-Valver using six-pin coils, as he can't get coils for the old set to go above 60 metres. What's wrong with winding your own, J. W. H.? You can easily "hank-wind" a 12- or 15-turn coil, bind the turns together with cotton and fix it to a two-pin plug. I've passed on your "Comet" query to the right department.

S. C. (11a, Leeds Road, Harrogate) is in trouble with the "B.C.L." Two. Unfortunately, I have no clue to the cause of his failure, but he would like to get in touch with some other short-wave enthusiast in the neighbourhood. Any offers?

W. L. S.

A PICTURESQUE STATION

Short-wave work is a hobby that has its enthusiastic followers all over the world. Here is a glimpse of the interior of a Nigerian amateur station which was first licensed in 1926. It is an example of what can be done under conditions which are admittedly not ideal.

THE latest recruit to popular song writing is the famous novelist Beverly Nichols, who has produced *Another One Gone*, which forms one side of a new H.M.V. record. This record is notable not only for the fact that Beverly Nichols wrote one number, but also because it brings back that old favourite combination of Norah Blaney and Gwen Farrar. I thought you would be glad to hear that!

On the other side this inimitable couple give us *Maybe I'm Wrong Again*; the record is B8293.

* * *

Did you hear that record of The Radio Rogues—*A Radio Party*? It was Brunswick B124, and was published some two years ago, I think. If you did not you missed a good record, and it is well worth getting even now. And as a companion to it get Decca K749, whereon the same Rogues have again inimicked a number of America's famous radio and film stars. The title is the same, and the record is as good as the first.

Jack Hylton Returns to H.M.V.

Jack Hylton is now back in the H.M.V. fold, and, though I consider the words ridiculous, probably his best record since his return to the famous label is *She Wore a Little Jacket of Blue*. It is H.M.V. BD143. Before leaving Decca Jack recorded the immortal *St. Louis Blues*, plus a most energetic vocal refrain. I am not sure that it shows Hylton and his Boys up as well as more ordinary numbers, but there is a very fine trumpet part running practically throughout, and followersof Hylton will know what that means. The other side is the famous *Hylton Stomp*. This is Hyltou at his raciest. More trumpet work.

* * *

A record that many of you will like to get is the Panachord No. 25702, on which *The Street Singer's Medley* is recorded. It is a collection of the numbers that he has made famous on past Decca records, and includes "Marta," "Play to me, Gipsy" and "Masquerade." * * *

I am not sure that I like the Kitty Masters duet with Val Rosing on Regal-Zonophone MR1601. Somehow the two artists seem to upset one's enjoyment of the numbers. Perhaps it is that we are used to hearing the numbers sung as solos, and *June in January* for one does not seem to lend itself to a duet, although the record is very well made. I like both artists in solo parts very much better.

* * *

I am glad Henry Hall is augmenting his band, especially as it is more fiddles he is introducing. It has always been on the thin side. I notice, too, with satisfaction the predominance of tuneful music in dance-band programmes nowadays.

I do not usually write anything about Parlophone records, for the simple reason that they do not send me any to review. I am sorry about this—perhaps more sorry than you—but in spite of the fact that they do not come under my normal task of record listening I do hear quite a lot of Parlophones. And I cannot let that series of delightful piano discs, made by Harry Roy's *Tiger Ragamuffins*, pass without drawing your attention to them.

At one-and-six a time they form wonderful value, and for sheer neatness they are unbeatable. The recording is first class, and for anyone with a liking for light rhythm music they form a most delightful selection. Ask to hear them when next you go to your dealer. The numbers are: F115, R1970, R1815, R1771, R1701 and R1921.

A Musical Discovery.

This is the age of discovery; in every sphere of life the public expect, if not genuine discovery, at least sensational claims. And the world of music is not exempt from that remark; musical discoveries, especially child prodigies, are always news.

The latest to be so extolled is Master Denis Gonet. He is said to be no mere child prodigy as generally accepted, but a thirteen-year-old boy "with the voice of a man." He is called by the recording company which discovered him, Regal-Zonophone, "The Boy Caruso." He is said to have the "golden tone and mannerisms of the late Italian tenor."

Judge for yourself from his recently released record on which he has sung *Vesti la giubba* from "Pagliacci" and *La donna e mobile* from "Rigoletto," arias that made Caruso famous.

Denis was heard singing in a cinema by a Regal-Zono official, so the story goes, and he was rushed to the studios to make the record, which is claimed to be the most phenomenal release for years.

In such a case I always feel that it is best to tell you about it rather than to criticise or describe the record as it appeals to me. Originality such as this cannot be truly criticised; there is no criterion to go by. It is not fair to compare the boy with the real Caruso; the record must be judged by itself alone, as a curio, maybe, but it is incomparable with anything else. Go and hear it and judge for yourself. Regal-Zono, MR1633.

* * *

And here is another novelty of quite a different kind, a recording of the *Grandfathers' Club*. I expect you heard this unique club broadcast in one of the recent "In Town To-night" programmes, and a most unusual broadcast it was, too.

The Grandfathers' Club was formed last October, and all its members are over sixty. On the opening day there were forty members: to-day there are 340, all of them drawn locally. Total age 20,000 years!

It is the first club of its kind to be inaugurated in the north of London, and has its headquarters at Holloway Baptist Church, where the recording was done. The veterans of the club attend each day, and begin with a service, after which they play games and rehearse for their musical activities.

The Grandfathers' Sing-Song.

Some of the men are actually great-great-grandfathers, and 300 of them are keen singers. This number sang on the wax from which the Regal-Zono record MR1645 was made. Four well-known ballads from their repertoire were chosen, and these were put over with a grand gusto that leaves one amazed at the virility in the old 'uns.

The two soloists are George Avery, aged 66, and Tom Harmon, 77. They are certainly really grand fathers.

