

POPULAR WIRELESS, February 7th, 1931.

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

LARGEST RADIO CIRCULATION IN THE WORLD

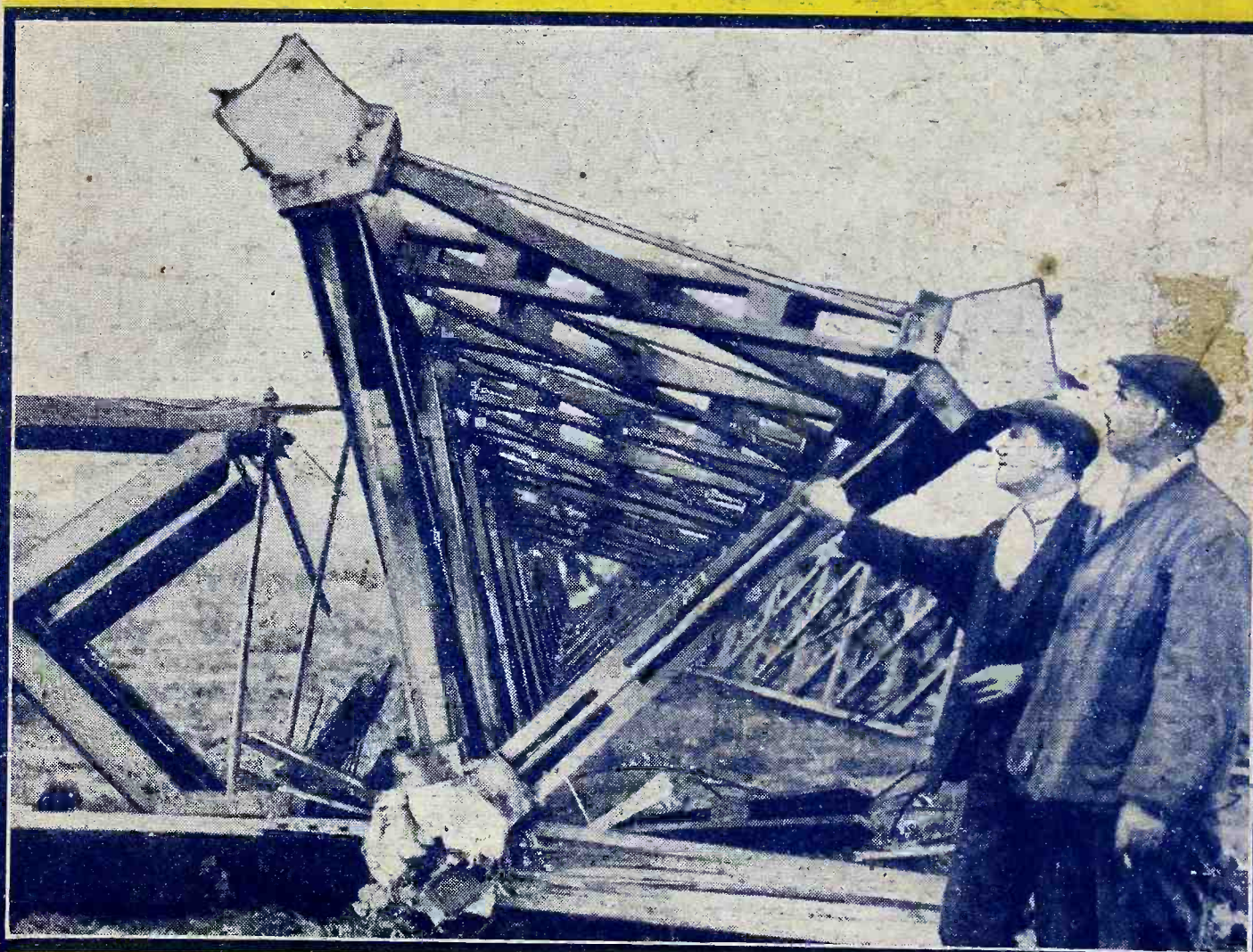
Popular Wireless

Every Thursday
PRICE
3d.

No. 453. Vol. XVIII.

INCORPORATING "WIRELESS"

February 7th, 1931.



SPECIAL ARTICLES IN THIS ISSUE

HEILSBERG—GERMANY'S SECOND REGIONAL. THE "SHORTADENSER."

WHEN YOU BUILD THAT SET—By G. V. DOWDING, Associate I.E.E.

HOW TO MAKE A "P.W." "SAFE-POWER" CHARGER. A WORLD BUILT OF WAVES

THE BIRTH OF AN ELECTRON. GOING OVER TO A.C.

The 500-foot masts at the Air Ministry's radio station at Northolt were found seriously to interfere with flying activities at the nearby aerodrome. Therefore, they pulled down the masts, (as shown above), and are going to put up two only 150 feet in height.



The LEWCOS H.F. CHOKE
Price 7/9

The LEWCOS L.F. TRANSFORMER
Price 20/-

“A

Perfect Combination”

is an extract from the following testimonial recently received from an enthusiastic user of The Lewcos H.F. Choke and L.F. Transformer

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The LEWCOS H.F. CHOKE

is specially constructed to eliminate self-oscillation.

Write for fully descriptive leaflet Ref. R.33.

“I recently constructed a receiver, and in the first instance employed a High Frequency Choke and L.F. Transformer already in my possession, but after reading your advertisement I decided to incorporate new items of your manufacture, and can assure you that your LFT 3 Constant Inductance Transformer and your well finished H.F. Choke are a *perfect combination*. I was previously troubled with instability in my set, but this has now disappeared and the reproduction is simply wonderful.”—(Signed), C. C., Mitcham.

The LEWCOS L.F. TRANSFORMER

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Write for fully descriptive leaflet Ref. R.61.

We respectfully request the public to order through their local Radio dealer, as we only supply direct to the trade.



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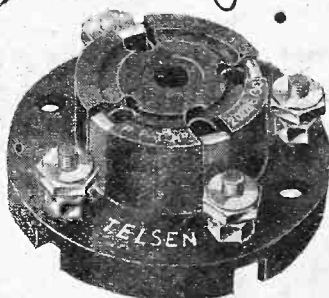
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TELSEN H.F. CHOKES.—Designed to cover the whole wave-band range from 18 to 4,000 metres. Extremely low self-capacity, shrouded in genuine Bakelite. Inductance, 150,000 microhenries. Resistance 400 ohms. Price 2/6 each.

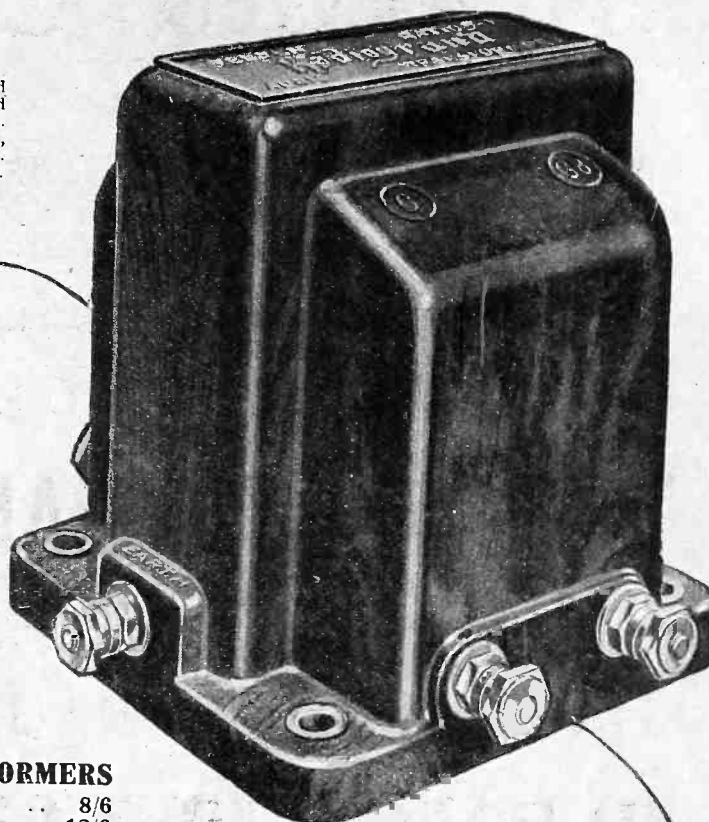
TELSEN FOUR PIN VALVE HOLDERS.
Price 1/- each.



TELSEN VALVE HOLDERS. Pro. Pat. No. 20286/30. An entirely new design in Valve Holders, embodying patent metal spring contacts which are designed to provide the most efficient contact with the valve legs, whether Split or Non-split. Low capacity, self locating, supplied with patent soldering tags and hexagon terminal nuts.

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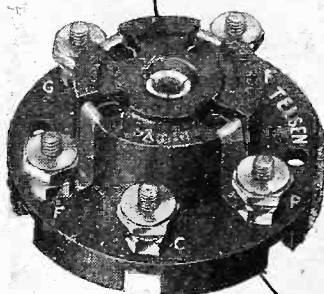
"ACE" Ratios 3-1 and 5-1 . . . 8/6
"RADIOGRAND" 3-1 and 5-1 . . . 12/6
"RADIOGRAND" Super, Ratio 7-1 17/6



Collective efficiency—simply another way of saying that efficient parts make an efficient whole. Especially is this the case where **TELSEN** components are concerned . . . each one a masterpiece of design and workmanship embodying many patented features . . . each one perfect in performance.

Experienced radio designers consistently choose **TELSEN** . . . there are reasons . . . here are three of them . . . amazing tonal quality . . . extraordinary volume . . . exceptionally long life.

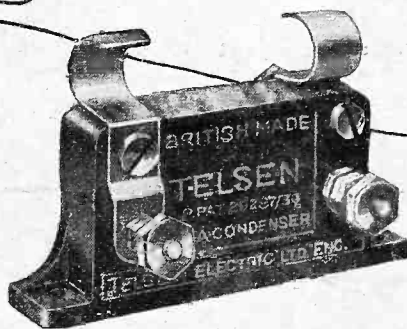
Choose your circuit . . . then choose **TELSEN** . . . and you will get the most out of your circuit. Your present set will take on a new lease of life if fitted with



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Price 1/3 each.



TELSEN GRID LEAKS. Absolutely silent and non-microphonic, practically unbreakable, cannot be burnt out and are unaffected by atmospheric changes. Not being wire wound there are no capacity effects. Made in capacities: 1, 2, 3, 4, and 5 megohms. Price 1/- each.



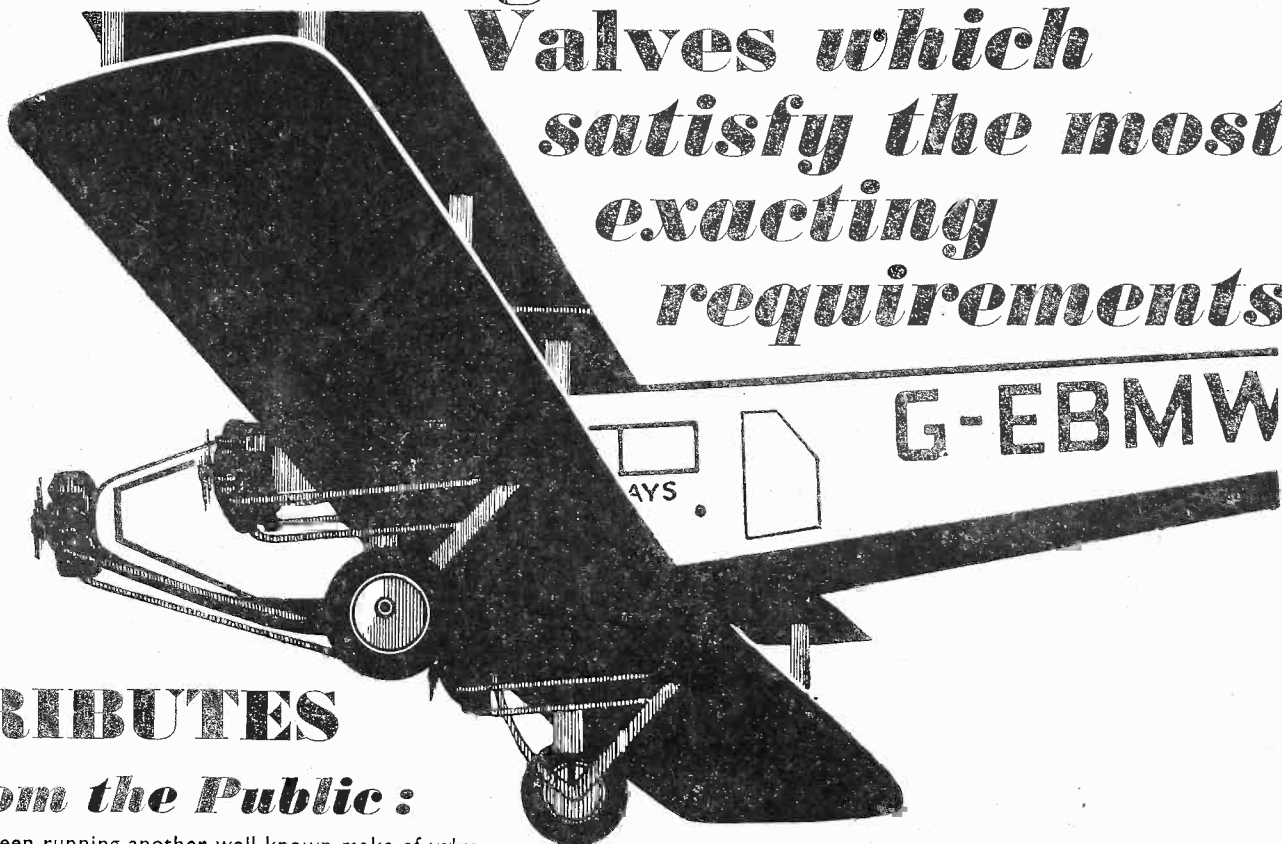
TELSEN FIXED (MICA) CONDENSERS.

Shrouded in genuine Bakelite, made in capacities up to .002 mfd. Pro. Pat. No. 20287/30. .0003 supplied complete with Patent Grid Leak Clips to facilitate series or parallel connection. Can be mounted upright or flat. Tested on 500 volts. Price 1/- each.

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COMPONENTS

Medium Magnification Valves which satisfy the most exacting requirements



TRIBUTES

From the Public :

"I had been running another well-known make of valve, but I can honestly say that it has not got the same in it as your HL210.

"I have tried several different makes but have found nothing better for all-round results than yours. They seem to have just that final touch and punch in them that others lack in bringing out distant stations."—E. R., Leicester.

From the Experts :

Marconi Valves, the products of unequalled research and manufacturing resources, are designed with one object in view—the evolution of a complete series which will enable the greatest practical benefit to be derived from the highest theoretical efficiency. To this end it is imperative to combine every useful feature in a perfectly balanced design—no single factor being emphasized to the detriment of practical performance.

All Marconi Valves are practical interpretations of this ideal ; each contains just those features, which, properly united, ensure the best all-round results and highest effective efficiency. The soundness of this principle is conclusively established by the fact that Marconi Valves are used by the B.B.C., Imperial Airways, Trinity House Beacon Stations and Lightships, Metropolitan Police, Empire Wireless Communications, Large Passenger Liners, etc.—a unique tribute to their unequalled performance and dependability.

"**HL**" The symbol of an unobtrusive, often overlooked, but nevertheless important member of the modern set—the medium magnification valve. Many people take immense pains over the selection of high frequency and output valves, but forget that the efficiency of the set is equally dependent on the intermediate stages.

Marconi medium magnification valves combine high mutual conductance and small current consumption with consistent performance through a long useful life. Suitable for the detector or initial L.F. position in almost all sets they are worthy team-mates of the famous Marconi Screen Grid and Output Types.

Recommend Marconi Valves—HL210 (2-volt), HL410 (4-volt) and HL610 (6-volt) for accumulators—price 8/6, or MH4 and MHL4 for A.C. mains—price 15/-.

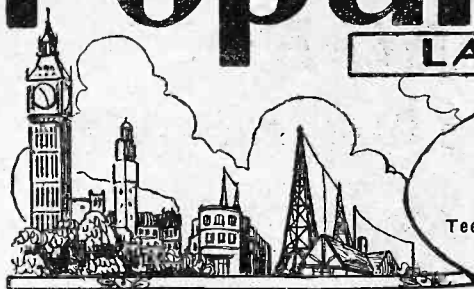
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The Valves
the
Experts Use!

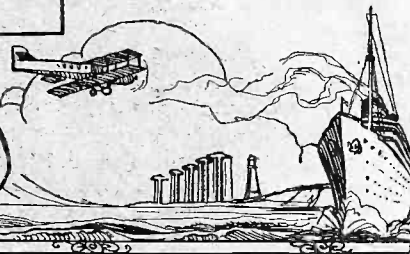
Valves

Popular Wireless

LARGEST NET SALES



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A STAR OF STARS
THE "COMET"
ARIEL THE "ROOTER"
BRITISH BUSINESS

RADIO NOTES & NEWS

A VOCAL BEACON
THE INTERVAL TICKS
DOPE FROM S. DIEGO
MUHLACKER
INTERFERENCE

The Star of Stars.

THE spring of 1931 opens auspiciously for "P.W." readers with a very fine piece of work by our Research Department which is the fruit of a year's experience in design embodied in one layout. The new set will excel even those "stars," the "Magic" and "Titan," and is, in our view, justly entitled to be called "the star of stars." The way in which all the requirements of a 1931 model are met, and yet are made consistent with simplicity and economy, renders this design quite the most interesting "P.W." readers have had placed before them for some time past.

The "Comet."

THE new "star," the "Comet" Three, which is announced in this issue and will be described in detail on February 14th, is presented in two complete forms, the Foundation Comet, and the Final Comet. You will be delighted with the ingenuity displayed in them and with the performance they give. To enter into further details here would be to anticipate next week's treat, and to "steal the thunder" of the men who did the work. I will add only that the novice in home construction simply could not make a better start than with the "Comet" and the old hand will discover that in radio receiver design there are still "fresh woods and pastures new."

Do It—NOW.

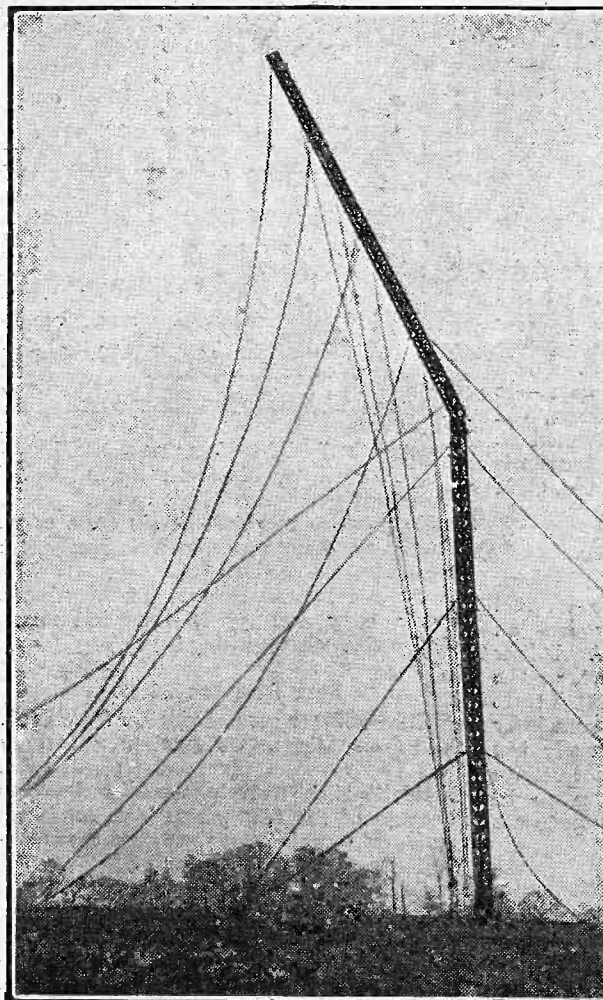
THERE will be an enormous demand for all numbers of "P.W." containing "Comet" articles, and especially for those of February 14th and 21st. May I point out that you will help yourselves and us also by placing a regular order for "P.W." with a newsagent. Look back over 1930 and consider in how many instances readers have implored us to secure for them back numbers. Perhaps you were one of the unfortunates who had to go a'begging and perchance, eventually, went hungry. By asking the newsagent to get you a copy every week you do not commit yourself to any greater expense but you may save yourself many a pang!

Ariel the "Rooter."

SYMPATHISING with me because of the strange omission of my name from the last Honours List—though I am to have a "statue" in Portland Place!—a kind reader has caused me to be awarded membership of the "Old Original Rooters

Club," of Hyde. I understand that I qualify by reason of the great interest I take in other people's business. Do I? I suppose it is a compliment, and as such I smilingly accept it, and offer our readers the reflection of my glory. These Rooters appear to be a jovial crowd—they meet at the Star Hotel!—who collect money for charitable purposes. But can Ariel, the Spirit of "P.W.," possess cash or property? I'll take counsel's opinion.

"STAND BACK, THERE!"



Here is one of Northolt's 500-ft. masts in the act of falling. As explained under our cover photograph this week, it has been decided to use shorter masts to make the neighbourhood safer for flying.

Television Versus Television?

IT is announced by Baird Television, Ltd., that they have issued a writ against the Gramophone Co., Ltd., claiming that the television apparatus demonstrated at the Physical and Optical Societies' Exhibition by the last-mentioned company infringes Baird's patent rights. Even if I knew anything about either system, I could not comment on the merits of the case at this stage, but I think that I voice the feelings of the "man in the street" when I remark that, although an inventor or company must fend for itself, it seems a pity that the history of television looks like being tainted with wearisome, expensive and often unnecessary litigation, just like that of radio telegraphy.

British Business Abroad.

IT'S about time that British business interests abroad began to stir their stumps. The Prince of Wales is using up large chunks of his life on their behalf, so it's up to them to "make good." Why this thustness? This is why! New Zealand's 1930 radio imports were about £86,000, of which £70,000 went to the U.S.A. In Latvia the law is that no sets with less than five valves may be imported, and British makers of such are said to be hardly represented at all. In Japan, British prices are reported to be too high compared with German and American. And so on, and so forth.

Foreign Items.

DENMARK is said to be afflicted with radio "piracy." The police are on the job, and penalties ranging from confiscation of sets to fines of from £2 5s. to £22 10s. are all ready. On dit that Russia has just finished building a 100 kw. station at Kolpino, near
(Continued on next page.)

RADIO NOTES AND NEWS

(Continued from previous page.)

Leningrad. In Norway the Government plans to reorganise the broadcasting system, providing for the ultimate operation of 41 stations, which should make crystal reception possible for 90 per cent of the population.

Crystal Reception.

A PART from cheapness, what is the attraction in crystal work? To the very sophisticated ear there is a certain purity of tone, no doubt, but some say that is nix against the inconveniences of telephones and the benefits of L.S. working? Tied to the 'phone like a dog to its kennel, with hot and aching ears, one cannot move freely about the room, or hear what people say—or hear the door-knocker. After all, the wireless programmes are often but a pleasant background to family life—dance music, for instance—and folk are not prohibited from speaking while the L.S. is in operation. The telephone, they contend, is a selfish indulgence, unless one is quite solitary.

That Weighty Accumulator.

HOW the very dickens seems to enter the clement called lead, when one has to lug (no pun intended!) the accumulator to the charging or ruining station! (Though that is a form of exercise which I have always denied myself.) It is, therefore, almost a relief to consider the weight of the Exide battery which Sir Hubert Wilkins will take in his submarine in which he is going cruising in Arctic seas. Only fifty tons! And this great brute will need the six hours' attention of the generators to charge it. Pity they can't run the sub. off a crystal!

The Vocal Beacon.

WHEN I said the other day that the new talking beacon on Cumbrae Island was a worthy successor of the Northern Lighthouse Board's works I had in mind the family of Robert Louis Stevenson. His father was a lighthouse engineer attached to the Board and R. L. S. himself for a time tried his hand at the game—to please his pa—and, thank goodness, did not stick it. I am highly interested to learn now that the talking radio beacon is the invention of Mr. C. A. Stevenson, C.E., a cousin of R. L. S.

The Interval Signal.

THE more I hear the B.B.C.'s interval signal, the less I admire it, and the more I feel that they lost an opportunity. What is it? A hollow knocking! The Cock Lane Ghost, or the knocking at the door in "Macbeth"! It reminds one, gruesomely, of somebody buried alive and tapping assiduously but hopelessly on the lid of the coffin. I believe that this dismal noise will have to be stopped. Why can't they simply put on a gramophone record?

"No Weakness, Danton!"

THIS famous phrase came into my mind when I read in the "Electrician" that it is not without mixed feelings one reads of the latest Marconi contract for equipping Arabia with wireless. "No doubt it is progress," says this well-known periodical, which I have never suspected of

possessing sentiment, "but even the most enthusiastic engineer must sometimes feel a pang at the thought of the approaching complete modernisation of the few 'lands of mystery' that still remain untouched by modern civilisation." All wrong! Let the "enthusiastic engineer" be in the tropics, "out of" ice, and he will long for a modern refrigerating plant! Let him be lost in a waterless desert, and he will pray for a portable radio transmitter!

For Demon Constructors.

TO those who like to flit from flower to flower, so to speak, who can hook up sets in less time than their lady friends can powder their noses; I commend a survey of the February issue of the "Wireless

SHORT WAVES.

Figures of Ariel and Prospero are to typify Wireless and the B.B.C. in the sculptures on the new building in Portland Place; but we understand that it is not proposed that the listener-in shall be represented by Caliban. "Punch."

* * *
"Radio as teacher. Valuable medium for acquiring a language," run headlines in the "Daily Mirror."
Yes, but what language!

* * *
"Then I must just be a brother to you," said he sadly.
"That's all right, Jimmy; do you mind starting by overhauling my wireless set for me?"

* * *
A remarkable number of reports have been received lately of wireless sets being stolen in various parts of the country.
A kind of radio raid-o!

* * *
"A home w/out radio is as bread w/out butter," is the slogan now being used by a North-Country radio dealer.
And w/out "jam," either!

* * *
"What is the world coming to?" runs a headline in a provincial paper.
It isn't coming to; it's still under the ether.

* * *
Radio Fan: "I picked up WGY last night."
Auto Fan: "Huh! Wouldn't she give you her full name?"

* * *
"Radio News."
"Sight moves quicker than sound," we read in a contemporary.
Then we should have had Television long before we were able to listen-in.

Constructor." There is no nonsense, hypothesis, or theory about it. It caters for the downright "man of his hands." It is radio practice in print, at six D. a copy. To the passionate artisan it is just plain manna in the wilderness. Action is its motto and its sign manual is a busy hand. Get a copy and try it out. It's man's stuff and no shenanicking!

Dope from San Diego.

