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-feet 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.

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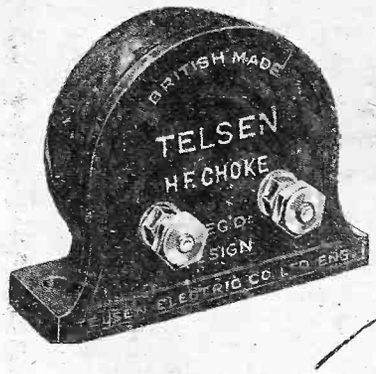

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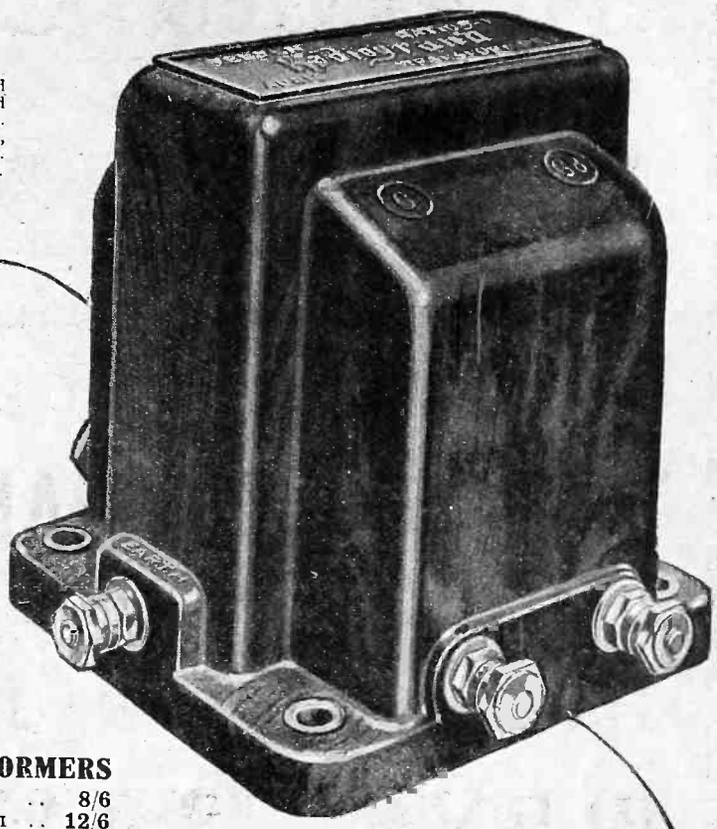

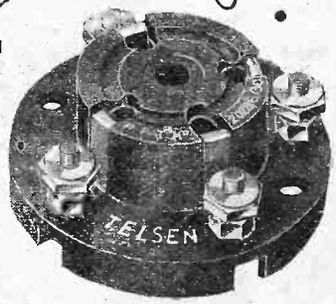

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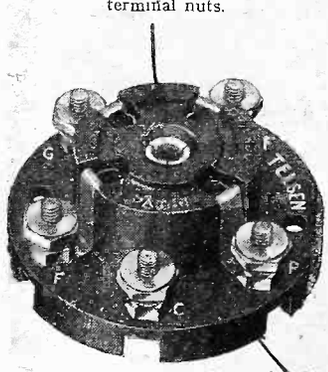

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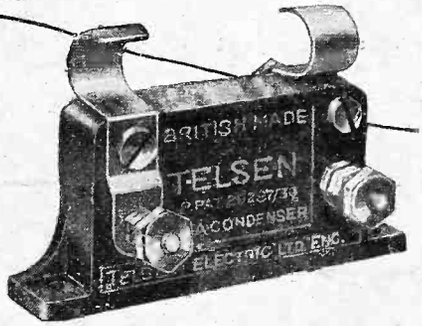

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"I had been running another well-known make of valve, but I can honestly say that it has not got the same in it as your HL210.

"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.

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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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Popular Wireless

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

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

RADIO NOTES & NEWS

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."

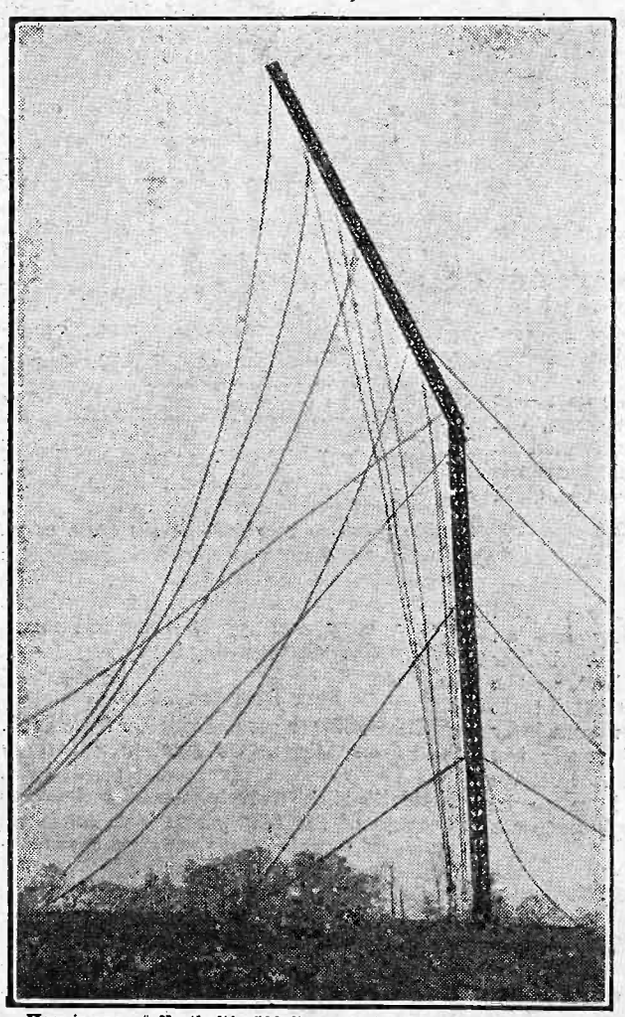
Do It—NOW.

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 "statoo" 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 thusness? 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.

APART 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 element 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 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!

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 W G Y 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.

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 wave-length 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.

R. W. 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 outcries 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., 1¼ 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., 1¼ 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 grousing 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.

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 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.

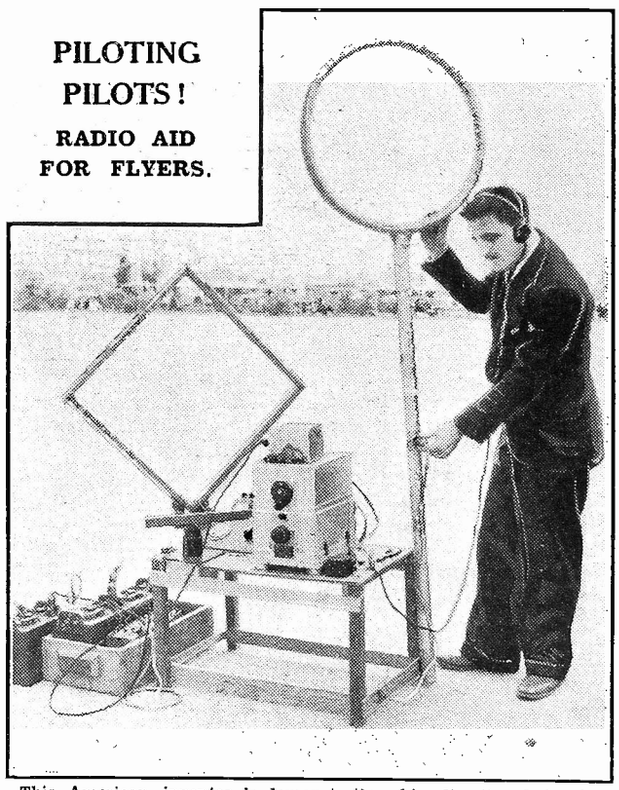
But this particular case is only one of many, and the object of Mr. Dowding's article, which we publish in this issue (and incidentally, the sole object of this particular editorial sermon), is to beg readers who build sets according to published specifications, whether in this of any other journal,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

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.

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.

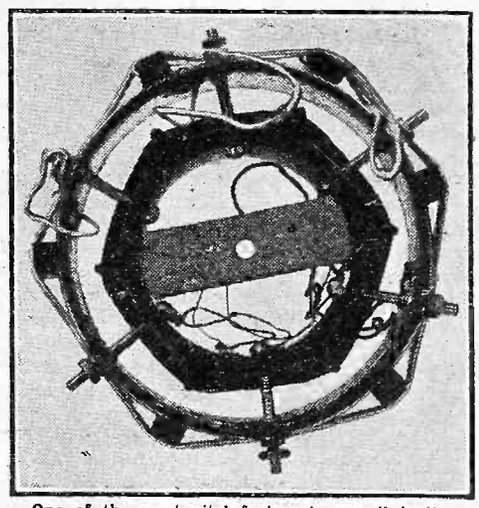
YOU can take all sorts of liberties with a modern set that would have been disastrous with receivers current in the early years of broadcasting. As a matter of fact, to attempt the construction of any set in those days was to embark upon an adventure into the unknown. You see, components and accessories 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 mfds. that measured up to only ·0003 mfds., 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.

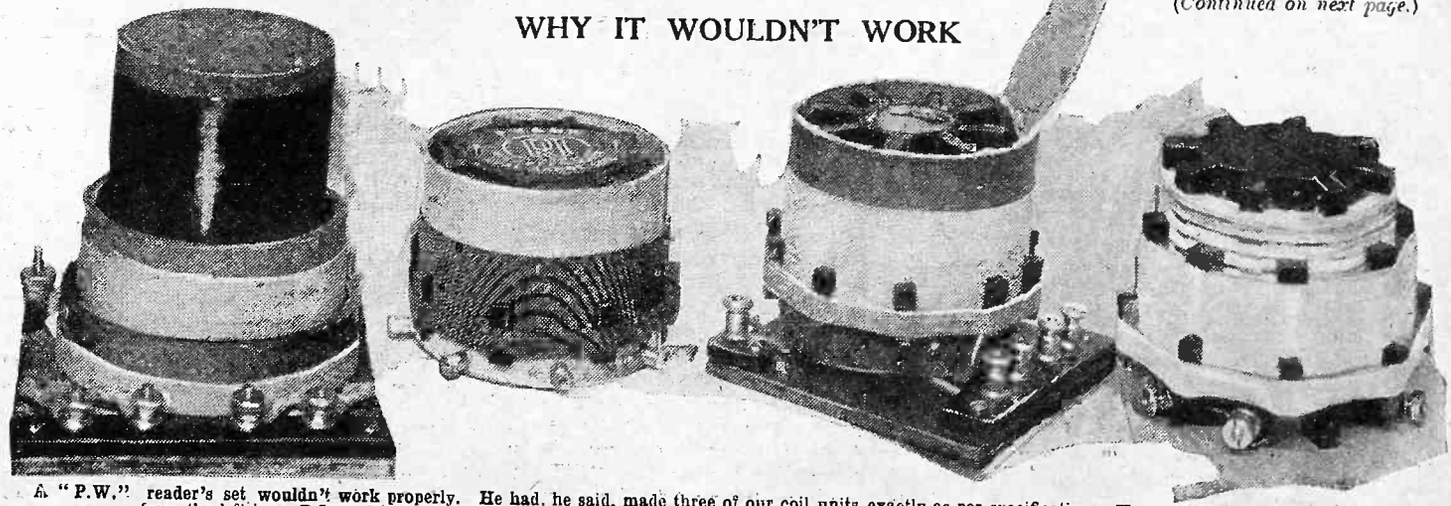
Ruining a Receiver.

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

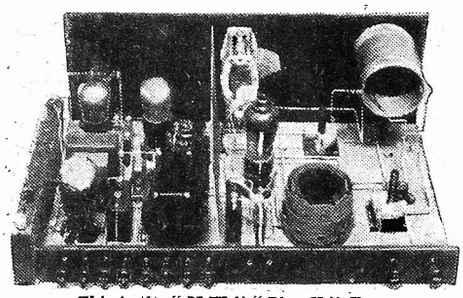
(Continued from previous page.)

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

THE ORIGINAL MODEL—



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

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-valver. But now, with ninety per cent or so valve 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. 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.

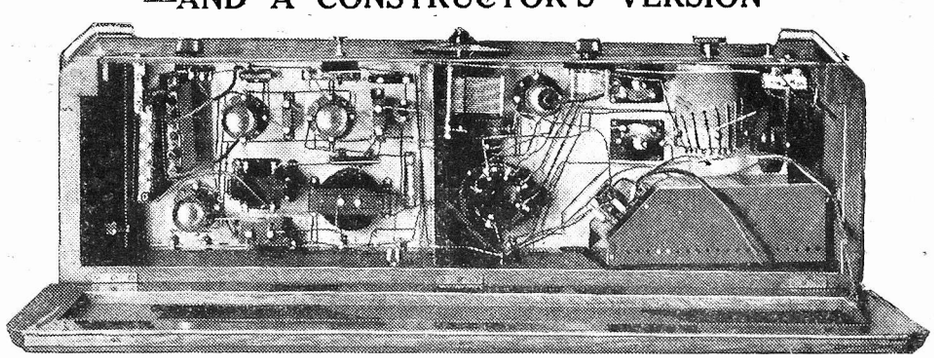
We cannot undertake to receive faulty sets for examination, however much we would like to. You see, there are about one hundred and fifty thousand or so of you regular readers, and if only one-tenth of one per cent of you were to meet with trouble and push your gear along to us, it would mean we'd have 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 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.

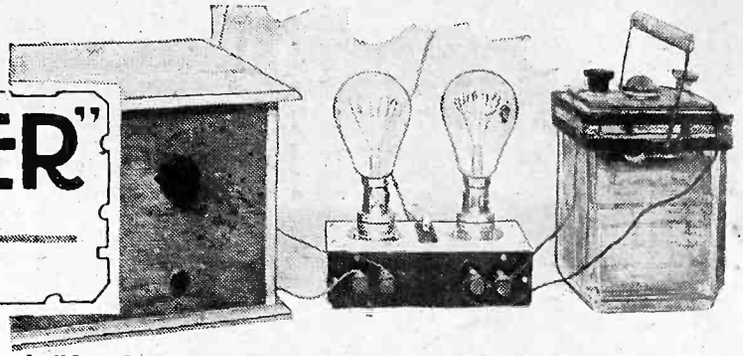
So, for goodness' sake, don't think I'm having a chuckle at, or holding up anyone for public ridicule who slips up in assembling a radio outfit. I am appealing especially to new readers of "P.W." to treat their radio construction more as a science than as a kind of jig-saw puzzle.

—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!

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 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.

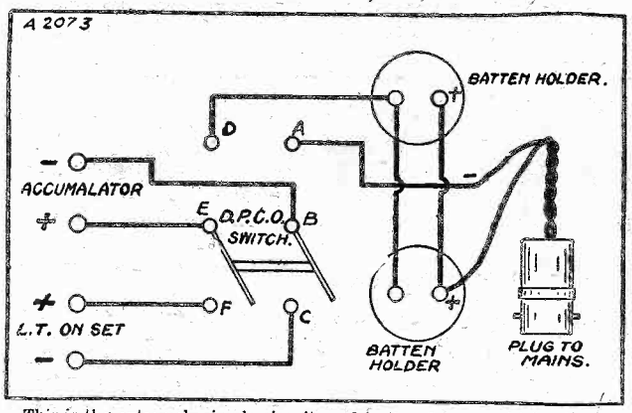
In designing it we have borne in mind not merely the usual safety requirements which have been so strong a feature of the whole series, but also the vital one of convenience in use.

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 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!

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.

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 esay 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.

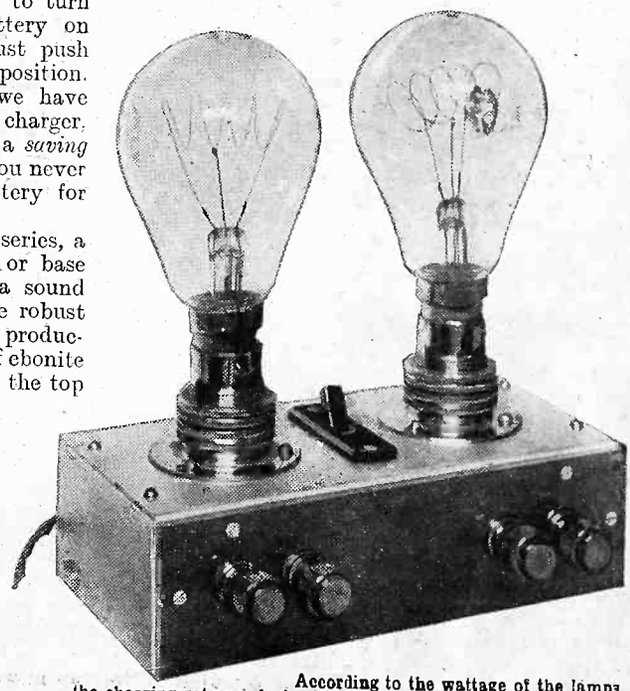
By the way, you will note that the underside of the base is not closed in. The interior wiring is "live" when the charger is working, hence steps should be taken to prevent unwary persons from getting shocks from it.

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.)

READY FOR USE



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.

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.

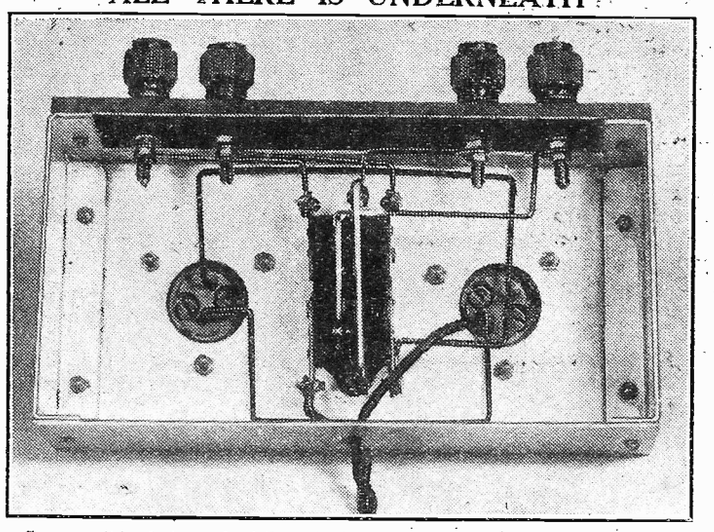
* * *

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.

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.

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.

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 "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.

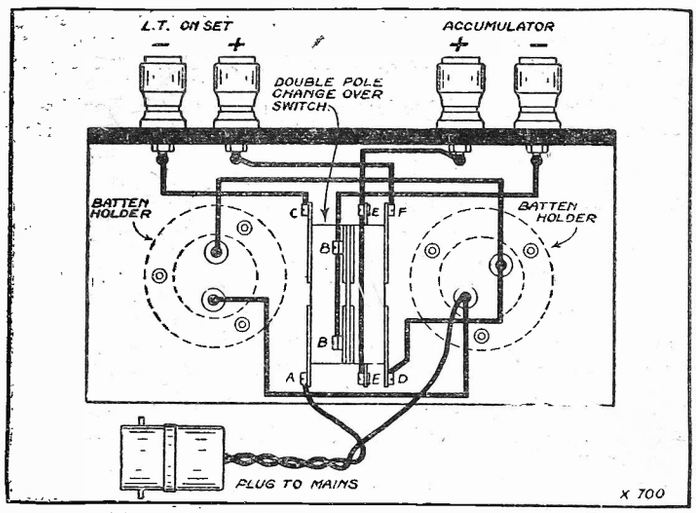
If the polarity thus found agrees with the marking of the terminals, well and good. If it does not, reverse the plug in the mains point. In future be careful to see that the plug is always kept this way in.

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.

NOT MUCH TO WIRE



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

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.

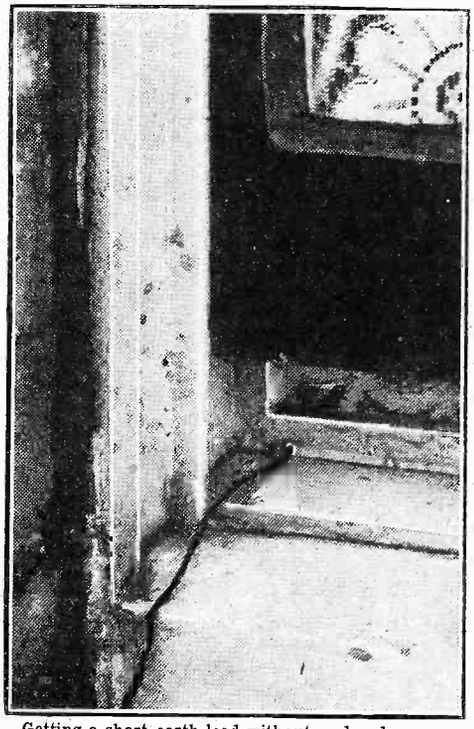
"Is there any method of connecting the volume control so that this hum can be avoided? Alternatively, does the presence of this hum indicate a fault?"

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 categoric 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 CRITICISED

NEW 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 Panoptican, 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 Sterndale 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, 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."

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.

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"

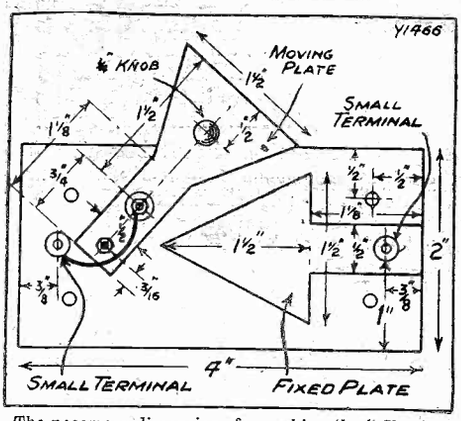
A small series condenser in the aerial lead is a great help to successful short-wave reception. Here is a simple design of home-made condenser for the short-wave enthusiast.

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

HOW IT'S MADE.



The necessary dimensions for making the "Shortadenser."

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 "Neutradyne" 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.

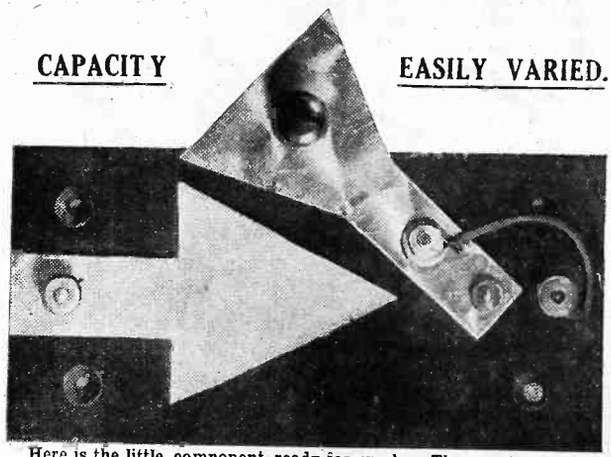
The latter is arranged to pivot about a point near the narrow end. It is secured here with a brass screw through the base, with a spring washer between the ebonite and the plate. Put a nut on top of the plate, tighten until the plate only moves rather stiffly, then add another nut to lock the first one.

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 1¾ 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 countersunk-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 ⅛ 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.

* * *

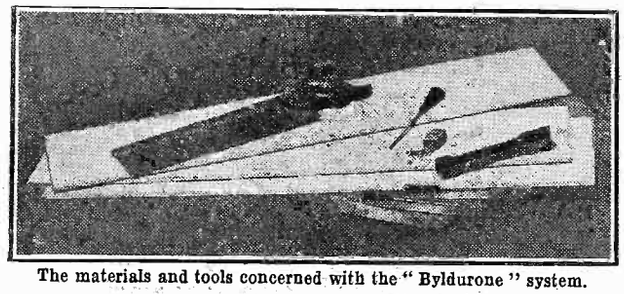
Twenty studios will be arranged for in the new B.B.C. headquarters, one being large enough to accommodate a full orchestra and an audience of about 1,000 people.

FROM THE TECHNICAL EDITOR'S NOTE BOOK.

Tested and Found—?

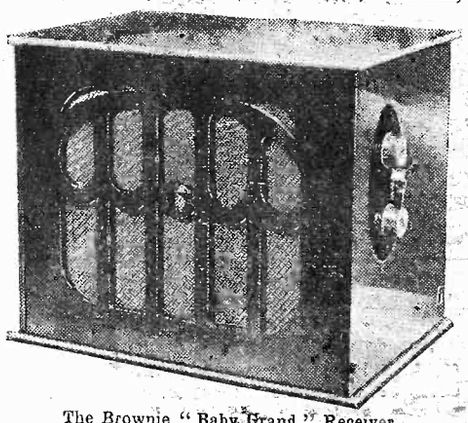
"BYLDURONE."

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 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 materials and tools concerned with the "Byldurone" system.

The originators of this scheme, and the suppliers of the sets of parts, are our old friends J. J. Eastick & Sons, Ltd., of Eelex House, 118, Bunhill Row, London, 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 Brownie "Baby Grand" Receiver.

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 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.

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.

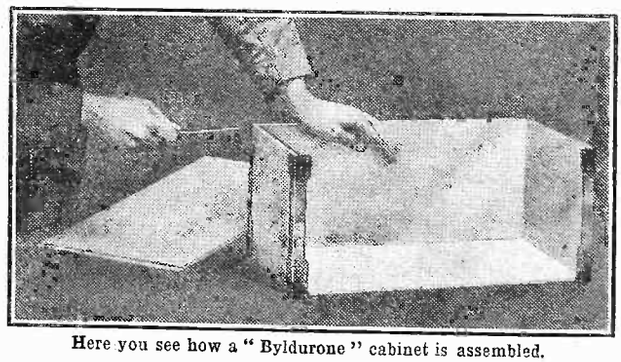
We should like to point out that we prefer to receive production samples picked from stock, and that we cannot guarantee their safe return undamaged, as it is our practice thoroughly to dissect much of the gear in the course of our investigations!

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.

RADIO PART EXCHANGE SCHEME.

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



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

R.I. TRANSFORMERS AND CHOKES

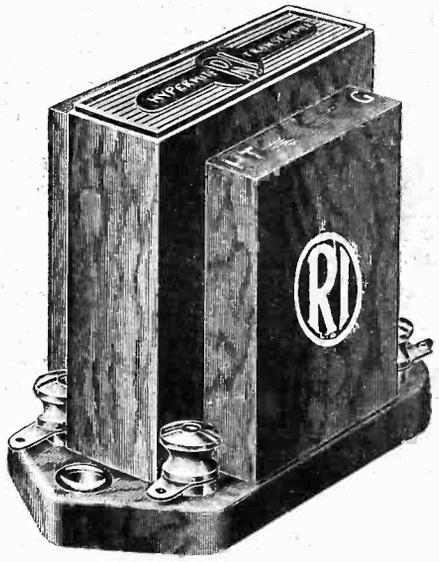
The prices of R.I. Transformers now range from 21/- down to 10/6. EACH MODEL IS THE MOST EFFICIENT IN ITS CLASS AND ABSOLUTELY THE CHEAPEST IN COMPARISON WITH ANY OTHER, considering reliability and guaranteed performance. They are best beyond refute—therefore it is obviously wiser to insist on R.I. Ask 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 2⅜ × 1⅜ × 2¼ ins. high, and handsome BAKELITE CASE finished as FIGURED WALNUT. Primary inductance 50 henries. Ratio 3½ to 1. - - - - - - **12/6**



The "HYPERMITE"

AND THE

"HYPERMU" Nikalloy Core L.F. Transformer

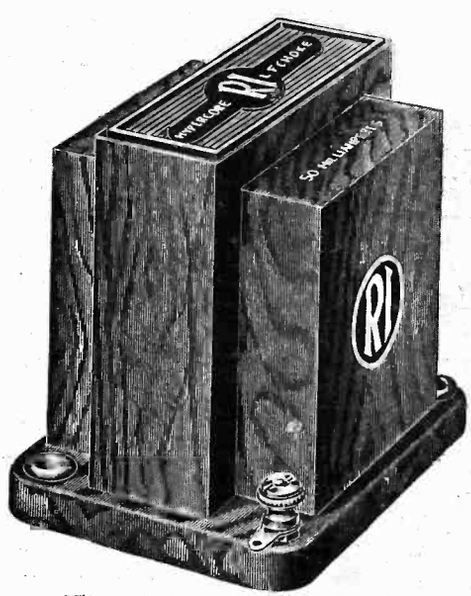
The original NIKALLOY model giving an amplification MORE POWERFUL AND UNIFORM THAN ANY OTHER COMMERCIAL L.F. TRANSFORMER. It is impossible to buy better whatever the cost. Primary inductance, 85 henries. Ratio 4 to 1. Distinguished by the HANDSOME BLACK BAKELITE CASE. - - - **21/-**

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 3½ to 1. Primary inductance 35/40 henries. Weight 18 ozs. THE LOWEST PRICED TRANSFORMER WITH SUCH HIGH PRIMARY INDUCTANCE - - - **10/6**

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 - - - - - **17/6**



The "HYPERCORE"

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 milliamps. Size 2 × 2½ × 2⅜ ins. high. List No. DY25 - - - - - - - - **12/6**

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.

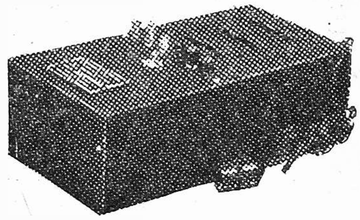
NEW SUPER 4-VALVE PORTABLE SEPARATES TWO BROOKMANS PARK STATIONS UNDER THE AERIALS

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, Konigswusterhausen, 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.

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

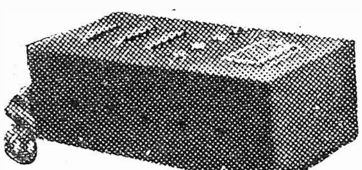
SPECIAL OFFER: 7 days' approval to test. This unit value £7 will be sent to any address on payment of £4 5 0 cash, or C.O.D., with the guarantee that if it is not superior to other units on the market and not giving complete satisfaction the money will be instantly refunded if returned undamaged. It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



Easy payments arranged.

NORTHAMPTON PLATING CO. SUPER A.C. ELIMINATOR

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.



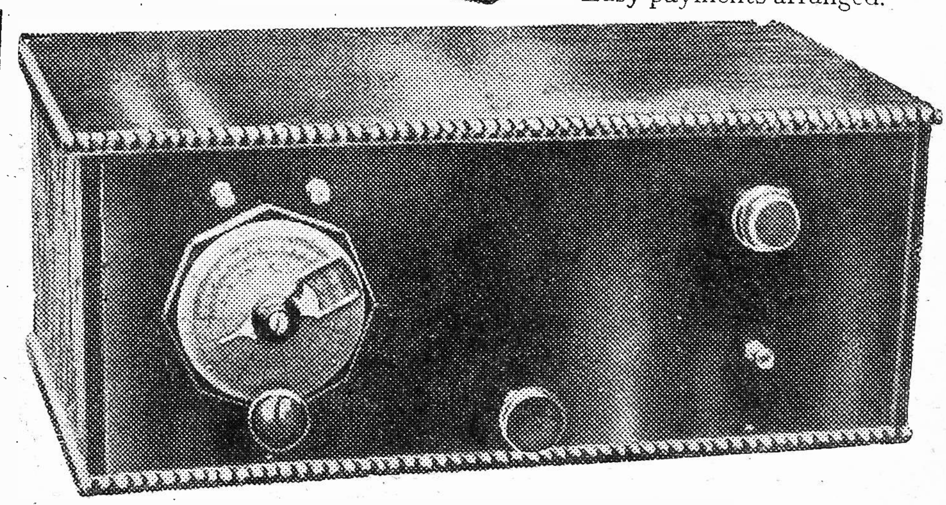
READ THESE TESTIMONIALS

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 42 volts for the highest in most cases I have received well over 39 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.—1.1.31.

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/-	Anti-Mic. Valve Holder	**9d.**
2/3	Rheostat	**9d.**
2/-	Indoor Aerial	**9d.**
2/-	Earth Tube	**1/6**
50/-	Guaranteed 'Phones	**4/11**
1/6	S.M. Dial	**1/11**
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. Cone 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**
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.M3	**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**
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**

New Cycles, Guaranteed, **59/11**; with 3-speed, **79/11**; with Dunlop Tyres, **10/-** extra.

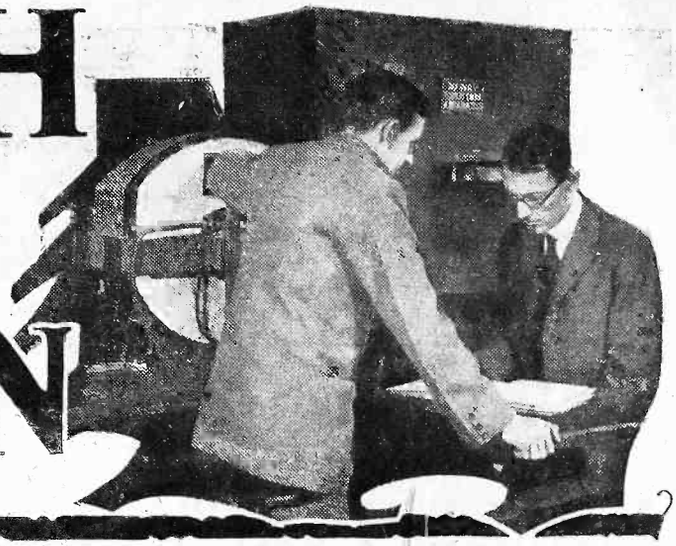
Parts supplied for all sets at Reduced Prices. Send now to avoid disappointment. Cash with order or C.O.D. Special terms to those making sets. All goods guaranteed and exchanged if not satisfactory. Inquire for anything you want. Trade supplied. Send for our wonderful Bargain Price List, P.W.

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.**

The BIRTH of an ELECTRON



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 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 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 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 $\frac{1}{20}$th of the velocity of light, that is, about 10,000 miles per 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.

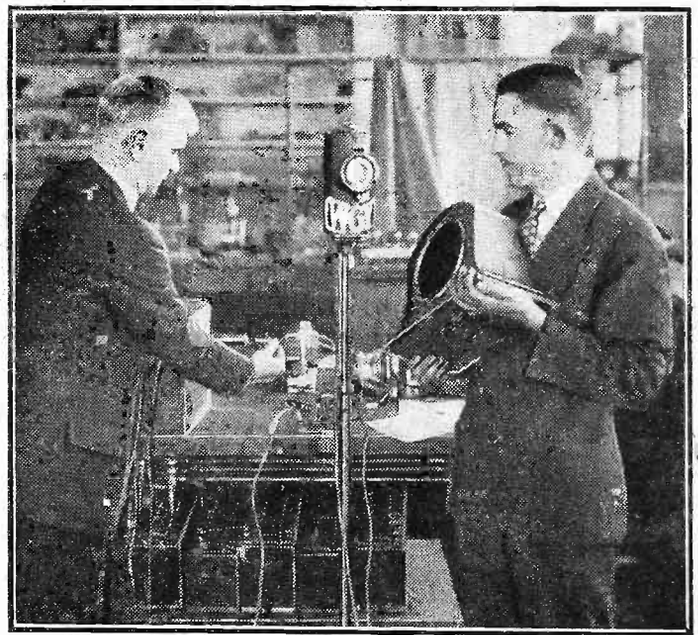
Sometimes an atom will release or expel one of its electrons, and when this happens the expelled electron is known as a *beta particle*. In some cases these beta-particles come out from the atom with definite velocities, but in other cases their velocities appear to be quite indiscriminate.

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.

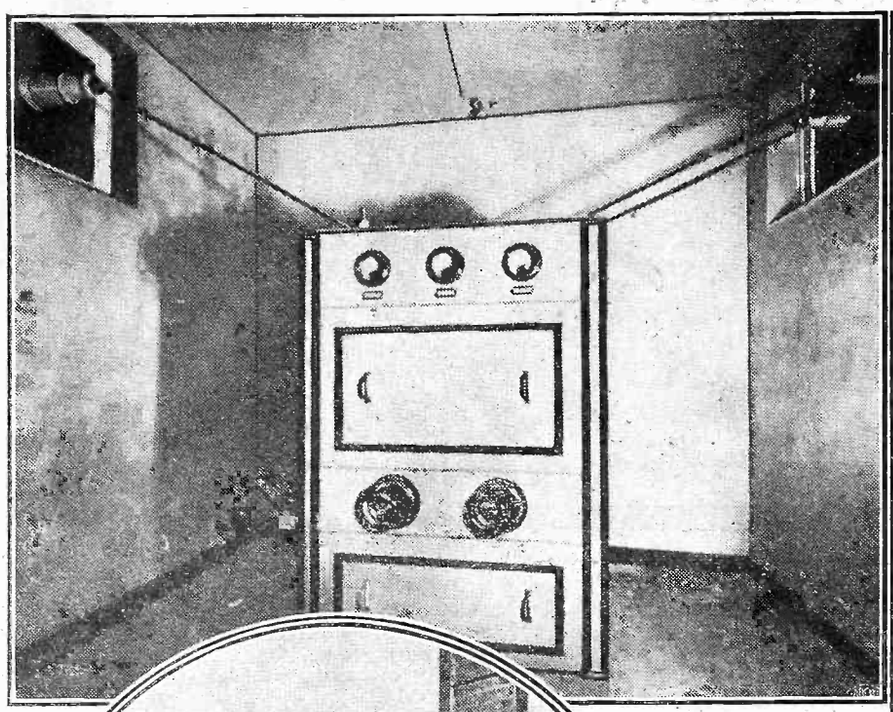
Storehouse of Energy.

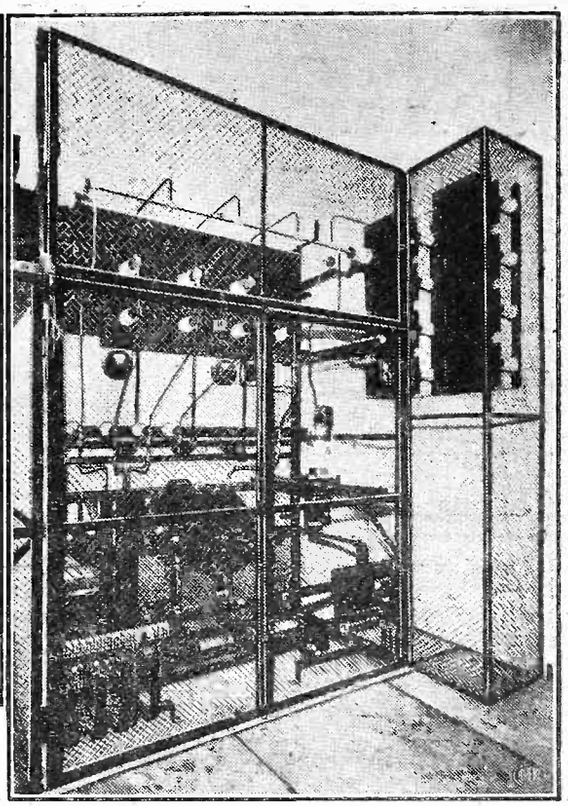
We also know that in certain circumstances an electro-magnetic radiation will proceed from the atom, this radiation being called a *gamma ray*. Gamma rays are regarded as being identifiable with other forms of ether-vibration such as light, heat, radio-waves and X-rays, being more nearly akin, however, to X-rays of excessively short "wave-length."

VOICE OF THE ATOM BROADCAST.



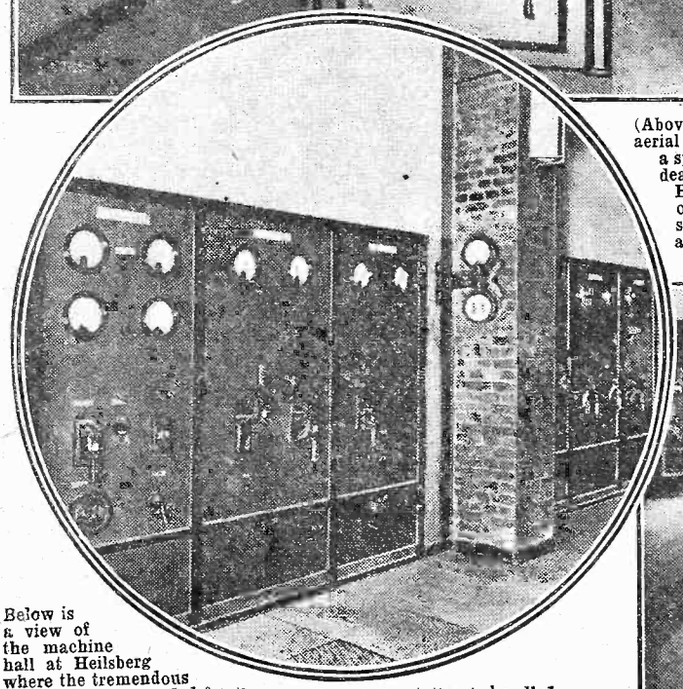
An interesting experiment in New York, when the noise made by an atom exploding was broadcast.



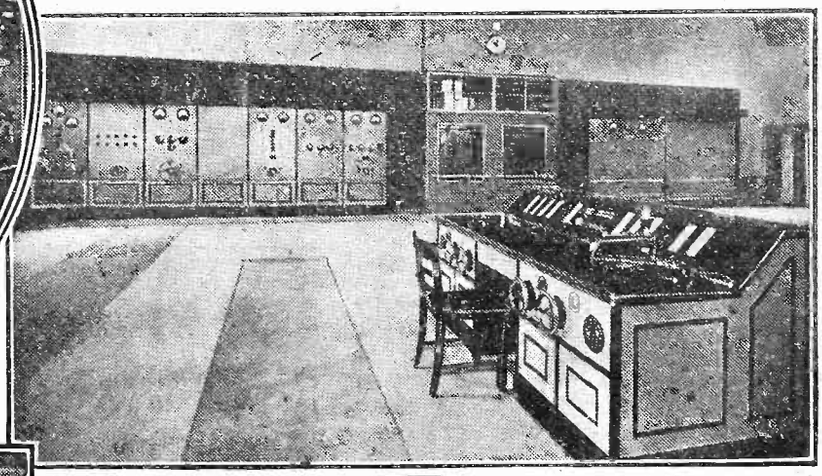


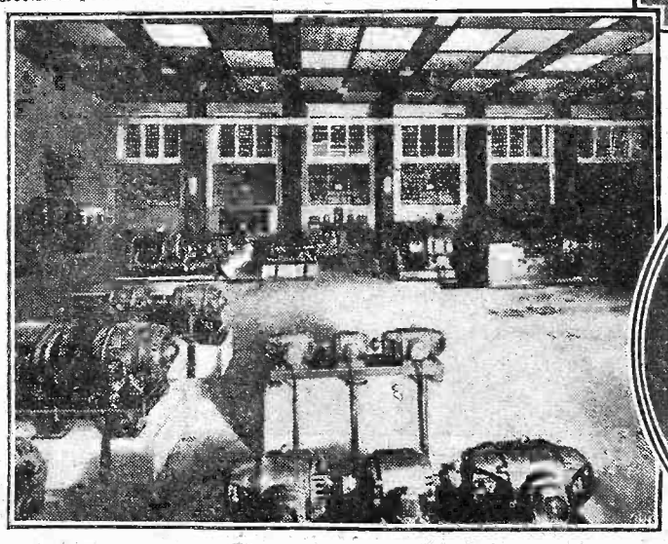
(Above) The inside of the aerial coupling cabin; (right) a special switchboard that deals with 10,000 volts H.T.; and (left) a view of some of the main switchboards whence the alternators are controlled.

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.

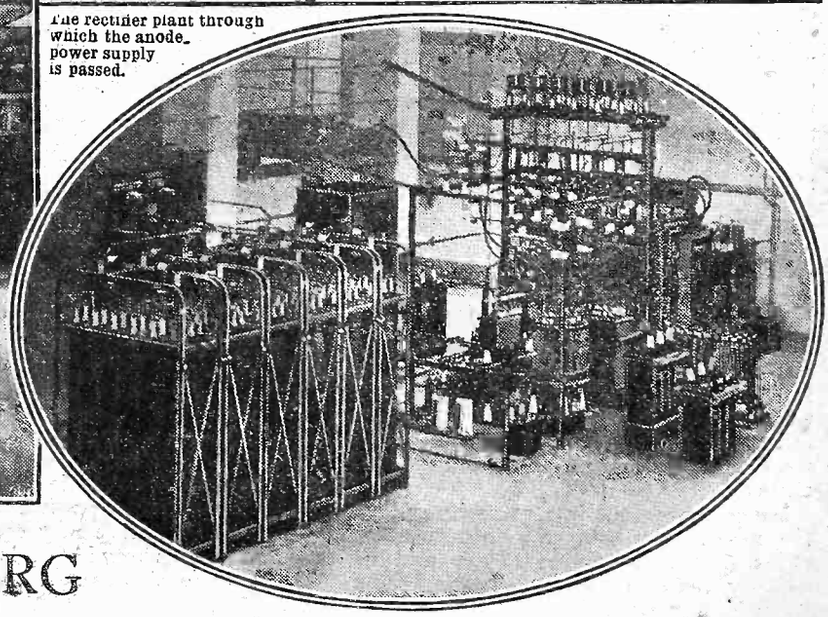


Below is a view of the machine hall at Heilsberg where the tremendous electrical power needed for the operation of the station is handled.





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



SEEN AT HEILSBERG

HEILSBERG

GERMANY'S SECOND REGIONAL

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.

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 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.

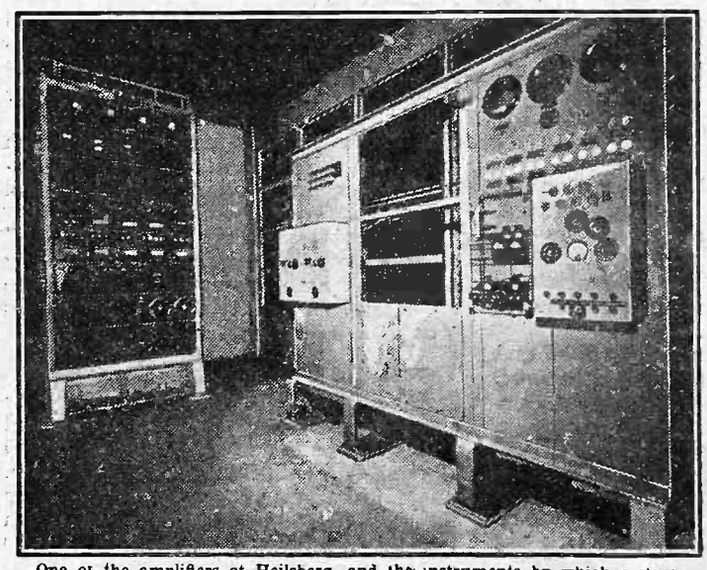
Water is forced from a reservoir through the valves by suitable rotary pumps, and after being led through a counter-flow surface cooler is returned to the pumps. Cooling of the pipe system of the counter-flow cooler is effected by water.

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.

SHORT-WAVE NOTES

By W. L. S.

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. 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 Pittsburg, relaying K D K A on 48·86 metres. He is usually the strongest of the whole lot, and is very reliable.

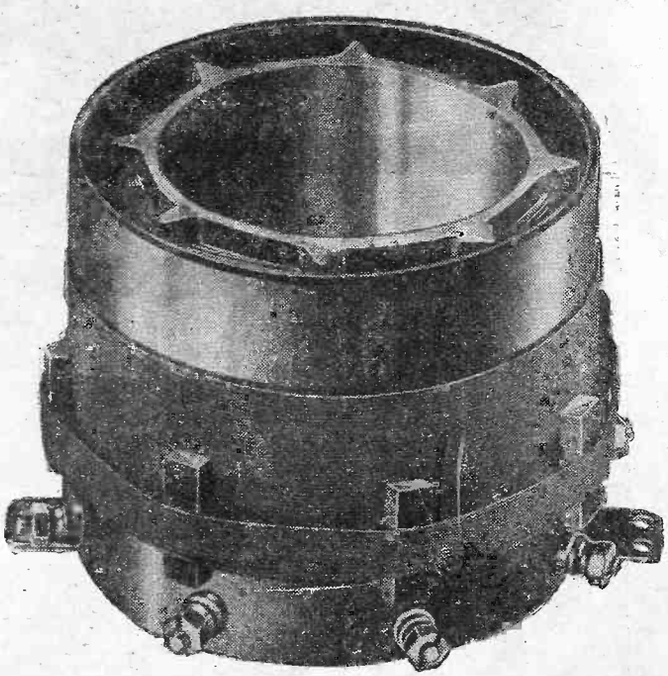
Quite by accident I came across a map showing the future disposition of the World's long-distance wireless telephone services. From it I see that the Buenos Aires station (which I mentioned last week in this connection) will be running services with Paris, Madrid, and Berlin. "Trans Radio" will soon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



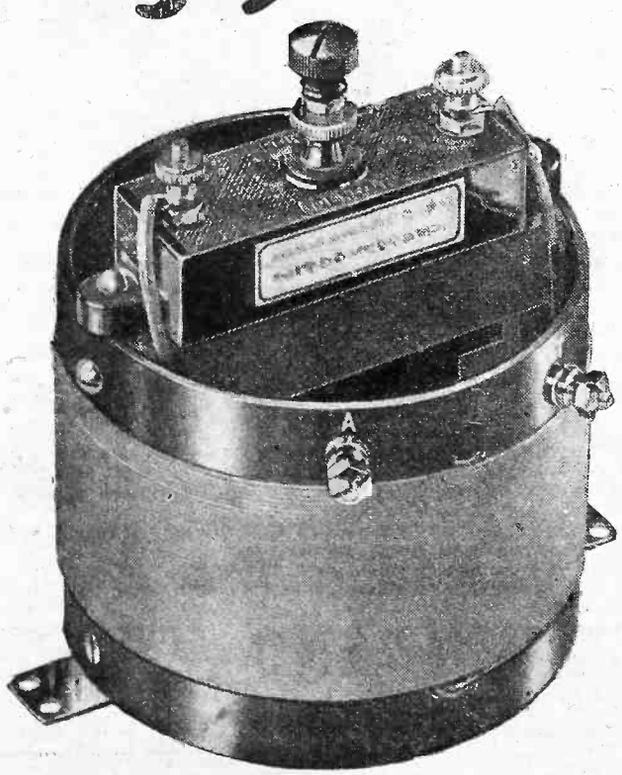
Price 12/6

Ready Radio

159, BOROUGH HIGH STREET, LONDON BRIDGE, S.E.1.

Telephone: Hop 5555 *(Private Exchange)* *Telegrams:* READIRAD, SEDIST

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.

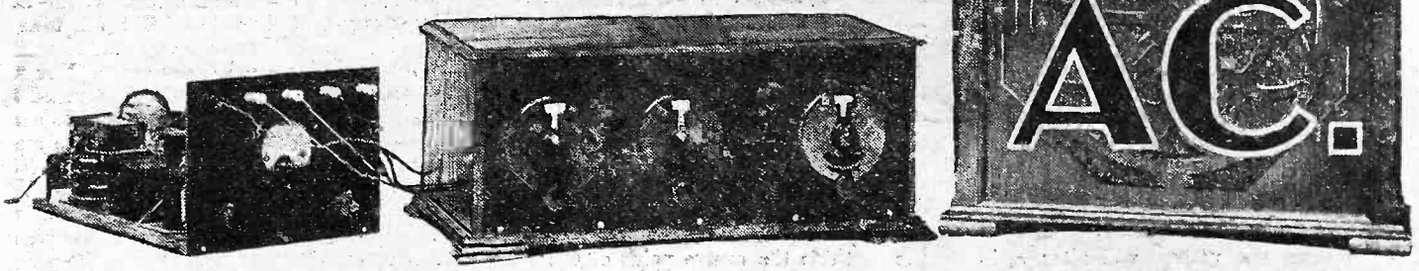
Made strictly to specification by Ready Radio—tested and approved by "Popular Wireless."

"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."

PRICE **5/9**

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.

GOING OVER TO A.C.



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.

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.

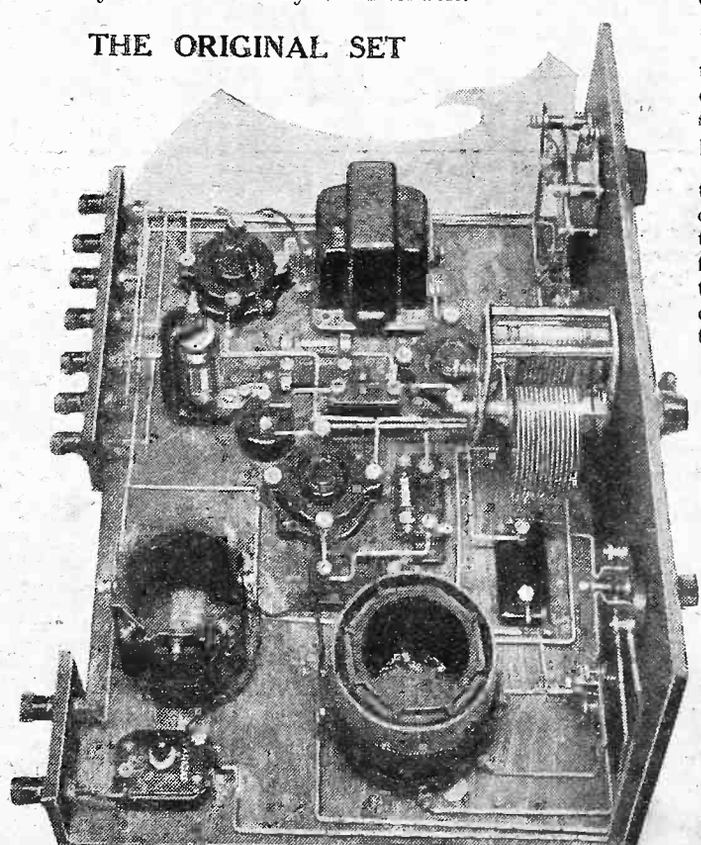
Sets with S.G., H.F. Stages.

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, 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.

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.

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 built 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.*)

GOING OVER TO A.C.

(Continued from previous page.)

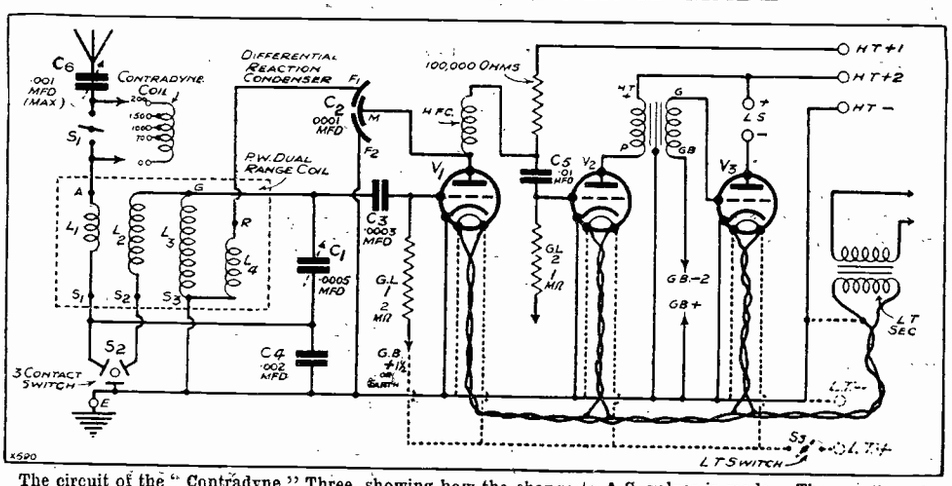
an A.C. set in which the L.T. transformer is quite separate.

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.

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 4½ 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 4½ 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 4½ to 4. You have got to drop half a volt to bring it down to 4. Therefore, you want to put in about ½ ohm.

You may be able, when buying the transformer, either to get the makers to state the various voltages for the various number 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 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.1, 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 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 1½-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.

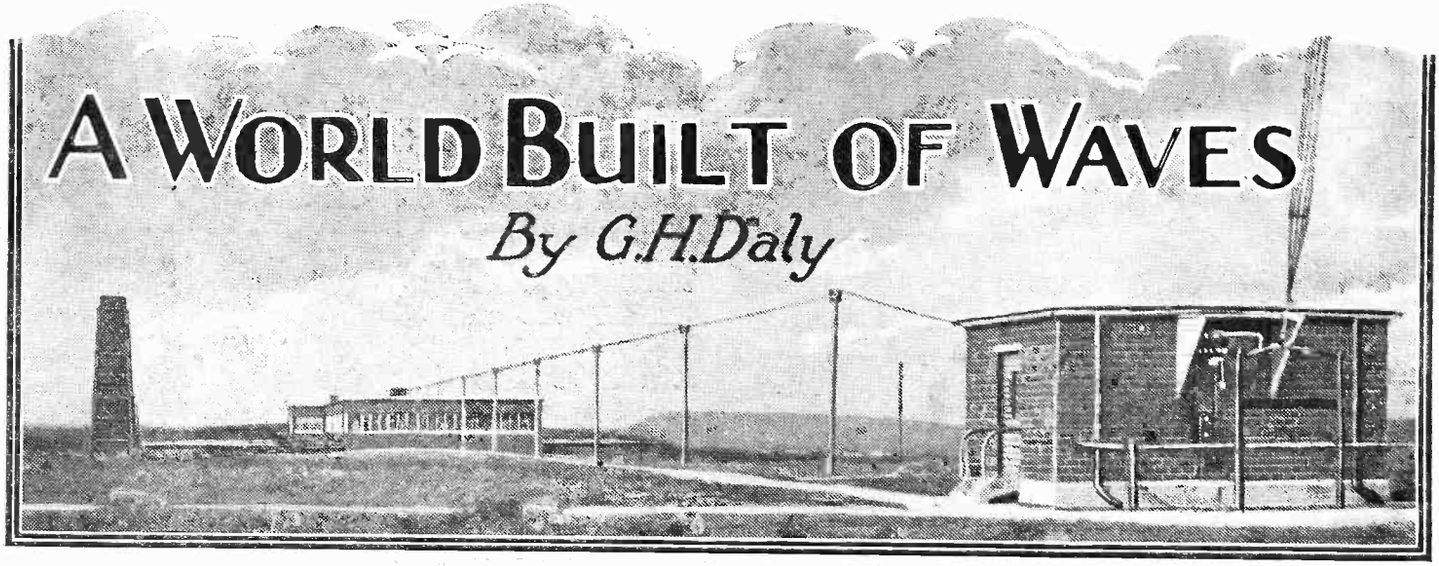
And now about that automatic bias. This can be obtained by placing in series with each L.F. valve cathode (between cathode and earth) a resistance of 1,000 ohms. This will give 1-volt bias per milliamp H.T. current consumed by the valve in question. The grid return is then made to the earthed wiring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

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.

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.

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.

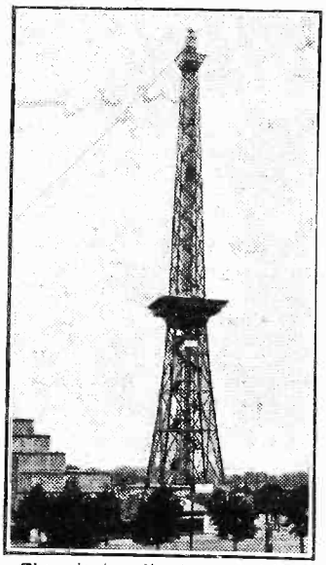
From 30,000 to 5 Metres.

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 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.

A RADIO TOWER



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

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.

MR BARTON CHAPPLE

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

SAYS —

"I HAVE recently conducted a series of experiments with a view to proving whether any advantage was to be gained from the use of anti-phonic valve-holders as applied to valves of modern design. The results prove in a conclusive and striking manner that the employment of sprung valveholders of good British manufacture can effectively reduce, almost to elimination point, the distortion which is frequently caused by vibration and mechanical shock. Such sprung valveholders also tend undoubtedly to assist in retaining the emission qualities of valves by protecting the filaments from the disintegrating action caused by mechanical shocks."

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.

THE BENJAMIN ELECTRIC LTD., TARIFF ROAD, TOTTENHAM, N.17.

IGRANIC ELECTRIC CO., LTD., 149, QUEEN VICTORIA ST., E.C.4.

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.

W G Y GETS OVER

The Editor, POPULAR WIRELESS.

Dear Sir,—It may interest some of your readers to know that W G Y 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.

W G Y 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.

London, S.W.16. (G.P.O.)

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.

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

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. Lile, 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 7½ 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.)

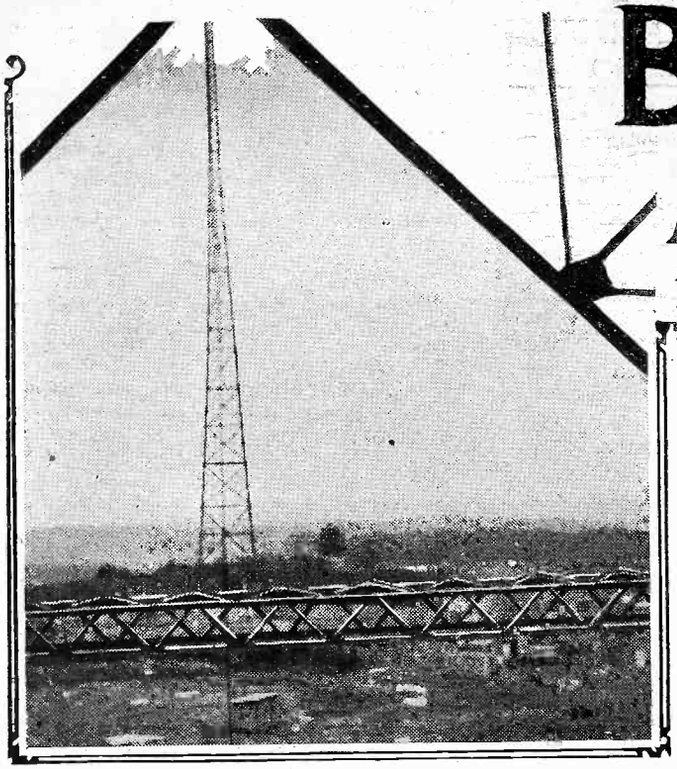
HOW IS THE SET GOING NOW?

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.

LONDON READERS PLEASE NOTE: Inquiries should NOT be made by 'phone or in person at Fleetway House or Tallis House.



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.

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 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-Electrique. One only needs to press a button and relays automatically do the rest of the work of putting the 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 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.

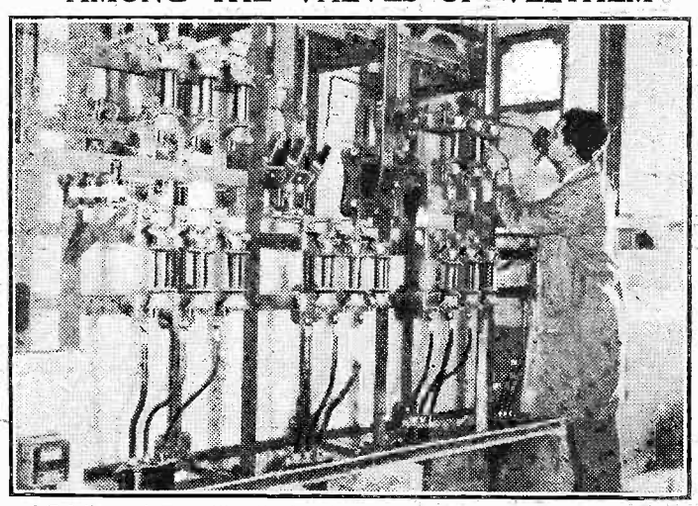
We left Velthem after my having been able to compliment the designers on the excellent layout of the station. One transmitter is on one side of a large hall, the other on the other side, with a direct view from the entrance hall through a glass partition into the transmitter hall.

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.

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.

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 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.

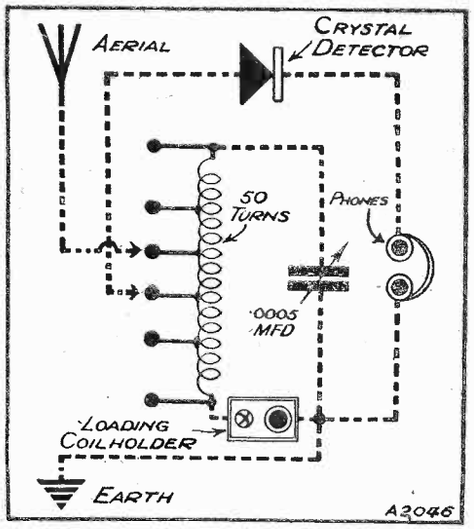
On the other hand, if your detector is at present coupled to its L.F. valve by an anode resistance, you could probably use a transformer quite satisfactorily in the new unit. But good results from such a unit are not merely a matter of adding new components and correctly wiring them, so before going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

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 ong-wave coil must be removed, and the loading-coil holder "shorted."

"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.

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.

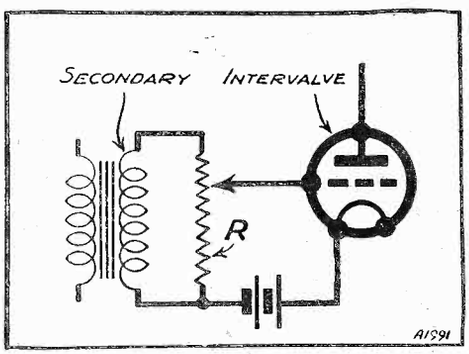
USING L.F. TRANSFORMER AND VOLUME CONTROL.

J. L. (Derby).—"My friend and I both made a set, his det. and two transformers, and mine det., 1 resistance, 1 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 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.)

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.

"JOHNNIE" (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!

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.*)

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 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.

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.

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.*)

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 tappings, so that the proper tappings 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 tappings 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

(Continued on next page.)

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.

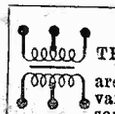
The curious thing is that the voltage on the screen has to be considerably greater than that on the anode. And yet in these conditions the valve will operate apparently as satisfactorily as with the normal voltages prescribed by the makers. At the same time it is sometimes necessary to bring the grid 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 some little circumstances with regard to the construction of the valve, but where a valve *can* be used in this way it is obviously a great saving.

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.

TAPPED TRANSFORMERS



are used in a variety of circuits, sometimes with one and sometimes (as in our example) with BOTH windings centre-tapped.

* * *

As an output transformer it enables primary or secondary impedance to be altered to suit the valve or loud speaker.

* * *

Centre-tapped transformers are used also for push-pull circuits to combine the inputs or outputs of two valves.

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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210 H.L.

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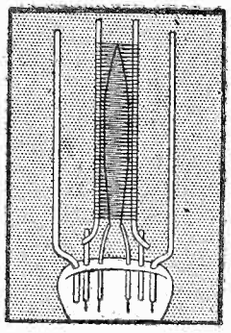
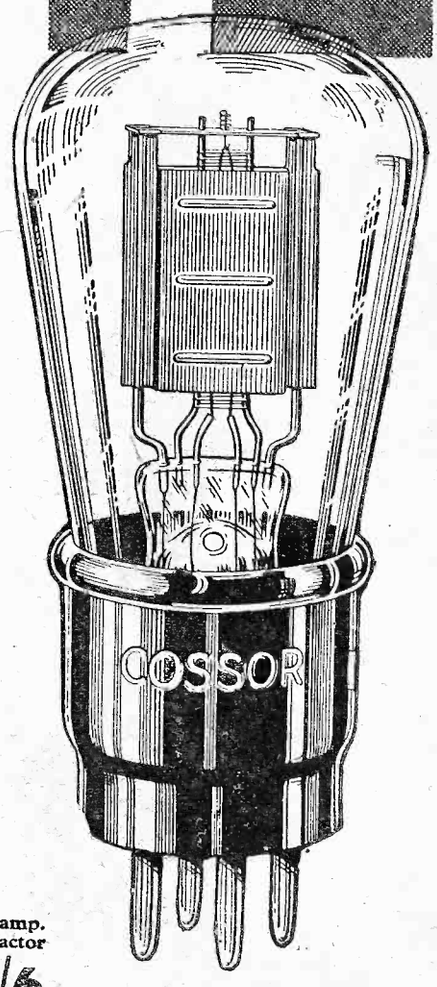


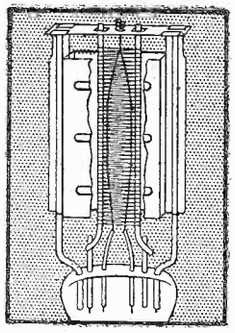
SEVEN POINT SUSPENSION

Practical experience has shown that the Cossor 7 point suspension system definitely eliminates microphonic noises. This system is employed in the support of the exceptionally long filament of the Cossor 210 H.L.