* * *

More Jubilee records grace the catalogue of Columbia. There are four new ones this month, following on the "Scrapbook" disc of last. There is an Empire Cavalcade under the title of *Empire Pageant* by Debroy Somers and his Band (not very inspiring, in my opinion) (Col. DX681); there is the special *Silver Jubilee March* which has been composed in honour of the occasion, and is played by the B.B.C. Military Band under Walton O'Donnell (Col. DB1518); and there are the two records of 25 *Years of Musical Comedy*. These years cover those of the King's reign, and the various successes of the stage are excellently recalled to us by Geraldo and his Orchestra, supported by Natalie Hall and Monte Rey.

The numbers are (Col. DX679-80), and the two discs make fine light entertainment. The tunes range from "Come to the Ball" from "The Quaker Girl" to "I'm on a See-Saw," the recent hit from "Jill Darling."

All the above records are decked in special Silver Jubilee labels. The last pair are certainly worth getting.

K. D. R.

TESTING YOUR SET
DISTORTION and LACK of VOLUME

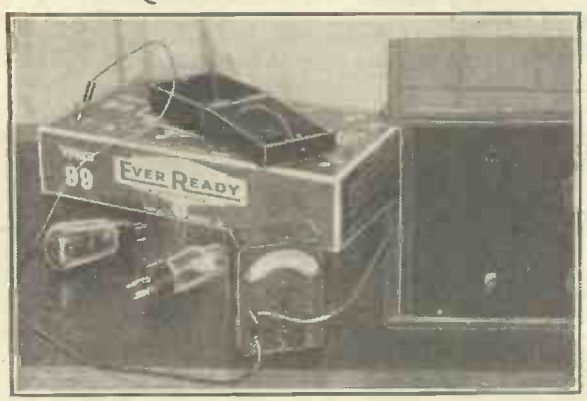
This article on set testing deals with well-known types of faults, and shows how rapid checking of vital points will lead to a tracing of the cause of the trouble.

By A. JOHNSON-RANDALL.

AMONG the common maladies which are liable to attack a radio set the two mentioned in the heading of this article are as distressing as any. Little, if any, pleasure can be got out of a set which persistently distorts, and I think you will agree that a sudden loss of volume can be very nearly as irritating.

When I speak of distortion I am thinking of those jangling sounds which signify horribly mutilated music and of announcers who sound very much as if they had plums in their mouths. This kind of reproduction completely kills the pleasure of listening. And it is not much fun if all you can get from your set, even with the volume control in its maximum position, is just a whisper from your local National or Regional station.

A QUESTION OF EMISSION



Two valves have been removed from this set, leaving one inside. The set is switched on, and there is an AvoMinor reading milliamps, in series with the H.T. negative. This checks the emission of the valve in the set. If this valve is then removed, and one of the others replaced, a second valve can be similarly tested. The same procedure will give the emission of the third valve if desired.

Some Likely Troubles.

I am not going to attempt to tell you how to find any of the more obscure faults, because that would be impossible within the space at my disposal. And, moreover, the average listener is not equipped to track down faults of this nature for himself. But there are certain little troubles which often cause distortion and lack of volume which most people can discover and put right themselves. Let me tell you some of them.

When your set suddenly takes upon itself to distort you should start by suspecting the H.F. side and make quite sure that one of the several earthing connections has not come adrift. First have a look at the earth lead itself and note whether it is still firmly attached to the earthing terminal on the set, and follow it out to see that it goes to earth as it should.

Many cases of distortion, as well as lack of volume, are due to this all-important connection having been broken away from the set, or from its earthing tube, water pipe or whatever earthing arrangement is employed.

Check Earthing.

Then take a look at the inside of the set and note whether the screens on the coils, and on the gang condenser if your set employs one, are making good contact with their bases; see also that the earthing points from these various screens to the baseboard or chassis are making proper contact.

Such items as these may seem very obvious ones, but it is the obvious things that are so often overlooked.

You may wonder why the absence of an earth connection can cause distortion. The reason is that even one faulty earthing point will often produce instability or, at any rate, a tendency for the set to oscillate. And when a set is unstable the reproduction usually suffers.

I feel that a good deal of the trouble under the heading of "lack of volume" is caused by badly trimmed tuning circuits. Many modern receivers incorporate matched tuning coils and ganged condensers. Sometimes there are only two sections to the gang condenser; sometimes there are three.

If your set has a ganged control and you have never been able to get the results that you should it is just as well to check over the trimming.

If you look at your condenser you will find that the makers have equipped each section with a compensating adjustment known as a trimmer. In some condensers these trimmers are on the top and in others at the side or back. In some cases the adjustment is carried out by means of a screwdriver or a piece of wood shaped like a screwdriver blade, and in others by rotating a star-shaped adjusting wheel with a pencil or stick.

Trimming a Gang Condenser.

To readjust your trimming, set each of the little trimmers on your condenser about half-way in. That is to say, you should screw them up and then unscrew them each about a couple of turns. Then tune in a weak station at the lower end of the medium waveband and adjust each trimmer until you bring in the station as loudly as you can.

It is as well to apply a little reaction during this operation and to weaken the station as much as possible with the aid of the volume control; further reductions of volume may be found desirable as the process of trimming proceeds.

Then tune in another station, also a weak one, at the upper end of the medium waveband and check up your trimming. In this

(*Continued on page* 210)

FIFTEEN MONTHS OLD!

A grid-bias battery will not last for ever. After nine months—and even before—it should be tested for voltage. Here is one being removed from a set after 15 months' use. The set was faulty, and no wonder, for the grid-bias battery gave only half its proper voltage.

RADIOTORIAL

The Editor will be pleased to consider articles and photographs dealing with all radio subjects, but cannot accept responsibility for manuscripts or photos. Every care will be taken to return MSS. not accepted for publication. A stamped, addressed envelope must be sent with every article.

All Editorial communications should be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

All inquiries concerning advertising rates, etc., to be addressed to the Advertisement Offices, John Carpenter House, John Carpenter Street, London, E.C.4.