CHARMED to get a nice letter from H. H. (San Diego, California), not only because he lyricises about Mr. Kendall's short-wave 'phone filter, but also because of his chatty and fresh American style. His explorations amongst the short-waves have brought him some thrills, and I am glad to know that one of them is hearing Big Ben. He offers a tip in reference to the spacing of the vanes on short-wave tuning condensers. Trying to reach a lower wavelength he removed the vanes one by one, with unsatisfactory results; so in replacing them he doubled their previous spacing. This "spread out the bands more," making

tuning easier, and lowered the capacity enough for him to get down to 16 metres.

Bill, fra' Owdham.

NICE letter from W. McC. of Oldham, who reports that—good heavens! What happened? I have just noticed that his letter is dated July 20th!—reports that on 42 metres he overheard I I M M from 100 miles north of Rome working with 2 X O (London), and giving a general call to all amateurs. Bill was nearly canted off his chair with the volume. This station ought to be worth a search. (By the way, yours is an unusual name. Do you know that a Mr. McC., without the final "e" was one of the mutineers of the "Bounty," who settled on Pitcairn Island? I expect his descendants still exist there.)

What the Dons Endure.

RW. R. (Cambuslang) sends me a clipping from a Buenos Aires newspaper of December 17th, showing that days' programmes. A ghastly dish to set before a gaucho! It runs something like this: News, news, talk on gymnastics, news, municipal bulletin, records, news, records, records, records, records, duet, records, news, duet, records, talk, news, news, songs, news, duet, records, songs, and so on, all the dreary day. I say, what gluttons for news! Well, there will be another revolution in the Argentine, I should think.

Sunday in Canada.

H. B. (Ontario), having read the outeries of people here against the B.B.C.'s Sunday programmes, asks me what I think about the following, which was presented by his local station on the last Sunday in 1930. At 10 a.m., an hour of Evangelist singing. 11 a.m., 1½ hours of Lutheran church (in German). 4 p.m., one hour of hymn-singing. 5 p.m., C.N.R. Symphony. 6.30 p.m., half an hour of records. 7 p.m., 1½ hours Baptist church. After that they shut down, and H. B. was able to get some music from the U.S.A. After that our Sunday fare doesn't seem to hurt one quite so badly, eh?

Radio and Sport.

A LONG time ago I wrote a story about a farmer who liked the programmes so little that he took his loud speaker into the orchard and used it to scare the birds off his fruit. I was therefore amused to read in a sporting paper that a certain rich man installed a radio set close to the boundary of his land for the purpose of turning back any of his pheasants which might try to leave his covert. In principle the arrangement worked; in practice it worked too well, because the covert was small, and the birds, one and all, were scared clean away from it!

Interference with Mühlacker.

AFTER all the grouching about Mühlacker's interference with London, one cannot help smiling at the humour of a writer to the "Evening News," who asks what all the fuss is about. "If," he says, "London would only stop interfering with Mühlacker, I, who prefer good music to dull talks, would be well satisfied." He applauds the B.B.C.'s efforts to separate the two stations, so that he can receive his Mühlacker in peace! This point of view had not occurred to me. I must try this German fellow out and see what he gives us.

ARIEL.



ANNOUNCING THE "COMET" THREE

ALL ABOUT A WONDERFUL NEW "STAR" SET.

"P.W." "star" sets are world famous. Can there be anyone, for instance, who has not heard either of the "Titan" or the "Magic"? Those two productions are the high lights of "P.W.'s" set construction programme of the past two years or so. It would be hard to give anything like a close approximation of the numbers of listeners still using "Titans" and "Magics," but we do know from trade information that six figures have been reached—to give conservative estimates.

Our Star Sets.

The reason for such popularity is not hard to see. "P.W.'s" "star" sets are not stunt sets produced hurriedly for no other purpose than that of stimulating interest in home construction. That they do this very thing is a valuable incidental.

Our policy is, however, to concentrate the knowledge and experience gained in, say, a whole year's working in one design. That does not mean that the receivers we describe in the interim are experimental—that we are "trying things out" and hoping for the best.

Far from it. Every design dealt with in our pages is in itself a thoroughly tried and tested design, though some are intended for special classes of amateur and have limited appeals. Obviously, a journal with the wide circulation of POPULAR WIRELESS must cater for minorities as well as majorities.

"Stop Press" Advantages.

The more popular sets comprise what we may term "stop press" advantages. They are right up to date and embody the latest developments and improvements. Some of these innovations may in time become superseded by even better methods; while in other cases, alternative schemes that are not in themselves superior to existing methods may be discovered, and then in combination with what may have been thought to be obsolete ideas produce real "hot stuff" results.

In next week's issue of "P.W." will appear the full constructional details of the "Comet" Three, a receiver which embodies all that is best of the most recent radio developments and improvements within

the scope of its stage grouping, and which stands out as the summit, the peak of achievement of the work of the Research Department.

We claim that it is a "star of stars" in the way of radio receivers.

And it is to be presented to you in a novel form, but this point will require detailed explanation.

A 1931 "star" set must obviously have the advantages of knife-edge selectivity, real power, enabling, if necessary, moving-coil loud speakers properly to be operated, a sensitivity permitting of the loud-speaker reception of a large number of stations, first-class quality response, provision for correct application of a gramophone pick-up, panel wave-change switching, unified drum dial tuning, graded reaction control, effective volume control, complete stability, freedom from "breaking through" on long waves, and other such things.

But a set that is intended for a wide circle of home constructors must also be easy to handle, simple and safe to build, inexpensive to construct and operate. It must, in fact, be entirely free from snags.

How can these two lists of requirements ever be made satisfactorily to line up? You may think it entirely impossible. But there is a way and you will learn all about it next week. To satisfy your immediate curiosity we can tell you this much.

Foundation and Final.

The "Comet" Three assumes two complete and self-contained forms. The first is the Foundation "Comet" and the second is the Final "Comet." The Foundation is a "hot-stuff" set, having a fine appearance and giving a fine performance. But it is like a racing car stripped to the minimum. An extremely easy set to build, it uses few components, and the most inexpert can easily assemble it and get good results.

By skilful design, sufficient room is left in the structure of the Foundation "Comet" for all the refinements and extra devices that make the Final "Comet" the most luxurious, the most magnificent outfit of its kind ever conceived.

And you will be told how to add these extras in easy stages. That means you will start off with a fine complete set, but as you can afford to do so, you can fit the completing items. A further advantage of this method is that you will be absolutely certain to get the optimum results from every portion of the final receiver.

Test It For Yourself.

And remember, the Foundation "Comet" looks no more of a skeleton than the Final "Comet" has the appearance of a radio Christmas tree. Both are units with nice lines, and either separately can stand up against the best of ordinary sets in this respect—and give it points.

In conclusion, it should be noted that next week's "P.W." will contain full constructional details of the Foundation "Comet." The day following the purchase of your next issue of "P.W.," you will be able to put most of our claim for this outstanding production to the test.

FREE

WITH EVERY COPY OF NEXT
WEEK'S "P.W." A

FULL-SIZE BLUE PRINT

of the most widely-attractive set
yet designed

THE "COMET"

A Receiver that will have no limits in its appeal, no snags in its construction and which will completely satisfy the least as well as the most ambitious of constructors, in short, the perfect "PROGRESSIVE" set.

ORDER YOUR COPY

OF NEXT WEEK'S "P.W." NOW
and short-circuit disappointment—
an immense demand is inevitable.

Usual Price. On Sale Feb. 12.

THAT SAFETY MARGIN—

WHAT HAPPENS IF YOU EXCEED IT.

By THE EDITOR.

WE hope our readers will give particular attention to an article which we publish in this issue entitled: "When You Build That Set."

It is a timely and important article by our Technical Editor, and it deals with certain aspects of radio set construction which we earnestly hope our readers will closely study.

When you have read Mr. Dowding's article, take a good look at the photographs he has chosen to illustrate his text; and take, especially, a very good look at the photograph of the interior of the four-valve set.

Now, there is quite a history attached to that set. The photograph we publish shows the set as constructed by one of our readers. We are not going to give his name for his case is representative of several others, and if the following "prologue" doesn't quite fit that is because we want to make it as widely general as possible.

A Conference Called.

Some weeks ago the "P.W." and "M.W." Query Department began to experience great difficulty in giving suitable assistance to this reader. He had built the set, had spent time, trouble and money on it, and the results he eventually obtained were, to use his own description, "absolutely rotten!"

Now that's the sort of criticism that puts the Chief of our Research Department on his mettle.

The Chief of the Query Department called for a conference and said, in effect, to the Chief of the Research Department: "Look here, this reader has built this receiver which your department designed. He says he has followed out your instructions, has bought the best components, has checked and re-checked the wiring, tested each component, etc., etc., and still can't get the set to work properly."

"The reader maintains that he has built the set as per specification; it won't work, and he concludes by saying—more or less—that the design must be faulty. Now, it's up to you!"

Thus the Chief of the Query Department, who'd had his fill of complaints from the builder of the set and thought it high time the designer should come in for his share!

An Invitation Accepted.

Well, the reader's complaints were studied, his wiring diagram carefully checked, and more advice offered. Still no solution to the problem. In fact, the reader who had built the set was beginning to be quite annoyed!

Well, eventually Mr. Dowding and Mr. G. P. Kendall held another court of inquiry, and it was decided that, as the case was a special one, the reader should be invited to let us inspect the set.

In due course the invitation was accepted, and the set arrived. The photograph of

it's "innards" you will find illustrating Mr. Dowding's article.

If you refer to the photo which illustrates the set as we designed it, you will see the difference, and therein lies the whole trouble.

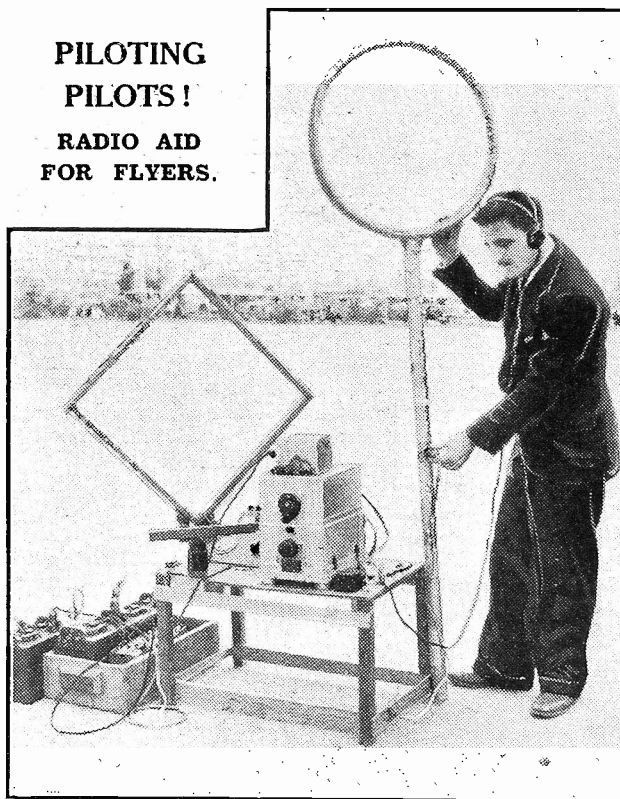
What Is It?

This particular reader had not followed the designer's specification. He thought he had—as closely as mattered.

But therein he was at fault. It is perfectly true that "P.W." sets are designed with a fairly generous margin of safety, but there are limits.

Note, for example, the H.F. stage. What is that queer-looking object near the

PILOTING PILOTS! RADIO AID FOR FLYERS.



This American inventor is demonstrating his direction-finder for aeroplanes, which enables the pilot to tune-in to the terminal station and fly to it even in fog, guided by the radio signals.

tuning coil, and unpleasantly near the S.G. valve? A hot-water bottle? No. A cash register? No. A small typewriter, folded up? No. Give it up? Yes! Well, it so happens that it is a mains unit!

Wrong Valves.

Do you wonder the designer said naughty words when he inspected this particular set? And can you imagine what the Query Chief thought (and said), when he remembered the builder was all the time convinced that the set had really been built as per the designer's specification?

There were other little things about this particular set which clearly showed that

the builder had *not* carried out the designer's instructions.

Apart from one or two instances where the layout had been changed—where connections had been made by wires which went the longest way round instead of the shortest—there were at least two examples of components of wrong values being used.

Well, to cut a long story short, the faults were pointed out to the reader, and he promised entirely to rebuild it.

Only One of Many.

But this particular case is only one of many, and the object of Mr. Dowding's article, which we publish in this issue (and incidentally, the sole object of this particular editorial sermon), is to beg readers who build sets according to published specifications, whether in this or any other journal, to *keep to the designer's specification*.

Modern wireless sets are delicate and finely balanced, scientific "creations." A reasonable margin of safety is allowed for—but don't exceed it. Otherwise, you are going to have an awful job getting the set right; you are possibly going to write to the designer and blame him, and, in short, give yourself a lot of needless worry.

A good set is worth respectful and considerate treatment, so follow the designer's instructions as closely as ever you can.

HERE AND THERE

U.S. Radio—B.B.C.
Orchestra—Handling
Valves, etc.

Nearly 50 per cent of all the families in the United States of America possess wireless receiving sets.

The American broadcast listener pays no licence fee, but revenue is obtained by the broadcasting of advertising matter, generally well disguised.

About two-thirds of the receiving sets in the U.S.A. are five- or six-valvers.

Battery sets are now the exception in the United States.

The membership of the Radio Circle—which is the backbone of the Children's Hour—is about 40,000.

Through the Children's Hospital Fund three hospital cots have recently been endowed in London.

The new B.B.C. Symphony Orchestra absorbed the old Queen's Hall Orchestra and the London Wireless Orchestra.

The National Chorus, which is the standing choral organisation of the B.B.C. for concert hall performance, is 250 strong and is composed only of amateurs.

Never tighten the top terminal of an S.G. valve or the side terminal on a pentode with pliers, as the thread is not intended to stand up to such treatment.



WHEN YOU BUILD THAT SET

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

SOME WORDS IN SEASON FOR CONSTRUCTORS OF RADIO RECEIVERS.

YOU can take all sorts of liberties with a modern set that would have been disastrous with receivers current in the early years of broadcasting. As a matter of fact, to attempt the construction of any set in those days was to embark upon an adventure into the unknown. You see, components and accessories varied such a lot among themselves. Valves, for instance, were quite hit-or-miss affairs. None of the valve makers advertised the characteristics of their products—perhaps some of them didn't even know them!

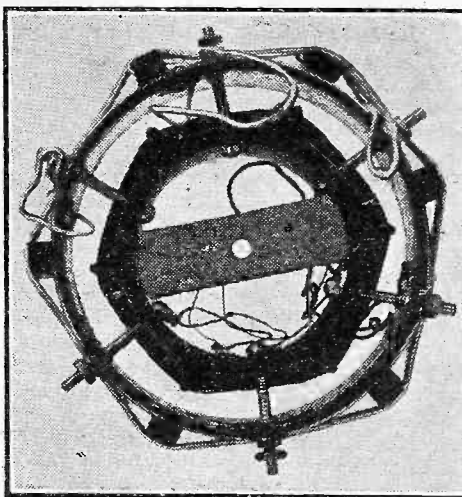
"How They Differed!"

At most there were only "H.F." and "L.F." types—and goodness, how they differed! The impedances varied all over the place. And much the same sort of thing applied to many components. I remember fixed condensers marked .001 mfd., that measured up to only .0003 mfd., and grid leaks marked 2 megohms (2,000,000 ohms) that could conjure up no more than 200,000 ohms when put to the test.

It was wonderful to get really passable results in those days with one's first set assembly, using haphazardly purchased parts costing sixteen times as much and being only a sixteenth as efficient as modern parts! And "P.W." used to receive thousands of letters of absolutely lyrical praise from people who weren't really getting

good results. They were so staggered that they had accomplished some success that they simply had to tell the world about it!

A SERIOUS FAULT



One of the most vital factors in a coil is the diameter of its former. Here is a "P.W." Dual-Range Coil Unit with an undersized ribbed former.

But times have changed. For the worse, some think. I don't. I expect I enjoyed the element of romance always present in those

pioneering days as much as anybody else, but I enjoy these days of scientific precision even better. Quite rightly, present-day constructors do not consider set-building a gamble—they look for good results with any design due to reputable designers.

And the radio industry is able to supply parts conforming to definite standards of electrical efficiency. I'm not saying that such articles represent one hundred per cent. of the stock of every radio store. They don't. There's an awful lot of gear for sale that it would be better to forget—if we could. But we can't, because some people will insist on being attracted by a price, and forget that elementary fact of economics that the cheapest is not always the least expensive.

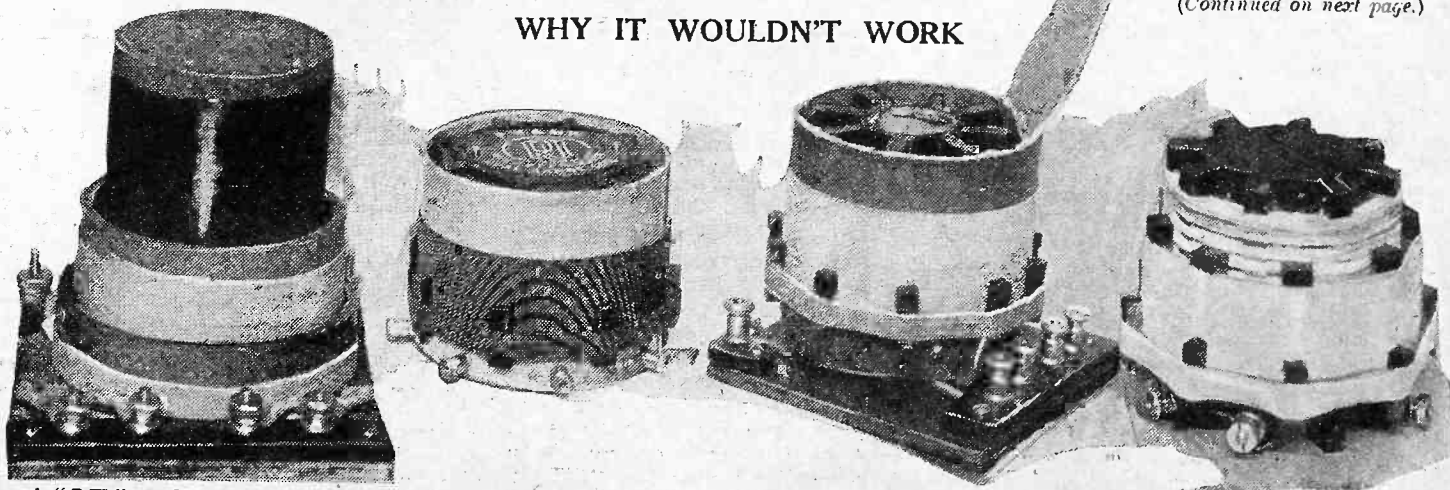
Ruining a Receiver.

It may not matter much if your wife decides to purchase a sixpenny saucepan made of tin instead of one made of copper and costing 12s. 6d. Maybe the sixpenny utensil won't last as long as the 12s. 6d. one—but will its life be no longer than a twenty-fifth of the other? That's all you have to worry about there. It doesn't matter a great deal to the gas-stove what kind of saucepan or kettle you buy!

Radio components and accessories aren't so independent. A one-hundred-guinea radio-gramophone can be sunk to the level of a cheap portable gramophone, so far as record reproduction goes, merely by

(Continued on next page.)

WHY IT WOULDN'T WORK



A "P.W." reader's set wouldn't work properly. He had, he said, made three of our coil units exactly as per specification. Have a look at 'em. The second coil from the left is an R.I., and is, of course, O.K. Compare it with the home-made versions, and note how these vary from the correct design.

WHEN YOU BUILD THAT SET

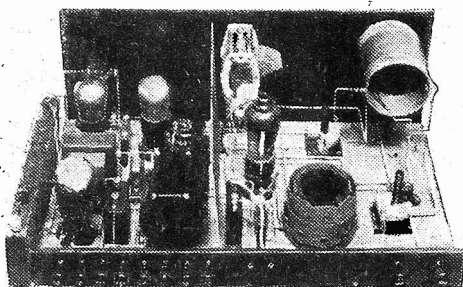
(Continued from previous page.)

replacing one of its good valves for a cheap and nasty one whose characteristics widely vary from its published specification.

But inasmuch as you have had the good sense to purchase POPULAR WIRELESS, you will not need me to amplify such obviousities as the above! They stand merely as an introduction to the special points I do want to get over properly on this particular occasion.

They concern the actual construction of receivers. And they contain both reassurances and warnings. I will start off

THE ORIGINAL MODEL—



This is the "M.W." "Plus X" Four.

with the former. "P.W." sets are designed to have wide margins of safety. All good sets are designed that way nowadays.

You can divert from the specification a little bit here and there without incurring any risk of failure. But don't step outside that margin. "What and where is this margin?" you may ask.

That is what I cannot possibly define. When you are assembling the outfit stick just as close to the specification as you can. The very unskilled constructor—the man who has never built a set before in his life, and has little knowledge of electricity or mechanics, will probably eat up all his margin unconsciously and think he has been most precise in his copying of the design! But we must cater for that man. And by so doing we make things better for the practical amateur inasmuch as we provide him with a receiver of rocklike stability that will give one-hundred-per-cent. service even through periods of misuse and neglect that the most conscientious of us are apt to inflict upon our possessions.

Sets are Carefully Designed.

I mentioned stability for a very definite reason. A good set of to-day will not "spill over" at the first sign of battery decay, or with a very slight variation in component positioning, or in the wiring. Designers deliberately take liberties with their original models and endeavour to emulate the bad conditions under which their sets may have to work, and make sure that the design will stand up to such treatment.

As our chief of research explained in an article in "P.W." some few weeks ago, you can, for instance, dispense with soldering in any "P.W." set design, and wire from terminal to terminal, using almost any kind of wire you like. Or you can, if you will,

run your wiring on the approved shortest-branch methods. And all this without much effect on the results the finished set will give.

As you can probably guess, it takes very careful designing to ensure that a set can be treated in this way.

But even so you cannot depart farther than a certain definite limit from the design of a set without meeting trouble. It is impossible to lay down hard-and-fast rules regarding such limits, for they naturally vary as with different individual sets.

The margins should, as I have indicated, be employed to cover completely accidental discrepancies and not deliberate attempts to vary a design. You shouldn't try doing that unless you happen to be a set designer yourself. Half our queries are concerned with the troubles of people that have tried to re-design our sets for us!

What I mean is that if a two-megohm grid leak is specified for a certain part of a circuit, don't use one of three megohms, even if someone who says he ought to know tells you it will make little difference. Always keep absolutely to component values—that is vitally essential.

They make a Big Difference.

And don't use wire of different gauge or formers of different diameter, in making up your own coils. Such discrepancies are liable, for example, to make all the difference between getting a good reaction control and getting no reaction at all!

It is quite obvious that many people do not realise this. And the situation is rendered a trifle more difficult by the fact that constructors as a whole are more ambitious these days.

Once upon a time—I begin this sentence like that because it may read fairytale-like to many of you—hardly anyone would attempt anything much more than a crystal set to begin with. They would then tentatively try their hand at a one-valve. But now, with ninety per cent or so valve

And by that I do not mean merely hook up the same kind of parts in the same order as in the original model. Your objective should be a receiver that coincides just as closely as is possible, in every detail, with the original model of the design you are copying.

Smaller jobs of construction are just as important. I have already mentioned coils. There may be an idea that, providing you wind on the right number of turns of wire, success is assured. But that is far from being the case.

The wire must be wound on in the specified direction, and on a former of exactly the dimensions given. And the position of the winding on the former may be important—it probably will be if another winding figures in the structure.

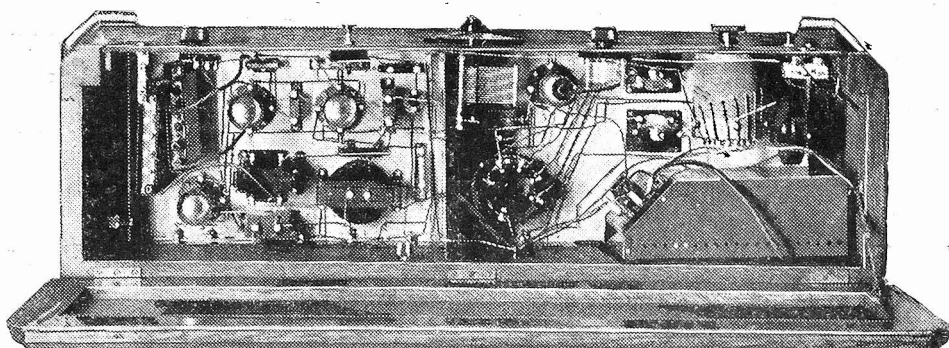
Exactly to Specification.

We cannot undertake to receive faulty sets for examination, however much we would like to. You see, there are about one hundred and fifty thousand or so of you regular readers, and if only one-tenth of one per cent of you were to meet with trouble and push your gear along to us, it would mean we'd have the whole of our research department flooded out. But what we do is to select certain querists who are apparently meeting with unusual kinds of faults, and get their sets from them, so we can find out exactly where are these interesting snags.

Most of the cases are of people who say they have adhered absolutely to the constructional details and tried every remedy suggested to overcome the trouble they are experiencing. And what a shock we often get when the set arrives! We hardly recognise the thing for our own receiver at times!

But I for one do not immediately pour forth invective directed at such a constructor—none of us on "P.W." does. We realise that a man might make a mess of—what seems to us, and a good many of

—AND A CONSTRUCTOR'S VERSION



Would you think this was the same set? It is supposed to be! Note the mains unit crammed into the H.F. end. If such a distorted version of the original design worked at all it would be a minor miracle!

sets in use where there were once only about ten per cent, many constructors begin with a three or even four-valve set. And I think this is less a compliment to their own prowess as it is a compliment to the prices of modern radio gear.

But there you are, when nearly all one's friends and all one's neighbours have three, four, and five-valve sets, one can be excused for not going right back to crystal sets to learn the elements of radio set construction. And it is not necessary that one should. You can make your set a three or four-valve set so long as you do stick to the book.

you—a simple job of set building, and yet be a mighty clever fellow in some other way. I, for instance, know a good bit about radio sets, but I'm a poor amateur at carpentry. A professional carpenter could be forgiven for laughing at some of my efforts in that direction.

So, for goodness' sake, don't think I'm having a chuckle at, or holding up anyone for public ridicule who slips up in assembling a radio outfit. I am appealing especially to new readers of "P.W." to treat their radio construction more as a science than as a kind of jig-saw puzzle.

A.P.W. "SAFE-POWER" CHARGER

Here are full details of an extremely simple battery charger for D.C. mains. It is economical to use, easy to build and to operate, and, what is most important, designed in accordance with our famous "P.W." "Safe-Power" schemes. It is therefore perfectly safe to handle.

THE first "P.W." series of "Safe-Power" mains units came to an end some time ago, but since then we have observed a considerable revival of interest in L.T. battery-charging from D.C. mains, and so we have decided to make an addition to the line.