To all users of non-screened grid Receivers this new Cossor valve is of special interest. Designed specifically for more efficient H.F. Amplification it incorporates all the most advanced constructional features. The famous Cossor System of 7 point suspension ensures complete freedom from microphonic noises. Its favourable grid current characteristics permit a remarkable degree of distortionless H.F. amplification without the use of grid bias. The new Mica Bridge Mounting method of assembly ensures greatly increased accuracy in the inter-electrode spacing and an unusually high standard of uniformity. The use of the new Cossor 210 H.L. will result in a considerable increase of efficiency in any non-screened grid Receiver.

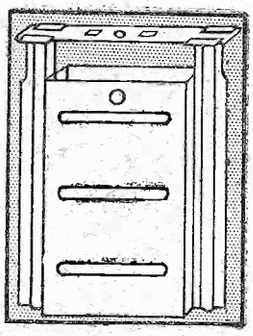


The new Cossor 210 H.L. 2 volts, ·1 amp. Impedance 22,000. Amplification Factor 24, Mutual Conductance, 1·1 m.a./v. Anode voltage 75-150. Price 8/6



UNIFORM PERFORMANCE

The Cossor mica bridge construction permits no variation of characteristics due to differences in inter-electrode spacing. Complete uniformity of performance is therefore ensured between all valves of the same type.



MICA BRIDGE MOUNTING

Permanent alignment of the electrode system is ensured by a stout mica bridge which forms an integral part of the anode assembly. When finally secured in position the whole structure becomes one interlocked unit.

THE NEW COSSOR 210 H.L.

Be sure to get one of our novel, circular Station Charts, which give identification details of nearly 50 stations with space for entering your own dial readings. Ask your dealer for a copy, price 2d. or send 2d. stamp to us and head your letter 'Station Chart P.W

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Popular Wireless

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A. JOHNSON RANDALL.

MY SILENT SET
ATOMS AND EXPERTS
WORLD-WIDE RADIO
THAT INTERVAL SIGNAL

RADIO NOTES & NEWS

THE "COMET"
SHORT REPLIES
MUSICAL NOISES
STILL MORE LICENCES

My Silent Set.

RATHER funny! An evening or two ago I was telling a visitor how silent my set was—quiet background and so on. Well, we listened in. G-r-r-r! Ponk! (*Oh, that's the maid switching on the scullery light!*) "What's that humming noise?" "Oh, that's the mains; I can improve that!" G-r-r-r! Ponk! (*That's the maid switching off the scullery light!*) Pip, pip, pip, pip, pip! Our watches duly checked. *Schlischen schlaschen schlosschen ein zwei*, etc. (*Oh, that's that darned Mühlacker station!*) Ponk! (*That's my daughter switching on the drawing-room light!*) Ponk! It's off again! Sizzle phutt grrr! (*That's the electric masseur chap next door but two!*) And so it went on.

Frank Discussions.

THE "Catholic Herald" has made amends quite prettily for its error in calling "P.W." an organ of the B.B.C., and I acknowledge it with thanks. I am sorry that its Editor cannot, apparently, see the humour of his suggestion. No organ of the B.B.C. would be allowed to wallop the B.B.C. as we are privileged to do! Well, I must not continue this little bicker with our contemporary. The "C.H." does not like scientists to broadcast about religion. Right ho! But H. G. Wells is not a scientist, though he once was a teacher of science. He is, however, a clear and independent thinker.

What They Get In Ceylon.

I HAVE been examining the broadcast programmes of Ceylon, and wish to tell you and the B.B.C. announcers that on January 26th the Rev. Paththalagedera Bodhi Mangalaramadhipathi Matale Sri Panna Sri Thero spoke on "Kama Vachara Pin." This little bit of fun was kindly organised by Mr. A. A. Gabo Singho! Sing hey, sing ho! I should be interested to know what the Editor of the "C.H." thinks about that lot. But, I say—what a test for a suspected case of "under the influence of"! Scotland Yard ought to secure the English copyright!

Atoms and Experts.

A MAN from Aberdeen asks me—*on a postcard*—why I have not japed with the "experts" lately. I am profoundly touched to think that some shafts of (my brand of) humour have pierced the hide of a denizen of that beautiful city. Let him remember that I have reformed. Anyway, I am afraid there are precious few targets for me, for the "Yorkshire Observer" says in its blunt, manly way, "No man can claim to be an expert on wireless until he has become the master of modern research into the structure of the atom——"

Just Wire.

HAS it ever struck you what an enormously important part wire plays in our everyday life in this so-called wireless age? Wireless, as we of the Friendly Following know right well, is based on the use of wires. Our telegraphs, telephones, light, heat, bells, trams, railways, in so far as they are electrically worked, are dependent upon wire. In fact, wire is a wonderful study in itself, and its mathematics are too, too goresome—as they say in London's most advanced circles.

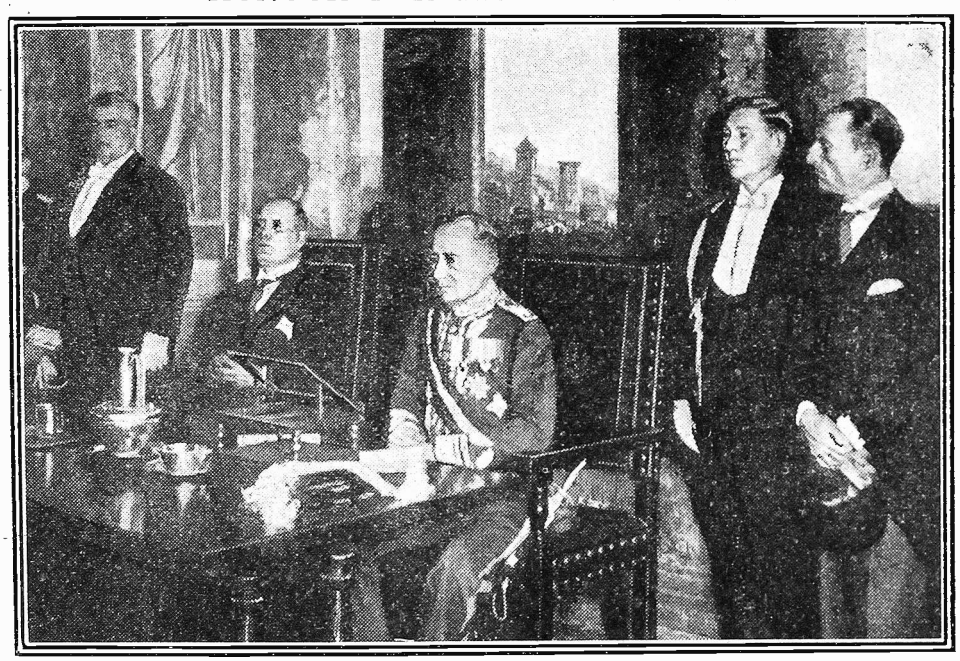
When one "thinks of a wire, coil it, pass a current through it, think of the microhenries you first thought of, double it, subtract the lines of force and add the magnetic flux," one realises from what simple beginnings sprang the mighty science of electrical engineering.

One-Man Radio Sets.

PROFESSOR W. R. BRYANS, of New York University, is alleged to have made the following statement: "Loud speakers are driving hundreds into the divorce courts annually. No two members of a family want to hear the same radio programme." The professor—I know not of what!—thinks that the rule ought to be "one man, one set" plus ear-telephones. Making due allowance for the ease with which citizens of the U.S.A. can be legally unhitched on trivial excuses, I still feel inclined to describe the professor's dictum as—er—not correct. In short, I don't believe him. Loud speakers in America very probably send people to the nerve specialists, but not to the divorce courts by hundreds.

(*Continued on next page.*)

HONOUR FOR RADIO INVENTOR



The scene in Rome when Marchese Marconi was elected President of the Italian Royal Academy. Seated on his right is Mussolini.

RADIO NOTES AND NEWS

(Continued from previous page.)

Round Earth in 44 Minutes.

IT is much more heartening to consider what was done on the occasion of the Richmond, Ind., Palladium's 100th birthday. I do not know whether this is a theatre, vaudeville show, a hotel or a restaurant, but all the same, it is a 100 years old and during a banquet in its honour a message of congratulation was given a push off by Mr. R. Crandall, an American amateur transmitter (W 9 F K E), who received it, forty-four minutes later, after it had been handed on from amateur to amateur, right round the earth.

World-Wide Radio.

RADIO and "P.W." share a world-wide distribution. All the way from Chile, S.L.L. writes to congratulate us on our Christmas Number. *Mille gracise señor.* He also points out that the Enfield reader who reported reception of "Grad-Radio, Buenos Aires" (see S. Wave Notes on page 638) really heard "Transradio Argentino," which is located at Monte Grande near Buenos Aires and works on 28·98 metres. S.L.L. asks what has become of 5 S W and Koenigswusterhausen, which appear to him to have been silent for some months. As sar as I know 5 S W has never stopped fending on 25·53 metres, and K.—now known as Zeesen—is still sending on 31·38 and 1,635 metres.

Radio and the Metal Industry.

REFERRING to the statistics quoted by me in our issue of January 24th, of the amount of metals used annually by the U.S.A. in the radio industry, W.H.D. (Manchester) says that according to the figures given of the number of sets made and the weight of the metals used, twenty-three sets would weigh one ton. A bit hefty, I agree! But, perhaps the American statisicians included batteries, loud speakers, "earth" plates, aerial wire, and suchlike oddments. These Manchester realists should not spoil a good par. by looking gift figures "in the mouth."

That Interval Signal.

THE B.B.C.'s interval signal continues to excite the criticism of listeners. Since I last commented upon it I have seen it referred to as a "death-watch beetle" and likened to the sound of a coffin being nailed down in an empty house! In fact, one may say that it is a "hollow knockery" of what an interval signal ought to be! It brings to one's mind the alleged rapping of the notorious Cock Lane ghost, the descending thuds in the last bars of the "Pathetic" Symphony, or the tick-tock of a hidden "infernal machine." Poor work!

Note for Parents.

IN these difficult times, when almost every trade and profession is overcrowded, it may be useful for me to make public the fact that positions as Wireless Operator-Mechanics in the R.A.F. are open to 500 lads between the ages of 15 and 17, who pass in open and limited competitions for entry into the techical training schools at Halton, Bucks, and Cranwell, Lincs. For full particulars, apply to the Secretary, Air Mnistry (Aircraft Apprentices Dept.), Gwydyr House, Whitehall, London, S.W.1.

The "Comet."

TO C. H. N., of Thornton Heath, who in a pleasant note rather "rubs in" a certain non-"P.W." set and drops a hint to me to try and inspire our technical force to a supreme effort, I think it will be sufficient to point to the "Comet." He can read all about it in this very number and I hope that he will admit that we hold our own. As for those technical research boys, they don't need any prodding. We have to clap their lids on sometimes—they are so fizzy with ideas!

Imperial Airways.

IN view of the Schneider Trophy controversy and what it involves, I was particularly pleased to receive a most interesting story from Imperials Airways, Ltd., showing how British skill and enterprise is revolutionising modern goods transport. It is a common occurrence for twenty tons of freight to pass through the Croydon air terminus in one day, and during a certain period of nine months seven hundred tons of urgent mails and merchandise were airborne over the European and Indian lines of the Company. Nearly two million wireless valves have been flown between London and the continent, and about £80,000 worth of loud speakers. Amongst the items which have been carried figure brussels sprouts, lobsters, bullion, day-old chicks, a full-grown lion, a horse, and tanks of sea-horses.

SHORT WAVES.

MUSIC IN CHUNKS.

Then listeners cut it off.—"Daily Mirror."

* * *

RADIO SOCIETY FOR CROOKS.

"At a specially convened meeting of several Crook wireless enthusiasts a few days ago, it was decided . . ."

Not to pay for their licences, probably.

* * *

"The people on Mars listen to our wireless programmes," declares a scientist.

All we can say is, they must have queer tastes.—"Sunday Pictorial."

* * *

THE HARDEST JOB.

Wireless and its general merits was the topic of conversation between several clubmen.

"After listening to the wireless now for some years," said Smith, "my family have decided to have a little orchestra of their own. My wife is learning to play the banjo, Willie is learning to play the flute, Ernest rather fancies himself as a jazz-drummer, and Doris and Mildred are learning the violin."

"And what are you learning?" inquired Brown.

The other made a grimace.

"I'm learning to bear it," he returned.—"Answers."

* * *

THOSE WIRELESS TALKS.

"The only way to tell the weight of the stars," says Sir James Jeans, "is to weigh them altogether."

Anyone who intended weighing them separately should therefore abandon the idea.—"Punch."

* * *

It is rumoured that television will soon make it possible for us to sit in a theatre and watch a cricket match. No doubt the distractions of the stage will be much appreciated when rain stops play.

* * *

He: "How many reception rooms have you got?"

She: "Oh, only one. You see, we've only got one crystal set."

A Go-ahead Society.

I HAVE pleasure in drawing attention to the South Croydon and District Radio Society, which is very anxious to increase its membership, a trait which is characteristic of a "live" society, not of a moribund one, mark you! I believe in clubs and societies and have never failed to do what I can to help them with a little space in these notes. They keep the movement going, foster interest and activity and are altogether beneficial to their members and the radio world in general. Write to the Hon. Sec.: Mr. E. L. Cumbers, 14, Campden Road, South Croydon. The society meets at The Surrey Drovers' Hotel, Selsdon Road, S. Croydon.

Short Replies.

F. R. (Sheffield). Thanks. The slip you mention was afterwards corrected. C. S. (Bognor). Best o' luck with the "Outer Circle." Why don't Bognorites like the Regis? Are you republicans? H. G. B. (Cricklewood).—Much interested! Passed to technicals for consideration, but demand is for most modern circuits. Quite agree that best "foreign" music comes off gramophone records! T. N. (Kilmarnock). No, I do not know where you can obtain the transformers whose name you have forgotten. I've forgotten! J. T. L. (Plymouth). You are in error in believing that I'm Scottish, vegetarian and play bridge. I'm not a business man, eat raw beef and play poker.

Over in France.

POOR Madame Leriche, who, I recently reported, lost her case against the gentleman who complained that her electrically-driven gramophone interfered with his radio reception, appealed against the judgment—and lost again, this time letting herself in for double costs and getting eight days in which to make her "grammy" non-interfering. If the law goes by precedents in France I should think that this case pretty well clinches the matter in favour of radio against canned music. But I feel a certain sympathy for the lady, because I should so like a labour-saving grammy myself.

Musical Noises.

IT is extraordinary how clever composers are able to reproduce, in an aestheticised form, the noise of machines by the use of musical instruments. Take "R.U.R.," for instance. All the sounds of the factory in that play were made by musical instruments. On February 25th a symphonic episode, "The Factory," depicing a steel factory at work, is to be broadcast. The composer is Alexandre Mossolov. I sincerely hope that no composer will now pick on a boiler factory! By the way, Schonberg used huge chains for certain effects in his "Gurre-lieder."

Still More Licences.

BY the end of 1930 the total of receiving licences issued in this country had reached 3,411,910, including 19,460 free licences to the blind. During the year the increase was 455,174, as compared with increases of 326,448 for 1929 and 230,598 for 1928. In December, 1930, the total rose by 85,012, which is to me astounding. Was the increase due to a change of heart on the part of "pirates" or to the newly converted to radio use? In spite of the unemployment which was rife, eighty-five thousand people had half-a-quid to spare for amusement.

ARIEL

BEHIND THE MICROPHONE

BY CAPT. P. P. ECKERSLEY M.I.E.E.

Our Chief Radio Consultant takes you behind the scenes before and during the opening of a new broadcasting station. This is his fourth article of a special series.

THE early days of the B.B.C. seemed to me to be most occupied in worrying either about the opening of the next station, or about how the last one was functioning now it had been opened.

Such-and-such a station has to be opened. A date is given optimistically by me, the then Chief Engineer of the B.B.C. I break the news to those who have to go into the details—I mean get the station ready. H. Bishop, now the Assistant-Chief Engineer of the B.B.C., is the first to whom it has to be gently hinted that we have three weeks before station X Y Z has to be officially opened.

After he has been brought round he says he'll see what could be done about it. I see no more of him in London. About three days before zero hour London sees no more of me. I arrive at the "new premises."

Apparently Hopeless Chaos.

The door is wide open and a trail of straw and sawdust swirls into the street. Vans keep driving up and disgorging more stuff. They never drive away. There is, among others, the question whether the Station Director is to have an oak or mahogany table.

Also have the curtains for the studio shrunk too indecently to cover the temporary wiring? There are no rectifying valves, as Z has had a flash over in Y and the valves have had to be sent away. The electricians cannot get on wiring the amplifier room because the wall has collapsed and there is a plasterer's strike. I go to lunch.

I have a habit of trying, as far as possible, to give people a job of work and not fuss them. Bishop is a person particularly to be trusted, a miracle worker as far as my experience goes, so I have two checks to prevent me asking more than once every minute whether he thinks it will be all right.

"What the Eye Cannot See——"

The dawn of the day which must inevitably contain the evening finds me early awake. About 4.30 p.m. Bishop allows me to use the Hoover in the studio and I diligently push it about watching its greedy cleanliness in rapt satisfaction.

My attempts to make it swallow valve cartons, stray flex, tin tacks, as well as straw, dust, a carpet slipper and the charlady's soap produce gratifying noises within, but little result. I get feverish and start hiding things.

This goes behind the "shrunk" curtains, *that* behind the accumulators, the *other* fits well into the Station Director's cupboard. Things go anywhere but in that studio which so soon will be hushed to hear the voices of the white-tied élite.

I have to leave, still to the sound of hammering, and vans still seem to arrive. But there is a kind of hush: it seems expectant, can it really be that we are ready?

I call round, on my way to change, to see the transmitter. I trip over an earth wire, see the dim tops of masts against the hurry of windy clouds, find the orange oblong of the door and listen to the discreet hum of alternators.

A Welcome Scene.

Warmth invades me, backgrounded by that subtle smell of newly-warmed shellac, and I see the pink glow of the control valve anodes to tell me power is on. There is a test. A loud speaker chants the anthem of the engineer.

"One, two, three, four, five, *six*, seven, eight, nine, ten. I hope this test is quite O.K." It would seem so. Needles are steady, no flickits, all is orderly, calm and prepared.

So, soothed, I go to my hotel to chase a reluctant piece of hot water into a bath and clothe myself in the black and white uniform of occasion.

ON "P.W."s STAFF

Capt. P. P. Eckersley, Radio Consultant-in-Chief to "Popular Wireless."

Dinner is neither before nor after, as it were, and I am too excited to eat. At last we set out. Mr. Reith, the Admiral, maybe Bishop, calm as ever, to find the long familiar straw has gone, policemen to salute us, a red carpet even has appeared to grace our patent leather feet.

An over-worked palm tree, blasé from a surfeit of hunt balls and mayoral occasions, stands satirically above and about the place where the piano hits the balustrade; The station Director's table (mahogany) is discreetly draped with a white cloth.

On it are foodstuffs of that highly-coloured kind that inevitably accompany any function where refreshments are described as "light." There is also a bottle of "spirits," but we know that it, like so much else that is essential to the occasion, is hidden.

A Terrible Ordeal.

They are coming. Men with chains and their womenkind. Even a man with a sort of jewelled mashie. And there are Lords and Sirs and one is only safe saying "Sir" indiscriminately. One B.B.C. official is heard saying "My Lord," whereat another mutters "My Gawd."

We are in the studio. I stand as if I were a guest. A face peers through the window from the control-room and signals frantically. The General Manager has the advantage of being able to see him. Noises! More noises! Red lights flick! Less noises! More flicks! Less noise! Silence! Deep, hushed, profound! The Station Director faces the mike. He speaks.

Is it going through? Yes? No? *NO!* Sorry. Sweat pours from me. I sneak out to the control-room. It *is* going through. "Why did you shake your head?" Because there is a "hiss" in the 'phones! Intermittent. Isn't there another? Mr. Reith wants me.

"Opened" at Last.

Wants to know what he should say about the engineers. Anything—wonderful work—hope it is. Say it afterwards when it will be. What? Sh! The Mayor. Long speech. "This invention which fair bids" (he means bids fair) "waves, mystérious" (he does not know how true that is considering the wiring) "much pleasure. Opened."

It is! It's opened! Cheers! Who's this? A Lord. Hurray! there's a Lord. Good Lord. Nice Lord. "Er—ah—unknown forces, Caxton, joke, end." It is over.

Where is that hidden thing? All going now. So enjoyed, so interesting, where is my fruit salad? Let's go and eat something. Phew! it was good. And the Police Band is going through just beautifully.

The Aftermath.

And so to bed full of trifle and fruit salad, and nuts and grape pips, which are bothering things when an opening is over. But to-morrow, in the cold morning at 11 a.m. precisely, a poor soprano must *sing* in that dead room. She will, I know, sing of spring. *Spring!*

I wonder how long it will take to get it straightened up? London for me, and then to promise another opening in a month's time. And the licences are coming in and it's all largely fun, anyway!

THE SEMMERING CONFERENCE

By THE EDITOR.

Latest details about an International assembly of broadcasting authorities that is meeting in an attempt to straighten out Europe's congested ether.

LISTENERS will have learnt with unanimous satisfaction that at last steps have been taken to clear up the present muddle in the ether.

We expressed the fear, in a recent issue, that the situation would get worse and worse unless promptly dealt with—that to wait until 1932, when the International Radio Conference will meet in Madrid, would be fatal.

A Temporary Measure.

We are therefore very glad to note that our fear was removed, for by the time these words are read a specially convened conference of broadcasting experts from all the important European countries, except Russia, will have started to "get busy" at Semmering, in the Austrian Alps.

It is, indeed, quite likely that the conference will have finished by the time this issue of "P.W." is on sale, and, if so, we hope the wave-length problem will have been cleared up.

But we doubt it: some temporary expedient will doubtless have been hit upon, but it is unlikely that the entire problem will have been completely and finally settled. Londoners, however, will be particularly interested in one aspect of the problem—that of interference caused by Mühlacker and the London Regional transmitter. We certainly hope the German and British delegates to the conference will settle this item, although it is but one of many.

Beyond finding a solution to the Mühlacker problem, it is not anticipated that much will be accomplished in the way of dealing with the general ether congestion.

The conference will, by this time, have discussed the wave-length problem as a whole, and patched up one or two of the more glaring defects; but the main discussion will have centred round the preparation of data, viewpoints of delegates, etc., which will be more fully and comprehensively dealt with at the Madrid Conference in 1932.

Authority Essential.

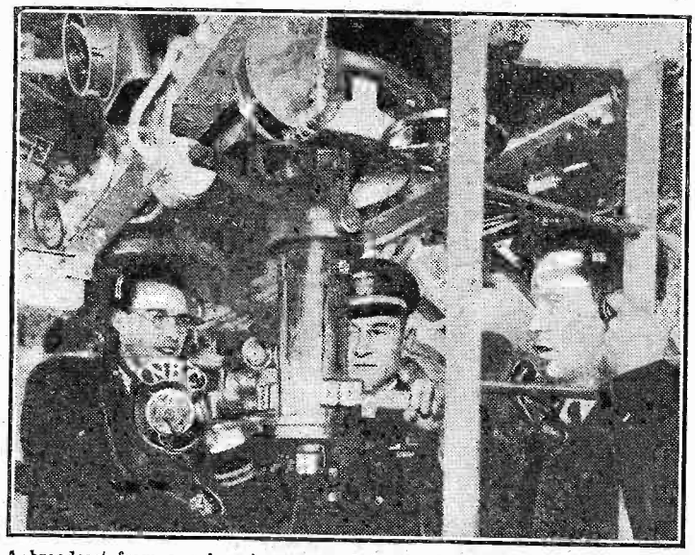
The delegates at Semmering realise the vital importance of securing *authority*.

And it seems pretty clear that no real solution to the problem of the ether will be obtained until the Union [backed by the governments concerned—until it is authorised, in fact, to *enforce* its decisions.

Sensible recommendations for curing an ever-growing evil are no earthly use unless they are acted upon, so it is to be hoped that during their talks the delegates will have agreed to make a really energetic attempt to get authority from all governments concerned.

After all, these delegates are technical experts—they are especially "ether experts"—and, just as a Minister of Transport has authority to enforce regulations, backed by his government, so an Ether Minister is badly wanted for the same reason.

AN UNDER-SEA BROADCAST



A broadcast from a submarine arranged by the National Broadcasting Co. of America. The naval officer is looking through the periscope. This observation device is twisted round by the handles he is holding.

And each Ether Minister, from each country, should have power to pledge his government to ether rules and regulations decided upon at the conferences held by the Broadcasting Union. The control of ether traffic is not merely a national affair of the highest importance; it is an international affair, and its importance cannot be over-estimated.

International Law Required.

Let us hope, then, that we shall be given full details about the conference at Semmering, and that not only will the Mühlacker trouble be satisfactorily settled, but that plans will have been made to obtain definite authority for the conference when it meets again in Madrid.

The main objects are simple: the conference should be, firstly, backed by international law with, secondly, power to enforce broadcasting stations to keep to specific wave-lengths and to use a specific power.

And the wave-lengths granted, and the power granted to the stations concerned, should be authorised by the Union, and only the Union.

* * *

In this issue of "P.W." we present to you the "Comet" Three. On other pages you will read all about it and, remembering the "Titan" and the "Magic" designs, you will realise that "P.W." does not make a "song about a set" for nothing.

This "Comet" is the third extra-special set we have had the pleasure of presenting to you—a set for all with, of course, our guarantee that it is "the goods."

The "Titan" was a fine set; so was the "Magic." It was better than the "Titan" because progress is inevitable, improvements are always going on. And for that very reason, in the twelve months or so that have passed since we offered you the "Magic," the work carried out by the Research Department has resulted in still further improvements.

They are embodied in our latest design, the "Comet" Three. Build it. We feel absolutely certain you will find it the best three-valver you have ever built.

CORRESPONDENCE.

WE ARE SO MODEST!

THE "P.W." "CLEAR-CUT" CONE

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

WE ARE SO MODEST!

The Editor, POPULAR WIRELESS.

Sir,—When I read your first article on the "Clear-cut Cone" I thought your claims for it were very extravagant, and I was a doubting Thomas. I had a double linen cone 24 in. square with a Blue Spot "R" and, although the results were good, they were not nearly so good as you claimed for your cone only 10 in. diameter.

The area of my cones was about 950 square inches, whilst the area of your cones about 170 inches (less than a fifth of mine), for the life of me, I could not see where your cone could give results equal to that I was obtaining.

Still, as the cost was negligible and the trouble very small, I made it up from your details. I was very surprised at the results without the baffle, but now I have the baffle fixed I am delighted; the results both as to tone and volume, high notes and bass are so good that your claims for it are very modest—not extravagant.

One claim you did not make was, the much better pick-up by the set when reaching out. I have got stations clearly the last few evenings that I could only get a chirp from with my old cones.

Thank you for a very delightful speaker.

Wishing every success to "P.W." and your designers.

I remain,

Yours faithfully,

A. W. S.

Wednesbury.

THE "P.W." "CLEAR-CUT" CONE.

The Editor, POPULAR WIRELESS.

Dear Sir,—With reference to your "Clear-Cut" Cone which you published in "P.W." a short time ago; I feel it is only justice to express to you how pleased I am with same.

I had before an ordinary cabinet speaker. When I saw details of your "C.C." Cone, I was tempted to convert my cabinet, but refrained from doing so, thinking that my unit would not suit.

However, I finally made up my mind, taking the name of your popular book for granted that it would be a certain success. The result was marvellous; never before had I heard such clear reproduction. In my opinion, it should be more known. Then I am certain that some wireless enthusiasts would not be so satisfied with their buzzing old speakers. My unit was a 12/6 Ormond unit.

Yours faithfully,

FREDERICK TUGWOOD.

Plymouth, Devon.

Where the Programmes Come From—Savoy Hill.

IF I WERE GOVERNOR of the B·B·C

If you were suddenly appointed Governor of the B.B.C., what changes would you make in the programmes or in the administration? Harold A. Albert put this question to some eminent personalities of the microphone, with the following interesting and surprising results.

J. H. SQUIRE, famous leader of the Celeste Octet.

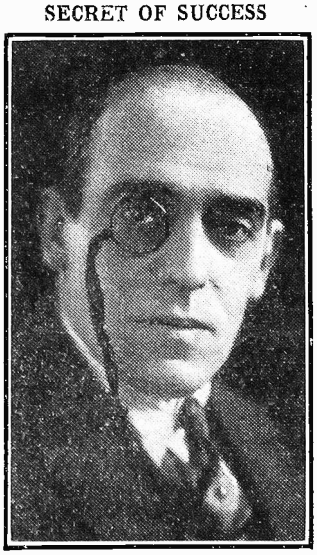
I SHOULD first of all compel those responsible for the accounting at Savoy Hill to pay the Celeste Octet a fee of £10,000 a year, and then I should see to it that every performer before the "mike" had an audience—for none knows better than I that in sympathy lies half the secret of success. The variety artist who broadcasts generally has an audience in the studio who indicate to him how his work goes over, but the poor musician has to play to padded walls.

I am informed that this state of affairs will be remedied when the powers that be move into their new palace in Portland Place, but if I were to become Governor of the B.B.C. to-morrow I should commence the new regime at once.

A Studio Audience.

To get the audience would be an easy matter. In fact, I should probably have more people applying than I could possibly seat; to remedy this, I should charge every one a small fee. Then folks would not come to a concert simply in order to be out of the cold!

SECRET OF SUCCESS



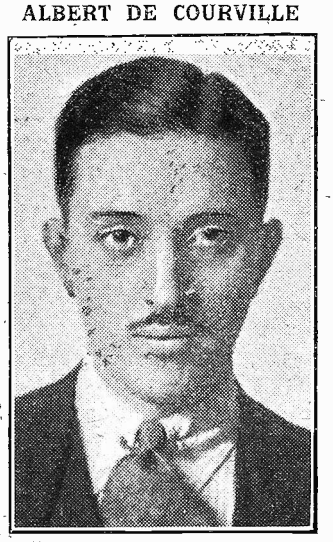
The leader of the famous Celeste Octet says that the sympathy of an audience is the secret of success.

I would also endeavour to reform the wireless licence. I think it obviously unfair that the man with a crystal set should have to pay the same as the man with an all-electric five-valver. No, I would not lower the fee for the crystal set owner.

Anyone who can afford to pay seven-and-sixpence for a dog licence or even sixpence for a crystal, can afford to pay ten shillings for their wireless entertainment. But I should see to it that the people who could pay twenty or thirty guineas for a super set should pay accordingly for the extra value they received in programmes.

That's about all, I think.

ALBERT DE COURVILLE



"The popular taste is not sufficiently considered."

ALBERT DE COURVILLE, the famous Theatrical Producer.

A broadcast programme should not only be on as high a level as anything offered in the theatre; it should have the same popular appeal. Were I to become a Governor of the B.B.C., I should make this belief my foremost canon for the judgment and construction of broadcast programmes.

Masses, Not Minorities.

At present, the popular taste is not sufficiently considered. The B.B.C. is taking too much interest in that minority who are interested only in chamber music, talks, rarely played—and therefore usually boring—dramatic works, and so on.

I should cut education right out of the programmes. Most people when they seek relaxation want entertainment, not dry-as-dust lectures, highbrow histrionics, and unmelodious music. They want to laugh, not to learn.

Oh, yes, I know all the platitudes about the wireless audience, and how varied it is. But people who really want education and chamber music, who are sufficiently enthusiastic, seek to satisfy their needs in the lecture hall and concert room, not in the theatre.

We must realise that the wireless audience is largely the same as one meets with in a popular theatre—with the big difference that the great majority of the people are for various reasons unable to visit the theatres, but are wholly dependent on broadcast entertainment.

I should attempt to make radio something for the masses, not for the minority.

LEONARD HENRY, the Wireless Comedian.

"What an extraordinary feeling it would be,
To know they'd made me Captain of the B.B.C."—(Untraditional.)

The advantages would be enormous. Fancy being able to sack everybody except yourself.

"UNCLE" LEONARD

". . . the advantages would be enormous."

Think of being able to roam Savoy Hill unchecked with all those lovely little knobs to twiddle. And I daresay one could get one's accumulator charged for almost next to nothing.

What fun it would be to speak into the microphone in Number One Studio, and

(*Continued on next page.*)

IF I WERE GOVERNOR OF THE B.B.C.

(Continued from previous page.)

to rush downstairs into the Control Room to hear how one comes through. What an opportunity to keep oneself waiting for hours in the Waiting Room, knowing all the time that one could see oneself if one wanted to.

Imagine being in a position to sell the air to advertisers, so that plaintive requests to buy Somebody's Safety Sausages would occur in the middle of a Bach Cantata. What a wonderful chance to exercise my errand-boy complex (the love of chalking rude words on garden gates), and to gain the gorgeous satisfaction of saying the most *dreadful* things into the microphone.

What a chance to have a few uninterrupted words with:

(*a*) Your golfing friend, who *will* tell you how he did the third in one and kissed the caddie. (And all the time you know he was at the 19th, with one foot on the brass rail and one hand in the clove dish.)

(*b*) Your opposite on the 8.15, whose newly-born is the largest, prettiest, and most wonderful brat in the whole wide world.

(*c*) That Queen of digestion underminers, your wife—who has made the medical profession what it is to-day.

Think of the great glow of satisfaction one would get from knowing that one could do things so much better than the people already there.

Could one?

I wonder!

PHILIP RIDGEWAY, the Producer of so many popular Wireless Revues.

It is always easier to criticise than to construct, and this applies especially to listeners Day by day, the B.B.C. is inundated by letters, the great majority of a highly critical nature. I firmly believe that if but one-tenth of these criticisms were to be acted on, the whole structure of the B. B. C. would go to pieces, and the programmes become so bad that everyone would automatically sell their sets.

PHILIP RIDGEWAY

Famous for his "Fly's Home" Stories.

No, there are small things I might do were I to become governor of the B.B.C., but in the main I should follow the admirable precepts of public entertainment and education set up by Sir John Reith, who ably conducts his staff in the tremendous task of satisfying everybody with something.

Variety programmes, for instance, might be reorganised so that each individual artist in costume played—with stage lighting and a proper stage—to an invited audience somewhere in front. This would satisfy the temperament of the average artist with an atmosphere to which he is accustomed.

Something of the same kind might be done with speakers. At the moment, they have to sit alone in a little room and talk to themselves.

Hard Job For An Actor!

I should like an apparently interested audience of at least one, and plenty of flowers to supply that nice atmosphere which is not so easily given by bare or draped walls. It would be terrible, I admit, were the studio listener to appear bored, but I should overcome this by engaging a trained actor for the job.

AUTHOR OF "THE WHITE CHATEAU"

Captain Reginald Berkeley says Arnold Bennett would give the programmes a good start.

To sum up, I can conscientiously say that I would not interfere very much with the B.B.C. as it is at present. I have seen hundreds of theatres and public institutions, but I have never known such team work as prevails at Savoy Hill. It is little short of marvellous. All flattery aside. Marvellous!

Captain REGINALD BERKELEY, the famous Radio Playwright, of "White Chateau" and other favourites.

If I were in charge of broadcasting, the first thing I would do would be to appoint a Director of Programmes responsible only to the governing body, and a member of it. It is sheer nonsense to expect an administrative expert like Sir John Reith to initiate imaginative programmes. As well expect a baker to arrange a ballet!

The director of broadcast programmes ought to have the qualities of a Reinhardt. He should have a thorough understanding not only of music both light and serious, and of the various branches of literary and dramatic art, but also of showmanship and public taste.

Why Not Arnold Bennett?

He needs to realise through experience what constitutes good entertainment and to have the quality of remembering that the majority of listeners own their sets at least as much for amusement as for instruction.

A good man to give the thing a start would be a young Arnold Bennett, who should bring the requisite qualities and knowledge plus a profound understanding of human nature and the modern point of view. In default of anyone better equipped, Mr. Bennett himself might be persuaded to make a beginning.

BATTERIES v. MAINS

Comparing the Cost.

By T. P. BLYTHMAN, B.Sc.

IT is proposed in this article to compare the costs of running a three-valve receiver from the mains, and from batteries. A typical three-valve set takes a high tension current of about 10 milliamps at a voltage of 100, and a low-tension current of half an amp. at a voltage of two.

Let us consider the cost of working it from batteries for a period of a year. If we assume that the receiver is used for 800 hours during the year, this averages a little over two hours every day.

A high-tension battery giving 10 milliamps will probably have a life of 200 hours, therefore we shall require four of these in the time. At fifteen shillings each this makes £3.

A Typical Case.

How much energy shall we obtain for this sum? A current of 10 milliamps at a voltage of 100 represents a power of 100 × ·01, which is one watt, since amps × volts = watts. The energy is a number of watts multiplied by the number of hours, so that for 800 hours the energy consumed is 800 watt-hours.

The unit of energy measured by the house metres is a kilowatt hour or 1,000 watt-hours. In a year we shall, therefore, use four-fifths of a unit, for which we have to pay £3 for batteries.

Turning, now, to the low-tension supply, a two-volt, twenty amp.-hour accumulator costs an average of sixpence to be charged. If the current used by the valves is half an amp. this should last about 40 hours, so that in a year it will have to be re-charged 800 ÷ 40, which is 20 times. This, at sixpence a time, comes to ten shillings.

The energy obtained from the accumulator is found by multiplying the volts by the amps. *i.e.* 2 × ·5, which equals one watt per hour, or 800 watt-hours per year. This is again equal to four-fifths of a kilowatt-hour or unit. This energy has cost us ten shillings.

Comparative Costs.

Consider, now, what the same amount of energy obtained from the mains would have cost. A unit of electricity from the mains costs an average of 5d. Hence, four-fifths of a unit would cost 4d. The total cost of high tension and low tension energy from the mains would be eightpence. By using batteries we have to pay £3 10s. for the same amount.

These calculations ought to make it clear which is the cheaper.

Of course, to obtain the supply from the mains requires an initial expense for the necessary eliminators, but after these are installed, the cost of operating the set will be practically negligible. There will, of course, be a slight loss in mains transformers, etc., and there might be a rectifying valve to run; but even so, A.C. mains working, even using A.C. valves, is very cheap. (It is slightly different with D.C., owing to the necessity of breaking down the voltage for the valve filaments.)

THE "CRYSTAPHONE"

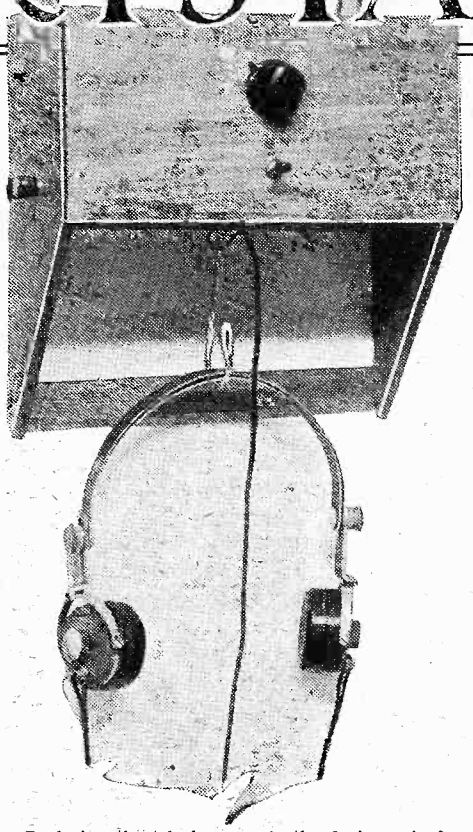
An easily-made sentinel to stand between your set and a breakdown.

Designed and described by the "P.W." RESEARCH DEPARTMENT.

HERE is a really interesting little device for the knowing constructor to gloat over. No matter what kind of wireless set you have, or hope to have, you ought to get acquainted with the "Crystaphone."

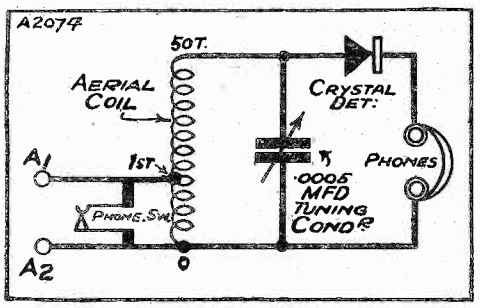
What is it? Well, if you said it is a crystal set for the valve-set owner you wouldn't be far out, strange as that may seem!

And it is a lot more than that. The photographs show it to be a kind of wall-bracket, on which you can hang your 'phones, with just a couple of knobs and two terminals showing. Let us see how it is used.



Replacing the telephones cuts the device out of action and lets you listen on your other set in the ordinary way.

SIMPLICITY SWITCHING



As soon as you lift the 'phones you bring the test crystal set into action.

If you are a valve-set owner you connect your "Crystaphone" in the lead-in, and you can then carry on receiving on your valve set just the same as formerly. But with this important difference.

You are safeguarded against the loss of programmes. When one day the set suddenly sulks—as it's sure to do some time!—and everybody listens for the loud speaker, and asks "Why has it stopped?" you don't have to fret or fume or worry. You simply consult the "Crystaphone."

Very Simple.

Walk up to your neat little wall-bracket, take down the 'phones, and listen to them. They will tell you instantly if the breakdown is at your end or at the broadcasting station; for merely by unhooking the 'phones you bring into action a complete crystal set! All that bother of testing the set and trying battery leads to see if something has come adrift there is abolished, for one of the uses of the "Crystaphone" is to always stand by as an emergency test receiver. Then, even if your valve set breaks down you unfailingly have the programme available at an instant's notice.

This way of using the "Crystaphone" has several incidental advantages which every experienced set owner will appreciate, and which may as well be mentioned here before passing to its other uses. Suppose, for instance, you get "a whistle on the local programme."

It may be your set or it may be some foreign station's heterodyne. You can tell which in a second if you have a "Crystaphone," which lets you listen to whatever is *in the aerial*—an invaluable check!

When we say that the little gadget operates not only as a first-class crystal set, but can also be adapted as a mild form of wave-trap in the very simplest manner, you will appreciate how handy it can be.

Low Cost.

Moreover, nearly the whole thing is home made, so the cost is ridiculously low. It is quite independent of the main set (in fact, it doesn't mind if there *is* no other set!), so we are sure that it will find plenty of enthusiastic admirers.

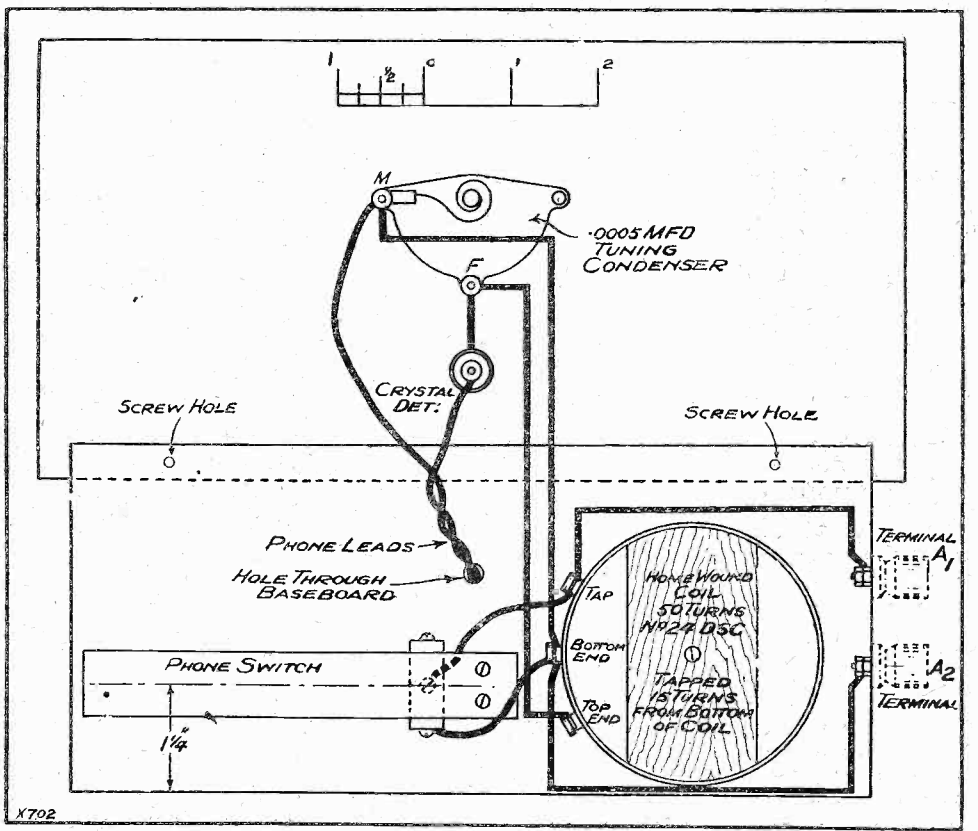
To make it is a

(*Continued on page* 1029.)

THE PARTS NEEDED.

- 1 ·0005-mfd. variable condenser, solid dielectric type (Ready Radio, or Burton).
- 1 Crystal detector (Red Diamond, or Brownie, R.I., etc.).
- 1 3-in. diameter coil former, about 3 in. long (Pirtoid, or other good insulating material).
- 5 Terminals (three very small ones for coil, two ordinary).
- Wood, screws, wire, etc.

YOU CAN MAKE IT—COIL AND ALL—IN ONE EVENING



The radio part of the "Crystaphone"—coil switch, etc.—is as easy to tackle as the woodwork.

FREE NEXT WEEK

TO ALL READERS OF Popular Wireless

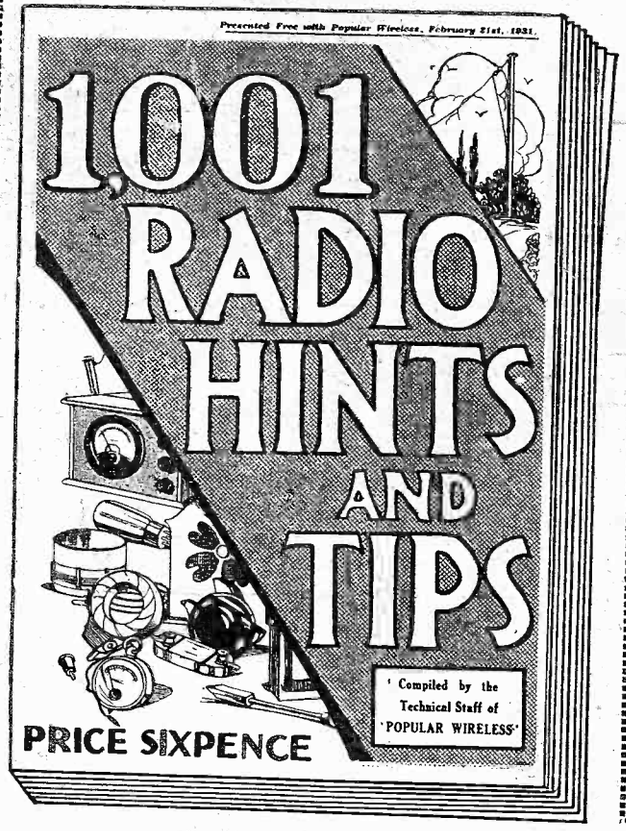
THIS MAGNIFICENT 44 PAGE BOOK

covers all phases of radio reception and provides invaluable information on all branches of the subject.

It is intensely practical and will prove an undoubted boon to every set owner.

Whether you build your own receiver or use a commercial model

YOU NEED THIS BOOK.



YOUR RADIO PROBLEM IS DEALT WITH

in this remarkable Gift Book. It is absolutely packed with practical information and will give you very great assistance in tracing that little problem that has been worrying you for so long.

Full of valuable and interesting notes you will find the

"1001 HINTS AND TIPS"

book worth its weight in gold. This book cannot be obtained elsewhere at *Any Price.*

ALSO

LOOK OUT FOR

"FLEXI-COUPLING THE COMET"

A fully illustrated article describing one of the most valuable, yet simple, refinements that can be added to "P.W.'s" latest set.

MAKE SURE OF YOUR "P.W." NEXT WEEK

On Sale February 19th. *Price 3d. as usual.*

THE "CRYSTAPHONE"

(*Continued from page* 1027.)

very simple task, the "carpentry" called for being of a very elementary kind. Yet the finished instrument is quite ornamental, and it certainly does not disfigure any wall on which it hangs.

The photographs and diagrams show the constructional details, but first of all there is the coil to make. A very simple matter.

You wind 50 turns of No. 24 (or thereabouts) D.S.C. wire on a 3-in. diam. "tube" or former, making a "tapping"—i.e. a connecting point—at the fifteenth turn from the bottom.

The two ends and the tapping are each connected to little terminals mounted on the coil former, as shown. A piece of shaped wood screwed across the inside of the coil to enable it to be mounted later to its baseboard completes this part of the work.

Dealing with the Woodwork.

Now for the "cabinet" or wall bracket. The sizes of the front (or "panel") and two sides, as well as of the crossbar which connects the lower corners, are given in one of the diagrams.

You also need wooden top and bottom "shelves," the latter acting as a baseboard on which the coil is to be mounted, and the top coming in useful as a shelf for an ornament, or books, or what you like. The dimensions for these shelves are 9¼ in. by 4 in.

On the "panel" must be mounted the variable condenser and crystal detector, as shown, and in our model we placed the condenser 1¾ in. down, and the crystal 2 in. below this, both on the centre line.

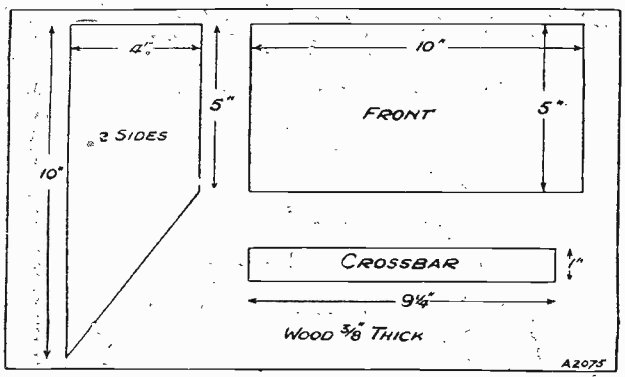
With the two terminals screwed in one side, the "Crystaphone" is ready for assembly, except for the switch.

This is mainly of wood and the diagrams make it quite clear. The bottom contact is a block of wood with a strip of copper over it. For those who find them necessary, complete constructional details of this switch will be given under "Radiotorial."

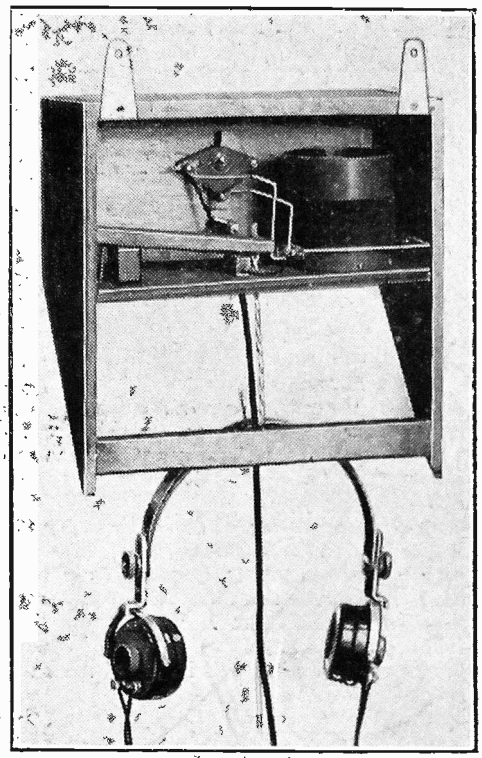
The "switch" being wired across A_1 and A_2, short-circuits the aerial currents straight through the "Crystaphone" when the 'phones hang on the hook.

If the hook is lifted the aerial currents will then run through 15 turns of the coil, so after tuning the ·0005 condenser you can always pick up the programme in the 'phones. Simplicity itself!

THE MAIN WOODWORK



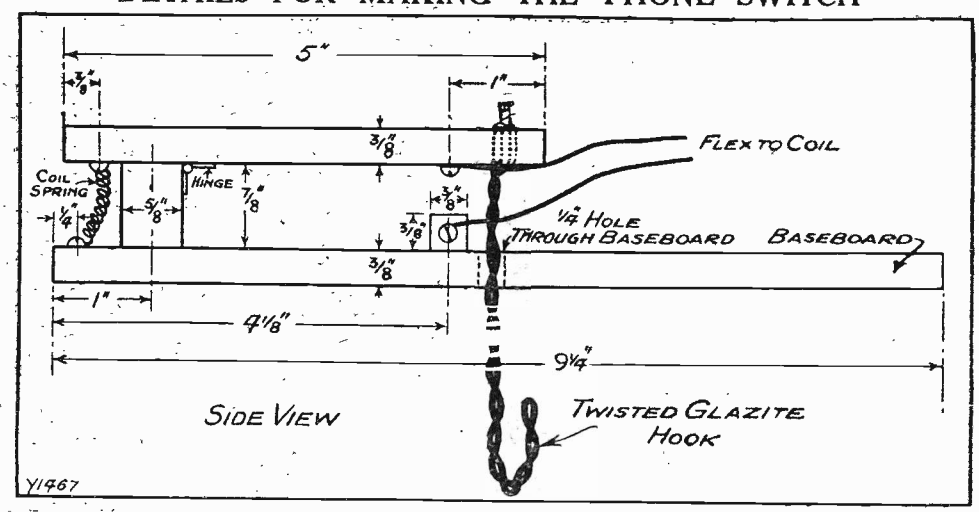
In addition there is just a small baseboard and a top shelf, as shown in a photograph.



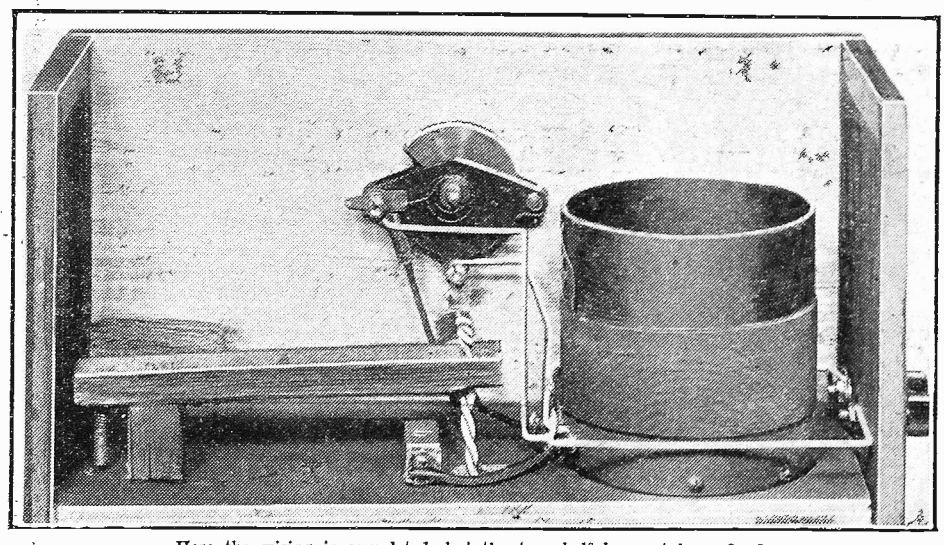
The "Crystaphone" as seen from the back.

The most convenient method of wiring

DETAILS FOR MAKING THE 'PHONE SWITCH



A CLOSE-UP OF THE "CRYSTAPHONE'S" INTERIOR



Here the wiring is completed, but the top shelf has not been fixed.

is to leave the top shelf off till the various connections have been made, as the terminals, etc., are much more accessible this way.

As the 'phones will be joined permanently in circuit in most instances, no 'phone terminals are used, but instead the 'phone leads are taken up through a hole in the bottom shelf to the appropriate connecting points. If preferred a pair of terminals can be used, one connected to the crystal and one to the moving vanes of the condenser, instead of making the connections direct.

This would allow the 'phones to be disconnected easily if required elsewhere. Similarly, it allows the detector circuit to be broken altogether if it is desired to use the "Crystaphone" as a form of wave-trap in conjunction with another set. So if you intend to try this, fit a couple of 'phone terminals to the bottom shelf instead of running the 'phone leads direct.

LATEST BROADCASTING NEWS.

CENTRALISATION SCORES

THE INTERNATIONAL SITUATION—EDUCATION CONFLICTS—COMING EVENTS.

THE announcement of the disbanding of the Northern Wireless Orchestra on March 31st is much more significant than appears on the surface. The struggle for the maintenance of this Orchestra has gone on for three years and has not been helped by the exceptionally good work of the Orchestra.

But the argument of economy and ruthless reduction has prevailed. After the end of March there will be in Manchester only nine instrumentalists as the nucleus of local orchestral effort. The B.B.C. has taken pains to point out that the "Studio Orchestra" of nine will be augmented for special occasions.

There was added, however, to the intimation of the end of the Northern Wireless Orchestra the significant remark that the principal B.B.C. Orchestras would be available to Northern listeners through the new Regional Transmitter.

Those who know what is happening behind the scenes at Savoy Hill are in no doubt as to the real meaning of this utterance. It represents a very definite victory for the centralisers. Regional broadcasting is again in serious danger.

The International Situation.

Tests carried out jointly by the B.B.C. and representatives of German Broadcasting in the hope of finding a solution of the Mühlacker–London Regional difficulty have been unsuccessful.

Anxious consultation is now going on at the meeting of the Internationsl Union of Broadcasters in Austria whither Admiral Carpendale and Mr. Noel Ashbridge have gone to represent the B.B.C.

Competent opinion sees very little hope of a "political" solution. There is a strong probability that the whole existing distribution of broadcasting channels will have to be revised.

Those who are in a position to know, take the view that the separation between channels will have to be doubled, thereby reducing the number by 50 per cent.

The result to Great Britain would be 5 X X plus four exclusives in the Broadcast Band as against 5 X X plus 9 exclusives now.

This would necessitate the abandonment of the Regional Scheme. On the other hand, it would greatly simplify the organisation of the B.B.C. and would make possible a big reduction of staff.

Education Conflicts.

The creation of three "Talks Directors" at Savoy Hill has been followed by the inevitable internecine conflict. Terrific competition has been created. Miss Matheson, Miss Sommerville and Mr. Siepmann, each with a separate organisation attempts to attract the most important and popular lecturers and speakers. There is manœuvre and counter-manœuvre.

Pledges are made and broken. Meanwhile much time is wasted, and it remains to be seen whether the programmes will be any better. It is high time that the B.B.C. imported a new super-director for the Talks Department to look after the serried ranks of its directors.

Coming Events.

Here are some "high lights" in forthcoming programmes of interest to listeners throughout the British Isles.

Mr. Val Gielgud, the Production Director at Savoy Hill, is producing, in conjunction with Mr. E. A. Harding, a radio version of "The Tempest" on Sunday afternoon, February 22nd. The actors taking part are Ralph Richardson, Leslie French, George Howe and John Gielgud.

Members of the medical profession seldom appear in the broadcast programmes, except in official talks, and when a doctor, so famous as Sir James Crichton-Browne consents to speak before the microphone the event assumes outstanding importance. Sir James, who is in his nineties, will broadcast some of his reminiscences on Saturday, February 21st.

Midland Regional listeners will look forward to a concert to be given by the Coventry Silver Band on Tuesday, February 24th. Although founded sixty-three years ago as the Ragged School Band, this combination really owes its existence to a few older members who kept it going during the dark days of the Great War, since when it has "mopped up" prizes right and left.

Brahms' "First Symphony," regarded as one of the world's greatest treasures, is one of the principal items in the next Hallé Concert to be relayed on Thursday, February 26th. The solo artist in the concert is Gasper Cassado, the famous Catalonian 'cellist.

A talk on the Welsh Historical Exhibition, which takes place at the City Hall, Cardiff, between February 21st and 28th, will be given for West Regional listeners on Friday, February 27th, by Mr. W. Arthur Evans, Secretary of the National Union of Welsh Societies.

"Macpherson's Lament," a radio play by Andrew P. Wilson and Arthur Geddes, based on the old Banffshire tradition of the robber Macpherson's arrest and public execution, will be broadcast to Scottish listeners on Friday, February 27th.

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.

"Stop Press."

THERE was plenty of "pep" in this little show, as well as Pepper (Harry S.).

The cleverest part of it was a brilliant little imitation of A. J. Alan singing a vaudeville song. The most amusing part of it was a skit on how things are managed at Savoy Hill, and the number of departments and people concerned was, to say the least, not small.

The requirement was a musical box, price threepence; but do you think it could be got? B.B.C. Exchange got busy; practically every department was involved; everybody was ringing everybody else up; and when at last it had been obtained, the news came through that the programme for which the blessed box had been wanted was cancelled! How much truth was there in it? We shall never know!

Bouquets for Ladies.

I wish to hand bouquets to three women. The first is Miss Gertrude Kingston, who embellished her delightful talk on the theatrical world "yesterday and to-day" with an altogether charming and, as it seemed to me, lifelike imitation of the divine Sara. It was a tour-de-force which in a theatre would have "brought the house down"; and, on the wireless, doubtless brought many houses down.

Nina Tarasova.

The second is Nina Tarasova, whose name I do not remember having seen before in the vaudeville programmes. She calls herself an international diseuse, but she sang four songs—in French, Russian, and English. She has a beautiful voice, and is a great artiste.

(Continued on page 1068.)

HOW TO MAKE A LONG-WAVE FRAME

Besides the considerable practical advantages to be gained, there is a peculiar fascination in operating a set on a frame aerial, and the following description of a long-wave brother to our recently described frame aerial will be welcomed by a large number of readers.

IN the January 31st issue of POPULAR WIRELESS (No. 452) we described the construction of a frame aerial to cover the medium wave-length band. This week we are showing how a long-wave model on the same design can be made.

But before we go into the practical details, let us see how the long-wave frame can help the listener to modern broadcasting.

Though there are many cases where a frame aerial is not necessary, there are still others, especially near the coast, where such an aerial would be a very great boon.

Cut Out That Jamming.

No matter if your set is powerful and selective, in many cases the raucous voices of ships will make themselves heard above the broadcasts you may be trying to listen to.

The National transmitter on long waves does not have its programmes improved by the coarse croak of a destroyer, while the efforts of about a dozen ships to get through the jamming in the Channel does nothing to render more entertaining the concert from Kalundborg or Radio Paris.

But what can one do? Situated fairly near the coast with its flat-tuned land stations and the ever-impatient bursts of "traffic" from passing vessels, the owner of a radio receiver frequently has a very bad time.

The solution is often to be found in the frame aerial which, besides being highly directional, is also more selective than the ordinary average aerial system. It will not be affected even by powerful spark transmissions.

Type of Set to Use.

It is capable of being sharply tuned and will often solve all jamming problems for the man who has a fairly powerful set.

You need one H.F. stage at least if you are to hear the long-wave National satisfactorily over a distance exceeding 100 miles with a frame aerial. Or you can reckon it another way. Listen on a detector and 2 L.F. receiver on an ordinary aerial, and then on a frame. You will find a stage of H.F. necessary before you could reach the same volume of reception as before.

But the frame aerial can be used with detector and 2 L.F. sets quite well in many cases, as witness some of the earlier models of portables which have successfully received 5 X X as far away as Devon and Cornwall.

Given further amplification the frame becomes a very rosy proposition, and we feel that a large number of readers will find this long-wave frame a valuable companion to the medium-wave model recently described.

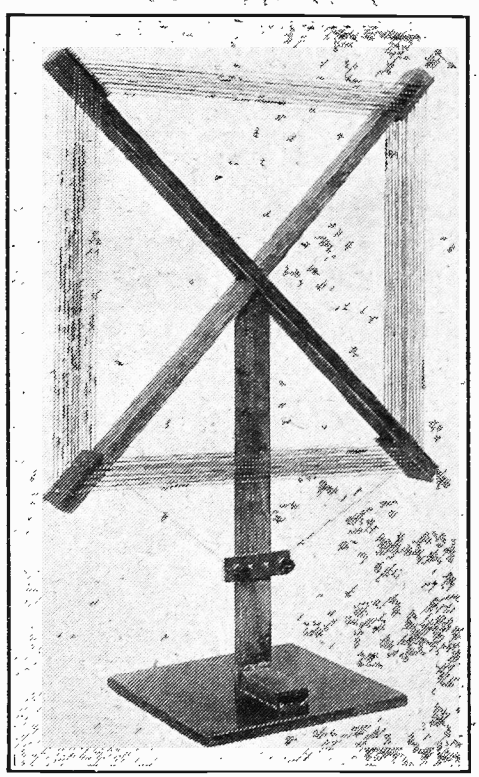
The construction is very similar, the same type of construction being employed. All that is different is the winding, which naturally has to have far more turns.

The illustration shows how the framework is built, and those of our readers who have "P. W." No. 452 will be able to see the exact dimensions from the diagram on page 950. But for those who have not, the following dimensions will be of assistance.

The base is of $\frac{1}{2}$ in. wood and measures 9 in. square. The upright is $4\frac{1}{2}$ in. up to the 3 in. terminal strip, and above this it is about 10 in. The two cross pieces measure 24 in. by $1\frac{3}{8}$ in. and are $\frac{5}{8}$ in. thick.

The ebonite pieces, which have seven sloping slots $\frac{1}{4}$ in. deep and $\frac{1}{4}$ in. apart on each side, measure $2\frac{1}{2}$ in. by 2 in. by $\frac{3}{16}$ in.

FROM 1,000 to 2,000 METRES



Here is the long-wave frame described in the accompanying article. The aerial will cover the whole of the long-wave broadcast band.

In winding the long-wave frame 26-gauge D.S.C. wire is employed, and 56 turns are wound on in *one* direction. This latter is important; otherwise the frame will be useless.

Putting on the Winding.

When winding, the best procedure is as follows: Start at one of the terminals and wind round the slots on the side of the frame nearer you. Wind four times round each of the first four slots, then go round four times in the next series, and so on till you have completed the fourth turn in the seventh slot. This completes one side.

Now hitch the wire across the same ebonite corner-piece from the outside slot (where you have just finished) diagonally to the inner one on the other side. Then proceed to wind this side in the same direction as the first.

That is, if with the first side you went round clockwise; when you turn the frame round to wind the second side you must go round anti-clockwise.

How to Connect Up.

On this side you proceed four times round each line of slots until you reach the outside one nearest the remaining terminal. Then take the line across to the terminal and the job is finished.

In use all you have to do is to connect the frame *across* your first tuning condenser, disconnecting any coil you may have there. Then you tune in the usual way, remembering that the tuning will be sharper than when you had an aerial, and that you should not use an earth if the set is stable without one, as the earth tends to reduce the directional properties of the frame.

THE NORTH REGIONAL

Some points in the design.

Nearly 10,000 gallons of water a day are to be used by the North Regional station, so a reservoir capable of holding 200,000 gallons has been arranged for.

* * *

Special precautions against frost had to be taken at Moorside Edge owing to the altitude of the station.

* * *

The aerials have been so designed that if necessary a strong current can be passed through the wires to melt any ice or snow which may adhere to them.

STATIONS WORTH HEARING

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

By R. W. H.

RECEPTION conditions for distant stations are always to some extent dependent upon the weather. Though the exact relationship between weather and wireless has not been worked out, we can, at any rate, say that sudden large changes of temperature or jumpiness on the part of the barometer are usually accompanied by atmospheric interference and often fading.

It does not seem to matter very much what the reading of the barometer is so long as the glass is steady; in fact, my own experience is that the very best long-distance reception is frequently obtained on thoroughly dirty nights, when the rain is pelting down and the wind is howling round the chimneys.

Good Guides

As we advance from winter-time to spring conditions we must expect a period of fluctuations in both thermometer and barometer readings. It is most likely then that though any week will contain several good nights, it may also have one or two when long-distance work is hardly worth while.

One of the best tips I know for discovering easily and quickly whether long-distance reception is likely to be good or otherwise on any particular night is to make use of what I call reference stations.