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 reception. 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 specialties described may be the subjects 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

REDUCTION IN GRID-CONDENSER CAPACITY REDUCES HUM.

T. E. McW. (Glasgow).—"After trying further decoupling and smoothing without conspicuous success I cured the hum completely, by accident!

"All I did was to change my old grid condenser (·0003 mfd.) for a ·0001 mfd. of same make. I can't see how this can affect the hum from mains, can you? But whatever the reason, the result is to cure that maddening mumble all the time, which was driving me crazy."

Reducing the capacity of the detector's grid condenser is a well-known method of lessening hum which may be reaching the detector via insufficiently smoothed H.F. stages.

The alteration you made in the capacity increased the reactance of the condenser to three times its original value, and it was this that put a stop to the trace of L.F. ripple that was getting through to the detector. When amplified even a small ripple would be quite sufficient to cause the hum from which you were suffering.

A LOW-FREQUENCY FILTER.

E. W. (Nr. Shrewsbury).—"For the purpose of cutting out heterodyne interference I am making a low-frequency filter to connect across part of the output choke.

"I have been given particulars for constructing a choke with an inductance of 1 henry—about 1¼ lbs. of 32 D.C.C. wire, wound on a 2-in. internal-diameter former 1½ in. long, in a ¾-in. slot.

"What capacity should I use to tune a 1-henry inductance to 9,000 cycles? Would an ordinary tuning condenser do? I should prefer this if possible, as I want to be able to adjust the filter exactly to heterodyne interference from different stations, but, of course, all round about 9,000 cycles."

You will need a capacity of about ·0003 mfd. for the purpose, so an ordinary tuning condenser will be perfectly satisfactory.

The tuning of such a filter is necessarily rather sharp if the device is to be effective on different interferences, so it is advantageous to use a good slow-motion condenser, mounted where any adjustments that may be necessary can be carried out easily.

ALTERING H.T. WHEN SWITCHING OVER TO GRAMOPHONE.

G. E. (West Worthing).—"There is one thing I notice about changing over to gramophone that I have not seen explained.

"When the switch is on 'radio' there is no grid bias on the valve, but when over to 'gramophone' a grid bias of 1½ is applied. For this latter to work at its best I find it necessary to increase the high tension on H.T.2 lead (detector), changing back to the lower H.T. voltage for radio to get best results on long-distance reception.

"Is this a usual thing, or should there be no need to change the H.T. when switching over?"

It is quite common to find that switching in the small grid bias for pick-up work makes more H.T. desirable on the plate of the detector; but in many sets the difference is not very marked, and in some sets it is not discernible at all.

Much depends upon whether the detector is a valve that is "tolerant" of H.T. variations, or whether it is one that definitely works better within sharply defined limits of H.T. voltage.

Evidently the valve that you are now using is rather particular about its plate voltage, and you are doing the right thing in increasing, as you do, when you change over from working it as a detector to working it as an L.F. amplifier with bias (in the "gramophone" position).

LISTENING TO THEIR OWN SONG

Dr. W. Grosz, Jimmy Kennedy and Jimmy Phillips—composer, lyric-writer and publisher respectively of the big song success, "Roll Along, Covered Wagon"—listen-in to a broadcast of the number on a Cossor set.

RETRIMMING REQUIRED?

"Some five years ago I fitted up my set, which is a ganged S.G., Det., L.F., with a screened down-lead. This was at the suggestion of a friend who had been very pleased at his own success with a similar set, when he tried an aerial lead of this kind to reduce hum picked up by the lead.

"In his case results seemed to improve all round, but I was not so lucky. The set is certainly quieter as far as stray interferences go, but I feel it is also quieter on the foreign stations.

"It has now been suggested by another friend (they are full of bright ideas, my friends) that I ought to try retrimming the aerial ganging, because the extra capacity of the screened lead wants to be compensated for.

"It could be done, easily enough, as far as getting at the trimmer is concerned, but I have always understood that it is unwise to alter the trimming of a ganged set unless it is absolutely essential to do so.

"What do you advise?"

We do not advise everybody to interfere with the trimming adjustments of a set which has been satisfactorily trimmed; but it is evident that you would approach the matter with due caution, and we therefore think there is no harm at all in your trying to ascertain if a reduction in the trimming capacity across the aerial circuit is advisable.

All you have to do is to take careful note of the present setting. And then reduce the capacity, experimentally, returning to the former setting if you prove that there is no benefit in the altered position.

You may find that less capacity on this trimmer will make a lot of difference to your results, because it sometimes happens that a screened down-lead will have the effect of throwing out the aerial circuit's ganging. But this is rather unusual, so do not be surprised if the new adjustment, or the effect of it, proves to be slight.

SIMPLE CONVERSION TO PARALLEL FEED.

S. M. (Great Bookham).—"Although it is old-fashioned, I do not want to part with the set, but I should like to improve it. And having been told of two cases where the transformer (L.F.) was altered to parallel-feed I am in hopes of doing the same for my set.

"Unfortunately, I cannot see how it is done with my wiring, which is different from the other sets I know of. What is the simplest way of connecting for parallel-feed?

"The present arrangement of that part of the set which will be affected, working through from the H.T.+1 lead to the detector plate, is easily described. This is how the wiring goes now: H.T.+1 to transformer's H.T.+ terminal. P terminal of transformer to H.F. choke. Other side of choke to plate of detector and reaction condenser.

"The G. and G B. terminals of transformer go to next valve and bias as usual, and I believe I need not alter these.

"I already have the 25,000-ohm resistance and 1-mfd. condenser. Please say how they should be wired into the set."

The simplest way is to mount the resistance near to the transformer's H.T.+ and P terminals, and then change over the wiring; that is to say, the wire that goes from H.T.+ to the transformer should be moved over to one of the resistance terminals instead. And on the other terminal of the resistance put the wiring that formerly went to the transformer's P terminal.

You now have two vacant terminals on the transformer. Join its H.T.+ terminal to the valve holder's filament negative lead (or to any earthed point, such as a screen, earth terminal, etc.). And join the other vacant transformer terminal to one side of the 1-mfd. condenser.