It seems that the early objection (of expense) to charging from D.C. mains is gradually disappearing. At one time, of course, it was regarded as prohibitively wasteful, but in those days valves were

that it should not be run down far, and that it be brought right up to the fully-charged state every time it is put on charge.

This really means that it must be charged every night or every second night with great regularity, and that is where the importance of convenience comes in. Human nature being what it is, if the battery has to be disconnected from the set, taken to another room and connected up to the charger, it is by no means certain to get done as regularly as it should!

What is wanted is pretty obvious: a charger incorporating a switching device, so that everything can be kept permanently connected up. Thus, all you have to do to disconnect the accumulator from the set and put it on charge is to operate the switch, and it is easy to make a habit of doing this every night when reception has finished.

Controls the Set.

As a matter of fact, if this switching device is properly arranged it need not add an extra "operation" at all. You can leave the L.T. switch on the set permanently "on," and do the

whole control with the charging switch alone. To work the set you put the switch in one position, and to turn the set off and put the battery on charge for the night you just push the switch over to the other position.

That, naturally, is how we have designed our "Safe-Power" charger, and you will find it is really a *saving* of trouble to use it, because you never have to disconnect the battery for charging at all.

As in every member of the series, a neat little metal "chassis" or base provides the foundation for a sound and reliable unit with all the robust appearance of an engineer's production. One side of the base is of ebonite and carries four terminals, on the top is a double-pole change-over switch and two lamp holders, and that is all. Pretty simple, isn't it?

The Metal Base.

You can obtain this base fitted with the ebonite strip and with all drilling done, from the usual suppliers but those who are good at metal work may like the main dimensions. Here they are:

Length, 7 ins.; width, 3½ in. (not counting thickness of ebonite strip); depth, 2 in.

The "batten" type lampholders are secured to the top with brass screws and nuts, likewise the switch, and then when the terminals have been fitted comes the final step, i.e., the wiring. There is very little of it, and the job will only take you a few minutes, but you will find it easier to do if you first remove the two ends of the metal base. These can be replaced when the wiring is finished.

Fixing the Charger.

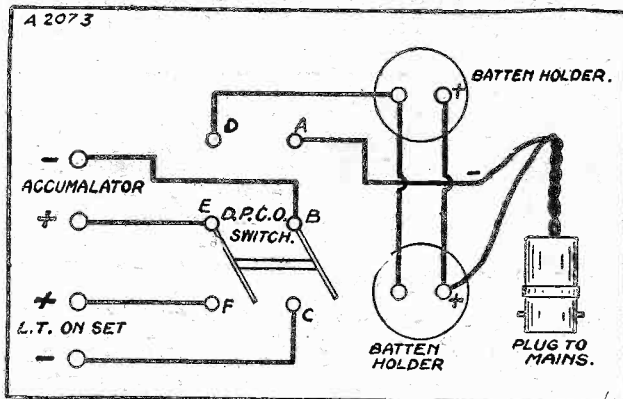
By the way, you will note that the underside of the base is not closed in. The interior wiring is "live" when the charger is working, hence steps should be taken to prevent unwary persons from getting shocks from it.

The intention is that the unit shall be fixed in place in some convenient spot, e.g. the underside of the table on which the set stands. If this is done (with a couple of small metal brackets fixed to the unit with screws and nuts) there is no risk, since the underside is protected.

The place chosen, of course, should be such that it is easy to reach the change-over switch, but there is no need to be able to see it; the lamp (or lamps) light up in the "charge" position, so you can tell in a moment how the switch is set.

(Continued on next page.)

EVER SO SIMPLE, ISN'T IT?



This is the extremely simple circuit used in the charger, which cannot possibly go wrong or cause any trouble.

greedy, and so we had to use large accumulators with a heavy charging rate.

Valves have now become so modest in their filament currents that medium-sized sets can be run satisfactorily from quite small L.T. batteries, and this has made some considerable alteration in the position. So, too, has the development of the modern method of "trickle" charging.

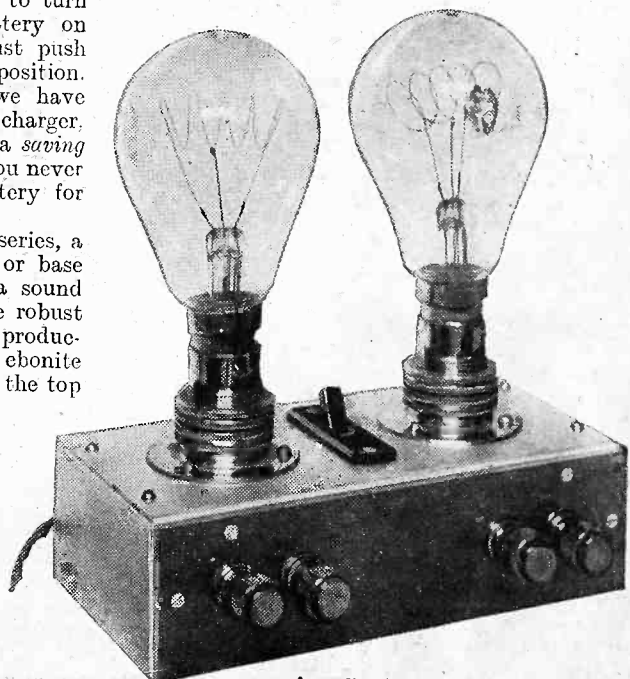
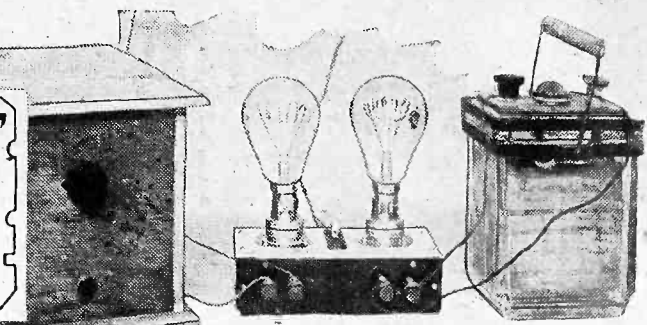
These two factors together would appear to have brought D.C. mains charging well into the realm of practical politics, hence the birth of yet another "Safe-Power" unit.

Perfectly Safe.

In designing it we have borne in mind not merely the usual safety requirements which have been so strong a feature of the whole series, but also the vital one of convenience in use.

This is really of very great importance. The whole success of the trickle method of charging depends on the frequent and regular bringing up of the battery to a fully-charged condition. The idea, as you may know, is to start with a fully-charged battery and arrange to give it every night a small charge to make up for the current used during the previous day and evening.

For this purpose a very low charging rate is used, and to keep a battery healthy under these conditions it is necessary



According to the wattage of the lamps the charging rate can be increased or decreased as desired.

AN EXTERNAL VOLUME CONTROL

THERE are large numbers of simple sets of the two- or three-valve type which are not provided with any means of controlling volume, but on which it is often found desirable to cut down the power from near-by stations. A simple means of adjusting volume can be added to such sets without interfering with them in any way.

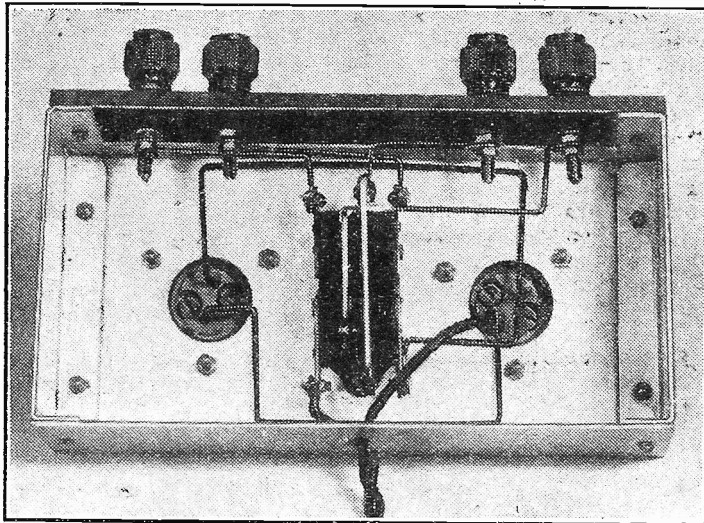
The control consists of a variable capacity in series with the aerial lead. As this capacity is decreased, volume will be cut down and vice versa. It will not permit another station to interfere in the same way as volume control by de-tuning would; and, as a matter of fact, in many cases it will improve the selectivity of the receiver.

A condenser with a maximum capacity of .0005 is connected in series with the aerial lead to the set. When at its maximum it will not usually affect the set in any way whether it is used on medium or long waves. The condenser may be of the ordinary tuning, compression or solid dielectric type.

CURING MICROPHONIC VALVES.

ONE of the most annoying little troubles which can occur in radio is the gradually-building-up howl which is caused by a microphonic valve.

ALL THERE IS UNDERNEATH



Compare this photograph of the actual charger with the wiring diagram, and you will see exactly how the connections are made.

With many valves it can be cured by sticking a lump of Plasticine on top of the valve, or by damping the glass in some other manner. Sometimes, however, practically any valve put in the detector position will start up a howl, all with their own particular note.

This generally only happens when a very high degree of magnification is being obtained from the various stages of the set, or when the set is working right on the edge of instability. It will also be

found as a rule that in such cases a rather higher H.T. voltage than usual is in use on the detector valve, making it more sensitive than it would be normally.

If such is the case, the remedy is obviously to reduce the voltage when the trouble is almost sure to cease. It may be necessary to go as low as 30 to 40 volts, but the loss in sensitivity will not matter in a set with high-gain L.F. stages.

The B.B.C.'s Studio choral work is undertaken by members of the Wireless Chorus, the numbers varying according to programmes.

Eight soloists known as the "Wireless Singers" form the nucleus of the Wireless Chorus.

The B.B.C. will always consider plays which have been specially written or adapted for the microphone.

About four out of every five applications for the B.B.C.'s S.O.S. facilities are turned down for not complying with the rules.

In all the time that it has been running the B.B.C.'s S.O.S. service has—so far as is known—been abused only twice.

Every year about 850 or 900 S.O.S. messages are broadcast, approximately half of them being successful.

The site of the Scottish Regional Station has been chosen at Westerglen.

A most important difference between the new North Regional station and Brookmans Park is in the height of the masts. The height of the Brookmans Park masts is limited to 200 feet by the Air Ministry, but the North Regional's three masts are each 500 feet high.

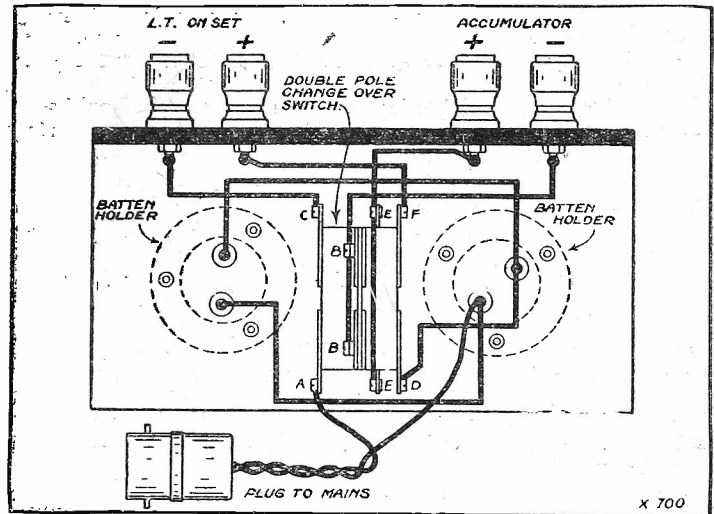
Four Post Office telephone cables connect the Savoy Hill studio to Brookmans Park.

A "P.W." "SAFE-POWER" CHARGER

(Continued from previous page.)

Now to get the unit connected up and working. Join the battery to the terminals marked "accumulator," and those marked

NOT MUCH TO WIRE



When wiring up be careful that you connect the switch properly, or you may have trouble.

"L.T. on set" to the ones on your receiver to which the battery used to be connected. Be careful to get the positives and negatives right.

Now put a lamp (any size for a start) in one of the sockets and insert the plug (or adapter) in a mains point. See that the L.T. switch on the set is at "on," and try the switch on the charger in each position. In one you will find the set is turned on, and works as usual, and in the other the lamp lights up.

Testing Polarity.

The latter is the "charge" position, but before you are ready to go ahead and use the unit you have first to find the right way round for the plug in the mains point to make the polarity come right for charging.

To do this, you want a piece of pole-finding paper, or a pole-finder device. Disconnect the leads from the battery while the mains plug is out of its socket, then insert the plug, put the switch in the "charge" position, and try the ends of these wires on the pole-finding paper.

If the polarity thus found agrees with the marking of the terminals, well and good. If it does not, reverse the plug in the mains point. In future be careful to see that the plug is always kept this way in.

The Charging Rate.

Finally, about the charge rate. If the total filament consumption of your set is anything up to .3 amp. you require a rate of about .2 amp. for charging. On mains of 200 volts or over this means one lamp of 40 watts in either (not both) socket. On 100 volts you want a lamp of 80 watts, or a pair giving a total wattage of 80.

For sets with larger filament currents you should preserve the same ratio, and in these cases you will generally have to use two lamps to get the right current.

COMPONENTS FOR THE "SAFE-POWER" CHARGER.

- 1 "Safe-Power" charger chassis (Magnum, or Keystone, Ready Radio, etc.)
- 2 Batten lamp holders.
- 1 Double-pole change-over switch, mains type (Bulgin).
- 4 Insulated terminals (Belling and Lee).
- Wire, screws and nuts, flex, mains plug or adapter, etc.

CAPT. ECKERSLEY'S — QUERY CORNER

Some questions and answers of general radio interest that will aid you in your radio reception.



SUPER-HET QUALITY? — HUM FROM THE VOLUME CONTROL—WATCH YOUR WATCH—TWO-FOUR-OR SIX-VOLTERS?

Under the above title, week by week, our Chief Radio Consultant comments upon radio queries submitted by "P.W." readers. Don't address your questions to Captain Eckersley, however, a selection of those received by the Query Department in the ordinary way will be answered by him.

Super-Het Quality?

D. N. (Stroud).—"I am rather keen to make up a super-het, using S.G. intermediate stages, but I seem to remember having read an article in which it was stated that it is impossible to get perfect quality with any receiver of this type.

"I do not understand why it should not be possible to get first-class quality, and would be glad if you would kindly explain matters to me."

I do not understand why this rumour has got round that it is impossible to get good quality out of a super-het. I see no theoretical reason whatever why this should be so.

I have heard most excellent quality from the super-het., more I cannot say, except to wish you the very best results and the most interesting time in building a super-het., and to hope that more and more people will realise that this type of instrument does possess several theoretical advantages which might become practical if the practical design were studied *au fond*.

Hum From the Volume Control.

M. A. B. (Felixstowe).—"With the particular volume control I have in use, each time I touch the knob—which, by the way, is joined direct to the grid of the valve, the volume control being a potentiometer across the secondary of the L.F. transformer—a humming noise is heard in the loud speaker.

"I find that if I touch the grid of the valve, a similar hum is heard. An examination of the volume control has shown that there is a metal ring just under the knob outside the panel, with the result that when I touch the volume control, I really place my fingers on the grid of the valve.

"Is there any method of connecting the volume control so that this hum can be avoided? Alternatively, does the presence of this hum indicate a fault?"

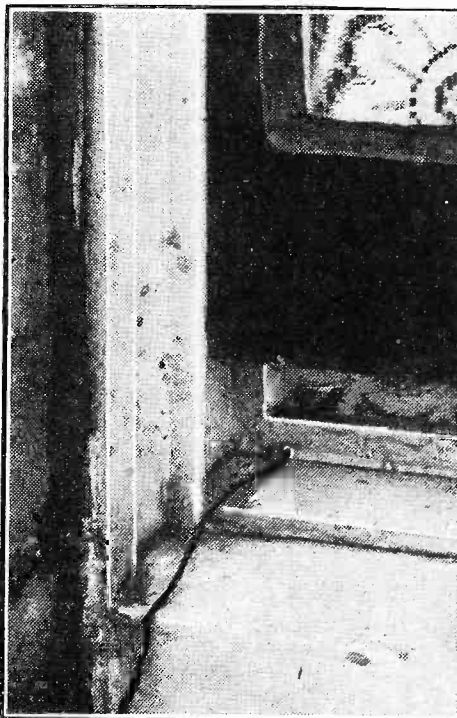
The body has considerable capacity and a resistance which varies very much, but is of the order of hundreds of thousands of ohms. You, sir, are a leaky condenser.

The connection of a leaky condenser between grid and earth is a probable means of upsetting the balance of the circuit against hum as originally conceived. I cannot give you a more categorical answer than this, but I can assure you that the presence of the hum does not indicate a fault, and I can only recommend you to a

better mechanical design for overcoming the trouble that you have correctly diagnosed.

It is a little difficult to recommend to you a means whereby you could overcome the necessity of touching the metal of the volume control adjustment, but I do know one which is nasty but very effective, and that is wrap it up in insulating tape.

THE EARTH-LEAD'S EXIT



Getting a short earth lead without undue damage to window frames, etc., is often something of a problem, but the method shown here has proved very satisfactory in use.

Then, again, if you are an ingenious mechanic, you might make a little cup to go over the top of the knob, the cup to be secured by screws which bite into the insulator and nowhere touch metal.

Watch Your Watch.

M. C. (Dulwich).—"I have been in the habit of making adjustments to my moving-coil loud speaker when wearing my wrist watch and the behaviour of the watch has been adversely affected thereby.

"This, I imagine, must be a fairly common experience with professional electrical engineers, and I would welcome some advice as to the method of curing the magnetisation of the watch which, I take it, is responsible for its present erratic behaviour. Can such a cure be effected at home?"

It seems I must study many of the professions as I make my way along the primrose path to the everlasting bonfire. I answer as one ignoramus to another, and as one who curiously has never suffered from the trouble of a magnetised watch, even though my body which supports my watch must frequently have been interlaced with many dense lines of magnetic force.

I imagine, although I speak under correction, that the magnetic force produces an effect in the mainspring which is necessarily made of magnetic material, and I should suggest that the mainspring would have to be replaced once it has been magnetised.

Whether all those little wheels are made of steel I do not really know; if they are they may be getting into awful trouble, particularly that little fellow that works in the escapement, but I am sure that the repair could not be undertaken at home.

But I am assured that if the watch is placed in an alternating magnetic field and then slowly removed it is restored to its pristine effectiveness. Do let me know if that's true.

Two-four-or Six-Volters?

N. O. (Birmingham).—"Valve makers list 2-, 4- and 6-volt valves in their catalogues, and since I am making up a set, I shall be glad if you will let me know whether there is any advantage from the point of view of signal strength in choosing 6- or 4-volt valves, in preference to 2-volters?"

"I am a complete novice, and I only want to get the best results."

There is no real difference, except that the power output of a 6-volt valve is generally more than a 2-(or 4-volt) valve. There isn't so much in it as all that, and when you think that a 2-volt accumulator of given cost and bulk lasts longer than a 6-volt accumulator you have an argument for a 2-volt valve. But you also have one for a 6, so obviously be typically British and buy a 4-volt valve.

LATEST BROADCASTING NEWS.

SUNDAY POLICY
CRITICISEDNEW RIDGEWAY SERIES—
NIGHT LIFE—MICROPHONE
NEWCOMERS, Etc.

THE Sunday policy of the B.B.C. is under closer and more critical examination now than ever before. There are several lines of attack; some wish alternatives to religious services; some wish to eliminate religious services entirely; some seek a rearrangement that will enable the main evening programme to start earlier; and some are asking for longer transmissions. Newspapers appear to be getting a good deal of correspondence on various aspects of this subject. It is unlikely the B.B.C. will make any drastic alteration of Sunday programme policy, at least at this juncture.

But it is expected that the hours of transmission will be slightly extended. This will make a further inroad into the "silent" periods so dear to the hard-pressed amateur. As to alternatives to religious services, there will be no relaxation in that direction for a long time yet.

The New Ridgeway Series.

As already exclusively announced in POPULAR WIRELESS, Mr. Philip Ridgeway returns to the microphone early in March with another series of his feature "Parade" programmes. Altogether he is arranging six shows, each of which will be heard twice—once on the National transmitters and repeated another night for London Regional listeners—and he promises even more enjoyable evenings than his last bunch of entertainments gave.

To do this Mr. Ridgeway is busy engaging new artistes, and he has just succeeded in his search for a girl with a "pure young English voice."

Already he has given more than a hundred auditions, and will probably give many more before he finds the artistes he wants. The first of the new "Ridgeway Parades" will be broadcast on Monday, March 2nd (National), and Tuesday, March 3rd (London Regional).

Night Life of Two Centuries.

Mr. Lance de G. Sieveking, the "ideas" specialist at Savoy Hill, has just completed his next special programme which National and London Regional listeners are to hear on Thursday and Saturday, February 12th and 14th.

It is entitled "The Pursuit of Pleasure," and is intended to give listeners an idea of night life during the last two centuries at pleasure resorts, some of which are now known only by name and tradition.

Among them are Vauxhall Gardens, the Grecian Saloon, Astley's Circus, the Cock Pit Royal, the Diorama, the Royal Panopticon, and the Devil's Tavern. Characters who will be heard in imagination are Mozart, Grimaldi, Henry Irving, Jenny Lind, Madame Bonzo (the lady balloonist), Sir William Stensole Bennett, and dear old Marie Lloyd.

Microphone Newcomers.

First appearances before the microphone are always as interesting to listeners as they are supposed to be as terrible to those who consent to undergo the ordeal. But first broadcasts are not now so commonplace as they once were, so that it is worthy of mention that one or two are included in programmes for the near future.

Jack Martin's Majestic Orchestra is a newcomer to the Northern programmes, and Manchester and Leeds listeners will no doubt give it the usual hearty welcome when its programme is relayed from the Hotel Majestic, St. Anne's-on-Sea, at 10.30 p.m. on Wednesday, February 18th.

Another first broadcast to catch our eye is that by the Pentrepoeth Senior Boys' School Choir during a Welsh programme from the Cardiff studio on Monday evening, February 16th. This Choir was not formed until 1928, but it has already given performances of two Gilbert and Sullivan light operas and won a first prize at the Llanelly National Eisteddfod. In the same programme will be Pennillion singing by Mr. Alwyn Jones, and items by the National Orchestra of Wales.

Opera Excerpts.

A new series of excerpts from operas beginning with a relay of the Covent Garden Opera Company's performance of "Rigoletto" from the Empire Theatre,

NEXT WEEK.

HIGH OVER EVERYTHING
LOOMS

THE "COMET"!

There is sure to be a big demand for the
6d. BLUE PRINT FREE

so

ORDER YOUR
"P.W." NOW



Relays from seaside resorts have lost none of their popularity.

The seaside spells holidays, and, whether it is winter or summer, the microphone generally succeeds in capturing an atmosphere of freedom from care and worry, which although mainly reminiscent, nevertheless is very enjoyable.

Liverpool, for National listeners next Tuesday, February 10th, will be an attractive feature during the next few weeks. Four days later London Regional listeners will hear part of "Il Trovatore."

FOR THE LISTENER

By "PHILEMON."

A critical survey of some of the recent programmes, with frank comments on the fare provided and the way it is served up.

Personalities.

MR. HAROLD NICOLSON has broken out in another place. Four o'clock in the afternoon is perhaps an awkward time for most of us; but, if you can manage it, I exhort you to listen to the brilliant word-etchings which he makes of modern personalities on Tuesdays. It is a task peculiarly suited to his gifts; for there is a natural acid about him which suggests the etcher.

The Mouse and the Lions.

It was amusing the other evening in the Symphony concert to hear Wanda Landowska with her harpsichord joyously struggling to hold her own with the trombones and the drums in Poulenc's Concert Champêtre.

It sounded rather like a mouse running in and out among the paws of roaring lions, making its little noise. Ansermet did his

best with Poulenc, and I had moments of illumination and gaiety; but in the matter of this modern music I still feel like a Babe lost in the howling woods.

Foreigner Broadcasters.

It is not often one hears an Englishman broadcasting from a foreign station, but foreigners seem to occupy our programmes in increasing force. Not only in music. Dr. Briffault and Professor Malanowski debate the problems of Marriage in alien accents.

Interesting as they are, I do not think they debate very well, and surely we have anthropologists who could do it better? Often foreigners seem to lack the sense of humour; or perhaps they leave it behind them, imagining that we prefer to take not only our pleasures but our lessons sadly!

(Continued on page 1008.)

THE "SHORTADENSER"

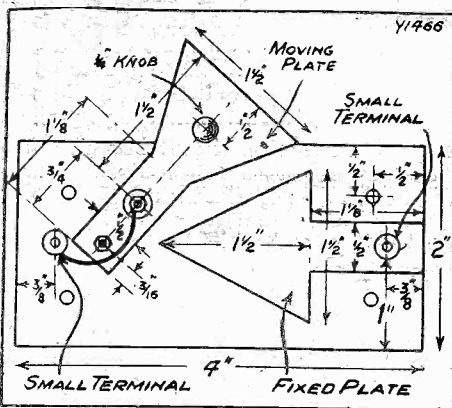
A small series condenser in the aerial lead is a great help to successful short-wave reception. Here is a simple design of home-made condenser for the short-wave enthusiast.

HAVE you ever disconnected the aerial lead from a short-wave set, left it lying near by, and then searched for signals? It is apt to be an illuminating experience, for you will often find that the stations come in almost as well as ever.

How do they manage it? Mostly by way of the small capacity existing between the aerial lead and the wiring and components in the receiver. You will find that if the disconnected lead is moved more than perhaps a foot or so from the set, signals practically cease.

This indicates that as long as there is a certain amount of capacity between aerial and set the signals will get through, but if

HOW IT'S MADE.



The necessary dimensions for making the "Shortadenser."

the capacity is reduced too much they will become very weak.

It is interesting to try making the capacity a bit bigger. For example, let the disconnected aerial lead trail about among the actual wiring and components of the tuned circuit in the set. In many cases signals will now be practically up to normal, and there will be in all probability a definite improvement in the reaction control.

Smoother Reaction Control.

This last is important. It would seem that to insert just the right value of capacity in series in the aerial lead might well lead to a general improvement in results. As long as the capacity is not too small there is no loss of volume, and reaction is almost always made smoother and brought better under control.

This is more particularly the case with a fair sized aerial. On quite small ones a series condenser is not as a rule beneficial, and the set works just as well without it.

A series condenser in the aerial lead is quite commonly used in short-wave work, and it is generally of some adjustable type with quite a small maximum capacity, say, .00005 mfd. Condensers of the "Neutrodyne" type are often employed for the purpose, and the operator sets the capacity to suit his aerial and receiver.

Now, a very simple little component will serve the purpose perfectly well, and it occurred to us recently that the short-wave enthusiasts might like a design for one they could make for themselves.

There are all sorts of ways of making up a small adjustable capacity of this kind, and it doesn't very much matter how it is done. The scheme we chose for our example works out very simply from the constructional point of view, and functions perfectly satisfactorily.