These are stations of no great power and situated at considerable distances, whose transmissions are known to come in well on good nights. Since conditions may not be the same over the whole of the medium wave-band, it is just as well to have three of these, one near the lower end, one about the middle, and a third up at the top.

Daylight Reception.

Those that I use myself are Kiel on 232·2 metres, Breslau on 325 metres, and Munich on 533 metres. The settings of these are known exactly, so that they can be tuned-in if they are coming through. Five minutes spent with the reference stations will show the reader whether it is worth his while to make an ether trip abroad or whether he can more profitably devote the evening to home reception. On the long waves I can recommend either Huizen or Hilversum (whichever is operating on 1875 metres) and Warsaw on 1411 metres as useful reference stations.

There are many people who believe that long-distance reception is pretty well impossible until after dark. This, however, is not the case, for the long-wave stations can usually be well received, so long as there is some high-frequency amplification available, at any time of day or night when they are operating.

The week-end is an excellent time for hearing them, since 5 X X closes down from 11 a.m. to 2 p.m. on Saturdays and is silent between 11 a.m. and 3 p.m. on Sundays. And these are just the times when many of the long-wave foreign stations are putting out excellent programmes.

Good daylight stations are Radio Paris, Königswusterhausen, Eiffel Tower, Kalundborg and Oslo. The long-wave Dutch transmission is well received in most localities, though not in all, and the same applies to Motala.

Even on the medium waves there are certain stations which are frequently well heard in broad daylight. Chief amongst these are Langenberg, Mühlacker, the medium-wave Dutch transmission on 289·8 metres, and Heilsberg. Mühlacker comes across with such power that his morning programmes can be picked up even on a portable set. I have actually had him on the loud speaker at 9 a.m. with a simple detector plus note-mag. two-valver.

Here is the week's medium-wave selection. Stations which are coming in very strongly are printed in Italics. *Budapest*, Riga, Vienna, *Brussels No.* 1, Milan, Prague, *Langenberg*, Lyons Doua, Rome, *Stockholm*, Belgrade, *Kattowitz*, Bucharest, *Frankfort*, *Toulouse*, *Hamburg*, *Mühlacker*, Graz, *Barcelona*, Strasbourg, Brunn, Breslau, *Gothenburg*, *Bordeaux*, *Lafayette*, Kosice, *Turin*, *Bratislava*, Leipzig, *Hoerby*, Gleiwitz, Nuremburg.

SHORT-WAVE NOTES

A weekly contribution for short-wave enthusiasts by W. L. S., "P.W.'s" short-wave expert, who operates a very well-known amateur station and is one of the leading experts on the subject.

AT the beginning of the year I remarked that the short-waver of the future should be a single-control affair, with one mains plug and a terminal for a small aerial. Although I may be a little slow in practising what I preach, I always do it in the long run, and I have made a start towards it by working hard to get that "single-control" ideal first.

The ganging of two circuits tuned to the same frequency should not present any difficulties, and does not, as we all know, on the broadcast band. On short waves, though, where such a small variation in capacity covers so many kilocycles and shoots through so many stations, we have to use rather more care.

A Practical Scheme.

The best way I have found of solving any small troubles that may arise is this. I have always been in favour of leaving your "D. and L.F." set more or less untouched when using a screened-grid stage; this is, of course, best done by employing "tuned-grid" coupling for the latter. By this I mean that one feeds its anode through a choke and couples down to the top of the existing detector grid coil through a small condenser.

This last is the key to the whole method. This small condenser introduces a certain small amount of damping into that tuned grid circuit. If the damping is of a serious nature it simply means that the condenser is too big.

Now, if we use an exactly similar coil for the grid coil of the screened-grid valve, we can also introduce a similar amount of damping by tapping the aerial on to that coil through a small adjustable condenser.

By experiment one finds the value of capacity that gives this happy state of affairs, and it is quite easily done.

Simply forget the screened-grid stage for a few moments, having first tuned in some fairly strong and reliable station on the detector tuning. If you now remove the clip coupling the S.G. stage, you will naturally lose the signal.

Definite Proof.

Now, however, you hitch on your small aerial, through a small adjustable condenser, on the same point that the other lead came off. Whether you were tapping the screened-grid stage half-way down the coil or on to the top doesn't affect matters at all, as long as you put the aerial on the same point.

If you adjust the aerial condenser to that, the signal you are testing on comes back to the same dial reading, you have done the trick. It follows that the loading effect upon your detector grid coil is now just the same as it was when the screened-grid stage was coupled up.

If, therefore, you choose an identical coil to this grid coil, and use it for the *first* grid coil (on the S.G. valve of course) and tap your aerial on to a similar place, through this prepared condenser, you will have, as nearly as possible, similar conditions in the two circuits, and you will find, in practice, that you can tune them quite well with the two halves of a twin-gang condenser.

"Trimmer" Not Necessary.

There are, of course, various small inaccuracies in this method, such as those introduced by the grid-filament capacities of the valves. But I have tried it out several times and never have the two circuits been seriously "out of gang" at any part of the scale.

Incidentally, there is no need to provide a "trimmer" across either half of the condenser, since "trimming," when necessary can be achieved by a slight resetting of the adjustable condenser in the aerial circuit.

If your screened-grid stage is behaving as it should, you will find that when the two circuits are ganged in this way the reaction control will hardly need touching from one end of the scale to the other.

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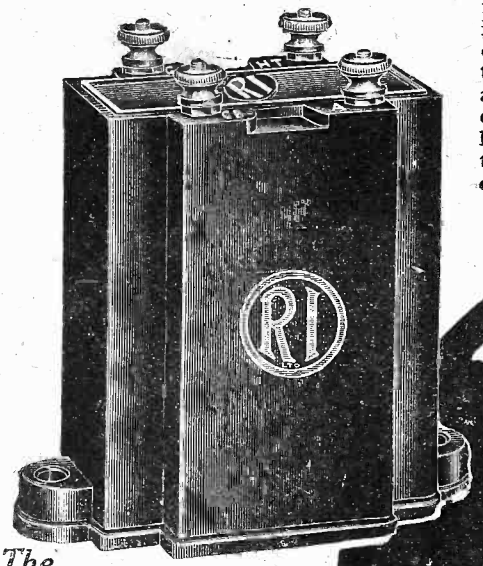

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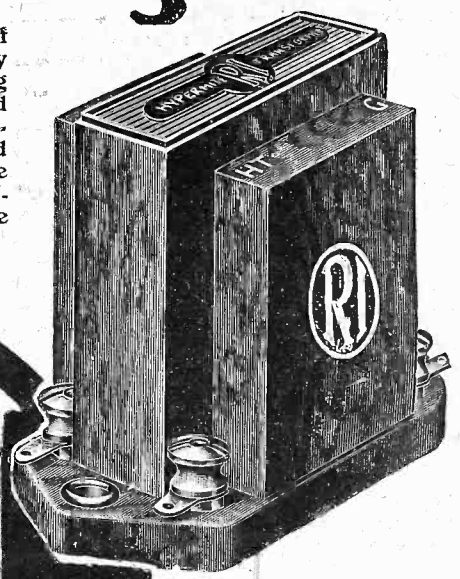

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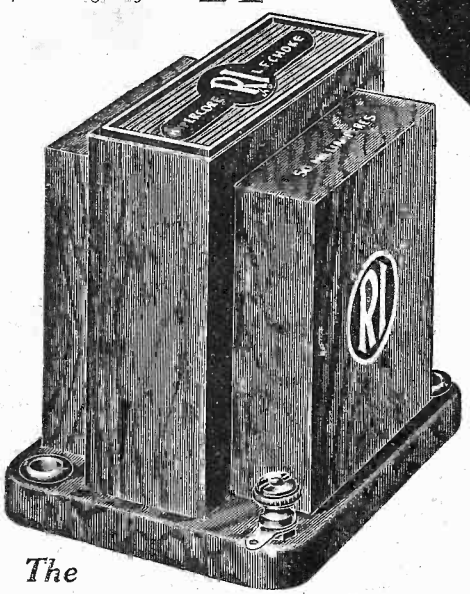

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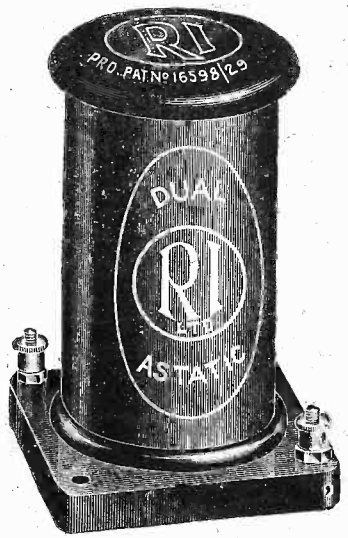

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Resistance D.C. 650 ohms.
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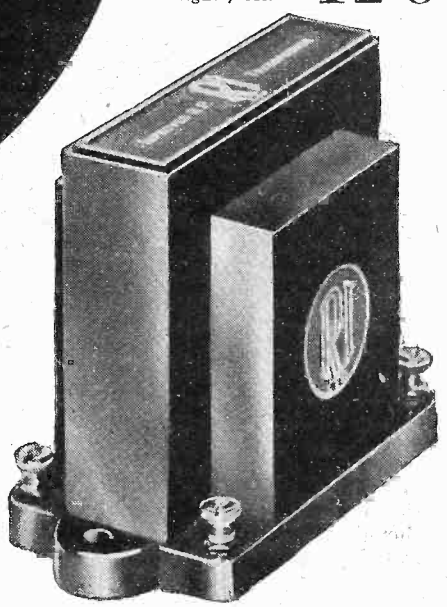

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Politics and Broadcasting

by Captain Ian Fraser

A straightforward talk on a subject of vital interest to us all.

I THINK politicians are generally bad listeners—they prefer talking. This affects their capacity to judge broadcasting, and it must also be conceded, of course, that their work is done mostly in the evenings so that they have not much time to enjoy broadcast programmes.

I am sure that practically every politician would like to broadcast a "talk" and would think that millions ought to hear it; and yet he would probably join in with the rest in denouncing talks, and demanding more music.

Are There Too Many?

How much weight is there in the criticism that there are too many talks? At one time the clamour against talks was great. We do not hear so much of it now. Is this because during the last seven or eight years we have re-learned the lost art of listening? In Dickens' time English people used to listen—we had penny readings and Town Criers. Then came low-priced newspapers and cinemas, and listening became unfashionable.

And when broadcasting arrived we treated it wrongly. Perhaps we turned it on at six or seven o'clock and left it on till we went to bed, regarding it rather like an orchestra in a restaurant—a kind of background to our ordinary conversation. As long as it played music this was not too bad, but when a talk was given it interrupted our talking. We did not give ourselves a chance of listening to it and appreciating it. We merely heard it and were annoyed.

Or else we came in and switched it on and expected it, apart from the magic of bringing anything at all into our homes, to bring the very thing we wanted at the particular moment when we happened to press the button. We switched it off, and said, "Broadcasting is no good; they never send out anything worth hearing."

Political Broadcasts.

Some people still do both these foolish things, but an increasing number, I think, treat broadcasting more reasonably. They look to see what is on, listen if it pleases them, and do something else if it does not. Almost every taste is catered for, and if treated in this way broadcasting will give the most particular listener something that he likes at frequent intervals.

How far ought political matters to be broadcast? There are two ways of looking at this, depending upon whether you are a politician or a listener. I think politicians have not made enough use of broadcasting in England. They complain that the popular newspapers distort policy by exaggerating what they like and suppressing what they do not like, and yet they make scant use of the wonderful machine which science has put at their disposal to enable them to talk directly to millions of electors.

THE AUTHOR

Capt. Ian Fraser has had a distinguished career, both in the Army and as a member of Parliament. He was blinded in the War, and has always been specially interested in Wireless. His name has recently been mentioned as a possible future Governor of the B.B.C.

For a long time controversy was excluded altogether. The "Morning Post" said that the Englishman's Home was his Castle—that it must not be invaded at night by controversy. No wonder the broadcast spoken word was dull. Imagine how dull the "Morning Post" would be if its splendid leader writers were forbidden to be controversial. The truth is that controversy is the breath of life.

Debates Are Entertaining.

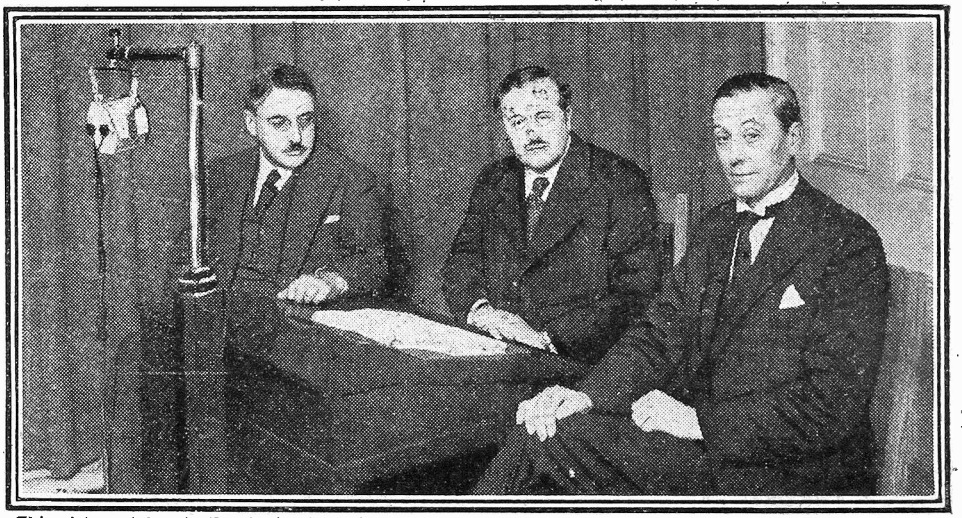
Then there is the point of view of the listener. He certainly does not want too much political talk. But a little argument at nicely-spaced intervals, delivered by men who excel in the art of debate, is not merely interesting to the politically minded but entertaining as well.

It was a Conservative Government which framed the constitution of the British Broadcasting Corporation, supplying it with that measure of public control which a monopolistic service should have, and endowing it at the same time with sufficient freedom from bureaucratic interference to enable it to maintain its commercial management and methods.

It was a Conservative Government which later freed it from its shackles and allowed

(*Continued on next page.*)

A FAMOUS RADIO DEBATE



This picture, taken in the studio at London, shows—from left to right—Mr. Ramsay Muir, Sir Kingsley Wood, and Mr. Arthur Greenwood at a de-rating discussion before the microphone.

POLITICS AND BROADCASTING

(Continued from previous page.)

it to broadcast controversy. There was a great deal of anxiety in certain Tory circles when this happened. "What will the Socialists do when they get hold of it?" was the question that worried a good many people. It was never, I think, justifiable to hold back freedom from the B.B.C. on the ground that some government some day might abuse this freedom.

What Government Can Do.

Of course, H.M. Government for the time being can, subject to the will of Parliament, and sometimes even in defiance of it, do all manner of dreadful things. They could in theory destroy the Army, the Navy, and the Air Force, or dis-Establish the Church: but in practice they are usually too busy carrying out their promises—or failing to carry them, out and justifying themselves—to do any of these things.

I do not believe the Governors of the B.B.C., provided they are well chosen as individuals, will allow the instrument to be used improperly, no matter to what Party they belong. Nor do I believe that if they did show themselves subservient to a Government which sought to abuse the system, the government would reap any benefit from it. The whole Press of the United Kingdom would be prompt to seize upon any abuse of broadcasting by politicians no matter who they were, and the public are apt to re-act strongly against those who trick and deceive them.

The appointment of the present Governors runs for five years, until the end of this year, when the government of the day will have to re-appoint all or some of them. The best persons, irrespective of party, but including as wide as possible a difference of views and sympathies, should be entrusted with this work, and comparative youth might well be one of the qualifications taken into consideration. We are very apt in England not to trust people until they are old, and not to respect them until they are dead.

As long as we make sure that the right people guide the B.B.C., and that it is not too closely associated with the Post Office or other Government departments, it will continue to hold its place as one of the most important agencies for the promotion of culture and entertainment in Britain.

NEWS FOR THE NAVY

This U.S. Telegraphist is well-known to Naval men, because he sends (in Morse) on high power from Arlington the accounts of baseball matches, etc., which are received by U.S. ships in all parts of the world.

I do not think the present Government would wish to interfere with broadcasting, though probably they have not had much time to think about it. Moreover, the framers of the Constitution disassociated the B.B.C. in its day-to-day work from the control of the Post Office. We set up an autonomous body, responsible, of course, ultimately to Parliament, but having a large measure of freedom, power, and initiative. We appointed thereon responsible persons not representing any particular party or parties, but having wide views and broad sympathies, and we made sure that the staff which had built up the service should carry it on.

Give Youth a Chance.

Political partisans tend to become convinced—far too convinced, I think—that their political opponents are not good at anything at all, whereas in fact, all political parties contain persons who are responsible and can be relied upon to carry out a National Trust if it is imposed upon them.

TWO USEFUL TIPS

Connecting 'Phones—For Marking Panels.

Connecting 'Phones.

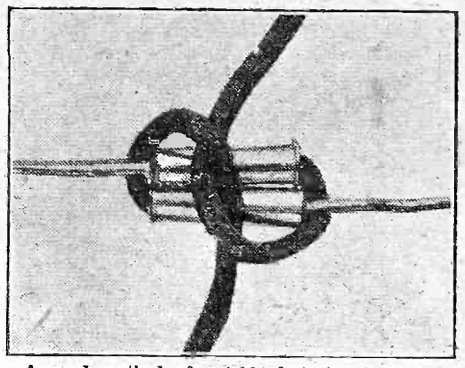
CRYSTAL-SET users often desire to connect up two pairs of 'phones temporarily, and in as quick a manner as possible. Even, sometimes, a couple of loud speakers may be required to work together.

Here is a simple and quick method of effecting the above.

The 'phones or loud speakers are connected up to the set *in series*, that is to say, one terminal tag of each instrument is connected to the receiver. The two remaining tags are joined together merely by tying them in the manner shown in the photograph.

When tying the terminal tags, see that the metal portions of them are held together in contact by the loop-knot. Contact will thus be established between the 'phones or loud speakers. If, however, the terminal tags are not held in firm con-

VERY EASILY DONE



A good method of quickly fastening two tags together.

tact together by the knot, "frying" and scraping noises will be heard in the 'phones every time the leads are moved. On the other hand, the knot should not be tied too tightly, or else the wire will tend to be pulled out of the tags.

Very often, however, a small elastic band or two slipped over the knotted area will serve to establish firm contact between the two tags and thus allow the wires to be moved about without setting up unpleasant noises in the 'phones or loud speakers.

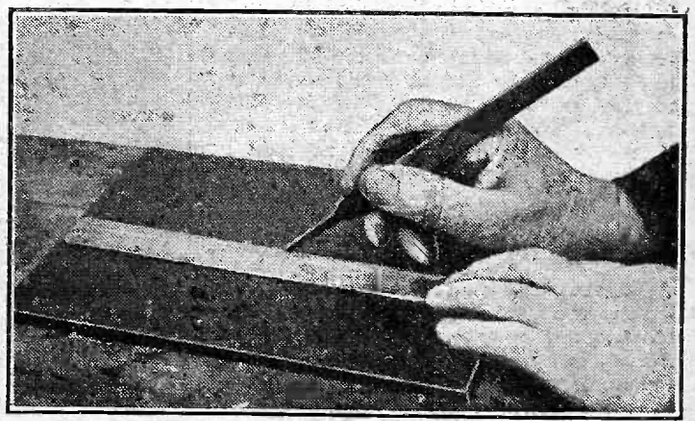
A Useful Scriber.

SOME sort of scriber or marking-out tool is usually required by the constructor when laying out panel assemblies. Many articles, of course, can be used for this purpose, but, to my mind, there is nothing more handy than an ordinary file of smallish size, the pointed end of which has been sharpened up a little by rubbing on a stone.

Such a tool has an excellent balance in the hand, and it can be used to make two varieties of markings—a thin, narrow line, and, when used "broadside on," a wider and rather deeper line. For this purpose, of course, the point of the file has to be sharpened to a semi-chisel shape.

Not only can a file be used in this manner for the scribing of ebonite panels, but, owing to the hardness of the metal, it may successfully be employed for putting any necessary marks on articles of brass, copper, or aluminium.

MARKING OUT THE PANEL



The method of using a file for scribing as mentioned above.

CAPT. ECKERSLEY'S QUERY CORNER

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

SHORT-WAVES AND HAND CAPACITY—IS IT WORTH IT?
—AUTOMATIC G.B.

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.

Short Waves and Hand Capacity.

K. E. S. (Kensington).—"I have in use an all-wave set which gives excellent results on both the medium and long-wave coils. On the short-waves, however, the set suffers badly from hand-capacity troubles.

"Why should the set be quite free from hand-capacity troubles on the normal wave lengths, and yet suffer from hand-capacity troubles on the low waves?"

It is curious that in answering you question I had just replied to another which more or less covered the same ground.

As the wave-length on which you wish to receive becomes shorter, the frequency gets greater. Thus a wave-length of 30 metres has a frequency of ten million alternations per second.

Now a condenser has an effect which is proportional to the frequency, and obviously when you come to this very high frequency the effect of stray capacities is greater than at lower frequencies.

There are several ways of getting over the trouble. Screening is one, and if you are building a detector and 2-note mags, you can easily enclose the high-frequency circuits in an earthed metal box, connecting one side of the condenser to that earthed metal box, when your hand will not make any effect provided the screening is carried out properly.

Some people (not to bother the tinsmith) put a long ebonite handle on to the condenser and carry it right away on a sort of insulated remote control, when the hand need never approach the set nearer than say 1 ft. Of course, the screening method is by far the better.

Is It Worth It?

T. J. R. (Manchester).—"My receiver consists of a detector and 2 L.F., both transformer-coupled. Two valves would, I imagine, be quite adequate for the local station, since the volume control is always set at the minimum position when receiving from the local.

"Am I likely to reduce my H.T. consumption very much by switching out one of the L.F. stages? L.T. consumption does not matter in my particular case.

"On going into the matter, I find that a suitable switch will cost 7s. 6d., and that is quite a fair proportion of the charge for a new H.T. battery. Unless, therefore, it is likely to reduce my H.T. consumption to a marked degree, the conversion would hardly be worth while.

"Would I benefit or otherwise by switching one of the L.F. valves out of circuit?"

This seems to me to be a question of economics, but economics is an exact science (in spite of the books you read on the subject!), and I am at a loss to give you advice without exact knowledge of a fundamental factor, namely, the proportion of the current consumption absorbed in the penultimate stage of your low frequency, the cost of your set, and the length of time you expect it and its other components to last?

This, however, is the way I would go to work if I knew these factors. I would say that my battery had an ampere-hour-capacity of J.

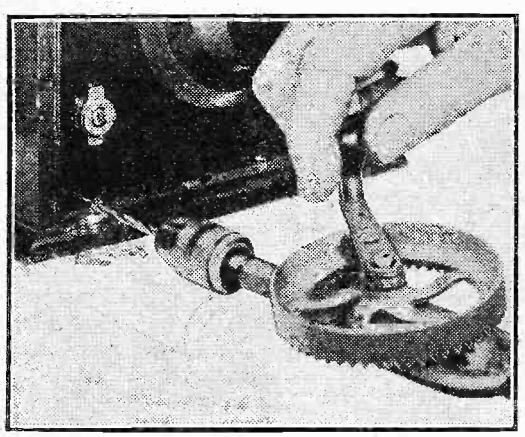
Suppose, for instance, a battery discharges at 5 milliamps for 100 hours, then dies, it has half an ampere-hour-capacity. I would thus divide J by the total number of amps. taken by my set and find out the number of hours working I would expect from my battery.

I would then find out the cost of battery and so work out the high-tension consumption costs per hour. I would next do the same piece of arithmetic assuming that the battery was not asked to supply the current for my penultimate stage of low frequency, and I would again work out the cost per hour.

I would then make a calculation as to the probable total length of life of my set and I would write off the 7s. 6d. switch over that time, and I would thereby have a direct comparison between the cost of high-tension consumption without buying the switch, and the cost of high-tension consumption plus the write-off charge of the switch.

I would also be careful to see whether I was not going into details a little bit too much considering that I would have to write off valves and perhaps the whole set itself over a certain period of years, and that this depreciation and maintenance charge of the whole set might be very large compared to the current consumption charge.

THOSE FIXING SCREWS

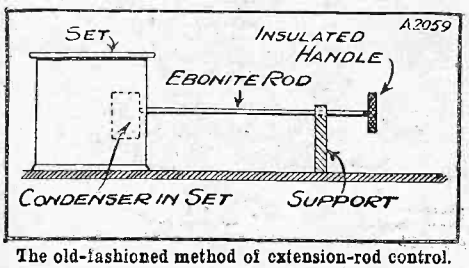


To ensure a good fit drill through the panel into the baseboard when both are in position in the cabinet.

Automatic G.B.

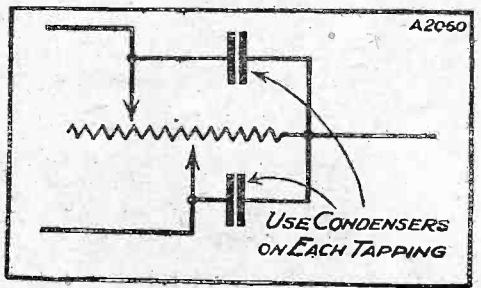
H. J. J. (Harrow).—"I am thinking of obtaining automatic grid bias for my receiver by inserting a resistance between H.T. — and L.T. —. Two grid-bias voltages are required—is there any reason why a tapping should not be taken from each L.F. stage to one resistance?" No, provided you place a condenser between each of the tappings on the biassing potentiometer and earth.

USING A TUNING EXTENSION



The old-fashioned method of extension-rod control.

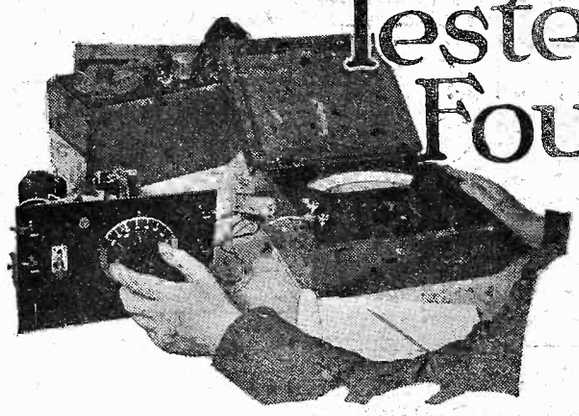
GETTING "FREE" GRID BIAS



This is the method referred to above.

FROM THE TECHNICAL EDITOR'S NOTE BOOK.

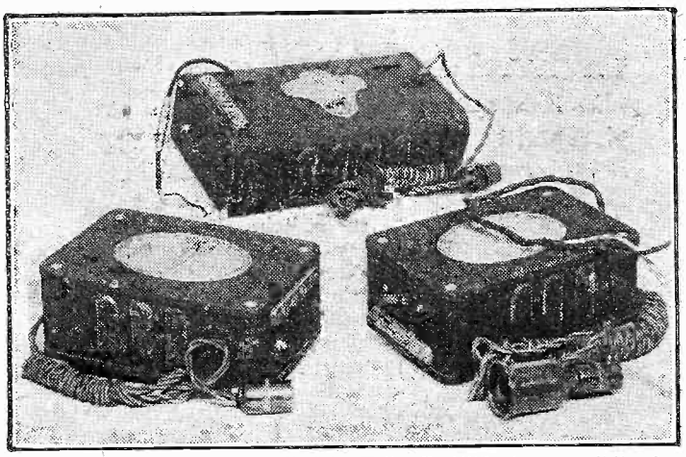
Tested and Found—?



CHEAPER ELECTRIC RADIO.

IT'S such a very simple matter nowadays to make your set—any set, any portable—"all-electric" to the extent of obtaining H.T. and accumulator-replenishing current from the mains, that I cannot help believing that there must be a large proportion of our readers who still stick to battery-operated receivers solely because of the question of expense.

Now Regentone have again gone a long way towards removing this possible difficulty by introducing three new mains units at prices which I believe are far below anything hitherto available. With these new Regentone Mains Units on the market one can hardly believe that anyone interested in "all-electric" radio will hesitate, on the score of expense, to convert his set to mains operation. It must be remembered with regard to these new units that they fit inside any portable receiver, though they are, of course, equally suitable for all popular two-, three- and four-valve receivers.



Here are the three "Regentone" Mains Units. Neat little chaps, aren't they?

There is one D.C. unit (Model H.) and this embodies an L.T. charger (½ to 1 amp.) as well as giving 120 volts H.T. at 25 milliamps. There are three fixed H.T. tappings, viz., 60/70 volts, S.G. and power. The price of the excellent little D.C. unit is a mere £2 12s. 6d.

There is an H.T. unit for A.C. mains (Model W 1 D) with a similar output arrangement, and this is only £3 7s. 6d.

The A.C. combined unit (H.T. with L.T. charger, Model W 5 A) has a 120-volt 20-m/a H.T. output and an efficient trickle charger, and this costs £4 15s. 0d.

So you see these units are most excellent value for money, and do constitute a distinct challenge to the H.T. battery in point of initial costs—the first time, I believe, the battery has received a real challenge on this ground. In running costs—but you will not require me to tell you how the mains pay in that regard!

Now for our tests with these units. We have a very comprehensive power system especially installed in our Research Department, and this enables us to take off D.C. and any voltage at any frequency of A.C. So we are well placed for giving practical tests to any kind of mains apparatus.

The little D.C. model was found to give its rated output with a bit to spare, and in regard to both separation and smoothing it can give points to many more expensive instruments. Needless to say we were critical in respect of the qualities in view of the fact that the units are particularly applicable to portables, and portables show up discrepancies of mains-unit design very markedly, as many "P.W." readers will know.

The A.C. models also gave an excellent showing, and I have no hesitation in saying that these, too, are every bit as good as quite a few more elaborate and more expensive units I have had on the bench.

Regentone are to be congratulated on making available such fine little units at such reasonable prices.

NEW MARCONI VALVES.

I have the pleasure of introducing to you two new Marconi 2-volters. I say pleasure, because I have a very soft spot for the 2-volter and must place on record (for the umpteenth time!) that I reckon 2-volt valve advance is one hundred times as important as that of any other voltage rating. Apart from anything else, I suppose 75 per cent of listeners use 2-volt valves.

Well, the Marconi L.P.2 has the staggering mutual conductance of 3·85. Does that mean anything to you? Maybe it doesn't, but if I mention it means the L.P.2 is a 2-volt valve about four times as good as a good 6-volter of a year or two ago, you may begin to see that it is a little tube that commands attention.

It is a small power-valve with a 2-volt, 0·2-ampere filament, having an amplification factor of 15 and an impedance of 3,900 ohms. And those figures mean it is capable of sufficient power output for all ordinary purposes, and has an unusually low energy consumption. It is obviously particularly suitable for portable and other receivers where economy, performance, and cost must be considered.

The Marconi P.2 is, in the fullest sense of the term, a super-power valve, and it also has a 2-volt 0·2-ampere filament with an amplification factor of 7·5 and impedance 2,150 ohms. It achieves the impressive mutual conductance of 3·5. It is capable of sufficient output properly to drive a large cone or moving-coil speaker, yet is economical and suitable for use in the last stage of portable and other receivers operated from a limited H.T. supply.

I have carefully tried both these new Marconi valves and I find them just as excellent as their characteristics promise they should be.

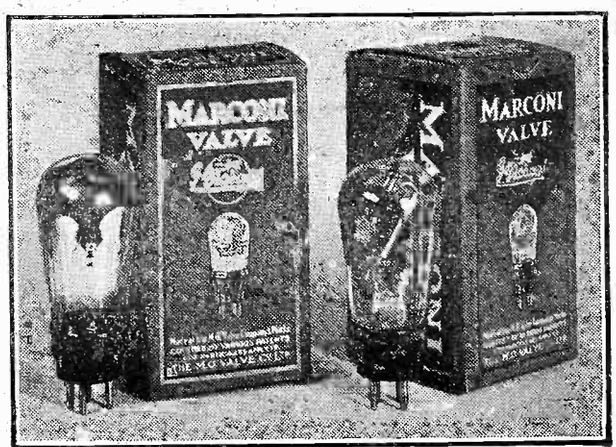
Manufacturers and traders are invited to submit radio apparatus of any kind for review purposes. All examinations and tests are carried out in the "P.W." Technical Department with the strictest of impartiality, under the personal supervision of the Technical Editor.

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.

NEW SIX-SIXTY VALVES.

Six-Sixty Radio Co., Ltd., are producing a new A.C. valve, the SS.4Y.SG, and a new 2-volt power valve known as the SS.220.PA.

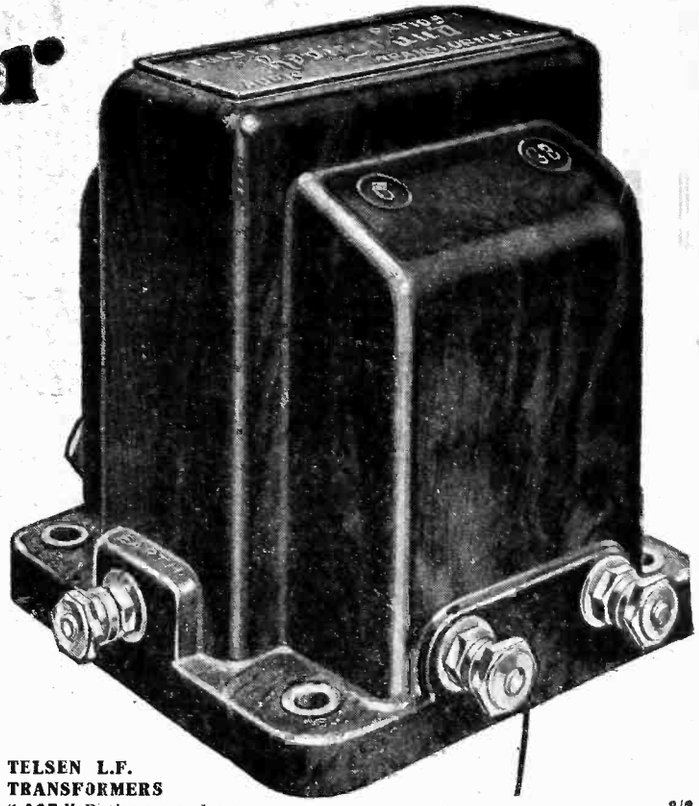


The two new Marconi two-volters step out of their cartons so that you can see them!

Specified for The "COMET" & every other set of importance

If any further proof of the high standard of Telsen performance is needed, it is contained in the fact that in every new circuit of note the designer has chosen Telsen Components, thus assuring maximum results. For vivid clarity of tone, purity and volume of reproduction, Telsen Components are absolutely unrivalled. For perfect reception—fit

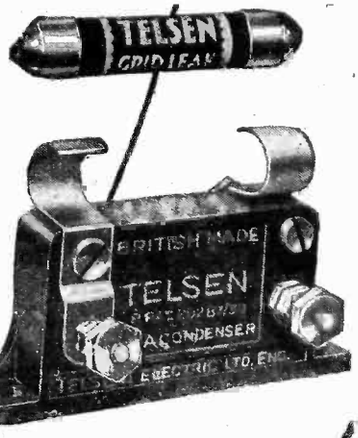
TELSEN COMPONENTS



TELSEN L.F. TRANSFORMERS

"ACE" Ratios 3-1 and 5-1	8/6
"RADIOGRAND" 3-1 and 5-1	12/6
(Specially Selected and Specified for the "Comet" 3.)	
"RADIOGRAND" Super Ratio 7-1	17/6

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 ½, ¾, 1, 2, 3, 4 & 5 megohms. Price **1/-** each.

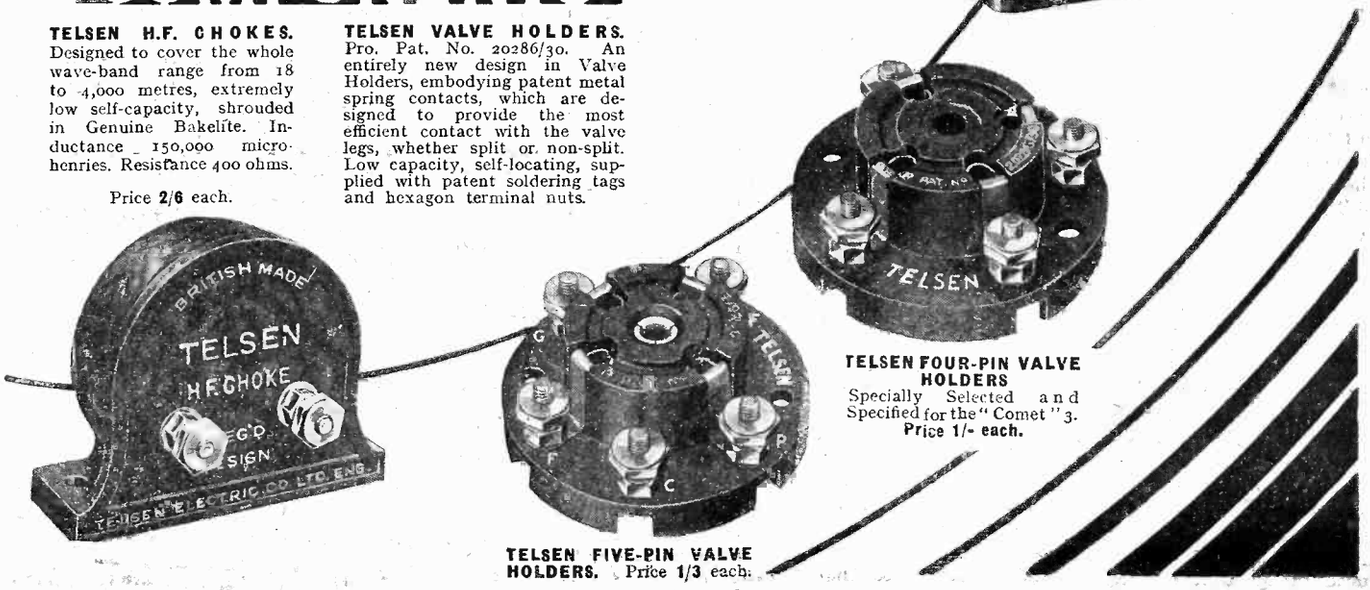


TELSEN FIXED (MICA) CONDENSERS.—Shrouded in Genuine Bakelite, made in capacities up to ·002 mfd. Pro. Pat. No. 20287/30. ·0003 supplied complete with Patent Grid Leak Clips to facilitate series or parallel connection. Can be mounted upright or flat. Tested on 500 volts. Price **1/-** each.

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 micro-henries. Resistance 400 ohms.

Price **2/6** each.

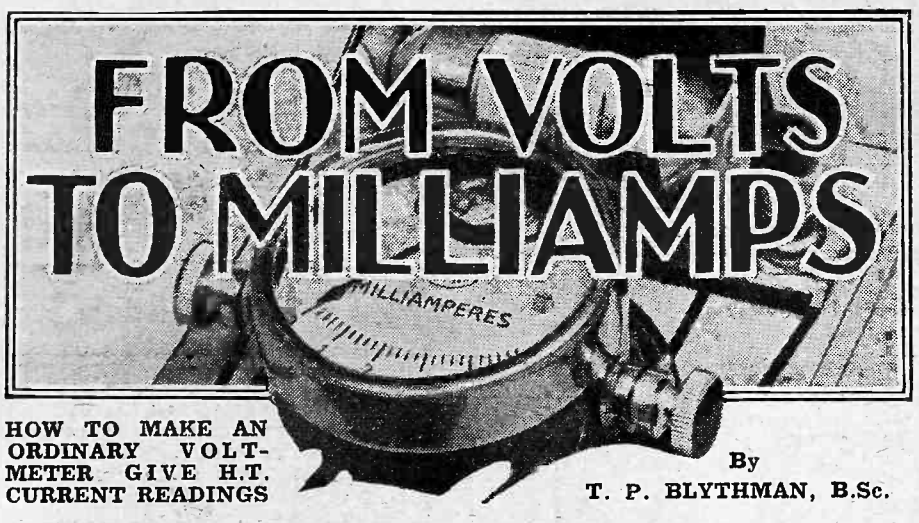
TELSEN VALVE HOLDERS. Pro. Pat. No. 20286/30. An entirely new design in Valve Holders, embodying patent metal spring contacts, which are designed to provide the most efficient contact with the valve legs, whether split or non-split. Low capacity, self-locating, supplied with patent soldering tags and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



TELSEN FOUR-PIN VALVE HOLDERS
Specially Selected and Specified for the "Comet" 3.
Price 1/- each.

TELSEN FIVE-PIN VALVE HOLDERS. Price **1/3** each.

FROM VOLTS TO MILLIAMPS



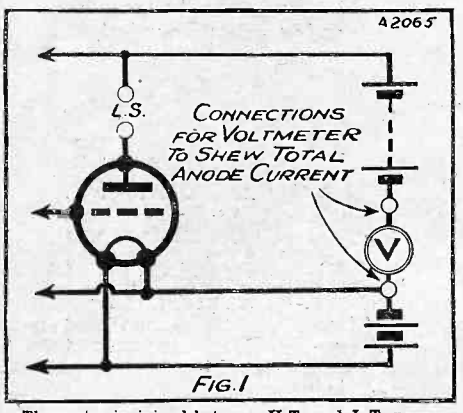
HOW TO MAKE AN ORDINARY VOLTMETER GIVE H.T. CURRENT READINGS

By T. P. BLYTHMAN, B.Sc.

MANY listeners possess a pocket voltmeter for measuring the voltage of the accumulator and the high-tension battery. Such an instrument can also be used to measure milliamps if the owner is willing to make a simple calculation first.

The ordinary voltmeter gives a low-tension reading of 6 volts, and it is this scale that we shall use. If we know the resistance of this coil, which should be stated on the dial of all reliable instruments, it is easy to calculate the current flowing through the meter when a voltage of 6 is applied across its terminals. The resistance of the

READING THE TOTAL



The meter is joined between H.T. and L.T. negative, so that all the H.T. current passes through it.

low-reading coil is usually about 200 ohms, and we shall take this figure for our calculation.

Ohm's law states that the voltage across the ends of a wire is equal to the product of the resistance of the wire in ohms and the current flowing in it measured in amps. In symbols, $V = CR$. If we know two of these values the third can be found by a simple calculation. In this case, $6 = C \times 200$, and therefore $C = 6 \div 200$, which equals ·03 amp. or 30 milliamps.

The Scale in Milliamps.

Thus, a scale reading of 6 volts corresponds to a current of 30 milliamps, and so 1 volt deflection on the scale means that 5 milliamps of current are flowing. To change volts to milliamps on the scale we must multiply by five. Having now graduated the scale we can use the voltmeter to measure the high-tension current flowing in different circuits.

By connecting the instrument between the negative of the high-tension battery and the accumulator, the reading, when it is multiplied by five, will tell us the total current taken from the battery by all the valves. (See Fig. 1.)

One Valve at a Time.

If the voltmeter is connected in the anode circuit of each valve in turn it will tell us how much current each valve is taking. It will also give us an idea of the correct value of grid bias to give the low-frequency amplifying valves, because if the pointer is not steady it shows that distortion is taking place and the grid bias must be altered.

Another use to which the voltmeter can be put is to find the exact voltage on the plate of the valves. This, we know, will be less than that of the battery because of the drop in voltage across the resistance of the anode circuit.

In the case of a resistance-coupled amplifier the value of the resistance is known, and so we can proceed at once to find the current flowing in the circuit. The voltmeter is connected between the resistance and the high-tension tapping, as in Fig. 2, and the deflection noted.

Suppose this to be ·2 volt. By multiplying this by five we have a current of 1 milliamp flowing. Ohm's law gives us the statement that $V = C \times R$, and if the anode resistance is 100,000 ohms, we have $V = 100{,}000 \times 001$, which equals 100 volts.

Actual Voltage on Anode.

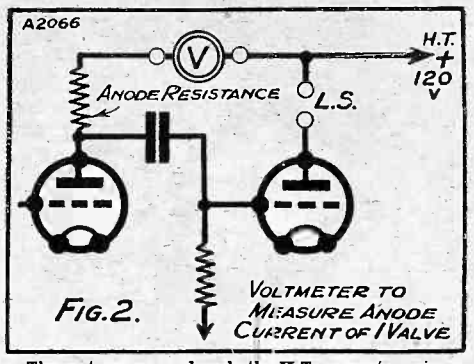
Thus, the fall in voltage across the resistance is 100 volts. If the battery is 120 volts, only 120 — 100, which is 20 volts, will be applied to the anode. This shows how small a fraction of the voltage actually reaches the anode in a resistance-coupled amplifier.

When the primary of a transformer or choke is in the anode circuit the resistance of this must be found before the drop in voltage can be calculated. The valves are removed from the set and the batteries are disconnected while the voltmeter is placed in the same position as before. The negative of the high-tension battery is connected to the vacant socket of the valve holder formerly occupied by the plate of the valve. (See Fig. 3.)

The high-tension tapping is now adjusted so that a deflection of at least 1 volt is obtained on the voltmeter. This corresponds to 5 milliamps. Suppose the voltage which gives this deflection be 10. Then, by applying the law that $V = CR$, we have $10 = 005 \times R$, and therefore $R = 10$ divided by ·005, which is 2,000 ohms. This value of R includes the resistance of the voltmeter, as this time it must be taken into account.

Replacing the valves and adjusting the high-tension voltage to the correct amount, we now measure the anode current, and we

CHECKING ONE VALVE



The meter now reads only the H.T. current passing to one valve.

will suppose this to be 2 milliamps—that is, a deflection of ·4 volt. Making use of Ohm's law again, we have the drop in voltage equal to 2,000 × ·002, which is only 4 volts.

The actual voltage on the plate of the valve will this time be 120 — 4, which is 116 volts. This will explain why it is more difficult to get reaction with a resistance of the order of 100,000 ohms in the anode of the detector valve. It also points out the necessity of using high voltages in resistance-coupled amplifiers.

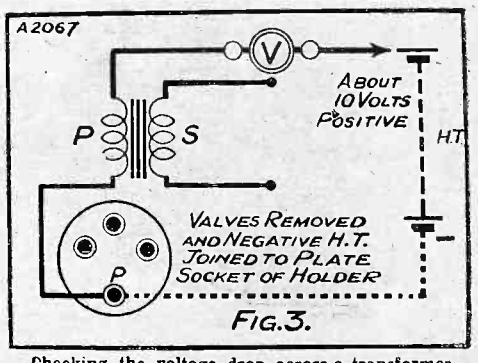
Useful for Many Purposes

Of course, the uses of the voltmeter employed in this way are not confined simply to the examples given. You will find many other cases where it will be helpful.

For instance, if you wish to verify the value of an anode resistance you can proceed as follows. Measure its value in the same way as you find the resistance of the transformer primary, and after subtracting the resistance of the meter, compare the figure with the nominal rating of the resistance.

These experiments are simple to perform, and only require a cheap voltmeter and the easy calculations outlined above. The enthusiastic amateur will be well repaid by spending a little time in performing them, and will derive a greater knowledge of the working of his receiver from them.

AN INTERESTING TEST



Checking the voltage drop across a transformer primary.

The "COM

IF you were to look the word "Comet" up in an encyclopedia you would probably find something to the effect that it was an affair with a brilliantly shining head and a sparkling tail. You will discover ere long that the name is about as appropriate a one as could be chosen for "P.W.'s" "star" set design for 1931.

The brilliant "head" you see this week. The "sparkling tail" will gradually unfold itself week by week in future issues, until the whole is disclosed and the set of the year is revealed in all its details and with all its possible refinements.

We have a tremendous lot to tell you about this wonderful receiver, so perhaps we had better start in to explain things at once.

First of all, about that "head and tail" business; don't make the mistake of thinking that the "head" is in any way incomplete and that you must wait for the whole of the tail to arrive before you will have much of a set.

On the contrary, what you are seeing this week is the "Foundation" version, and it is absolutely complete in itself.

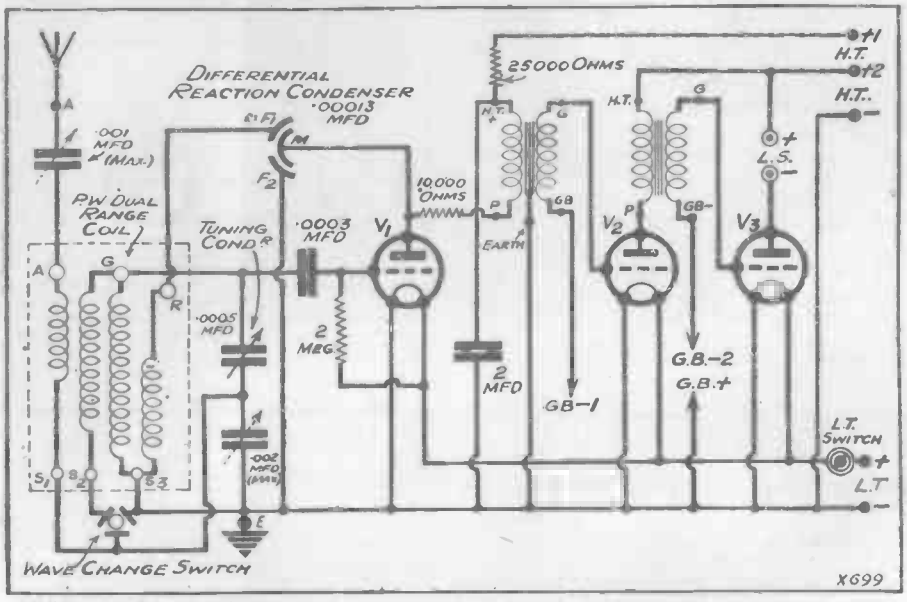
Definitely New Features.

Just as it stands it is the finest set of its type ever produced. A strong statement, maybe, but one we make with entire confidence. The "Comet" is the outcome of many years of research into the problems involved in receivers of this type, and it embodies every feature we have found worth while.

Many of these have never been presented in combination before, and their total effect is so noteworthy that this fact alone would justify the strong claim we have just made.

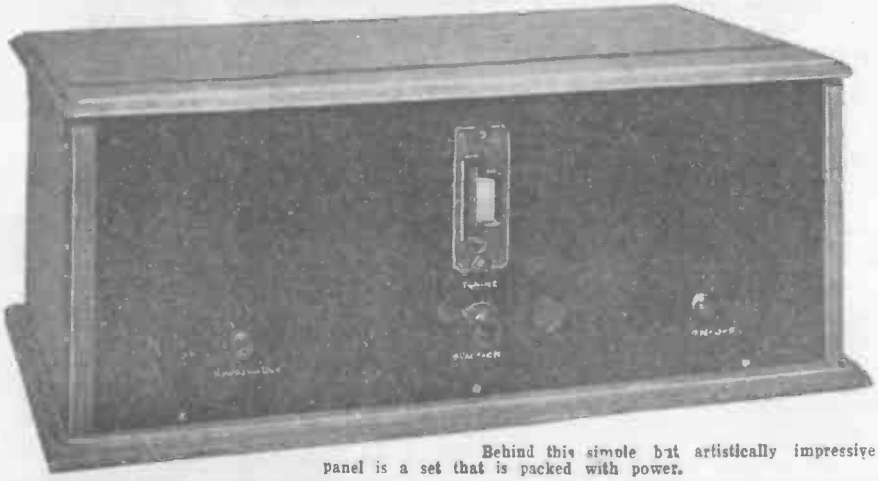
That is not all, however. Very far from it, for there are many things in the design which are definitely new.

EVERY WORTH-WHILE RADIO REFINEMENT PROVIDED FOR



The theoretical circuit of the "Comet" is shown above. It forms the self-contained foundation for the most "progressive" receiver ever designed.

THE THREE-VALVE RECEIVER WITH A FUTURE



Behind this simple but artistically impressive panel is a set that is packed with power.

Here is a set you have been looking for—a "star of stars" embodying all that is best of the most recent radio developments. The Full-Size Blue Print given free with this copy of "P.W." emphasises the extreme simplicity of construction, and you will see at a glance that it is indeed the perfect home constructor's set. But though everything possible has been done to make the "Comet" easy to build, no sacrifice in results has been made as you will find when you try the set out. The purity and power of reproduction will astound you.

The basic idea of the foundation model receiver of absolutely top-notch efficien of the detector and two L.F. type, extrem simple, yet giving a standard of performa impossible even a few months ago.

Faultless Results.

Simplification has not been carried too of course, and even the "Foundation" vers has a sufficiency of refinements to sati

START TO BU

1	Panel, 18in. × 7in. (Peto-Scott, or Goltone, Lissen, Permicolete.).	1
1	Cabinet to fit, with baseboard 10 in. deep (Camco, or Pickett, Osborn, Lock, Kay, etc.). (NOTE.—If you intend to use the "Comet" as a radio-gram outfit it is suggested that you just build it on panel and baseboard, and defer the purchase of a cabinet until you have seen a later article in the series.)	1
1	·0005-mfd. "thumb control" variable condenser (J.B., or other compact type such as the Cyldon, illustrated elsewhere, or the Polar).	3
1	·0001-mfd. or larger, up to ·0002-mfd. differential reaction condenser (one in set is of ·00013 mfd., and this value, or the similar one of ·00015 mfd., is particularly suitable) (Lotus, or Ready Radio, Igranic, Ormond, Polar, J.B., Dubilier, Lissen, Wearite, Magnum, Parex, Burton, etc.).	1
1	L.T. switch (Ready Radio, or Goltone, Lissen, Igranic, Lotus, Benjamin, Bulgin, W.B., Keystone, Magnum, Red Diamond, Wearite, Junit, Ormond, etc.).	1

A MAGNIFICENT SET AS IT STANDS—A

ET" THREE

1. EASY TO BUILD
2. PANEL WAVE-CHANGE
3. VIRILE REACTION
4. PERFECTLY PROGRESSIVE
5. COMPLETELY ADAPTABLE
6. NO COMPLICATED COMPONENTS
7. POWERFUL L.F. AMPLIFICATION
8. SPECIAL STABILITY SYSTEM
9. SINGLE DRUM-DIAL TUNING

THE "COMET" IS HERE

the critical user and ensure faultless results.

That is the "head" of the "Comet," and you can build it with the certainty that you will have an extraordinarily fine set even if you fit none of our later additions. It has been so designed, however, that without any alterations at all to the first lay-out all sorts of valuable refinements can be worked into it.

It is purely a matter of additions of the simplest sort, and if you make them all you will have a receiver of such amazing flexibility and capabilities as has never before been put into the hands of the home constructor.

But you need not make *all* the additions. You can pick out just the one, or whatever combination of refinements, you think you require, and leave out those which do not appeal to you. Our series of articles will make all this perfectly clear and simple, and if you care to follow them right through we can promise you a most fascinating time as the receiver grows week by week in its capabilities.

Have No Misgivings.

The wonderful sensitivity and excellent selectivity of the "Comet" are based very largely upon the remarkable "P.W." high-efficiency dual-range coil in the detector circuit, used in the best modern fashion.

Tests under a wide variety of conditions have shown that here is a receiver which really will bring in a satisfactory string of foreign stations at proper loud-speaker strength so long as it is given a fair chance, with an outdoor aerial of reasonable efficiency and valves of the right types.

On an indoor aerial it will perform better than any other set of its type we have tested, but no great number of foreign stations can be expected, and the volume of those which can be reached will not be very satisfactory. Under such conditions a set with a screened-grid H.F. valve is really required.

Its selectivity is very good, too, and it will be adequate for all situations outside the areas of acute difficulty close to main and Regional broadcasting stations.

Even here much can be done by a suitable setting of the selectivity control, but we are not depending on the standard model to cope with these special conditions.

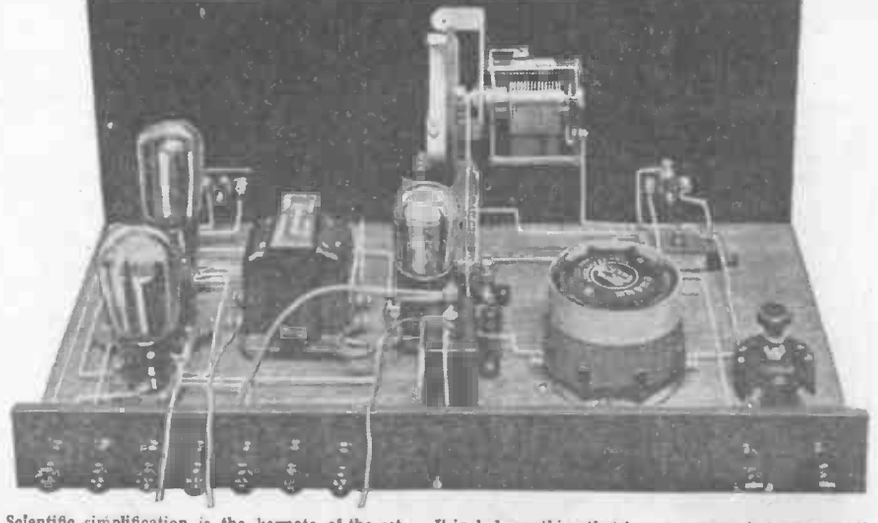
Next week will be described the remarkable new "P.W." method of coupling the aerial circuit which has been christened "Flexi-Coupling." This imparts an absolutely amazing degree of selectivity and actually increases the volume of the foreign stations.

Have no misgivings on the score of selectivity, therefore. Build the "Comet" and quite likely the standard version will prove adequate to your needs. If you should find you need more selectivity, just add "Flexi-Coupling" and then you are certain of success.

Exceptional Power.

Much of the exceptional power of the "Comet" comes from its remarkable L.F. amplifying circuits. Here we have the modern type of transformer coupling in both stages, with a proper filter in the detector feed to prevent battery coupling, with the addition of an important novel feature, never before used, we believe, in a set without H.F. amplification.

This is an earthing screen underneath the whole set, which has been found to have a truly remarkable effect in ensuring stable and perfect functioning from a high-power L.F. amplifying circuit. It seems ludicrously simple, but it does its job most effectively.



Scientific simplification is the keynote of the set. It includes nothing that is unnecessary, but every worthwhile radio refinement has been provided for.

UILD NOW—WITH THESE PARTS

Three-point on-off wave-change switch. (This MUST be of the right type. No form of change-over action will serve, but a plain three-point on-off motion). (Ready Radio, or W.B., Bulgin, Keystone, Wearite, Ormond, Red Diamond, Magnum, etc.).

"P.W." dual-range coil (R.I., or Ready Radio, Wearite, Keystone, Goltone, Parex, Magnum, Tunewell).

Valve holders (Telsen, or W.B., Igranic, Lotus, Lissen, Clix, Benjamin, Bulgin, Junit, Formo, Wearite, Dario, Magnum, etc.).

·0003-mfd. [illegible] condenser (Ready Radio, or Telsen, Dubilier, T.C.C., Ediswan, Ferranti, Mullard, Igranic, Watmel, Formo, etc.).

2-mfd. condenser (T.C.C., or Lissen, Igranic, Ferranti, Dubilier, Hydra, Mullard, Filta, etc.).

2-meg. grid leak and holder (Dubilier, or Lissen, Telsen, Ferranti, Ediswan, Igranic, Mullard, etc.).

2 L.F. transformers, low or medium ratio (Telsen "Radiogrand" and Igranic "Midget" in original set. Other satisfactory pairs can be chosen from the usual good alternative makes, e.g. Varley, Lissen, Ferranti, Lotus, Mullard, R.I., Lewcos, etc. See text).

2 Spaghetti resistances, one of 10,000 and one of 25,000 ohms (Ready Radio, or Bulgin, Keystone, Magnum, etc.).

1 Compression-type adjustable condenser, ·001-mfd. maximum (marked "Selectivity Control" on blue print) (Lewcos, or Lissen, Polar, R.I. Formo, etc.).

1 Ditto, ·002-mfd. maximum (Formo, etc.).

1 Terminal strip, 18 in. × 2 in. (Peto-Scott, or Wearite, Ready Radio, etc.).

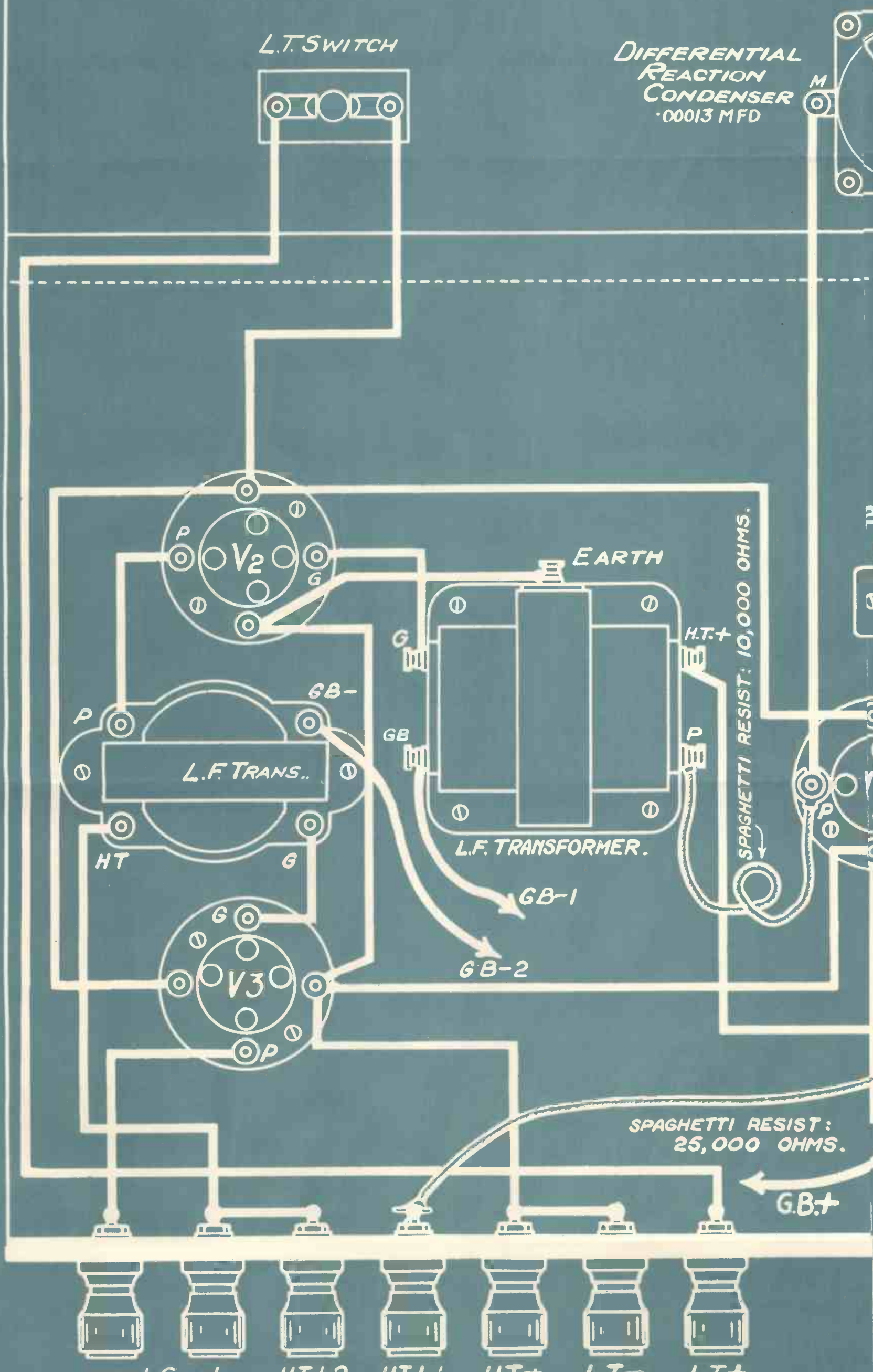
1 Sheet of copper foil, 18 in. × 10 in., for covering underside of baseboard (Ready Radio, or Parex, Keystone, etc.).

9 Terminals, markings as on blue print (Belling & Lee, or Eelex, Igranic, Clix, etc.).
G.B. plugs (Belling & Lee, or Clix, Eelex, etc.). Glazite, screws, etc.

ND A FOUNDATION OF LIMITLESS POSSIBILITIES!

T127

THE "COMET" THREE
FULL SIZE BLUE PRINT
PRICE 6d



·0005 M F D
TUNING CONDENSER

F

M

F1

F2

WAVE CHANGE SWITCH

LONG WAVE
COUPLING

·002 MFD
(MAX:)

2 MEG:

G

·0003
M F D

S3

R

S2

P. W.
DUAL RANGE
COIL

G

S1

·001 MFD (MAX)

SELECTIVITY

CONTROL

2 MFD

A

FOIL TAB CONNECTED HERE.

E

A

CONSTRUCTING THE "COMET"

To supplement the Blue Print here are some further practical set-building details of the "Comet" Three, which will enable even the most inexperienced to make a good job of it.

THE description you have just read will have given you a pretty clear idea of what the "Comet" is and what it can become if you follow through this series of articles, so now we can get down to business and set about telling you how to build it.

Drilling the Panel.

To begin at the logical point, let us tackle first the question of panel drilling. For the comparatively simple standard version of the receiver this is a very easy and quick business. It will be quite easy to add the holes for extra gadgets, too, for we have devised a special scheme for this which we will tell you about next week.

First of all, you want just three holes for single-hole mounting components, these being the reaction condenser and the L.T. and wave-change switches.

The Reamer.

Having marked out the positions for these on the back of the panel, run a $\frac{1}{8}$-in. drill through each to provide a pilot hole. Then examine the components, select a drill of the right size for each, and enlarge up the holes correspondingly. Drilling is made much easier and more accurate in this way.

If you haven't got a very large selection of drills, by the way, don't forget that you can do the enlarging job very easily and quite quickly with the useful tool known as a reamer.

Mechanics are apt to scoff at this method, but it is a mighty handy one for the man who is not too well equipped with tools.

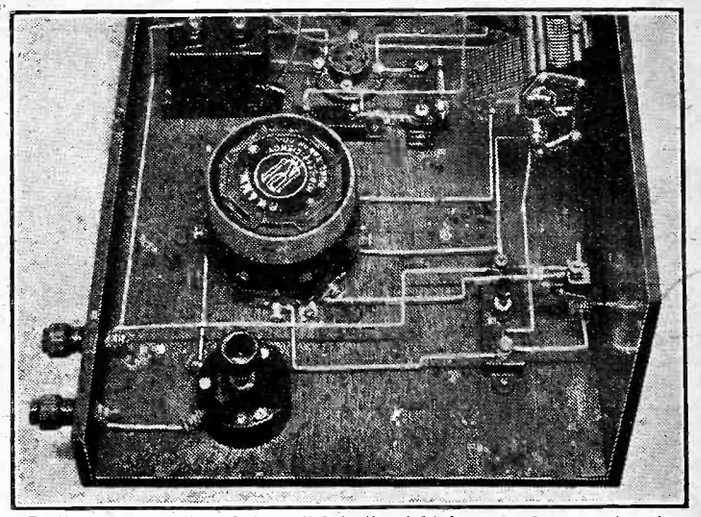
Then comes the hole for the tuning condenser. The drum-control type we used in the original set requires an oblong hole to be cut, and this job takes a little longer.

Of course, you could use an ordinary type of single-hole-mounting condenser if you like, provided that it was compact, and fit it with a small vernier dial like the Igranic "Junior." The "thumb-control" type, however, gives a set an attractively modern appearance, and it is very pleasant to operate.

Not Difficult

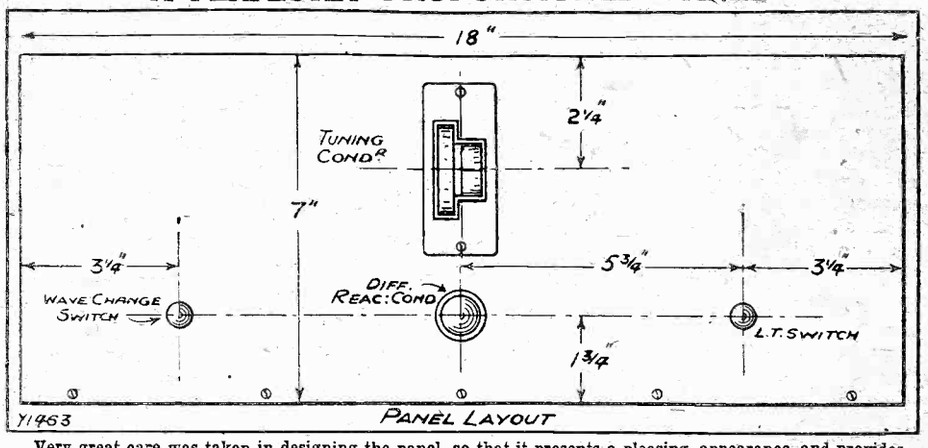
Besides, there is no really serious difficulty about the fitting, for the condenser is accompanied by a "template" which makes the job quite straightforward. This template indicates the outline of the oblong hole to be cut, and also the position of the holes for the two screws which fix both the condenser and the "escutcheon plate" to the panel.