Finally, join the remaining terminal of the condenser to that end of the 25,000-ohm resistance which is *not* connected to the H.T.+ lead, i.e. to the one that you joined to the H.F. choke. This completes the alteration.

As you asked us to give you the simplest connections for parallel feed we have done so, but we warn you that these are not necessarily the best for your set.

Try them, and if the hoped-for benefit is not apparent we will explain how, by a variation of these connections, a method of getting greater amplification can be experimented with.

(*Continued on next page.*)

RADIOTORIAL QUESTIONS & ANSWERS

(*Continued from previous page.*)

WHYS AND WHEREFORES OF A SHORT-WAVER.

R. B. (Walthamstow, E.17).—"I have taken an interest in short-wave radio, but I know nothing about this subject.

"I have managed to get hold of a copy of POPULAR WIRELESS dated November 18th, 1933, in which is described an all-band S.W. receiver.

"This little set would, I think, suit my requirements, but there are one or two parts that I do not know the meaning of their presence.

"Would you please oblige by giving me, briefly, their uses?

"Firstly, why the ·0002-mfd. condenser in the aerial?

"Secondly, what is the idea of the crocodile clip? Why not use all the aerial coil?

"And, lastly, I notice that the whole outfit is housed in a metal chassis, when I have read that the less metal used in a S.-W. set the better results."

You probably know that the whole success of a short-wave set depends upon its ability to oscillate smoothly and answer readily to reaction control. So do not attempt to do without the series condenser or the clip connection, or you will be in for no end of reaction difficulty.

The metal chassis is an essential feature of this design. You have been misinformed about "the less metal used in a S.-W. set the better the results." If the metal is used correctly, as in this design, it is indispensable to such results and absence of hand capacity as this type of set can provide.

"A FUSE IN TIME . . . ."

(*Continued from page* 196.)

burn out the valves if put across the filaments.

Instead of taking low-tension negative to grid-bias positive with a short wire between the terminals, put in a fuse. You can now buy double fuses—or rather double holders with separate fuses for high tension and grid bias—connected up as shown by the sketch.

For mains sets input fuses are, of course, always advisable. A fuse should be inserted in each of the mains leads before they reach the transformer primary. Cartridge-type fuses from 1 to 5 amperes are available.

Protecting Mains Sets.

It is quite true that somewhere in the house wiring system is already fitted a fuse applying to the particular point from which the set is drawing its current. These are 5-ampere fuses, though, and a great deal of damage can be done in a wireless set long before that figure is reached.

A twin fuse holder between the mains plug and the mains transformer ought to be a standard stipulation among all constructors.

Finally, in this little effort on fuses, remember the golden rule: When a fuse blows don't fit another. Find out why the first one went.

"The Experimenter"

ON THE TEST BENCH

Details of a novel all-wave coil unit and a ganged switch for coils.

IT is not difficult to design a coil unit which will cover both short and ordinary wavelengths, but it is extremely difficult to obtain this wide coverage and at the same time preserve a reasonable standard of efficiency.

That is why the plug-in coil idea for universal receivers has been maintained to this day, although plug-ins for the medium and long waves went out of favour six or seven years ago.

But Messrs. A. F. Bulgin and Co., Ltd., of Abbey Road, Barking, Essex, have combined the best features of the plug-in and the one-unit-with-switch schemes in a most interesting and useful device.

This is termed the Bulgin Multiple Short-Wave

MULTI-RANGE

This ingenious coil unit covers the short, medium and long-wave ranges.

Coil Chassis, which, if we may be permitted to say so, is a misnomer and is not fully descriptive of the article, for it takes in the medium and long waves as well.

Briefly, the unit is a substantial multi-coil holder, incorporating snap-action, five-way switch mechanism. Five separate coils can be accommodated in it, and these are arranged radially, as can be observed from the accompanying photographs.

The coils available for use in the chassis are as follows: 10–22 metres, 20–45 metres, 40–90 metres, 85–170 metres (3s. 6d. each); 130–240 metres (3s. 9d.); 200–500 metres (4s.); 1,000–2,000 (4s. 6d.).

It will be noticed that there are seven coils in this range, but the requirements of practically all listeners are adequately covered by a selected five of them.

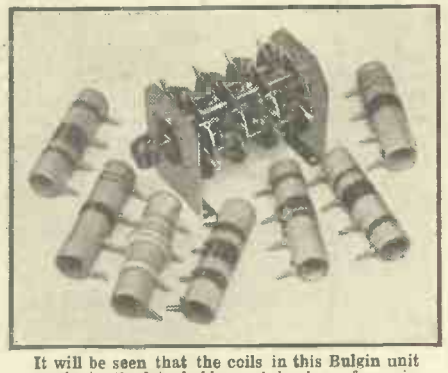
Designed For Baseboard Mounting.

Each of the coils has four widely spaced pins, and these fit into appropriate sockets on the chassis. The chassis, complete with knob and dial, retails at 15s. 6d. The dial is engraved with wave-ranges corresponding to those which would normally be used.

The mechanism is fitted with end plates for baseboard mounting, and panel mounting by means of one hole is possible if desired. There are only the four nicely placed terminals for wiring up, so that it will be appreciated that it is a very easy matter to embody the chassis in a set; actually it is much simpler to do this than it is to fix up many of the quite ordinary medium-long coil units.

The switch mechanism is very good. There are silver-plated contacts of a self-cleaning nature, the springs of which are stiff and rigidly positioned. Obviously, the manufacturers were determined that there should be no switch trouble, and they have

SIMPLE AND EFFICIENT



It will be seen that the coils in this Bulgin unit are instantly detachable, each having a four-pin mounting. Five of the coils are used, but seven are available to cover the various wavebands.

designed accordingly. The switching for five sets of coils is no light matter, particularly as three of them are concerned with the short waves. Had this Bulgin product evinced the slightest weakness in this respect the whole proposition would have failed completely.