You want first an oblong piece of ebonite as a base, with holes for fixing screws at the corners. On this you seccotine a piece of thin aluminium or copper foil, cut to the special arrow-head shape illustrated, and mount through both base and foil a small terminal for connection to this "plate" of the condenser.

The "Moving" Plate.

The "moving" plate is cut from a thicker gauge of copper or aluminium, say 22 or 24 gauge, again to a rather peculiar special shape which is quite clearly illustrated. These special shapes, by the way, are arranged to give the desired variation of capacity with a comparatively small alteration in the position of the moving plate.

The latter is arranged to pivot about a point near the narrow end. It is secured here with a brass screw through the base, with a spring washer between the ebonite and the plate. Put a nut on top of the plate, tighten until the plate only moves rather stiffly, then add another nut to lock the first one.

Before thus assembling, however, fix a small knob of some kind where indicated,



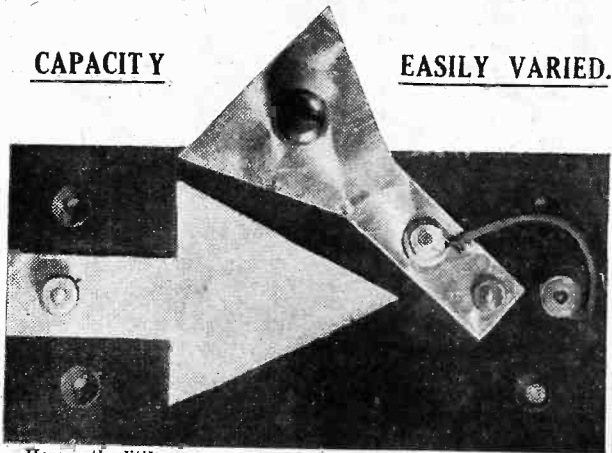
and at another point fix another screw and nut through the plate to grip the end of a short piece of flex (about 1 1/2 in. long). This flex provides the connection between the moving plate and the other terminal mounted in the base; never depend on rubbing contacts in short-wave gear.

The knob, by the way, can be just a little block of wood secured with a small counter-sunk-head brass screw passing up into it through the metal plate. We actually used an odd ebonite knob we found in the junk box, fixed with a brass screw of the correct thread to fit the tapped hole in the underside.

Having assembled the little gadget, you have just to bend the upper plate until it is about 1/8 in. or a little less above the fixed plate, and it is ready to use.

CAPACITY

EASILY VARIED.



Here is the little component ready for work. The moving plate can be swung clear of the fixed on either side.

BROADCAST BREVITIES

During 1930 the average increase in the number of wireless licences taken out in this country was seventy per day.

Provided Treasury sanction is forthcoming, the B.B.C. will erect a permanent short-wave station at Daventry for Empire service. The B.B.C. is to claim only actual out-of-pocket expenditure.

The counties in which the percentage of licences to population is highest are Oxfordshire, Hertfordshire, "London," and Northants.

Of the ten shillings paid for a wireless licence the B.B.C. receives only about 6s. 6d.

The dots of the B.B.C. hour time signal represent respectively the 55th, 56th, 57th, 58th, 59th, and 60th seconds.

For the benefit of ships at sea, etc., Rugby transmits at 10 a.m. and 6 p.m. a time signal which can be received in most parts of the world.

The new B.B.C. headquarters in Portland Place, London, W., has twelve floors, three of which are below street level.

Twenty studios will be arranged for in the new B.B.C. headquarters, one being large enough to accommodate a full orchestra and an audience of about 1,000 people.

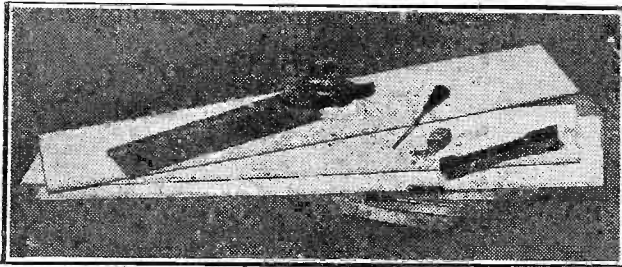
FROM THE TECHNICAL EDITOR'S NOTE BOOK.

Tested and Found-?



"BYLDURONE."

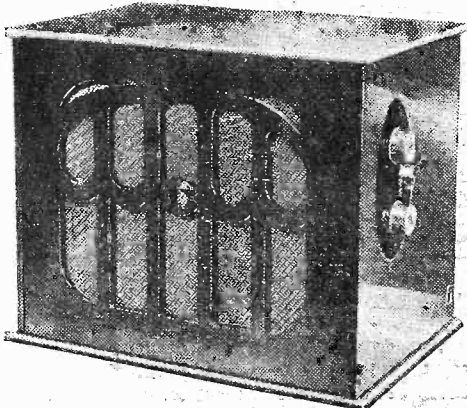
THIS is an interesting scheme which enables an amateur quite easily to construct a cabinet having a good appearance, and which is inexpensive and easy to assemble. All the tools needed are a saw and a screwdriver. The necessary wood is



The materials and tools concerned with the "Byldurone" system.

supplied in standard lengths, and sets of four angle pieces are obtainable in nickel plate, oxy-copper, oxy-silver, or in a colour to match the cabinet finishing materials, of which there is a wide range available, including crocodile, lizard, leather and wood-veneer.

The originators of this scheme, and the suppliers of the sets of parts, are our old friends J. J. Eastick & Sons, Ltd., of Eex House, 118, Bunhill Row, London,



The Brownie "Baby Grand" Receiver.

E.C.1. I would advise all constructors to send to this firm for any literature Eastick's may have available regarding their "Byldurone" scheme.

THE EELEX RADIO BULLETIN.

The latest number of this enterprising J. J. Eastick & Son's house organ is to hand, and comprises, as usual, much interesting and useful reading.

NEW BROWNIE SET.

The Brownie Wireless Co., Ltd., is now marketing a two-valve set, which is called the "Baby Grand," for only £3 5s., and this two-valve set has a handsome polished oak cabinet with built-in loud speaker. And the price, 65s., includes two British valves and royalties paid. I have not tested one of these sets, but it sounds a real bargain. The

Brownie people are also marketing a three-valve all-mains set for fifteen guineas.

THE RADIO AMATEUR'S HANDBOOK.

This is the handbook of the American Radio Relay League, and is a comprehensive manual of short-wave practice and procedure. I have just been glancing through the new seventh edition, and it certainly does seem a fine production. I expect W. L. S. will have something to say about it in his notes in due course. In the meantime, I presume you have to send over to America for it. The price is one dollar.

A MULLARD FOLDER.

The revised edition of the Mullard folder entitled "A Million Aerials Lead Down to Mullard Valves," is now available to the trade, and will no doubt eagerly be absorbed in thousands by dealers. The folder is brought right up-to-date and gives full data regarding all Mullard battery and mains-operated receiving valves.

ANOTHER FERRANTI CHART.

Ferranti, Ltd., have prepared a constructional chart dealing with an A.C. mains three-valve receiver, copies of which they are prepared to send to all interested "P.W." readers who care to ask for them.

ALL-ELECTRIC SETS.

Those "P.W." readers who contemplate buying an all-electric set should make a special point of acquiring the new folder issued by Varley. This gives full details of the Varley Senior All-electric Receiver, and the Varley Radio Gramophone. This last is entirely self-contained and, with its one-dial tuning, super-power moving-coil speaker, etc., is a particularly fine instrument.

GILBERT WIRELESS CABINETS.

The list of wireless cabinets due to J. C. Gilbert of Old Swindon, Wilts, details a most comprehensive range of types suitable for all purposes and all pockets.

GAS-OHMS.

I have now received samples of those Gas-ohms to which I referred in this page a few weeks back. Gas-ohms, as you will probably remember, are gas-filled resistances, made by Rotor Electric, Ltd. The resistance elements are enclosed in small glass tubes filled with a special gas.

But a Gas-ohm grid leak has similar dimensions to a grid leak of any normal

Manufacturers and traders are invited to submit radio apparatus of any kind for review purposes. All examinations and tests are carried out in the "P.W." Technical Department with the strictest of impartiality, under the personal supervision of the Technical Editor.

We should like to point out that we prefer to receive production samples picked from stock, and that we cannot guarantee their safe return undamaged, as it is our practice thoroughly to dissect much of the gear in the course of our investigations!

And readers should note that the subsequent reports appearing on this page are intended as guides to buyers, and are therefore framed up in a readily readable manner free from technicalities unnecessary for that immediate purpose.

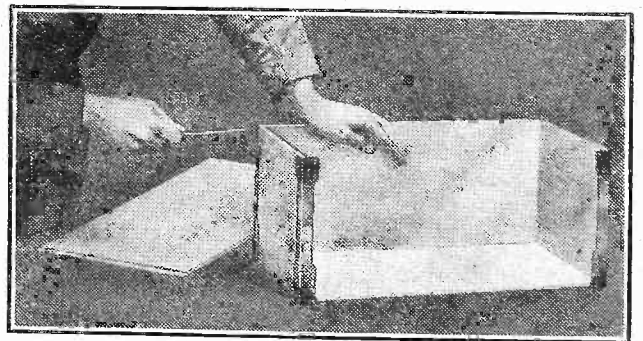
construction, and will fit in any ordinary grid-leak holder.

I carefully tested two samples sent me and found their resistances almost exactly identical with the specifications. I know of only one other make which in my tests has measured up so closely.

It is clear that Gas-ohms should be consistent and reliable in use, and as their prices are low, they should enjoy considerable success.

RADIO PART EXCHANGE SCHEME.

Messrs. Wingrove & Rogers, makers of the famous Polar condensers, have launched a special part exchange scheme. This, in



Here you see how a "Byldurone" cabinet is assembled.

brief, means that they will allow two shillings on any old variable condenser returned to them through local dealers irrespective of make, if it is accompanied by an order for one of the Polar Ideal condensers or Ideal drum controls.

They will accept any number of old condensers on these terms.



TRANSFORMERS AND CHOKES

The prices of R.I. Transformers now range from 21/- down to 10/6. EACH MODEL IS THE MOST EFFICIENT IN ITS CLASS AND ABSOLUTELY THE CHEAPEST IN COMPARISON WITH ANY OTHER, considering reliability and guaranteed performance. They are best beyond refute—therefore it is obviously wiser to insist on R.I. Ask your Radio dealer for R.I. Literature or write direct to R.I. in cases of difficulty.

The **HYPERMITE**

NIKALLOY CORE L.F. TRANSFORMER

The lowest priced transformer with the amazing NIKALLOY core that can be relied upon to give the FULL EFFICIENCY THAT NIKALLOY ALONE MAKES POSSIBLE. It is the smallest transformer yielding such a remarkable performance, and is INDISPENSABLE FOR MODERN COMPACT AND ECONOMICAL SET BUILDING.

HYPERMITE. Model DY20. Distinguished by its small size $2\frac{3}{4} \times 1\frac{1}{2} \times 2\frac{1}{2}$ ins. high, and handsome BAKELITE CASE finished as FIGURED WALNUT. Primary inductance 50 henries. Ratio $3\frac{1}{2}$ to 1.

12/6

AND THE

"HYPERMU" Nikalloy Core L.F. Transformer

The original NIKALLOY model giving an amplification MORE POWERFUL AND UNIFORM THAN ANY OTHER COMMERCIAL L.F. TRANSFORMER. It is impossible to buy better whatever the cost. Primary inductance, 85 henries. Ratio 4 to 1. Distinguished by the HANDSOME BLACK BAKELITE CASE.

21/-

The Improved G.P., L.F. Transformer

A new, larger "general purpose" transformer for use where considerations of space do not arise. Fitted in a beautiful GREEN BAKELITE CASE. With an improved iron core, its electrical characteristics shew a vast advance on the original G.P. model. Ratio $3\frac{1}{2}$ to 1. Primary inductance 35/40 henries. Weight 18 ozs. THE LOWEST PRICED TRANSFORMER WITH SUCH HIGH PRIMARY INDUCTANCE

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The "HYPERCORE" Output or Filter Smoothing Choke

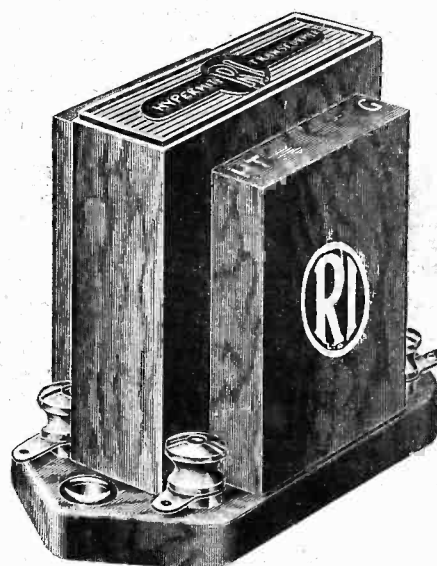
THE FIRST NICKEL IRON CHOKE for OUTPUT FILTER OR SMOOTHING PURPOSES. Low self capacity with high inductance ENSURES BRILLIANCE OF REPRODUCTION. Inductance 30 henries, Maximum D.C. 80 milliamperes A striking example of British Radio Production

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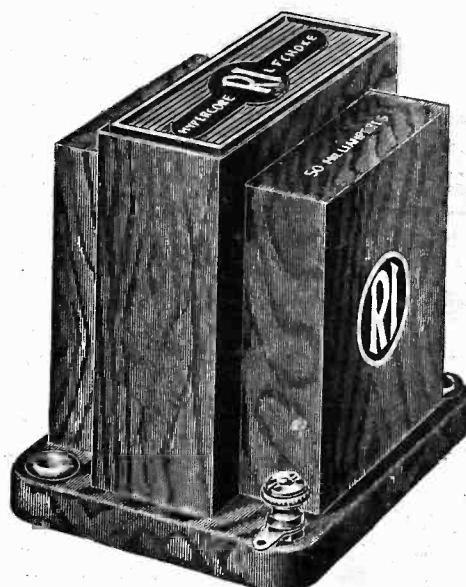
and the New G.P. Filter Output Choke

For output filter smoothing or L.F. coupling (maximum D.C. 60 m.a.) A small general purpose choke encased in beautiful GREEN BAKELITE. For portables and other receivers where space is limited. D.C. resistance 400 ohms. Inductance 25 henries. Maximum D.C. 30/60 millamps. Size $2 \times 2\frac{1}{2} \times 2\frac{1}{2}$ ins. high. List No. DY25

12/6



The "HYPERMITE"



The "HYPERCORE"

BUY R.I. THE BEST—THEY COST NO MORE AND ENSURE SATISFACTION

THE ADVERTISEMENT OF R.I. LTD., MADRIGAL WORKS, PURLEY WAY, CROYDON.

'Phone: Thornton Heath 3211.

GREATEST RADIO SENSATION

3-VALVE SET OBTAINS OVER 60 STATIONS ON LOUD-SPEAKER WITH INDOOR AERIAL

This is the new Northampton Plating Co. Super Selective 3-Valve Loud Speaker set, which is now offered to the public. After months of careful research a circuit has been designed superior in selectivity to a screen-grid set, and yet remarkably simple. It can be used, not only for cutting out the local station, but for other disturbances, such as Morse. It is the simplest, cheapest, and most selective in the world. No soldering required or coil changing. Experts have declared it absolutely unique. Over fifty stations have been obtained on loud-speaker with aerial 20 feet high, using cheap valves, including Cardiff, Paris, Madrid, Manchester, Stuttgart, Toulouse, Hamburg, Glasgow, Frankfurt, Rome, Langenberg, Berlin, Brussels, Hilversum, Kalundborg, Königswusterhausen, Radio Paris. These were obtained 3 miles from Daventry while 5GB was working. Thousands of novices with no knowledge of wireless have built the old Northampton Plating Co. Super 2 and 3 in all parts of the world, and have been astounded by the results even with cheap components, but the new Super Selective 3 makes other sets old-fashioned and marks the greatest improvement in valve sets for years. Orders have poured in from all parts of the world, including America, Turkey, Gold Coast, and Nigeria. In order to give everyone the opportunity of testing out the new circuit, two 6d. Blueprints, one for new Super Selective 2 and one for Super Selective 3 Valve, will be supplied for 3d. each.

NEW SUPER 4-VALVE PORTABLE SEPARATES TWO BROOKMANS PARK STATIONS UNDER THE AERIALS

This is the latest model circuit by the Northampton Plating Co. offered to the public for the first time. It has been specially designed to satisfy the requirements of the new Regional stations. Owing to its wonderful selectivity, it requires no wavetrap and obtains under favourable conditions a large number of Continental stations at loud-speaker strength, including Toulouse, Hilversum, Eiffel Tower, Königswusterhausen, and Radio Paris. At less than half the price of a high-class portable set, it is acknowledged under severe technical tests to be far superior. In order to show what marvellous results can be obtained, the set was placed between two aerials at the entrance to Brookmans Park, and the two programmes were easily separated. The set was also taken on a 1,000-mile motor tour over England and Wales. On the south coast and east coast many stations were easily obtained on loud speaker at good strength. Even in Wales, where reception is difficult, excellent results were also obtained. In order that everyone may be able to construct this unique portable set, a full-size shilling Blueprint, with details and instructions, can be obtained from Northampton Plating Co. for 6d. Letters must be fully stamped. NAME AND ADDRESS IN BLOCK LETTERS.

TRADE SERVICE AGENTS WANTED.

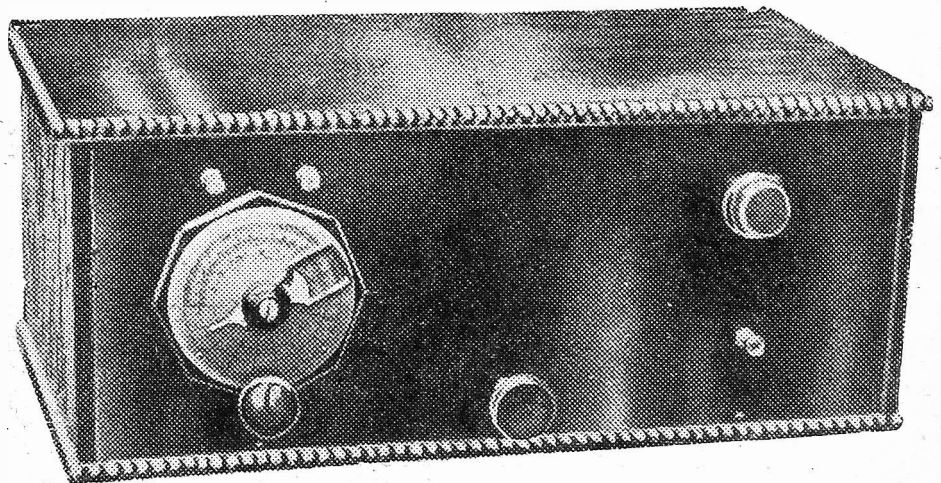
READ THESE TESTIMONIALS

It may, perhaps, interest you to know that I had my 3-valve set converted to your circuit some months ago, and I have logged over sixty stations on the loud speaker. When I tell you that I only have an indoor aerial and the gas bracket for an earth you will understand this is a remarkable achievement, particularly as I am situated practically on the top of the tram wires and electric railway a couple of hundred yards away. I am certainly troubled with noises as the trams come up the street, but this, I presume, is only to be expected.—C. R. A., Birkenhead. 5.1.31.

Thanking you for goods of such excellent value received so quickly and well packed. I have made your 2-valve set and am quite astonished at the result.

Working at 12 volts for the highest in most cases I have received well over 30 stations. Each of these with the greatest quality. I am using a poor little indoor aerial slung too near the wall and ceiling. Wishing you greatest success.—N. M., Herne Hill.—7.1.31.

I have examined the above testimonials, and am satisfied that these are genuine communications.—Advertisement Manager, Daily Newspaper.



SPECIAL WIRELESS AND CYCLE BARGAINS

| Usual Price. | Sale Price. |
|-----------------------------------|-------------|
| 10/- Latest Type Cabinet, 12 by 8 | 4/11 |
| 5/- Ebonite for same, 12 by 8 | 3/- |
| 5/11 Transformer | 3/6 |
| 4/6 0005 Variable Condenser | 2/11 |
| 2/- 002 Condenser | 10d. |
| 1/6 0003 | 10d. |
| 1/- Grid Leak, 2-meg. | 10d. |
| 1/3 Anti-Mic. Valve Holder | 9d. |
| 1/3 Rheostat | 9d. |
| 2/- Indoor Aerial | 9d. |
| 2/- Earth Tube | 1/6 |
| 50/- Guaranteed Phones | 4/11 |
| 1/6 S.M. Dial | 1/11 |

| Usual Price. | Sale Price. |
|--|-------------|
| 17/6 New Cossor Type Long-wave Coils, pair | 9/6 |
| 7/6 Volume Control | 3/11 |
| 7/6 H.F. Choke | 3/11 |
| 2/6 Daventry 5 G B Coil | 1/3 |
| 10/6 6-volt Amplion Valve | 3/11 |
| 12/6 Cone Unit | 6/11 |
| 12/6 Cone Speaker Cabinets | 7/11 |
| 2/- 12-in. Coax Speaker Frets | 11d. |
| 3/- 15-in. Cone Speaker Frets | 1/11 |
| 7/6 Old Cossor Type Coils | 3/11 |
| 15/- Old Cossor Type Cabinets, 21 by 7 | 7/11 |
| Ebonite for same | 3/11 |

| Usual Price. | Sale Price. |
|------------------------------------|-------------|
| 12/6 Mullard Type Cabinet, 18 by 7 | 6/11 |
| 7/6 Aluminium Panel, 18 by 7 | 3/11 |
| 17/6 Dual Coil for M.M.3 | 12/6 |
| Triotron Dull Emitter Valve | 4/11 |
| 5/- Cycle Tyre | 2/6 |
| 2/6 Cycle Tube | 1/3 |
| 6d. Panel Transfer | 3d. |
| 6/6 Double-reading Voltmeter | 3/11 |
| Triotron Super Power Valve | 6/6 |
| 15/- Titan Coil | 9/11 |
| 9/- 60-volt H.T. Battery | 3/11 |
| 12/6 100-volt H.T. Battery | 6/11 |
| 15/- 120-volts H.T. Battery | 7/11 |

| Usual Price. | Sale Price. |
|------------------------------------|-------------|
| 5/6 2-volts Accumulator | 3/6 |
| 2/- Accumulator Carrier | 11d. |
| 4/6 Neutralising Condenser | 2/11 |
| 4/- Reaction Condenser | 2/6 |
| 5/- Diff. Reaction | 2/11 |
| 2/- Loud Speaker Cord | 11d. |
| 2/- Phone Cord | 11d. |
| 6/- S.L.F. Condenser | 3/11 |
| 21/- D.C. Eliminator, 15 milliamps | 17/6 |
| 4/- A.C. Eliminator, 20 milliamps | 59/- |
| 17/6 Electric Iron, Weight, 5lb. | 7/11 |
| 30/- Cone Speaker | 9/11 |
| 25/- Electric Heater | 9/11 |
| Phones Repaired | 2/6 |

Parts supplied for all sets at Reduced Prices. Send now to avoid disappointment. Cash with order or C.O.D. Special terms to those making sets. All goods guaranteed and exchanged if not satisfactory. Inquire for anything you want. Trade supplied. Send for our wonderful Bargain Price List, P.W.

Trade Service Agents Wanted.
Owing to the enormous number of inquiries and orders, write clearly Name and Address in Block letters to the firm that made Radio popular. Letters must be fully stamped.

NORTHAMPTON PLATING CO. (Radio and Cycle Manufacturers), NORTHAMPTON.

MAKE YOUR SET ALL-ELECTRIC BY FITTING THE NORTHAMPTON PLATING CO. SUPER A.C. H.T. ELIMINATOR WITH TRICKLE CHARGER

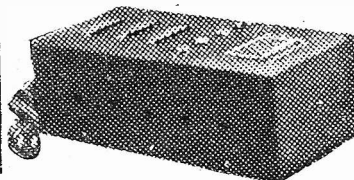
SPECIAL OFFER: 7 days' approval to test. This unit value £7 will be sent to any address on payment of £4 5 0 cash, or C.O.D., with the guarantee that if it is not superior to other units on the market and not giving complete satisfaction the money will be instantly refunded if returned undamaged. It is most silent in operation. Trade inquiries invited. STATE MAINS VOLTAGE AND CYCLES and VOLTAGE OF ACCUMULATOR.

Easy payments arranged.

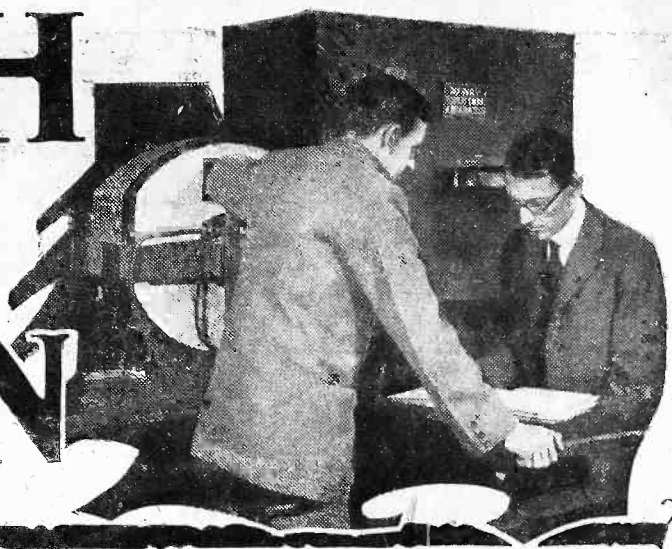
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SPECIAL OFFER 7 days' approval to test. This A.C. eliminator, value £4 will be sent to any address on payment of 59s. cash or C.O.D., with the guarantee that if it is not superior to other eliminators on the market, and not giving complete satisfaction the money will be refunded instantly if returned in good condition and undamaged. It is guaranteed

to be most silent in operation, giving over 20 milliamperes and suitable for 2-, 3-, and 4-valve sets. Test it for yourself. Trade inquiries invited. State mains voltage and cycles. Easy payments arranged.



The BIRTH of an ELECTRON



IN wireless work we continually make use of electrons—those invisibly minute particles of negative electricity which are emitted from the heated filament of a valve. The electrons form the anode current which eventually passes to the loud speaker and brings about the reproduction of broadcast music.

We all know that electrons form part of the atoms of any material substance and that by heating a substance—such as the valve filament—we may readily provide a source of free electrons which we can use for our particular requirements.

But it is only comparatively recently that we have learned much of the actual structure of the atom in which the electrons themselves play so vital a part.

Miniature Solar Systems.

Inasmuch as the electrons consist of, or at any rate "carry," negative electricity whilst the atom as a whole is electrically uncharged, we are obliged to conclude that the atom comprises in its make-up an amount of positive electrification equivalent to the negative electricity represented by the whole of its collection of electrons. Some few years back it was customary to regard the atom as consisting of a collection of electrons performing various evolutions within an imaginary "sphere of positive electrification," but we knew little of the nature of this supposed sphere.