DUAL-RANGE TUNING



By the mere operation of the switch in the right foreground you can tune in either long- or medium-wave stations without the bother of coil changing.

A PERFECTLY PROPORTIONED PANEL



Very great care was taken in designing the panel, so that it presents a pleasing appearance and provides perfect ease of control.

With the aid of the template mark out the outline of the oblong with a sharp-pointed instrument, then, at each corner, drill a $\frac{1}{8}$-in. hole. The best way of completing the job is to join up these holes with a fretsaw, and this is the method we advise.

Quite Cheap.

Quite a cheap hand fretsaw will serve, such as you can purchase for perhaps 5s., and it is really worth while to get one, for it will prove a most useful tool. The best blades to get are the fairly fine-toothed ones intended for metal work, and a few spare ones are advised; they are easily broken in ebonite if you have not used a fretsaw before, and they are very cheap.

As an alternative to the fretsaw there is the drilling and filing method. This takes a bit longer, but, after all, it is worth a little time to make a set like the "Comet," isn't it?

Take your $\frac{1}{8}$-in. drill and run a series of holes along the outline of the desired oblong cut. Put the holes as close together as you can without their breaking through into each other, and when you have done take a chisel or a strong knife and proceed to join them up.

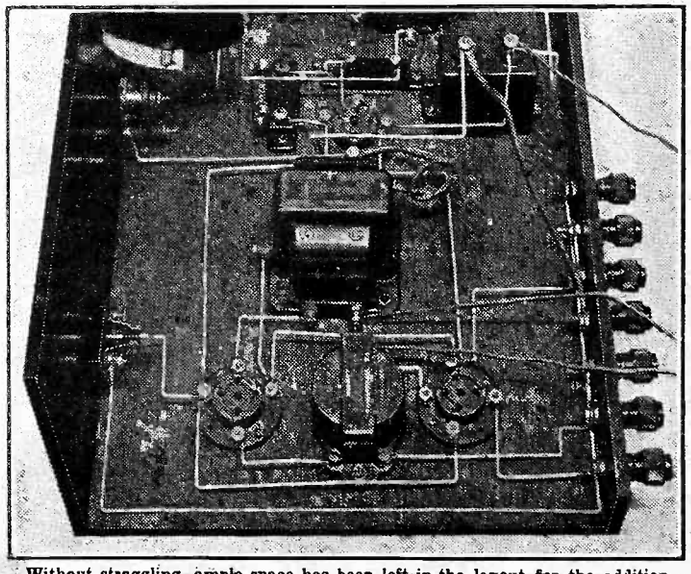
The Panel Finished.

Now knock out the oblong piece of panel thus released, and trim up the ragged edges of the hole with a coarse file. It may look a bit of a job on paper, but it is easy enough in practice, and you needn't worry unduly about making a very accurate job, because the "escutcheon plate" which goes on the panel will cover up any minor mistakes.

So much for the panel. Do not fix any of the components to it yet, but turn your attention to the baseboard. To the underside of this you have to fix the sheet of copper foil which acts as a stabilising

(*Continued on next page.*)

THE TAIL OF THE COMET



Without straggling, ample space has been left in the layout for the addition of the various refinements which you may care to add to the set later on.

CONSTRUCTING THE "COMET"

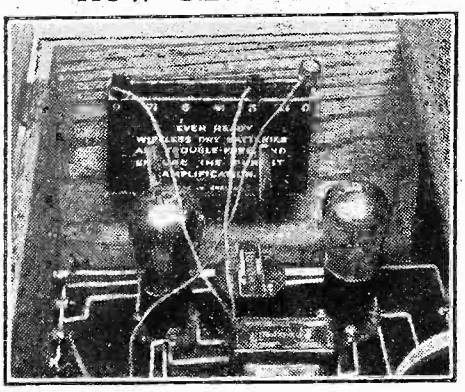
(Continued from previous page.)

screen in a manner you will by now understand.

See that the foil fits the baseboard nicely, and trim it with scissors if it tends to project at the edges anywhere. Next fix it to the baseboard with screws round the edges, and a few dotted about in the middle and elsewhere to hold it close to the wood and prevent it from sagging untidily.

The best screws to use, by the way, are small brass ones (about ¼ in.) with countersunk heads. Drive them in firmly and their heads will scarcely project at all.

HOW G.B. IS FIXED



The best place for the grid-bias battery is on the side of the cabinet, as shown.

Now a very important point. Provision *must* be made for connecting this copper sheet to earth. We did it by means of a strip of copper foil gripped under the main sheet, i.e. between the sheet and the wood, by one of the fixing screws at the edge.

This strip must be so placed that it can be bent round and gripped under the earth terminal, either under the head or, better still, under the nut on the shank of the terminal. It is as well, therefore, next to drill the terminal strip and fit the terminals.

Fixing the Foil.

This done, you will be able to mark where the earth terminal comes, and so fit the copper tab in exactly the right place, with an extra screw to hold it. To make it easy to grip under the earth terminal, by the way, it is as well to cut the end of the tab like a spade terminal (small scissors), although a plain hole will do.

The next step is the fitting of the terminal strip, and the panel to the baseboard. This is done with a few screws through the parts in question into the front and rear edges of the board.

Just one hint here: It is usual to fit panel, strip and baseboard flush at the edges. For the "Comet" it is better to raise the baseboard just a fraction—say 1/16 in.—up, so that if the heads of the screws fixing the copper foil project a trifle they will not scrape on the bottom of the cabinet as the set is put in or drawn out.

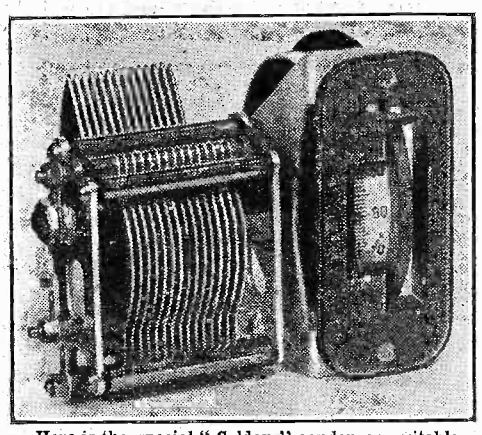
Keep to the Specification.

Now, with the strip, the panel, and the baseboard fitted together, you can proceed to mount the four components on the panel, and then you are ready to begin the layout and fixing of the parts on the baseboard.

This is the main part of the work, and although there is nothing "critical" about the layout of the "Comet," we must warn you to make a very good copy of the original set.

The reason for this is not an electrical one at all. It is simply that you may want to add the various refinements we shall be describing later, and they won't go in properly unless you copy our spacing, which was carefully worked out to admit them.

THUMB CONTROL



Here is the special "Cyldon" condenser, suitable for use in the "Comet."

Copy the Blue Print.

Take the blue print, therefore, and a ruler, and measure off the positions of the parts with reasonable care before fixing them down. To be sure, a quarter of an inch or so either way won't matter, but try to keep within some such limit as this.

When all the parts are in place, and their positions checked (see that the terminals of the coil come in the right places, too) you are ready to start wiring, and here we have very little to tell you, because the blue print makes it all so clear. It is just a matter of working over it wire by wire, and as each connection is added marking off the corresponding line on the print as a check.

No Soldering Required.

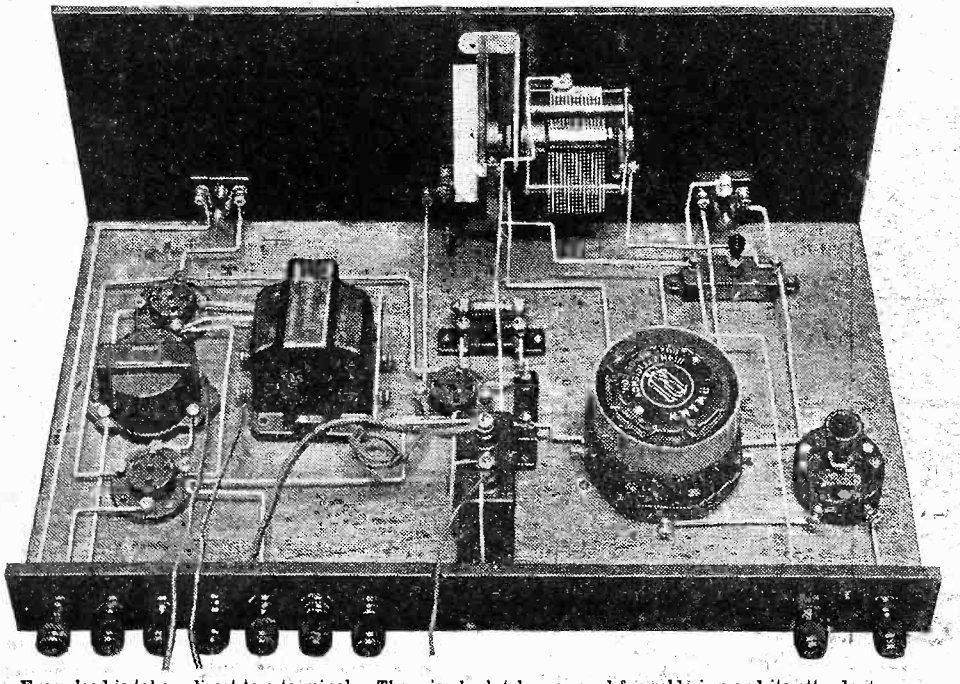
It is particularly to be noted that no soldering is required or advised. The connections all run between points which have nuts or terminals, and again a close copy is recommended, and for the same reason.

There is really only one actual wiring point for us to explain, and that concerns the connection between the L.T. circuit and the fifth terminal on the second L.F. transformer (the Telsen one). This has the effect of earthing the core, but it is not essential, being merely an extra stabilising precaution. If your particular transformer has no fifth terminal, just omit the wire in question.

Mention of transformers, by the way, reminds us to add that it is as well to use the lowest ratio available in any particular type in which a choice is offered.

Now a final point: some types of thumb-control condensers are supplied with a screening plate, but this is not required with the "Comet" and should be omitted in fitting.

NO NEED TO SOLDER A SINGLE WIRE



Every lead is taken direct to a terminal. There is absolutely no need for soldering and its attendant mess and bother.

THE COIL IN THE "COMET."

Here are full details for making the famous "P.W." Dual-Range Coil used in this remarkable receiver.

THE coil used in the "Comet," to which the receiver owes a good deal of its phenomenal power, is the new "P.W." high-efficiency dual-range unit. There is no doubt that this coil raises wave-change switching to quite a new standard of efficiency.

It wipes out those losses which many people have thought inevitable with wave-change switching, it is definitely of superlative efficiency judged purely as a coil, and it is scientifically worked out to meet the needs of modern circuits.

A 'Flexible" Coil.

Better still, it has been designed with the greatest care to render it what may be termed "flexible," i.e. to make it suitable for use in all sorts of different circuits. Thus it can be used over and over again in all kinds of receivers.

It is quite within the powers of a careful constructor to make a satisfactory specimen of the unit for himself if he follows the instructions faithfully and closely, and the specification has been given in "P.W." twice. However, this was some time ago, and in any case our circulation has gone up considerably since then, so we are repeating it briefly for the benefit of new readers.

The windings of the unit are carried on two main formers, which are placed one inside the other. The outer is a tube of some good insulating material, e.g. "Pirtoid," 3 in. diameter and 2½ in. long. This carries the low-wave secondary winding, with the aerial (or primary) winding arranged over the lower end of the secondary on ebonite spacers.

The Long-Wave Former.

The inner former is of the ribbed type, e.g. "Becol," with 8 or 9 ribs. Length, 2½ in.; diameter over the ribs, 2¼ in. The diameters of these formers are most important, and any serious variation in either may upset the working of the unit completely.

The ribbed former carries the long-wave secondary and the reaction winding in a series of slots. These are made by filing with the edge of a small file a series of notches in the ribs. There are eleven of these slots in each rib, and these are about $\frac{3}{32}$ in. wide, with $\frac{3}{32}$ in. space between each slot and the next. The top slot is $\frac{3}{32}$ in. from the top end of the former. Depth to be $\frac{3}{16}$ in. (This usually means the full depth of the ribs.)

The inner former is fixed and positioned inside the outer with six brass screws about 1 in. long passing outwards through holes in both formers. To locate the inner one properly in a roughly central position, i.e. with an equal space all round between it and the outer one, use small bushes cut from ebonite tube and slipped on to the screws, or extra nuts and washers.

These screws serve also as terminals. Put double nuts and a washer on the outer end of each (a soldering tag also if you like) and secure the various ends of the windings to the inner ends of the screws, i.e. under their heads.

The Windings.

The screws should be placed round the lower edge of the unit, about ¼ in. therefrom, in positions you will be able to gather from the blue print (wiring diagram) of the "Comet," and marked to agree therewith.

Provision for fixing the unit down is easily made; small brass brackets, or a wooden cross-piece fitted inside the lower end of the ribbed former before the unit is assembled.

Windings: Primary, 12 turns of No. 24 D.S.C. wire, on 8 or 9 "spacers"; these to be about $\frac{3}{16} \times \frac{1}{4} \times \frac{3}{4}$ in. long, of ebonite. Low-wave secondary, 48 turns of same wire in a single layer on the 3-in. tube. Gauge of wire and nature of covering *must* be as specified.

For directions of these (and the other) windings, see special diagram. This makes the point clear, and also indicates to which terminals the ends of the windings are to be connected.

The long-wave secondary has 250 turns of No. 26 D.S.C. wire, occupying 10 of the slots, i.e. there are 25 in each slot. These slots are: No. 1 from the bottom, then No. 3, No. 4 and so on up to the top, i.e. all the slots except the second one up from the bottom. This is left for the reaction winding, which is 30 turns of No. 30 D.S.C. wire.

Check Your Windings.

To get the long-wave secondary winding across from slot No. 1 to No. 3 might seem difficult, with the reaction coil in No. 2 in between, but it is easy enough really. Put the reaction in first, and then take the secondary wire across the top with a bit of paper between, or put the secondary on first and take the wire across from slot 1 to slot 3 flat on the surface of the former. Put a bit of paper over it where it crosses before putting on the reaction winding.

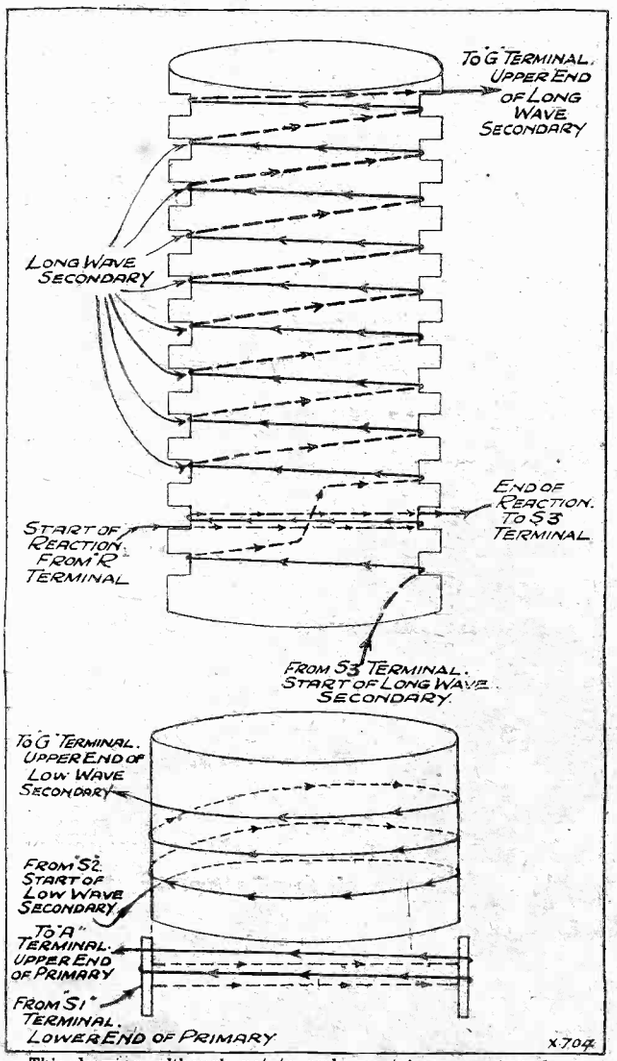
The positioning of the windings is very important. The lower edge of the primary must be over the lower edge (i.e. the bottom turn) of the low-wave secondary, and this in turn must come over the bottom slot in the ribbed former.

That really completes the instructions you need, and if you follow out the specification conscientiously you cannot fail to turn out a coil of very high efficiency indeed.

Above all, see that your formers are of the correct sizes and that your windings are in the correct directions.

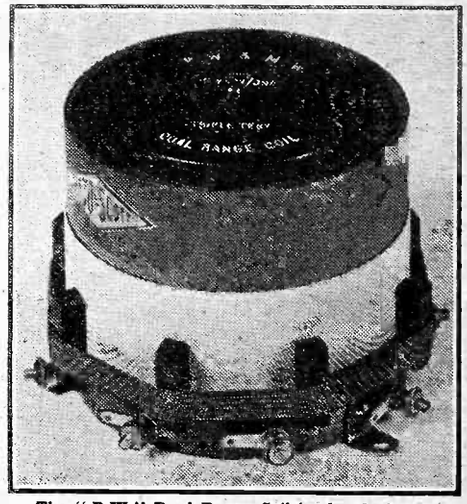
The connections of the windings to the terminals should be checked over very carefully indeed from the special diagram on this page. To identify the start of the reaction coil you might tie a knot in it. We have labelled the "start" and "end" differently this time, by the way, but the final result is just the same as that produced by the original instructions.

BUILD YOUR OWN COIL

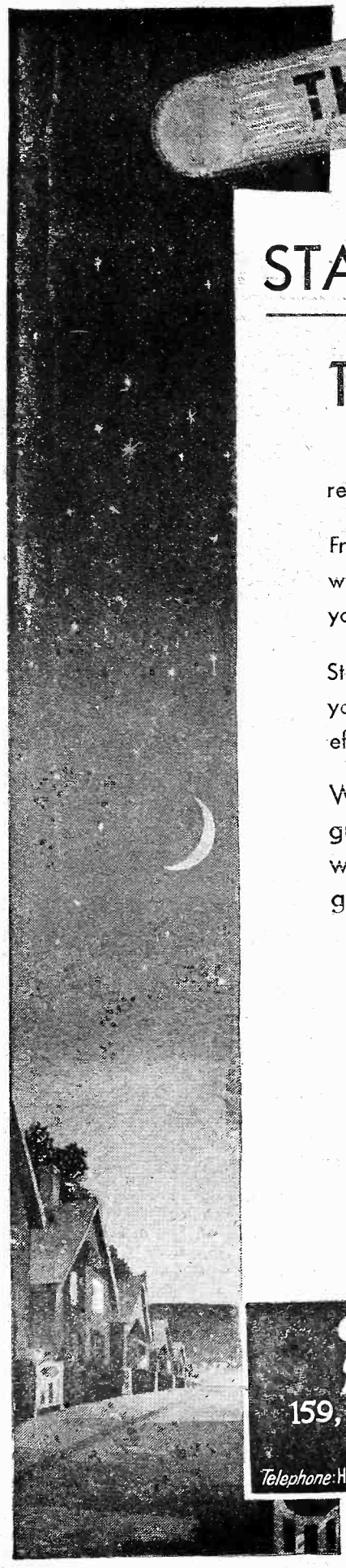


This drawing, although not to scale, contains a great deal of important detail.

CONCENTRATED EFFICIENCY



The "P.W." Dual-Range Coil is already famous as an aid to simplified tuning. This is a well-known commercial version made according to "P.W." specification.



START RIGHT with the "COMET"

The "Comet" Three is just the set to appeal to every "P.W." reader. Powerful, sensitive, selective, with splendid quality yet extremely easy to build and very inexpensive. A receiver which will give you wonderful results, providing you use Components which you know are he best obtainable.

From time to time "Popular Wireless" will tell you of additions and alterations which you can make to your "Comet" if you wish. Whether you do or not, you must START RIGHT.

Start right with Ready Radio. Build your "Comet" with a Ready Radio Kit and you have our guarantee that every Component is of the highest possible efficiency and thoroughly tested before dispatch.

What is more, Ready Radio have hundreds of complete tested and guaranteed Kits ready for IMMEDIATE DISPATCH. No need to wait for the parts you want—order them from Ready Radio and get them at once.

Every purchaser of a Ready Radio Kit has the benefit of free technical advice from the Ready Radio Technical Experts.

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See also pages 1050, 1053 and 1055.

See also pages 1049, 1050 & 1053

OPERATING the "COMET"

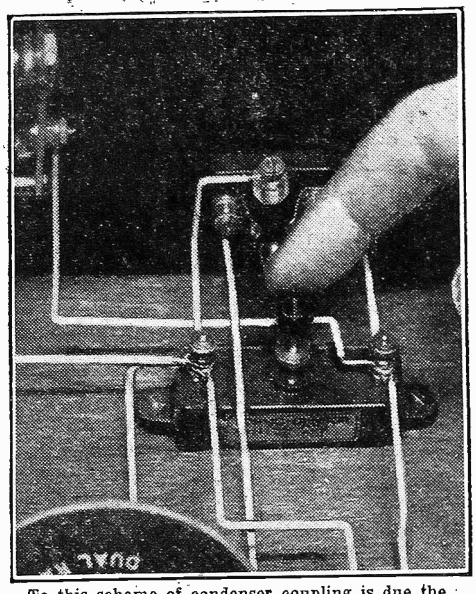
How you get the last ounce out of this remarkable receiver.

Plenty of foreign programmes are waiting to be pulled in. Get your share!

WHEN you arrive at the exciting moment when your newly-built "Comet" is ready to go on test you can demonstrate the truth of the claims that have been made for it. To help you to get the very best possible results from it we have prepared some operating notes and general hints in rather greater detail than usual, because we expect quite a number of new readers will be making the "Comet" as their first set.

First comes the choice of a trio of valves, and this is rather important. Even the "Comet" cannot give good results if you give it unsuitable valves, or valves of poor efficiency.

BROOKMANS COUPLING



To this scheme of condenser coupling is due the remarkable long-wave efficiency achieved in the "Comet."

For the detector you want a valve of either the "H.F." or "special detector" type. Examples of the first are the Cossor 210H.F., Mullard P.M.2.H.F., Osram or Marconi H.L.210, Mazda H.F.210, Six-Sixty 210 H.F.

Suitable "special detector" types are the Mullard P.M.2.DX., Dario "Super Detector," Six-Sixty 217D, Cossor 210 Det., etc. We have found that slightly better results are usually obtained with one of these valves, but there is not very much difference to be observed.

The L.F. Valves.

For the first L.F. stage you should use a valve of the L.F. type, a few examples being these: Mazda L.210, Mullard P.M.1 L.F., Cossor 210L.F., Marconi or Osram L210, Six-Sixty 210 L.F.

In the third socket you have to decide between the "power" and "super-power" types. The latter is much to be preferred, because in so extremely powerful a set the ordinary power valve is very easily overloaded.

The super-power type, however, runs away with a pretty heavy H.T. current, and really requires a battery of the "triple-capacity" size, and not less than 100 volts. With a mains H.T. unit, of course, the matter is simple. Choose a super-power valve, by all means, so long as your unit is rated to deliver, say, 30 milliamps or more.

Avoid Overloading.

Where the H.T. supply is limited and economy must be practised the ordinary power type is to be preferred. Be careful to avoid overloading on strong stations, however, and limit the volume to the level the valve will handle nicely without distortion.

This is a most important point. You simply cannot get good quality if you just tune in the local fully and take no steps to keep the volume within reasonable bounds. This is absolutely essential with so powerful a set unless you have a most enormous super-power valve and very high voltage H.T. supply.

The simplest method of volume control in the standard model "Comet" is the following procedure: Set reaction to minimum, and reduce the setting of the "selectivity control" to minimum; in other words, unscrew the knob to the limit of its effective travel. If the volume is still too great, just detune a little on the tuning drum.

High H.T. Not Essential.

A special feature of the "Comet" is that it does not absolutely demand a high voltage H.T. battery, such as must be used with a screened-grid set. It will definitely work with only about 60 or 70 volts, so far as bringing in the distant stations is concerned. Of course, a higher voltage is needed to handle strong signals properly, and to get good quality from the local you really want 100 volts, or so.

The adjustment is simple: To terminal H.T. + 1 apply from 40 to 60 or 70 volts, adjusting it for the smoothest possible reaction control. On H.T. + 2 just apply all the voltage you have available, as much as 150 being permissible with modern valves. Of course, such a figure will only be possible for those with mains H.T. units. About 100 or 120 volts will serve admirably for general purposes.

Now the controls in brief. Push the wave-change switch inwards for long waves, pull outwards for medium waves. Adjust selectivity control thus: First screw down fully, then gradually unscrew until just sufficient selectivity is obtained. Reaction is increased by turning to the right; use it to keep the set nearly, but *not quite*, oscillating when searching.

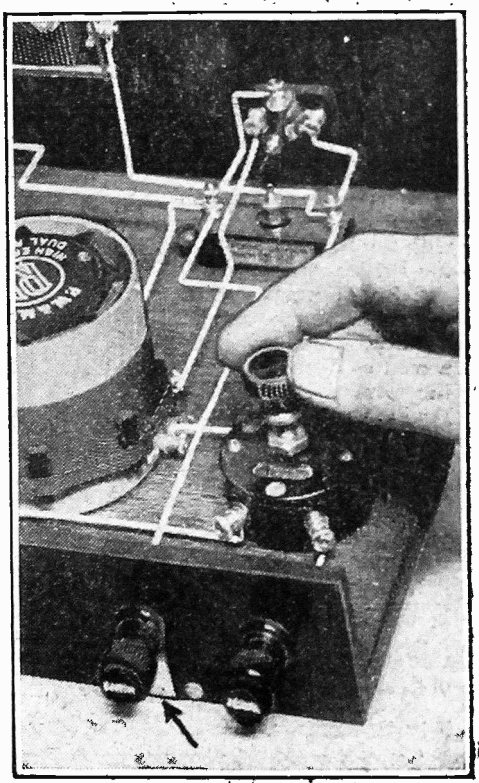
Aerial Coupling Adjustments.

Aerial coupling on long waves: Set ·002-mfd. compression type condenser to a midway adjustment, then try varying either way a little and re-tune. A little experimenting will soon find the setting which best suits your aerial.

By the way, on some aerials you will occasionally find you can get better volume on long waves by screwing the selectivity control knob fully down. You are not likely to need to do this often, but the tip is worth remembering if ever you come across a very weak long-wave station.

With the grid-bias adjustment it is a little difficult to deal helpfully, because valves vary so much in their requirements. You should really be guided by the data slip you will receive with the valves.

VARYING SELECTIVITY



The adjustment of the aerial-series condenser sharpens your tuning to the required degree for your aerial. The arrow indicates the earthing tab of the copper screen.

ALTERNATIVE MAKES OF L.F. TRANSFORMERS.

The following pairs of L.F. transformers (in addition to those seen in the photos) have been tested in the original receiver and found to give satisfactory results:

Varley "Nicore I" and Ferranti A.F.8.
Ferranti A.F.3 and Igranic "Midget."
Lissen "Super" and Lissen "Tonex."
Telsen "Radiogrand" and Lewcos.
Varley "Nicore II" and Lotus.
Telsen "Ace" and Lissen "Tonex."
R.I. "Hypermite" and Lotus.

INTERNATIONAL RADIO

In view of the ever-increasing congestion in the ether, this special "P.W." interview with Mr. Burrows, Secretary-General of the International Radio Union, is of particular interest, for it gives you an insight into the way attempts are made pacifically to arrange Europe's broadcasting.

MR. A. R. BURROWS, former Director of Programmes of the B.B.C. and now Secretary General of the Union Internationale de Radiodiffusion at Geneva, was kind enough to give me, on behalf of "P.W.," some of his ideas on the influence of the Union's work on broadcasting in Europe.

"Apart from the fact that people are realising more and more that radio has come to stay, that it is taking up a definite place in our lives and in the lives of the nations, we must all realise that without some interchange or exchange of ideas, such as is promoted by the International Broadcasting Union, European broadcasting might have been very different.

International Courtesy.

"Take, for instance, a recent happening," Mr. Burrows went on to say, "the catastrophe of R101. Well, the moment news of it had come through, the Stuttgart station (in whose district the home of the Zeppelin lies) closed down for five minutes as a sign of sympathy with the loss to aircraft and to the British nation.

"Other German stations cut out their dance music that evening. Then I have witnessed at Vienna the relay of the memorial service from St. Paul's, a broadcast which was also relayed by many other European stations, including Budapest, by wireless link.

"After all, not so very many years ago, all these countries were enemy countries. And it is my firm belief that it is the work of broadcasting, and also of the Union, that has paved the way for similar spontaneous demonstrations of international sympathy.

Friendly Meetings.

"Now that the telephone cables in Europe have been vastly improved and largely adapted to broadcasting frequencies, regular international broadcasts are planned and will be carried out, and these again, will help us in our understanding of other nations."

And here Mr. Burrows stressed the spirit of friendliness which pervades their meetings, and the very fact that they are not delegates of governments that are meeting, but that more or less private organisations send representatives. There is an unofficiality at the Union meetings that makes it possible for things to be discussed and solutions arrived at which otherwise might require very different handling.

On the question of wave-lengths, Mr. Burrows was extremely reticent. "Generally speaking, wave-length allocation is very often a question of a compromise between local considerations and international requirements," he said. "And, after all, the local man is the most important.

"It is he who pays for the station, and he certainly is entitled to the best possible service from his local transmitter.

"And if one views all wave-length allocations from these angles one will see that very often geographical formations make it essential for a station to have as long a wave as possible for good service, and in many other instances other local conditions have had to be considered."

Very Active Organisation.

The Union is at present very active in the collection and exchange among its members of data concerning radio drama. I understand, from what Mr. Burrows told me, that the Union finds ways and means for suitable translation of radio plays specially written for the microphone, and that the experiences of each broadcaster is being collected by means of questionnaires, and circulated to all members, thus enabling one to benefit by the experiences of others.

The next meeting of the Union will probably take place next February in Vienna, when the technical committee will have to complete the preparations for the last meeting of the C.C.I.R. before the 1932 Madrid conference in May at Copenhagen.

HE WAS "UNCLE ARTHUR"

Mr. Arthur Burrows may be doing radio work of the most vitally important international character at Geneva, but it is dubious whether he'll there gain such a direct grip on the affection of listeners as he did when, as you see him above, he was golden-voiced "Uncle Arthur" of 2 L O, one of the most popular microphone personalities broadcasting has heard "on the air." His "fan mail" must have been prodigious in those days.

AT BROOKMANS PARK

Interesting details of the Twin Transmitters.

The Brookmans Park station is fifteen miles from Charing Cross, and stands about 400 feet above sea level.

* * *

The actual site of the Brookmans Park station is a single field, of some 34 acres in extent.

* * *

The power of the Brookmans Park station is derived from four 6-cylinder Diesel engines driving D.C. generators, each capable of an output of 200 k.w.

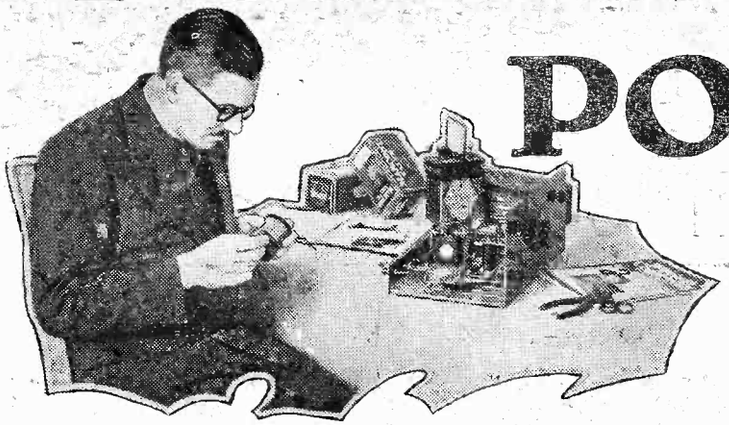
* * *

The capacity of the B.C.C.'s accumulator at Brookmans Park is about 2,000 ampere hours!

* * *

Owing to the dangerously high voltages used on parts of the B.B.C.'s transmitting plant, doors are arranged which cannot be opened without shutting off the current.

MORE COMPONENT POINTERS



By Victor King.

A well-known set designer has some trenchant remarks to make concerning some component failings that may seem of little consequence in theory but which in practice cause so much annoyance to home constructors.

SOME few months ago I contributed an article to "P.W." in which I pointed out some minor faults frequently encountered in radio components. I explained that these faults were to be seen in the most modern designs due to the best and most conscientious of our manufacturers.

You see, they were mostly little things that would not worry a set maker, but which prove irritating to the home-constructor not equipped with everything in the way of tools, and who has not very much mechanical knowledge.

Still a Few.

Maybe my article had something to do with it—maybe not—but it is a fact that many, if not all of the points I mentioned, have now been rectified in a large number of makes of components.

But there are still quite a few annoying trifles encountered, and these I propose to bring forward here and now. Constructors would do well to look out for them in components they intend buying, and manufacturers who steer clear of them will assuredly increase their popularity in no small measure.

I cannot help thinking that it would pay any radio concern making components for home-constructors to do a little home-construction themselves, using their own products and building a "P. W." or other set with no other tools than a screwdriver and a pair of pliers. They'd gather some mighty useful tips!

An Apt Illustration.

In this connection, I am reminded of a quite well-known car. The first models of this were made with the gear lever far too short for comfortable driving, and two or three firms did a roaring trade selling extension pieces to make good the deficiency! If the designer of that car had been an owner-driver he would never have made such a mistake, and he would also have placed the accumulator in a more accessible position, and done a few other things to make the maintenance more easy for the ordinary non-mechanical buyer!

Forgive me if I have told you that on a previous occasion, but it is so apt an example of the wide gap there is often between the designer's drawing office and the man-in-the-street, that I simply cannot help repeating it—if indeed this is repetition.

However, to return to the immediate matter in hand. Have you noticed how many components are supplied with slotted terminal nuts these days? The nuts are sometimes hexagonal and sometimes square. Theoretically, they make it possible for you to tighten them up with a spanner, pliers, or with a screwdriver.

Those Split Terminal Nuts!

But the last must, in cases, be of the split variety, otherwise it can be employed only with difficulty. For that slotted terminal nut to be of real value to the home-constructor it should be deep, so that it extends well above the shank of the screw when it is driven down as far as it will go.

And while we are on the subject of terminals, I would urge all amateurs to make sure that the terminals on the components they intend buying are accessibly placed. There is a tendency to place terminals well down towards the bases of components nowadays. Such a practice certainly makes for neat connecting-up, although in a rather compacted outfit it also introduces difficulties into the wiring at times.

Especially is this the case when the terminals project horizontally from the sides. I consider that it should be the aim of all component designers to place their terminals vertically wherever possible.

Horizontal mountings on a device such as the "P.W." dual-range coil aren't going to matter much for an article of this kind, figuring as it does in the H.F. sections of a set, it will invariably be well spaced from other items, and so enable complete access to be obtained pretty well all round it.

There is yet another thing in regard to terminals that is worth considerable prominence. I refer to the soldering tags that are usually fitted. How often are these so dimensioned, and the terminals so situated, that one tag can easily foul another tag and cause a short circuit or strike a contact with something else!

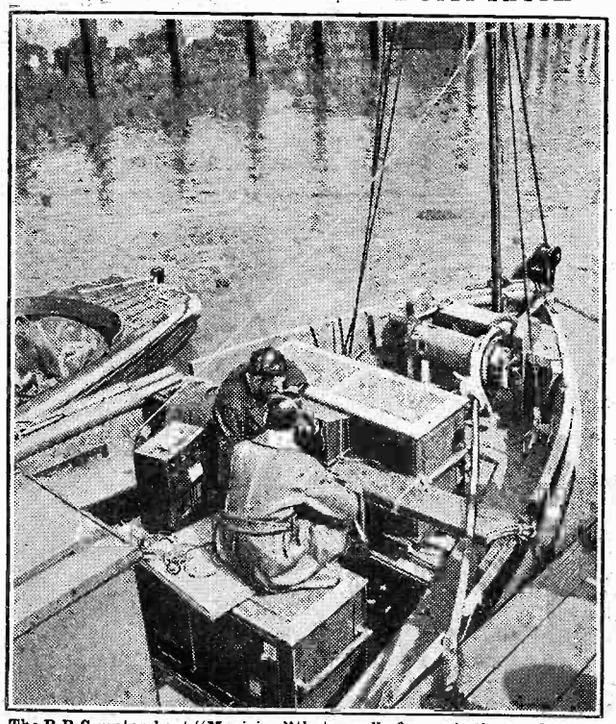
Soldering Tags.

Personally, I loathe soldering tags—when I am not soldering. But that reminds me of a useful hint. If you snip off the projecting tab of a soldering tag with a pair of scissors or with tin snips, the result is a metal washer of handy size.

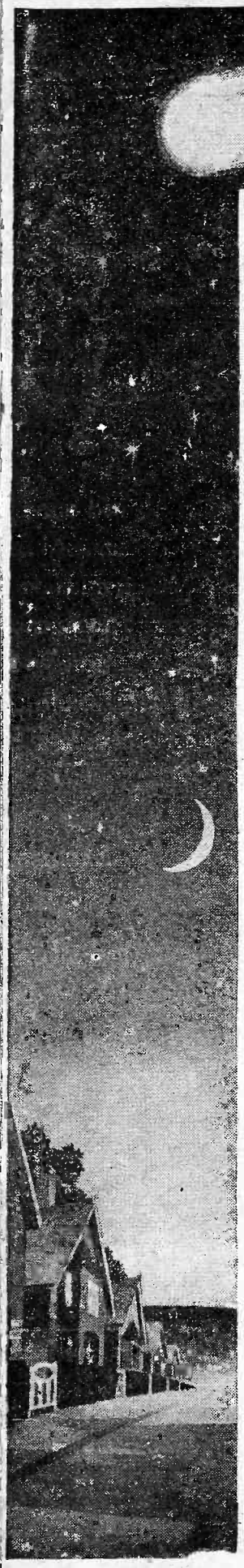
While I write, other terminal failings occur to mind. For instance, I wish to goodness there were a universal provision of terminals of really adequate dimensions. High marks must be given to a number of manufacturers for this, but many do not deserve any marks at all! They give you tiny little affairs that will hardly hold a wire of any respectable gauge.

(*Continued on page* 1056.)

BROADCASTING THE BOAT-RACE



The B.B.C. motor-boat "Magician" that usually figures in the yearly boat-race broadcasts. The vessel is fitted with a special short-wave transmitter.



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PRE-H.F. VOLUME CONTROL

A novel scheme that has several important advantages.

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

THERE are several forms of pre-detector volume control, all of which work very well in practice, though some of them are really compromises between theory and practice.

The three most common methods are variable screen-grid potential, variable grid bias (in a negative direction only), and varying the input to one of the H.F. valves by means of a potentiometer connected across the tuned circuit.

When using battery-heated valves there is, of course, also, the method of using a resistance in series with the filament to give a control of volume. Unfortunately, this method cannot be used with indirectly-heated cathode valves, which are being used so much to-day.

Affecting the Characteristics.

Now both the potential variation methods, either of the screening grid or the grid have a considerable effect on the characteristics of the valve, and from this point of view are not desirable. They may lead to rectification occurring, in which case, of course, very heavy damping is applied to the tuned circuit and "cross talk" results.

The potentiometer across the tuned circuit method I don't care for very much, because it introduces extra damping into the tuned circuit with which it is used. Although this may not be serious from the point of view of loss of amplification, especially when efficient coils are being used, so that the H.F. stage is on the verge of regeneration, it is not to be recommended where high selectivity is required.

I was carrying out some experimental work recently on a large H.F. amplifier, using three stages of A.C. screen grid H.F. amplification. In view of the enormous magnification obtained from these three H.F. stages, I felt that some form of pre-H.F. volume control was desirable for local station work.

Delightfully Easy.

I also wanted to be able to adjust the aerial coupling at the bottom of the tuning condensers so as to avoid the extreme flatness of tuning that often occurs owing to the aerial circuit tending to come into tune.

While I was considering this problem my eyes happened to fall on a differential condenser which was lying on the bench, and it immediately occurred to me that in this little component lay the solution to my difficulty.

It seemed to me that if I connected it across either the aerial inductance or aerial tap, as shown in the circuit diagram, I should have a delightfully easy control of the H.F. potential applied to the first H.F. valve, and also of the coupling between the aerial and the set.

I lost no time in trying out this scheme, and found that it worked perfectly. I found that it was possible when using the three screen-grid valves to cut down the volume of the local station on an outside aerial, even when using full amplification in the H.F. amplifier, to a very low volume, and after the differential condenser had been screened, so as to avoid any direct pick-up from it, the volume was reduced still further to a point where it was only just audible.

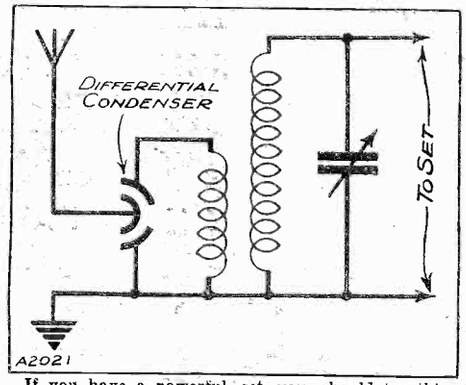
At the same time I found that when I got down on the lower part of the broadcast wave-band, where there was a tendency for the aerial to come into tune, by using the differential condenser I obtained control of the actual coupling, so that the aerial circuit no longer fell out of step with the other parts of the ganged circuit.

Smooth Control.

The use of a differential condenser in this way makes a delightful control of volume, and it will be seen that even in a powerful receiver it can be used entirely as a pre-H.F. volume control, and thus does away with the necessity of a screening grid control on the H.F. amplifier.

I would like to sound a warning note here, however, that the condenser used should certainly be an efficient one, preferably with air dielectric, otherwise a satisfactory control of volume may not be obtained.

WHY NOT TRY IT?



If you have a powerful set you should try this scheme. It is easily applied and really does give effective results.

ETHER JOTTINGS

A few interesting items relating to various broadcasters.

Although there are many stations sharing wave-lengths on the lower wave-band, the only long-wave stations to do this are Cracow (Russia), Stamboul (Turkey), and Boden (Sweden), which share 1,200 metres.

* * *

Apart from the short-wave station at Chelmsford (5 S W), the lowest broadcasting wave-length used by the B.B.C. is 200 metres, for Leeds.

There are only two regular European broadcasting stations with wave-lengths below Leeds and these are Karlskrona (Sweden) and St. Quentin (France).

* * *

Oslo (Norway) recently took over a wave-length of 1,060 metres, and now uses 75 kw.

* * *

The Heaviside layer effect was once described by Sir Oliver Lodge as an "unexpected bonus on the part of Providence."

* * *

The behaviour of short-wave transmissions is powerfully affected by sunshine.

MORE COMPONENT POINTERS.

(Continued

What we want are those substantial constructions with nice large base nuts that provide ample "bedding" for a loop of 18 gauge wire. But, even so, you want a respectably sized nut to screw down and not one of those bevel-edged arrangements that sends a wire loop squirming outwards as you screw down.

Probably the manufacturers' answer to this would be that you should either solder or use washers. I suppose we should; but we don't. At least I don't, and I am sure that there are many like me. In passing, I must mention that I have two electric soldering irons and one ferocious gas affair, but that, nevertheless, if I can assemble a hook-up without soldering, I'll do so.

Test It Before Buying.

By the way, never pay your money for a component without running round the terminals to see if they are tightly mounted. If you can loosen any of them with your fingers, even if you have to apply some strength, turn the article down. A finger-tight fixing never stands up against a test of time. It is one of the mysteries of mechanics that screws that are not absolutely "bedded" will work loose even if, apparently, no force, no pressure, no vibration is applied to it.

I fancy the loosening is caused by expansion and contraction due to temperature changes. However, never drive a terminal nut too hard home with pliers or screwdriver. You can't go far with most of the flimsy little screws of brass you find on radio components before you strip their threads. As far as that goes, it takes a fairly hefty steel nut and bolt to withstand the force that can be applied by anyone with pliers. You see, you get such a leverage.

I have often wondered why some mechanic hasn't invented a spring spanner that would "give" at a certain point and so absolutely prevent thread stripping. The spring tension could easily be adjusted for different sizes of nuts and for different materials such as brass, steel, etc.

That Last Quarter Turn!

The average man doesn't know how far he can go with his turning and if he is conscientious it worries him a great deal, this seeming trifle. He screws up the nut, stops after a little, and wonders whether it will be tight enough. Then, maybe, he decides to give the thing another quarter or half twist, "just to make sure." If he is lucky nothing happens; if he is unlucky on this occasion, he finds that the nut apparently is still quite loose. So he twists on, only to find that he has stripped the thread and completely ruined the terminal.

There were other points I had intended to deal with, but I find I have exhausted my space. Perhaps on some future occasion I shall be able to pursue this topic further. In the meantime, it would help if every reader who finds himself actually in trouble through one of the above-mentioned terminal faults would write to the manufacturer concerned. My experience leads me to believe that all the big firms receive such information with real gratitude.

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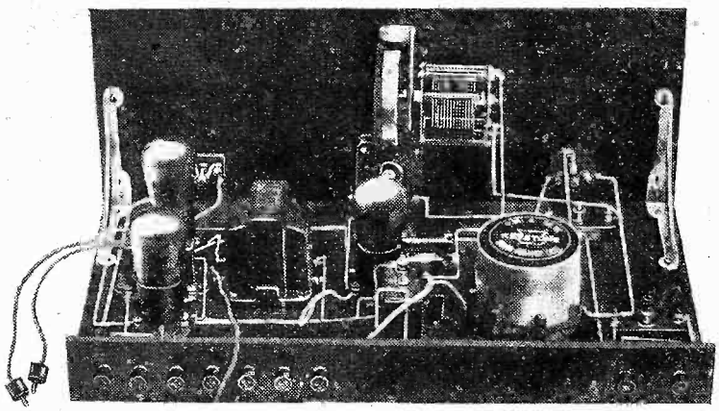

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*1	Cyldon ·0005-mfd. "thumb control" variable condenser		11	6
1	·00013-mfd. differential reaction condenser, J.B.		4	6
1	Keystone 3-point wave-change switch		1	3
1	Keystone L.T. switch		1	3
1	Keystone P.W. dual-range coil		12	6
3	Telsen valve holders		3	0
1	Sovereign ·0003-mfd. fixed condenser			10
1	Franklin 2-mfd. fixed condenser		2	8
1	Lissen 2-meg. grid leak and holder		1	6
2	L.F. transformers (Telsen "Radiogrand" and Igranic "Midget")	1	3	0
2	Keystone spaghetti resistances, 10,000 and 25,000 ohms		3	0
1	Formo or Sovereign ·001-mfd. (max.) compression type condenser		1	6
1	Formo or Sovereign ·002-mfd. (max.) compression type condenser		2	3
1	Terminal strip, 18" × 2"		2	0
1	Sheet of aluminium foil, 18" × 10", for covering underside of baseboard		1	0
9	Belling-Lee terminals		2	3
1	Koncctcrkit, comprising Keystone angle brackets, wire for connecting, wood screws, G.B. plugs, etc.		GRATIS	
3	Mullard valves—P.M.1 H.F., or P.M.2DX, P.M.1 L.F. and P.M.2 or P.M.2A	1	7	6
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The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless 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

ADJUSTING SELECTIVITY ON THE "3-COIL" THREE.

N. A. (Jedburgh).—"How is the '3-coil Three adjusted for a different degree of selectivity?"

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In general it is best to put the one for the second coil (L2) on the tapping which gives greatest volume, and get your selectivity by the tapping on L1.

NOTE.—The compression type-condenser connected in the aerial lead is meant entirely as a supplementary control. Keep it set at maximum normally, with the knob screwed right down, and reduce it from this setting only if you must.

AUTOMATIC GRID BIAS.

R. J. W. (Leytonstone).—"I am interested in this stunt of getting grid bias for an A.C. valve without the use of a grid battery.

"So far as I can see it consists simply in placing a resistance shunted by a suitable condenser between the cathode of the valve and that side of the grid circuit which normally goes to the cathode, including H.T.—. What I do NOT see is how to alter this resistance for different values of grid bias, or calculate what it should be for a known value of bias. Must it be worked out by the makers, or can you tell me a rule by which the value may be ascertained?"

The only rule you need in such a case is our old friend Ohm's Law, which in one of its forms says that $V = R \times C$. V is the voltage, R and C being respectively resistance (ohms) and current (amps.).

The current under consideration is that in the anode circuit of the A.C. valve in question, all of which must flow via the cathode and the resistance which is connected between this and H.T.—. With such an arrangement the value of the current in amperes multiplied by the value of the resistance in

(*Continued on page* 1062.)

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.

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RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 1060.)

ohms will give you the number of volts grid bias obtainable, by the connections you mention.

The plate current can be measured by a milliammeter, or can be taken from the valve maker's data showing what current flows under given conditions. Then the value of the resistance necessary to give the required voltage bias to the grid can easily be calculated from $R = \frac{V}{C}$. Usually 1,000 ohms is correct, giving 1 volt bias per 1 milliamp anode current.

ON THE TICK.

S G. (Halesowen, Birmingham).—"We find the time signals from the Regional and the other one from Daventry (5 X X) very handy, particularly now that my boy has been apprenticed to a watchmaker—a position which prompts him to doubt the veracity of every clock in the neighbourhood!

"What with Big Ben and the dots there are plenty of signals going out from these stations, but I am not sure that I have got the hang of them yet. Why do they sometimes drop one, and what times are the recognised signals from these two stations sent out?"

The recognised times for the Midland Regional (479·2 metres) are: Big Ben at 12 noon, and the six dots at 6.30 p.m. and again at 10.15 p.m. on weekdays. On Sundays the six dots go out at 3.30 p.m. and 9 p.m.

A much better time signal service is given on the Daventry National station (1,554·4 metres), where time signals are compulsory and will *always* be broadcast, even if this means superimposing them on the programmes.

The full Daventry (5 X X) time signal service is given below:

10.15 a.m.—Big Ben.	4.45 p.m.—Six dots.
10.30 a.m.—Six dots.	6.30 p.m.—Six dots.
12 noon. —Big Ben.	9 p.m. —Six dots.
1 p.m. —Six dots.	11.30 p.m.—Six dots.

As a general rule, Big Ben is broadcast also at the beginning of any programme emanating from London, and it is the rule to close a weekday programme with Big Ben whenever possible.

To conform with the requirements of shipping and other services relying on the broadcast time signal, the six dots are sent out on 1,554·4 metres at the times named without fail. Similarly on Sundays, when they go out at 10.30 a.m., 3 p.m., and 9 p.m. again without fail.

WHY NOT MORE WAVE-LENGTHS FOR BROADCASTING?

D. B. (Norwich).—"Why is it that all the important British and foreign stations are either between 200–600 metres or between 1,000–2,000 metres? Surely a greater wave-length could be used and stations placed at least ten to twenty, or even more, metres apart? Would this not be better than the inadequate system used to-day?"

You appear to forget, D. B., that broadcasting is only one side of radio. Those wave-lengths you covet are needed by other people, who believe that listeners to broadcasting have far too many wave-lengths already!

First and foremost, there are the world's ships. Remember that wireless is a ship's *only* means of keeping in touch with the world, and so their radio is not only of great importance from a business point of view, but may give warning of disaster.

There have been several occasions on which nearly a thousand lives at a time have been saved by a ship's S O S. And nearly every day smaller rescues are carried out by the aid of wireless!

So obviously you can't have all the wave-lengths for B.B.C. wireless—which is just entertainment for we stay-at-homes—at the expense of people whose lives may depend on it.

How about aeroplanes, too? Round about 900 metres you can hear Croydon telling the cross-Channel 'planes what weather to look for, etc. We can't ask the pilots to do without wireless help because we want easier tuning, can we?

Air Force, Navy, Mercantile Marine, and Empire communications all depend to a greater or less degree on wireless communications, and that is why European listeners have only a limited band of wave-lengths allotted to their broadcasting stations.

TECHNICAL TWISTERS

No. 48.—L.F. COUPLINGS.

CAN YOU FILL IN THE MISSING LETTERS?

Methods of L.F. coupling can be divided into three main types—R.C. . . . . and . . . . .

Of these the . . . . . is easily the most common.

Modifications of the transformer method are the parallel-fed transformer and the . . . . - . . . . . scheme.

Besides being used between all . . . - . . . . . valves, L.F. coupling is used between the first L.F. valve and the . . . . . .

Last week's missing words (in order) were Diode. Triode. Four, tetrode. Pentode.

USING A.C.

D. K. (Watford).—"I have recently converted my set (three-valver, det. and two L.F., one stage R.C. and one transformer) for A.C. valves, and at first I had a great deal of trouble with motor-boating. I have now managed to stop this, and the set is working pretty well, except that the amplification is so great that I have a lot of trouble to prevent overloading. The reaction control is not too good, either. Can you help me to get rid of these remaining difficulties?"

If you haven't used A.C. valves of the indirectly-heated type before this kind of trouble is apt to be puzzling, but it is natural enough really. These valves give so much more "mag." than their opposite numbers in the battery range that over loading is very prone to occur with two L.F. stages.

(*Continued on page* 1064.)

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 1062.)

The remedy is simple: cut down the amplification a little. This will generally make the set far more pleasant to handle and also more stable. In your set a good way to do it is to reduce the value of the anode resistance in the R.C. stage to 25,000 or perhaps 50,000 ohms.

This change is sometimes advisable when going over from battery valves. Incidentally, it should correct your reaction trouble as well.

VOLUME CONTROL CONNECTIONS.

M. A. A. (Cheshunt).—"To keep the input to the S.G. valve at the required value I propose to use a 400-ohm potentiometer with slider connected to the negative grid-bias battery (H.F.) and one other end to the tuning coil. The bottom of the tuning condenser will go to L.T.—, thus placing the potentiometer in the tuned circuit. The remaining terminal of the potentiometer is left unconnected. Would the 400-ohm potentiometer be O.K., or do you think that for steady control conditions the value should be higher?"

Four hundred ohms is quite a usual value to employ in such circumstances, and is, in fact, we believe, used by the B.B.C. where such a control of volume is necessary. You would notice some difference in selectivity according to the position of the slider with such an arrangement.

TESTING 'PHONES.

"Short-Wave Willie" (Bournemouth).—"What is the best way to tell if 'phones are O.K.?"

Place the earpieces over the ears in the ordinary manner, and then put one of the tags at the end of the cord into the mouth, holding it firmly between the lips. Now, in one hand take the other tag of the telephones, and in the other hand take a key, a nail, or a similar piece of metal, and rub this gently on the second tag.

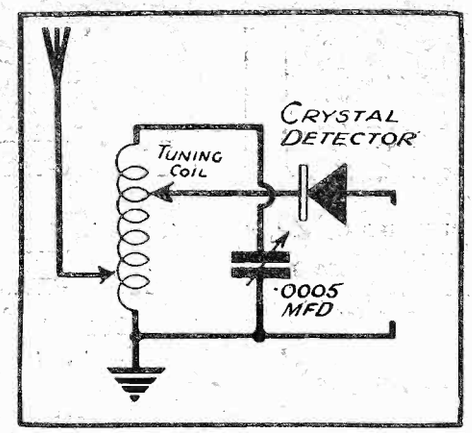
If the telephones are in good order you will hear noises corresponding with this rubbing in the telephones.

The noises, of course, will not be very loud, for in the absence of an external battery you are working the telephones by a kind of human electricity, generated in your own body. But so sensitive are a good pair of telephones that if they are O.K. the noise will be absolutely distinct and unmistakable.

If you wish to test each earpiece separately, you can do so by removing one of the earpieces from the ear and listening only with the other. Or, alternatively, you can place a pad between the ear itself and the adjacent earpiece, so as to cut off the sound from the latter.

In this way you can compare the loudness of the two sounds, but do not forget that most people hear better with one ear than the other, so before definitely pronouncing one earpiece less sensitive than the other, turn the telephones round and try both earpieces on one ear.

MISSING LINKS No. 1



This week we are commencing a new series of Radio Puzzles called "Missing Links." There is no prize attached to the solution, but as we go on you will find it great fun trying to fill in the components and connections that are omitted from the diagrams.

In order that you may "get the idea," No. 1 is a very simple "Missing Link," and if you should get "stuck," you will find the solution on page 1073, under "Radio Symbols."

MEASURING A VALVE'S IMPEDANCE.

R. O. W. (Winchester).—"Is it possible for the ordinary experimenter actually to measure a valve's impedance without laboratory testing gear, and, if so, how?"

What is generally known as the impedance of the valve is the resistance that it offers to the flow of alternating current in the plate circuit, and this can be measured with a milliammeter in conjunction with known plate voltages. The valve should be set to its ordinary working conditions, and then its plate resistance or impedance can be found by ascertaining the ratio between the change in plate voltage and the consequent change in plate current. Suppose, for instance, you were measuring the impedance of an L.F. valve for which the makers recommend a grid bias of 4½ volts in conjunction with a plate voltage of 90 as well as corresponding higher and lower values. With the milliammeter in circuit and no signals on the grid, but simply the correct grid bias, increase the plate voltage by, say, 10 volts, and note the milliammeter reading for this value, which may be, perhaps, 3 milliamps.

Then reset the plate voltage to a corresponding value below the normal, in this case 80 volts, and note the effect on plate current as shown by the milliammeter. We will presume that it has dropped to 1 milliamp., indicating that with its normal grid bias the valve will pass 3 milliamps. at 100 volts and 1 milliamp. at 80 volts.

We now know that a 20-volt change in plate voltage (100 − 80 = 20) results in a drop of plate current from 3 milliamps, to 1 milliamp. = 2 milliamps. Expressing this as a ratio we have $\frac{\text{20 volts}}{\text{2 milliamps.}}$ or

$$\frac{20}{\cdot0002} = 10{,}000 \text{ ohms.}$$

This, then, is the average plate resistance between the working points selected.

(*Continued on page* 1066.)

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page 1064.*)

A SIMPLE CIRCUIT PUZZLE.

J. L. (New Barnet).—"Just as a matter of interest, and not because I cannot afford it, I have been puzzling over a circuit using two tapped coils and two tuning condensers. One coil and condenser has a crystal and telephones across and acts as my Regional set receiver, the other coil and condenser being set to wave-trap the National programme. Aerial and earth are fixed on clips which go on to the coils, but my idea was that if, as I can do, I cut out the National programme wave-trap when I am listening to the Regional, I ought also to be able to listen to the National and cut out the Regional with the other coil and condenser.

"I suppose really it would be a simple arrangement, and yet I cannot see how it could be done so that by just switching the telephones over from one to the other pair of terminals, I could receive either programme, using the other coil and condenser to trap the unwanted one. What would be the connections for such a set?"

It could very easily be arranged. One tapped coil with its condenser socket we will call the Regional circuit, and the other tapped coil with its tuning condenser socket we will call the National circuit. Ignoring the aerial and earth leads for a moment, join the junction of one coil and its variable condenser to the junction between the other coil and its variable condenser, and also run a wire from this point to the crystal detector. You must have two pairs of 'phone terminals, one for Regional and one for National, and one of the Regional and one of the National terminals must be joined together and taken to the remaining side of the crystal detector. Now join the remaining National 'phone terminal to the other side of the National tuning coil and condenser and the remaining Regional 'phone terminal to the other side of the Regional coil and condenser, and your alterations are complete. The aerial and the earth leads are tapped in at appropriate places along either coil, and you will hear either the National or the Regional according to which pair of terminals are being used, the other circuit acting as a wave-trap to cut out the unwanted programme; but in order to get good results in the rejection and the reception a little judgment may be necessary in juggling the aerial and earth wires, which, however, should give quite good reception if placed respectively on the centre taps of the two circuits.

USING THE DETECTOR WITH A GRAMOPHONE PICK-UP.

T. M. (Redlands, Bristol).—"The B.B.C. say 'For use with a gramophone pick-up the detector can be used as an extra L.F. stage.' How can this be arranged?"

There is hardly any arranging to be done, for all that is meant by the above is that instead of inserting the pick-up across the grid and filament of the first L.F. amplifying valve it can be inserted across the grid and filament of the detector valve, all other connections remaining as before. So if you use a pick-up adaptor of the type that plugs into a valve holder, all you have to do is to plug it into the detector valve holder instead of to the first L.F. Or, alternatively, if some form of switching is contemplated to switch in at the detector instead of the L.F. valve, it takes advantage of the low-frequency coupling between the detector and its succeeding stage.

X-COIL SELECTIVITY.

L. J. (Ipswich).—"My aerial comes to the tapping on an X coil much after the style of the 'Popular Wirelet' No. 28, January 24th issue; but, although we are far enough away from a broadcasting station, goodness knows, my selectivity can only be called rotten! I get the London Regional over about eleven degrees of the condenser; but, to my surprise, I saw a similar-looking X-coil arrangement that was as sharp as a knife. Why is mine so punk?"

Probably your X-coil holder is wired the wrong way round, this being a common cause of non-selectivity with X coils. For most coils the pin of the coil holder needs to go to earth, L.T., etc; but some X coils require the socket and not the pin to do so.

Try the effect of simply changing over the connections to your X-coil holder. This simply means all external wiring to the socket must now go to the pin, and vice-versa. Probably that will cure your trouble.

THE 1,200-METRE MYSTERY.

B. F. H. (Belfast).—"On several occasions I heard the Stamboul station (Constantinople), but lately there appears to be a different station on this wave-length. Who is it?"

The situation on 1,200 metres is a little puzzling at the moment, for this wave-length has been officially alloted to Istamboul (Turkey), Boden (Sweden), and to Kharkov (Russia). The latter is the most powerful of these stations; Istamboul being next; and Boden, with a power of 75 kw., being the smallest station, from the power point of view.

Recent reports, however, show that the new Iceland station at Reykjavik has been testing on a wave-length of 1,200 metres, while another "P.W." reader reports having heard what he believes to be Warsaw on this wave-length. To make confusion worse confounded, both Boden and Istamboul appear to have been "wobbling" their wave-lengths (to get away from the interference caused by the newcomers, apparently), so that just Who is doing What upon the 1,200 metres is something of a mystery at the moment.

"P.W." PANELS No. 6. HIGH-FREQUENCY CHOKES

Are mainly used either for reaction purposes, or for providing aperiodic coupling for H.F. valves. Almost any choke will do for the former purpose, but a really efficient one is necessary in the latter case.

Ordinary broadcast H.F. chokes are not suitable for short-waves, unless they are specifically stated to be of "universal" range.

A No. 60 plug-in coil makes a good H.F. choke for the short waves.

FOR THE LISTENER

(Continued from page 1030.)

Megan.

The third is Miss Megan Lloyd George. She was supposed to speak about "The Month in Wales," and really I did not feel very keenly interested in the month in Wales. Nor, I think, did she.

What she really spoke about was Wales, its people, language, art, drama. She must, I think, be a very clever young lady, on whom her father's muffler has fallen like a shawl; with an engaging voice, without the slightest trace of a Welsh accent. Which was hardly fair to her country-people, look you!

Radio Saying of the Week.

"A little knowledge may be a dangerous thing, but great knowledge is fatal."—Harold Nicolson.

"Edward the Second."

Now that Mr. Gielgud knows that the radio-drama fans are comparatively few in number, there is every reason why he should go for high game like this great play by Christopher Marlowe, Gent.

I could pick holes in the production if I had a mind to; there was too much shouting for one thing, and at times I had no clue as to who was speaking; but to me at least it was a great pleasure to be reminded of the outlines of this stirring drama and to hear again some of Marlowe's magnificent lines. Some of Marlowe's lines are finer than Shakespeare at his best; but William has more of them!

Athene Seyler.

Athene Seyler took the part of Queen Isabella, and was obviously in a class by herself; as, indeed, her fellow-actors would be the first to admit. You felt the difference as soon as she spoke. I am rather against the introduction of these distinguished outsiders to stiffen the B.B.C. Repertory Company.

It is bad production, and bad art, to have one personality in a company far outstanding the rest. No doubt listeners are interested to hear these renowned voices; but the play is the thing, and an outstanding player among second-raters makes the texture of the production uneven.

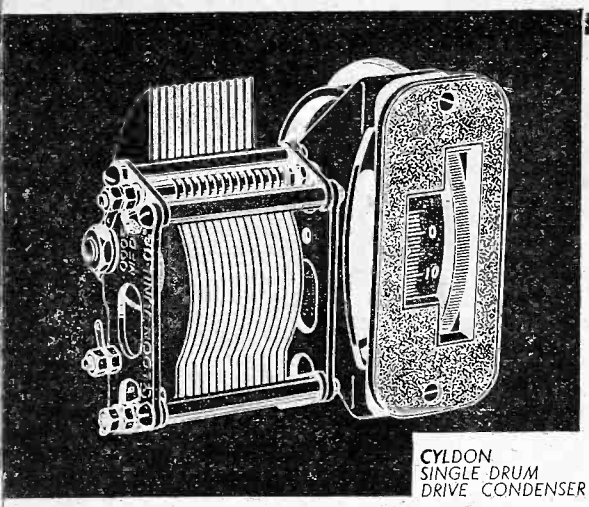
Soccer.

I am one of those old-fashioned diehards who believes that Rugger is a better game than Soccer, but I am equally persuaded that a Soccer broadcast is much better than a Rugger one.

This is partly because of the nature of the game, and partly because there is only one Allison. Captain Wakelam, good as he is, always seems to me to be reporting the game from the neighbourhood of the Royal box, while Mr. Allison is at the ring-side with a favour in his coat. Indeed, sometimes I believe he has been known in an exciting moment to bash Derek McCulloch's hat in!

Stravinsky.

Well, now you know the best and the worst about this musical composer, for Mr. Ernest Newman has spoken. Besides, you have heard Stravinsky playing his own music and conducting it; and Mr. Newman says it is simple enough for the ordinary musician to understand.



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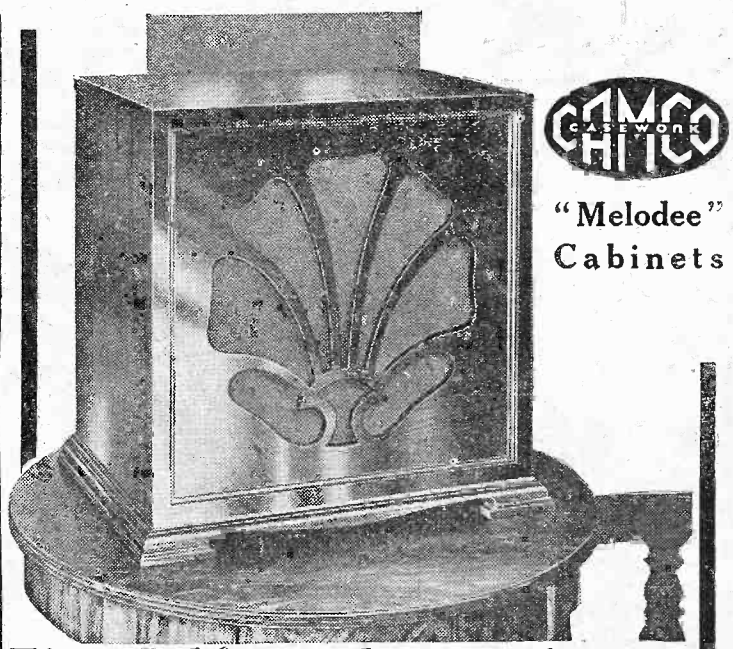

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USING A PENTODE

Some interesting correspondence on the subject.