It does not do so; far from it. The complicated switching is as reliable as the best simple two-way switch. It is also of a low-capacity type: another essential quality for any H.F. switching, let alone that concerned with short-wave work.

By means of a simple but most effective scheme the switching has been given a snap action, thus ensuring that correct positions are maintained at each point and eliminating the possibility of irritating half-ways. On a previous occasion we have referred to the efficiency of Bulgin short-wave components, and so it remains only to say that one of our short-wave experts has tested this Multiple Short-Wave Coil Chassis and found it to be entirely satisfactory throughout all its several wavebands.

A SWITCH FOR COILS.

THERE are many constructors who would like to make their own coil units, but find that hitherto, at any rate, it has been difficult, if not impossible, to simulate the commercial designs.

Particularly does this apply to the switching. The actual coils themselves are quite easy to construct, and there are on the market all the separate materials needed. Coil cans can be purchased if the screened type is desired, and all shapes and sizes of formers are to be obtained. There remains only the wire, and there is plenty of that in the shops at cheap enough prices.

So much for the coils. But switching is a different matter. Separate switches can, of course, be used, and where only the one coil unit is concerned there is nothing to be said against doing that. With two units two wavechange switches have to be employed.

Not so good! And so the complication of ganging the switches is bound to be considered, for what constructor could tolerate two separate wavechange switches these days unless it were absolutely unavoidable?

We said "complication," but perhaps that is not the right word to use, because the new component which Messrs. Wright and Weaire have recently made available for home constructors is a perfectly satisfactory pair of switches neatly ganged and all ready for use.

In fact, it is in essentials identically the switch gear which figures in some of their own excellent two-gang coil units: two efficient switches operated

GANGED SWITCHES

The Wearite ganged switch for wave-changing.

by the one control knob and mounted upon the one framework.

Perhaps, to be more fair to the device, we should say that it is one switch with well-separated sections, because, to some, to style it two switches ganged may conjure up visions of a couple of switches more or less flimsily linked. In this Wearite switch mechanism reliability of action is a very strong feature.

There are definite snap action and definite stops. The contacts are of large area and are self-cleaning. Also they are so arranged that they possess a low capacity. Another good feature is that the spindle has a large flat, and so, once the knob is in position, there can be no turning on the spindle.

Altogether, then, as you can see, it is a well-designed and well-made device and one which does full credit to all concerned in its production. The smoothness and efficiency of its action will particularly appeal to all those whose previous experience of switches has been confined to the less satisfactory types.

While its main purpose is for coil switching experimenters will no doubt discover many other uses for it. Its existence proves conclusively that Messrs. Wright and Weaire have the interests of the home constructor very much to the fore.

A NEW "MAGIC THREE"

In October, 1929, was published in "Popular Wireless" a set that was destined to become the most famous home constructor set of all time.

That was the "Magic Three," and there are still thousands of these remarkable receivers still giving faithful service. And that "Magic Three" is not done yet. It can easily be modernised to bring it up-to-date and really fit to deal with 1935 conditions.

Next week we shall tell you how to alter your "Magic" if you have one, or how to build a new "Magic" if you have not, so that you may be the possessor of a completely up-to-date design.

DISTORTION AND LACK OF VOLUME

(*Continued from page* 207.)

way you should have no difficulty in finding the best position for these small trimming adjustments. All that is needed is a little patience.

Now suppose we turn to the L.F. side. If you are troubled with distortion the first question you should ask yourself is: When did I last buy new H.T. and G.B. batteries? The problem of the H.T. battery will not worry you if you happen to be using a mains unit, neither will it concern you if your receiver is of the all-mains type. In the latter case your set will not employ a G.B. battery.

But if your set is a battery model take notice of these suggestions. If you have had your H.T. battery in use for some time, then I would strongly advise you to test it yourself (or get somebody to test it for you). All that you will need is a voltmeter. Double-range voltmeters are now obtainable for round about £1, and for another £1 you can purchase one of those ingenious and extremely useful pieces of apparatus which give you eight or nine different ranges at the touch of a switch. I am referring to instruments like the AvoMinor.

Checking the Batteries.

Test the voltage of your H.T. battery when it is actually delivering current to the valves. First of all, connect your voltmeter across the maximum positive tap on the battery and H.T. neg. (plus on the voltmeter to plus on the battery and negative to negative). If the battery voltage has dropped 33⅓ per cent of its maximum it is time you bought a new one.

Now the G.B. battery. How long have you had it? If it is more than eight or nine months old suspect it immediately. Take it out of the set and test its voltage on the low-reading side of your voltmeter. If you haven't a voltmeter, then buy a new G.B. battery.

A partly-run-down H.T. supply or a dud G.B. battery is probably the most common cause of distortion, and moreover in such a case there is frequently a marked loss of volume at the same time due to the fact that the valves are all suffering from an insufficient supply of volts on their anode.

Another cause of distortion is incorrect G.B. or insufficient H.T., even when the battery itself is in good condition. You should make quite sure that your H.T. and G.B. voltages are strictly in accordance with those recommended by the valve makers for the particular valves you are using in your set.

How to Test Your Valves.

Finally, the valves themselves. How long have they been in use? Valves don't last for ever, you know! So if you have had yours in regular use for a very long time it is probable that their emissions are beginning to fall off. This means that, even though you may apply two perfectly good volts from a fully charged L.T. accumulator to the filaments and the correct H.T. and G.B. voltages, you will still get poor results from your set.

The output valve, when it is getting what one might term "worn out"—that is to say, when its emission is beginning to fail—invariably causes distortion. In the case of any of the other valves in the set this falling off in emission will inevitably produce lack of volume.

So if any or all of your particular valves have been in use for a long period, say two years, get your local service dealer to check them over for you, or, alternatively, ask the makers to do so. It is highly probable that replacement will be necessary.