More recently our conception of the atom was revised, and the atom was regarded as consisting of a central core or nucleus of positive electrification, surrounded by the negative electrons, these latter moving in their prescribed courses or orbits after the general fashion of the planets.

How are They Held?

Even this conception, however, was open to certain objections and more recently still our idea of the nucleus has been still further modified by the assumption of what we may call a sub-nucleus, this sub-nucleus being regarded as a concentrated store of force. Inasmuch as the electrons are negatively charged, we must regard the particles in the nucleus as being positively charged; these positively charged particles are sometimes called *protons*.

We can appreciate in a general way how the negative electrons are held in their orbits by the attraction of the positive nucleus, but in order to understand how the positive protons in the nucleus are held

Myriads of tiny particles surging round the various circuits in your radio set! That is the picture conjured up in this fascinating article. By Dr. J. H. T. ROBERTS, F.Inst. P.

in their prescribed relationships to one another—since their positive charges would presumably cause mutual repulsion between them—we have to assume that they in turn are held by the attraction of the concentrated store of force which, as I mentioned above, we now call the sub-nucleus.

Ordinarily an atom is a singularly peaceful and stable structure, but occasionally—for reasons which are so speculative that they amount practically to mere chance—an atom will "explode," in the sense that it will emit one of its positively charged

second. Of course, the alpha particle in ordinary circumstances never gets very far, although actually its velocity is enormously greater than any velocities which we can impart to material bodies.

The speed of a high-velocity shell, for instance, is of the order of about one mile per second, whilst theoretically a projectile fired vertically upwards with an initial velocity of about seven miles per second would pass completely out of the range of the earth's attraction and never return.

A Direct Hit.

If one of these alpha particles happens to make a direct "hit" upon another atom, it may penetrate right into the innermost parts of the atom and cause a disruption somewhat similar to that which originally released the alpha particle itself.

Sometimes an atom will release or expel one of its electrons, and when this happens the expelled electron is known as a *beta particle*. In some cases these beta particles come out from the atom with definite velocities, but in other cases their velocities appear to be quite indiscriminate.

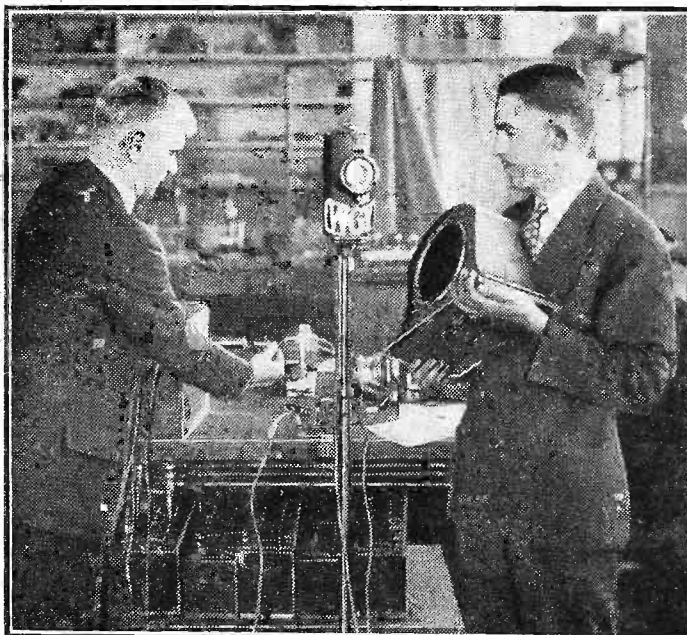
The electrons which come out with definite velocities have enabled us to learn a good deal about the construction of the electronic systems of the atom, and there is a good deal of evidence to indicate that the outer parts of the atom are divided into separate regions.

Storehouse of Energy.

We also know that in certain circumstances an electromagnetic radiation will proceed from the atom, this radiation being

called a *gamma ray*. Gamma rays are regarded as being identifiable with other forms of ether-vibration such as light, heat, radio-waves and X-rays, being more nearly akin, however, to X-rays of excessively short "wave-length."

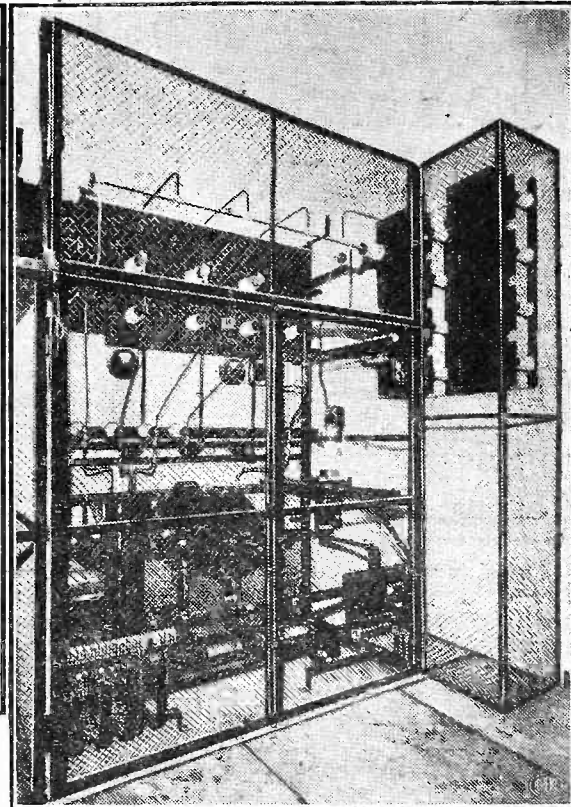
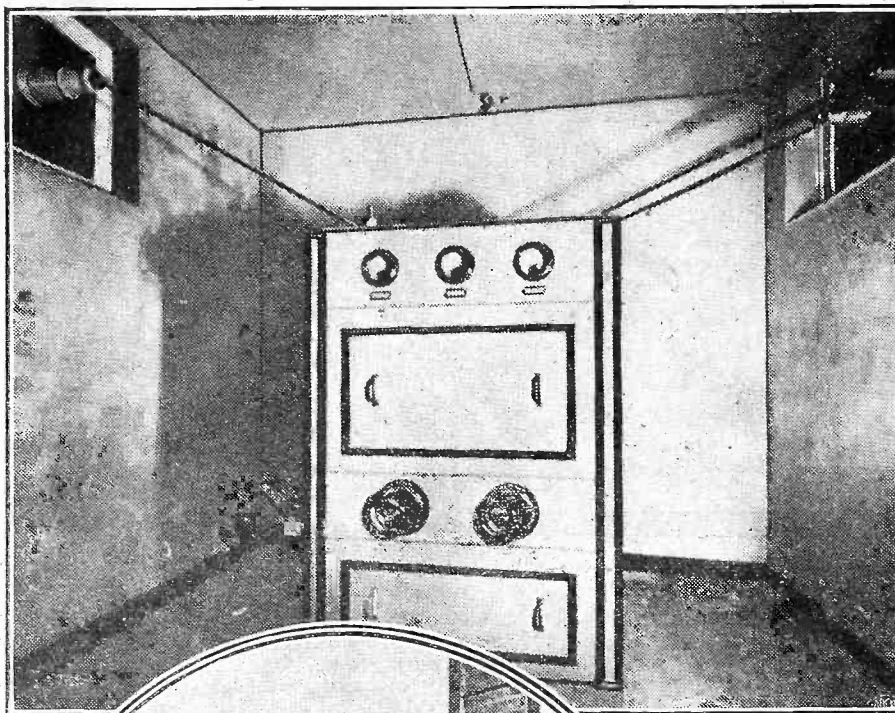
VOICE OF THE ATOM BROADCAST.



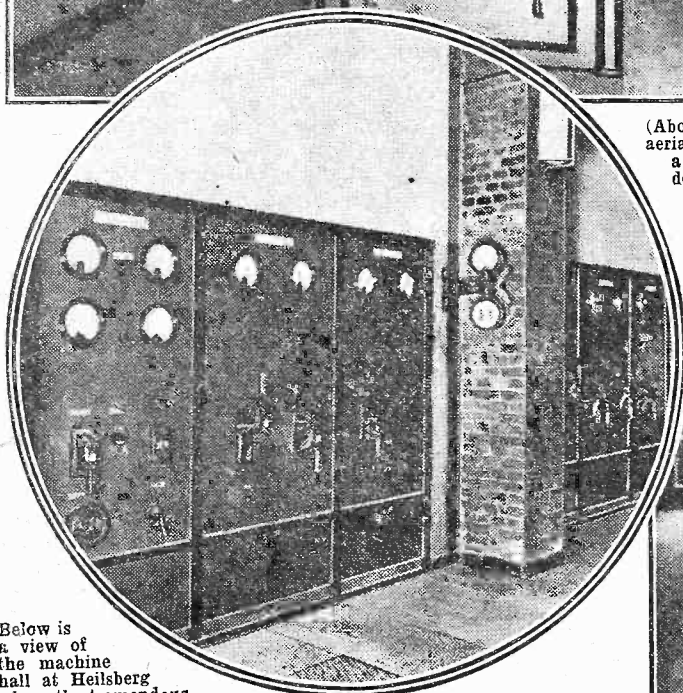
An interesting experiment in New York, when the noise made by an atom exploding was broadcast.

particles; such a particle when so emitted is known as an *alpha particle*.

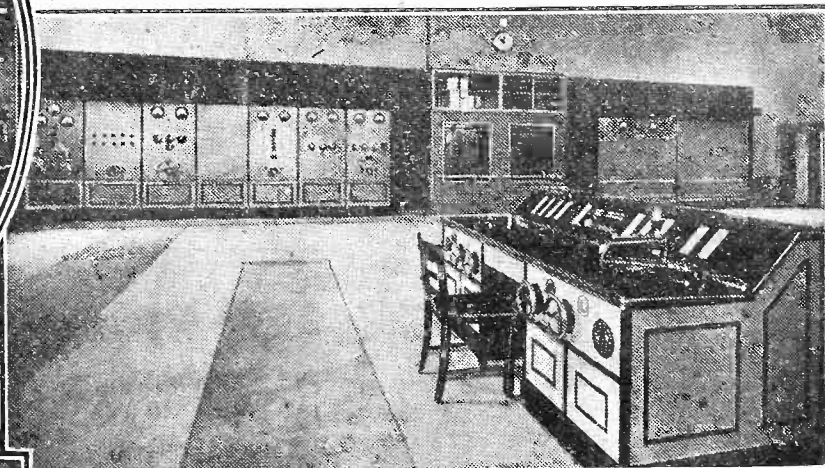
This alpha particle may come out from the atom with a very high velocity, in some cases even as high as $\frac{1}{10}$ th of the velocity of light, that is, about 10,000 miles per



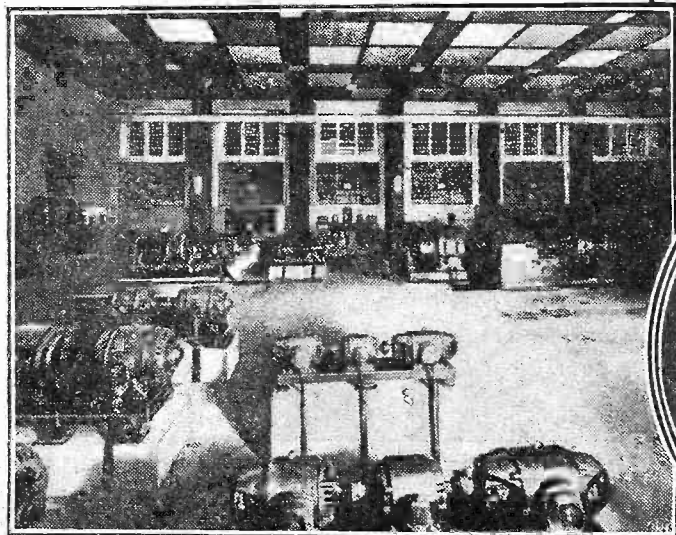
(Above) The inside of the aerial coupling cabin; (right) a special switchboard that deals with 10,000 volts H.T.; and (left) a view of some of the main switchboards whence the alternators are controlled.



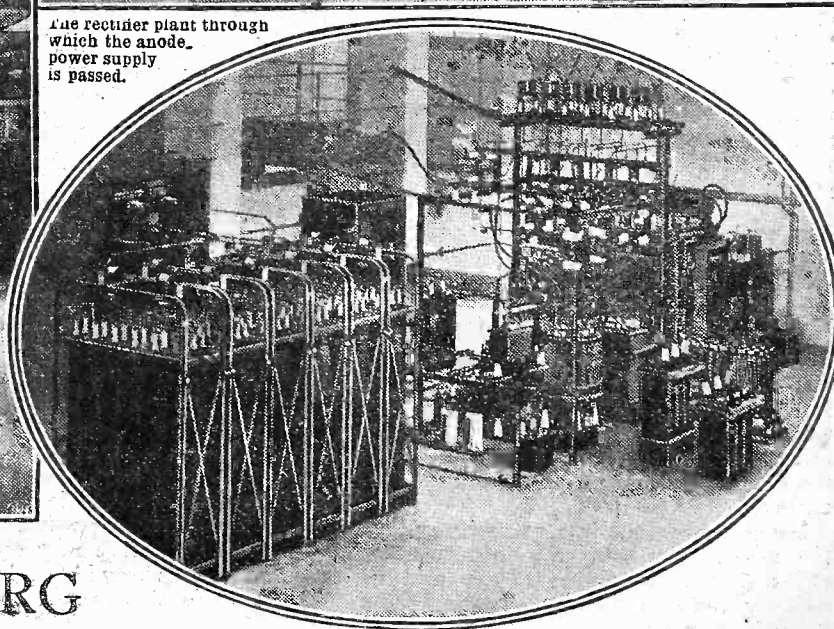
Below is a view of the machine hall at Heilsberg where the tremendous electrical power needed for the operation of the station is handled.



In the illustration below we see the control-desk in the new transmitter hall. At this desk the engineer-in-charge can check up the functioning of the whole installation.



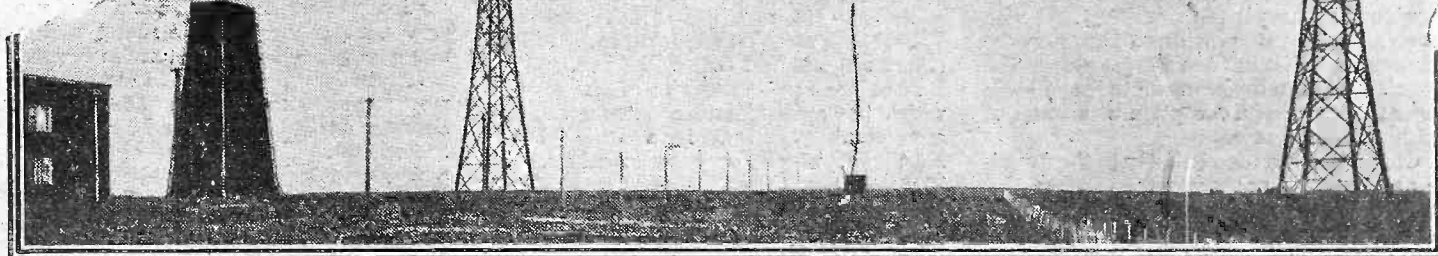
The rectifier plant through which the anode power supply is passed.



SEEN AT HEILSBURG

HEILSBERG

GERMANY'S SECOND REGIONAL



THE starting of a high-power wireless station at Heilsberg, a little town of around 6,000 inhabitants, about 47 miles from Königsberg, is an interesting event to the wireless world. Not only because it is another of the chain of nine powerful transmitters, expected according to the new Regional scheme to cover the whole of Germany, but on account of some distinctly novel features embodied in it.

The aerial output of the station is 75 kw. This high power is produced by an eight-stage transmitter, and may be at short notice raised to 150 kw.

Crystal Controlled

The first stage is crystal-controlled, its output being 1 watt, at an anode tension of 200 volts. This crystal control will warrant constancy of wave-length.

The second and third stages are amplifier stages, the former with an output of 10 watts and an anode tension of 300 volts, and the latter with an output of 150 watts and 4,000 volts anode tension. The fourth stage serves for "doubling," with an output of about 300 watts and an anode tension of 4,000 volts, which is also used on the fifth and sixth stages.

The fifth is an amplifier stage with an output of about 1 kw., and the sixth stage serves the same purpose with an output of 2.5 kw. The transmitter is modulated—by varying the grid potential—in the sixth stage, while the seventh is for amplification with a 10-kw. output and an anode tension of 10,000 volts.

The eighth and final stage has a telephony output of 75 kw., its anode tension also being 10,000 volts. The high frequency modulated in the sixth stage thus has to go through three amplifier stages before being radiated from the aerial.

Checking Quality

Inasmuch as the circuits of the various stages are only slightly damped normally, the side-bands of modulation would be cut off in them. To avoid this, there have been inserted into the circuits special damping resistances increasing the decrement to the limits compatible with a satisfactory transmission.

In addition to loud speaker check on the quality, there are instruments for checking

Here are some interesting details about the famous East Prussian broadcaster, which has recently been heard in all parts of this country. On the opposite page a selection of photographs of the new station is provided.

By OUR SPECIAL CORRESPONDENT.

modulation. Thus a perfect transmission is always ensured.

The station building is T-shaped, the short stroke of the T containing several armoured rooms, in which are instruments for making delicate measurements. The longitudinal stroke of the T comprises the transmitter building, which is separated by a partition from the machine-room.

In the centre of the transmitter section there is the switch desk, which carries the signalling devices of the transmitter, controls for the generators, measuring instruments, and the telephone exchange.

Power for the transmitter is supplied from the high-tension system of the local power

plant, the voltage being conveniently reduced to a normal figure of 380 volts, which is kept constant by self-controlled transformers.

A Diesel engine set of 640 kw. is resorted to at times of peak load, and supplies either the whole or part of the necessary power. In the latter case it is connected up in parallel with the power mains system.

The accumulator switchboard is also accommodated in the transmitter-room. The accumulators themselves, inclusive of emergency lighting batteries, are installed in a special room in the basement, where also is the valve-cooling plant.

Cooling the Anodes

It will be readily understood that special importance attaches to the cooling of valves, any alteration of the cooling water due to either physical or chemical phenomena having to be guarded against. This is why an internal water circulation by means of distilled or rain water has been provided for the actual cooling of the valves. The pipe system is made of copper.

Water is forced from a reservoir through the valves by suitable rotary pumps, and after being led through a counter-flow surface cooler is returned

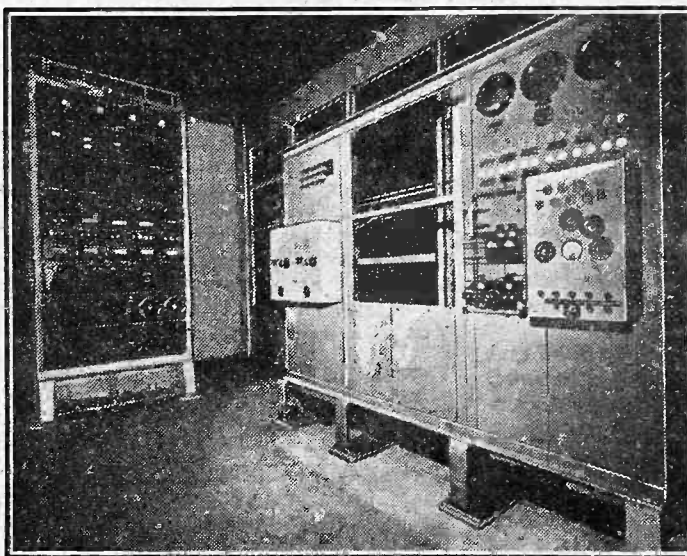
to the pumps. Cooling of the pipe system of the counter-flow cooler is effected by water.

A power line carried on wooden masts connects the transmitter to the aerial coupling cabin situated right under the aerial. This cabin, as well as the two masts, is constructed of pitch-pine and screwed down with bronze screws.

The aerial is about 84 ft. long, is 330 ft. above the ground. It can be earthed from the switch desk in the transmitter building.

The station works on a wave-length of 276.5 metres, corresponding to a frequency of 1,085 kilocycles.

KEEPING AN EYE ON IT!



One of the amplifiers at Heilsberg, and the instruments by which a close check on the transmission can be carried out.

STATIONS WORTH HEARING.

Some practical distant programme notes compiled by a special contributor who rightly searches the ether in order to obtain really practical and up-to-the-minute information.

By R. W. H.

THE outstanding feature at the moment in long-distance reception is the way in which the American stations are coming in. Now is the time for those who have never heard speech and music on the medium wave-band from the far side of the Herring Pond to buckle down to it and score their first successful reception at a range of 3,000 miles and more.

Old hands who used to listen to the American stations five or six years ago will be glad to hear them again. They are not yet quite so strong as they were then; many of you will remember that in those days, though there was no U.S.A. station with a power of more than 5 kilowatts, and few that went beyond 1.5, good reception on single-valve sets was recorded by hundreds of people in this country.

To-day, a good stage of H.F. is required as a rule. Signal strength appears to be on the increase, and we may look for better and better reception during the next few weeks.

Finding the Americans.

Here is a tip about finding American stations. Don't just search from end to end of the band, using what a fly-fisherman would call chuck-and-chance-it methods. Make out a list of likely stations before you start, putting in their approximate condenser settings. This is easily done from the condenser readings for European stations that you already have.

A good list for the present time is the following: W E A F (454 m.), W L W (428.5 m.), W G N (416.6 m.), W G Y (380 m.), W A B C (348 m.), K D K A (306 m.), W B Z (303 m.), W T I C (282 m.), W P G (272.6 m.) and W I O D (230.6 m.).

Here are some examples of the way in which the approximate condenser settings are found. W I O D is a little below Nurnberg, which everyone receives, and if you can get Cork's setting it is just a little above his.

On Long Waves.

W P G is just below Heilsberg (W P G, by the way, is the most powerfully received of American stations at the moment), W B Z requires practically the same setting as Bordeaux Lafayette and is just below Cardiff. K D K A is a tick above.

To show you how well stations are coming in I may say that I made a list of twenty-five possibles the other night and picked up nineteen of them, mostly at excellent strength, in less than an hour.

To come back nearer home, European stations are coming in in the most marvellous way, better in fact than they have ever done for years. All of those that I mentioned last week are still fine signals, and I have a few additions for you.

On the long waves, Lahti is now very well heard in many parts of the country, though the strength of the station is not constant.

but may show quite large variations from night to night. Warsaw is usually strong, and Oslo deserves attention. One of the most astonishing transmissions is that of Moscow Trades Union on 1304 metres, which must be using enormous power on certain nights during the week. If only the station would provide more entertainment and a smaller ration of dreary speeches he would be worth listening to.

Loud Low-power Stations.

On the medium band, Rabat shows good strength on most nights and Prague is coming in as well as he did a couple of years ago. Langenberg is a fine signal, and you may get a surprise if you tune in Brünn.

If you want three good tests I can recommend Augsburg on 559.7 metres, Dresden on 319 metres, and Flensburg on 218 metres. The first two of these have a power rating of only .3 kilowatt, whilst the last is a .6 kilowatt station. All can give good loud-speaker reception if there is enough H.F. available.

STUDIO NOTES

Piano Quality—Echo problems—etc.

One of the most difficult types of broadcast is a talk at the piano, and the B.B.C. has lately been using a condenser microphone for this class of broadcast.

Ordinary hair felt of rather loose texture is largely used to line the walls, ceilings, etc., of studios.

Light curtains hanging in loose folds in front of the studio walls have been found to present an undesirable buzz that for a long time made speech and piano music very difficult to broadcast together.

THIS week I have an unusually large batch of queries, mostly on subjects of general interest, but I do not propose to answer them all in view of the numbers. To take the more interesting, however, may I mention these?

First, one reader wants to know whether it is worth while learning Morse, or whether he will find, after having done so, that most of the short-wave transmissions are in code, thus rendering the knowledge of Morse worthless. Naturally, the greater part of the commercial traffic is handled in code, but surely the amateurs alone are sufficiently interesting to make Morse worth while?

Learning Morse.

There are some 40,000 amateurs on the face of the globe, I believe, although probably only a small percentage are active. The vast majority of them use Morse, and by logging "DX" for amateurs you will hear countries that you would never otherwise log at all.

The same reader mentions G B W and W M C on 9,000 kilocycles or thereabouts, with a query as to their location. The latter must be W N C, Ocean Township, N.J., who works telephony with G B W (Rugby) on frequencies of that order. The wave-lengths are 30.64 metres for G B W and 30.77 for W N C.

"E.B." of Southampton is an enthusiast who appreciates the necessity for using common-sense in laying out a receiver.

SHORT-WAVE NOTES

By W. L. S.

He mentions that he spent two whole evenings planning the layout of the parts on the baseboard, and the soldering of every wire was a matter for several minutes' careful thought! As a result he has a short-waver that is "a real delight to handle."

If a few more listeners took as much trouble as this there would be fewer threshold howls, hand-capacity troubles, and general calls on the doctor.

The most interesting part of "E.B.'s" story is that, although he uses no screening at all, and nothing unconventional in the entire set, he has yet to hear a howl, and his "bag" is a large one.

Transatlantic Shortwavers.

And now to business. Readers who have short-wavers of the "ultra" class (by which I mean those who scorn to tune above 40 metres) should mend their ways at once. The longer waves are going through a very fine period just at present, and the American broadcasting stations in the region of 50 metres have never come across at better strength.

The 80-metre amateur wave is also an eye-opener, since the North Americans come in well from midnight, right through to 9 or 10 a.m., and are at their best between 7 and 8 a.m.

For this reason, instead of giving the "Weekly Five," I am giving a list of the American stations that one can expect to hear on a good night, with their exact wave-lengths for calibration purposes.

Big Noises.

49-02, W 2 X E, Long Island; 49-34, W 9 X A A, Chicago; 49-5, V E 9 C L, Winnipeg; 49-5, W 3 X A U, Philadelphia; 49-83, W 9 X F, Chicago; 49-18, W 3 X A L, Bound Brook, N.J.; 49-34, W 2 X C X, Kearny, N.J.; 49-5, W 8 X A L, Cincinnati; 49-67, W 2 X A L, Coytesville, N.J.

Rather below this little group is the really big noise, W 8 X K, East Pittsburgh, relaying K D K A on 48.86 metres. He is usually the strongest of the whole lot, and is very reliable.