IN his "Query Corner" a few weeks ago, Captain Eckersley in a reply to "J. L. (Balham)," discussed the use of the Pentode valve and said: "A loud speaker, as such, has an impedance which varies over the frequency range: at 10,000 cycles it may have an impedance of 20,000 ohms, at 50 cycles it may have an impedance of only 1,000 ohms.

"At 10,000 cycles, therefore, the pentode valve has achieved something like its theoretical magnification. At 50 cycles it has achieved hardly any magnification at all.

"Thus the Pentode valve with the loud speaker connected straight in its anode circuit magnifies the high notes but not the low. And as the high notes as radiated are very much more feeble than the low notes, the volume would not appear to increase in proportion to the theoretical magnification of the valve if the loud speaker is connected straight in the anode circuit."

"I Quite Disagree."

We have received the following letter from Dr. F. W. Lanchester, F.R.S., M.Inst. C.E., M.I.Mech.E., etc., director of Lanchester's Laboratories, in which he says: "I notice in your current issue the question under the letters 'J. L. (Balham),' relating to the use of the Pentode valve and the unsatisfactory results achieved, also the reply by Captain Eckersley to this letter.

"I believe that 'J. L. (Balham)' is not alone in having experienced the trouble in question. In fact, it is one that I have been at great pains to investigate and in which I quite disagree with Captain Eckersley's reply. At the outset I will say that the speaker used by me is one having a minimum measured impedance at about 100 cycles of 15 ohms, and a maximum in the region of 3,000 cycles of 19 ohms.

"I mention this to clear the air in view of Captain Eckersley's remarks on this point. In an explanation of the Pentode valve and its use, which my Company will shortly be issuing and which is now in the Press, I quote the following paragraphs:

"Another Aspect."

"The Pentode valve gives serious distortion if associated with an impedance comparable to that of the valve itself. Otherwise expressed, if so associated or coupled, the swing permissible without distortion has to be kept so small as to destroy the utility of the valve. By 'comparable to' it is meant that the impedance of the speaker circuit must be kept below, say, one-fifth or one-sixth of the published valve impedance.

"If the impedance is fixed in accordance with (1) above, the amplification factor of the valve is in the region of 12 or 18 (instead of 80 or 100) certainly no more. That is to say, only three times the effective amplification factor of a triode, such as Osram (P.610).

"There is another aspect of the Pentode valve to which we have given most careful consideration. The bass frequency which a power valve will pass without serious loss depends upon the relation between the

(Continued on page 1072.)

USING A PENTODE.

(*Continued from page* 1070.)

inductance (henries) of the transformer, and the effective resistances of the valve and speaker circuits. Owing to the high impedance of the Pentode valve, which is some ten or twenty times that of an ordinary power valve, the effective combined resistance or impedance depends mainly upon the impedance of the speaker circuit, and the only possibility of maintaining the necessary relation between inductance and resistance as above is by keeping the speaker circuit resistance even lower than that recommended from other considerations by the makers of the Pentode valve.

"The Alternative."

"The alternative would be to supply a transformer of such large dimensions that the cost would be prohibitive. The user of a Pentode valve, therefore, is between the 'devil and the deep sea,' and commonly a set with a Pentode valve is bass deficient. No speaker can give a full bass emission if the set has cut it out.

"If due attention be paid to the foregoing it will be easily understood that the amplification factor of 12 or 18 which remains credited to the Pentode valve in the second paragraph above, is whittled down to about half that value if the impedance of the speaker be so adjusted (by the use of an appropriate transformer ratio) as to pass the bass in adequate volume."

We passed a copy of the letter to our Chief Radio Consultant, Capt. P. P. Eckersley, M.I.E.E., who replies hereunder:

"I have read Dr. Lanchester's letter with great interest. I think we both are perfectly in agreement, but if there is any argument, it is rather on premises than upon an interpretation of facts.

"Most people use a Pentode valve because they want to get the maximum volume from it with reasonable quality. If this is their ideal, they can, by making the anode impedance high, get a greater output from a pentode valve by a given expenditure of energy than they are liable to get with the more common type of power output valve.

"Power Producing Possibilities."

"If, however, they try and realise the power producing possibilities of the Pentode valve, and do not take care that at low frequencies the anode impedance is of the same order as the valve, then they will get a distortion of the frequency spectrum. That is, they will get less bass reproduction. Throughout the whole gamut they will get a 10 per cent distortion, but throughout the whole gamut they will get a greater power than normally associated with a power output stage.

"If the Pentode valve is to be used to get distortionless reproduction, it is essential to cut down its magnification to a very considerable extent, and it would appear that it would be wiser in this case to use an ordinary valve.

"In sum, one cannot have everything, and if one will put up with a little bit of a compromise on distortion, one can get more volume and the Pentode is a very good way of doing it. I do not see the necessity to use a Pentode if one is not after efficiency as measured by the ratio of volts output to volts input. It was on the basis of this argument, with this implication, that I answered 'J. L.' (Balham)."

TECHNICAL NOTES

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

Bandpass Filters.

THE bandpass-filter is the subject of a good deal of interest to experimenters and constructors lately, although improved tuning circuits, based on the "bandpass" were introduced in sets described by our monthly contemporary "Modern Wireless," nearly two years ago!

Resonant Circuits.

The bandpass-filter, as most of my readers are well aware, is based simply upon the principle of a resonant circuit. For the greatest selectivity, what we want is a circuit which will give a sufficient response to the particular frequency which we desire to receive, but will give only a very small response when the incoming frequency is a little bit removed from the desired one.

Expressing it in a popular, rather than a scientific way, it comes to this: How much difference must there be between the desired frequency and a neighbouring frequency in order that the response of a circuit to the neighbouring frequency will be only a fraction—one-fifth or one-tenth—of the desired frequency?

RADIO SYMBOLS

Phones

Your telephones are the real "detectors" of radio signals, as distinct from the crystal or valve rectifier. They should be carefully handled, and on no account should they be subjected to knocks or dropping on the floor.

They should always be connected the correct way round, the positive tag going to H.T.+ in the case of a valve set. In a crystal set it does not matter which way they are connected.

Response Curve.

The clearest and simplest way to understand the behaviour of the circuit is to draw its response curve, or resonance curve, as it is sometimes called. This shows the response—which may be in millivolts generated—as against the frequency.

If the voltage generated is plotted vertically and the frequency is plotted horizontally, we will get a curve having a peak," and the sharpness of this peak is a measure of the sharpness of the selectivity of the circuit.

If there were nothing more in the problem than this it would be a comparatively simple matter to arrange a circuit having an exceedingly sharp response curve so that adjacent wave-lengths, even very close to the desired one, would be cut out.

Frequency Band.

But unfortunately there is more in it than this, for a signal, as is well known, comprises a certain *band* of frequencies, generally computed to be about 5,000 cycles on each side of the actual resonance point. Perhaps I should interpose the remark here, that the question of the frequency band and its influence upon the reception of signals has lately become the subject of a great deal of discussion and experiment, and opinions on the point differ considerably between radio experts.

However, we need not concern ourselves with these more detailed enquiries for the moment, and it will be sufficient to assume,

(*Continued on next page.*)

TECHNICAL NOTES

(Continued from previous page.)

as has generally been done, that a band of about 5,000 cycles on each side of the resonance point is necessary.

Now if the resonance curve is so sharp that it seriously cuts out frequencies within this band, the reproduction will be distorted.

Coupled Circuits.

This, however, is where the bandpass-filter comes in. Suppose that two tuned circuits are being used, the energy being transferred from one to another, we can obtain very sharp selectivity.

Generally there will be a tendency, however, for the two circuits not to be tuned at precisely the same point and the result is that we get a resonance curve for the combination of the two circuits which, looked at from a distance, appears like an ordinary single-circuit resonance curve lopped off at about the middle, leaving a flat or approximately flat top.

On closer inspection it will be found that the top of the curve has two small peaks side by side, but that does not affect the general argument. The result of all this is that we get a sharp cut-off at the sides, that is to say, a steeply-falling curve, but this curve covers a reasonably wide band and is not confined to an exceedingly narrow band as each of the individual curves, of which it is composed, would be.

The breadth of the resonance region or band gives us what is needed for getting good quality, whilst the very steep fall of the curve on either side gives us the necessary selectivity, in the sense that it excludes wave-lengths very closely adjacent to the desired band.

Common Tuning.

In actual practice the two-tuned circuits of the bandpass-filter may be tuned by a common condenser so that—after the system has been balanced up—there is no extra tuning control.

It turns out, however, that this is not all beer and skittles, because if the arrangement is very selective the signal strength of the desired frequency is liable to be much reduced, whilst if the two peaks are separated out you may get double-tuning, that is, tuning at two different points on the dial.

L.F. Shielding.

A point which is sometimes overlooked with regard to indirectly heated valves is that the wiring which carries the heating current can often with advantage be shielded. This may be done by using lead-covered wire, with the lead covering connected to earth.

Alternatively, twin-flex wire may be used without specific shielding, but this should be kept as far away as possible from the other wiring of the circuit, especially from the leads connected to the anodes.

With A.C. operation of the receiver it is naturally desirable to reduce the A.C. hum as much as possible, and although this can be reduced to a very small amount, so small as to be virtually negligible, according to my experience of such receivers there is always at least a trace (sometimes a good deal more than a trace) of A.C. background remaining.

(Continued on next page.)

TECHNICAL NOTES

(*Continued from previous page.*)

I know people often claim that in their receivers the A.C. hum is entirely eliminated, but I do not think there is ever *quite* the same freedom from background as with a battery-operated set. At any rate, as I say, it does not matter very much, because with careful screening and wiring the hum can be reduced to such a small amount as to be entirely negligible for all ordinary purposes; indeed, it is only when there is nothing coming through that the hum can be heard at all.

Special Screens.

Incidentally, talking about the screening of the A.C. leads, you will often find that it is better to use soft iron sheet for the screening. In the case of H.F. screening, owing to the high-frequency and the eddy-currents, any metallic sheet will serve the purpose, since the magnetic effects are produced by the eddy-currents themselves, and the metal sheet does not need to have any normal magnetic properties. But with the screening of the heating current of a mains receiver you will find that iron sheet, say about ⅛ in. thick (connected to earth, of course), will be much more satisfactory.

A Practical Point.

A reader asks me whether there is any way of preventing screws—ordinary wood screws—from becoming stuck in the wood so that it is impossible to get them out after they have been there for some time.

I presume, although he does not say so, that he refers to *steel* screws, because with brass screws this trouble does not usually occur. With steel screws, especially in fairly soft wood, the screw becomes rusty and, if it has been left there for any length of time, the rust binds it very tightly indeed; so much so that either the head of the screw twists off when you are attempting to withdraw it or the nick in the screw is destroyed by the driver.

Useful to Know.

There is one very simple dodge for obviating this, and that is to oil or grease the screw liberally before inserting it. This is a trick sometimes used by carpenters, but it is not entirely satisfactory, and for wireless work the oil or grease is generally objectionable.

There is, however, a much better solution, since copper-plated screws have been introduced. These are electrically copper-plated and the copper covering forms a permanent protection, whilst the steel screw beneath is much stronger than a corresponding brass one.

(*Continued on next page.*)

TECHNICAL NOTES

(Continued from previous page.)

Copper coated steel screws form, in my experience, a complete solution of the rusting difficulty with ordinary steel screws. They can be obtained at practically any ordinary stores which supply screws.

L.S. Extensions Leads.

I have had several letters lately on the question of using loud speakers in different rooms. You will remember that I made some reference to this a short while back. One reader in particular wants to know whether, when using loud speakers in different rooms, it is *essential* to have an output filter and also what type of wiring should be used for connecting up to the distant speakers.

The question of the output filter is one which depends partly upon the loud speakers themselves and partly upon the distance from the set to the speakers. Generally it is a good plan to use an output filter *in any case*, even when the loud speaker is adjacent to the set, as I have previously pointed out.

Points to Remember.

When the loud speaker is at a distance from the receiver, the use of an output filter becomes doubly important, because in this case the high-tension current (if no output filter is used) has to go the entire length of the loud speaker leads and back again, and this is not only dangerous but also wasteful, since there is certain to be some amount of leakage of the H.T. current. In addition to this, the resistance of the long leads may be a disadvantage, especially if these consist of thin wire.

Output Filter.

So from every point of view, it is advantageous to have an output filter. The filter may consist of a large L.F. choke and a large condenser. The choke should have a high inductance, even 30 henries not being too much, whilst the capacity should be at least a couple of microfarads. An alternative to the filter is an output transformer.

As regards the leads to the loud speaker, these, if they are to be loose, will have to be of the double flex type, but if they are to be permanently wired they should preferably be two separate wires spaced a small distance apart throughout their entire length. Ordinary bell wire is quite suitable for this purpose, and is much cheaper than electric-light flex.

Series and Parallel.

If a number of plugs are to be fitted in different rooms so that the loud speaker may be moved about from one place to another and just plugged in, obviously the plugs must all be connected in *parallel* with one another.

On the other hand, loud speakers, as I mentioned a week or two back, may sometimes with advantage be connected in *series*, but in this case obviously they must all be in circuit at the same time.

If you wish to cut out one of the loud speakers when using the series arrangement, it is not necessary to disconnect it from the circuit; you can use a short-circuiting switch connected across the terminals of the loud speaker, which will have the same effect with the minimum of trouble in its operation.

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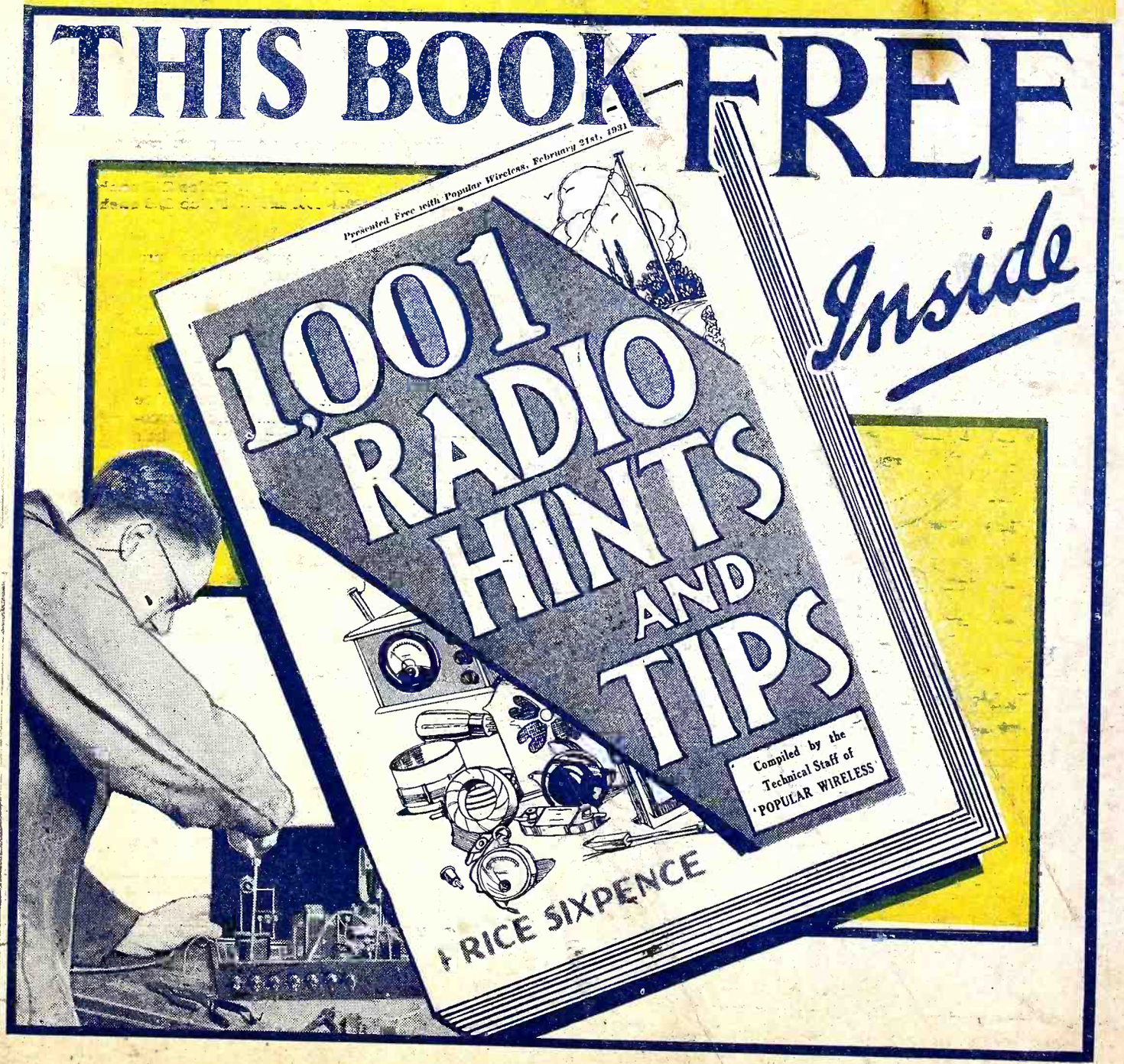

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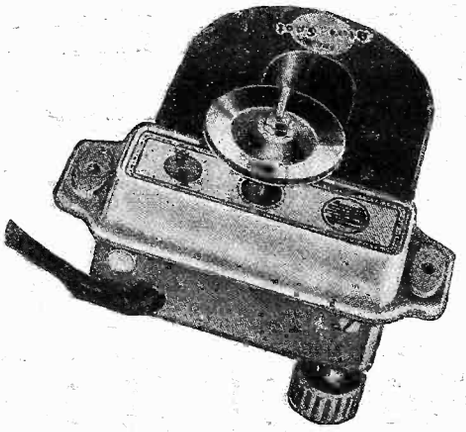

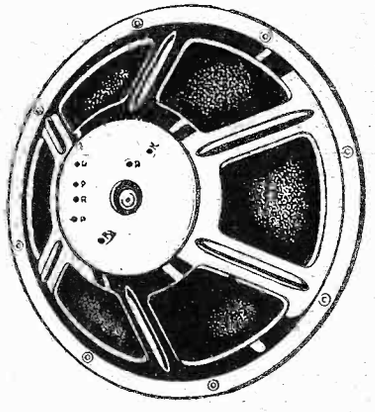

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TREAT IN STORE?
HONEGGER IN DANGER
WIRELESS FOR THE BLIND
NECESSARY TRIFLES

RADIO NOTES & NEWS

BUSINESS AS USUAL
WHO BEGAN IT?
ELIMINATING THE LOCAL
GOOD BUSINESS

Another Picture.

THE bouquet which I handed to a wireless firm recently for prompt and effective attention has brought from J. W. (Montrose) a story of unhappy experiences with British firms. Most of his complaint is on the score of delay, one firm taking two weeks to send him a catalogue for which he had paid a shilling. He ordered a cabinet three weeks ago and is still without it. I know, old man! Firms here are very square when they get going, but I certainly have found them dilatory.

The German Invasion.

WHAT with the interference of Mühlacker and the B.B.C.'s joke of an interval signal, my desk looks like "I don't know what"—as my typist says! —and I was so preoccupied with ruminating about all the choice remarks let fall by my witty correspondents that I overran my station to-night, and when I queried the matter before a strange, foreign porter, he said: "The 'hups' doo." And I nearly went off into another trance in the "hup."

A Cheap Unit.

ONE of the most interesting letters was from H. A. C. (Leicester), who questions me severely about S.G. valves. My set was made—I freely confess it!—by an engineer who holds an important position in the radio world, and we spared no expense. It is quite selective enough for my patience, and I can cut out Mühlacker if I fiddle about for several minutes. I don't know much more than that about the performance of S.G. sets! The S.G. set *can* be tophole: it all depends on the maker. H. A. C. achieved an H.F. unit out of "junk" at a cost of about 10s. and got rid of the German. That proves what I said before!

A Treat in Store?

IN view of what we are suffering from German jamming now, it is with considerable apprehension that I learn that plans are afoot for a 100 kw. German station to be used for broadcasting advertisements for international consumption. It is said that the announcements will be made in several languages, too. That *will* be nice! The last word on a scheme like that is, however, not yet uttered, and I hope that the last word will be on the side of the public. If it isn't—I'll have food for my pen, sure enough, and I'll dip it in acid.

A Set—Or Not a Set?

THE first case which I have seen reported, of a person being summoned for the alleged working of a wireless set without a licence and being let off because of a ruling that a licence was unnecessary, was that of Mr. J. Lowe, of Manchester. Mr. Lowe said that he had used his set only for amplifying purposes in connection with his gramophone. According to the newspaper report he pointed out that the rules on the back of his licence allowed for the use of a receiver for that purpose without a licence. But do they? And in any case, there is this point—if he had a licence why was he summoned? And if the rules of the Post Office allow for that, why did the magistrates take the trouble to rule likewise?

"MISS" MARCONI

The Marchesa Marconi, wife of the great radio inventor, and her baby daughter. The little girl was born in July, 1930, and is a chubby, robust child with "magnetic" eyes, and no doubt plenty of "loud-speaker volume"!

Honegger in Danger.

AS a constructor of non-music, Stravinsky is encroaching perilously near the proud position held by Honegger as the world's greatest caricaturist of music. I will not be so unwary as to invite requests for my definition of music, but I will admit that it does not embrace noises such as those to which I listened, horror-struck, on the recent "Stravinsky night." All I will say is that if Stravinsky writes great music, then Schumann, Mendelssohn, and Beethoven were amateurs. If this is genius, Mozart was a mutt!

Answer to Query.

F. H. (nr. Doncaster) asks for the address of a station which he says he heard working on 51.26 metres, calling London, Chelmsford, and New York; call-signal, H B J. Sir, I believe the address to be The Vatican, Vatican City, New Rome, and the owner the Pope. The call-signal is really H V J, and the wave-length 50.26 metres. F. H. encloses a copy of "Notes and News" for Feb. 19th, 1927, but does not say why. However, I was touched to see the dear old thing.

Wireless for the Blind.

I HEAR that at the end of January the total amount received by the British "Wireless for the Blind" Fund amounted to £30,000, of which £5,000 had been sent in response to Mr. Winston Churchill's Christmas Day appeal. More than 7,500 sets have already been distributed, and six thousand more are being prepared. Unfortunately more funds are still required, in fact, some £15,000, and donations will therefore be thankfully received at the offices of the Fund, 226, Gt. Portland Street, London, W.1.

A Few Necessary Trifles.

A PAGE from "La Revue de Radio-Belgique," which O. C. D. (Brussels) was good enough to send to me, has brought a few moments of radiance into my drab (*wot?*) life. "A Novice" enquires of the Editor of that periodical as follows, freely translated. "I have won a set in a competition. In spite of the fact that I have connected an aerial to the 'A' terminal, and an earth to the 'E' terminal,

(*Continued on next page.*)

RADIO NOTES AND NEWS

(*Continued from previous page.*)

the darned lamps won't light up. What about it?" And the Editor's reply, in brief. "Get an accumulator, an H.T. battery, and a loud-speaker, and waggle the rheostats and condensers!" Lovely!

"Amos 'n Andy."

M'KAY, E. V. G. (Rathgar), P. S. N. (Lewes), D. R. (Scarborough), and some ten others! I reckon you all got those two niggers direct from the States much better than we all received 'em via the B.B.C. It sure was a washout, that relay. I said to myself, I ses, as I agonised over the fading, "blasting" noise supposed to be America's premier comedians, "If some of my gang ain't in on this; roundabout *thoity* metres, me name's not Hayriel," I ses. Arrah, ye spalpeens, ye've got the better o' me,—forninst me, so to spake—in that I've none o' yez shorrut-wave re-savors, I haven't neither. But did I speak like that? 'Tis a darlin' thought!

Business as Usual.

JUST before I annoy you with some science let me divert you with a letter from one of those teeming millions of down-trodden people for whose sake the Gandhi bloke is prepared to forbid [illegible] to murder British officer's wives, cost what it may. "Sir, I observing your Magics, opine that biggish trade possible perpetrated in this district where multiple Marconists practise receivery. Suppose you appointing me sole Agency Magics with ten and one of one half per cent to the under-subscribed.—M. A., Allhalbabad University." The answer is that "P.W." doesn't desire to perpetrate any trade other than to enlighten its public in the usual price per copy. We throw in the grand sets, free!

Who Began It?

COMMENTING on the announcement by a Sunday newspaper of a "special radio feature" the "World's Press News" alleges that Mr. Sydney Moseley "pioneered the newspaper radio feature" and that "this special boosting is no more than 'sheep-work.'" That's pretty warm comment, so I will e'en put the "World's Press News" right. Subject to correction by anyone who thinks that he knows better, I will say that the "Daily Mail" was the first English newspaper to "feature" radio—and the articles were not written by Mr. Moseley! I never used to see Mr. Moseley's name in connection with radio as far back as 1922! My bad eyes, no doubt!

Anniversary.

SUNDAY, Feb. 22nd, is the anniversary of the birth, at Hamburg in 1857, of Heinrich Hertz, whose name will for ever be revered by scientists and by radio men in particular. For in the years 1884 to 1889 Hertz accomplished work in physical research which paved the way to the discovery of wireless communication; he demonstrated the propagation of electro-magnetic waves in space, measured their velocity and length, and proved that they are in nature identical with light waves. Unfortunately for the world he died at the early age of thirty-seven.

Cork It Up!

I SEE that the General Council of the National Union of Short-distance Flyers *demand* that it be made *compulsory* for all wireless aerials to be corked because the mortality of sporting pigeons is heavily increasing owing to the birds butting into the wires. I think that homing pigeons are pretty and remarkable birds, and that pigeon-racers might have far worse hobbies, but I don't like "demand" and "compulsory," and I advise the Council to be less like roaring lions and more like sucking doves—or even pigeons. Then they may get the authorities and the public to listen to them. Will the Union pay for the corks?

SHORT WAVES.

A listener says a German station prevented him from hearing much of a wireless talk.

And to think that Germany was once our enemy!—"The Star."

* * *

THE HOME DOCTOR.

The electrician was called in to repair the wireless set. Puzzled, he took it to pieces and found a number of cough lozenges in the loud speaker.

"I put them there," confessed the small son of the house. "The poor man sounded so hoarse!"—"Daily Mirror."

* * *

A correspondent from St. Austell writes requesting us to "send him our assistants" to help him trace the trouble in his wireless set.

We're very sorry, but they're all busy at the moment.

* * *

Gramophone records of favourite wireless items are selling well. An appropriate present for an agricultural friend is a record of a week's fat-stock prices set to a syncopated rhythm.—"Punch."

* * *

1st Radio Fan: "How are things going with you, old man?"

2nd Radio Fan (gloomily): "Not at all well. Nothing but interference all the time."

1st Radio Fan: "What do you put it down to? Is it Morse, static—or, perhaps, trams?"

2nd Radio Fan: "No, B.B.C.!"

* * *

"Radio takes you to the Circus Ring," ran a recent headline in the "Manchester Evening Chronicle."

Judging by the "roaring" that goes on in our set, we're in the lion's cage already.

* * *

"It is estimated that the B.B.C. will have £1,069,648 to spend. . . . How will it be spent?"—(Wireless Note).

All one can say just now is that the plans for disbursement are in the air.—"Birmingham Gazette."

* * *

PERHAPS!

The dull radiation from our local station
Upon my intelligence jars;
So I'll alter my range,
Just by way of a change,
And receive S.B. items from Mars.

Where We Score.

A NOTE from F. M. (Folkestone) puts the spotlight on "P.W." and I cannot refrain from referring to it. He bought an L.S. Unit and chassis, but found that no instructions accompanied it. Accordingly he was in some doubt about the correct adjustment until he saw an article in "Popular Wireless" which told him what he wished to know. That's us! Practical and up to date. A Headingley reader has just written to say that, though he sometimes strays from the fold, he always has to return to "P.W." He alleges that elsewhere he finds designs too much like the expensive cookery recipes—"Take three pounds of butter, a pint of old brandy and two dozen eggs, etc."—but that we do not specify such expensive parts, yet "get there" just the same. O.K. by me, Chief!

"Push-Pull" Patent Extended.

AN interesting patent case was determined early this year when Standard Telephones and Cables, Ltd., and Electrical Research Products, Inc., U.S.A., applied for a five years' extension of Patent No. 275 of 1915, for a push-pull amplifier in connection with wireless valves. The application was opposed by the Columbia Graphophone Co., Ltd., the Radio Manufacturers' Association, and several well-known manufacturers. As he held that by reason of the war, four years had been cut out of the life of the patent, Mr. Justice Luxmoore granted an extension of four years.

The "Outer Circle."

OUR mad organ-grinder, from the "——" Workhouse, "——," Yorks, who conceals his noble lineage under the name of Giovanni Marita, writes to brag about how he converted his "Manchester Chronicle" crystal set into a "P.W." "Outer Circle," after which, he says, he heard many stations on the Continent. A neighbour, doubtless an ice-cream professor, is cited as a "witness of reception." Television on a crystal? Pity he omits to mention the names of the stations logged, though. Then his bragging would have some weight. Love to the other inmates!

Eliminating the "Local."

J. Mc. (Liverpool).—Mc what?—wishes to inform P. F. (Glasgow) that he (this McSomething) resides less than half a mile from the Liverpool transmitter and can cut it out of his three-valver fitted with the 5s. Brookmans Rejector. Even so, he did not follow the "book of words" strictly, for he uses a "50" plug-in coil and a ·001 fixed condenser. Reception of foreigners is, however, slightly reduced in volume. When J. Mc-I-don't-know-what cuts out this rejector the "local" comes in without aerial or "earth."

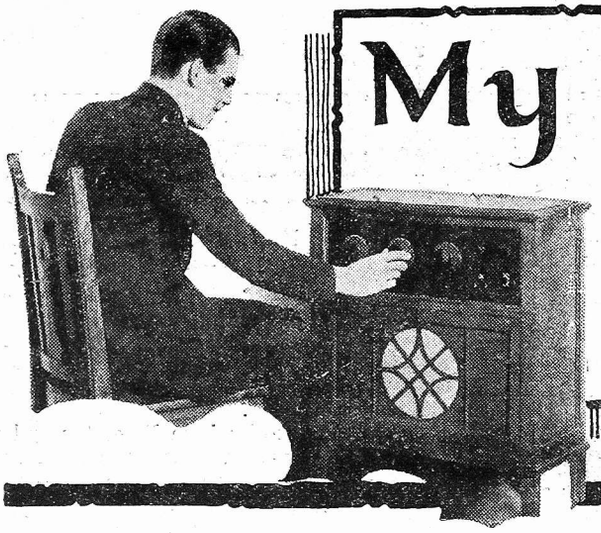
B.B.C. Methods.

A SPORTING cove of Barnstaple wants to rouse up a protest against the B.B.C.'s idea of lightening programmes with irrelevant bursts of melody. He was anxious, at the time he wrote, about a certain boxing match, which he feared would be refined by music every few rounds. As I don't listen to pugilistic broadcasts I can't say what actually happened, but in principle I agree with my correspondent about the irritation which these interruptions create. Those wretched Greenwich "pip pips" for example. I believe that the B.B.C. would interrupt the proceedings of the Day of Judgment with them!

Good Business.

THE wisdom of dealing with reputable firms, such as, for instance, those who advertise in "P.W." is shown by the account given to us by G. N. (Carluke) of his experience with a well-known firm to whom he sent an L.F. unit for repair. The thing was lost in the post, but before our reader had time to lodge a claim against the Post Office the firm had sent him a new unit. This is by no means an isolated example of the straight, or rather, generous treatment of customers by the better class of firm. These little acts ensure further custom and harm no one.

ARIEL.



My Ideal Sunday Broadcast Programme

ANDREW SOUTAR, the Famous Novelist and Publicist.

IN my opinion, the B.B.C. could with advantage follow the example set by American broadcasting programmes in the past, if not to-day; namely, come down off its perch a little, and cater more for the common man in the street.

When I was in the States, the principal stations shared between them a gentleman who can only be described as a national pastor, and who was so popular that when he "came on the air" every listener used to tune-in his set and listen. He was there, it seemed, to help everybody.

Not only did he give direct and homely talks which stirred the American people through and through, but he was ready to assist, if necessary, every individual man and woman. Anyone who cared to send in questions on the little matters of human conduct that are so puzzling to everyone would be answered. Not without reason was the "national pastor" a national favourite.

"NO CHANGE"

Miss Winifred Graham says she is quite satisfied with the Sunday programmes as they are.

Why not have something of the kind here? Rev. "Dick" Sheppard showed that a really human cleric would not go unheard, and the idea could at least be given a trial. After all, the Church has made the English Sunday the melancholy day it is. The B.B.C. could, if it wished, make it the brightest day of the week.

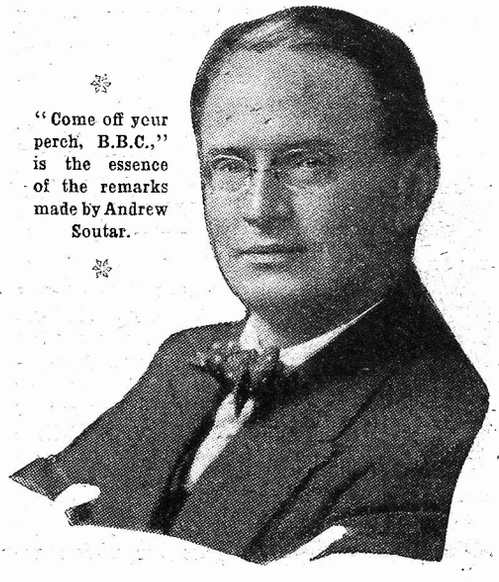
Why Not Good Secular Music?

Why not more symphony concerts on Sundays, for instance? There is more true beauty, more understanding of God, to be obtained from the work of the great music masters than is to be found in many a church. There is no irreverence in secular music, there would be no irreverence in really interesting talks.

Ever since the inception of the B.B.C., listeners have grumbled about the "dull" Sunday broadcast programmes, whilst others have expressed themselves as being well pleased with them. In an attempt to get at the truth of the matter, "P.W." asked six people, representative of public thought, to express their views on the matter.

CHRISTOPHER STONE, the Popular Gramophone Critic.

I am surprised that since the present controversy is but an echo from an older one, listeners should so soon have forgotten the restrictions imposed on the broadcasting authorities. If I remember rightly, the B.B.C. are under an agreement with the Churches not to transmit anything except relays from religious institutions themselves, during the hours of Divine Service; and so, taking this into consideration, and the fact that even Announcers and engineers must have a day of rest sometimes, I doubt whether we are likely to see my own



"Come off your perch, B.B.C.," is the essence of the remarks made by Andrew Soutar.

private idea of a perfect broadcast programme for some considerable time.

Still, a compromise might be effected. There is still a certain amount of time during which there is neither any broadcasting service nor any church service; I see no reason why this should not be filled by the reproduction of gramophone records. In these days many a record can be transmitted as perfectly as the real thing—so why not?

All that is required is one or two engineers and a gentleman to change the records. Indeed, I have already pointed this out to the B.B.C. and detailed to them the long list of excellent discs of sacred music which at present go almost unheard save by the favoured few. And I have offered to change the records myself!

WINIFRED GRAHAM, the Well-known Authoress.

My ideal conception of a Sunday broadcast programme is little different from the reality of to-day. In other words, I am not at all sure that I would have them changed if I could. But I realise that to many men and women Sunday is the great wireless day, the one day of the week during which they can listen to everything. Surely for these an alternative station might cater?

COMPROMISE

Mr. Christopher Stone suggests a compromise not unconnected with gramophone records.

Since, however, I am asked to record my own point of view, selfishly, and without any regard for other people, I say "no change."

I go to church in the morning, and so I have no time to listen then; I entertain a few friends to tea in the afternoon and so am thoroughly occupied during that time; in the evening—well, I have a programme to my taste for at least two hours, and by the end of that I am ready to go to bed—though this latter fact is no reflection on the programmes!

(*Continued on next page.*)

MY IDEAL SUNDAY BROADCAST PROGRAMME.

(*Continued from previous page.*)

MISS PHYLLIS NEILSON-TERRY, the Popular Actress.

In my ideal Sunday wireless service, both stations available to every listener under the Regional Scheme would be utilised to offer a contrast—but for one station, the station to which I should tune-in, the programme would be roughly as follows:

Morning: A church service with a good choir and, most important of all, a good speaker. This to be followed by lunch-time music similar to that given during the week. Then in the afternoon, from about Three o'clock onwards, a light orchestral concert or else a studio production of Shakespeare.

Some time ago we were given a number of scenes from Shakespeare in the late afternoon, and, one Sunday, I actually seem to remember a performance of Flecker's "Hassan," but dramatic production has not been overdone, although Sunday afternoon seems to me to be an ideal time for it.

In the evening, perhaps, there would be a Symphony concert, a service, and possibly an opera. Then, to conclude, the Epilogue. I would not miss this for anything!

J. H. SQUIRE, leader of the Squire Celeste Octet.

The B.B.C. Sunday programmes are, I submit, the acme of perfect construction, and are so arranged that any clear-headed man or woman must find it difficult to see the point of view expressed by those who are apt to decry them. In the old days, when technical difficulties prohibited a real alternative programme, some people may have had a right to grumble. To-day, I see very little the matter.

"ACME OF PERFECT CONSTRUCTION"

Mr. J. H. Squire, who is seen above with his popular Octet, says "leave the programmes as they are."

I would not have the programmes dreary—but are they? I would not have any single person left uncatered for—but are the jazz lovers so steeped in their sin that they cannot even enjoy the light music given by the small orchestras and bands from time to time?

If the church service is to give way to vaudeville and dance music—and I cannot visualise the possibility—are the invalids, the bed-ridden and the sick to be entirely unconsidered?

No, leave the programmes as they are, I say! They give offence to no one in their present state; revised, they *might* do so. The only alteration I might make is so small as to be hardly worth consideration, namely, to fill up with a light concert the gap between the evening and afternoon transmissions.

AN ORDINARY LISTENER, the first person we met in the street.

I am a low-brow. I do not go to church, I do not like Symphony concerts, I detest Chamber music. I am so very low-brow, indeed, that I cannot even appreciate the mournful numbers generally rendered by the Wireless Military Band. Nor do I go into rhapsodies when I hear a screeching woman, or a deep-toned man. I am interested in the news bulletin, the variety programmes, and what is commonly known as "tea-time music." How am I catered for?

CONTRASTS

Miss Phyllis Neilson-Terry appeals for contrasts.

I get one news bulletin on Sunday, and, if I am very lucky, in the evening a relay from an hotel. Then at half-past ten the Announcer gently puts me to bed. No, sir, it isn't good enough.

The time allotted to programmes on Sundays is hardly half the time given on week-days, but I have yet to understand why this should be.

The Surplus

With the colossal surplus realised every year, surely the B.B.C. can afford a few extra engineers and announcers so that the others may have the day off? Let's have a full-time Sunday and let the extra time be filled in by dance music, light matter, and all the things for which we listeners have been asking!

On second thoughts, however, perhaps matters had better stay as they are. It gives me a chance to tune-in the Continent so it is really a blessing in disguise!

THE "OUTER CIRCLE."

A correspondent's successful experiments.

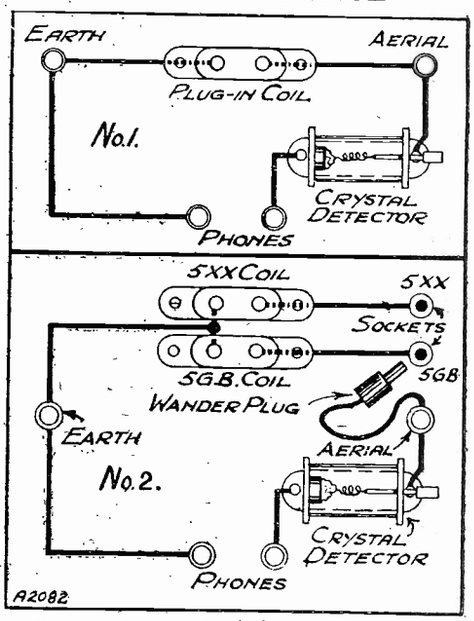
The Editor, POPULAR WIRELESS.

DEAR SIR,—You will get still louder and clearer reception on your admirable "Outer Circle" Crystal Set if you dispense with tuning condensers altogether, and cut your coils experimentally to exact wave-length to suit your aerial. My circuit design is enclosed.

I reside 53 miles from Daventry and on this set get speech and music from both 5 X X and 5 G B as loud and clear as if artists were in my room.

Wind the coils a little too long, and cut off inch by inch until exact. At first music will sound distant, but as you shorten the wire, will approach nearer. At exact wave-length announcers will sound close beside you.

THE LAST OUNCE



The two schemes our correspondent employs to get the very last ounce out of his "Outer Circle" Crystal Set.

For Weary Willies and Tired Tims, whose constitutional lassitude is too languid to change a plug-in coil, I append a second design.

It employs wander plug and two coils of different wave-lengths permanently fixed. On polite request, any obliging by-stander would move the plug when asked to change over to the other station.

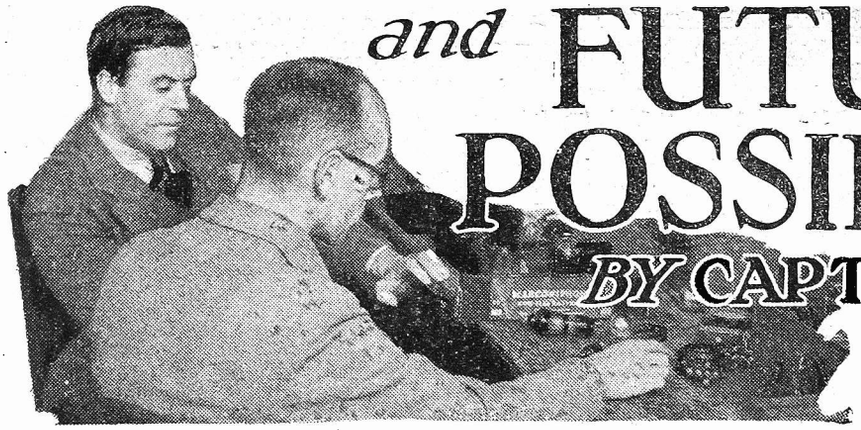
Yours faithfully,
S. KENSIT WILKINSON.

P.S.—On my outdoor aerial, 198 turns on duo-lateral suit 5 X X, and 96 turns for 5 G B. When B.B.C. closes down, I can hear strong Continental stations sufficiently clearly to distinguish the words of speeches.

* * *

(You certainly do generally get better results if you go to work like Mr. Wilkinson. But not all constructors are prepared to experiment and fix their tuning in such a way.—TECH. EDITOR.)

PRESENT THOUGHTS and FUTURE POSSIBILITIES



BY CAPT. P. P. ECKERSLEY M.I.E.E.

Our Radio Consultant-in-Chief, who contributed a great deal to the moulding of British Broadcasting, criticises present conditions, and ventures a few remarks and suggestions regarding the future.

ANYONE superficially examining the state of the development of broadcasting might be inclined to believe that we had reached a state of comparative stability. To me a closer examination shows that there is a manifest failure of many of the attempted crystallisations of modern technique.

In the first place it is questionable whether the experiment to monopolise broadcasting is justifiable on all counts. Broadcasting would have been as free as the Press had it not been for the technical necessity to restrict the number of stations operating simultaneously.

The Evils of Monopoly.

The inadequate ether gamut allocated to broadcasting services brought about monopoly. To my mind monopoly of the technical side of broadcasting is essential, but I doubt if so obvious a case could be made out for the necessity to invest in one body the responsibility for what is to be sent out. It induces that worst of all vices, caution.

The future must see some greater freedom for the public to express its feelings, even though it is wiser not to act upon the opinions of an uninstructed majority.

I think the future must see a more constant examination into the activities of the corporation entrusted with ether broadcasting monopoly.

What energy, life, flexibility and good spirit there was behind the poor programmes sent out by the B.B.C. when it was on trial; what caution, emasculation, sameness, dullness, characterises its presentation of the excellent programmes of to-day!

We Need a Dictator.

What is the ultimate aim of broadcasting even if machinery could be devised to force initiative into the minds and hearts of its trustees? To my mind broadcasting is the means of enabling us with our mind's eye to see through the gap of our loud speaker into a world of beauty in art and of thought in the spoken word.

Talks should live through the knowledge and enthusiasm of the talker, drama should not be palely excused for failure because we cannot listen to it, but should be, as it has sometimes been, dramatic in terms of its own medium.

Music should be chosen to soothe the tired upon the one hand or to interest thought upon the other. Broadcasting should be a rostrum for violent controversy, and thus a means to educate us to the enjoyment of thought.

The announcers should be men of wide culture and experience and not repressed for fear they might become more popular than their employers.

All this will never come about unless an almost unbelievably energetic and enthusiastic and encouraged dictator arrives or unless each dictator is stimulated by an insecurity of a proper sort, or unless the medium itself allows of greater flexibility.

I believe in monopoly, but monopoly only to further the true interests of the listener. A policeman can hold up traffic or direct it; our transport is slowed up all too frequently because the former policy is more in vogue than the latter.

A monopoly can hold up progress or direct it. Traffic will be quicker as the technical means to implement transport are improved. Broadcasting will be more stimulating as the technical means to implement it become more flexible. It is the technical basis which is the true foundation of all developments.

To-day ether broadcasting must admit technical failure in many respects. This is not due to a failure of the technicians developing it, it is intrinsic in the method. I live 15 miles from two 45 kw. stations.

Neither gives me clear reception and both give me variations of the same programme. If more channels for alternative programmes were available, and if the monopoly were consequently forced (by sheer lack of the same sort of material!) to experiment on new lines, then it could be forced to put over minority programmes, to forget the claims of the organisation and to remember those of the public.

Press-the-Button Radio.

It is technical progress which will in the end determine the policy of the programme makers. Again I say I believe in monopoly, but only in a stimulated monopoly.

If we had more and wider channels for broadcasting, we can conceive of everyone's receiving set with six buttons to press and six definite clear contrasted programmes for his choice.

We could imagine, if there were more channels for broadcasting, a revival of something like the electrophone, when theatres, churches, continuous dance music, musical halls, debates, parliament, important lectures, after-dinner speeches, were all simultaneously available with the constructively thoughtful programmes sent out by a body entrusted with the monopoly.

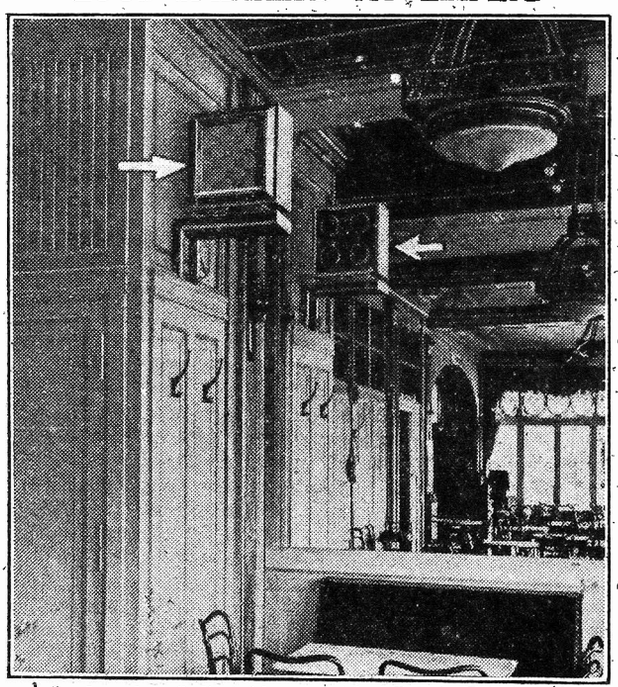
Even Television.

I foresee future development in technicalities, then, as a struggle to secure more and more channels for the simultaneous broadcasting of different programmes. If means could be found to do this, all sorts of developments are possible. Even television might thus find practical application.

Doubtless in time we shall be able to see an adequate picture transmitted from one room to another. The problem will then be only a quarter solved, there would be yet the problem how to transmit this picture to a wide public.

(*Continued on page* 1118.)

LOUD SPEAKERS AT LEIPZIG



Loud speakers (indicated by arrows) installed at a Leipzig café.

CONSTRUCTORS' PROBLEMS

An interesting commentary on the "confessions" of some of our correspondents.

By THE EDITOR

MANY readers who read our editorial, "That Safety Margin," appear to have found a good deal of truth in it. In fact, some of the letters we have received have been in the nature of "confessions!"

One reader writes to say that he has been in the habit of making outstanding "P.W." sets for several years, but admits that he has always more or less "paraphrased" our original set design and the instructions with it. For example, he admits not always using the specified components, or the alternatives, given in our constructional articles.

"I have been more or less successful," this particular reader informs us, "until I decided to build the 'Chef d'Œuvre.' In this case I altered the layout to suit a panel I had by me, and also used one or two components not mentioned as suitable by the designer. In doing so I suppose I saved about twenty-five shillings in cash—but it proved the truth of the old adage, 'spoiling the ship for a ha'porth of tar.' I got results of a kind, but I was not satisfied, so one day I rebuilt the set absolutely, as per the designer's instructions, and I must say the results obtained were vastly better.

First-class Advice.

"Since then I have decided it is cheaper in the long run not to mess about with a design, and so you can count me as one of your readers who has learnt by experience that it pays to follow the designer. I hope your editorial article will help other readers to realise this fact."

We hope so, too, because we know by experience, and from the very significant information we obtain from a perusal of readers' queries, that ninety-five per cent of the trouble experienced by readers who build our sets is due to the constructor introducing his own variations into the design.

Here is an extract from a letter sent in by another reader who is obviously an "old hand," and his experience just goes to show how even an amateur with years of experience behind him can encounter snags which, although simple in themselves, can cause endless trouble and expense.

An Old Hand.

"The difficulty with an amateur constructor like myself," writes our correspondent, "is that we have no option, when beaten by some unknown fault, but to scrap the set entirely and try something else until we get a set that *will* work, for the simple reason (and quite logical one) that everybody in trouble cannot possibly reach the designer for assistance, although quite positive that the set is *really* exactly to specification.

"I started 'monkeying' with wireless nearly *twenty* years ago and, although I can fairly claim to be a capable constructor, I have never studied the theoretical end of the business at all. Prior to the war a few of us experimenters were trying to find out how the radio worked by home-made telegraph keys, solid copper wire aerials, coils borrowed from Ford cars, etc., coherers with filings tapped by buzzer hammers, and 'phone receivers "borrowed" from old telephone sets.

"When the war broke out the police wrote 'Finis' to all that, and down came the aerials. Most of us then turned to other experiments, in a khaki uniform. After that job was over and we were home again, we found very little advancement, but it came, gradually.

Early Days.

"I remember the first variable condenser, a card wrapped in silver paper pushed in and out of an envelope similarly coated. The first valve, smuggled in from Japan by a chum who was a ship's operator, and handled as though it was a chunk of dynamite. Then we got 'peanut' valves from the States, but they cost about 25s. each.

MINERS' LEADER LISTENS IN

Mr. A. J. Cook, Secretary of the Miners' Federation, listens in at the Manor House Hospital, where he recently had an injured leg amputated.

"Coming down to 1923, in England, I built an ambitious three-valver of American design, Cossor bright emitters, etc., but *what* a search I had, all over the country for a pair of 'phones! I got a good set, however, and still use them.

"I had lots of fun with my set out in the country, heaving a wire up in to the nearest tree for an aerial, and when at home putting the earphones into two teacups for a loud speaker. I built several small sets afterwards and then, in a weak moment, started out to build a *real* set, a six-valver, 2 H.F. screened and neutralised, det. R.C. and 2 push-pull power.

"That set was a regular nightmare. I expected to get any station on earth that happened to be working, instead I got 2 L O with difficulty—and right here in London, too! I wrote to the magazine that boosted it, but they ignored my letters. I tried all the tests I could think of, checked the wiring until I knew it blindfold, rewired it and retested it all to no purpose.

"I then hired a wireless expert for a fee of a guinea to go over it: it beat him. I hired another and, after paying him, all I got was emphatic advice to scrap it as useless! I tried all the wireless friends I knew and it beat them, too.

"Then the 'P.W.' 'Magic' Three came out and I promptly set my teeth into it—and what a revelation it was! I have built several of them for others; have doctored them for other people in difficulties and I always had a roaring success.

"Then I added S.G. to my own set by building the 'Magic' Four, and considered I had the last word in sets. What a comfort it was to roam the Continent to get away from the B.B.C. blues!

"The Set Would Not Work."

"Then came the Dual-Range Coil and I fell. I dismantled my old, beloved 'Magic' Four and carefully assembled the 'Exhibition' Four. Every joint and terminal tag carefully soldered, every component of the best and exactly in the position designed for it.

"The set just would not work properly; selectivity and sensitivity 'punk'; just noise, grating, groaning, and shrieking, with the m.a. needle suffering from St. Vitus' dance. I checked the wiring several times, then got wireless friends to do likewise; checked everything over with 'phones and battery: all O.K.

"I suspected my H.T. eliminator, so bought dry H.T. batteries—no better, and another pound note wasted. I sent the eliminator back to the makers, who returned it promptly as being in perfect condition!

"This was getting serious, and Christmas was coming along, so I tore the whole works down again and made up another "Magic" Three to see me over Christmas, and it, *of course*, did not let me down.

"I then decided to reassemble my old 'Magic' Four and use the new coils in it, as I noticed you promised to publish the new diagram, but I could not wait. I used every care, soldered joints, spacing of wires and components according to plan, every terminal plier tight. *Switched on and nothing happened.*

A Mystery Solved.

"I started all my tests again and found I had one of the coils connected wrongly. Corrected this and the set came to life with a roar—but *what* a roar! Just noise, distortion, and general instability, with no selectivity whatever. Tried different valves, different aerials, earths, batteries, grid leaks, potentiometer settings, etc., but it was no use. My friends blamed everything from coils to terminals, but could not find any faults on test.

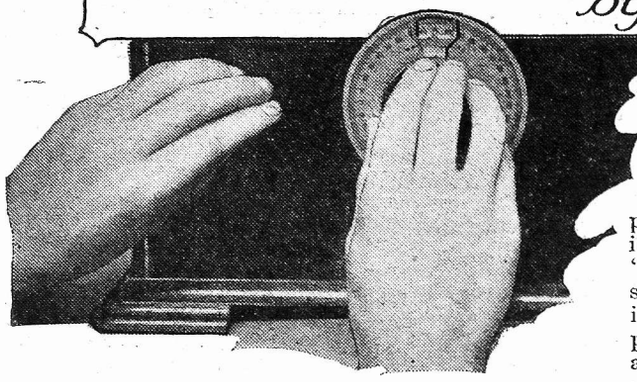
"I looked at all my beautiful wiring and orderly placing of components ruefully, and thought of the waste of time and money spent on it only to get all this terrible noise and distortion. Thinking desperately of some new test to apply before making a clean sweep of it I casually *changed the grid bias tappings* and, hey presto!—the mystery was solved—or, rather, the set changed to a beautifully well-behaved, powerful, but docile instrument that is now a joy to handle. Distance is no object, purity of the best, and I can make our twin at B.P. sit up, beg and behave."

Space will not allow further extracts from the many letters we have received apropos of our article, "That Safety Margin," but we hope to give further examples of readers' experiences next week.

THE CHAOTIC ETHER

WHY NOT CUT OUT THAT SPACE-WAVE?

by J. C. JEVONS



A suggested remedy for the present congestion in the ether that seems worthy of close consideration.

AS Captain Eckersley says, we cannot use the best waves for broadcasting so long as most stations are limited to wave-lengths between 250 and 550 metres. The trouble is that on this wave-band, engineers are forced to use excessive power in order to give the required service.

We have our own Regional scheme of high-powered stations, and the German authorities have now definitely decided to go ahead with seven more stations similar to Mühlacker and Heilsberg, each nominally rated at 75 though capable of developing 150 kilowatts. This is but the beginning. Other European countries will be compelled to follow suit, more or less in self-defence, as soon as they are able to do so.

A Vicious Circle.

In short, a vicious circle is being created simply because waves between 250–550 metres are not naturally adapted to the needs of broadcasting. To ensure a reliable service the radiated energy must first and foremost have a predominant earth-bound component, sufficient to cover a local radius of, say, 50 or 100 miles from the transmitting aerial.

Unfortunately, waves between 250 and 550 metres are more inclined to travel upwards through space than to cling to the ground. After reflection from the Heaviside Layer, the space-waves come back to earth again, possibly some hundreds of miles away. This, of course, makes it comparatively easy for British listeners to hear German, French, Spanish, Italian and other transmissions, providing we are willing to put up with a certain amount of fading.

But it does not provide a reliable local service. Each nation naturally wants to cater primarily for its own citizens, and is more or less indifferent to what happens to the waves once they have passed the boundaries of the country of origin.

Getting Worse and Worse.

The only way in which it has, so far, been found possible to supply local listeners with a satisfactory service on waves of medium length is by increasing the power output from the transmitting aerial. And this starts the vicious circle.

High-powered stations in each country can give good service on 250–550 metres to their own citizens, but will cause increased interference in foreign countries due to the reflected space-waves. This leads to a corresponding increase in the power employed in the affected countries in order to counteract the "imported" interference. As soon as the "backwash" is felt in the first country, it must promptly use still more power, and so the thing will go on until the ether becomes an intolerable welter of conflicting waves.

As one remedy Captain Eckersley advocates the more extensive use of longer wave-lengths—say between 1,000 and 2,000 metres. Within this band of frequencies, the earthbound component is predominant, and reliable service over a larger local area can be ensured with a reasonable power-output. Unfortunately, as one increases wave-length one finds far less accommodation in the ether.

If, for instance, broadcasting were confined to wave-lengths between 1,000 and 2,000 metres, not more than fifteen different stations could operate simultaneously without overlap. A wave-length of 1,000 metres represents a frequency of 300 kilocycles, whilst one of 2,000 metres is equal to 150 kilocycles. The difference, 150 kilocycles, provides elbow room for only 15 stations, assuming a gap of 10 kilocycles between each to prevent overlapping of the modulation side-bands.

This, on the face of it, is quite inadequate to meet the growing demands of all the European countries. It is true that the existing facilities for broadcasting on the longer wave-lengths might well be extended, but this would at best only give a temporary measure of relief.

The Super-Het Solution.

Of course, there is the remedy for developing new and more effective methods of selective reception. The superheterodyne circuit offers one of the most promising means of defence along these lines, but it is too expensive for most listeners.

The same objection applies to the new Stenode Radiostat receiver, which is a development of the supersonic principle, and will presumably be even more expensive.

There is, however, another possibility that still remains to be explored. Why not tackle the problem from the transmitting end, and devise some method of radiation which shall free the 250–550 wave-band from unwanted "space" waves?

The question may perhaps appear presumptuous, but the time is coming when some such solution will become imperative if European transmission continues to increase at its present rate.

As previously explained, the inherent weakness of the 250–550 wave-band is its tendency to radiate upwards instead of along the ground. We know that waves can be prevented from spreading *laterally* by directional methods, such as the well-known Beam aerial.

A Far Better Plan.

Why not apply the same methods to prevent the waves from spreading *upwards*. If they can be confined horizontally, why not vertically? By making such an aerial of circular shape the radiation could be distributed uniformly in all directions towards the horizon, as is necessary for broadcasting, though at the same time the upward spread could be strictly limited.

It is admitted that up to the present Beam aerials have only been used successfully with waves below the 100-metre mark. But the directional principle holds good for any wave-length, the question of cost being the chief obstacle to its use in the case of longer waves.

If there is no other alternative, even a very expensive aerial system is better than a complete breakdown of the broadcast service due to over-congestion in the ether. After all, it will be cheaper in the long run to erect a few costly aerials, rather than to force millions of listeners to install complicated and expensive super-selective sets.

THEY USE SEAWEED!

A workman packing the walls of one of the new Portland Place studios with dry seaweed, so as to make them soundproof.

LATEST BROADCASTING NEWS.

B.B.C. ORGANISATION.

DR. BOULT'S SINCERITY—BRASS BANDS—SIR HARRY LAUDER—TROUBLES OF £30,000!

THERE is in progress a general tightening up of the organisation of the B.B.C., which appears now to be getting back more to the state of affairs which prevailed in the days of the B.B.C. when it was a "company" and not a "corporation."

Curiously enough, the "reversion to type" is being arranged under the ægis of a chairman who previously spent most of his useful public service as Speaker in the House of Commons.

The point is that Sir John Reith has begun to take a real interest in programmes, apart from Sunday transmissions. It follows that several existing jobs may become redundant.

Dr. Boult's Sincerity.

Few people have realised what was involved in and implied by the postponement of "Morning Heroes," which was to have been given as part of the B.B.C. Symphony Concert at the Queen's Hall on Wednesday, February 4th. "Morning Heroes" is Arthur Bliss's Choral Symphony of War—the only thing of its kind in music.

It was to have been conducted by Dr. Adrian Boult, who is reported as having said that he was out of sympathy with the motif, and who also felt that he had had an inadequate opportunity of rehearsal.

In view of this situation, it is more than creditable to Dr. Boult that he not only declined to conduct an inadequately rehearsed performance, but he also readily accepted the offer of the composer to conduct the work himself on March 25th as part of a programme the rest of which Dr. Boult will be directing.

It so happens that March 25th will be a particularly appropriate anniversary for this musical masterpiece.

It was in March, 1918, that Arthur Bliss got his inspiration for the original embodiment of the impression "Pass, Pass Ye Proud Brigades." Listeners generally will realise the terrific significance of the dedication "To the memory of my brother, Francis Kennard Bliss, and all other comrades killed in battle." All honour to the sense of delicacy and fair-mindedness of Dr. Adrian Boult.

"POPULAR WIRELESS" HAS AN UNRIVALLED BROADCASTING NEWS SERVICE AND IS ABLE TO PRESENT TO ITS READERS ALL WORTH-WHILE NEWS AND VIEWS REGARDING B.B.C. ACTIVITIES.

Brass Bands.

It is all very well for the B.B.C. to say that they pay no attention to the Press. It would be wrong, of course, if the B.B.C. were to allow any section of the Press to disturb it into a policy of panic for a commercial reason. There appears, however, to be little danger of any such development.

On the other hand, it would be more graceful of the B.B.C. to admit Press assistance when offered and accepted. The case in point is the recent agitation for a brass band.

Although the B.B.C. officially denied the possibility of the formation of anything remotely resembling a brass band, it has leaked out that Mr. Barlow (first tuba in the Orchestra) has formed an emergency brass band by augmenting the brass section of the Wireless Military Band.

Sir Harry Lauder.

No one has asked Mr. Stanford Robinson to write a tribute to Sir Harry. I wonder why?

Troubles of £30,000!

Despite the efforts of the Home Office to keep things pure, there are many of us who are now hoping to win one of the big prizes in the next Irish sweepstake. Mr. W. P. Crozier, a Northern journalist who has given many broadcast talks, has written his first radio play, and he has taken as his theme the troubles of a man who has won £30,000 in a sweepstake—a lot of money; in fact, sufficient to give the play a nice-sounding title.

Lucky Chap!

The lucky man, whom Mr. Crozier calls Amos Gradwell, has a wife and a sister who make up their minds they are better able than Amos to handle such a large sum, particularly when they begin to fear that a good chunk of it looks like finding a home with the Reverend Somebody's mission.

The story of the play is interesting, but we must not reveal more of it, otherwise it will spoil the broadcast performance which is down for Northern listeners on Friday, March 6th. Personally, I am making a note of this date.

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.

Sir Harry Lauder.

IT was good to hear him again. Not so young as he was, like the rest of us; his laughter not quite so spontaneous nor so clear; but his singing voice, which has charmed the round world for more than a generation, almost as good as ever; the songs themselves just as good as ever. But they are his own songs, and will die with him. I cannot imagine anybody else singing "Tobermory."

Gloucester Orpheus.

I had to give Sir Harry short shrift, for not the archangel himself would lure me from listening to the Gloucester Orpheus Society. For purity of tone, balance of voices, fine training and conductorship, there can be few choirs to equal this one.

I have rarely heard the "Skye Boat Song" sung so well. And as if the choir itself were not enough, Jean Coxon added to the programme a glorious rendering of "The Bell Song" from Delibes' "Lakme." Down there they know how to prepare a feast!

"Dr. Abernethy."

This was hardly a play. It was a series of interviews between Dr. Abernethy and his patients, designed to show off the "rough diamond."

It was good fun listening to him; it must have been an experience consulting him! The date was 1815 or thereabouts, when the medical ranks were not so crowded; nowadays it would go rather hard with his practice if he behaved like that. But he was a fine character.

The part was admirably played by Walter Fitzgerald. Dramatic character-sketches of others of these "old worthies" like Beau Brummel would make an interesting series.

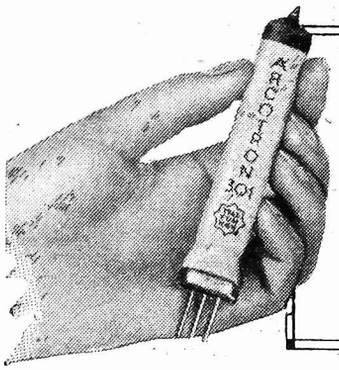
Light Music and the G.P. Quintet.

We are apt to overlook those who continually serve us, and to take them for granted.

Listeners probably owe more to the Gershom Parkington Quintet than to any other group of men appearing at the microphone. They seem ready to lend a hand anywhere. They seem to me to get better and better.

Their playing is always a pleasure to listen to; their programmes are always bright and fresh; and they have the knack of choosing interesting soloists to assist them. They are among the old stagers in

(*Continued on page* 1118.)



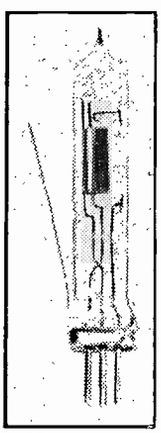
THOSE RADIO RODS

Some authentic technical details about those amazing little mains valves with external control electrodes.

By Dr. ALFRED GRADENWITZ.

ATTEMPTS to control the electrons in a valve statically, from outside the glass, date back to the early days of valve development. However, the tests carried out failed to lead to any tangible results owing to the impossibility of obtaining sufficient amplification for practical purposes.

This was mainly due to the fact that in the case of ordinary bulbs the control electrode could not possibly influence the space charge around the cathode. The peculiar shape of radio rods had to be adopted in order that the controlling outside surface might encompass the area of the space charge sufficiently closely.



Inside view of one type of rod.

Bias Ineffective.

Radio rods are subject to operating conditions altogether different from those of ordinary valves. It is, for instance, impossible to record any statical characteristics of this new type of valve, the glass wall being charged inside with electrons whenever a positive voltage is applied to the control grid, while the total voltage resulting from that of the control coating and the voltage of the charge on the inside of the wall is always nil. No amount of positive grid bias has any effect.

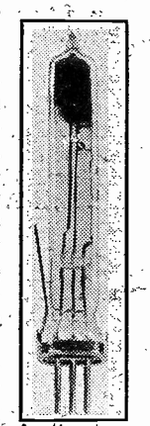
Use of Gas-filled Rods.

This is true also more or less of any negative voltage applied to the control coating, providing there are some slight remnants of gas in the valve. At the same time, gas-filled Telefunken rods will respond to alternating H.F. voltages, there being set up excess charges on the wall whenever the voltage of the outside coating is varied, so that the resulting voltage no longer is nil. These excess charges always take a certain time to be compensated across the insulation resistance of the glass wall.

Telefunken rods destined for purposes of amplification are designed as high vacuum valves, whereas those devised for detecting purposes are of the gas-filled type.

Telefunken rods are directly heated with alternating current. No directly-heated mains valves have so far been very successful as detectors, owing to the direct effect exerted by the filament on the grid and the influence of voltage variations on rectification.

However, gas-filled Telefunken rods, on account of their characteristic behaviour, as explained, are insensitive to low-frequency voltages.



Another type of radio rod.

Detecting Action.

Any voltages applied from outside are, so far as the negative half-wave is concerned, compensated by the ions of the residual gas; in fact, the lag between the electrons and ions is only felt as the frequency becomes more rapid, until the ions in the case of real high frequency are no longer able to follow.