Incidentally, if you have a milliammeter you can quite easily test your valves for emission. Disconnect the lead which goes from the H.T. battery to the H.T. negative terminal on the set. Connect the positive (+) terminal of the milliammeter to the H.T. neg. terminal on the set and the negative terminal of the meter to the negative socket of the H.T. battery.

When all the valves are "on" the reading on the meter will be the total H.T. current taken by the set. You can check up any individual valve by removing the remaining ones from their holders and just leaving the particular specimen you wish to check in circuit.

Since you have already made sure that your H.T. and G.B. voltages are in order, all you have to do is to see that the current flowing is approximately that stated by the valve makers in their list. Should the current be greatly below the maker's figure suspect the emission.

"THE RIVALS"

(*Continued from page* 194.)

It isn't often that we hear the National Anthem played in any but the orthodox way. When we do we sit up and take notice. On the occasion of the Royal Philharmonic Society's concert, relayed from Queen's Hall and conducted by Sir Thomas Beecham, I thought that the National Anthem was very staccato.

* * *

Mary Field and F. Percy Smith continued the Nature Filming. Talks in a conversation which revealed an expert knowledge of the subject. Though collaborators in their art, they were frequently at variance with one another, and one wonders how they contrive to avoid coming to blows. They clearly proved that there are pros and cons to every question, and that public taste is a very difficult thing to gauge.

* * *

Alistair Cooke always gives a candid and helpful criticism on the cinema. He tends to be rather deep in his criticisms and sometimes above the heads of us average cinema-goers.

Consequently, the cinema industry needn't fear a lack of patronage, although the recent releases are, in the main, judged by Alistair Cooke to be only mediocre.

* * *

Listeners who read their newspapers may be a little irritated by the growing number of specially interpolated talks dealing with current topics. Such listeners must find this news a bit stale. The Stresa Conference and the absence at it of the Lord Privy Seal through illness was a case in point.

* * *

Congratulations to the Aberaman Original Silver Band on a very fine concert. I was particularly struck with their Sullivan selections, which I thought would compare with the best that this type of band has ever given on the air.

C. B.

NOTHING HAPPENS AT ALL!

(*Continued from page* 193.)

set spring to life if the vital spot is touched and the broken circuit completed.

Another somewhat similar possibility is that one of the internal connections in the receiver has come adrift. If it is visible a careful check over the whole of the wiring will eventually reveal it.

Not Always Visible.

Sometimes, however, particularly in a receiver with soldered connections, a break is not always visible. Judicious pushing of the wiring will usually reveal the seat of the trouble in this event.

But here we ought to interpose a warning. It is highly undesirable to adopt this method of testing in the case of a mains receiver. Even the most expert, using, may be, insulated pliers, is liable to receive a nasty shock under such conditions.

If you have progressed so far as this and still get no results you must expect the worst. Probably one of the components has broken down.

Testing By Clicks.

Unless you have special testing instruments, substitution of suspected components is the best way to proceed, having arrived at the decision that there is some faulty part or the other. Often you can isolate the fault to a particular stage by pulling out each valve in turn, starting at the last one and noting whether or not a click is heard in the loudspeaker. The removal of the H.T. plug, when there are separate ones for each valve, will also sometimes serve the same purpose.

Finally, it may be mentioned that, even in cases where the set has suddenly gone dead, the tests for batteries and valves, as in the case of results that gradually fade away, may prove something. Anyway, always bear in mind that fault tracing is 90 per cent common sense and only 10 per cent technical knowledge.

SPLUTTERS, CRACKLES AND HUM!

(*Continued from page* 195.)

and see if the slider movement causes a kick in the meter, denoting a faulty place.

One end of the potentiometer goes to the battery, of course, while the slider is joined via the meter to the other contact on the battery. Also test for continuity throughout the whole winding, leaving the slider out of the test.

Other Points to Watch.

On-off switches are also to be numbered among the guilty, I am afraid, and not so infrequently as you might imagine where the battery set is concerned. Bad plunger contact, faulty terminal connections and weak springs are the chief causes here.

As a matter of fact, wherever there is a piece of wire inside or outside a component there is a chance of crackle or spluttering. Not that I mean to suggest that the average set is a very vulnerable instrument, but sets age as well as machinery, and it is the ageing process that is often at the root of the noise problem.

TRYING OUT A SET

Jottings of interest to every reader
By Dr. J. H. T. ROBERTS, F.Inst.P.

PEOPLE often ask me whether such and such a set would be suitable for their requirements, or, if not, whether I will recommend the "best" set. This is all very difficult, because so much depends upon the particular taste and fancy of the user. In the first place, you have to consider whether the set is suitable for the particular location—I mean so far as reception is concerned—and in the second place there is the important matter of the style and loudness of the reproduction.

The first question can be settled most satisfactorily by having the set brought round to your house for a trial under the actual working conditions; this the dealer is invariably only too willing to arrange. As regards the second part, you might think that this was just a matter of going into the showrooms (or into the house of a friend who had a similar set) and listening to it. But it is unfortunately not so simple as that.

Radio Reception.

Assuming that there is no difficulty about the set from what we may call the radio point of view, it may still sound very different in your house from what it did in the shop or in the friend's house. This may be due to the size or shape of the room, or to what the furniture people call, I believe, the "soft furnishings"—curtains, upholstery and so on. All these things have a very definite influence upon the quality and general character of the reproduction. The same set may sound loud and resonant in a rather bare room and yet muffled and "dead" in a heavily draped room. If the loudness of the set cannot be increased sufficiently to overcome all this, you may find yourself disappointed in your own home with a type of set that pleased you very much in someone else's.

So, from every point of view you should have the set sent home and installed just as you intend to use it before making up your mind whether it suits you.

The Big Noise.

Talking of loudness of reproduction, it is surprising how people "fall for" a set with tremendous volume. Somehow great volume seems to fascinate or compel them. This is a pity, because ten to one if they buy the set they will never want to work it at full volume. And if the set is so designed as to give very large volume without distortion it may seem a bit lacking in character when volume-controlled down to a reasonable or small volume—as it will almost certainly need to be for ordinary home use. Isn't it much better to judge the performance of the set at about the volume you intend to use? After all, you don't buy a racing car for ordinary town use, and why should you buy a radio capable of filling the Albert Hall for your drawing-room?