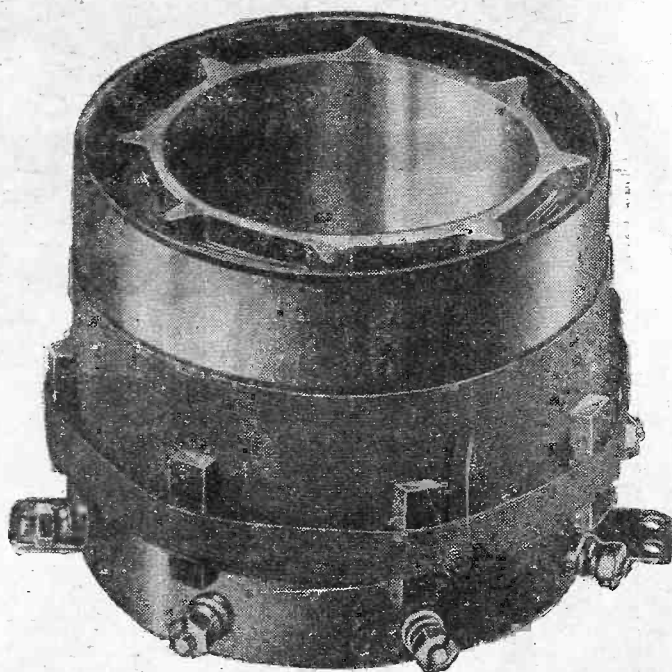
Quite by accident I came across a map showing the future disposition of the World's long-distance wireless telephone services. From it I see that the Buenos Aires station (which I mentioned last week in this connection) will be running services with Paris, Madrid, and Berlin. "Trans Radió" will soon be in regular operation. Incidentally, his distance from London is 6,000 miles.

MADE BY READY RADIO—YOUR GUARANTEE OF HIGHEST EFFICIENCY

The "P.W." Dual Range Coil

The high-efficiency coil which is used so successfully in many "Popular Wireless" and "Modern Wireless" Circuits. Contains medium- and long-wave windings and reaction. Gives high selectivity and eliminates the usual "dead-end" losses. Suitable for most modern circuits. Fitted with two brackets for simple baseboard mounting. PRICE **12'6**

No Ready Radio Coil leaves our test-room until it satisfies the conditions laid down by "Popular Wireless," and has received an actual broadcast test.



Price **12'6**

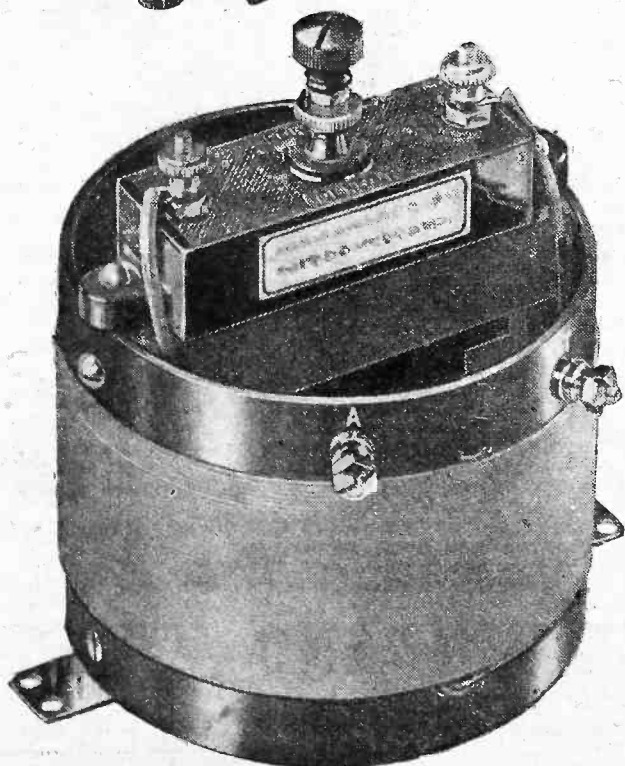
Ready Radio

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Telephone: Hop 5555 (Private Exchange)

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Price **5'9**



THIS "P.W." REJECTOR REALLY DOES CUT OUT LOCAL INTERFERENCE

Cut out that local with the new "Popular Wireless" Brookmans Rejector. It definitely eliminates local interference and improves distant reception.

Made strictly to specification by Ready Radio—tested and approved by "Popular Wireless."

"Popular Wireless," Jan. 24th, says:—
"We have received samples of the Ready Radio 'P.W.' Rejector, and find that they are in accordance with our original specification in point of efficiency."

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Cheaper electric radio by Regentone—specialists in all-electric radio! Three new Mains Units added to the Regentone range. Three new Mains Units which fit inside any portable.

Prices lower than ever before for such high quality in electric radio. Now it costs only £2 : 12 : 6 to electrify your portable for D.C. Mains (Model II); £4 : 15 : 0 for A.C. Mains (Model W.5.A); or Model W.1.D. (H.T. only, 3 fixed tapings) price £3 : 7 : 6.

These additions to the famous Regentone range, known wherever radio is known, give you electric radio at its cheapest and best. Write for FREE Art Booklet, with colour supplement "Cheaper Electric Radio by Regentone"—or get it from your dealer.

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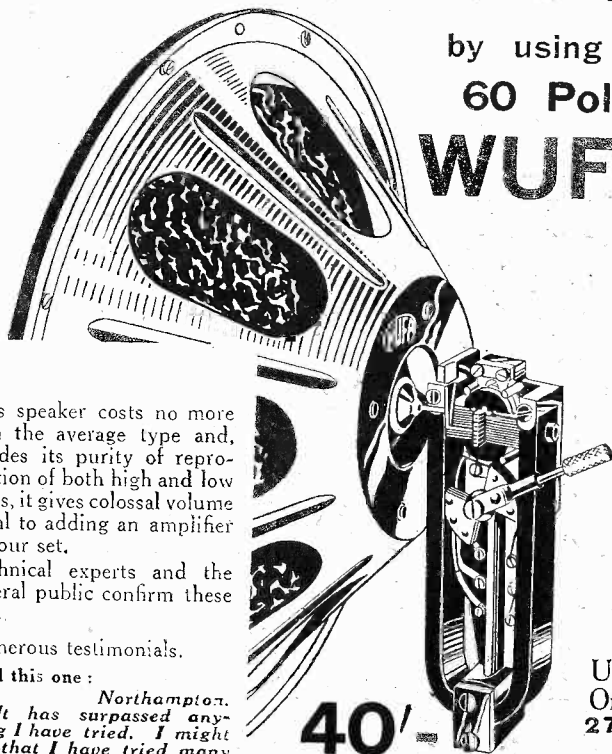
E.W.G.

FREE AMPLIFICATION

by using a

60 Pole

WUFA



This speaker costs no more than the average type and, besides its purity of reproduction of both high and low notes, it gives colossal volume equal to adding an amplifier to your set.

Technical experts and the general public confirm these facts.

Numerous testimonials.

Read this one:

Northampton.
"It has surpassed anything I have tried. I might add that I have tried many of various kinds, but I have not yet had an equal for the W.B."

40/-
Complete with Chassis.

Unit Only
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M. LICHTENBERG, Ask to Hear a WUFA—You will then want it
4, Great Queen St., Kingsway, London, W.C.2.

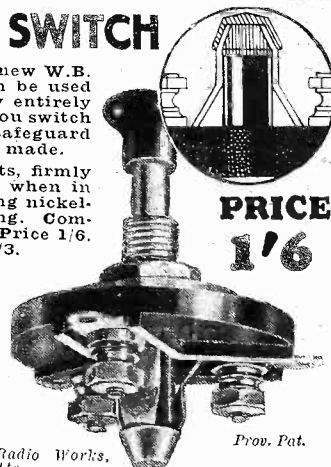
NEW W.B. 3-POINT SWITCH

Protect your valves with this new W.B. Switch. The extra contact can be used to disconnect the H.T. battery entirely from your filament circuit as you switch out the filaments—a big safeguard where adjustments are being made.

Three powerful spring contacts, firmly gripped between double cones when in the "on" position. Self-cleaning nickel-silver contacts. One-hole fixing. Completely insulated from panel. Price 1/6. 2-point model, price 1/3.



Made by the Makers of the famous W.B. Permanent Magnet Moving Coil Loud - Speakers, Cone - Speakers, and Valveholders.



PRICE
1/6

Whiteley Electrical Radio Co., Ltd., Radio Works, Nottingham Road, Mansfield, Notts.

Prov. Pat.

Well! Who Was Right?

REMEMBER that argument you had with John the other night? Neither of you would give in, and so it went on for hours and hours. But who was really right after all? You don't know, do you?

Don't argue—buy THIS AND THAT. It will tell you all you want to know about everyday subjects.

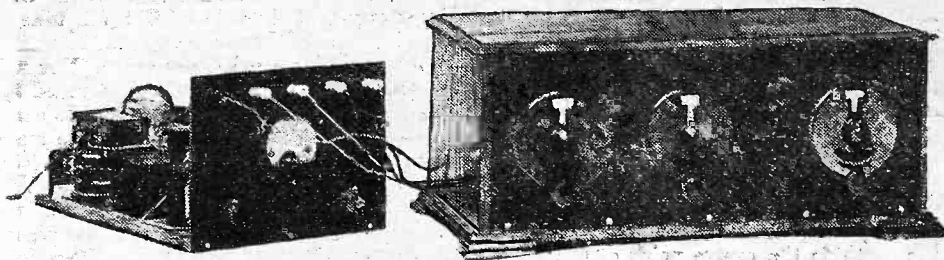
It is a paper for men and women of all ages and all classes. Bright, lively and topical—it is the paper for the million. Buy it regularly!

THIS AND THAT

Every Thursday, 2d.

GOING OVER TO

AC.



I AM frequently asked the best way to convert a battery receiver for use with mains valves, so I will try in this article to deal with the subject as simply as I can.

In my opinion, one of the best ways to convert a receiver is to do it bit by bit, so we will assume that we are dealing with the L.T. side only, the H.T. mains unit already being in our possession.

If not, it would be advisable to build this unit first, and to get used to taking the H.T. from the mains before touching the L.T. portion. This is because if hum were introduced, and you had converted the whole set at once, it would be a difficult job to find out exactly what was wrong with the set, but if you tackle the mains H.T. portion first, you will be able to deal with any little snags due to the H.T. side much more easily.

The Transformer to Use.

To commence with, if you are making a new H.T. unit you will need an all-power type of transformer which will give you sufficient L.T. for all the valves you need when the time comes to convert the filament supply to A.C.

This L.T. winding will be ignored in the construction of the H.T. unit, and you can go ahead and use your battery valves with the mains H.T. supply till such time as you desire to start the alterations of the filament wiring and the substitution of indirectly-heated A.C. valves.

I am taking, for a definite illustration of changing over, a set which was recently published in *POPULAR WIRELESS*—the "Contradyne" Three. It will be noticed, of course, that this does not use a screened-grid valve, and in the changing-over process the user of a screened-grid valve set may meet some snags.

In the first place, the A.C. screened-grid valve has a far greater amplification factor than its battery brother, and consequently very much better screening has to be employed in order to prevent feed-back between the anode and the grid circuits.

Sets with S.G., H.F. Stages.

Another thing is that with the exception of one or two models the impedance of the A.C. screened-grid valve is so much higher than that of the battery model, and therefore calls for a higher impedance anode circuit if full advantage of the magnification factor of the valve is to be taken.

In the case of a battery set using two screened-grid stages, the best thing one can do, in considering the change-over to A.C., is to leave it alone. That may sound Irish,

It often occurs that one wishes to convert a battery set to operate from A.C. mains, but many people fight shy of the idea. That it is not difficult, however, is shown in this article, which deals with a well-known circuit and its conversion for mains operation.

By K. D. ROGERS.

but it is really necessary in 99.9 out of 100 cases to re-design the whole H.F. side of the set if you are hoping to get good results on A.C.

The average screened-grid valve set is not designed for A.C. working, and far too many cases have come to my knowledge of set owners who have blithely gone ahead and converted their sets to A.C., only to find that they became absolutely uncontrollable.

But the detector and two L.F. type, or even the H.F. detector and L.F. type, can be converted without much trouble. As I said before, the H.F. may want a bit more screening, but this is quite obvious screening and can be carried out fairly easily, when only one screened-grid valve is being employed.

How to Set to Work.

But to return to the set we are taking as an example. We will assume that not only have we decided for some reason or other to convert it bit by bit (one valve at a time), which is very easily done, but that because our first L.F. valve is "packing up" we start there, and use our first indirectly-heated A.C. valve in the first L.F. stage.

What do we have to do? Well, it is delightfully easy, for there are two ways of going about it. One is to build a little adaptor which will plug into the socket of the present four-pin holder so that one can

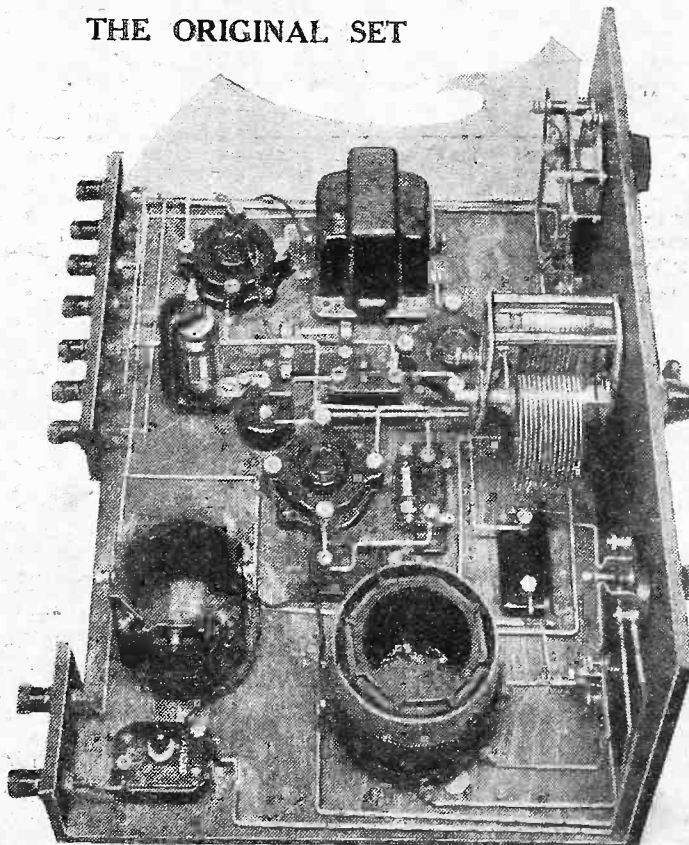
change rapidly over from A.C. to D.C. valves and note the difference, and the other way is to take out the four-pin valve socket and insert a five-pin holder, and re-wire.

We will assume we do the latter. The re-wiring of the holder is exactly the same except for the filament contacts, and in this case they will not be connected in parallel with the filament wiring of the rest of the set, a twisted flex lead is taken from the two filament terminals of the valve holder to the L.T. side of the mains transformer.

L.T. Transformer.

And here let me add that if you have got an ordinary H.T. mains unit which you have been using for some time, and it has not got an L.T. winding, one can get an L.T. transformer from many of the leading transformer makers, so that there is no need to scrap the old unit. Personally, I am using (Continued on next page.)

THE ORIGINAL SET



This is the battery model "Contradyne" Three, described in "Popular Wireless" No. 439. The theoretical circuit, showing the alterations for A.C. conversion, is given on the next page of this article.

GOING OVER TO A.C.

(Continued from previous page.)

an A.C. set in which the L.T. transformer is quite separate.

There is one thing to look out for, however, when getting a transformer, and that is that it should be as constant as possible over varying loads. It should be able to supply the total number of valves you are going to have in your set at 4 volts 1 amp., but should not rise in its voltage at all considerably when you come down to only two or even one valve.

Compensation for Varying Load.

Of course, the voltage will alter a bit, so when you are converting your set one valve at a time it is just as well to put a filament rheostat of the heavy variety—there are quite a number to be got from ordinary wireless dealers, and some of the old Burndepts will do very well—having a maximum resistance of about 6 ohms, in series with the L.T. supply.

of valves, or perhaps to get your dealer to test it with an A.C. voltmeter, and in this case you will know exactly how many ohms you have got to put in it. But, anyhow, you see it is not an insuperable difficulty, and you will not go far wrong if you start off with the .5 ohm.

Connecting the Cathode.

The connections to the indirectly-heated A.C. valve are exactly the same as for the battery valve (as you will see by the dotted and "full" connections on the accompanying diagram) with the exception of the cathode. This will be taken directly to earth. Also the heater wiring should preferably be earthed by connecting one side or other of the twisted flex wiring to the cathode. Very often this method of connecting the wiring is better than connecting the earth to the centre point of the secondary as is sometimes recommended.

The grid bias, of course, will have to be adjusted according to the valve you are using, which will probably be something of the A.C.H.L. or M.H.L. type. The main point to remember is that this valve is probably of higher magnification than the battery valve you have been using, and so

filament wiring goes near the grid wiring of any stage.

You will be able to take out the L.T. resistance now, for you will be passing 2 amps. and if you have got anything like a decent transformer you will be nearing the correct voltage.

Your filter output circuit will remain if you have one (in our example circuit we have not got one), and, of course, the A.C. indirectly-heated valves will all take a maximum anode voltage of 200.

And now for the detector stage. You will remember that we have already earthed the filament wiring, so there is no need to earth it elsewhere, but provision should be made in the detector wiring for either positive or zero grid bias. That is, the grid leak must be taken down from the grid of the valve to a bias plug, which is either placed $1\frac{1}{2}$ -volts positive or in the top of the plug of the grid-bias battery which goes to earth and to cathode.

Effects of Changing Over.

The wiring is carried out in just the same way, and you will find when you change over that there will be very much more magnification, because the A.C. detector usually has an amplification factor of something like 35, as against the ordinary H.F. battery-type of detector's 20.

Such types as 41 M.H.F., M.H.4, and 354 V. are suitable here.

The advantage of going over stage by stage is largely wrapped up in the increased magnification of each stage, because if any little trouble occurs at any time it will be limited to the stage with which you are dealing at the time. Consequently, if everything has gone all right up to now, and motor-boating suddenly occurs, you can fairly safely reckon it is due to the high mag. of the detector stage, and that probably some anti-motor-boating device is required in this stage, or in the first L.F. as well.

An output filter is really advisable with A.C. valves, so the next step is to fit one. The connections are simple, for one side of the loud-speaker goes to the free terminal of the condenser, which is connected to the anode of the valve and to the L.F. choke, and the other side of the loud speaker goes direct to the cathode of the valve. Do not take it to earth or to H.T. negative, because later on you may want to insert automatic grid bias, and in this event the loud-speaker impulses will have to flow through the bias resistance, and so may give rise to a reaction effect.

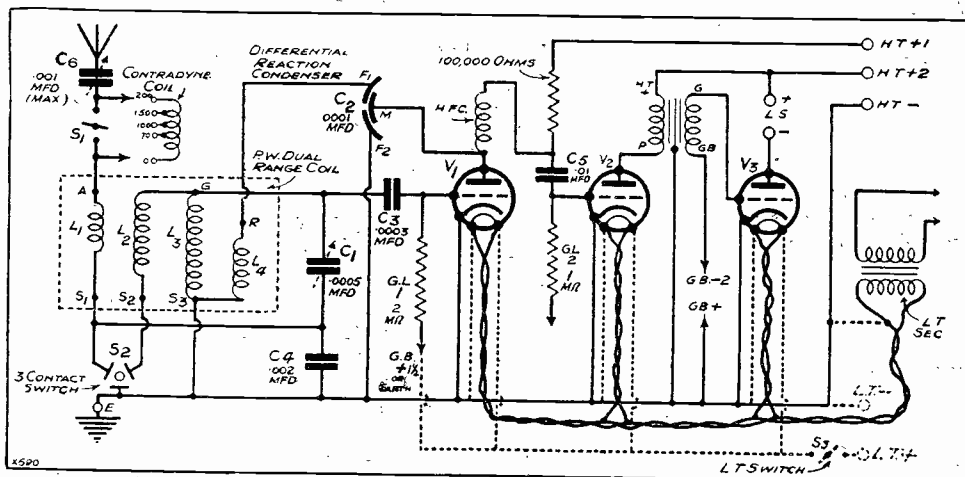
Fitting Automatic Bias.

And now about that automatic bias. This can be obtained by placing in series with each L.F. valve cathode (between cathode and earth) a resistance of 1,000 ohms. This will give 1-volt bias per milli-amp H.T. current consumed by the valve in question. The grid return is then made to the earthed wiring of the set, and each bias resistance should be by-passed by a 2-mfd. condenser.

In simple sets that's all there is to it, but I should get the A.C. valves going first with battery bias as shown in the diagram, the automatic bias can be added afterwards.

Don't forget, however, that every volt of bias obtained means a volt off the H.T. available for the particular valve in question. When the bias battery has been done away with the detector grid return, of course, is taken permanently to earth.

HOW THE CHANGE-OVER IS MADE



The circuit of the "Contradyne" Three, showing how the change to A.C. valves is made. The question of automatic bias is dealt with in the article, but as it is felt that it is best to use battery bias at first, the latter type is shown in the diagram.

Now the trouble, of course, is how you are to know when you have got 4 volts across your filament. If the transformer is a good one, and you have got it on the right mains voltage, when you have the maximum number of valves in, the L.T. will be at a pressure of 4 volts. Then when you reduce the number of valves, you can reckon it will not go over $4\frac{1}{2}$ volts even if you are only using one valve.

The Resistance to Use.

The proper way, of course, is to test with an A.C. voltmeter, but that instrument is very expensive, though it is a valuable meter to have handy. Without its aid the best thing to do is to reckon that with one valve you have got $4\frac{1}{2}$ volts, and 1 amp. is what you require for your valve.

Therefore, you have got to put a resistance in which will cut down your voltage from $4\frac{1}{2}$ to 4. You have got to drop half a volt to bring it down to 4. Therefore, you want to put in about $\frac{1}{2}$ ohm.

You may be able, when buying the transformer, either to get the makers to state the various voltages for the various number

you may overload the last valve until you change this latter for an A.C. type also.

I think it best to do the detector last, so the next stage in the alteration should be the final stage of the set.

Here the same procedure is carried out; the bias is applied as usual, for I assume that you are not going in for automatic bias at this stage of the proceeding, for it can be obtained afterwards. In the last stage the wiring is again carried out according to the diagram reproduced above.

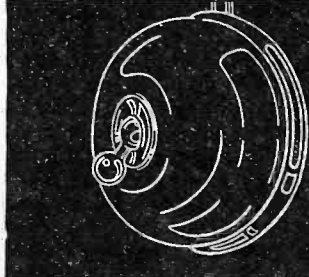
One thing which must be borne in mind, however, is that you need not use an indirectly-heated valve for the last stage, for you can employ a directly-heated one, such as the P.X.4, if desired.

Suitable Output Valves.

Good suitable indirectly-heated valves are the Mazda A.C.P. or the A.C.P.I. M.L.4, or 104 V.

But whichever type you use all you have to do is to change over your valve holder as before, wire up with twisted flex to the filament wiring of the valve which is already done, taking care in each case that no

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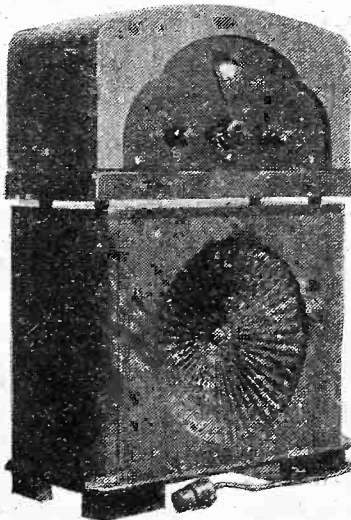
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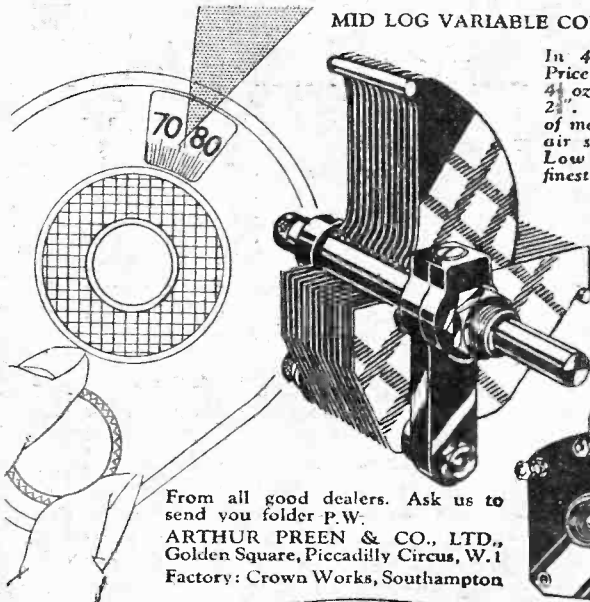
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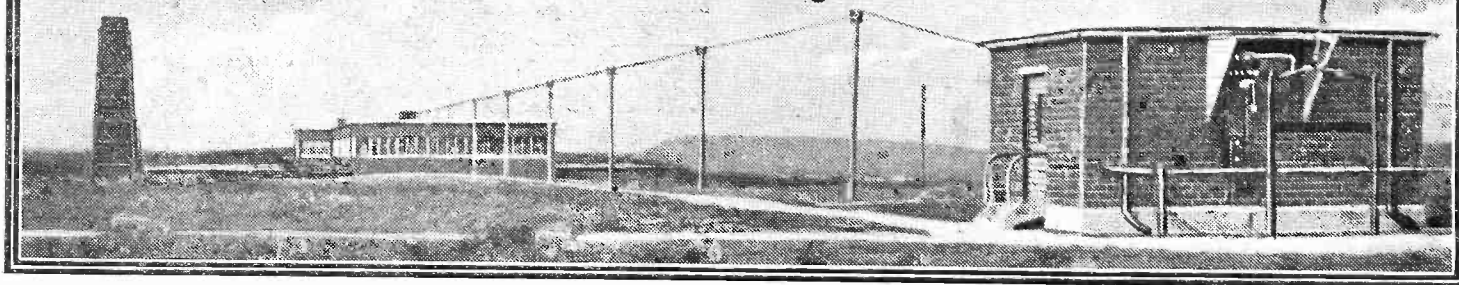
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A WORLD BUILT OF WAVES

By G.H.Daly



SOMETHING of a sensation has been caused by Sir James Jeans, Secretary of the Royal Society, who has advanced the theory that ether waves, such as light and wireless waves, are the foundation stones of the universe. He thinks that the universe is made of ether waves, of which matter is condensed or bottled-up waves, while radiation, such as wireless, light, and all the other waves of the ether, is free or unbottled waves.

The theory is especially interesting from a wireless point of view, for wireless waves are part and parcel of this radiation, which is now thought to be at the root of all matter.

Nature's Foundation Bricks.

The new theory is not precisely unexpected, for all the latest scientific discoveries, such as the presence of the ether wave in the electron, have been leading up to this point. And some time ago Sir Oliver Lodge suggested that matter was made of ether waves; in fact, he worked out a very similar theory in even greater detail, but, as was the case with his wireless inventions, the prophet hath not much honour in his own country.

In view of this new theory it is interesting to see what is known of these denizens of the ether which are to replace the electron as the latest milestone in the path of scientific progress.

When discussing ether waves it is natural to start with those we term wireless waves, and are so familiar with in their concert-producing properties; although we may now imagine that in view of their new importance, Nature must regard it almost as blasphemy for us to use her foundation bricks, as it were, to sing and shout across the world.