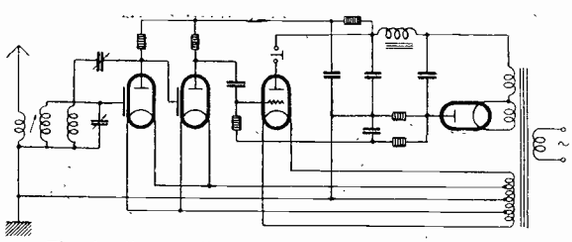
Only low-frequency oscillations are thus compensated by ions, resulting in a rectifying effect which is quite similar to the detecting effect of standard valves.

The insensitiveness of the gas-filled radio rod to low frequency by no means affects the low-frequency modulations of the H.F. pulses. Oscillation on the grid being invariably of high frequency, and being in turn modulated in accordance with the rhythm of the speech or music transmitted.

Insensitive to L.F. Pulses.

Whereas a frequency of, say, 100 reaching the grid from the alternating-current mains has practically no influence upon detector rods, a sound of the frequency of 100 arriving from the transmitter in the form of modulated high frequency will readily be passed on.

HOW THEY ARE USED



The circuit connections of an all-mains radio-rod receiver.

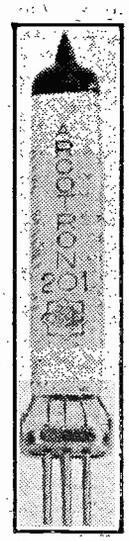
Smoothing Apparatus Simplified.

The most conspicuous advantage of gas-filled Telefunken rods, therefore, is seen to be in the absence of any grid hum, thus greatly simplifying the design of the smoothing apparatus.

Another most welcome advantage of radio rods is that, owing to direct heating, they will start working immediately they are switched on.

A diagram is shown of a typical circuit for these rods. Coupling condensers and grid resistances between the detecting and resistance rods respectively can be dispensed with, the steady voltage of the control coating being without any influence on the working of the valve.

Telefunken rods behave in many respects in different ways from standard valves, and enable considerable simplification of the circuits employed.



Outside view of one of the rods.

Instances of this have already been given, namely, the absence of coupling condensers, and the fact that directly-heated cathodes can be utilised. The property of the detector of being unresponsive to low-frequency pulses has the advantage of making the question of back coupling from following L.F. stages of much less importance.

Ordinary Output Valve.

You have seen why radio rods are not suitable for L.F. purposes, and therefore will not be surprised to note that a three-electrode valve of the ordinary type is utilised for the output. The circuit shown is, of course, a three-valve H.F., det. and L.F. arrangement, complete with all-mains power supply apparatus.

A half-wave rectifier valve is used for H.T. purposes, and only one smoothing choke is required, instead of the two usually necessary.

SPRUNG VALVE HOLDERS

A SPECIAL campaign to emphasise the advantages of the use of sprung-type valve holders has been launched by the Benjamin Electric Ltd. in conjunction with the Igranic Electric Co. Ltd.

In this connection, they have had extensive experiments carried out to show exactly what effect good sprung valve holders can have in regard to the quality of results given, and the life of valves. The above firms are issuing a booklet of great interest to the constructor, entitled "The Elimination of Pong," and this gives a full account of the experiments.

HOW TO MAKE THE "COMET" SELECTOR COIL.

Full constructional details of the coil that figures in the wonderful "Flexi-coupling" system applied to the "P.W." "Comet."

By G. P. KENDALL, B.Sc.

THE "Star-Turn" type of Selector coil which we have adapted to meet the needs of the "P.W." "Flexi-Coupling" scheme is a standard unit obtainable from most of the firms who specialise in coils for "Popular Wireless" and "Modern Wireless" sets. A proportion of our readers, however, like to make their own coils, and for their benefit we are giving the specification on this page.

The winding itself is extremely simple, although a number of tappings have to be made. The mechanical details, however, require to be carried out with some care if a satisfactory unit is to be produced, and reliable action of the Selector switch.

Easy to Construct.

The reader with a fair amount of experience of constructional and coil winding work need not hesitate to tackle the job, for it is not really difficult. It is just a matter of a little painstaking work in fitting up the stud switch and assembling the unit.

There is nothing critical about it electrically, and slight variations in the winding, method of assembly, and so on, make no difference to its working. In this respect it is much simpler and more straightforward than a dual-range coil, where the various windings must be correctly proportioned and positioned in relation to each other.

Essentially, the unit consists of a tapped single-layer winding of 84 turns in all, on the usual tube, with a stud switch to vary the amount of coil in circuit in steps of four turns at a time. This is found, in practice, to give quite sufficiently close tuning for an aerial circuit.

The basis, then, is a piece of tubing of some good insulating material, such as "Pirtoid," with a diameter of 3 in., length 3½ or 4 in. In each end of this a wooden cross-piece is fitted, one to provide a means of mounting to the panel (two screws) and the other to form the attachment for a disc of ebonite of about 2¾ in. diameter, on which the studs and arm of the Selector switch are mounted.

The Terminal Connections.

The switch has 18 studs, and the arm is fixed on the end of a brass spindle running right up the centre of the coil and out through a hole in the panel. Holes for this spindle are required in the wooden cross-pieces, of course, and a knob is placed on the end to enable the switch to be rotated. Some simple kind of pointer is desirable on the knob, to indicate roughly where the switch arm is at any given moment.

The tube carries three small terminals, marked A, B and C, and a convenient position for these is at the end furthest from the panel. The actual positions do not matter much, but it is best to see that they read A, B, C from right to left as you look at the coil from the back of the set in which it is mounted.

The winding comprises 84 turns of No. 24 gauge wire (either double cotton or double silk covered will serve) in a single layer. Begin at the end of the tube nearest the panel and wind on 20 turns.

From this point take a tapping to No. 1 stud on the switch. This is the stud on which the arm rests when the knob is turned fully to the left.

Now put on 4 turns, tap out to No. 2 stud, 4 more turns, tap to No. 3, and so on until 84 turns are on. Take the finishing end to No. 17 stud, leaving No. 18 blank for another purpose.

Now the internal connections of the unit. Terminal A is to be wired to the arm of the switch, and C to the start of the winding. The 18th stud, blank until now, is to be wired to terminal B.

That really completes the job, but there remain one or two details to be discussed. The appearance of the unit, for example, would be improved by a covering of Empire cloth over the winding. It is easily stuck in place with a few little dabs of molten Chatterton's compound.

Then there is the question of some sort of indicator on the panel to tell you where you are. Most people will find a knob and pointer of some kind sufficient because, after all, you really make the adjustment by ear.

Spacing the Turns.

If desired, however, it is a simple matter to cut out a card scale and seccotine it to the panel, and mark it out with 18 divisions to denote the position of the pointer for each of the stud positions. If you first mark out a rough scale, it is easy to copy it neatly in Indian ink and secure this second attempt to the panel after marking it out.

By the by, it may be a help to you in placing the winding on the tube to know the actual length which it occupies. Well, with No. 24 double silk-covered wire, wound reasonably carefully, the 84 turns should cover approximately two inches of the tube.

If you bear this in mind when starting the coil you will be able to get your winding nicely in the middle of the former. It doesn't matter electrically, of course, but it looks neater this way.

How Tappings are Taken.

As you will have realised by now, the length of 3½ inches given for the tube is somewhat longer than you need, but we chose this size for two reasons. In the first place it is a standard size in the "Pirtoid" range of tubes, and secondly it just allows room for double cotton-covered wire to be used, if desired.

The length of the winding in this case would be approximately 2¾ inches. Of course, the winding length will vary a little according with the neatness with which you make the tappings and the closeness of the turns to each other, which in turn depends on your skill in winding. If it is your first attempt, therefore, it is wise to expect the winding to run perhaps an eighth of an inch over the figures we have given.

The tappings, by the way, are quite easily made in the following fashion: As you reach each point, push a hole in the tube with a sharp-pointed scriber or other tool which will not injure the adjacent turn of the winding, and take a loop of the wire through and so to the appropriate stud of the Selector switch.

A SCOOP FOR AMERICAN BROADCASTERS

Bobby Jones (centre), who holds all the leading British and American Golf Championships, has fixed up with Mr. Aylsworth, President of America's National Broadcasting Co., to broadcast a series of golf talks.

SOME SHORT REMINDERS

Correct negative bias on the grids of S.G. valves often improves selectivity.

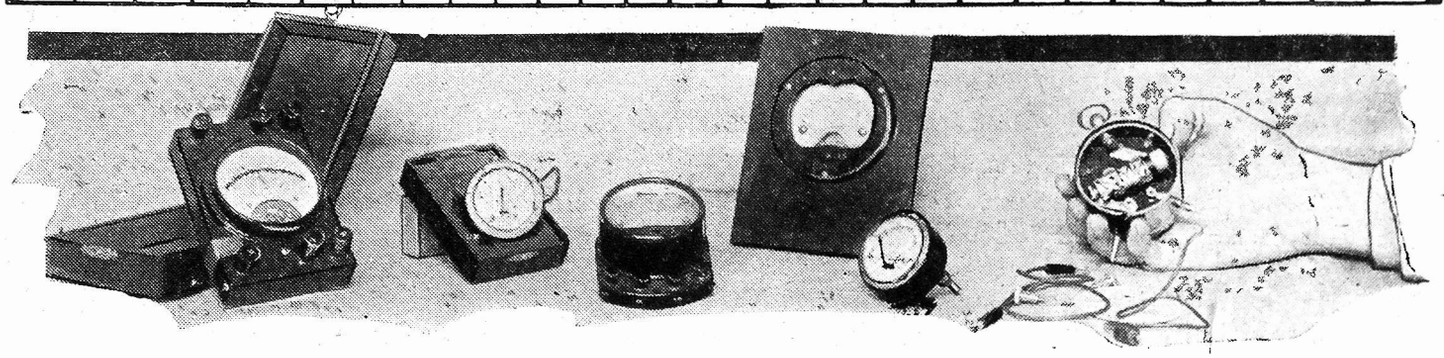
* * *

It is expected that the change-over from Savoy Hill to Broadcasting House will take place in the autumn of 1931.

* * *

In a well-designed broadcasting aerial most of the energy is radiated horizontally, but a certain amount of radiation takes place at all angles.

HOW THOSE METERS WORK



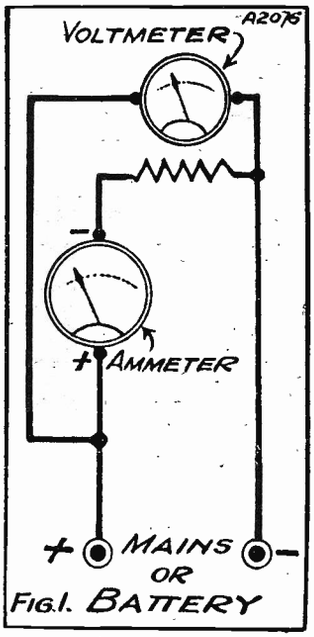
Some interesting notes that will help you to appreciate a good meter when you meet it.

By E. BLAKEY.

HOW many wireless enthusiasts are there who have not at some time wondered how voltmeters, etc., work ?

In writing this article, it is my hope that it will enlighten those who are as yet totally ignorant of the principles of the two types of instruments most commonly in use, the voltmeter and the ammeter.

First, let me remind you that it is useless to think a 3s. 6d. voltmeter is an accurate testing instrument. Such types of instrument often consume as much current as a power valve. To leave such an instrument in circuit with your H.T. battery means very quick ruination of the battery.



WHERE THEY WORK

An ammeter is joined in series, so all the current in the circuit passes through it. But a voltmeter is shunted or paralleled right across the two points between which the voltage difference to be measured exists.

Volt and Amp. Meters.

I will describe the principles of the moving-coil and hot-wire type instruments. The first type is most common to amateurs. and a good make moving-coil instrument provides a means of reliable testing. The hot-wire type is to be found more in the laboratory than on the amateur's bench ; nevertheless, it is well worth describing for the benefit of the amateur.

Essentially, a *Voltmeter* is an instrument used to measure the potential difference between the mains or across a battery. It is designed to consume as little current as possible and has a *high* resistance.

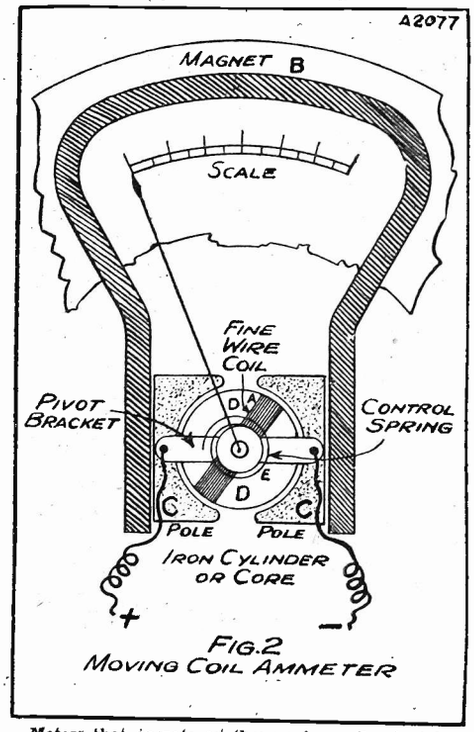
An *Ammeter* is used to measure the current flowing in a circuit. It is connected in series with the mains, battery, etc., at any convenient point. Its resistance must be as *low* as possible (just opposite to the voltmeter), in order that there will be a very small voltage drop across it. Reference to Fig. 1 will show how the voltmeter and ammeter are connected respectively.

The Moving-Coil Type.

The working parts of a moving-coil voltmeter and ammeter are similar. A fine-wire insulated coil (A) on a rectangular aluminium former, held by two pivots in jewelled bearings and carrying a pointer, generally constructed from aluminium, is energised by current from the circuit in which measurements are to be made (Fig. 2).

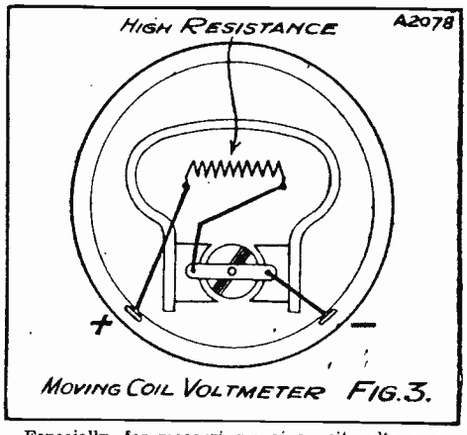
The coil rotates between the poles of a permanent horseshoe magnet (B) which has shaped pole-pieces (C). Between these pole-pieces, leaving very small air gaps, is a fixed iron cylinder (D) to intensify the " flux." It is in the space between the poles and the cylinder that the coil moves.

MOVING COIL TYPE



Meters that operate on the moving-coil principle are generally very reliable instruments.

FOR MAINS UNITS



Especially for measuring mains unit voltages a very high-resistance voltmeter is desirable. High resistances are included in the construction of most good voltmeters.

Two spiral springs (E) which carry current to and from the coil have their inner ends fixed to a pivot (the pivot mentioned in connection with the rotation of the coil) and their outer ends fixed to the standing part of the instrument.

We must now recall our elementary theoretical knowledge in connection with this very interesting part of the function of the instrument.

" Dead-Beat " Instruments.

The coil (A) when carrying current tends to move so that its " flux " is at right angles to the magnetic plane, therefore enclosing as many " lines of force " as possible.

Or to put it another way. A " clockwise " twisting torque proportional to the current flowing is exerted between the magnet and the coil against the " counter-clockwise " torque of the springs. Therefore, according to the strength of the current flowing, the pointer will take up a certain position on the scale.

(Continued on next page.)

HOW THOSE METERS WORK

(Continued from previous page.)

You will notice with no current flowing the springs are "all-out," and when current is flowing in the circuit the springs are tightened up according to the amount of current in the circuit.

In most good-class instruments the pointer comes to rest quickly. This is generally described as "dead-beat" action. This is due to:

(a) the lightness of the moving parts;
(b) the current induced in the winding and aluminium frame as the coil moves through the "flux."

It would be perhaps as well if, for the benefit of non-technical readers, I gave a little explanation of the term "flux."

Flux-Density.

You know that current does not flow through a wire just as water through a hose-pipe. When current is flowing through wire, a magnetic field is created round that wire. The "Flux-density" is the number of lines per square centimetre in any part of the "cross-section" of a magnetic field.

By placing iron within the coil (the cylinder), the magnetic properties are very much more pronounced. This is because iron is the best conductor of magnetic lines of force that is known. It is better than air by several hundred times.

You will see, therefore, the iron cylinder is there for a very special purpose; many people think it would be well out of the instrument so that the coil may have more space in which to rotate. This, you will see, is entirely wrong.

HEAT DOES IT!

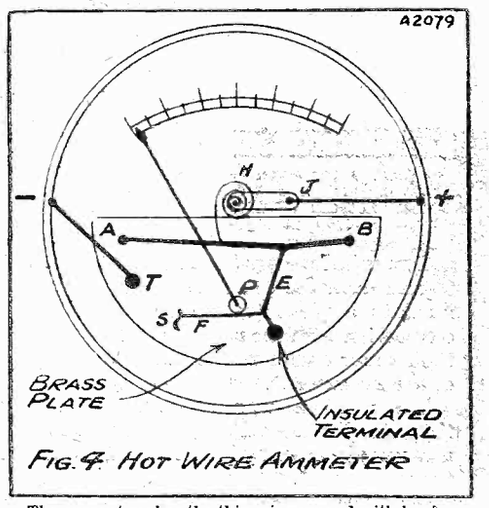


FIG. 4. HOT WIRE AMMETER

The current makes the thin wire expand with heat, and so moves the needle.

At this point you will realise that the making of instruments of this type is more difficult than is generally supposed, and (I mention this with emphasis) that any tampering can very easily cause "rubbing-contacts," etc. Use your instruments very carefully, just as you would a good watch, for both are instruments of precision.

Now some special points about the ammeter. The coil winding is very fine and can only carry small currents. It is therefore necessary to "shunt-off" the greater part of the current to be measured by an ammeter shunt in parallel with the instrument. The shunt is usually made of strips of manganin, which has a very low resistance and is unaffected by temperature changes. The resistance of the instrument and that of the shunt and of the leads bear a definite ratio to one another.

Therefore the instrument carries a definite fraction of the main current, but is graduated to register the main current. The combined resistance of ammeter and shunts in parallel is so small that it has no appreciable effect on the resistance of, or on the current in, the circuit.

Ammeter terminals are always marked + and −, and must always be connected correctly.

Shunts are not necessary with ammeters designed to measure small currents. (Milliammeters.)

A voltmeter is connected across two points in a circuit to measure their potential difference. A resistance (see Fig. 3) is put in series with it so that it will not appreciably affect the resistance of the circuit, and only carry a small current.

The Hot Wire Ammeter and Voltmeter.

To explain this, let us note each "step" on Fig. 4 before going further with the text.

AB—Platinum - silver bridge wire.
S—Spring.
F—Silk fibre.
E—Phosphor-bronze wire.
P—Pulley and pointer.
H—Hair-spring.

Trace the connection from the + terminal of the instrument and you will see that, disregarding the electron theory and taking the old electrician's current flow hypothesis, which is simpler to understand in this case, current enters at the block marked "J." It is now carried to the platinum-silver bridge wire (AB) by the hair-spring (H). Note the bridge wire is connected to terminals marked A and B, which are connected to a brass plate. Current leaves by the terminal T connected to the brass plate also.

An Ingenious Idea.

Near to the centre of the bridge wire (AB) is connected a phosphor-bronze wire (E) which is much thinner than AB. The other end of E is fixed to an insulated terminal. To E is attached a piece of silk fibre (F) which is wrapped round the grooved roller (P), to which the pointer is fixed, and the other end of F is attached to the small, flat spring S, generally by an eyelet or similar attachment.

And now to describe the action of the instrument.

When current flows through AB its sag increases, naturally E becomes more deflected; this causes a movement by F (which measures the deflection of E) which, seeing it is wrapped round the pulley P, turns it, and so causes the pointer to move. Just run through this again and get a clear understanding of the principles.

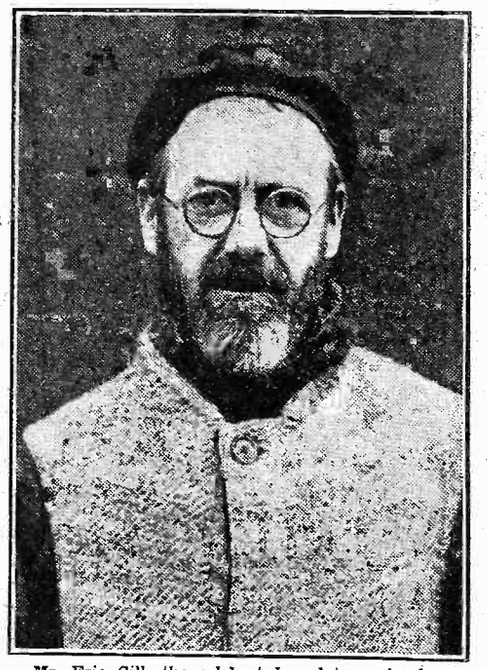
Damping Out Vibration.

As in the moving-coil type instrument, there is a device for "dead-beat" action. An aluminium disc attached to the spindle of the needle moves between the poles of a small, powerful permanent horseshoe magnet. When any movement occurs, the current induced in the disc produces a magnetic field opposing the motion, thus delaying it.

The main object of the disc is to damp out mechanical vibration, which you will realise would be inevitable without it, due to the construction and action of the instrument.

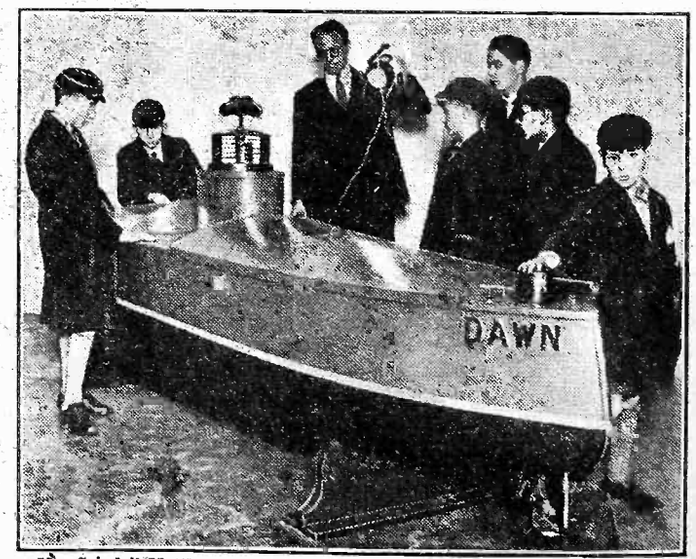
As in the case of the moving-coil type instrument, shunts are connected in parallel with an ammeter, and a high resistance is fitted in series with a voltmeter.

COMPLIMENT FOR "P.W."?

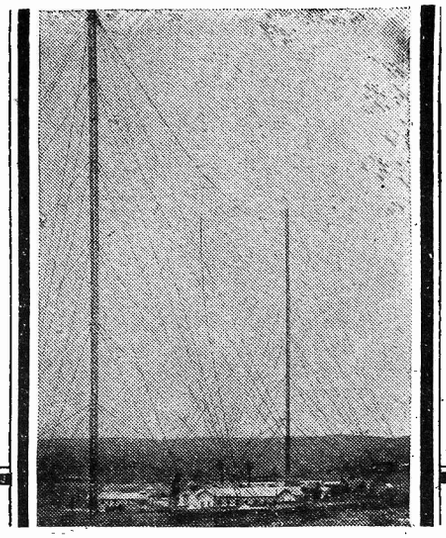


Mr. Eric Gill, the celebrated sculptor, who has included "Ariel" in his group for the new B.B.C. building at Portland Place.

CONTROLLED BY RAYS



Mr. Grindell-Matthews and his new boat, which can be controlled entirely by wireless or by light rays.



JAMMED AGAINST A GIANT

A Special Correspondent describes a lightning tour of the Balkans, and a visit to the Istanboul broadcasting station, which broadcasts on the same wave-length as the giant Moscow station.

IN a friend's car I motored through the military zone encircling Istanboul to the centre of the city—which is certainly not the most pleasing form of motoring, nor the easiest method of approach!

Having concluded business visits in Bucharest, and having duly visited King Carol's Broadcaster, as reported in "P.W.," I found myself, some while back, at a loose end in Bucharest and with the rather ambitious desire (at least, if you knew the country you would realise that it was an ambitious desire) to visit Constantinople.

Terrible Journey

Train travel in these parts is a mockery as a service. A business friend in Bucharest had to go to Istanboul—a thing, poor chap, which he had frequently to do—and he kept a large American saloon exclusively for the pilgrimage.

The distance is roughly the same as that from London to York, assuming that one goes as the crow flies; but crows don't fly straight in Turkey! And, apart from the distance, the roads are awful.

We did eventually get through Istanboul and on to Constantinople; but there's no interest in that part of the journey for wireless enthusiasts.

As a matter of fact, there are only two roads worth the name at "Constan," and one of them, to San Stephano, leads through the maze of Istanboul's narrow and Orientally dirty narrow passages, which, because Istanboul is a city, one must call "streets."

The "Radio Dealer"

That American saloon was a real chariot! I am told that motorists are discouraged by the officials as well as by the roads in the Balkans. Certainly our trip to the broadcasting station was as hazardous a thing as one could possibly wish for. The police in Istanboul have a temperament of their own!

No officials in this part of the world are inclined to over-humanitarian sympathies, but the military methods of the Istanboul and Constan traffic "bobbies" are deeply galling; and one has no remedy, for it is made painfully obvious that motorists—private motorists, at least—are not wanted.

And yet the Turks tolerate such a modern thing as radio.

While in the market area of Istanboul, I saw my first Oriental radio "shop," the utter confusion of which would make even Caledonian market blush for shame!

Had I "bitten" I could have bought high-tension batteries which, owing to the heat, could have had little pep left in them; or a selection of German and Austrian valves of doubtful vintage. It all makes one wonder how radio amateurs manage in Istanboul.

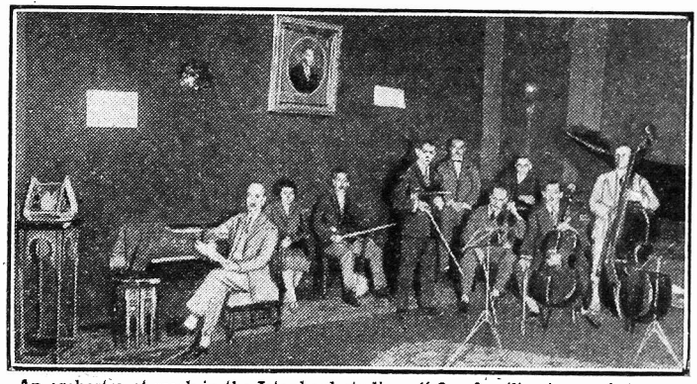
There was little time to spare, so, while the Bucharest man conducted his business in the City, I borrowed his car and made an impromptu attempt to find Istanboul's radio station, which is some distance out of the city itself, and faces open country.

I have since learned that for this valiant endeavour I might have been hung, drawn and quartered by the authorities for driving without a foreigner's permit.

Poorly Heard in England.

The giant masts of the station guide one over the undulating country; and so I arrived. A station engineer took me round and showed me the plant, which was rather uninspiring, the aerial and earth arrangements, which are immense, and the studio, which to a Britisher is amusing.

THEY HAVE THEIR "JAZZ"!



An orchestra at work in the Istanboul studio. "Our familiar tunes of two or three seasons ago are twisted to suit their own rhythm," says our correspondent.

Also he explained why it is that, although Istanboul has an excellent range, thanks to its wonderful geographical position, it is poorly received in England and well-heard down in the Southern and Western parts of the world.

Istanboul is jammed against a giant. Its own power is 5 kilowatts, which is good; but there is Moscow's new 75-kilowatter on exactly the same wave-length of 1,935 metres. There is also another giant, Kharkov, which is generally to be found round about the eleven-hundred and twelve-hundred mark.

These Russians are picked up at fair strength in England, though nobody wants to hear their propaganda, and the huge wipe-out doesn't give Istanboul much of a chance.

Transmitter Being Revised.

At the moment, Istanboul is "off the air" and the transmitting plant is being revised—a thing which was hinted to me on my visit—and perhaps when it returns it will be more easily received with single H.F. stage sets in this country.

I saw a copy of the monthly wave-length measurements by the Brussels U.I.R. laboratory, and the wave-length line of Istanboul was commendably straight. Right on the line on one or two nights were two Morse stations. There is plenty of shipping and commercial traffic in these parts; but probably Turkish listeners are not very critical.

Afterwards we went along to the studio. This is heavily draped, infernally hot, and devoid of any external ventilation or illumination. The lighting, I believe, comes from locally-generated power, for I heard a chuffing suspiciously like a gas-engine.

If you have ever heard Istanboul, or the other more powerful Turkish station Ankara, you will know what a weird idea of music these countrymen have. They have their jazz, and our familiar tunes of two and three seasons ago are twisted to suit their own rhythm. In their jazz bands and light orchestras there is plenty of "string," but precious little bass. In fact, they appear to loathe the drums.

The studio, to be truthful about it, is grossly old-fashioned and hardly in keeping with the national temperature; for, as I have said, there is no proper ventilation.

To spend an evening in Istanboul's studio would certainly not be my idea of Turkish Delight!

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

By R. W. H.

THE period of excellent long-distance reception conditions which opened shortly after the beginning of the year shows no signs of coming to an end. We have occasional bouts of atmospherics, which generally affect the long-wave transmissions rather more than the short, and on odd evenings fading may reappear for a time. Never, though, has the latter been so bad as it was towards the end of 1930.

Americans Coming Over Well.

American reception is becoming better and better. Not for many years had I made a real night of it, but recently conditions were so good that I simply could not go to bed until the clock had struck five!

With the big set the American stations were coming in with a volume comparable to that of Rome or Hamburg or Turin; the volume control had, in fact, to be turned right back for fear of rousing the rest of the household from their slumbers.

As the big set was doing so well I switched on a four-valve portable (S.G.—D—2 L.F.) and found that it was easily capable of pulling in the programmes of several stations—*not*, by the way, tuned to the silent point between squeals.

On that memorable night I picked up thirty-four Americans and could probably have got more if I had by me a complete list of U.S.A. stations with their frequencies and wave-lengths. Amongst the best at the present time are WIOD, WPG, KMOX, WTIC, WBZ, KDKA, WABC, WGY, WJZ, WLW and WEAF.

Those below 300 metres are usually the strongest from midnight until about 1 a.m. Then the longer-wave stations begin to strengthen up and fine reception of them shortly becomes possible as a rule.

A New Transmitter.

On this side of the "Herring Pond" there is a very big selection just now. I have a new station for you—or rather an old station with a new transmitter—in Lwow, which we used to call Lemburg.

The name by the way is pronounced Lvoo, or something very like that, in case you are trying to catch the call-sign. The wave-length is 381 metres (788 Kcs.).

This station comes through strongly and you should have no difficulty in finding him. Incidentally, if you do so you have practically the exact tuning for WGY, so make a note of the settings.

On the long-waves all stations are coming in well. The very best are Radio-Paris, the Eiffel Tower, Kalundborg, Oslo (when not heterodyned) and at most times Huizen, who is now sending out the Hilversum programmes.

The medium band is full of interest. As you have possibly observed, Heilsberg has now worked up to full power, and is receivable even on small sets at excellent loud-speaker strength. I hear, though, that he is not over popular with those who listen to the home relays using not very selective sets.

Listen For These.

Budapest is a little off colour at the moment and Vienna, usually so good, is not quite what he was. Other stations slightly below the mark are Lyons Doua and Munich.

To look on the bright side, there are quite a score of stations now from which fine reception is obtainable if the set has adequate selectivity. Notable amongst these are Brussels No. 1, and often No. 2 as well; Milan, who is generally most reliable; Langenberg, Rome, Stockholm and Katowitz, all of whom may be regarded as regular stand-bys. The list also contains Frankfurt, Toulouse, Strasbourg, Hilversum (Huizen programmes), Breslau and Turin, to mention just a few of the best.

SHORT-WAVE NOTES

A weekly contribution for short-wave enthusiasts by W. L. S., "P.W.'s" short-wave expert, who operates a very well-known amateur station and is one of the leading experts on the subject.

APROPOS my mention of Radio Saigon in these notes recently, a reader, "F. W.," has been good enough to forward me some particulars straight from the station. The directors take for granted a desire to subscribe twenty-five dollars per annum to give "moral and material assistance" to the development of the transmissions.

Where is Rome?

The chief particulars are: Aerial power, 12 kilowatts; wave-length, 49 metres; call-sign, F 3-I C D. The announcement is "Hello, hello, here is Radio Saigon." The brochure concludes by stating that "there are two other stations at Saigon."

These are the Government station, working with Paris and Japan on 24·91 metres, and a privately-owned broadcasting station, power 800 watts, on 31·5 metres. Has anyone ever heard of the last-mentioned? I have had several claims of reception of the Government station on 24·91, or 24·98 metres.

What exactly is Rome doing? From the latest information I have on hand, there is a large, blank space against him on 25·4 metres, followed by the words, "Now on 80 metres." Personally, I have not heard him on 80 for some weeks, and I have at least half-a-dozen letters remarking on his terrific strength, particularly during the afternoons, on 25·4. Can anyone clear the business up?

"N. J. B." is very worried because he has "My Screened-Grid Short-Waver," and can't receive much with it in spite of my frequent statements that conditions have been good. Well, "N. J. B.," don't blame the set, particularly as it has been going so well in the past, for conditions aren't always the same everywhere, and I don't write these notes from Co. Kildare! Quite possibly you are right in a trough of bad receiving conditions still. Even here things are so variable that I am afraid to make any comment on conditions for fear they change while I am writing!

The Vatican.

"B. T." of Hampton sends an interesting list of stations logged recently, awarding the palm to C T 1 A A, Lisbon, whom no one else ever seems to mention. This is the same station that is famous on the amateur waves for the length of his C Q calls and the number of DX stations that reply to all of them! Sorry, "B. T.," but I have no up-to-date information about E A J, W E O and W E J, except that the former is at Barcelona, and the other two, I believe, both at Rocky Point with the other R.C.A. bunch.

Several correspondents have heard Marchese Marconi and others speaking from the new Vatican station on 50·25 metres. This station appears to be received in this country at about the same strength as Rome, I 2 R O, although I must confess that I have not yet caught him.

A Boston Schedule.

Until February 28th, W 1 X A Z, Boston, Mass., is transmitting daily on 31·35 metres from 1200 to 0400 G M T, and radiating a series of programmes "dedicated to short-wave listeners." I am afraid it is rather late in February to listen for him, but there are some days left yet for those that have not already heard him. The schedule is as follows:

1200 to 1400: Central and South America, Siam, Dutch East Indies, Australia, Japan and Philippine Islands.

1700 to 1800: British East Africa, Madagascar, India and Siam.

1900 to 2100: Great Britain, Spain, Portugal, France, Morocco, West Africa, Italy, Scandinavia, Netherlands, Germany and all Central European Countries, South Africa, India and Australia.

2300 to 0200: Great Britain, India, Siam, Dutch East Indies, Philippine Islands, Japan, Central and South America.

I have given the schedule in full because it is rather interesting to note the best times for transmitting to the different parts of the world, as estimated by people who ought to know something about it!

(*Continued on page* 1124.)

CAPT. ECKERSLEY'S QUERY CORNER

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

TRAMWAY NOISES—WHAT IS OHM'S LAW?—HOW IS A CHARGE DISTRIBUTED?—BACKGROUND WITH FOREIGN STATIONS.

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.

Tramway Noises.

D. O. (Plumstead).—"I have a three-valve receiver which works perfectly, but unfortunately, I am situated rather near a tramway system. I find that when a tram passes my house, I get crackling noises in my loud speaker.

"How can I cut this out?"

I doubt whether you can overcome tramway noise by doing anything to your receiving set. It is, however, worth while trying some things.

For instance, your aerial should be as far away from the tram route as possible, and your set should be reasonably selective and not too sensitive for the station or stations it is desired to receive. The royal road to the elimination of tramway noise is to alter certain connections in the motors of the tramcar, or to get the tramway authorities to use a special form of collector bow.

The B.B.C. know more about this question in detail than I do and it would be worth your while to write to them, explaining your exact situation, when they might be able to help you in some way.

In certain parts of the country tramway authorities have been extremely generous towards the interests of the wireless listener and have done a great deal to modify the tramcar installation so that it shall produce the minimum of disturbance to listeners.

* * *

What Is Ohm's Law?

M. S. (Tilbury).—"I am a beginner, and I have often seen the words 'Ohm's Law' mentioned in articles. Will you please explain what Ohm's Law is?"

I am glad that as a beginner, you are beginning at the beginning and not at the ending, like so many beginners!

Ohm's Law expresses the relationship between electrical pressure acting around a circuit, to resistance to electric flow in that circuit, and to the rate of electric flow in that circuit.

Pressure is volts. Resistance is resistance, and rate of flow is amperes.

Consider a water pump, as shown in the diagram forcing water round a pipe. As the pump is driven faster the pressure it exerts on its outlet and the suck it exerts on its inlet is greater: the difference between the push and the suck is the pressure exerted by the pump.

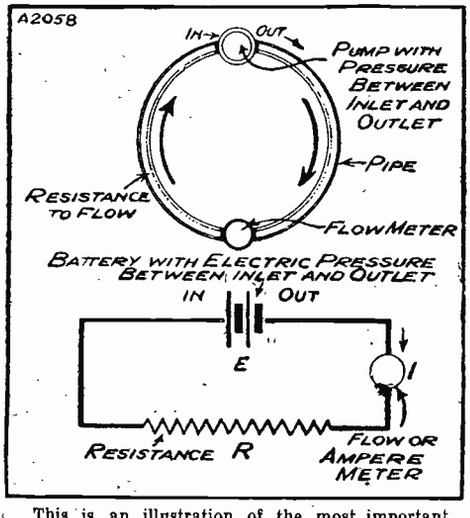
If you put a flow meter in the pipe, then, as the pressure of the pump is increased, the registered rate of flow will increase. If the pipe (with a given pressure) is narrow and furred-up inside it will take a big pressure to make a given flow.

If the pipe is large and smooth it will take a less pressure to make a given flow.

There is thus a clear relationship between pressure, resistance and rate of flow. Electrically, the pump is a battery having a voltage, the pipe is the conducting circuit and the rate of flow is measured in amperes and is called current.

The greater the pressure or voltage, the greater the current for a given resistance, the greater the resistance for a given voltage, the less the current.

OHM'S LAW



This is an illustration of the most important and valuable law in electricity and radio. Without it we should be almost powerless to design electric motors, lighting supplies, radio sets and transmitters, and a sound understanding of the simple law is essential before you can really grasp the principles of radio.

If we call E voltage, R resistance, and I current, then $E = R \times I$. $I = E$ divided by R. $R = E$ divided by I. This comes out in the right quantities if E is expressed in volts, I in amperes and R expressed in ohms.

That is Ohm's Law. It applies to alternating current as well as direct current, but any resistance to flow is then called impedance.

* * *

How is a Charge Distributed?

A. S.—"In a condenser with the dielectric wedge shaped, is the charge on the plates greater at the narrow end, or is it evenly distributed?"

If you have a wedge-shaped dielectric between two plates, and you fill one plate with a surplus of electrons the other plate with less, this is another way of saying that one plate is negative and the other positive.

Although the distribution of the electrons is actually non-uniform, being more dense where the plates are close together, actually the charge on the plate is no different from that when the plates are parallel at a difference of distance apart equal to the average distance apart when they are not parallel, or when, as you say, the dielectric is wedge-shaped.

For the purposes of definition the charge on the plate is equal to the capacity times the voltage. And so the actual charge in the plate—that is, the quantity of electricity—is equal for a given voltage to what it would be if the plates were parallel and of distance apart equal to the average distance apart when they are not parallel.

But the distribution of the charge is different when the dielectric is wedge-shaped from when the plates are parallel. It is a question of distinguishing between the total charge on the plates—which is unvaried if the plate is rocked round the average distance—and the distribution *of the charge*, which varies across the plate according as one part is brought nearer to the other.

* * *

Background With Foreign Stations.

L. R. (Cobham).—"I am rather keen on receiving distant transmissions, but I have never been able to tune in any of these distant programmes without getting some background of atmospheric or other noises.

"Is background inseparable from these long-distance transmissions, or is there a means of cutting this out?"

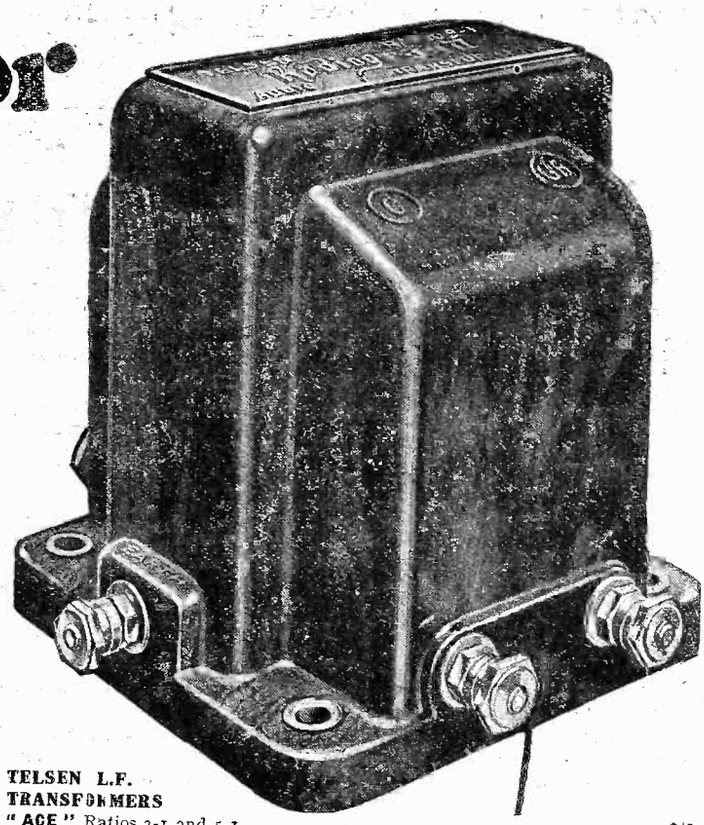
The degree of background is in direct proportion to the ratio between the absolute value of strength of the station you wish to receive and the absolute value of the background.

The powerful local station drowns all background almost always, the distant station is seldom strong enough to overcome quite feeble background. On the peak of strength a powerful foreign station received in country districts can be free from background, on an average strength a moderate powered foreign station received in the heart of a big city is never free from background.

Specified for The "COMET" & every other set of importance

If any further proof of the high standard of Telsen performance is needed, it is contained in the fact that in every new circuit of note the designer has chosen Telsen Components, thus assuring maximum results. For vivid clarity of tone, purity and volume of reproduction, Telsen Components are absolutely unrivalled. For perfect reception—fit

TELSEN COMPONENTS



TELSEN L.F. TRANSFORMERS

"ACE" Ratios 3-1 and 5-1	8/6
"RADIOGRAND" 3-1 and 5-1	12/6
(Specially Selected and Specified for the "Comet" 3.)	
"RADIOGRAND" Super Ratio 7-1	17/6

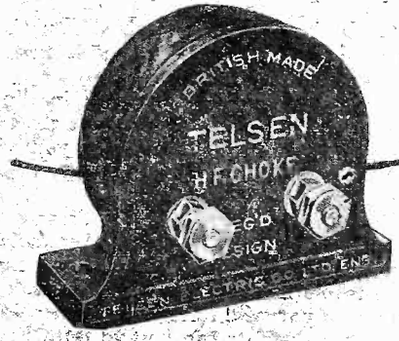
TELSEN GRID LEAKS.—Absolutely silent and non-microphonic, practically unbreakable, cannot be burnt out and are unaffected by atmospheric changes. Not being wire wound there are no capacity effects. Made in capacities ½, ¾, 1, 2, 3, 4 & 5 megohms. Price **1/-** each.

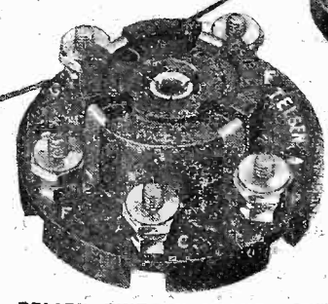
TELSEN FIXED (MICA) CONDENSERS.—Shrouded in Genuine Bakelite, made in capacities up to ·002 mfd. Pro. Pat. No. 20287/30. ·0003 supplied complete with Patent Grid Leak Clips to facilitate series or parallel connection. Can be mounted upright or flat. Tested on 500 volts. Price **1/-** each.

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.

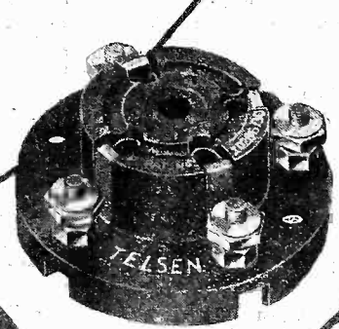
Price **2/6** each.

TELSEN 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.





TELSEN FIVE-PIN VALVE HOLDERS. Price **1/3** each.



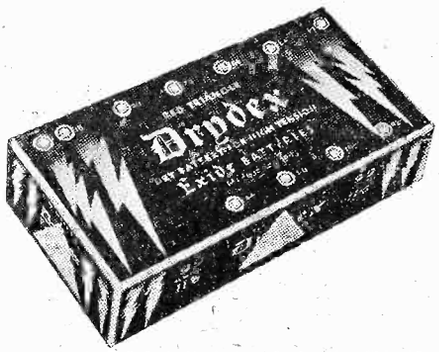
TELSEN FOUR-PIN VALVE HOLDERS
Specially Selected and Specified for the "Comet" 3.
Price 1/- each.

FROM THE TECHNICAL EDITOR'S NOTE BOOK.

Tested and Found—?

KITS FOR THE "COMET."

AS I have often said before, there is no better way of collecting the parts for building a set than by purchasing a complete kit from a dependable firm. In such conditions you have all the "collating" done for you, and all the little incidentals, such as screws, etc., are provided. And the panel is prepared and there remains only the simple job of screwing down the components and wiring them up.



One of the H.T. batteries made by the Chloride Electrical Storage Co., Ltd.

"Comet" kits, for example, are being sold by Ready Radio, and first-class kits they are, too. We've tested a "Comet" assembled from one of these kits, and it's just as good as our original model. Could more be said ?

DRYDEX BATTERIES.

Many people must have wondered when Chlorides, makers of those world-famous Exide accumulators, would turn their attention to the manufacture of dry batteries for radio H.T., flashlamps, bells, etc.

And now they have at last done so, and you will no doubt already have seen plenty of the advertisements figuring in the nation-wide publicity campaign that has been organised to introduce "Drydex" batteries to the world.

We know a bit about Chlorides—I've been up to their works at Manchester—and we also have had the opportunity of inspecting some "Drydex" H.T. batteries, and you can take it from me that they are decidedly good.

With the modesty of a great concern that has achieved its greatness through "service" as against sheer "stunting," Chlorides claim only that "Drydex" is as good as any and better than most—or words to that effect.

And when you come to think about it, reliability is what is most wanted in a battery, and if "Drydex" won't give you that, nothing so far made can.

FERRANTI CHART.

The Ferranti Screened-Grid Four and the Ferranti Three-Valve A.C. Mains Receiver form the subjects of two new constructional charts Ferranti's, Ltd., now have available for distribution to all those who care to write for them.

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.

A WONDERFUL S.G.

The latest addition to the Mullard range of receiving valves is the type S.4.V.B., a screened-grid valve for use with A.C. mains. It is of the indirectly-heated type, that is, it has a heater element which raises the temperature of the cathode by conduction through an insulating material.

The characteristics of the S.4.V.B. are as follows: Heater voltage, 4; heater current, 1 amp.; anode impedance, 257,000 ohms; amplification factor, 900; mutual conductance, 3·5. The valve is designed to operate with a maximum anode voltage of 200.

A grid bias of 1 volt is recommended. This latest Mullard product is extraordinarily efficient. Its characteristics are wonderful, and there is, of course, nothing like it in the form of a battery equivalent.

An amplification factor of 900 is enormous and the mutual conductance of 3·5 very clearly indicates "goodness." It is, in fact, about seven times as good as what would have been regarded as a first-class S.G. not so very long ago.

We tested the S.4.V.B. in a one-stage H.F. amplifier in the correct conditions as to voltages, etc., and using a high impedance intervalve coupling as advised (in this case a particularly efficient tuned anode scheme). Considerable amplification was achieved, and undoubtedly the results were superior to those normally given by two stages of three-electrode H.F. amplification.

The one stage was entirely sufficient for any ordinary purposes. The S.4.V.B. is, in view of its impedance, H.T. volts, etc., a welcome innovation. And Mullards could certainly call a halt and find no occasion to feel dissatisfied with the progress they have made in A.C. valve design for a very long time to come.

OUR DUAL-RANGE COILS.

Among the leading manufacturers who are making the "P.W." dual-range coils are Messrs. Peto Scott Co., Ltd., one of "P.W.'s" very earliest advertisers. It is almost unnecessary, in the circumstances, for us to say that the firm is making our coils very nicely, but I would like to add that it is obvious from the numerous samples I have seen that Peto Scott's are taking vastly more pains with this job than are some other manufacturers.

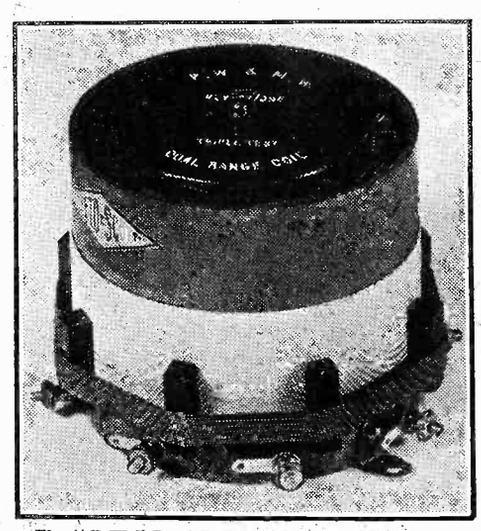
I think altogether there are about twelve firms making, no doubt in large numbers, the "P.W." dual range coils.

We feel absolutely confident that at least half are entirely trustworthy, but we cannot be absolutely certain about some of the others. True, we have had samples from most of them, but then samples sent in for test and report can vary somewhat from the articles sold to the public, a point I would urge "P.W." readers to remember.

They must not always take it for granted that they are going to be able to buy goods of the quality of the samples that we receive. However, firms like Messrs. Peto Scott, Ltd., and indeed one might almost say the majority of the advertisers in "P.W.," do not carefully pick out their test samples. Anyway it is certain that if you purchase a Peto Scott "P.W." dual-range coil it will be every bit as good as the samples I have been sent for the purpose of preparing this particular report.

A LOUD-SPEAKER CABINET.

The Carrington Mfg. Co., Ltd., inform us that their Melodee cabinet No. 1 size is suitable for the new "Special" chassis marketed by British Blue Spot.



The "P.W." Dual-Range coil, as made by Messrs. Peto Scott.

FLEXI-COUPLI

The panel-light indicates when the set is switched on, and provides ample illumination for tuning.

HERE ARE THE FIRST EASY-TO-APPLY ADDITIONS FOR YOUR "COMET" THREE. YOU NEED ONLY FIT THOSE YOU FEEL YOU REALLY WANT.

QUITE early on in the development of the "Comet" we took every opportunity of explaining the general idea of the set to people whose opinion seemed worth having, and then waiting for the inevitable comment.

It was quite amusing to note how promptly they told us it was hopeless! The mere idea of producing a "detector and L.F." receiver as "P.W."'s star effort for the season seemed to amaze them.

The Ideal Set.

They fully agreed that this was the ideal general-purpose type of set, with its economy, simplicity, power and reliability, but they couldn't imagine how it was that we seemed to have forgotten the modern need for selectivity.

Granted that we might have some fine schemes for obtaining perfect stability and tremendous power and good quality from the L.F. side, they didn't see how we could possibly expect a receiver of this type to cope with present-day "Regional" conditions.

Even the great improvement in sensitivity and selectivity achieved by the new "P.W." dual-range coil did not seem to them sufficient, for with so powerful a low-frequency amplifying side they knew there would be trouble with interference in the difficult areas close around a Regional station.

Privately we quite agreed with them, but since that remarkable "P.W." development, "Flexi-Coupling," was still a close secret we could not explain any further. Indeed, one of our main objects in soliciting these opinions was to get confirmation of our own belief in the need for a new device of this sort.

We have been considering this question of selectivity very closely and carefully of late, and we have come to the conclusion that the ideal should *not* be to raise the selectivity of *all* sets to the excessively high standard necessary in the areas close around a Regional station.

Knife-Edged Tuning.

To do so is simply to increase quite unnecessarily the cost and complication of sets so far as those readers are concerned who live outside the special areas in question. Why do it? Why not standardise two general types of sets, one for Regional areas and one for other places?

Possibly the practical difficulties of such a scheme might be too great, but the special system of progressive development which is such a fascinating feature of the "Comet" lends itself to the idea admirably. You will understand that what we gave you last week was the "Comet" in its simplest form, with just the essentials necessary to produce a really fine receiver.

This standard model has been so planned and designed that you can add very easily a whole range of special gadgets and refinements, and as this series progresses you can pick out just the ones which appeal to you, and put the others by for future consideration.

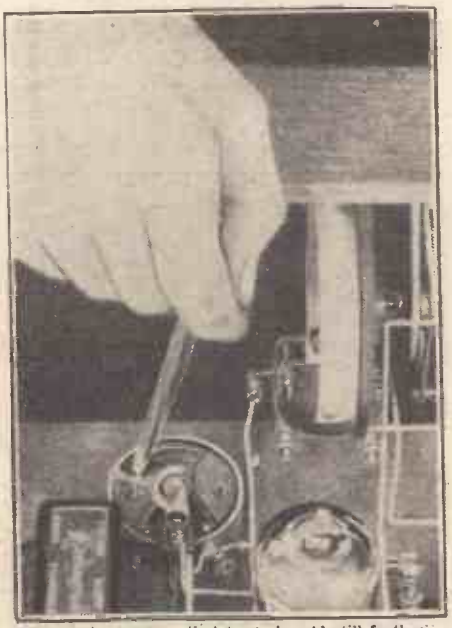
First we are dealing with "Flexi-coupling," the important "P.W." development which we are confident will revolutionise our readers' conception of what can be done with a detector and low-frequency receiver. This wonderful system gives you extraordinary selectivity, yet there remains only a single tuning dial or drum, and there is no ganging and no complicated system of matched coils or other source of unreliability.

All you add is a standard "Selector" coil, already in use for a different circuit in our sister journal

THE NEW CO

1 "Star-Turn" Selector Co
Wearite, Paroussi, Keyston
1 400 or 200-ohm baseboard-
(Lissen, or Igranic, Ready R
1 Panel light (Bulgin).

STILL MORE POWER



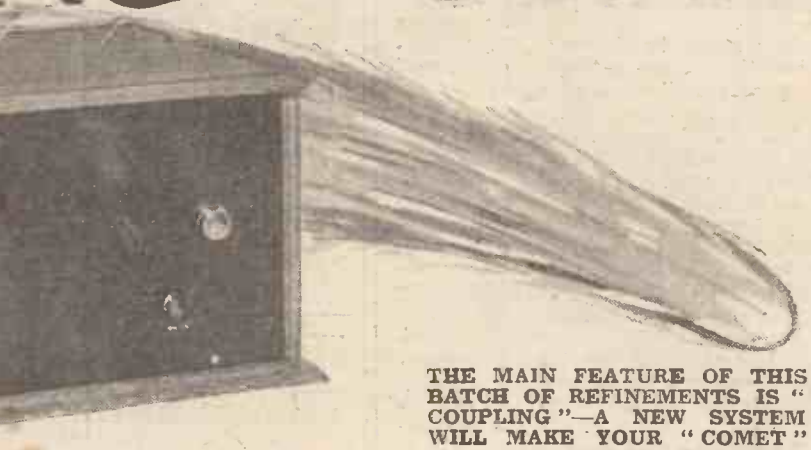
The potentiometer that tends to add still further to the power of the set, and makes the reaction wonderfully smooth.

AND IT'S SO SIMPLE!

Mr. G. P. Kendall, B.Sc., demonstrates the extreme simplicity of t

YOU CAN NOW GIVE YOUR "C

NG *the* "COMET"



THE MAIN FEATURE OF THIS FIRST BATCH OF REFINEMENTS IS "FLEXI-COUPLING"—A NEW SYSTEM THAT WILL MAKE YOUR "COMET" MARVELLOUSLY SELECTIVE.

"Modern Wireless," and a special coupling device which you produce with a little piece of rubber-covered flex (single, not double).

You then have what is really a fully-tuned aerial circuit, instead of the comparatively inefficient "aperiodic" system, used in the ordinary set. As a result, you then need only extremely weak coupling from the aerial to the tuned circuit proper, and this means knife-edged selectivity.

MPONENTS.

il (Ready Radio, or e, Magnum, etc.). mounting potentiometer adio, Wearite, etc.).

The fact that the aerial is now tuned to the station being received means better selectivity in itself, in addition to the effect of the weak coupling, and better volume, too. This last may surprise you, in view of the feeble coupling used, but try it out and you will find it is true.

ne "P.W." Flexi-coupling method of super station-selection

The Selector coil, you will find, has a knob controlling a stud switch, and this is your means of adjusting the tuning of the aerial circuit. It is not a critical setting, and adds scarcely at all to the complication of handling the set. Put the Selector roughly right, pick up your station on the tuning dial, then seek for the best stud on the Selector, and that is all.

To fit the coil, just drill a hole near the left-hand end of the panel, two inches therefrom and 3¼ inches down from the upper edge. (This is a corresponding position on the left to that indicated on the right of the panel in the diagram showing the fitting of a "panel light" to indicate when the set is turned on.)

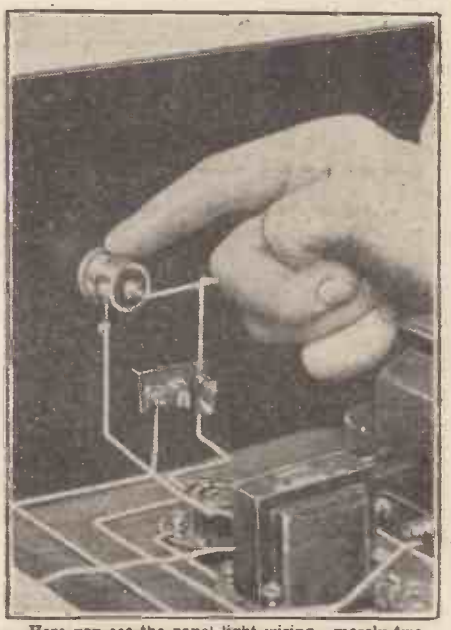
That done, remove the present wire between aerial terminal and selectivity control condenser. Instead, wire aerial to "A" on Selector coil. Wire "B" on Selector to point on selectivity control condenser from which wire has just been removed.

Now for the "Flexi-coupling." Take a length of single rubber-covered flexible, not too thick (*i.e.*, not the very heavy kind used for aerial leads), bare the end and secure it under "C" on Selector coil. Wind it twice round the dual range coil, at the top edge of the single layer winding or over this winding, and secure the end (bared) under the earth terminal.

As Sharp as You Like.

Now try out the set and see what amazing selectivity you get, with even increased volume. The beauty of "Flexi-coupling" is that you can adjust it to suit your exact selectivity requirements.

Thus, for more selectivity pull the two turns up on the dual coil to a position nearer the top and away from the single-layer winding, or try just one turn. For less selectivity and still better volume try three turns and adjust their position as before. You will find these simple little experiments extraordinarily interesting to carry out.



Here you see the panel-light wiring—merely two new leads.

Now about the other refinements suggested this week One is a panel light to warn you that the set is "on," and a diagram shows how to fit this and add the two new wires needed. Very useful gadget, preventing many a run-down battery.

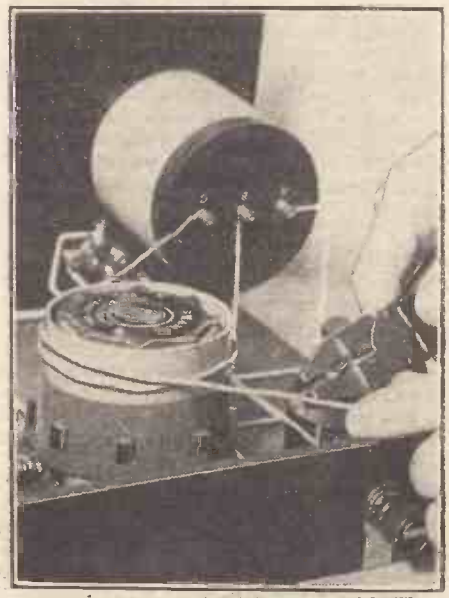
The other is a refinement we advise for all, because it enables you to get absolutely silky reaction with practically any detector valve. This is the potentiometer you see in the second diagram.

Adding a Potentiometer.

Note the removal of the wire between grid leak and detector filament. Wire leak instead to slider. Break present lead between filament of V_2 and filament of V_1, and insert new wires to join same points, but also to call on the way past, so to speak, at one terminal of "potmeter."

(Continued on next page.)

THE MAGIC TURN



The only coupling is via this turn or two of flexible wire—and yet you lose no power!

COMET" SUPER-SELECTIVITY

FLEXI-COUPLING THE "COMET."

(Continued from previous page.)

Wire remaining terminal of "pot'meter" to any convenient spot on the opposite side of the filament circuit, *i.e.*, the negative side. (A good point is the earthing terminal on the first L.F. transformer, as shown.)

To adjust, first turn slider round fully clockwise, then gradually bring it back until reaction *just* becomes smooth. Don't go too far or volume will suffer.

An Important Point.

This last is rather an important point. You can practically always get perfectly smooth reaction by turning the slider right round in an anti-clockwise direction, but with most detector valves you do not then get the best volume.

The idea is to keep the slider turned as far as possible in the clockwise direction without losing the wonderful silkiness of reaction control which a potentiometer provides. The best point is quickly found, and no further adjustment is needed. (That is why the potentiometer is not on the panel.)

Now let us add some final hints about the operation of the "Comet" when "Flexi-coupling" has been added. We should very much like to tell you more about the theory of "Flexi-coupling," but we must keep for the moment to its more practical aspects.

A Selector Hint.

The general idea we have already given you; the Selector is not critical in its adjustment, and so the set remains practically as easy to operate as ever. You see, you can leave the Selector switch almost anywhere, pick up your station weakly on the tuning dial, then bring the aerial into tune and get the extra power and knife-edge selectivity characteristic of a "Flexi-coupled" receiver.

It is important to understand that you will only get this wonderful selectivity when you have set the Selector switch to the right stud. Do not expect to get your station absolutely clear of all interference, therefore, until you have adjusted the Selector.

Just a little practice will show you how to make these adjustments quite quickly and easily. When you have tuned-in a given station, for example, you will find it is a good scheme to keep moving the Selector switch a stud or so at a time to follow up the movement of the condenser dial as you search for other stations.

To go over to long waves, by the way, there is a special setting of the Selector switch, since "Flexi-coupling" is not used on the long-wave range. (The normal selectivity of the "Comet" is ample here.)

Accordingly, the Selector must be turned round fully to the right until you feel it come up against the stop. It must be kept here all the time you are working on long waves, and only brought into operation again when you switch back to the lower wave-band. It is most important to follow this procedure exactly, or you cannot get the proper effect.

Now a wiring-up hint about the Selector coil. Be careful to check up your connections by the lettering of its terminals. Their position may vary a little in the different makes, but this doesn't matter a bit if you connect up *according to the markings.*

Volume Control.

If the coil is a home-made one, of course (see article elsewhere in this issue), you will remember the function of each terminal clearly and there will be no risk of any mistake. It is very important to see that there is no such mistake, because if the terminals are wired up in any other way than that described, proper results cannot be obtained.

The question of volume control requires a little consideration now that "Flexi-coupling" has been added. The power of the "Comet" is so great, you see, that precautions must be taken to prevent overloading and consequent distortion on the local station.

With the "Foundation" model it is pretty obvious what to do: Keep reaction at minimum, reduce the "selectivity control" condenser practically to minimum, and then de-tune a trifle if the volume is still too great.

When the "Comet" has been "Flexi-coupled" according to the instructions we have given on these pages you can no longer do this. The selectivity control now only operates on long waves, for which purpose it will usually be kept somewhere near maximum, by the way.

The necessary adjustment of selectivity on the medium wave-band to suit individual conditions is obtained by varying the "Flexi-coupling" in the manner we have described, but this cannot be pressed into service as a means of controlling volume.

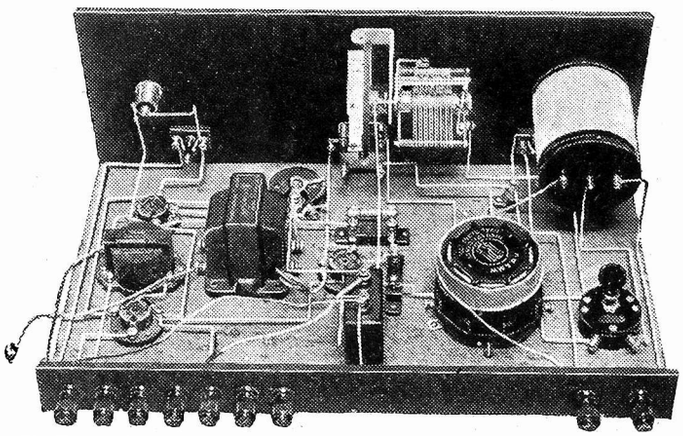
Instead, you can use a very simple scheme involving the de-tuning of the aerial circuit. As a rule, you will get quite a useful effect by turning the selector knob fully to the left, then just tune in the local on the condenser dial alone.

In this way the aerial circuit is thrown right out of tune, and the reduction of efficiency which then results is sufficient to cut down the volume of the local sufficiently in the majority of cases. If in some situations it does not, of course, all you have to do is to de-tune the condenser a little as well.

If in other localities rather further from the local transmitter too great a reduction takes place, the remedy is obvious: Just bring the aerial a little more into tune, or use just a mere trifle of reaction.

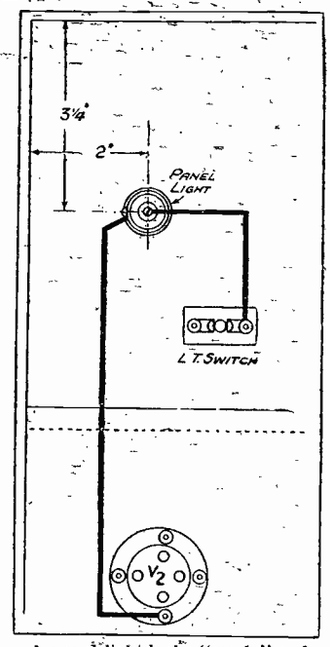
This method of setting about the solution of the problem of volume control enables quite good effects to be obtained, and a very little testing will show you what to do in future to meet the needs of your particular circumstances. Once determined the right adjustments for local reception with the best quality of reproduction can be found again in a moment.

JUST BEGINNING TO GROW



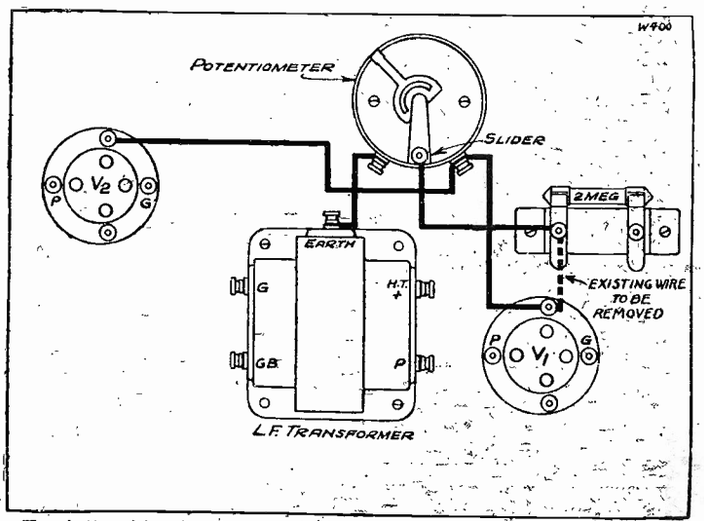
The Foundation "Comet" Three with the first batch of additions built in. Can you see now how "perfectly progressive" the design is?