Still, no matter what I say, people will always be hypnotised by sheer noise. That is why the man with the very loud voice, whether he has anything behind it or not, so often "gets away with it."

(*Continued on next page.*)

TRYING OUT A SET

(*Continued from previous page.*)

Moving-coil Speakers.

The majority of sets nowadays are fitted with moving-coil speakers of one kind or another; in some cases the field magnet is energised by a current, in others a permanent magnet is used. I have noticed that many people do not appreciate the difference between one moving-coil speaker and another. So long as it is a "moving coil" it is "all right," as though they were all identical.

This is very far from the truth, and I want to warn you that moving-coil speakers range through the whole gamut of good, bad and indifferent. Merely because a speaker is of the M.C. type does not mean that it is necessarily a good thing. Perhaps I should qualify this slightly by saying that the M.C. principle is the most up-to-date, and so it is definitely a strong point in its favour if it is a moving-coil instrument as against other types. But that is as far as it goes.

Electrical Efficiency.

I might just say a word as to the difference between the M.C. and the moving-iron principle. In the ordinary type of speaker there is an armature of some sort—an iron part that moves about or vibrates in accordance with variations in the strength of the magnetic field—and the "speech currents" are led into a coil surrounding the field magnet. Such a system has certain drawbacks, one being that the comparatively heavy iron armature cannot respond fully to the higher frequencies.

The Speech Currents.

In the moving-coil type of speaker, however, the moving-iron part is replaced by a small coil, which is very light in weight, and the speech currents are fed through this coil. The coil is placed in the strong magnetic field in the "gap" of a powerful magnet, which, as I said above, may be a permanent magnet or an electrically-energised one. In any case, you will see that the whole arrangement is very much more efficient electrically, and the moving coil, being of such small mass, can respond much more faithfully to the speech frequencies. The speech coil is, of course, firmly attached to the centre of the diaphragm and so communicates its movements to the air.

A Valve Discovery.

A good deal of interest has been created by the announcement recently of some American scientists, working in Philadelphia and San Francisco, that they have discovered a means of operating a valve without any heating filament—in other words, a so-called "cold" valve. This valve, it appears, consists of a glass envelope, in the usual way, containing two cathodes and one anode. The anode is roughly in the form of a cylindrical ring—that is, a narrow strip of metal formed into circular shape—and the two cathodes, which may be flat metal discs, are somewhat smaller in diameter than this ring. The action of the valve appears to depend to a large extent upon a photo-active substance which is coated upon the surfaces of the two cathodes.

Photo-Electrons.

When light falls upon this material it causes a small emission of electrons—"photo-electrons," as they are called—and if a suitable voltage is applied between either cathode and the anode these electrons will hit the anode and cause ions to be emitted from it which in turn will strike the material on the cathode and cause still further emission of electrons, the whole process building itself up so that, in fact, a ballast resistance has to be introduced to limit the current.

You will observe that the process is somewhat similar to that which takes place in certain conditions in a gas at a suitably low pressure, and which is known there as "ionisation by collision." By suitable modifications of the tube and of the associated circuits it is said to be possible to make it act as an oscillator and also as a rectifier.

It seems that this valve is more likely to be used in connection with television than with ordinary radio apparatus. An anode current of as much as 45 milliamps is said to be obtainable with an anode potential of 200 volts.

Are You on D.C.?

A large number of people who have electric light nowadays are on the A.C. supply, but there is still a good deal of D.C. supply about, and those readers who happen to be on D.C. have their own peculiar problems. The A.C. people are much more generally catered for by manufacturers, and the D.C. people have often felt that they have a bit of a grievance in that they are more or less left to solve their problems themselves.

There is the old question of commutator ripple on D.C. mains which is sometimes very difficult to get rid of. The D.C. ripple can be got over by a skilful arrangement of a sufficient number of chokes and condensers, in the same general way as in the case of the hum of A.C. mains. Then there is also the fact that although one pole of the A.C. mains is reputed to be earthed, it is not very efficiently earthed—or, if you like to put it another way, the current flowing through it causes the potential to differ from true zero—and consequently there is a difference of potential between the reputed earths of the mains and the earth connection of the set.

It Has its Advantages.

D.C. users have the further disadvantage that they cannot—at any rate, economically—charge their own low-tension accumulators. If they use the D.C. current direct through the batteries they waste something like 95 per cent of the total energy drawn from the mains, only the odd 5 per cent or so being used in charging the battery. A.C. users, on the other hand, are provided with a great variety of economical battery-charging devices which step down the voltage to that required for the batteries.

There is one crumb of comfort which D.C. users *have*, however, and that is that if they use high-tension accumulators they can conveniently charge these from their D.C. mains!

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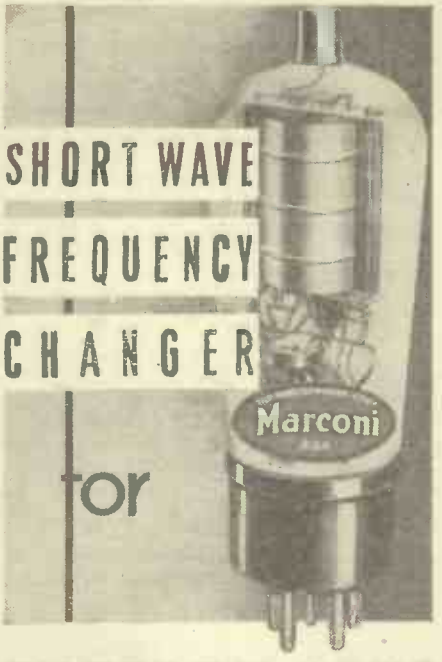

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G. Marconi

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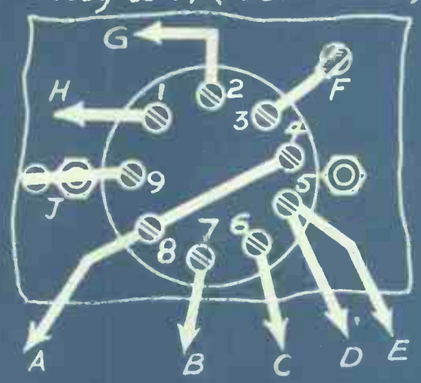

.0002 Mfd. Differential Reaction Condenser

.002 Mfd

F2

F1

M

L.S

Metal cut away

On-Off Switch

Two Gang Tuning Condenser

To Cap of V1

10,000 Ohm Volume Control

Slider

Aerial

Metal cut away

Earth

M.B.