From 30,000 to 5 Metres.

However, that is beside the point, and we can commence with wireless waves because they are the largest and longest ether waves for which we have any practical use. There are longer waves, such as those of an alternating current machine, and some day they may be of use for giving us light and heat without wires, but at present we start off with wireless waves.

The longest waves used commercially are from 15,000 to 30,000 metres in the case of such stations as St. Assise, Annappolis and Bordeaux. Longer waves than these

What do we owe to the ether? Everything, according to the latest scientific pronouncements, which state that the whole universe is made up of "bottled" ether.

are not practicable, although Marconi once built an experimental receiver which would tune up to 120,000 metres. With this receiver he is said to have heard natural signals which possibly came from outside the earth. Probably they corresponded to the wireless echoes heard nowadays.

Wireless waves find no difficulty in penetrating brick walls, stone, wood, and earth. The longer the wave, the more easily will it

penetrate any normal obstruction. Long waves also tend to cling more to the surface of the earth than their brethren the short waves, and for this reason the long waves were regarded in days gone by as being more reliable for long-distance communication. This, however, has now turned out to be something of a fallacy, and short waves are coming rapidly into their own.

Short wireless waves, i.e. those from 100 metres downwards, are more at home when they have left the surface of the earth and are travelling in free air, and only when they come in contact with the earth do they lose their strength to any appreciable extent. They are more inclined to skim along the surface of the earth, than to

penetrate deeply like the long waves.

Of the ultra short waves below five metres nothing very much is known. They do not appear to be able to penetrate any obstacles, and appear to be limited by the horizon, i.e. a distance of 13 miles at sea-level.

It is somewhere in the vicinity of the ultra short waves that the famous death-ray is thought to exist, and certain professors have claimed to be able to kill rats and stop machinery by waves of this variety. Looking at the subject with an open mind, it appears quite possible that some day a death ray will emerge from the waves of this frequency, but as yet that day has not arrived.

Heat and X-Rays.

Beyond the ultra short waves we have the heat waves which keep us warm and which can pass through walls and steel and, indeed, most material objects, to a certain extent. After these come the infra-red rays by means of which we can take photographs in the dark.

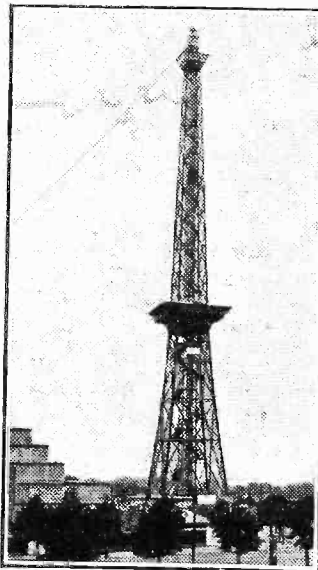
Then there are the ordinary light waves, red, orange, yellow, green, blue, indigo and violet, which together give us ordinary white light; and after these the ultra violet waves which make us sunburnt and are so useful for healing. Then follow some rays of no practical value at present, but closely on their heels come the X-rays of the surgeon which penetrate flesh and blood, but not bone, and therefore enable us to see a fracture.

What Are They?

Gamma rays of radium come next and these are proving extremely useful as a cure of cancer; until finally we arrive at the smallest and most powerful wave known to science, the cosmic ray, which comes from no one knows where, and by means of which we may some day accomplish undreamed-of wonders; at present it is but a scientific curiosity. Beyond the cosmic ray, small as it is, there lies plenty of room for a vast number of other ether rays which yet remain to be discovered, and in time to come new rays are almost certain to be located.

We call them all "waves" for convenience, but what they are waves in, or indeed, if they are waves at all, as we understand the term, is open to question.

A RADIO TOWER



The giant radio tower outside Berlin, containing lifts, a restaurant half-way up, and an observation platform at the top.

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Wh. Sch. B.Sc. (Hons. London) A.C.G.I. D.I.C. A.M.I.E.E

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A description of Mr. Barton Chapple's experiments is given in a booklet “The Elimination of Pong,” and every Constructor and Manufacturer who values pure reproduction will find this booklet highly instructive and valuable. A copy will be sent per return upon application to either of the addresses given below.

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CORRESPONDENCE.

SOME SALES SPEED!

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

SOME SALES SPEED!

The Editor, POPULAR WIRELESS.

Dear Sir,—Wishing to incorporate your new Dual-Wave Coil in my receiver, I recently purchased one from the largest radio dealers in Nottingham. It chanced to be the last in stock.

Imagine my surprise when, on unpacking it, I saw that the maker's test card was dated, "1 Jan., 1931." Allowing at least one day for transit from the makers to Nottingham, and another non-sales day (Sunday), this means that a consignment of the coils had been sold out in two days.

Surely this justifies your use of the adjective "popular" in the title of your splendid weekly, and shows it to be no vain boast.

Yours sincerely,

Nottingham.

R. C. SCRINE.

A FAULT TRACED.

The Editor, POPULAR WIRELESS.

Dear Sir,—I should like to relate my experience in building the "Double Brookmans Park" Rejector. After having completed it in a box slightly under the specified size, I found the Rejector gave too much amplification—in other words, the parts seemed to me too close to work properly.

I decided to space the components out a little more, so I mounted them on to my loud speaker cabinet, placing the condensers on the fretted front above the gauze tissue of the fretted opening.

I found to my astonishment that I could not cut 2 L.O. out, also that when I touched my set I received 2 L.O. at very great strength, yet when I took my finger off, it vanished. Presuming that my set was short circuiting, I tested it through with a voltmeter, to no avail.

After having called a friend in to look over the set, in talking I happened to touch the gauze of the speaker front with my hands, and to my amazement received full strength again from the set.

My friend immediately looked inside the cabinet and found that the three condensers were all touching

the gauze, the latter acting as a second aerial, being made of some metal thread.

Having cleared the gauze away from the condensers and wrapping the wave trap up in rubber sheeting, the set and wave-trap are working O.K.

Perhaps this little incident may be of assistance to others, as I will honestly say that it might have cost me dearly to have the matter traced by some of these so-called "wireless shops."

I certainly have found some of the articles in your book very interesting and instructive.

Yours faithfully,

Clapham Common.

S. HAYTER.

WGY GETS OVER

The Editor, POPULAR WIRELESS.

Dear Sir,—It may interest some of your readers to know that WGY America was received at approximately 2.30 a.m. Friday morning and held on 'phones until 3.15 a.m., and was still going strong when I switched off at 3.30 a.m.

WGY was received at good strength and very little fading. My reason for writing is that it was received on the ordinary medium wave-band, and is about the same reading on dial as Toulouse. So to those who have not short-wave sets, and would like a little night searching, try around with 'phones, or with a good set it would probably not be necessary to use 'phones, as the speaker would do, as my own set is only a straight three home-made Det. and 2 L.F. So with an up-to-date screen grid it could probably be put on speaker.

Hoping this will interest some of your readers. I take POPULAR WIRELESS regular, and have had many hints and much interesting reading from it.

Yours truly,

Blaenavon, Mon.

H. LEWIS.

REGARDING THOSE UNITS.

The Editor, POPULAR WIRELESS.

Dear Sir,—I note in your issue of January 10th a letter from Mr. C. Rednall, in which he asks why

makers of mains units do not stipulate the correct voltage output. As one attached to one of the principal firms making these instruments, and bearing in mind the almost daily queries of this kind, may I point out to him that this is impossible, as the voltage output is governed directly by the total consumption of the set?

With a good make of eliminator, however, he should have sufficient information to enable him to arrive at this, as in most cases a curve is supplied showing the H.T. voltage for any given consumption.

Yours faithfully,

Manchester.

R. T. DAVIES.

ORIGIN OF "DX."

The Editor, POPULAR WIRELESS.

Dear Sir,—The use of the letters "DX" to signify long-distance reception originated in America in the following way:

These letters are a telegraph abbreviation of the word "Duplex." As many of your readers will know, duplex telegraphy is a method of simultaneously sending and receiving over one wire.

Now the longer a telegraph line the more costly it is to install and maintain, so that it is necessary to make the most of them, and long lines are consequently usually worked duplex or "DX."

With short distances it is a more practical convenience to duplicate the lines and work simplex; that is, one direction only at the time.

Hence in America, with its many long lines, "DX" became synonymous with long distance.

As the early American wireless amateurs were also mostly professional "telegraphers," the use of "DX" to signify long-distance came as a matter of habit.

Yours faithfully,

B. S. T. WALLACE.

(G.P.O.)

London, S.W.10.

RADIO IN PICTURES.

The Editor, POPULAR WIRELESS.

Dear Sir,—I should like to say how very much I appreciated "Pentode's" articles on "Radio in Pictures" which have appeared in recent issues of "P.W."

It has been the very thing that I myself have been seeking to learn for a long long while; and I have learned more in those five weeks from these articles than I have done during the previous five years or more!

I have often wished I could be "like other fellows" in what seemed to me to be cleverness on their part—I have always felt such a duffer—but this has thrown a great light on a hitherto dark subject.

Yours faithfully,

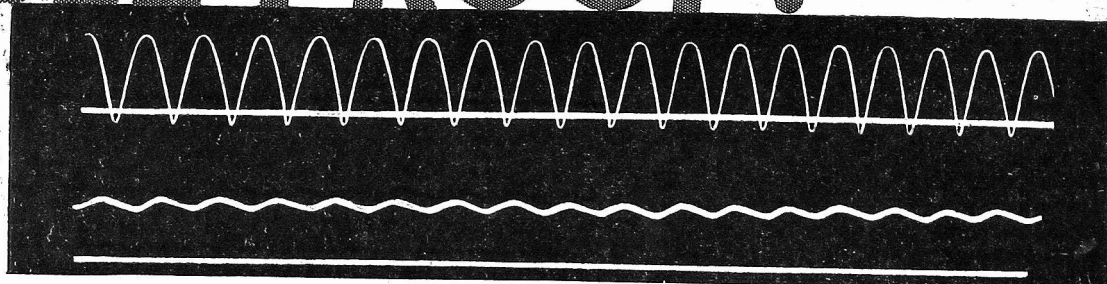
A. C. PLUMSTEAD.

Westcliff-on-Sea, Essex.

VISIBLE PROOF!

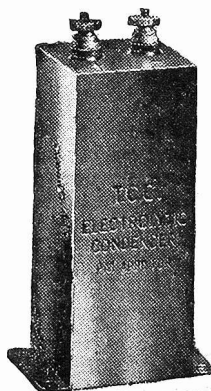
Fig. A.
WITHOUT
Condenser
in Circuit.

Fig. B.
WITH
Condenser
in Circuit.



— THAT T.C.C. ELECTROLYTIC CONDENSERS

banish Mains Ripple from Moving Coil Loud Speakers



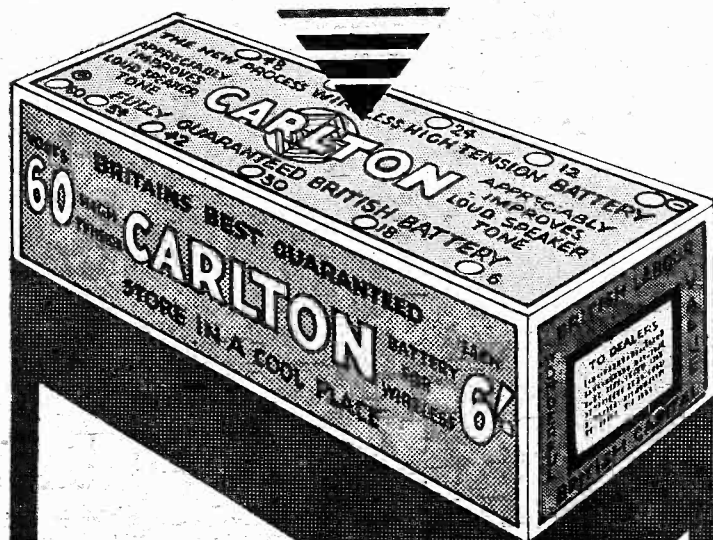
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STUDY this visible evidence—exact reproductions of two oscillograms which illustrate graphically the way in which the T.C.C. Electrolytic Condenser smooths the output of a moving coil loud speaker. Figure A records the voltage applied to the field windings of a moving coil loud speaker energised from A.C. mains by means of a transformer and metal rectifier. Figure B records the voltage when a 2,000 mfd. T.C.C. Electrolytic Condenser is connected in parallel with the field windings. From this visible proof it will be seen that that annoying mains ripple, so prevalent in moving coil reproduction, is completely banished by T.C.C.—the famous "Condenser in the green case." Get one from your Dealer to-day—and enjoy better reproduction.

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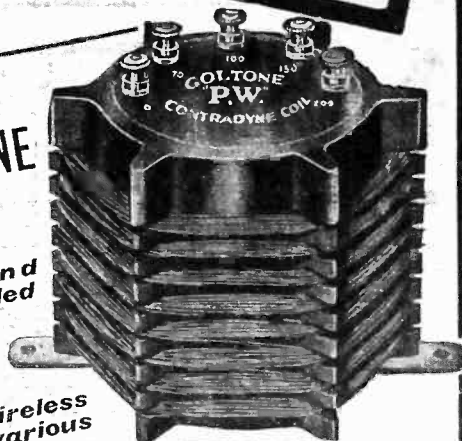
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Extract from "Popular Wireless," January 31st, 1931.
GOLSTONE CONTRADYNE DUAL RANGE COILS.
I would urge constructors to choose their makes with care. I've had samples sent me by Messrs. Ward & Goldstone, Ltd., and these are absolutely to specification, and very well made indeed.

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The purpose of this Coil is to eliminate Short Wave interference on lower end of Long Wave scale. Also provides protection against interference of local stations, giving purer reception.

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The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts or photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Little, Ltd., 4, Ludgate Circus, 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 specialities described may be the subject of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

QUESTIONS AND ANSWERS

THE "FOUR POUND" FOUR.

From last week's description it will be apparent to the constructor that the "Four Pound" Four is a particularly simple and straightforward set, so we need not anticipate any difficulty in construction, even by the comparatively inexperienced. The following details, however, giving the necessary working

data and recommended voltages, will clear up little points about operation that might otherwise crop up:

The battery connections should be: L.T.— and L.T.+, spade tags to the accumulator (voltage to suit filament rating of valves), and the H.T.— plug in negative socket of H.T. battery.

Put the H.T.+1 plug in a socket round about 70 volts (adjust for volume on the weak station), H.T.+2 in about a 60-volt socket (adjust for best reaction control), and H.T.+3 and +4 plugs in the maximum voltage socket or H.T.+3 in 110 volts, H.T.+4 in 120 volts socket.

The valves required are one screened-grid (V_1), one "special detector" or "H.F." type (V_2), one "L.F." (V_3), and one "power" or "super power" (V_4). There is a vacant space on the baseboard for the G.B. battery, and the G.B.+1 plug goes in the —3 volts socket. The G.B.—2 plug requires about $7\frac{1}{2}$ or 9 volts for an ordinary "power" valve, and a good deal more for a "super power" (see data slip received with valve).

The main selectivity control is the .001-mfd. compression condenser. First screw knob right down, then unscrew until you get just the degree of selectivity you require.

Finally, the operation of the wave-change switches: push the knobs inwards for long waves, pull them outwards for medium waves.

(Continued on page 1006.)

HOW IS THE SET GOING NOW?

Perhaps some mysterious noise has appeared, and is spoiling your radio reception?—Or one of the batteries seems to run down much faster than formerly?—Or you want a Blue Print?

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

Full details, including scale of charges, can be obtained direct from the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

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

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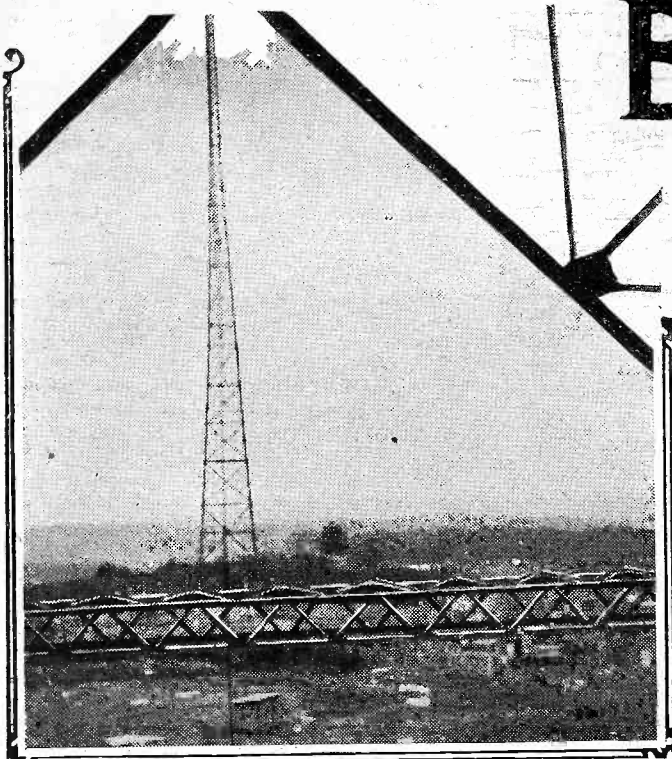
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BELGIUM'S BROADCASTING

FROM OUR OWN CORRESPONDENT



There have been many important changes in Belgian broadcasting of late, and now that the stations are coming through exceptionally well this account of a visit to the new Brussels station at Velthem is of special interest.

to the new rating, the Velthem transmitters will have 20 kw. in aerial, not so very powerful now with giant 60-and 100-kw. stations being built all over, but still a good medium power.

A plain stretches as far as the sea, and the new stations will give very good reception in Britain. They will be on the air by the end of the year at the very latest.

Velthem Is Home-Made!

I find that most European transmitters have been built either by Marconi or Telefunken, with a sprinkling of American sets and one or two French ones.

Velthem is home-built. Entirely designed and constructed by the Société Belge Radio-Électrique. One only needs to press a button and relays automatically do the rest of the work of putting the

and the Flemish stations would be in the same hands.

Heaps of space has been left at Velthem for the enlargement of the plant. Mr. Braillard pointed out that it was always less expensive to make the buildings large enough at the beginning, than to have to add to them at later periods.

A Cold Climb.

I did my best to climb up one of the masts to get a good photo of the buildings and other two masts, but either the ladder was too steep or I was too stiff, anyway at 66 ft. (masts are 350 ft. high) up I took my photos and went down again feeling that otherwise my hands might have been frozen off.

Anyway, I can say that I did try to get up. One gets quite used to aerial mast climbing after some time, and, as one of the engineers told me, they went up every morning to the top to keep them fit, and certainly it does make you tingle pleasantly.

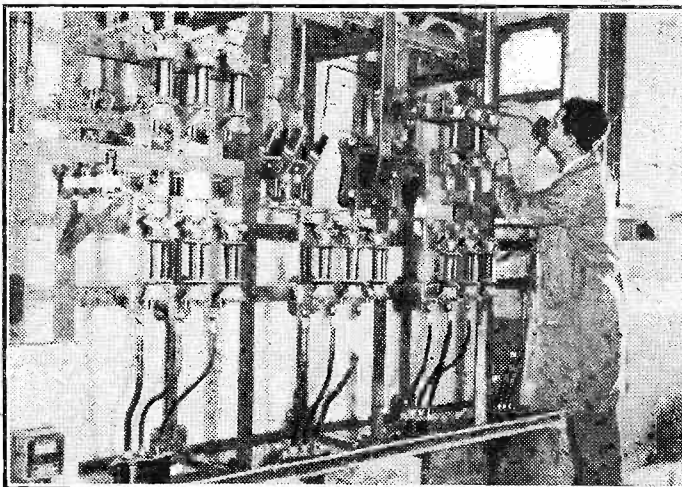
We left Velthem after my having been able to compliment the designers on the excellent layout of the station. One transmitter is on one side of a large hall, the other on the other side, with a direct view from the entrance hall through a glass partition into the transmitter hall.

Little did the good curé of Velthem think that such a devil's own device would surmount the rise above his good village when he set out over three hundred years ago on his pilgrimage to the Pope to ask for more Belgian bishops.

As it is, the present curé shows lively interest in the latest addition to his parish.

Velthem was formerly on the frontier between the bishopric of Cologne and of the Belgian bishopric.

AMONG THE VALVES OF VELTHEM



A Belgian engineer putting the final touches to the wiring at the back of the main feed switchboard.

transmitter in motion. A number of German transmitters have this same facility.

The whole of the apparatus is in duplicate, including the feed portion. This was necessary as, at the time of ordering the transmitters, nothing was fixed as regards the future of the broadcasting service and one did not know if the French

BELGIUM, not unlike France, has been on the verge of new and adequate laws regulating the broadcasting service for some years now. But here the semblance ends, because Belgium passed its last and definite law on broadcasting in May, 1930, and France, well, we all know that they are still squabbling over who is to have the monopoly of what many consider to be Europe's worst system of broadcasting stations (I make exception of Radio Paris and Toulouse, but no more).

Every Belgian listener has now to pay 20 frs. per annum for a crystal set and 60 frs. p.a. for a valve set. Nine-tenths of this goes to the I.N.R. together with half of the revenue derived from a tax on valves and sets, etc.

Firm Financial Footing.

This, together with State, Municipal and other subventions and income from publications, ought certainly to place Belgium's new broadcasting system on a firm, financial footing.

The consulting engineer of the Belgian broadcasting company, Mr. Braillard, well-known as the President of the technical commission of the U.I.R., was kind enough to drive me out to the new Velthem twin station.

One gets rather sick of seeing transmitters as, after all, except to the expert engineer, they are all very much alike and the public is rather tired of seeing two aerial masts with a house in the centre. But Velthem was a pleasant surprise.

Three Giant Masts.

The drive there, through miles of lovely forest, along wonderful roads, seemed to prepare one for the view of three giant masts perched on a rise in the undulating open country, following on the forest some miles away.

The little village of Velthem lies in a hollow below the transmitter, Louvain is not far off as the crow flies, and Brussels lies some twelve miles away. According

MODERN WIRELESS
BRITAIN'S
LEADING RADIO MAGAZINE

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1004.)

THE OSLO MYSTERY.

The difficulty in receiving Oslo's programme that was commented on in our January 17th issue ("P.W." No. 450), appears to have caused considerable interest, and many readers have been puzzled about this station. On the whole, results from Oslo in the S.E. and S. of England have been weak, as compared with Hilversum's on the same wave-length, very much as described by our querist, H. J. H., of Southampton. The cause of this is the increased distance.

On the other hand, some listeners in the London area get good Oslo results; and some N. of England listeners find that Hilversum came in better than Oslo does, though in their cases the distance from Hilversum is considerable, if not as great as from Oslo.

The difficulty of dogmatising on such reception is well illustrated by the accompanying extracts from typical letters.

C. T. (London, N.) says: "In your reply to H. J. H. (Southampton) you state that the reason for Oslo's weakness is its distance from London. Well, I use a 'Neu-type' Four, and get Kalundborg and Motala almost as loud as 5 X X, and yet Oslo is about the weakest thing on the long waves."

In a letter from Dublin, J. D. says: "H. J. H. (Southampton) enquires about Oslo, which to me is surprising, as this station with me is both powerful and good in quality. As a matter of fact, the reception from Oslo on my receiver during night time exceeds the volume from 5 X X. Being further from Oslo than your correspondent is what gives me surprise! If your correspondent previously received Hilversum when working on the 1,071-metre wave-length, it is rather peculiar that he cannot receive Oslo."

"MAGIC" WAVE-CHANGING FOR THE ORIGINAL "MAGIC" THREE.

T. E. (Kettering).—"Can you tell me how to adapt the scheme of 'Magic' Wave-Changing (which Mr. Johnson Randall described in 'P.W.' No. 450, for 'This Year's 'Magic' Three') to the old original 'Magic' Three?"

"I don't want to alter that set to the 'This Year's' model, but I should like that simple wave-change if it can be done."

It can be done quite easily, and in fact the whole principle of the alterations referred to can be applied to the original "Magic" Three instead of to "This Year's 'Magic' Three," if the following modification is made to your set.

To its A2 terminal fix a flex lead with a crocodile clip at the end. This clip is for connection to the No. 1 terminal on the six-pin coil base.

Now you can proceed in almost exactly the same way as explained by Mr. Johnson Randall, on page 865 (January 17th issue), but with this difference.

You ignore L1, C2, S1 and C1 altogether, as these parts are not in the original "Magic" Three; and you treat the new lead (on A2) as though it were "the flexible lead from S1" which is mentioned in the wave-changing article.

That is "all there is to it." To check it up afterwards you can, if you like, alter the diagram on page 866 so as to make it apply to your own set. This is easily done as follows:

Cross out C1, S1, C2 and L1, and all the leads which go to these points. Reverse the markings of the aerial terminals, making A1 into A2, and vice versa. Then draw in two new connections as explained below.

"P.W." PANELS. THE HIGH-TENSION BATTERY

Should always be chosen to suit the requirements of the valves.

Its voltage will drop considerably in time, so it is usual to choose a battery with a "margin" of voltage to begin with.

A standard-size battery is O.K. for the ordinary two-valve set, but a double-capacity battery is necessary for most three-valvers.

Very powerful sets require triple-capacity H.T. batteries for economical running.

The first new line to be drawn in is from the new A2 terminal to that side of C3 which is not joined to the new A1 terminal.

The second new line is a wavy one, also from A2, but going to the coil base. (This wavy line represents the flex lead and clip).

Your altered diagram then shows you exactly how your "Magic" Three wave-change connections should run from point to point.

Adding an Amplifier.

F. G. (Frindsbury).—"I have a three-valve set, screen-grid, det. and low-frequency amplifier. I can get quite a few stations, but some are weak, so I wish to add another valve."

"Could I have another screen-grid unit and connect it alongside my other set in another box? If so, could you give me the number of blue print?"

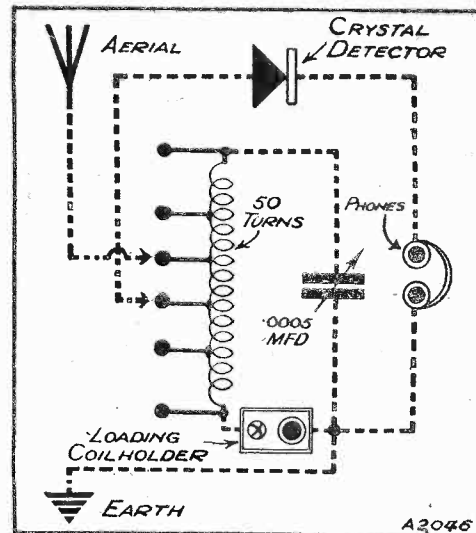
"Or do I want another amplifier? If so, which is best?"

Adding one high-frequency screened-grid stage in front of another S.G. valve is likely to prove a difficult business if you have not had much experience with such circuits, so we do not think that is advisable.

Adding a low-frequency amplifier is much less tricky, and no doubt you could manage this. It

POPULAR "WIRELETS" No. 29

A SIMPLE TAPPED CRystal SET.