SO SIMPLE!



A panel-light looks "posh" and takes no time to mount.

FITTING THE POTENTIOMETER



Here is the wiring for the potentiometer. You will find the trifling cost and time expended in fitting it very well worth while.

See also pages 1104 & 1107

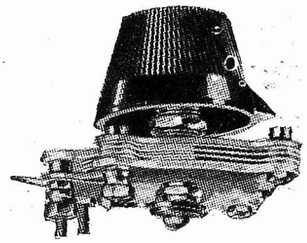
Flexi-couple your 'COMET' with a READIRAD 'STAR-TURN' COIL

No ReadiRad Coil leaves our Test Room until it satisfies the conditions laid down by "Popular Wireless" and has received an actual broadcast test.

This is the coil chosen by the designer for Flexi-Coupling the 'Comet'

An entirely new system of tuning which will give you an absolutely amazing degree of selectivity and actually increases the volume of distant programmes. You can add the ReadiRad 'Star-Turn' Coil to your 'Comet' Three quite easily and quickly, yet you will be amazed at the difference it makes. The ReadiRad Coil was chosen by the designer because of its high efficiency and accuracy of construction. Like all ReadiRad Components and Kits it is thoroughly tested and guaranteed before despatch. You naturally want the best possible reception from your 'Comet' Three—*make sure* of the best —use the ReadiRad 'Star-Turn' Coil. **12/6**

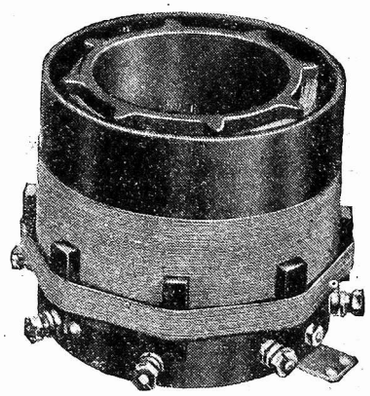
ReadiRad Reaction Condenser



Maximum capacity '00015 mfd. —the extra capacity range will give you beautifully smooth reaction control. Moving plates cannot short-circuit and all risk of earthing your H.T. positive is consequently avoided. Price **5/-.**

ReadiRad "Popular Wireless" Dual Range Coil

The Coil which is so largely r sponsible for the excellent performance of the 'Comet' Three. Covers medium and long wavelengths with an entire absence of the usual dead-end losses. Incorporates reaction winding. Made strictly in accordance with "Popular Wireless" Specification. Price **12/6.**



READY RADIO *for* IMMEDIATE DISPATCH

NOTES FROM THE NORTH

Topical news and items of interest particularly to Northern readers.

Contributed by OUR SPECIAL CORRESPONDENT.

WHAT a pity the relay of the Leeds pantomime on February 7th was not given in the National programme! Savoy Hill has not attempted any pantomime "O.B.'s" this year, whereas the Northern region has done three, and the last one, "Jack and the Beanstalk," from Leeds, was one of the finest theatre broadcasts ever given by the B.B.C. anywhere. It was also the occasion for an interesting experiment in broadcasting technique.

With many types of stage show, difficulty has hitherto been experienced in giving a continuous broadcast, owing to quick change of scene and rapid movements of the characters, and the previous pantomime broadcasts had avoided difficult scenes by going over to the studio for musical interludes.

A Wonderful Relay.

At Leeds, Mr. Victor Smythe, and Mr. Lionel Harvey, the engineer in charge, carried out experiments to see whether by the use of a greater number of microphones these difficult scenes could be effectively broadcast.

During the rehearsals of the broadcast, they found that it was possible to give a continuous relay of the entire first act (lasting two hours), and on the night of the broadcast eight microphones were used and the first act was transmitted in entirety.

It was a complete success. The pantomime was of a spectacular character, involving the movement of singers and speakers over a wide area of stage, but by the eight microphones (which I believe is a record for theatre broadcasting) distributed in various positions it was possible to transmit every sound clearly, and at even strength. The programme value of the pantomime was excellent and Mr. Smythe excelled himself as commentator.

Outside broadcasting has been one of the strongest features of Northern broadcasting during recent months. With test transmissions starting from Moorside Edge, there is a growing public interst in what programmes the new station will broadcast when it is in full service.

It will radiate both the National programme and the North Regional programme, and chief interest naturally surrounds the latter, as we all know what to expect on the National wave-length.

Splendid "O.B's."

The North Regional programme, on the other hand, is something new. Whether the programme organisers in the North of England can put up a satisfactory alternative programme in competition with Savoy Hill's National programme remains to be seen.

They are hard at work at Manchester, Leeds and Newcastle with their plans, and there seems to be an atmosphere of confidence in B.B.C. circles in the North.

Judging them by their recent programmes from the present North Regional stations, the musical programmes and outside broadcasting are their strongest lines.

This year, particularly, the Northern region has a splendid "O.B." record—the Manchester circus, the flyweight boxing championship at Manchester, a relay of Gracie Fields from the stage at Rochdale, an excerpt from Tommy Handley's stage show when it was at Blackpool, and the pantomimes at Manchester, Newcastle and Leeds, have been the chief "O.B.'s" and only one of them fell short of real success: the Newcastle pantomime.

Orchestra to be Disbanded.

As engineering achievements and for programme value, the rest were feathers in the cap of the North. It is questionable whether, since January 1st, the National programme has provided either such a variety or such a high standard of outside broadcasts.

In this direction one has no qualms about the future, but so far as music is concerned, one's estimate of the future North Regional programme from Moorside Edge is thrown completely out of gear by the decision to disband the Northern Wireless Orchestra.

If this orchestra were to be maintained, one would say without hesitation that the Northern programme will completely hold its own with the National.

I have expressed my opinion on this subject previously, and will not weary readers by repeating it. Instead, I will quote the wireless critic of one of the leading Northern papers, the "Yorkshire Evening Post." He says:

"It would be interesting to know why an orchestra which has made its mark in Northern programmes should be disbanded, especially at a time when we have been led to believe that with the advent of Moorside Edge the Northern standard will be improved.

"Unwise Move."

"It is not very difficult to trace the finger of London in the new move, and I can imagine that every effort has been made by the Northern authorities to convince headquarters of the unwisdom of their proposal. London, however, have not a very flexible mind, and *are not too well tutored in provincial tastes*, and it is hardly surprising therefore that the pleas made for the retention of the orchestra have been of no avail."

Note the phrase I have put in italics. It is an opinion held widely in the North of England.

We are told that the "nonet" which will replace the orchestra will be augmented from "time to time," and I gather that this may be fairly frequently. I hope so.

I understand that Mr. T. H. Morrison, the Northern Music Director, is to become musical adviser to both the Northern region and the Midland region. This is good news. In the North Mr. Morrison has steered the musical programmes on a very happy course, satisfying the demand for popular music, and yet maintaining a high standard.

No Proms.

The Northern "Promenade" concerts held experimentally last summer at Manchester, Leeds and Liverpool, are not to be repeated this year, but the relays of music from Northern holiday resorts will be a feature of the summer programmes as usual.

* * *

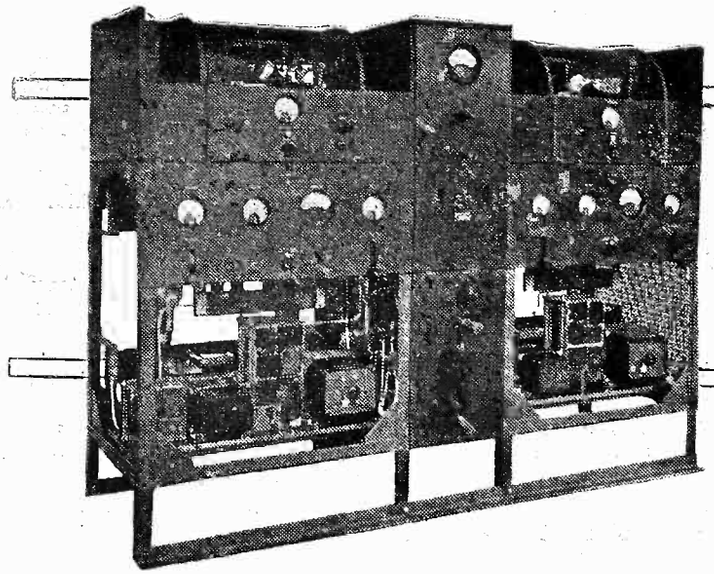
As we go to press we learn that during the past month satisfactory progress has been made in the installation of the transmitters and the equipment in the control rooms at the North Regional station.

It is probable that the North Regional transmitter, on 479 metres, will be heard testing outside programme hours before the end of February, but listeners should not attach any importance to the results of these unannounced tests, as we understand that the power or modulation may be widely different from that which will obtain during publicly announced test transmissions which will follow.

Statements have been made that there is some technical hitch in the design or equipment of the station. This we are told is quite incorrect, as there have been no delays other than those brought about by weather conditions and causes entirely outside the control of the Corporation.

COMPLETE WITH TRANSMITTER!

They are experimenting with kites carrying radio transmitters at the Slough Radio Research Station. They are one-valve transmitters using tiny cells for L.T. and H.T. and weighing less than a pound. The kite goes up to a height of about 500 feet, and 100 feet of the cable is aerial. A range of about one mile is achieved.



HIGH POWER PICK-UPS

An interesting article that shows you the inner workings of a talkie theatre, where the disc method of sound reproduction is in use.

By J. H. T. ROBERTS, D.Sc., F.Inst.P.

ELECTRICAL reproduction of gramophone records, which is now becoming so popular for home use, reaches probably its highest development in the cinematograph theatre where, of course, it is used in providing the synchronised sound for talking pictures (in cases where disc-records are used), and also for the musical and instrumental accompaniment effects to otherwise "silent" pictures.

In principle the electrical reproduction used in the cinema is the same as that used at home, but at the same time there are, as you may well imagine, many additional features, modifications and refinements necessary to suit the more serious and exacting conditions.

Enormous Volume.

In the first place, the volume of reproduction which is required is enormously greater than anything required in the home, and this fact alone greatly increases the problems involved in the design of the amplifiers and the loudspeakers.

To obtain enormously amplified volume without appreciable "scratch" or "background," and also without any serious distortion, is by no means an easy matter, and calls for the highest skill and care in the design and construction of the amplifiers and the loud speakers.

There are a number of gramophone equipments available for cinematograph purposes, and these usually comprise a turntable arrangement with electrical pick-up for playing the record and the necessary amplifiers and controls, these being enclosed or mounted for convenience in a metal container.

Non-Synchronised Records.

Where the record is synchronised with the film its rotation must, of course, be synchronously related to the movement of the projector, and usually the turntable is built up as part of the projector itself.

There is, however, a very large field for the entirely separate or non-synchronous turntable system, where the reproduction from the records, and the features projected upon the screen, although corresponding to one another in a general way, are not definitely synchronised. In this case the gramophone turntable unit is entirely separate from and not connected with the film projector, and may simply provide what is known as "incidental" music or "effects."

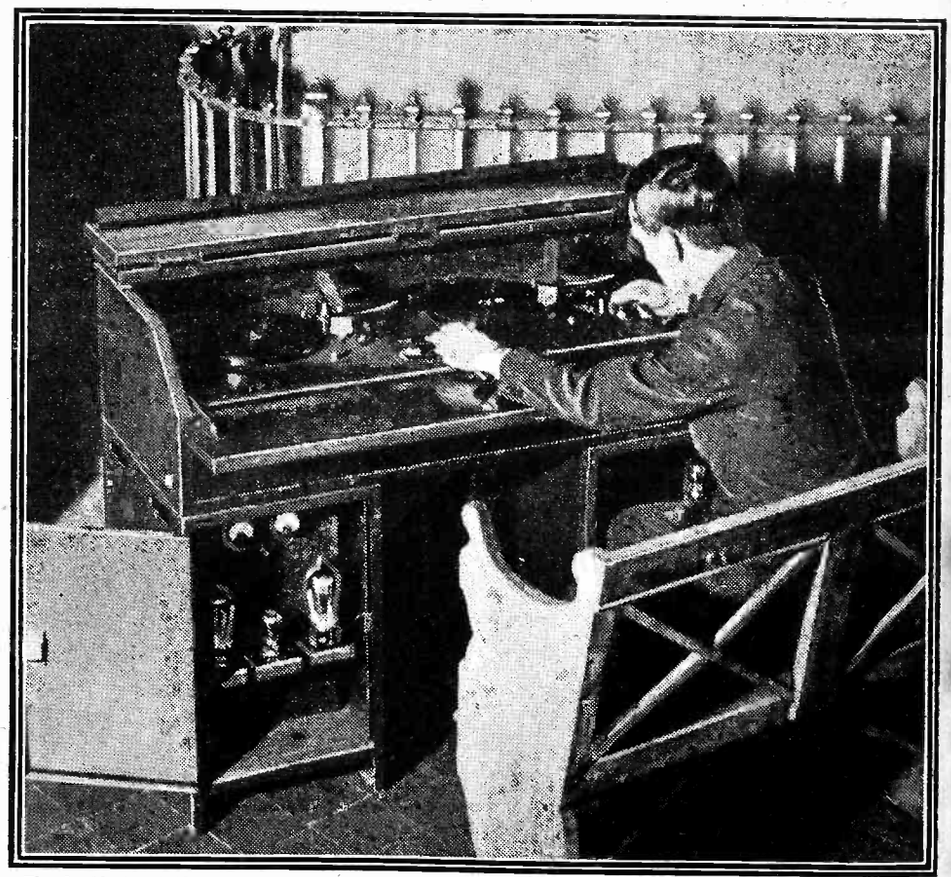
There are various types of cinematograph gramophone and amplifier units, and as a rule these employ at least two turntables, so that when one record is finished it is not necessary to interrupt the music whilst another record is substituted; the second record is already rotating on the adjacent turntable (each turntable being provided with its own pick-up), and by means of a control switch the completed record is "faded out" whilst the second record is at the same time "faded in."

Arrangement of Amplifiers.

The turntables, driving motors, pick-ups, amplifiers, switches and controls are usually made up into a complete unit, which is encased in a metal container both for

(*Continued on page* 1108.)

"BROADCASTING" BOW BELLS



The double turntable electric gramophone system installed in Bow Church, whence, by means of a speaker in the steeple, records of the famous Bow Bells can be "broadcast." This is being undertaken in connection with an effort to raise money for the putting of the old bells in order again.

Approved Kits ready for immediate despatch

LIST OF APPROVED COMPONENTS

	s.	d.
1 Ebonite panel, 18 in. by 7 in. (drilled to specification)	6	0
1 J.B. or Cyldon ·0005-mfd "thumb-control" variable condenser	11	6
1 ReadiRad ·00015 differential reaction condenser	5	0
1 ReadiRad L.T. Switch		10
1 ReadiRad 3-point on-and-off wave-change switch	1	6
1 ReadiRad "P.W." dual-range coil	12	6
3 Telsen valve holders	3	0
1 ReadiRad ·0003-mfd. fixed condenser		10
1 T.C.C. 2-mfd. condenser	3	10
1 ReadiRad 2-meg. grid leak and holder	1	4
2 L.F. Transformers: Telsen "Radiogrand" and Igranic "Midget"	12	6
1 ReadiRad 10,000-ohms spaghetti resistance	10	6
1 ReadiRad 25,000-ohms spaghetti resistance	1	0
1 Lewcos ·001-mfd. maximum compression type adjustable condenser	2	6
1 Formo ·002-mfd. maximum compression type adjustable condenser	2	3
1 ReadiRad drilled terminal strip, 18 in. × 2 in.	1	9
1 ReadiRad sheet of copper foil, 18 in. × 10 in.	1	6
9 Belling-Lee terminals Type "R"	2	3
3 Belling-Lee G.B. plugs		6
1 Packet of Jiffilinx, for "wiring-up"	2	6
	£4	5 0

Additional Components for Flexi-Coupling Comet	s.	d.
1 ReadiRad 1931 "Star-Turn" Coil	12	6
1 Readi-Rad 400-ohm Potentiometer	2	9
1 Bulgin Signal Lamp (D.9)	2	6
1 Low Consumption Bulb 2, 4 or 6 volts (*when ordering please state which voltage is required*)		6
	18	3

ANY PART CAN BE SUPPLIED SEPARATELY.

THE COMET THREE

KIT A Complete kit of components as specified. Price **£4.5.0**
or 12 monthly payments of **7/9**

KIT B Complete kit of components as specified with set of three Mullard Valves. Price **£5.12.6**
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KIT C Complete kit of components as specified with set of three Mullard Valves and attractive oak cabinet. Price **£7.2.6**
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THE FLEXI-COUPLED COMET

KIT A As Kit A above but with additional components specified for Flexi-Coupling. Price **£5.3.3**
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KIT B As Kit B above but with additional components specified for Flexi-Coupling. Price **£6.10.9**
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KIT C As Kit C above but with additional components specified for Flexi-Coupling. Price **£8.0.9**
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THE COMPLETELY ASSEMBLED FLEXI-COUPLED COMET — READY FOR USE— AERIAL TESTED. Including Royalties. With Flexi-Coupling tuning, valves and cabinet.
£9.5.9 or 12 monthly payments of **17/-**

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Save time and trouble and give you perfect connections throughout.

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Telephone: Hop 5555 (Private Exchange). *Telegrams: READIRAD, SEDIST.*

Please send me—

1 Comet Three Kit A at **£4-5-0** or 12 monthly payments of **7/9.**
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1 Flexi-Coupled Comet Kit B at **£6-10-9** or 12 monthly payments of **12/-.**
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(Cross out items not required.)

CASH ORDER FORM
Please dispatch to me at once the item marked above for which I enclose payment in full of £.....

C.O.D. ORDER FORM
Please dispatch to me at once the goods specified for which I will pay in full on delivery the sum of £.....

HIRE PURCHASE ORDER FORM
Please dispatch my Hire Purchase Order for the item marked above for which I enclose first deposit of £.....

FREE. Every purchaser of a Ready Radio Comet Kit will receive free one Atalanta Radio Screwdriver with full sized blue print and full instructions for building the Comet Three.

Name.....

Address.....

.....

Nearest Railway Station.....

HIGH-POWER PICK-UPS

(Continued from page 1106.)

mechanical protection and also for electrical shielding.

In one well-known unit of this kind transformer-coupling is used for the amplifier, transformers being arranged in parallel, with an output of about ten watts from four valves also arranged in parallel. Additional power can also be obtained if necessary by the addition of extra valves in parallel.

The Induction Motor.

The record turntables are driven by electric motors, and in some cases these are of the "induction" type, whilst in other cases they are of the "universal" type, employing a commutator. The universal type of motor, as its name implies, can be used on either A.C. or D.C. supply, and if it is wound for, say, 100 volts, it also becomes "universal" for different *voltages* by the simple process of including an adjustable resistance in series with it.

The Universal Motor

The objection is sometimes raised to the universal motor that sparking at the commutator causes crackling in the loud speaker, but with proper precautions this objection really amounts to very little. Another small point is that the universal motor generally runs at a fairly high speed, and this is sometimes apt to give rise to a certain amount of mechanical vibration of the record.

Completely Isolated.

On the other hand, the induction motor has the undeniable advantage that the armature is completely isolated electrically from the rest of the motor; consequently there is no need for any commutator or any other type of electrical connection to the armature.

It goes without saying that sparking troubles must, therefore, be non-existent. Furthermore, it is possible, by a suitable design, to arrange for the armature to be directly mounted upon the turntable spindle so that it rotates at turntable speed and, in view of this very slow speed, mechanical vibration troubles are also virtually eliminated.

Of course, the induction motor, although it can easily be made universal for *voltage*, can only be used on alternating current supply, and therefore is ruled out where the supply is D.C.

Watching for Distortion.

As a rule a milliammeter is constantly in circuit with the amplifier so as to indicate the anode current of the output stages, and also a careful watch on the needle serves as an instant indication of distortion due to overloading.

The high-tension current for the amplifying valves is often provided by means of a small motor-generator unit, the generator usually developing something between 600 and 1,000 volts D.C. If the mains supply is alternating current, the motor to drive this generator may also be of the induction type, which again helps to avoid any interference troubles.

Accumulator L.T.

Of course, it is impossible to adopt the same principle with the D.C. *generator*, which must have a commutator in the usual way, but by making the commutator with a large number of segments the commutator ripple becomes high-pitched and is comparatively simple to smooth out.

Generally the filament current for the amplifying valves is supplied by a heavy-duty low-tension accumulator-battery; in some cases this serves as a "buffer," and is actually on charge whilst it is in use, but preferably the battery is disconnected from charge whilst in use, and a second battery is on charge ready to be instantly switched in in substitution if necessary. Usually a third battery is also available as a standby in case anything should go wrong with either of the other two.

The controls include the change-over switch mentioned above, the main switch for connecting up the gramophone motors and the supply to the amplifier, speed control for the motors and a volume control for the reproduction.

STOPPING STATIC

Trying out a new German device for the elimination of radio interference caused by sparking trolley-poles on tramcars. It consists of a scheme that bypasses the spark energy to earth, thereby preventing the spark forming.

'TWIXT LONDON AND LINER

The little daughter of the assistant chief engineer of the "Majestic" speaking to her father, from a recent exhibition in London.

RECORDING AND REPRODUCING

How Records are Made

By C.M.

QUITE an interesting way of considering the electrical recording of gramophone records is to look at it as just a reversal of the process so many of us employ to play our records electrically.

Fundamentally, the apparatus used is very similar, although, of course, the power employed in the recording amplifiers is much greater. Instead of a loud speaker which gives out sound by changing electric currents into sound waves, a microphone is used to "take in" sound by changing sound waves into electric currents.

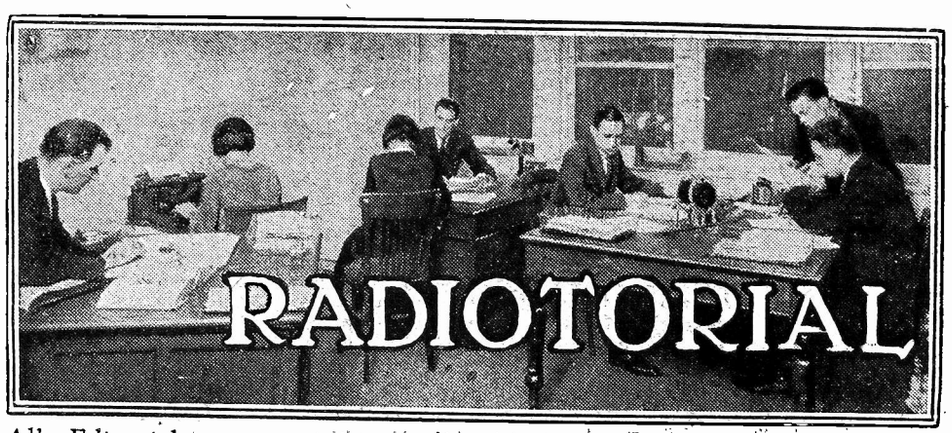
"Pick-up" Working Backwards.

Having thus obtained our varying electric currents, they are amplified by the valves just as the varying pulses from our pick-ups are amplified. When the pulses, much magnified, arrive at the amplifier output, they are fed into what is really a glorified pick-up working backwards.

Instead of the needle movement causing current to flow in the windings as in the case of a pick-up, currents flowing through the windings from the amplifier cause the needle to move. This needle, or stylus, as it is called, is arranged so that it traces a wavy line on a soft wax record which is afterwards specially treated and used to provide moulds for making the ordinary records.

HELLO, AUSTRALIA!

Another example of trans-oceanic telephony. A well-known Australian singer ringing up her home after her recent marriage in London.



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

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. Lile, 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

USING COMPACT TRANSFORMERS.

"MORRIS COWLEY" (Torquay).—"My intention is to pack the whole set into a small attaché case, and with this in view I would like to use one of the nickel-iron-core transformers instead of the larger one. I have been warned that they are inclined to saturate rather easily and cause distortion.

"Although the set will not be used for powerful loud-speaker work, I particularly do not want any form of such distortion, so I dropped a line to the transformer people, and they suggest using 'parallel feed.' Would that be likely to help, or shall I do better to stick to the older types?"

You do not say what valves you are using or the circuit position of the transformer in question, but if it is to be in the detector with a small plate current you should not be troubled with saturation distortion.

To shunt feed the transformer is certainly a step in the right direction; but, on the contrary, you would then have to use a resistance and coupling condenser, which might rather offset the advantages of the smaller size of the nickel-iron transformer compared with its larger brother.

We are afraid that in the absence of definite data as to size, etc., the question is one you will have to settle for yourself, taking into consideration the relative space demands and the recommendations of the manufacturers. If these latter are faithfully observed there should certainly be no distortion from the method.

GETTING SOME MORE STATIONS.

"AGE 15" (Westcliff-on-Sea).—"I have a good one-valve set with only one centre-tapped coil. The National comes in at 60 and the Regional at 130, using a 60 coil.

"Are there any other short-wave stations I could bring in? If so, would you be good enough to tell me what coil I should need?

"If there is any need I am willing to add one more valve to my set."

(*Continued on page* 1112.)

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.

LONDON READERS PLEASE NOTE: Inquiries should NOT be made by 'phone or in person at Fleetway House or Tallis House.

THE "CLEAR-CUT" CONE.

The Editor, POPULAR WIRELESS.

Dear Sir,—We wish to congratulate you on producing another winner, viz., the "Clear-Cut" Cone. Having made up this cone to your directions, and being amazed at the life-like reproduction, we decided to increase the size of the cone to twelve inches, and can say without any exaggeration that its truthful representation of music and speech surpasses anything we have heard before; in fact, its faithful interpretation sets it far above any other cone speaker, irrespective of price.

This cone, used in conjunction with the "Titan" Four, is as fine an outfit as anyone could wish for.

In conclusion, we should like to add there are in our circle ten faithful adherents to your "Titan" sets, who have nothing but praise for the originators of same.

Thanking you for a reproducer which is par excellence.

Yours faithfully,
CYRIL J. BROOKS.
ALEC S. S. RYELAND.
Plymouth. B. MARCH.

OUR "DUAL-RANGE" COIL.

The Editor, POPULAR WIRELESS.

Dear Sir,—As a regular reader of POPULAR WIRELESS, I thought I would let you know my experience with the new Dual-Range Coil.

I have incorporated one of these coils in my "Magic" Three, and results are simply splendid, giving better volume and purer tone.

I might add, I am using an indoor aerial, and can bring in a great number of foreigners at full loud-speaker strength.

Have recently built "Interchange" Three, which is an excellent set, although it has not the same punch as the "Magic" Three, which I consider one of the best circuits published.

Wishing your paper every success, I remain,
Yours faithfully,
W. J. SMITH.
Needham Mkt., Suffolk.

THE "CHEF D'ŒUVRE."

The Editor, POPULAR WIRELESS.

Dear Sir,—May I take this opportunity of thanking you for a fine receiver, namely, The "Chef D'Œuvre." On December 31st, 1930, I decided to scrap my old set and build the Chef D'Œuvre; January 2nd, 1931, stations coming in all over the dials with clearness and power, which I have yet to hear a three to beat. I might say, for example, of pulling power, that situate in Lincs I can receive Midland or National 5 X X without an aerial, which I think speaks well for a three-valve receiver. The selectivity is really great, the set laughs at the idea of interference from Mühlacker when you are listening to London Regional. May I thank you once again for a fine set?

Yours truly,
Near Scunthorpe. A. E. SYKES.

CORRESPONDENCE.

"P.W." SET SUCCESSES

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.

THE "MAXI-POWER" FOUR.

The Editor, POPULAR WIRELESS.

Dear Sir,—Referring to T. C. C.'s letter in a recent "P.W." If it is not too late, my experience with the "Maxi-Power" Four may be of some help to him.

I built up that particular circuit soon after it was published, and experienced the same difficulties as T. C. C. It was not until I had tested all and sundry in the set (and not without some gnashing of teeth) that I discovered the 3-point switches I was using were not 3-point "wave-change."

After these had been replaced by wave-change switches the trouble was not entirely cancelled out, for I found that a variable condenser I was using in the anode circuit was not of the ·0005 capacity.

This was replaced by a new one of the ·0005 capacity, and the trouble ceased, in fact, the tuning is so sharp on both ranges it almost severs the aerial.

Wishing "P.W." continued success, I am,
Yours faithfully,
Coventry. ALFRED HITCHENS.

THE "NIGHT-FLIGHT" THREE.

The Editor, POPULAR WIRELESS.

Dear Sir,—I feel I must write to congratulate the "P.W." staff for that splendid circuit, the "Night-Flight" Three. Using Clix valve holders and Lissen 8s. 6d. transformer, in first evening's test, W G Y, Radio Maroc, R F L and Nancy. Since then countless amateurs, K D K A, Bandoeng, 5 S W, and T. Telephone. I have built for myself and friends several short-wavers, including the white print "De Luxe" Short-Wave Three-two-valve white print short, waver, the "Lo-Wave" One, "Reacto" One, "Magic" Three, Two and One. One thing I cannot understand is, practically every week "W. L. S." has something to say about hand capacity and threshold howl.

Why? Tuning the earth lead with a variable again, why? The only hand capacity I have met, and only slight, was with the "Magic" Three, this stopped at once on rewiring with 18 S.W.G. bare wire and Triotron S.D.2 in place of P.M.1H.F. Threshold howl definitely never.

My short-wave aerial is 20 feet long and the earth six feet, and hangs from the same mast that carries the broadcast aerial, but vertically. I should very much like you to convey my thanks to Mr. L. H. Thomas (6 Q B) for his short-wave set, the "Digger," which I am also using, with the exception of 4 mfd. for the anti-mobo instead of 2 mfd. My most consistent stations are Rome, 80 metres, and W 3 X A L, Bound Brook, N.J., 49–18 metres, night after night. Re the letter in a recent "P.W." from R. L. S., Sutton, Surrey, I have also had this trouble, A P.M.2 power valve I have works fine in the "Magic" (Benjamin valve holder), but not a whisper in the "Night-Flight." The legs are well open, clean, and both valve holders are in perfect condition, neither will it work as first L.F. in the "Digger." I took it out for a walk one evening and tried it in "Sharp-Tune" Two and "Neutype" Four. Quite O.K., and I think I will leave it in the "Magic" till it dies, and then have it stuffed. And now I'll get on with the "Globe Trotter."

Thanking you and your staff once again,
Yours truly,
Romford. G. W. CLAYTON.

THE "EASY-CHANGE" THREE.

The Editor, POPULAR WIRELESS.

Dear Sir,—I felt I must write to tell you about your wonderful set, the "Easy-Change" Three, the blue print of which you gave away some little time ago. I am sixty to seventy feet above the road, but have a "gas-pipe" earth, and an interior aerial. In spite of this, I get twelve foreigners at L.S. strength, audible at ten feet from the L.S., and fifteen others at moderate volume, with no interference from London. Even Graz and Mühlacker are not interfered with by London. I have NO wave-trap!

With many thanks for such a fine, inexpensive set.
Yours faithfully,
Upper Street, N.1. IVOR B. M. LOMAS.

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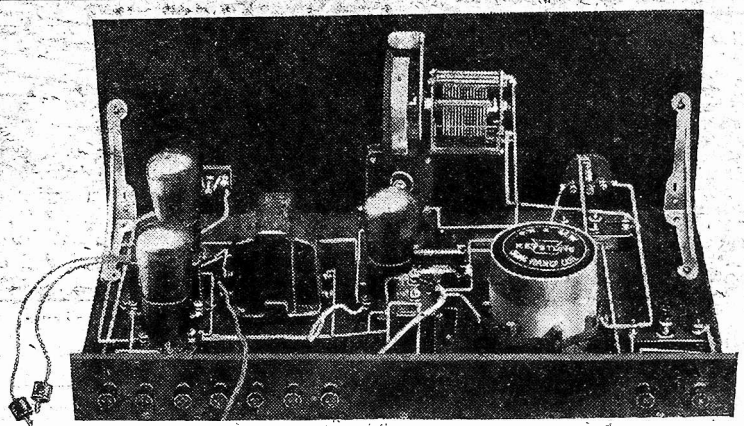

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FREE Every "Comet 3" Pilot Radio Kit contains a **FREE KONECTERKIT,** comprising Panel Brackets (Keystone Die-cast Aluminium Brackets with patent slots), wire for connecting, wood screws, G.B. plugs, etc. **Worth 5/-**

FREE Every purchaser of the Pilot "Comet 3" Kit will receive Free a full-sized blue print and a copy of "Popular Wireless" containing full constructional details.

FREE The owner of a Pilot "Comet 3" becomes automatically entitled to Free Technical Advice and Assistance.

Endorsement from "Popular Wireless."

3rd February, 1931

Dear Sirs,

"We have completed our tests on a model of the 'Popular Wireless' 'Comet 3' Receiver made up from your kits of parts, and have pleasure in informing you that the results obtained were fully up to the standard set by the original instrument.

(Signed) G. P. Kendall,
Research & Constructional Dept."

FLEXI-COUPLED "COMET 3"

(as described in this issue)

Extra Components

1 Keystone Star-Turn Selector Coil - 10/6
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FREE Please send me your Pilot Radio Chart with full particulars of the Guaranteed Pilot Radio Kit for the "Comet 3" as described in "Popular Wireless."

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FIRST WITH THE "COMET 3" IN 1931

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 1110.)

Most long-distance one-valve sets intended to get foreign as well as local stations use *two* coils, so we are a little uncertain as to what kind of circuit you have. Apart from the switch which puts it on and off, have you only *one* variable control, or are there two, one for tuning and one reaction?

If the former is the case, your set is definitely unsuitable for long-distance reception, and you would do better with one of the "P.W." sets of the one-valve type, which employ reaction and are suitable for foreign stations, such as the "Dual-Coil" One, "P.W." No. 440.

If, however, your set has a reaction control or a control marked "increase" or "strengthen," you should now be able to get plenty of stations besides the two London ones *if it is handled properly*. This is vitally important.

Full instructions for handling such a receiver were given in our free booklet called "The Key To The Ether," which was presented with "P.W."

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

It was stated on page 984 of "P.W." No. 453 (Feb. 7th issue) that 2 amp. is a usual rate for charging, and on mains of 200 volts or over this means one lamp of 40 watts in either socket. (Not in *both* sockets.) Constructors of the "Safe-Power" Charger should note that on 100-volt mains a lamp of 20 watts (not 80 as stated) is needed, or a pair giving a total wattage of 20.

CONDENSER CONNECTIONS.

H. H. B. (London, N.6).—"I notice in the diagram of the 'P.W.' Crystachoke, on page 689 (No. 445), and in the instructions given for wiring on page 930, the leads to variable condensers are reversed (different).

"Should earth be connected to the fixed vanes or to the movable vanes, or does it not make any difference?"

In a crystal set, where hand-capacity effects are never troublesome, it does not matter which way round a variable condenser is wired, results being just as good one way as the other.

Usually with valve sets the *moving* vanes of the variable condenser should go to *earth*, so this has somehow generally come to be regarded as the right method of connection.

In the Crystachoke it will not make the slightest difference which way round you connect the condenser.

THE SWITCH FOR THE "CRYSTAPHONE."

As not every constructor is able to read dimensional drawings with ease, a few additional details of the 'phone switch for the Crystaphone are given below.

The drawing on page 1029 ("P.W." No. 454) shows the switch as seen sideways. One inch from the left-hand end of it you have a $\frac{5}{8}$-in. wide wooden supporting pillar, on which is hinged a long crossbar. A home-made spring (turned up from odd wire) tends to hold this arm or crossbar level with the baseboard.

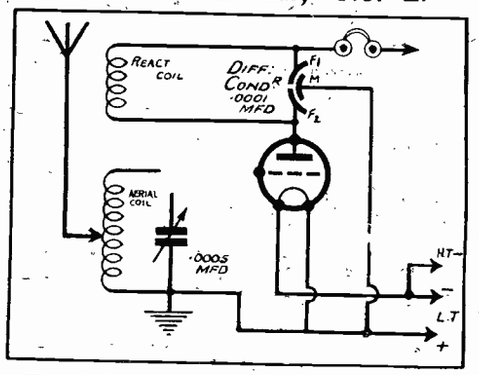
But on the right-hand end of that arm, half an inch from the end, is a long piece of twisted wire shaped into a hook and passing through a hole in the baseboard. When the 'phones are placed on that hook down comes the crossbar, until it reaches the "stop," which is fixed in the middle of the baseboard.

This stop is a little wooden block, carrying a strip of metal foil to make electrical contact with a flex wire. That wire, you will see, goes to the bottom end of the adjacent coil and to the terminal marked A_2.

Underneath the crossbar at the point where it touches the stop below, is a cheese-headed screw carrying another flex wire, this one going to the A_1 terminal and to the tap on the coil.

The only mechanical requirements are easy movement and robustness, and correct tension on the spring, which is easily arranged. Electrically the switch is equally simple, all that is necessary being good firm contact when the 'phones are hanging on the hook.

MISSING LINKS, No. 2.



Here is the second of our "Missing Link" diagrams, purposely left incomplete. You will see that the grid of the valve is not connected at all, and one side of the aerial coil, and one side of the aerial condenser, are "in the air."

CAN YOU COMPLETE THE DIAGRAM?

(Look out for the answer in next week's "P.W.")

THE "CLEAR CUT" TWO.

"Railway Man" (Crewe).—"One of our chaps here has a Blue Spot unit to which he fitted a home-made cone which is a fair treat to listen to. The man he got it from made it from directions in your paper, but all we can find out about it is that it was called the 'Clear Cut,' and it is a kind of double cone, one pushed through the other. Can you tell me what number of Popular Wireless it was described in?"

The "P.W." "Clear Cut" Cone to which you refer was described in our December 27th, 1930, issue, No. 447.

(*Continued on page* 1114.)

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1112.)

HOT STUFF!

"THERMO" (London, S.W.3).—"As my mains are alternating current I took the advice of a friendly dealer and fitted an A.C. power valve, and to me it was a surprise. The volume and quality are simply wonderful, but I am a little bit worried about the way it gets hot. The other two valves in the set are cool enough, but this last one gets very much hotter than my other power valve used to do. Probably it hands out quite double the power, but is it right for it to get so hot that I dare not touch it?"

It is quite in order for a power valve to get much hotter than any of the other valves, but it should certainly not get so hot that it is impossible to touch it while working. If you are getting about double the power you had from the last valve you probably should be getting about double the heat also, but just to make sure all is O.K. we should watch the valve carefully to see that there is no trace of blue glow whilst it is working, and make quite certain that it is getting the correct grid bias and H.T. voltages recommended by the makers. If at these voltages the anode current as measured by a milliammeter (your dealer friend would lend you one) is normal, you can be sure that the valve is working O.K., but if you have any doubts you should drop the makers a line rather than go on using a valve which did not behave normally.

VIOLENT OSCILLATION.

D. G. G. (Colchester, Essex).—"Results were far above my expectations and, in fact, were excellent except for one peculiarity. That is violent oscillation on any wave-length above 500 metres.

"It is impossible for me to use the top end of the scale because of this, which is all the more surprising when I tell you that the actual results are very smooth and sweet from just below this point to the bottom of the scale. What do you think the trouble is?"

The circuit shown on your diagram is so straightforward that it is free from suspicion, and one of the components must be causing the trouble. We are inclined to suspect the H.F. choke. If the inductive value of this is rather low there may be an unwanted tuning or resonance effect which would be overcome by wiring in series another H.F. choke, or by using a choke of greater inductive value. Alternatively a large plug-in coil can be employed for medium waves if it could replace the present choke without spacing trouble arising.

THE PENTODE'S PLATE CURRENT.

D. F. Y. (Cheltenham).—"I reckon I can safely call on my H.T. supply to give quite ten milliamps to the power valve, but the pentode I propose to use takes a plate current normally of 12. I was thinking of biassing down a little and probably reducing H.T. a bit to make this change, but a friend has pointed out that I am not reckoning on the current taken by the pentode's extra screened grid. Will this be enough to matter?"

Probably it would make all the difference in your case, for you admit that you are prepared to supply only ten milliamps where twelve would be better for the plate current. It is not unusual for the screening grid to take three or more milliamps, as a milliammeter inserted in this part of the circuit will show, so we certainly should not attempt to run the pentode unless you are prepared to increase your H.T. supply.

HOW TO START.

T. L. (Ashton-on-Ribble).—"My latest venture is a detector-pentode, run straight off the electric light. With only its two valves it is an absolute revelation of what can be done in distance and quality.

"It is streets ahead of any three-valver I have yet known, and, of course, very easy to handle. For foreign stations reaction has to be adjusted properly, but that is nothing to worry about.

"What does puzzle me is why it is so slow to start. At first when you switch on nothing happens. Silence.

"After about 30 second's time—generally just over a minute—the loud-speaker gives a 'click,' and then more silence. A little later I get very, very weak voices or music.

"Then this slowly gets louder and louder, till the strength is tip-top, after which the set works in fine fashion. Why is it so slow to start?

"I ought to say it is always like this—always has been. But switching off is normal.

"As soon as I put the switch 'off,' the programme goes snap. Like an ordinary set, no dying away, but a direct cut-off. So why the delay in starting?"

Both the unusually good results and the slow start when first switched on are quite normal when working with A.C. indirectly-heated valves. The special construction of these valves results in remarkably good characteristics of magnification, etc., owing to the fact that the "filament," or rather the cathode, has no heating current flowing through it, as in an ordinary valve.

The actual heating is done across an insulator, the heater being run direct from the mains through a suitable step-down transformer. The cathode is

(Continued on page 1116.)

"P.W." PANELS, No. 7.—REACTION.

Reaction is usually varied by alterations in the capacity of a variable condenser.
It is to some extent dependent on the tuning, and should therefore be operated in conjunction with the tuning controls.
Usually, increasing the wave-length has the effect of decreasing the degree of reaction, and vice-versa.
Other factors which noticeably affect reaction control are the H.T. on the valve in question, the value of its grid leak, and (in short-wave work) the aerial coupling.

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page 1114.*)

close enough to the heater to be activated by it, but it is completely separated electrically.

Because of the space between heater and cathode a certain time lag is always noticeable, whilst the cathode is "warming up." When cool no electrons are emitted from it, and it takes about two minutes to warm it thoroughly.

The "cluck" you hear from the loud speaker is probably the beginning of an appreciable plate current in the pentode's outfit circuit.

A SHORT-WAVE 'PHONE FILTER.

M. C. Y. (Wallington, Surrey).—"Being lured to it by W. L. S., I have had another go at short waves, and found more luck there this time than ever before. But there is one snag.

"Hand-capacity. If I put my 'phones on I can't go near the tuning without shifting it.

"Looking back in the old 'P.W.'s' I came across the idea of tuning the earth lead with a variable, and that certainly helped a lot. But what I want, I think, is a 'phone filter—referred to, but not described by W. L. S.

"What parts are needed, and how do you fix them for this?"

All you need is two H.F. (short-wave) chokes, two ·001 fixed condensers, and five terminals, as well as a little baseboard, etc., to mount them on.

If you like, you can make the chokes by winding for each 50 turns of fine insulated wire such as 30 D.S.C. on a two-inch diameter tube.

Fasten them to the baseboard, with the ·001's conveniently close. Three terminals should be arranged at one end of the baseboard, and two at the other.

These two should be marked "'Phones +" and "'Phones —" respectively, and each should be joined to an H.F. choke. The other end of that H.F. choke, which is joined to "'Phones +" goes to one ·001 and a terminal that should be marked "Input +." Similarly the "negative" choke should go to the other ·001 and to an "Input —" terminal.

Now all that remains is to connect the third terminal (marked "E") to the remaining terminals on the two fixed condensers.

In use "E" goes to the earth terminal on your set, and the others as marked, the result being a very efficient 'phone filter for short-wave reception.

VARYING THE VOLUME.

E. H. (Welwyn Garden City).—"The circuit is one screened-grid, detector, and low-frequency amplifier (transformer), and, as given originally, there was a 600-ohm resistance fitted between plate and screen of S.G. valve.

"Not having a 600-ohm fixed on hand, I put in a 1,000-ohm variable (good one, of the power class), and this I find gives me a wonderful smooth control of volume on all stations. Why?

"Being placed where it is, apparently putting more resistance in simply means cutting down the screen current a little. Why should that act as a volume control?"

We don't quite see your contention about the effect of increasing resistance. Certainly this does "reduce screen current a little," as you say, *but so would a reduction in screen voltage.* In fact, by increasing the external resistance as suggested, you are definitely dropping the voltage applied to the screen.

And that, of course, is one well-recognised way of adjusting volume with this class of valve. Its response is largely dependent upon the voltage at which the screen is placed, and altering this by means of alterations in the resistance placed between it and the supply is sure to have a direct effect on volume.

"POT" CONNECTIONS FOR A MOVING-COIL LOUD SPEAKER.

L. B. (London, S.E.18)—"Using a moving-coil loud speaker run from D.C. mains, does it matter which way round the 'field' winding is joined to the mains?"

Not in the slightest, generally speaking. But as some people claim one way to be better than the other on their speakers it is worth while trying for yourself to see if one way gives better reproduction than the other.

HORIZONTAL VALVE HOLDERS FOR S.G.'S.

F. N. C. (St. Leonards, Sussex).—"The only kind of valve holder I can get for mounting the S.G. valve through the upright screen is one with five sockets, not the usual four. And one of them (in the centre) is marked 'C'—the others being as usual.

"What am I going to do about that?"

These are five-pin valve holders, for use with either battery or mains valves. They are quite suitable for use as four-pins if you ignore the terminal marked "C." Simply treat it as though it were not there.

TECHNICAL TWISTERS

No. 49.—GRID-BIAS FOR DETECTORS.

CAN YOU FILL IN THE MISSING LETTERS?

The ordinary grid-leak-and-condenser type of detector works best with a slight . . . . . grid bias.

* * *

Usually a separate battery is unnecessary, the bias being obtained by connection to the . . . . . leg of the filament.

* * *

Indirectly-heated valves have a . . . . . instead of a filament, so with such valves it is sometimes the practice to supply the necessary bias separately.

* * *

The anode bend type of detector was worked with a . . . . . grid bias, but this type of detector is now comparatively unpopular because it is not so . . . . . as the leaky grid type.

Last week's missing words (in order) were: Transformer, Choke. Transformer. Auto-choke. Low-frequency, Detector.

PRESENT THOUGHTS AND FUTURE POSSIBILITIES.

(*Continued from page* 1085.)

If new methods could be found whereby more channels were available, television could well take place; to my mind, its prospects of immediate success are very small to-day, and on the basis of modern technique.

So I say at the end as I did at the beginning, that nothing will be allowed to stand still. The way of progress is through technical development. Technical development is barred by the inadequacy of the number of available wave-lengths. This one great fundamental problem stares us in the face.

How it will be solved is not for me at this moment to say, but it is my prophecy that the physical conductor will play a larger part in the dissemination of alternative programmes in the future than does the ether to-day. The physical conductor conserves its energy practically within its material boundaries and does not therefore interfere with the conduction of other physical conductors far away.

FOR THE LISTENER.

(*Continued from page* 1088.)

the broadcasting game; may they long continue!

Old Dishes, New Sauces.

A good cook can make an old dish very welcome by a new sauce. We get a good many old dishes in the programmes at one time or another; it is inevitable.

The ingredients, for example, which went to make up "Bumpkin Pie" have frequently occurred in other dishes; but Ernest Longstaff provided a new setting and a new sauce. It was a bright little affair.

There was a very clever duet between a Cock and a Hen, with a Black Leghorn in the offing, which I found extremely amusing.

Discretion.

Mr. Harold Nicolson was inclined to defend the sculptor of the statue of Earl Haig on Horseback against his critics. He did it very discreetly, not to say gingerly.

I find this brilliant talker much more amusing when he is not quite so discreet, not so determined to hold the balance even. He has an irony, sometimes a malice, even an apparent rudeness, which are very salty.

I trust that he has not become afraid of the next morning's postbag! It is odd, by the way, that we talk about handling a theme gingerly when we mean the opposite of "with ginger!"

The Talks on Persia.

The talks on Persia have not quite kept up to the standard which Miss Sackville-West set for them; but Mr. J. B. S. Wilkinson, on "Persian Legend and Story" came pretty near to it.

He sounded shy and slightly nervous. I liked him for that. Every listener loves a modest man.

I enjoyed immensely the stories he chose to tell us from Persian literature; they were simple and "of the soil," with a strange, rare flavour in them.

Ann the Artist.

Ann Penn gets my vote for the best vaudeville broadcast in recent programmes. She impersonates celebrities of her own world. They are not only recognisable—which is more than you can say of some—but she puts her own original stamp on them, being herself an artist to the finger-tips.

A B.B.C. Chaplain?

Parsons do not get much of a look in in this column of mine. Perhaps I reverence them too much; or perhaps I am frightened of them. But many listeners will be glad to hear that the Rev. Patrick McCormick is to conduct a series of broadcast services.

Which reminds me of something which has long been vaguely on my mind—the wish that the B.B.C. had a chaplain of its own. In religious matters I am not one of those who wishes to hear a new voice and a new point of view every week. I also fight shy of the popular parson; and I have observed that many of those who have not made a name for themselves in the Churches are the most effective in a broadcast service.

I should like one man, chosen for the job, all the time. I think he ought to be a layman. I also think that he should be, and should remain, unknown.

Unemployment.

The experts have had their say on this problem, and now the politicians (of each party) are handling it.

The expert states the problem, and makes some tentative suggestions as to how it might be tackled; the politician says how his party will immediately tackle it if the electors will only entrust them with the government of the country.

We trust the expert, who never gets further than the paper he is writing on; we suspect the politician (especially if we be of another party) who tries to "get a move on."

A Lovely Singer.

I mean Elena Gerhardt. I have praised her before. I will not cease to praise her. She sings old songs—Wolf, Schubert, Brahms—but she makes them new.

Somehow or other these lovely songs achieve a resurrection in her singing of them; as a tree puts forth new leaves in the spring. It is partly her voice; partly her technique; but I think it is chiefly herself.

She is not one of the great geniuses who sweep you off your feet; but one of the quieter ones who come into your room and open windows for you.

Dickens.

Sir Arthur Quiller-Couch spoke with authority. He made much of what may be called the reforming influence of the writings of Dickens.

The great gift, however, of this immortal writer was not that he reformed the existing world, but created and peopled another one into which we can withdraw for good company. I know Mrs. Gamp better than I knew my grandmother; and Pickwick better than I know my neighbour.

TECHNICAL NOTES

By J. H. T. ROBERTS D Sc.

I HAVE many times referred to the vital importance of a correct value of grid bias if the best quality of reproduction is to be obtained from the set. Also, as you know, any grid bias, whether of the correct value or not, has an influence upon the amount of anode current which flows through the valves.

It is, for this reason, an advantage to *increase* the grid bias as much as possible, but if it is increased beyond the proper amount then the *reproduction* will begin to suffer. From the point of view of saving H.T. current and taking care of the valves, therefore, it is desirable to have as high a value of grid bias as possible, since this has the direct effect of cutting down the anode current. From the point of view of quality of reproduction, however, you want to have the grid bias of just the correct amount, neither more nor less.

Ruining a Valve.

Now the importance of this is still further emphasised by a letter which I have had from a reader who has had the misfortune to ruin a super-power valve, owing to mistakes in connection with the grid bias.

For one thing, he has been accustomed to adjust grid bias values whilst a high value of H.T. was "on" the anodes of the valves in his set and, for another thing, he found that owing to a disconnection there was for a long period *no* grid bias applied to this super-power valve at all.

If you adjust the values of the grid bias whilst the H.T. is "on," it means that for short periods, while shifting from one grid bias connection to another on the G.B. battery, the valve is left "up in the air," without any grid bias at all. The moment the grid bias is withdrawn the anode current shoots up in value exactly as it would if the H.T. voltage were increased.

Inasmuch as a comparatively small variation in the grid bias voltage makes a large difference to the anode current, it is obvious that disconnecting the grid bias altogether is equivalent to an enormous increase in the H.T. voltage.

Now just think what the effect upon the valve would be if you left the grid bias alone but, say, *doubled* the anode voltage. It goes without saying that the valve would very quickly become overheated and in all probability, if the filament itself was not actually destroyed, the electronic emission might be reduced out of all recognition.

Super-Power Peculiarities.

What I have said above is important with all types of valves, but it is most particularly important with power and super-power valves where a high value both of H.T. voltage and of grid bias voltage is used, and where a heavy anode current is normally flowing.

You should take particular care, therefore, if you value your valves, always to switch off the H.T. voltage before attempting to tinker about with the grid bias

(*Continued on next page.*)

TECHNICAL NOTES.

(Continued from previous page.)

connections, and also to make absolutely certain that the grid bias voltage is really being applied to the grids of the valves, and that there is no possibility of a disconnection.

Altogether apart from quality of reproduction you have to bear in mind the load thrown upon your H.T. battery (or whatever the source of H.T. may be), the H.T. current consumption and, above all, the life and safety of the valves themselves.

Powerful Amplifiers.

Most experimenters realise full well the importance of using a correct value of grid bias, but it is surprising how common is this practice of fiddling about with the connections on the grid bias battery whilst an H.T. voltage of anything from 150 to 200 volts is on the anodes—or, in fact, with a powerful amplifier a voltage of even twice this amount.

With an H.T. voltage of 300 to 400 volts and a grid bias voltage of perhaps 100 to 150 volts you must exercise far more than ordinary care, and the conditions are very different from those where you have perhaps 80 or 90 volts on an ordinary L.F. valve and are working on a grid bias range of from 3 to 6 volts.

SCREENING

by means of sheets of metal, copper foil, etc., is often necessary in powerful sets to prevent unwanted interaction between the circuits.

It is particularly important on the high-frequency side, in view of the high magnification there and the ease with which H.F. impulses "stray" to adjacent circuits.

A Coil Hint.

When using a coil with special connections such as the "X" type of coil, whilst you obtain certain definite advantages over the ordinary plug-in type, at the same time there is a possibility of error, and I have more than once had letters from readers in which they tell me of trouble due to coils being connected the wrong way round, this trouble only having been discovered after every other possible cause had been "gone over."

When using an "X" coil to get better selectivity you may find that it does not come up to expectations and it is quite possible in such a case that it is because the coil is wrongly connected. Usually the pin of the coil holder for an "X" coil will be connected to "earth," whilst the terminal corresponding to the socket of the holder goes to "grid."

Connections.

If the results you obtain are not satisfactory it may be that you have got the wiring to the coil holder the wrong way round or, if this is correct, it is not impossible that the connections of the coil itself are reversed. In any case, without interfering with the coil, it is quite a simple matter to try reversing the connections to the holder in order to see which arrangement gives the best results.

Loud-Speaker Units.

In a somewhat similar way it is often worth while trying reversing the connections to the loud speaker, more particularly when this is of the permanent-magnet

(Continued on next page.)

TECHNICAL NOTES

(Continued from previous page.)

type. All experienced radio experimenters are fully aware of this, but newcomers to wireless sometimes do not appreciate that many loud speaker units are polarised devices and that they work much better when the current passes through in one direction than when it flows in the opposite direction.

It is unnecessary to investigate the polarity of the loud speaker unit at all; all you have to do is to try the connections to it one way round and then reverse them, and see which gives the better results.

Due To Steady Current.

I am assuming that some steady current is flowing through the loud-speaker windings, as it *will* be when the loud speaker is connected directly into the output or anode circuit of the receiver. If an output filter circuit or transformer arrangement is used as between the output of the set and the loud speaker, then the steady current is kept out of the loud-speaker windings; only the fluctuating signal current being allowed to get through. In this case it makes little or no difference which way the connections to the loud speaker are made.

But where a fairly large steady current is passing through the loud speaker, clearly, in most cases, it will be better if this current is in the direction to reinforce or assist the permanent magnetism of the unit rather than in the direction in which its electro-magnetic effect will be in opposition to the permanent magnetism of the unit.

For Quick Comparisons.

In passing, I may mention that sometimes the difference in the operation of the loud speaker, one way round and the other way round, is not very pronounced. This makes it difficult to judge which arrangement is the better, owing to the time taken in disconnecting the leads and reconnecting the opposite way.

Usually, by the time you have done this, the particular musical passages in the programme have changed to something of a different character; and altogether it is, as I say, not at all easy to make the comparison.

In actually making the test, it is a good plan to introduce a reversing switch into the leads to the loud speaker so that the connections can be reversed instantly. In this way you can get a change-over whilst on a particular type of reproduction.

Radio-Gram Points.

When using a radio-gram outfit, or a pick-up with the L.F. amplifier of the receiver, you cannot fail to notice how very liable the pick-up and leads are to interference of various kinds—capacity effects, humming and so on.

This is because the pick-up is itself connected into the most sensitive part of one of the valve circuits—that is, into the grid circuit, and frequently, the pick-up itself is actually "live."

(Continued on next page.)

TECHNICAL NOTES

(Continued from previous page.)

You will notice the instability and hum effects more particularly when a mains unit is employed for supplying H.T. voltage in connection with the outfit.

Short Leads.

As you know, it is very desirable to keep the leads between the pick-up and the set as short as possible. With a combined radio-gram outfit this is fairly easy; but with a separate gramophone, operating in conjunction with a low-frequency amplifier, often it is inconvenient to have the two adjacent, and a fair length of pick-up leads becomes inevitable. In these cases there is often a great tendency to howling and low-frequency instability generally.

It is very important to earth the metal casing or the metal frame of the pick-up, and in bad cases it is necessary to resort to the use of shielded leads; these may take the form of lead-covered electric-light flex, the lead covering being, of course, connected to earth.

Leads and Capacity.

This again brings with it its own peculiar disadvantage, however, because the lead-covered cable acts like a condenser and you get a capacity to earth, the effect of which is to by-pass the higher frequencies from the pick-up. It goes without saying also that the tone-arm, and any other metal parts in the vicinity, should preferably be connected to earth, otherwise they may acquire unknown and variable potentials and may react upon the pick-up circuit and cause trouble.

I should particularly mention that, when you are using a D.C. mains unit for either H.T. or L.T., it is desirable to connect to earth through a fair-sized fixed condenser.

Unsuspected Troubles.

I have had one or two further instances reported to me lately of trouble arising owing to materials being used in the construction of a receiver which were *supposed* to be insulators but which were, in fact, partial conductors.

A peculiar instance, somewhat of this character, was mentioned in "P.W.," a few weeks back, when a reader found that placing his set on a table covered with a particular kind of American cloth, caused low-frequency oscillation troubles, whereas the set behaved itself perfectly when placed in other positions in the room.

In the case in question certain investigations were made with the cloth and it was found that it had quite an appreciable conductivity. It was thus producing a

(Continued on next page.)

TECHNICAL NOTES

(Continued from previous page.)

capacity-reaction effect and was upsetting the receiver.

Examine the Cabinet.

The wooden baseboard of a receiver or, in fact, any wooden parts adjacent to the set, may act in a similar way if they are coated with a paint or varnish which is slightly conductive. Some classes of paint have a remarkably good electrical conductivity and are very far indeed from being insulators, whilst some kinds of varnish are hygroscopic—that is, have the property of attracting water vapour and becoming damp, so that they also may in that way act as partial conductors.

SHORT-WAVE NOTES

(Continued from page 1094.)

Full details of reception of any of these transmissions should be sent to "International Short-Wave Radio League, Jamaica Plain, Boston, Mass., U.S.A."

Those readers who have asked for particulars of the Short-Wave Radio League might take note of this address also.

I make no apology for returning to the theory of the "eleven-year cycle," particularly as Q S T has given it a kind of "official sanction" in its Editorial this month. Further, Q S T gives the European amateurs credit for anticipating trouble on the ultra-short waves, and preparing for it by opening up the longer bands again.

This Editorial predicts a definite falling-off in conditions on the 20 and 40-metre bands until the summer of *1934!* This same time should be a "peak" year for long-distance work on the two longer bands, 80 and 160 metres.

Wonderful "Peak" Year.

There is no denying that the facts all point to this. 1923, eleven years back from our coming "peak" year, was a wonderful year for U.S.A. stations even on 200 metres. Unfortunately, short waves hadn't been discovered then, so we can't tell whether it was a poor year for them.

The middle of the eleven year cycle from then, however, turns out to be the summer of 1928, which is remembered by all who were "on the air" at that time as being a marvellous season for short-waves D X, particularly on 20 metres, and interesting even on 10 metres.

Ever since then short-wave conditions have been going off, and in the recent R.S.G.B. 10-metre tests not a distant signal was heard by anyone.

And if all this were not convincing enough, we have the additional fact that conditions on the longer waves (from 80 up to 500 metres) have been absolutely marvellous this last season, and are still improving.

Until anything to shake my faith arrives, I am afraid I shall remain an "eleven-year cycle" fan.

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February 28th, 1931.

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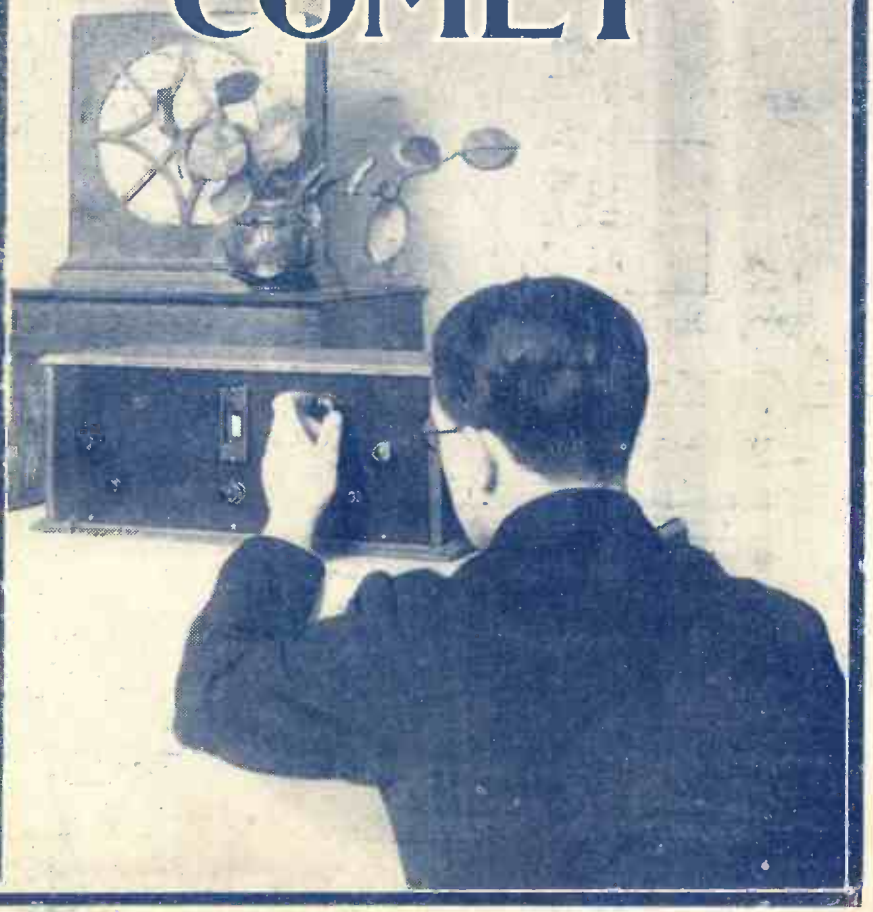

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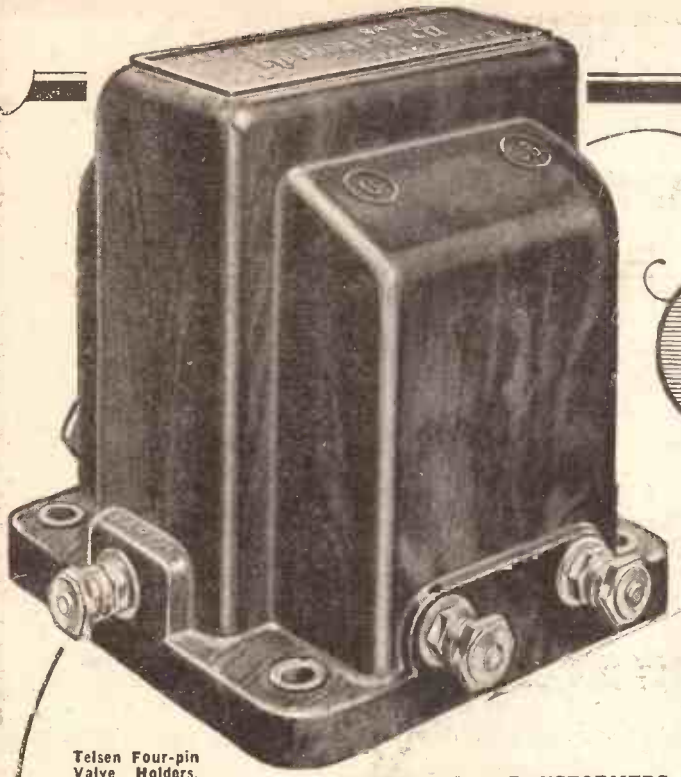

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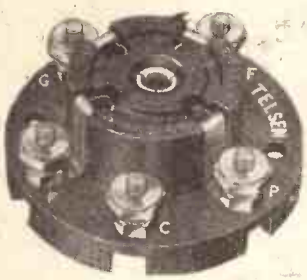

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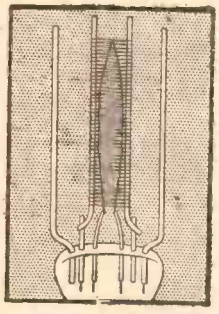
Designed for more efficient H.F. Amplification

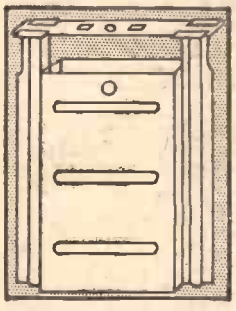
The New Cossor 210 H.L. affords to all users of non-screened grid Receivers an opportunity of materially improving the performance of their Sets. Its favourable grid current characteristics enable it to give an unusual degree of H.F. amplification without the use of grid bias. Its advanced constructional features (described in detail below) result in great mechanical strength, which ensures exceptionally long life. And, by employing the famous seven point system of filament suspension the New Cossor 210 H.L. is rendered definitely non-microphonic. The use of this valve will considerably increase the efficiency of any non-screened grid Receiver.

The new Cossor 210 H.L. 2 volts, ·1 amp. Impedance 22,000. Amplification Factor 24, Mutual Conductance, 1·1 m.a./v. Anode voltage 75-150. Price **8/6**



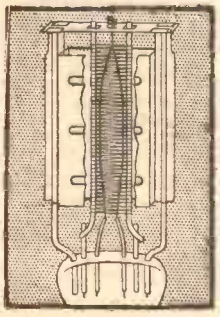
SEVEN POINT SUSPENSION

Practical experience has shown that the Cossor 7 point suspension system definitely eliminates microphonic noises. This system is employed in the support of the exceptionally long filament of the Cossor 210 H.L.



MICA BRIDGE MOUNTING

Permanent alignment of the electrode system is ensured by a stout mica bridge which forms an integral part of the anode assembly. When finally secured in position the whole structure becomes one interlocked unit.



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The Cossor mica bridge construction permits no variation of characteristics due to differences in inter-electrode spacing. Complete uniformity of performance is therefore ensured between all valves of the same type.

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RADIO NOTES & NEWS

Rival of Radio.

NO wonder the B.B.C. fails to please everybody. Take our Lady Assistants (kitchen), for example! We have had three in 18 months. (We marry 'em off quickly!) Each one has been dissatisfied with the little radio set I provided. Sophonisba Yvonne Andromeda Wilkins, now present, said she had no use for Bach, and had I any books "with pickshers." Yes, what sort of pictures? Unusual pickshers! Yes, I have some, but (thinks I) I'm not showing them to a tender chee-ild like you; why do you want them? A Picksher competition; £5 a week for life or a million sterling down!

Please Dinna Dae It.

SORRY! Influence of Harry Lauder! I do not receive many complaints about oscillation nowadays, and never suffered from it myself. I have, however, before me a letter from a Manor Park reader, complaining of what he believes was intentional oscillation. I am sorry to say that my worthy correspondent entered into a bit of a duel with his unknown tormentor, which no doubt was heartily enjoyed by the unfortunate bystanders, so to speak. Best thing to do is to canvass the neighbours, get the evidence and then complain to the Post Office.