Screened H.F. Choke

L.T.−

4

6

A

V3

G

L.T.+

5

1

2

3

G.B.−

Grid

H.T.+

Plate

V2

G

.0002 Mfd

2 Megs

Rear Trimmer

V1 See Key above

8

C

VC

W.L.Q.

Aerial Coil

M.B.

E

Screened Pigtail

W.L.T

H.F. Transformer

H.T. +

T

R

11

L.F. Transformer

S.W. Coupling

M.B. = Metallised Baseboard.

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.00016 Mfd Tuning Condenser

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Special Ultra-Short-Wave Condenser

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Contact with Metal Panel

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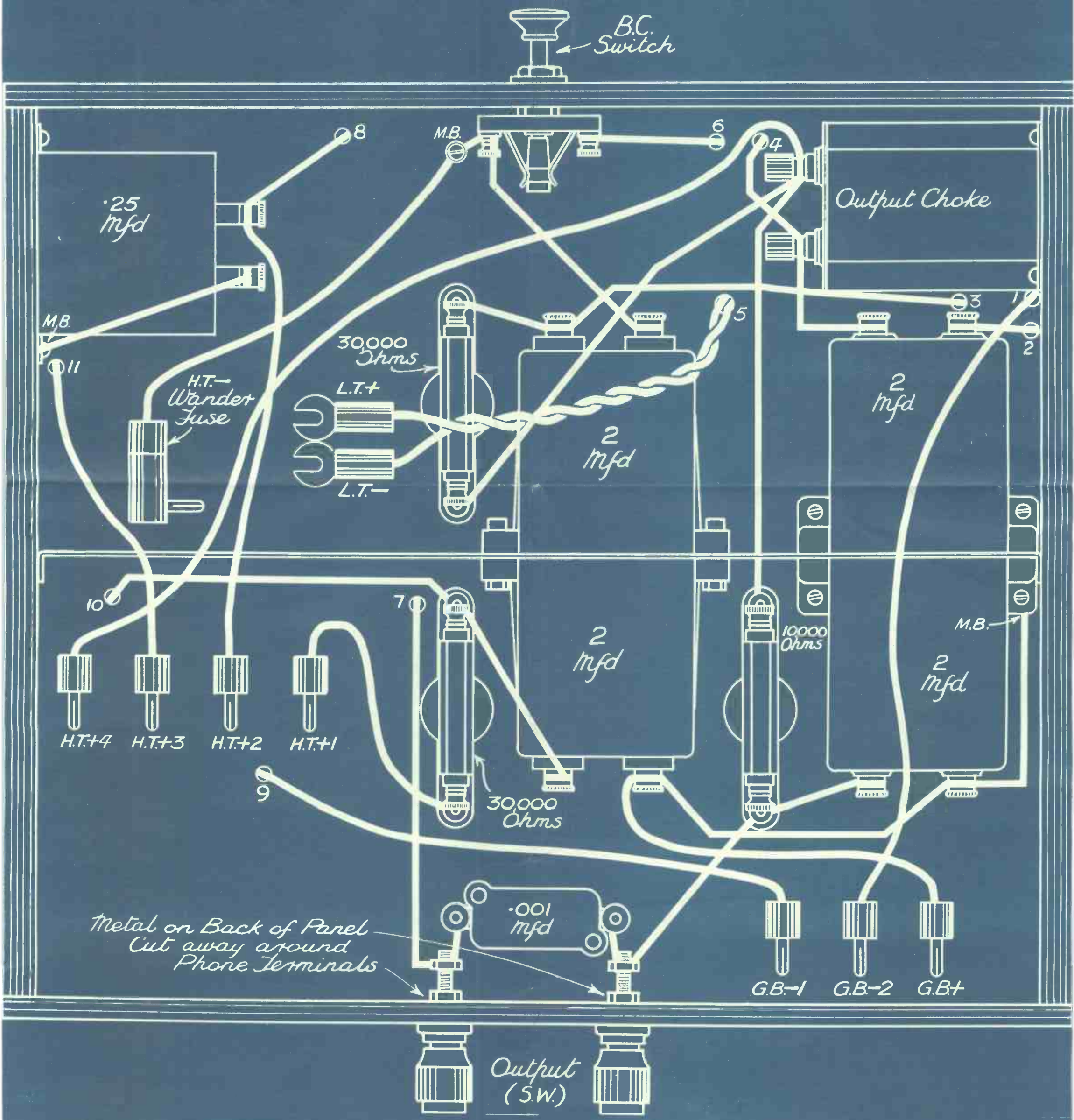
2 meg:

GB−

9

10

P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M.B.
8
6
4
.25 mfd
Output Choke
3
1
5
2
M.B.
11
H.T.– Wander Fuse
30,000 Ohms
L.T.+
L.T.–
2 mfd
2 mfd
10
7
2 mfd
10,000 Ohms
M.B.
2 mfd
H.T.+4
H.T.+3
H.T.+2
H.T.+1
9
30,000 Ohms
.001 mfd
Metal on Back of Panel Cut away around Phone Terminals
G.B.–1
G.B.–2
G.B.+
Output (S.W.)