The dotted lines above show how the "parts" given in last week's "Wirelet" are connected together to make a simple crystal set. When receiving on medium waves the on-wave coil must be removed, and the loading-coil holder "shorted."

could take the form of a separate unit built up in a box, and would stand up against your set, and employ the same batteries.

There are two types of L.F. amplifier which you could add, viz. a resistance or a transformer stage of L.F. amplification. If your set has an L.F. transformer in use we should recommend a resistance for the additional stage.

On the other hand, if your detector is at present coupled to its L.F. valve by an anode resistance, you could probably use a transformer quite satisfactorily in the new unit. But good results from such a unit are not merely a matter of adding new components and correctly wiring them, so before going ahead with the idea you should consider the following points.

Much greater volume will be obtainable under the new conditions, and that means a bigger drain on the batteries, and more work for your loud speaker. Is

(Continued on next page.)

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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

the latter capable of handling much greater volume? Obviously this will have to be considered, especially as a four-valve set really needs an output filter circuit for the loud speaker, whereas a three-valver can often get along without this. If your set has no output filter there will be that extra expense to consider.

We said earlier that the set and amplifier would "employ the same batteries," but that refers to the connections, and with an extra valve you would find "the same batteries" run down much more quickly. So you might have to get a larger H.T. battery to stand up to the extra work, and you certainly need more grid bias, if not L.T. as well.

You see, there are lots of points to watch, and although an amplifier can be added easily, it is not so certain that it will do all you expect from it.

If you fill in one of the Technical Query Dept.'s Application Forms, giving details of your present set and batteries, etc., it would be possible for us to give definite circuit details to suit your requirements. But frankly we don't like recommending a circuit without knowing something more about your set, as even the best amplifier may be disappointing if not properly suited to the set in front of it.

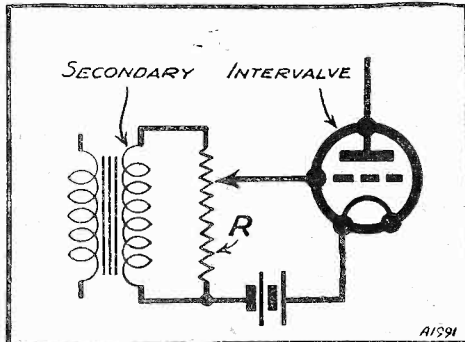
USING L.F. TRANSFORMER AND VOLUME CONTROL.

J. L. (Derby).—"My friend and I both made a set, his det. and two transformers, and mine det., I resistance, I transformer. He pulled his to bits in favour of a four-valver, but mine has been all I wanted until we shifted to another district and I lost my big aerial.

"Now I am needing just the extra punch that a two-transformer set would give me, but I don't know how to put it in place of the resistance, especially as I want to fit a volume control. (Separate components, not an R.C. unit).

"What should the connections be for the transformer and volume control?"

You will need to take out the anode resistance, its coupling condenser, and the grid leak attached to it. Then join the L.F. transformer's primary to the two points that previously went to the anode resistance.



Across the secondary of the L.F. transformer wire the ends of the volume control, and connect its slider to the grid of the following valve.

Then the end of transformer secondary that is marked G.B. is taken to the appropriate grid bias negative tapping, and volume is controlled by altering the slider's position.

The accompanying sketch shows the new wiring, the anode resistance, coupling condenser and grid leak now being "spare."

THE "MAXI-POWER" FOUR.

Use of the wrong type of switches in this set seems to have let several readers in for poor results with it, but the following letter explains how H. A. S. (Lower Hartshay) saved himself from having to buy two new switches of the correct type.

"I built the set and had the same trouble with it as T. C. C. (Notts)—'P.W.' January 10th. After a good sound test of all the components in the set, and a careful test of each valve and circuit, I was left with only the switches. These were 3-contact change-over type. But they are not suitable for the set. They have one long leg and one short leg, and the plunger goes to earth. The switch only earths one leg at once. But by taking the long

(Continued on next page.)

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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

leg off one switch and the short leg off the other I made two new switches, one with two long legs and the other with two short legs. This cured all my troubles!

"The 'Maxi-power' Four is a fine set and does all you claim for it. I built it for a friend and in the hands of a novice with 45-ft. aerial 20 ft. high, 23 stations were clocked on medium waves and 9 on high waves.

"P.S.—I am thinking of building your 'New Coil' Five. Will it be O.K. to leave out the reaction winding on two of the coils?"

With regard to the P.S. added by H.A.S., it is quite O.K. to leave off the reaction winding when not required by the circuit.

GETTING THE SHORT-WAVES.

H.R.B.I. (Birmingham).—"In one of your issues about the operation of the 'Magic' Three you mention that details for its work on short waves would be given in a further article.

"I must have overlooked this, and I have tried during the last three months to receive on the short waves, but all I can get is a little telegraphy and a man's voice calling out 'Hallo, New York,' and then some Morse from the same station, which I think is in Great Britain.

"I have six coils and the best results are on seven turns aerial, eight reaction, tapping in with crocodile clip on the third turn near the reaction coil.

"I have worked on both aerial terminals, the one connected to the neutralising condenser being the best. My aerial is 78-ft. long, earth 12 ft. Good results on the other wave-lengths. H.T. 120, grid bias—1, three volts; —2, 18 volts.

"Can you help me as I am now getting fed up. Have tried three or four different aerials, inside and outside, various lengths."

For wave-lengths of between about 18 and 35 metres you should try a No. 4 coil in the aerial socket and a No. 6 for reaction, or a No. 9 if your detector does not oscillate easily. It is as well to try both sizes and see which gives the proper control of reaction.

If you get "flat spots" where the set refuses to oscillate on certain dial positions, you can get over this by altering the adjustment of C3. As a rule this condenser will be set at maximum, but if you have any slight difficulty in getting proper reaction at any point on the tuning dial just reduce its capacity a little and the trouble will disappear.

The position of the tapping on short waves is not particularly critical, but it should be realised that the clip should not touch more than one turn at a time.

A very interesting band of short-wave stations is to be found between 30 and 60 metres, and this you will be able to cover if you put a No. 6 in the aerial and a No. 9 in the L3 holder. In this case, by the way, it pays to experiment a little with the tapping on L2, so try one or two turns as well as a point somewhere near the middle.

An important point in connection with this set on short waves is the modification for inserting a fixed condenser in series with the tuning condenser. This is very easily fitted.

At present you have a lead from the coil to the fixed plates of the variable condenser. Break this lead and insert in series with it a fixed condenser of .0003 mfd. (or .0005 will do) and provide this with grid-leak clips.

Then to short circuit the condenser when receiving on ordinary or long wave-lengths, all you have to do is to insert in the grid-leak clip a short piece of metal rod or tube, or at a pinch a little piece of wooden rod wrapped in tinfoil.

By removing this "shorting bar" when going on the lower waves you have in effect a lower tuning capacity in circuit which makes the set much easier to handle.

If, however, even with this modification and above operation you fail to get short-wave stations we think you must be using a not very suitable grid leak, grid condenser or detector valve, as these are the likeliest components which will sometimes give fairly good results on ordinary and long-waves, and yet might prove faulty on the short waves.

THE "CLEAR-CUT" CONE.

"JOHNIE" (Havant).—"Where can I write to for the back number containing the 'Clear-Cut' Cone?"

This was described fully in No. 447 (December 27th, 1930, issue). Back numbers that are still in print can be obtained from the Amalgamated Press, Ltd., Back Number Dept., Bear Alley, Farringdon Street, London, E.C.4. Price 4d. per copy (post free).

FOR THE LISTENER

(Continued from page 986.)

Karsavina.

Another of them! But very charming in her talk of "Yesterday and To-day." While she was speaking, Pavlova was probably in the minds of most of us. Alas, that these flowers should die! In my younger days I used to follow Pavlova much as a football fan follows his team from town to town.

I thought her dancing the loveliest thing I had ever seen or would see. No human being ever came so nearly to the frail beauty of a Butterfly as she did; and her "Swan" was the only dance that ever brought a lump into my throat. Her use of her arms and hands was wonderful; they were themselves like flowers, like two tall lilies set in a vase.

Variety Stars.

It was a very distinguished vaudeville programme that night. The stars sang together. There was Tommy Handley, back at the microphone from heaven knows where, full of beans, and recounting the history of Sir Timothy, a north-country knight of old, clad in armour like a battleship, and at a pinch serving his enemies in the office of a battering-ram.

There was Mabel Constanduros, with her Emily asking for an Outside Broadcast of a "missionary speaking in a cannibal's saucepan"—a useful tip for the next Diversions.

There were the Wireless Singers in folk songs, sung with any amount of dash and abandon—a very cheery item.

Slick and Superb.

There was Gillie Potter, delightfully apologising for a recent skit on Russia, and going one worse in a talk on Birmingham, where (he said) he had been much appreciated because, having need to use an easel on a platform, he had clothed its legs in stockings.

And there was Jack Payne and his Band, now playing, now stunting, and always with a slickness and superb accomplishment which made the heart merry. A great programme—and then some!

Going South.

Derek McCulloch took us a delightful railway journey from New York to New Orleans, with Plantation Songs all the way. Would that all journeys were so pleasant! The programme was cleverly arranged; and particularly engaging was the old negro car-attendant, with voice and manner to the very life, who acted as "introducer." What is the secret of these old songs? Why do they clutch at the heart? Simplicity, I suppose, and sincerity.

Memories.

I liked Air-Commodore Charlton talking on "Spion Kop." It brought back memories of anxious days, of days when Buller and "Bobs" were, like the names of Foch and Haig, in everybody's mouth.

The Boer War lasted for three years, and I suppose we thought it would be the last war!

I wondered, as I listened to Commodore Charlton, what would have happened if we had sprung an aeroplane upon the Boers, as later we sprung the Tanks upon the Germans!

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TECHNICAL NOTES

By J. H. T. ROBERTS, D.Sc.

Fascination of Several Dials.

A RECEIVER which has only a single control is—although usually very limited in its scope—perfectly simple to operate. As soon, however, as you have got two or more dials, the operation of the receiver becomes, if rather more difficult, very much more fascinating, and there is plenty of opportunity for exercising your skill in its manipulation.

Indiscriminate Dial Twisting.

I have often watched listeners turning a couple of dials on a receiver absolutely indiscriminately, I mean without any reference to one another, and I need hardly say that if by any chance a station should be tuned in by this "method," it is more by luck than by good management.

The fact is that the effects of the different controls are *not* independent but, on the contrary, are definitely dependent on one another and an adjustment of one dial almost inevitably involves the adjustment of another.

Neutralising.

Where a set has stages of high-frequency amplification it is important that these should be properly neutralised or that screen-grid valves should be used. This is important, not only because it makes a tremendous difference to the stability and ease of operation of the receiver, but also because a certain amount of accidental oscillation of the receiver is not then liable to cause interference to other receivers in the vicinity.

A very general case is where two tuning dials are used and a dial for the reaction condenser is also provided.

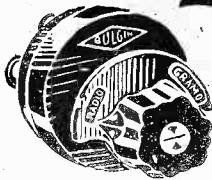
Many listeners never trouble to notice whether a movement of the tuning dial in one direction—say to the right, or clockwise—has the effect of *increasing* or *decreasing* the wave-length to which the set is tuned. As a matter of fact, in practically all cases you will find that when the control of the tuning condenser is moved to the right or clockwise the capacity of the condenser is *increased* and consequently the set is tuned for longer wave-lengths.

Reaction and Wave-length.

The same sort of thing applies in the case of the reaction control and, as a rule, you will find that when this is moved in the clockwise direction the reaction effect is increased. I should remark in this connection that the amount of movement of the

(Continued on next page.)

ROTARY SPECIFY

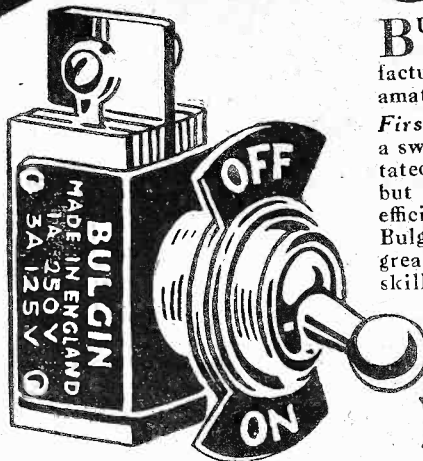


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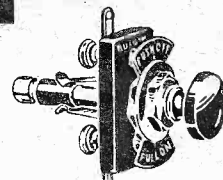
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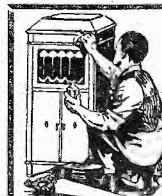
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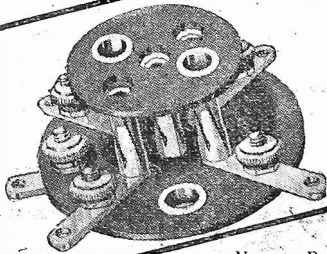
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TECHNICAL NOTES.

(Continued from previous page.)

reaction control to take the set in and out of oscillation is not the same at all parts of the dial. As a rule you will find that working on the shorter wave-lengths quite a small variation in the capacity of the reaction condenser is sufficient whilst a much larger variation is required when working on the longer wave-lengths.

Adjusting Dials.

You will find it also very handy to arrange the tuning dials so that they give about the same reading for a given wave-length.

Suppose when you have adjusted the two dials (assuming there are two) for proper reception of the desired station and you then find that their readings are quite different, it is easy to shift the dial of one of the condensers until it reads the same as the other dial, but without shifting the moving vanes.

This necessitates loosening the dial on its spindle and keeping the moving vane system of the condenser stationary whilst the dial is shifted in relation to it. The dial is usually secured to the spindle by means of a tiny sunk screw, called a "grub-screw," which can be manipulated by means of a very small screwdriver.

I should also mention that when finding the settings for the two dials it is preferable to make your tests without using reaction, because if you use reaction you have a third complication and every time you use either of the tuning dials you are liable to influence the amount of the reaction.

The result is that you never know where you are and you will never really be able to arrive at finality. But with reaction control turned down to zero it is quite a simple matter to tune in to a fairly powerful transmission (such as the local station) and then to adjust the tuning dials as mentioned above.

Effects of Oscillation.

Generally you will find that one of the tuning dials has a much more pronounced effect than the other, so that very small movement of the one has a considerable effect on the tuning, whilst it takes a large movement of the other to have any appreciable effect.

In this case you will naturally depend mainly upon the control which has the more pronounced effect, using the other one as a kind of vernier or fine adjustment.

There is one final point which I would like to mention, and that is that when searching for stations many listeners have the set actually in a state of oscillation and pick out stations by their various squeals. This rough and ready method is not the best one.

I am not thinking of the question of oscillation and re-radiation and its effect upon neighbouring listeners, because, as already mentioned, with properly neutralised H.F. stages or screen-grid valves, this question should not arise.

The receiver should be kept, by careful and continual readjustments of the reaction control, in a state just bordering on oscillation, and in this way you will be able to pick out the desired signals, speech or music, much more satisfactorily than by having the set in violent oscillation and squealing about all over the dials.

A Practical Point.

Going back to the question of the position of the dial on the spindle of the condenser, it is very important that after the dial has been put into the desired place it should be quite securely fixed again on the spindle. Quite a lot of trouble arises in the operation of receivers owing to dials not being tight on their spindles.

Obviously it is useless to make notes of the dial readings for particular wave-length settings if the dial can shift in relation to the movable vanes of the condenser. Also take care when tightening up the grub screw not to force it too hard, otherwise you may strip the threads in the ebonite or composition.

A good deal of trouble also arises often enough in a vernier condenser, owing to the control knob slipping in relation to the main dial. This, however, so long as the main dial is properly secured to the main spindle, does not upset the dial readings—it is merely a nuisance in the actual operation of the condenser.

Rejectors.

If the tuning on a tuning dial is so broad that the dial has to be moved through, say, half its range from the local station, it is obvious that some form of rejector is

TECHNICAL TWISTERS

No. 47.—THE VALVE.

CAN YOU FILL IN THE MISSING LETTERS?

The valve with a filament and plate but no grid was called a

In most valves there are three electrodes, so a valve of this class is called a

Screened-grid valves have electrodes, and this kind of valve is termed a

A valve with five electrodes is called a

Last week's missing words (in order) were Distance. Chelmsford. India. Australia, South Africa. Direction.

required; and with a suitable one properly adjusted, the local station should be confined to a very few degrees on the dial. This is essential if you wish to receive other stations.

Hints on Searching.

I have already mentioned the importance when searching for stations of a judicious use of reaction, and, in fact, I think it is no exaggeration to say that success in finding stations, especially distant ones, depends more upon the proper use of reaction than upon any other single factor.

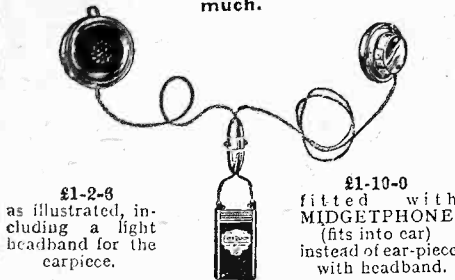
If you have the reaction too low, it is quite possible that the signals will be too weak to be discernible; whilst it is equally bad to go to the other extreme and have the set continuously in oscillation.

If the reaction were totally independent of the tuning it would be a very simple matter to set the receiver for a point just short of oscillation and then to confine your

(Continued on next page.)

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TECHNICAL NOTES

(Continued from previous page.)

attention entirely to the tuning; but inasmuch as the reaction and the tuning are mutually inter-dependent, it calls for a little skill to make continual adjustments of the reaction control corresponding to the adjustments of the tuning.

Some Pentode Points.

You will remember that I said that the pentode valve was an extremely useful and economical valve when used in appropriate circumstances, but that you must not jump to the conclusion that a pentode valve was just a mere substitute for a power or super-power valve, as some people seem to think. The pentode will give actually much greater amplification than can be obtained with a super-power valve, but that is not to say that it will be capable of handling anything like the same power output. You want to draw a careful distinction between *amplification* and *power-handling capacity*.

Matching to Speaker.

I have already mentioned the importance of the resistance of the loud speaker windings when using a pentode for the output stage. If the resistance of the loud-speaker is too low, as is often the case, the amplification obtained with the valve will not be up to expectations.

But if a special pentode output transformer is used, any difficulty in this direction can readily be overcome, and the output transformer has the further practical advantage that the high-tension current through the pentode does not pass through the loud-speaker windings; inasmuch as this high-tension current is often on the high side, it is quite a useful precaution to keep it out of the loud speaker.

Pentode Transformer.

The pentode output transformer is quite easily connected up, the output of the receiver simply passing into the primary of the transformer and the output of the secondary of the transformer passing into the loud speaker. The secondary of the transformer should have tapplings, so that the proper tapplings can be chosen to give the best result; in other words, so that the loud-speaker windings can be properly matched to the valve.

A Matter of Tone.

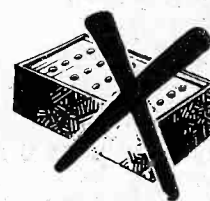
I think I have already mentioned that the pentode valve is apt to emphasise the higher frequencies and consequently to give a more shrill reproduction; and for this reason, if the loud speaker is somewhat low pitched, it tends to counteract the natural effect of the pentode valve and gives better results. At the same time, however, if you use a pentode output transformer you can get quite considerable variations in the tone of the reproduction by trying different tapplings on the secondary of the transformer.

Screen-Grid Voltages.

By the way, I have had several letters from readers of these Notes with regard to the remarks I made the other day about screen-grid valves and the voltages applied to the screen. You will sometimes find that

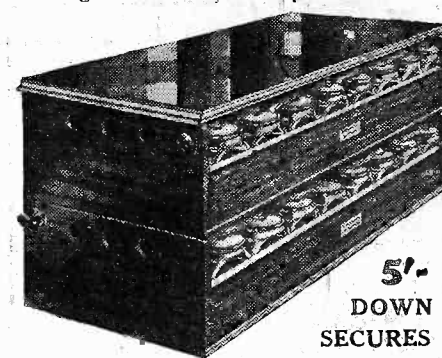
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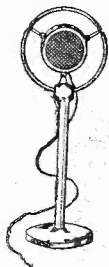
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SUNDAY GRAPHIC



TECHNICAL NOTES

(Continued from previous page.)

these voltages can be very considerably reduced, and naturally this means a great saving in H.T. battery current.

One of my readers says he works the valve with 40 volts on the screen and 20 on the anode, whilst I have had also reports of other screen-grid valves being worked on voltages very close to these.

The curious thing is that the voltage on the screen has to be considerably greater than that on the anode. And yet in these conditions the valve will operate apparently as satisfactorily as with the normal voltages prescribed by the makers. At the same time it is sometimes necessary to bring the grid bias down from, say, 3 volts to perhaps 1½ volts, or even zero.

A Screen-Grid Peculiarity.

Some screen-grid valves I have tried have entirely refused to submit to the treatment mentioned above. It seems to depend on

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Furthermore, the valve seems to work either with the high voltages specified or with these low and inverted voltages, but does not seem to work satisfactorily with any intermediate voltage values.

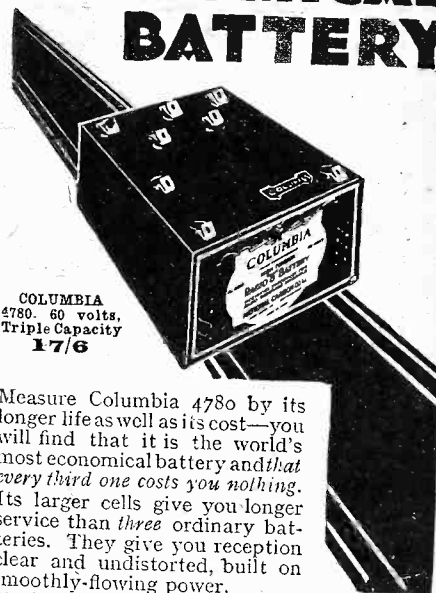
A Curious Trouble.

A reader sends me an account of some trouble he had with his receiver which puzzled him for a long time, and may, therefore, perhaps be worth mentioning for the benefit of others. Incidentally, it is by no means so uncommon as my correspondent thinks.

His set was a three-valve set using batteries for the L.T. and a mains unit, D.C., for the high tension. He found on switching on the receiver that a peculiar hum gradually built up, which sounded for all the world as though due to interference from nearby electric motors.

Eventually, he discovered that this was due to a defective grid leak and on replacing this with another one the trouble completely disappeared. This kind of thing often happens with a bad grid leak or anode resistance. It is difficult to say precisely what happens in the leak or resistance, but possibly there is some heating effect which takes place and which, after the set has been in use some little time, shows up in this way.

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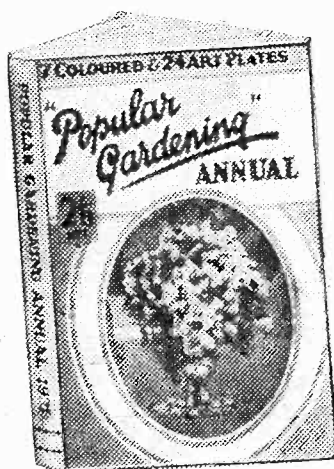
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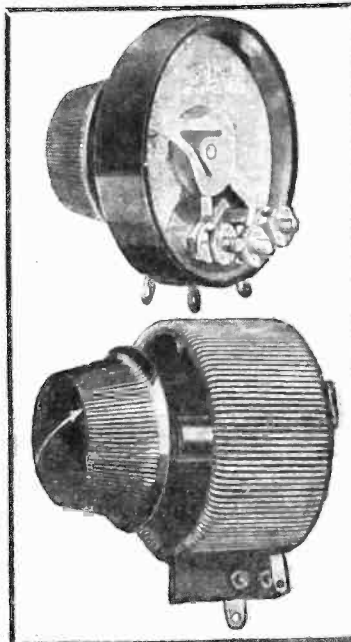


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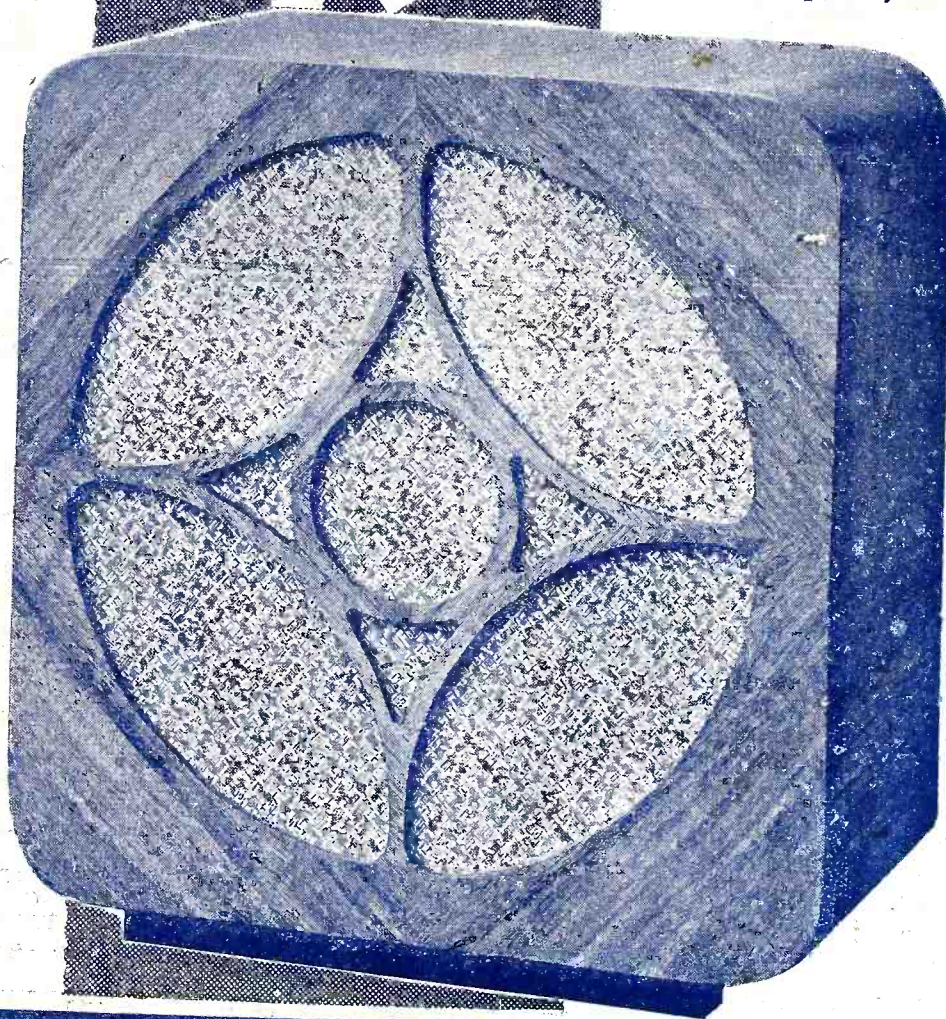
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