"Ariel" or "Aerial."?

IN reference to my note about the misspelling of my *nom de plume*, A. S. C. (Norwich) says that whilst writing a letter on a technical matter, he forgot how to spell "aerial," and seeing "P.W." open at "Notes and News," wrote "ariel." This error was continued inadvertently by his friend in drawing up a patent specification. So I am now duly archived! By the way, how do *you* pronounce "aerial"? I remember how surprised I was to hear Sir Ambrose Fleming say "ay-eer-ial." I do not question that pronunciation, but I believe that most of us say "air-ial."

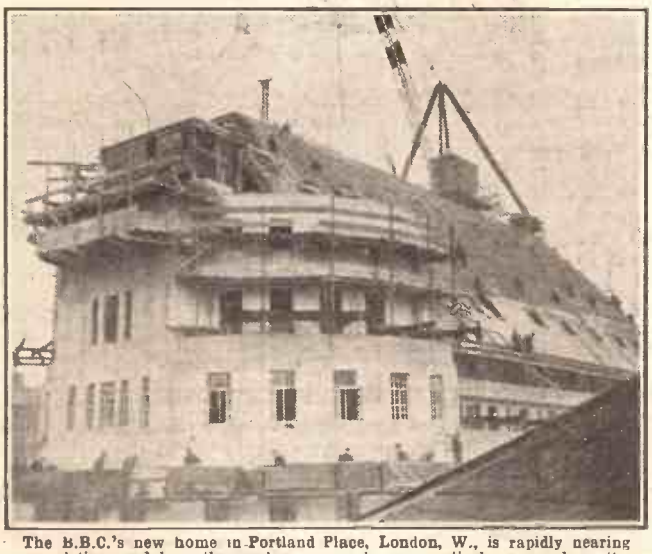
"My Radio Career."

TO get the egotistical stuff over at once, may I refer to H. B. C. (Bedford), who, with a number of other friendly followers, wishes to know more about my personal history as distinct from my radio adventures. Boys, that was the official autobiography as passed by the Censor, and the incident is now closed. H. B. C. asks whether I played Rugby football. No! T'other sort. And boxing. "When was there an 'Arieless'?" Can't remember the time when there *wasn't* one! "When did the small Ariels arrive?" In due course, sonny, in due course. Almost like a gal, with his questions, isn't he?

"Free Edge Twin Cone."

AFTER reading our article about the "Clear Cut Cone," H. B. (W.1) devised what he calls a "free edge twin-cone." Each cone is made of fairly stout vellum. One is 11 inches in diameter, and the other about 5 inches. Translating his rough sketch, I see that the point of the smaller cone goes to the L.S. unit and the larger cone is fitted over it like a snuffer over a candle. The edge of the larger is kept quite free. Pressure of the large cone upon the small one should be varied for the best results.

PUTTING THE LID ON IT!



The B.B.C.'s new home in Portland Place, London, W., is rapidly nearing completion, and here the workmen may be seen actively engaged on the roof. The new Broadcasting House is to be opened this year.

The Vatican Station.

SOME time before these Notes appear the Vatican station will have been officially inaugurated by the Pope and the Marchese Marconi.

A number of readers have reported overhearing its tests on 50·26 metres or thereabouts, and according to all accounts H V J is going to "tell the world" in no uncertain voice. This station may set a fashion, and people are already asking why not a similar one for the Archbishop of Canterbury?

Note on Tripe.

A TROWBRIDGE reader, who writes to call my attention to a joke and then tells me in a P.S. that he has lost the clipping, suggests that I should not poke fun at fellows who have logged more stations on their crystal sets with the aerial off than I have with my "A.C. Special."

Oh, I won't! I should be sorry for them if they couldn't, for I listen only to Mühlacker nowadays, I regret to say. This Wiltshire lad deplores the fact that I myself have not spotted this lost joke and included it in my other "tripe." Then, aghast at the word, he says that even tripe can be O.K. when "cooked"! Not too bad—but to suggest that I can "cook" is a compliment I do not merit. I can't even boil water without burning it! I always forget to grease the kettle.

Chi-Hoa.

I HAVE two letters before me, both about Chi-Hoa. One, from our valued Mr. Easter, of Cincinnati, giving full characteristics of the station, some of which may be useful to you long-distance enthusiasts. Chi-Hoa is 6 kilometres from Saigon, in French Indo-China. It is quartz-controlled. Aerial power, 12 k.w.; wave-length, 49 metres; call-signal, F 3 I C D; call, "Hello, hello! Here is Radio Saigon." Its orchestra possesses as soloists four first-prize winners of the Paris Conservatoire, for violin, 'cello, flute, and saxophone.

He Got Chi-Hoa.

A GODALMING friend writes to let me know that Chi-Hoa is a fairly old acquaintance. He was just turning away from R.M.S. Majestic, on 33 metres (not 22–26 metres, as some believe) when he dialled plumb into some Chinese music and heard the gong interval signal. He then got "good-night" in Cantonese

(*Continued on next page.*)

RADIO NOTES AND NEWS

(Continued from previous page.)

and some language unknown to him. (Assamese, mate !) As he was trying for a station on 49·1 metres I have no doubt that this was indeed Chi-Hoa—a lucky hit ! He is the first to report this pick-up to me, apart from Mr. Easter.

Canned Correspondence.

MY pile of letters has reached the usual winter zenith, so will my esteemed correspondents kindly accept the following acknowledgements in these instances ? M. J. C. (Gort, Co. Galway)—I like the French, English, and German bits of your letter, but the Irish looks like Greek, and *is* Greek to me. O. C. D. (Brussels).—When I have made quite sure what the French jokes are, I may pass them on to Arielites. Not before ! Thanks ! "Two Dozen Crystal Lovers." (All Kinds of Places).—Yes, yes, gentlemen ! Marvellous things, crystals ! I'll give you a special par. all to yourselves shortly. G. T. N. (Walsall).—No, I don't like whisky; I only drink it as penance ! Why don't you write about radio ? (Or send the whisky ?)

Cutting Out Mühlacker.

W. H. (Near Nottingham) finds that he can eliminate this nuisance by putting two ·0005 variable condensers in series with his aerial and tuning 'em till the pain stops. Yes, that is a common remedy for ordinary jamming, but some of us find that the German needs more skilled treatment. To those sufferers who find no relief from series condensers, Thermogene wool, Turkish baths, or Beecham's pills, I recommend—the "P.W." Brookmans Rejector ! This will get an oyster out of its shell, a limpet from a rock, a dog from a bone, or take the breeks off a Scot !

Smoking During Divine Service.

APROPOS the much discussed question put by a bishop, as to whether listeners extinguish their pipes during the broadcasting of religious services, the "Manchester Guardian" reminds us that in olden times smoking in church was so common that in some parish churches pipe-racks and cuspidors were provided and that even as late as 1850, in Wales the start of the sermon was the signal for the men to light up. While many people do not see much harm in smoking at home whilst listening to a broadcast sermon, I have noticed that numbers of men lay down their pipes during prayers.

"In the Days of the Comet."

WHEN H. G. Wells wrote that story he could not foresee, gifted as he was, and is, the "Comet" whose coming was heralded by signs and portents in "P.W." for February 7th, and which burst gloriously into view on February 14th. But that was just his rough luck and I hope you are thankful that you now have an accomplished fact and not a fanciful prophecy. This is a red letter month for "P.W.'s" friendly following. I am impatient to hear how you like the "Comet."

War on Interference.

IT is reported that the German Electro-technical Engineers' Association has appointed a special committee whose purpose is to enquire into and report on interference with radio reception by electric tramways and other electrical devices. All interested bodies, including the German Post Office, are represented. That is the proper way to do things. In Canada the interference nuisance is fought very determinedly and efficiently by the Government department which deals with radio matters, but at home here the onus seems to be placed on the victim rather than on the offender.

Creating the Demand.

THEY certainly do hit upon some novel ideas in the U.S.A.—prohibition being one of 'em ! No, I'm wrong ! Mahomet thought of *that*. Howsomever, I was about to report that they actually have what they call the "Civic Concert Service," its President being a lady named Miss Dema Harshbarger. The purpose of this set-up is the creation of new concert audiences in cities which have pretty thin musical seasons. One hundred and eighty cities in thirty-two different States have joined the movement and the new audiences so far created are spending more than a million dollars every year on musical artistes. Query ! How can you tell a new audience from an old one ?

SHORT WAVES.

P.-c. broadcasts his experiences. A sort of fun-in commentary.—"Daily Mirror."

* * *

The owner of a raided London shop said he did not hear the thieves owing to the noise of his loud speaker.
I have shown this to the man next door.—"Pictorial Weekly."

* * *

"What to hear on the radio" runs a newspaper headline.
There is, however, no truth in the rumour that this paper is not published on Sundays owing to lack of news for this column.

* * *

Impossible People.—The Bright Young Thing who thought Marconi invented the permanent wave.—"Daily Sketch."

* * *

FOG AND WIRELESS.

"Does fog interfere with wireless reception ?" asks a correspondent from Sunderland.
Well :
Moscow makes the most of Europe's mist ;
November brings a Comrade true and tireless.
For fogs at home and fogs abroad assist
The fog of propaganda o'er the wireless.
—"Manchester Guardian."

* * *

A LISTENER'S LIFE.

We tune, and tune, and try to get a station
For a programme which we want so much to hear
In despair we tear our hair,
We can't get them on the air—
A listener's life is not a happy one !

By request we send in fan mail to broadcasters,
Telling what we like, and do not like to hear ;
If it's praise, their hats they doff,
If it isn't—how they scoff !
A listener's life is not a happy one !
—"Radio Digest."

An Engaging Gauge.

WE get a fair assortment of models and specimens shot into this office —one of the most interesting and amusing aspects of technical journalism—though once I received a specimen hare (defunct) which I put in a cupboard and forgot till it began to call attention to itself. However, to encourage the more cunning artificers among ye, I hereby donate to E. D. (Bradford) one man's size pat on the back for his steel gauge for use in the making of our new "P.W." coil slots. Guaranteed O.K. by our Mr. Kendall.

An Awful Case.

A RICHMOND reader has made all my finer feelings limp with sympathy and my professional sense alert by revealing that he has tried during just over two years no less than twelve valve circuits, but has failed (1) to hear even one foreign station, and (2) to separate National and Regional. He asks whether I think luck comes into wireless. Well, as an old-timer, I do not sneer at what is generally called "luck," though I know it is simply calculable chance. But there is no luck whatever about the results of a circuit, if that circuit is properly made and fed.

Not Luck but Knowledge.

I HAVE known a qualified engineer look for a fault in a radio set for eight hours and fail to find it—and it was the most piffling trifle, too, when eventually located. So you, my Richmond friend, may take heart of grace. Evidently there has been some fundamental error or weakness common to all your sets; somewhere between your aerial and "earth" there has been a flaw. As you have made 12 sets you evidently don't know enough of the subject to diagnose the trouble and hence your only hope is to try a doctor—of radio sets. Look here ! Make up the "Foundation Comet," and if it doesn't work you can bet your boots you have made a horrid bloomer and need an expert's inspection. I shall be glad to hear from you again.

Noise on "National."

SO far as my set is concerned, this regular breathing sound still goes on, and irritates me mightily. Others have noticed this, and W. A., of Liverpool, believes that it represents an attempt to interfere with Radio Paris when that station is broadcasting a programme sponsored by a British advertiser. I regret that I cannot support such an Edgar Wallace-like theory, for the wretched noise is present whenever I listen-in on the long wave. Before turning to the idea of a plot against publicity I prefer to seek an engineering explanation.

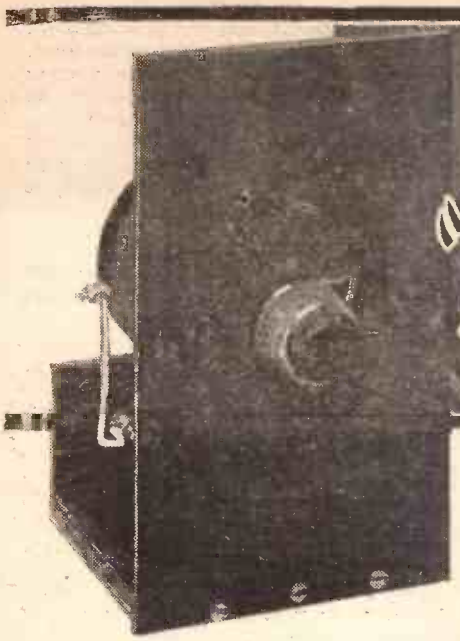
The Radio Pillow.

THEY won't let us escape radio, even in our beds. An American company has now produced a pillow for use in hospitals, Pullman cars, and other places where one "pounds an ear," containing a reproducing unit. This pillow is made of spongy rubber, and only by resting the head on it can the sounds be heard. Okay for invalids and slug-a-beds ! However, this is nothing compared to my nephew's five-valver. He tries to wake the dead !

The New Belgian Radio Law.

THE new radio law passed in Belgium last June came into force on February 1st, when the National Broadcasting Institute began to transmit, in Flemish on about 339 and in French on 508·8 metres. The Institute is controlled by a Committee presided over by the Minister of Posts and Telegraphs. The licence fee instituted is 60 francs per person per set. Belgium has not bulked very largely in the European output, so far, but we look forward to seeing her take her place now.

ARIEL.



The P.W. "Flexi-Coupler"

"Decrease your interference and increase strength of reception" is the slogan that should be applied to the remarkable little unit described here. It provides a simple but perfectly effective method of greatly increasing selectivity, but at the same time it definitely increases the strength of reception of the station you want.
Read about the wonderful device designed by the "P.W." RESEARCH DEPARTMENT.

SELECTIVITY is an essential quality in present-day radio receivers, but it would seem to be far more difficult to achieve than might be expected. At least, that is the impression that one would get from a study of a great deal of modern apparatus; and yet, is it really so difficult as it seems? You must judge for yourself when you have read further into this article.

Those New Stations.

The ether of Europe is in a bad way. It is crowded with stations, many of which are already operating on high power and threaten to increase that power in the near future. In a wave-band that should really ideally only hold about 100 stations, there are well over 200 and, as far as we can see, this number is steadily being increased.

ALL YOU NEED FOR IT:

- 1 Panel, 7 in. × 4 in.
- 1 Baseboard, 4 in. × 4 in.
- 1 Terminal strip, 4 in. × 2 in.
- 1 Star-Turn Selector Coil (Wearite or Ready Radio, R.I., Keystone, Magnum, Parex, Goltone, etc.).
- 3 Terminals (Eelex, or Igranic, Belling and Lee, etc.
- Wire, screws, etc.

We have had a taste of what the future may hold if something is not done to stop it, by the result of the new Mühlacker station. It heterodynes our London Regional very badly at times. The Midland Regional is heterodyned on many sets by Langenberg, and with the threatened increase in transmitters, and the gradual increase in power of many of them, things do not look too rosy.

Solving the Problem.

But, you will say, there are dozens of special circuits that have been brought out to enable sets with high degrees of selectivity to be constructed. H.F. amplifiers can be added to give additional tuned stages, and many little "wangles" may be resorted to to alleviate the etheric discomfort.

Unfortunately, most of the ideas you will have in your mind, such as additional H.F. stages, series aerial condensers, wavetraps, frame aerials, while undoubtedly assisting to provide additional selectivity, have the effect of cutting down the strength of reception of distant stations.

Or, if they do not do this (as in the case of the H.F. amplifier), they are expensive to install, and difficult to operate.

It's a bit of a problem, isn't it? How can we possibly have any arrangement that will at once be selective, inexpensive, easy to add, easy to operate, and, main thing of all, will not decrease the strength of reception of foreign or weak stations?

That was the problem that the "P.W." Research Department set themselves some time ago—and they have undoubtedly solved it *in every requirement.*

It is done by means of what we call the "P.W." "Flexi-coupling" scheme, and you may have read about it last week, for the method was applied to the "Comet," and the description of the slight alteration to that set in order to incorporate the new scheme was given last week.

In Unit Form.

In the case of the "Comet" it was desirable that the Flexi-coupling system was made an integral part of the set, but in many cases this is an impossibility. There simply isn't room in many receivers for the component that has to be added.

So we have made it up in unit form and called it the "P.W." "Flexi-Coupler." It will prove a boon to a great many set owners.

Primarily it is designed for use with sets having one or more "P.W." Dual-Range coils, the Dual-Range coil being in the first stage, though it could be used, with varying degrees of success, with "X" coils, and other systems of grid tuning. It was for sets with the "P.W." Dual-Range coil that the "Flexi-Coupler" was originally designed, so it is for these that we are now describing the little unit.

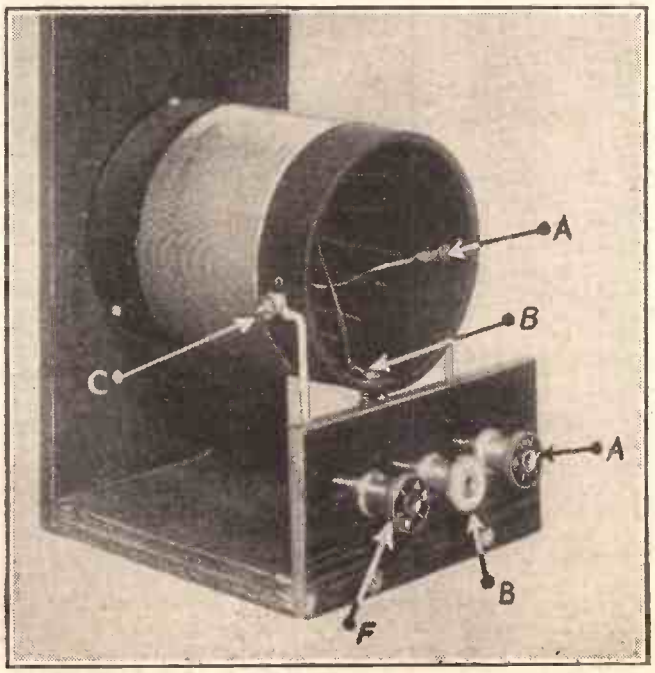
The Selector Coil.

On examination of the photos you will see that the "Flexi-Coupler" consists of a small upright panel and baseboard, with a terminal strip at the back, on which are mounted three terminals, reading left to right, F, B and A.

Now, before we go any further we must

(*Continued on next page.*)

SELECTIVITY AND SENSITIVITY INCREASED



All there is in it! The marks denote the few simple connections described in the article.

THE "P.W." "FLEXI-COUPLER"

(Continued from previous page.)

divert a little and explain the presence, mounted on the panel, of the "Star-Turn" Selector coil, constructional details for which were given last week,

The coil consists of a former of 3-in. diameter and has wound on it 84 turns of wire in usual solenoid fashion. It is, however, tapped at every four turns along the greater part of its length, but 20 turns are not so tapped. (You will find full details of this in the constructional article that appeared in last week's "P.W.")

Very Fine Tuning.

There is a slider running over the tappings and this is taken out to its aerial A, the end stud goes to B, and the beginning to C. Now, if the coil is joined up in the aerial circuit it is obvious that if aerial goes to A, earth to C, we can tune the aerial-earth circuit within fine limits.

The tuning of the aerial in this manner will give easy control of aerial tuning and not only will selectivity be increased, but sensitivity, for a tuned aerial system is very much better than an aperiodic one.

Really Hot!

Very well, then. If we take this coil and connect it in the aerial circuit between the aerial and the earth, arranging a shunt capacity feed to the Dual Range Coil, we shall get an added control of selectivity. And this has been done with great success. The terminal A goes to aerial, and C goes to earth. Of terminal B we will say nothing at present.

But good as that scheme is, there is one better. A scheme that has not only the advantage of great selectivity, and of providing increased sensitivity, but one which is so absurdly simple that no one can possibly go wrong with it. Moreover, the degree of selectivity and sensitivity can be adjusted minutely in a very simple manner.

It's Easy to Add.

As these few remarks are written, one of our sets using the "Flexi-Coupler"—not as an experiment but as a definite refinement incorporated into the receiver—is pushing out perfect reception of Muhlacker in spite of the fact that the London Regional is playing full blast with a military band programme.

The scheme is simply this. From the three terminals at the back of the "Flexi-Coupler" leads are taken to three points. Its A terminal goes to the aerial itself, which is disconnected from the aerial terminal of the set. The terminal B is taken to the A terminal of the set or to S_1 of the coil, whichever is the more convenient. Terminal F. is connected to the earth terminal via a long piece of flex. About that flex, more anon.

Inside the unit, as you will no doubt have seen from the illustrations, terminal A goes to A on the coil, F goes to C on the coil, and B goes to B on the coil. So we have really got the slider to aerial, the one end of the coil to earth via the flex, and the other terminal (B) to either A or S_1 as described above.

Superfine Flexibility.

Now this is what we do. In order to couple the tuned aerial to the rest of the circuit, we take a long flex lead from F and twist it two or three times round the Dual-Range coil; on its way to earth. This then provides a loose coupling.

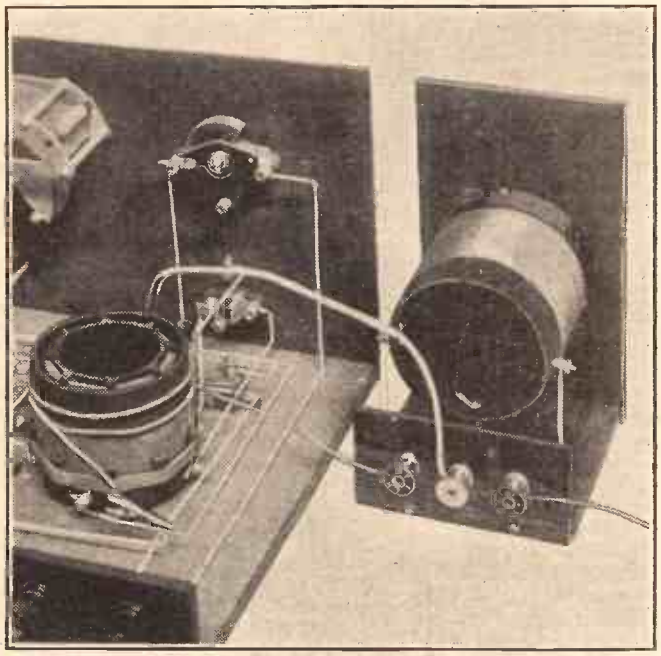
And the flexible lead can be varied in position to enable very fine variation of coupling to be obtained.

Thus, if you want very loose coupling, try one turn of the flex round the top of the dual coil. A slightly tighter coupling is provided by placing this round the lower portion near the small winding on the ebonite spacers.

Further coupling can be obtained by increasing the number of the turns of the flex. Probably three turns will be sufficiently tight coupling. In most cases two turns round the top usually gives about the best results. Very simple, isn't it? Just give the flex a couple of turns round the Dual-Range coil, and there you are!

It does not alter the handling of the wave-change device at all because this is where the terminal B comes in. When you want to go over to the long waves you turn the selector knob hard over to the right and then the slider (to which the aerial is connected) goes straight to B, i.e. to the Dual-Range coil. In this case the Flexi-coupling part of the scheme, not being required, is out of circuit.

HOW THE "FLEXI-COUPLER" IS USED



Showing the "Flexi-Coupler" in position alongside a receiver with the flex wound twice round the top of a Dual-Range Coil.

On the medium waves you tune in your London National, say, in just the usual way. Probably the dial reading will be the same, and then you vary the strength by turning the knob of the "Flexi-Coupler." You will find one position where it is at maximum. But on a powerful station you will always be able to *find* it when tuned in accurately on your tuning condenser, without having to adjust the "Flexi-Coupler."

As Selective As You Like.

On distant stations you will notice that the adjustment of the latter again will not prevent you *finding* the stations (provided the "Flexi-Coupler" knob isn't hard over to the right), but that the accurate setting of the coupler knob will make all the difference, giving really powerful results plus wonderful selectivity and elimination of your powerful local.

You will be surprised how very selective this scheme is, and don't forget the degree of selectivity is entirely in your hands. You merely vary the number and position of the flex turns round the coil.

Above three turns will not increase signals much, but will reduce selectivity rather considerably, so don't go winding on a lot of turns, for they are not needed.

Then, as you handle the set and get used to the operation of the coupler, you will be astonished at the fine tuning you can accomplish, the wonderful cutting out of interfering stations, and, *as well*, the *increase* of sensitivity of your set.

Sure and Simple.

The scheme is simple but it is sure, and we believe, it will prove one of the most useful things that have ever been offered to our readers.

There are no snags in it. You can't go wrong as long as you connect up the three terminals properly. It does not matter what way you wind the flex round the dual-wave coil; and finally, a most important point—the "Flexi-Coupler" does nothing to interfere with the wiring of your set, or its operation.

The latter is exactly the same as before. Nothing becomes unstable, or more difficult to handle. Tuning is sharper, of course, but not critical, and the stations you will find come in almost at the same position on the dials, and much stronger than you had them before.

So if you want more selectivity and more signal-strength on distant stations try the "Flexi-Coupler." You will be astonished at the results.

RECEPTION WRINKLES

Short-Wave Reaction, Pick-up Hum, etc.

Usually a battery in conjunction with a flash lamp is not to be compared with a battery and telephones as a testing instrument, being comparatively insensitive.

* * *

Where reaction is specially critical, such as in short-wave work, there is much to be said for the very small reaction coil wound of very fine wire, fixed rigidly at some distance from the grid coil.

* * *

The use of long leads to a gramophone pick-up is one of the very commonest causes of hum, so the positions of switches, jacks, etc., should be decided carefully.

BEHIND THE MICROPHONE

BY CAPT. P. P. ECKERSLEY M.I.E.E.

The fifth article of one of the most widely popular series our Radio Consultant-in-Chief has ever contributed to "P.W."

MY thoughts go back again, and I remember S.B.! When the B.B.C. started, every station was autonomous. Birmingham made a Birmingham programme, Manchester a Manchester programme, and London knew little of what went on in the provinces. It seemed to London, as it has apparently seemed since, that London could make a better programme than the provinces.

It seemed to the provinces that another point of view was tenable. It remained for headquarters to promulgate a new policy, because of technical progress. This is not an uncommon way to frame policy.

First Experiments.

Thus a few technicians thought that if it were possible to telephone to Manchester, it was possible to connect a London studio to the Manchester transmitter, and so broadcast the same programme from each simultaneously.

Experiments were put in hand. The Post Office officials were enthusiastic and started running wires here and there and everywhere. Curly little innocent ends of wires started worming their way into Marconi House, and romantic labels were tied round their necks.

This one was called NCTL and that MNR, and we were led to believe that one alternating volt applied correctly would pop out at Newcastle or Manchester, undistorted, pure, and puissant.

So we got a lot of Western Electric amplifiers and some high-tension, and we boldly connected inputs and outputs to plugs and jacks, and we sought another pair of wires throbbing with a programme, and then plonked this into various convenient holes.

There were a lot of telephones, and these rang like anything directly we did anything. Faint voices told us that noises resembling music were appearing in NCTL and MNR.

Zero Hour!

One Sunday afternoon a few of us were assembled in Marconi House ready to try an experimental S.B. "to all stations." Our programme was strictly local—myself and a microphone. Zero hour struck and, slightly excited, I started my babble.

The telephone jangled time and time again, now Manchester, now Newcastle, now Birmingham, now Cardiff. Each reported their O.K. in turn. After a while I was S.B. to all stations. I think I was the first person in the world to broadcast simultaneously from "all stations" of one nation.

But the experimental period, before we brought matters to this stage, was beset with incidents more or less worthy of notice in these reminiscences. Once we tried opera. Opera seemed, like glue, to get on to everything.

You could not plug in a 'phone anywhere without its echoing Isolde's soprano sighs. But suddenly the outside telephone rang. My bored "Hullo" was cut short with a roar of angry protest from someone who, it seemed, was trying to telephone to Birmingham and could get nothing but this "damned music."

Modern inventions, broadcasting, the telephone service, post-war England, the weather, business were all spoken about in one long paragraph, and my informant did not seem to take an optimistic view of any of these subjects.

Most particularly, he was not in favour of opera on his telephone. It was vain for me to point out that he had the unique opportunity of hearing the most famous tenor in Europe if he only hung on for "another three minutes"; he just seemed very annoyed!

A More Serious Incident.

Then there was the time when a private telephone conversation between the station directors of Aberdeen and Glasgow was radiated by the London station. The conversation dealt with the relative merits and price of a bassoon or a double-bass player.

SPEAKING FROM GENEVA

Mr. Vernon Bartlett delivering at Geneva a talk broadcast by most British stations—a wonderful development of the "S.B." system which Captain Eckersley can be said to have initiated.

It was *very* funny, and might have been staged by anyone (when it would not have been funny!). A more serious incident occurred when a business conversation got radiated.

There was much talk about forbidding S.B., and the provincial station directors saw a gleam of hope.

Perhaps the most amusing story concerned the use of S.B. and the opening of a station. Have I told it before? But it's worth repeating. An honourable and gallant high official of the B.B.C. was due to officiate at an "opening."

Waiting For Big Ben.

Part of the programme of the event was to relay the chimes of Big Ben, via loud speakers, to a large assembly of persons in the hall where the inaugural speeches had just been made.

It's a question of split seconds to fit it all in. The engineers are installed in their cellar; there is a vague murmur from above where eloquence is beating its wings, and the clock ticks on towards the time when each plug must be pulled, reversed, pushed again, when one miscalculation makes an audience laugh instead of praise, when co-operation between ten people scattered throughout the length and breadth of England is essential.

The time draws nearer; applause fades out and we are *over*. We wait. Silence, profound! The hand of the clock is shivering above nine o'clock; the second hand is almost there when the high official, importantly haughty in a blaze of white and black, flourishes his gold watch in the face of the engineers, damning them for a set of fools for "missing Big Ben."

At The Critical Moment!

The argument develops into hisses! The clock goes past. Confidence, my hearties, confidence! And the critic says, "Well, I'm going up to announce failure." His sad step is on the platform; he bows, he opens his mouth, when BOOM! TONG! BANG! TONK! Big Ben speaks from the loud speaker instead, and the high official bows to the applause. For once, time seems to have waited for him. Tide never did!

I have always remembered this incident; it's so nice to know that technicians are *always* right!

THE SUCCESS OF THE "COMET" THREE.

Our latest set sells *more than a quarter of a million "P.W.'s"* in one week!

BY THE EDITOR.

HAVE you built your "Comet" Three yet? If you have, let us know how you are getting on. The more the merrier!

Already we have had some hundreds of letters from readers who have "got busy," and some of them are so interesting that in an early issue we shall devote space to a number of extracts from various letters.

Some of them are particularly interesting in view of our recent editorials urging readers closely to follow the designer's instructions. One reader writes: "I built the 'Comet' Three the same day I purchased my copy of 'P.W.' containing the instructions; but I took a risk and paid for it. I used one or two components (I won't mention names!) which I had by me, there not being time that day to get the specified ones. And although I got the set working O.K., the results were nothing to shout about.

Exactly to Specification.

"On the Friday, however, I got the two necessary specified items, and soon made the necessary changes . . . And I can't tell you the difference they made. The set works amazingly well, and there is no doubt about the 'Comet' being a real winner . . ."

A good many letters have been received from readers who admit they "varied" the design at first, but eventually rehashed their sets and followed the designers' instructions as closely as possible.

One reader admits he used an ordinary condenser in place of the differential reaction types specified! But he soon altered that!

By the way, readers might be interested to know that the "Comet" Three issue of "P.W." was a record seller—the number of copies sold that particular week exceeding 250,000.

And yet there are still some pessimists who say that radio as a hobby is more or less dead! It doesn't look like it!

And those manufacturers who deal in the "P.W." and "M.W." Dual Range coil are finding business really booming. We know of one manufacturer making the dual-range coil who has had to take on sixty extra workmen to cope with the rush.

Yes, there's still plenty of life in amateur radio.

Another "Cold Valve."

News reaches us from America of a "cold" valve which may have possibilities. It is said the valve will never burn out because it has no filament. The patent claim made for the valve states that it provides for the use of photo-electric cells in place of the standard valves that now make use of a heated filament. The inventor is Adolph A. Thomas, of New York.

"In this principle," said Mr. Thomas, in discussing the patent, "there are no filaments to be heated. There is no hum or line noise caused by filament circuits, and, therefore, radio reception is improved. A single lamp illuminates all of the photo-tubes and lessens the cost of operation. Another advantage is greater simplicity and compactness. No 'A' battery is required."

Will Not Burn Out.

We understand the invention comprises new systems and apparatus for amplifying feeble electric impulses by utilising electron discharges in a valve of novel construction which is free from a filament or other form of heated electrode. The bulb is designed to operate cold for producing electron discharges.

"It is generally admitted," said Mr. Thomas, in his patent application, "that the greatest trouble with detector and amplifier tubes of the prior art lies in the filament, which has to be heated to emit electrons. The filament requires a separate source of direct current. Attempts have been made to provide a substitute for the filament battery by so-called eliminators, but these only serve to complicate the apparatus. The use of a hot filament as an electron emitter requires a separate source of heating current and a filament in circuit is always in danger of burning out. In fact, I may say that burned-out tubes have been the biggest plague in radio since the introduction of De Forest's audion nearly twenty years ago."

Light Does the Trick.

Mr. Thomas provides a filament-less valve in which an electronic stream is produced by a photo-electric element under the influence of light. A second element in the tube is spaced from the photo-electric element, and these two elements are connected in a circuit of substantially constant potential. Between this pair of spaced elements is interposed a third element adapted to be connected in a circuit of variable electric impulses.

The inventor says this third element acts like the grid in the old-type valves in that it controls the electronic flow between the two spaced elements in accordance with potential variations impressed upon it.

The photo-electric element is preferably connected to the negative side of the circuit, so as to have a negative charge and thus facilitate the emission of electrons. The light for influencing the photo-electric element is most conveniently derived from an electric lamp having constant intensity of illumination. In the basic aspect of the invention, the source of light rays to which the photo-electric element is subjected may be outside the vacuum tube or within the tube itself.

More Data Required.

"As far as I know," says Mr. Thomas, "this is the first radio tube adapted to operate cold. There being no filament or other electrode to be heated, it is impossible for the tube to burn out. Even if the electrodes should be accidentally connected to the wrong battery terminals, no harm would be done. Electrically speaking, therefore, the life of the tube is practically indefinite, it being subject only to mechanical breakage."

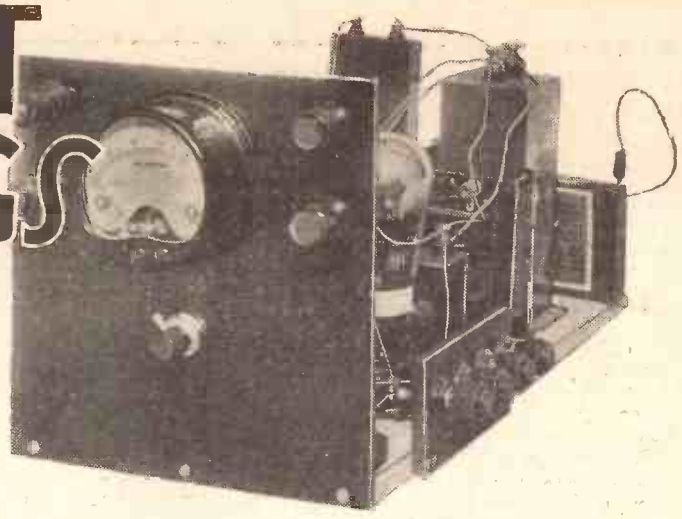
All this certainly sounds interesting, but we should certainly like to have more data about the valve—data obtained under working conditions.

On the face of it we should expect the current available to be extremely feeble; but perhaps it would be safest, and certainly fairer, to wait until we have tested one of these cold valves before criticising. We have written to New York in an attempt to obtain a specimen, and if we obtain one for test purposes, you will hear more about it in a future issue of "P.W."

TRANSPORT MINISTER'S RADIO SET

Mrs. Herbert Morrison, the wife of the Minister of Transport, is conducting a use-more-electricity campaign, and here she is shown plugging in her all electric wireless set.

MAINS UNIT COUPLINGS

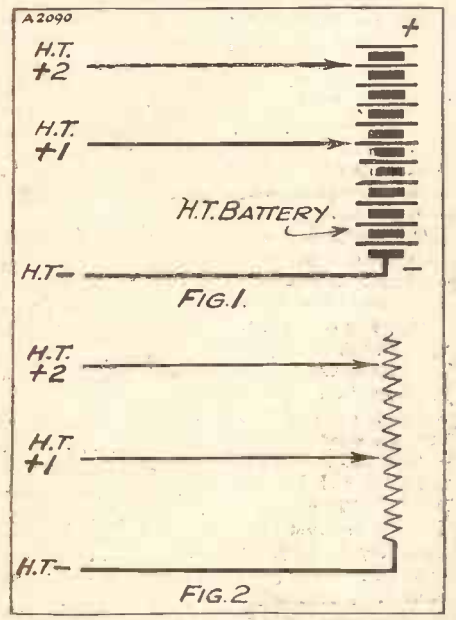


Howling and humming often accompany the first attempts on the part of a constructor to use an H.T. mains unit with his set. And in the following practical article the causes for such troubles are discussed.

By H. A. R. BAXTER.

MANY constructors find their initial attempts to use mains units are attended by unhappy results. They get either a howling or loud humming, or both. Motor-boating that pop-pop that sounds like a small, slow-running petrol engine is also a frequent ailment. But motor-boating and howling are generally due to similar causes. Humming we can dispose of very quickly. If you get mains hum to any

BATTERIES DO IT!



When an H.T. battery begins to get old its resistance goes up and tends to cause coupling effects—denoted, possibly, by howling.

appreciable degree you can reckon that the H.T. unit is badly designed—it has insufficient smoothing for the job of work it is trying to do.

The other trouble is caused by insufficient separation. That is to say, the mains unit is causing parts of the set to couple together that, electrically, should be well separated.

The Small H.T. Unit.

It has often been said that a small H.T. unit causes howling if it is unable to supply the current required by a set. That is not quite correct. Lack of current or, which is the same thing to a great extent, lack of voltage, will not cause a set to howl or even hum. In fact, the reverse should happen. The set should tend to be more stable with smaller H.T. supplies.

Actually what happens is this. A small H.T. mains unit, and when I say small I mean one that is designed for a small output, will not be provided with very elaborate separation devices, for its purpose will be to supply small sets with H.T., sets that have small H.T. requirements and, perhaps, only one, at most two, H.T. plus terminals. Such receivers will be capable of but small overall amplifications and "back-couplings" will not produce colossal build-ups.

But when one of these small units is used with a much larger receiver the greater amplification gets to work on any "feed-back" between the stages, and the howling is set up. Howling will be more certain if the anode and grid circuits in the set itself are not fairly well "de-coupled," and an attempt is made to serve two or three of the H.T. terminals by one output terminal on the mains unit.

Never Do It.

You should never do this. The very fact that the set has several H.T. terminals is fairly good evidence that the designer intended that those H.T. feeds should, among other things, be kept electrically separated in regard to L.F. or H.F. currents. When an H.T. battery is used, quite a different state of affairs exists. The resistance between any two points in an H.T. battery will, when the battery is in fairly good condition, amount to a matter of mere tens of ohms.

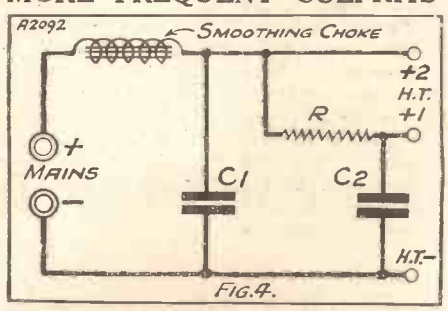
But the mutual resistance between the output terminals of an H.T. mains unit may be anything, depending upon the efficiency of the separation introduced.

A word or two in regard to this question of separation may assist readers to gain a clearer idea of the limitations imposed by the use of an inadequately designed unit.

Supposing the set you wish to use a unit with has two H.T. terminals feeding different parts of the set. One may be required in connection with the power valve in the last stage in the outfit, while the other serves a couple of earlier valves.

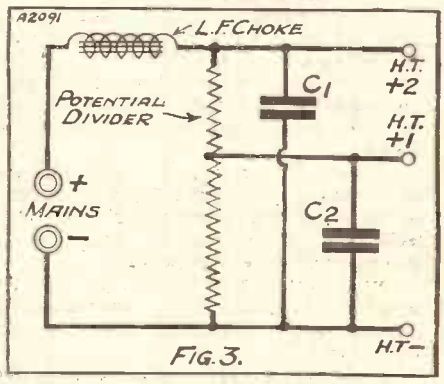
Obviously, unless "anti-motor-boating" devices of correct values are used in the set

MORE FREQUENT CULPRITS



Mains units need to be very carefully designed if howling and humming are to be prevented. Here you see a "skeleton" circuit that is mentioned in the article.

TRY THIS ONE



See if you can dig out how unwanted couplings occur in this circuit.

there will be a certain appreciable amount of L.F. energy flowing in the wires connected to both H.T. plus terminals. But if the L.F. energy of the last valve is fed back in any quantity to an earlier valve a vicious circle of amplification and further amplification, and still further amplification such as you get in H.F. with over-applied reaction will be set up.

Higher Mutual Coupling.

With the two terminals connected to a fairly good H.T. battery the coupling between them will be small. Have a look at Fig. 1 and at Fig. 2 where the battery is re-drawn as a resistance. The L.F. current that flows through the H.T. plus 2 lead, which possibly figures in a loud-speaker circuit, has to negotiate the H.T. battery. You can legitimately look at it that way for the purpose of this particular argument.

But a part of the H.T. battery also figures in the anode circuit of at least one other valve—possibly more. Therefore, an amount of energy will be passed on to that earlier

(*Continued on next page.*)

A GUIDE FOR CONSTRUCTORS

How to deal with and avoid those little troubles that are liable to crop up when you go "a little off the rails" in assembling a "P.W." set.

MANY of these troubles are caused by faulty "P.W." dual-range coils. We have found that in the case of home-constructed coils, readers frequently use an inner ribbed former of too small a diameter, and in consequence the reaction coupling is too weak and, in addition, the long-wave secondary is too small. The former should have a diameter of approximately 2½ in. over the ribs. It is essential to use exactly the gauges of wire specified.

When no reaction, or extremely erratic reaction is obtained, a reversed reaction winding should be suspected if the coil has been wound in all other respects to our published specification.

Faulty Reaction.

In sets which employ a stage of resistance capacity L.F. amplification following a detector valve, the value of the anode resistance should be checked up, because too high a value of resistance will produce poor, or even a complete absence of, reaction effects.

In addition, a freely-oscillating valve of the H.F. or special detector type should be used in the detector valve holder.

Another possibility is a faulty long-wave coupling compression-type condenser. These coupling condensers should have a maximum value of ·002 mfds. It is pointed out that the use of a condenser of too low a capacity rating, or one that is in any way defective, will very seriously affect the working of the set on the long waves.

The differential condenser must be of good make, and have a capacity of ·0001–·0002. In many cases faults have been traced to this component, and it has been found that the maximum capacity of the differential reaction condenser has been below ·0001, and in consequence it has not been possible to obtain sufficient reaction.

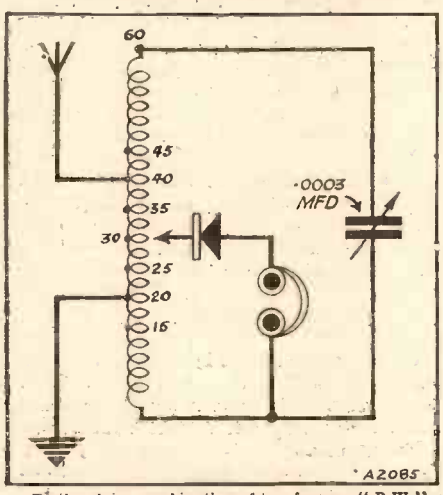
In more than one case in which readers have complained of not being able to obtain reaction on the long waves, we have traced the fault to a defective detector-grid condenser, and in these instances, it is interesting to note that the set has behaved normally on the medium wave-band.

Your H.T. Supply.

Reaction troubles might also be caused by the use of a poor quality H.F. choke, in sets where the H.F. choke is used in connection with a reaction arrangement.

In all cases, the value of H.T. which is applied to the valves should be carefully checked up, and the H.T. batteries, if of the dry cell or accumulator type, should be tested on load after the set has been working for a period.

"REALLY EXCEPTIONAL"



By the above combination of two famous "P.W." crystal circuits, Mr. O'Brien gets exceptionally good results.

H.T. eliminators must be capable of giving the required current output, and it should be borne in mind that mains units having rated outputs of 20 m.a. or under, are generally only suitable for receivers up to three valves, if one of them is of the power type. Sets which utilise super-power or S.G. valves require mains units with an output of at least 30 m.a.

All receivers of our design must be built exactly to our published specification if they are to give the results claimed. We are continually tracing causes of faults to bad wiring, failure to follow our instructions, and modifications to our published layouts, etc.

Another point concerns wave-change switches, and it is essential that these should be of the correct type. With all our published designs we give the names of approved makes of switches in the list of components, and when ordering, readers should specify the particular receiver in which it is intended to use the switch

TO KEEP THEM COOL!

The end of one of the ventilation ducts on the ceiling of a studio at the B.B.C. new Portland Place building. They had a lot of trouble preventing these ducts from carrying sounds from studio to studio.

MAINS UNIT COUPLINGS

(Continued from previous page.)

valve or valve group depending among other things upon the resistance in ohms in the H.T. battery mutual to the two circuits. The mutual resistance will lie between H.T. minus and H.T. plus 1 in our first two diagrams.

But in comparison with the thousands of ohms found in the other resistances in the circuits the H.T. battery resistance may be practically negligible.

When you turn to mains units your mutual coupling can be very much higher in resistance.

Supposing the thing incorporates a potential divider on the lines of Fig. 3, which is the skeleton circuit of a possible design. You see the similarity between this and the H.T. battery circuit? But two fixed condensers are brought in to provide a degree of "separation." From an L.F. point of view a condenser can be regarded as a resistance, and by placing resistances in parallel a resistance lower than either separately is produced.

Lowering the Resistance.

Condenser C has the effect of dropping the resistance across the extreme ends of the potential divider while C2 cuts down the L.F. (A.C.) resistance across the H.T.—1 H.T.+ points (across here you get what mutual coupling there is). But condensers so used must be large in capacity, or their L.F. resistances will be large and their usefulness so much the less. Even a 2-mfd. condenser has a resistance of well over a thousand ohms at a frequency of 60 cycles.

Fig. 4 is a skeleton circuit of a D.C. mains unit in which the voltage for one of the outputs is dropped by means of the series resistance R. Can you figure out how the coupling occurs here? And could you work out the degree of coupling?

In some future article I hope to be able to go more closely into the subject and show you how this can be done. In the meantime I trust I have at least illustrated the necessity for a wise selection of mains units where the more powerful receivers are concerned.

A READER'S "ULTRA CRYSTATUBE"

DEAR SIR,—Above is a combination of two famous "P.W." sets, and I find that it gives the loudest results of any crystal set so far. You will see that it combines the "Ultra" coil and "Crystatube." The coil consists of 60 turns No. 24 D.C.C. on a 3½-in. diameter former, tapped at the 15th, 20th, 30th, 35th, 40th and 45th turns, for the crystal clip. The earth and aerial are permanently joined to the 20th and 40th turns respectively. This is a really exceptional set, as anyone who tries it will agree.

Yours faithfully,
M. J. O'BRIEN.

Sutton,
Surrey.

AT HOME WITH RADIO STARS

You have heard the Sextet of Victor Olof on your set, and now you can read all about the man himself.

9. VICTOR OLOF.

YOU can weave a web of romance around the name of Victor Olof. You can picture him, a staid and venerable master of the Russian school, with Van Dyke beard and a purple plush coat, and the light of genius in watery blue eyes and the magic of music in his finger-tips.

The impression is not wholly correct. I know there is magic in Olof's finger-tips because my loud speaker has oft-times brought it to me. There is probably the light of genius in his eyes, but when I saw him I could not properly tell, for I had not the temerity to stare fixedly into them.

I know that they were brown, that his hair was middle-brown, and that the Van Dyke beard was absent. I held my breath when he told me he was English, and when I learnt that he was only thirty-one I was suitably horrified.

Fond of Gardening.

His dress is that of a bank manager or a stockbroker, or a successful salesman. Like your own, and rather better arranged than a journalist's. Like another English music master of our time, Solomon, Olof has no use for pose or affectation.

His house, situated in a quiet road at New Malden, might be your own. He is just an ordinary young Englishman earning his living in an ordinary way, and, I might say doing it rather better than some of his foreign confrères with even more musically picturesque names than his own.

You can talk to him easily, and you can listen to him easily. He is fond of gardening, and regrets that he cannot give more time to it. We stood outside his sitting-room in early springtime sunlight, and he pointed out to me the various things he had done, was doing, and proposed to do, with the lengthy strip of land at the rear of the house. There were three hundred and fifty-odd bulbs buried in the soil, some blackberry and gooseberry bushes at the bottom, and fruit trees.

An Early Broadcaster.

They were planted when Olof took over his house three years ago, and in the second year the cherry trees yielded just half a pound of fruit between them. Which, as most gardeners will tell you, is not as bad as it sounds.

Our conversation inevitably drifted towards music and broadcasting. Olof's father was a Swede, and an amateur musician. There were five children in the family, and with the exception of Victor, the youngest, none of them very musical.

Victor had his first violin lesson at six, and later studied at the Guildhall School of Music. For a considerable time, he was trained under Kalman Ronay, the master who was so helpful to Sandler, another well-known wireless violinist.

It is, of course, through his famous Sextet that Olof has become rather better known, but he has achieved considerable heights through his solo playing. He is, too, one of the oldest radio artistes still broadcasting, for he played violin solos at Marconi House in 1922, the very earliest days of the old B.B.C. In 1923, he gave a series of recitals and concerts in Vienna.

All Solo Stars.

It was ambition which inspired him to form the Sextet. He saw that if he could lead a group of polished string musicians it would be a step nearer ultimate success.

Every member of the Sextet, which consists of two violins, a piano, a 'cello, a viola, and a double bass, is a soloist of the highest class, and it was the idea of forming an orchestra a little better than any other of its kind which has done so much to gain a unique position in the music world for the Olof Sextet. Incidentally, Olof controls a much larger, but hardly quite so famous, salon orchestra.

FOUR MAIN HOBBIES

Victor Olof enjoys music, walking, photography and travelling abroad more than most other things.

Over a cup of China tea Olof clearly explained to me his interpretation of the art of broadcasting.

"There must be perfect *ensemble* in wireless work," he said. "One can never afford to forget the presence of the microphone. There is a tendency sometimes to be carried away by the music; to put more enthusiasm into one's work than is required. That, of course, is faulty technique, but on the concert platform it would probably pass unnoticed, for the audience are occupied with their eyes as well as their ears.

"In the wireless studio, a little too much vigour from the 'cello or the piano would drown the other instruments. That is why we indulge in so many rehearsals."

Admirer of Shaw.

Olof has a three-valve wireless set and a gramophone, but disclaims any knowledge of the engineering side of radio. Not long ago, when he was suffering from an attack of influenza, he enjoyed the novel experience of hearing his own Sextet broadcast from Savoy Hill. It was necessary, of course, to introduce a substitute violinist.

He has four main hobbies—music, walking, photography and travelling abroad. He showed me some beautiful photographs he took at Chamonix last year, one of which gained a prize in a newspaper competition. He reads, too, when the opportunity occurs, devoting himself mainly to works on political economy.

He is old-fashioned enough to admire Shaw, and no doubt smiles with the great G.B.S. at the rather pitiable mud-slinging capers of the many modern anti-Shavians.

July seems to have been a month of portent for Olof. He was born in July, his Sextet was formed in July, and he was married in July.

I did not have the opportunity of meeting Mrs. Olof, but from her photographs she looks very young and very charming; and, as her husband says, "essentially English."

A Busy Man.

The organist at the wedding, three years ago was Reginald Foort, who, of course, needs no introduction to wireless listeners. Mrs. Olof proves a very able secretary to her husband, for Olof himself is too busy to attend to the correspondence and commercial interests which invariably attend the musician of repute.

That is my impression of him. A young man; a busy man; a great musician; a human being. I think, after all, it sounds better than the Van Dyke beard and the purple plush coat!

LATEST BROADCASTING NEWS.

THE POLITICAL TANGLE.

THAT OPERA SUBSIDY—B.B.C. AND PROHIBITION—GRAND NATIONAL ARRANGEMENTS—PROGRAMME PEAKS.

THE B.B.C. no sooner came to terms with the Party Whips when it was involved in trouble with individual politicians who had an eye on the microphone. First there was the postponed discussion between Sir Oswald Mosley and Lord Eustace Percy wherein the action of the B.B.C. was characterised by Sir Oswald as "scandalous."

Then Mr. Winston Churchill applied for facilities to put his views over the air. But Savoy Hill told them that their proposals would form the subject of consultation with the Party Whips before any decision could be taken. And so the matter stands.

And will stand for some time, consultation with Party Whips being an extremely dilatory process. Meanwhile, there is growing restiveness among "back-benchers" generally as to the suppression of individual views involved in this alliance of the B.B.C. with the various Party headquarters.

That Opera Subsidy.

There is an ominous calm about the opera subsidy, which aroused so much interest towards the end of last year. Questions in the House of Commons are being neatly evaded. The indications are that the amount involved will be added to the Post Office vote for the B.B.C. in the late spring.

B.B.C. and Prohibition.

The B.B.C. is not, after all, to be the spearhead of the new attack by the temperance forces on the "curse of drink." Savoy Hill has decided definitely to take no part in the controversy. But the rule about keeping references to drink out of serious programmes is maintained.

Grand National Arrangements.

The Grand National is the black sheep of sporting events on which the B.B.C. broadcasts running commentaries, due, of course, to the fact that the race cannot be seen from start to finish from one particular spot. This year when the race is run, on Friday, March 27th, three commentators will be employed—Mr. R. C. Lyle, Mr. W. Hobbiss, and Mr. Alan Howland.

The last-named will be heard first. His job will be to describe the preliminary scenes, the runners and jockeys, and to see that listeners get some of the crowd effects.

Then Mr. Lyle takes up the story as he sees it from Messrs. Topham's private stand—the parade to the starting post and the race until the leaders approach the first jump before Beecher's Brook. At this stage Mr. Howland will announce the change-over of commentators, to Mr. Hobbiss at the Canal Turn for a description of the race until the leaders have passed the first jump beyond Valentine's Brook, when Mr. Hobbiss will hand over the commentary once more to Mr. Lyle.

The procedure for the second round of the course will be the same as for the first until the result and a summary of the race are given. Even then Mr. Howland will announce a further change-over to Mr. Hobbiss for his summary of the Canal Turn incidents, after which Mr. Howland will repeat the final results from the grand stand.

Altogether it is a very complicated affair, especially as part of the commentary will be put out by loud speakers on the stands at those stages when the progress of the race cannot be seen.

Programme Peaks.

Mr. Wickham Steed, Mr. Evelyn Wrench, and M. Boulestin are contributors to a new series of broadcast talks on Gastronomy, which is to start early next month. Mr. Wickham Steed opens the series with a talk entitled "Is Cooking an Art?" It will be recalled that a talk by Mr. Wickham Steed on Christmas Puddings was cancelled because the B.B.C. would not allow the speaker to mention brandy.

Miss Phyllis Neilson-Terry, Miss Florence McHugh and Henry Oscar are in the cast of "Rich Girl, Poor Girl," which, as already stated in our columns, has been adapted from the German play "Evelyne" by John Watt and Gordon McConnel for broadcast on Thursday and Saturday, March 5th and 7th respectively. Denis O'Neil is also taking part, having been specially released by Mr. Tom Walls from his part in "Marry the Girl." "Rich Girl, Poor Girl" is the first German musical play to receive its initial English performance from broadcasting. It is more modern in style than any musical production now running in London.

A radio version by Cecil Lewis of Joseph Conrad's novel "The Rescue," will be broadcast to National listeners on Friday, March 13th.

Mr. Philip Ridgeway intends that his next series of light programmes, which are to be broadcast next month, shall be worthy of the interest already being taken in them by listeners.

NEXT WEEK:

Full details of How to

MAKE YOUR "COMET" A RADIOGRAM

Also a long illustrated article

COMETISING YOUR "MAGIC" THREE

VERY SHORTLY:

SOPHIE TUCKER

writing on

"Mr. Marconi has a Lot to Answer For!"

FOR THE LISTENER.

By "PHILEMON."

Other people's views are not always very interesting, but our popular contributor certainly knocks the nail on the head more often than most critics of the broadcast programmes.

Longer Series.

A SERIES usually consists of six talks; and I see that one of our contemporaries wishes they might be longer. Personally I do not agree.

Six talks represent from two to three hours. I know of no subject under the face of the sun which may not be adequately treated in this time. Not profoundly and completely perhaps, but adequately; that is to say, enough to give the ordinary man the hang of it.

It depends partly, of course, upon the subject. For myself, for instance, six talks on World Finance are six too many!

Thinking Ahead.

Two series of talks have lately come to an end. That by Professor Heath on "Thinking Ahead" seemed to me a good one, because it suggested more questions than it answered. I like it when the other dog leaves me some meat on the bone.

Civilisation (concluded Professor Heath) is control of conditions; we are not therefore as yet a civilised race; we are still struggling against the influence of the "beast, the savage, and the mediævalist," and there is a long way to go.

The great thing, he said, was to face the facts frankly. I think he helped us to do this.

A Hitch.

Lord Eustace Percy and Sir Oswald Mosley were prepared to stage a pretty fight on the question "Does Tradition Hinder Progress," when, at the last minute, the talk was put off. I suspect that Sir Oswald was proving as little amenable to the B.B.C. as to the leaders of his party!

Apparently he didn't believe in speaking unless he could say what he thought. I was sorry to miss him. The Announcer seemed very sorry, too, and spoke in his

(*Continued on page* 1160.)

DANISH RADIO DEVELOPMENTS

From Denmark came the very first broadcasting of speech and music by radio, and that was a quarter of a century ago. What is happening in that country to-day? They are certainly not standing still in regard to radio, as you will gather from the following interesting contribution.

From OUR OWN CORRESPONDENT.

RADIO flourishes in the land of the Danes. Indeed, many of my readers will have long ago obtained their own concrete evidence of this fact in the guise of the several Danish broadcasting stations which they have picked up from time to time.

Copenhagen, for instance, which sends out its programmes on 281 metres. What long-distance enthusiast is not familiar with the national characteristics of that well-known broadcaster?

That Big Long-Waver.

Then there is its companion and relay station, situated at the Danish seaport town of Kalundborg, some sixty-nine miles west of Copenhagen. Kalundborg operates on a power of 10 kw. Its wave-length is rather high—1,153 m.—but, owing to its greater power, its programmes usually come in better in this country than do those of the main station at Copenhagen.

Lyngby radio station, near Copenhagen, is known to many English listeners. It is, in many respects, more of an experimental station than any of the others, and, so far as its programmes go, it is not of much interest to listeners, transmitting as it does merely weather reports and other official and meteorological matter.

Yet Lyngby is one of the most interesting radio stations in the world to the student of broadcasting, for it was from this little town that coherent speech and music were first transmitted by wireless in 1906. In that year, the inventor of the Poulsen Arc—Waldemar Poulsen, a Danish engineer—first demonstrated that his arc system of ether-wave production could be utilised for the successful transmission of telephony.

The First Concerts.

Poulsen continued his experiments at Lyngby until the War, at which time his station was purchased by the Danish Government for commercial use.

Amateur interest in broadcasting began in Denmark about 1920, and, in the following year, the station at Lyngby was fitted up with a telephony equipment which enabled it to transmit to one of the neighbouring islands.

In 1922 the Lyngby station began to transmit an occasional concert. Consequently it provided the first popular broadcasting station in Denmark. It is rather strange in these modern times to note the fact that when Lyngby first commenced its broadcast concerts it still employed the Poulsen Arc system of transmission, and that it used a wave-length as high as 2,400 metres.

In the same year two radio clubs were formed in Copenhagen. Subsequently these amalgamated under the title of the "Dansk Radio Klub."

An Illegal Exhibition.

The progress of radio broadcasting in Denmark, however, was, at that time, fraught with difficulties. These were mainly due to the fact that all amateur use of wireless receiving gear was absolutely prohibited by the authorities, and that it was not possible for an amateur to obtain a receiving licence unless he was a radio scientist or engineer of some importance.

The first amateur radio exhibition in Denmark was held at Copenhagen during the November of 1922. Despite the evident enthusiasm which it developed, it was still, in Danish law, an illegal exhibition, however.

As, at this period, no official broadcasting was carried out in Denmark, the Danish enthusiasts derived their programmes chiefly from the old B.B.C.; Newcastle, Aberdeen, and London comprising their favourite stations.

Then the State Telegraph Station at Lyngby began to radiate official broadcast-programmes, but, owing to its persistence in employing an arc transmitter, the quality of speech and music which it radiated was poor.

By this time, however, the radio germ had thoroughly infected not only Danish amateurs, but it had found its way also into high official circles in that country. The "Dansk RadioKlub" managed to obtain permission to install a small 0·5 kw. valve transmitter in the State Telegraph buildings in the centre of Copenhagen. Thus began the now well-known broadcasting station at Copenhagen.

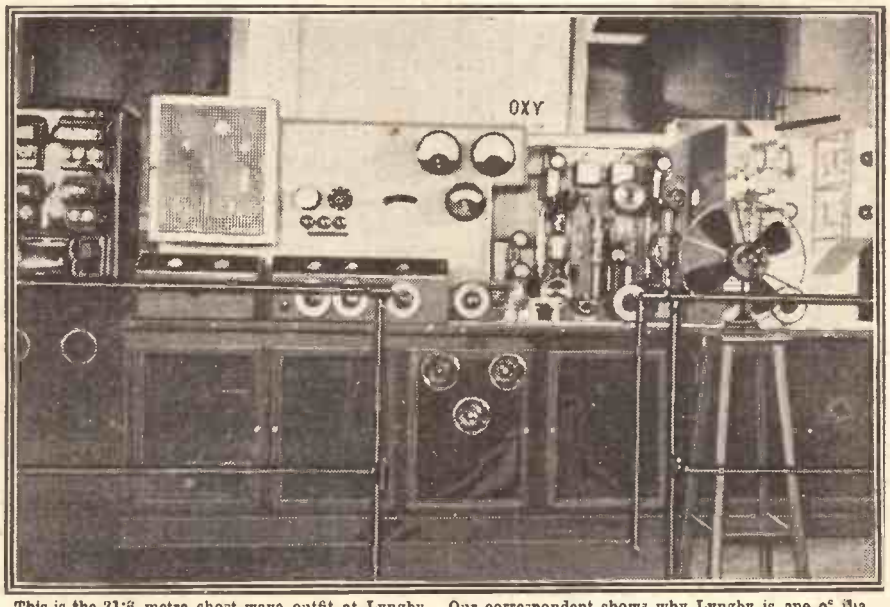
Broadcasting Begins.

It should be noted that the present station at Copenhagen still occupies the exact site of the old one. The present aerial at Copenhagen is almost exactly the same as the original one, and it hangs high up above the roof of the Central State Telegraph Offices in Copenhagen, a landmark which is visible for miles around.

So began radio broadcasting, and up-to-date radio-telephony generally, in Denmark. It has proceeded apace ever since, and there

(*Continued on next page.*)

LYNGBY'S EXPERIMENTAL SHORT-WAVER



This is the 31·6 metre short-wave outfit at Lyngby. Our correspondent shows why Lyngby is one of the most interesting radio stations in the world.

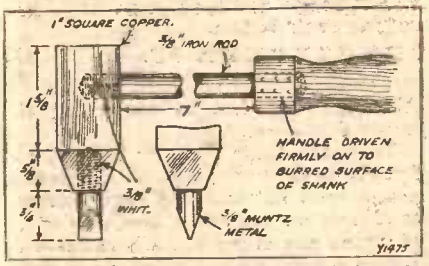
A NEW SOLDERING IRON

A reader uses muntz metal with excellent results.

The Editor, POPULAR WIRELESS.

Dear Sir,—Please find enclosed sketch of soldering iron, which you will find is a decided improvement over the solid copper "iron." The writer, in making up the soldering iron, which was to be used for fine work such as radio, requiring a fine point, would have used copper for the point, but this was not obtainable in handy size, and used Muntz metal instead of copper.

HOLDS THE TINNING



Showing how the piece of muntz metal is screwed into the copper bit.

He was surprised to find that the tinning on the point simply won't burn off, no matter what kind of a fire it is heated in; even overheating won't shift the tin. The point, of course, must be of muntz metal, which can be obtained easily.

I trust that this may be of use to you and others.

Yours faithfully,

A. STILL.

Hebburn-on-Tyne.

THE "CLEAR-CUT" CONE

Adapting this loud speaker to a popular unit.

The Editor, POPULAR WIRELESS.

Dear Sir,—Just a few words of thanks to you for your description and depiction of the "P.W." "Clear-Cut" Cone in the issue of December 27th, 1930. I have made the Cone to your instructions, and used an "Ormond" four-pole balanced armature instead of the "Blue Spot."

The difference between my former horn speaker performance and that of the "Clear-Cut" Cone is enormous, and listening to massed music and violin selections is now a pleasure indeed, as formerly a nightmare. I have mounted the cone and unit in a 20 in. by 20 in. by 12½ in. deep cabinet, with fretted front.

To those wishing to mount the cone to suit a similar "Ormond" unit to the one I used, the following particulars may be of use. Instead of keeping the back strap nailed directly to the square frame, as shown from the "Blue Spot" unit, nail two side pieces 2 7/16" × 4" × ⅜" as shown in sketch.

Again thanking you for a very fine and advantageous contribution to successful wireless.

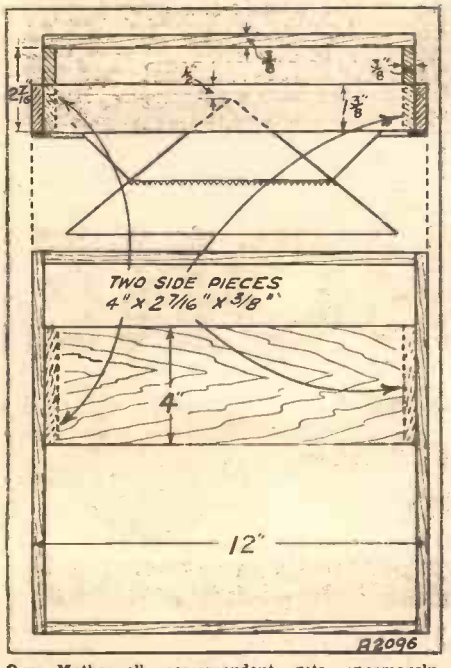
Yours faithfully,

THOMAS FORREST.

Motherwell.

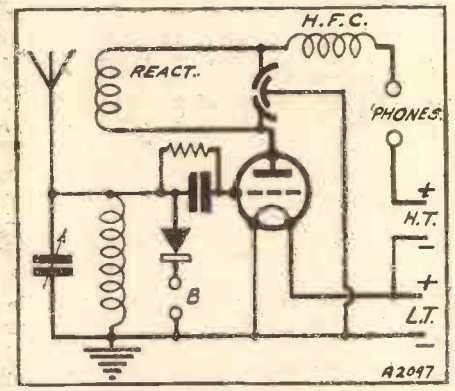
P.S.—My set is your "New Coil Two," with a third valve added.

WONDERFUL RESULTS



Our Motherwell correspondent gets enormously improved results by adapting his Ormond unit, as above, to be "P.W." "Clear-Cut" Cone.

SAVES THE BATTERIES



Mr. Derham has only to connect phones at "B" and he can listen with the crystal and be independent of batteries.

AN UNFAILING STANDBY

Applying the crystal to a valve set.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have a one-valve set for Edinburgh, and was recently "left in the lurch" by finding my accumulator was not ready at the charging station. Since I wanted to hear a particular programme that night, I rigged up the following alteration.

Briefly, the idea is to have a crystal detector combined with the valve set. I think the circuit explains itself. 'Phones can be inserted at B when the accumulator is being recharged.

Thanking you for your excellent article, and hoping this will be of interest to some of your readers.

Yours faithfully,

W. H. DERHAM.

Edinburgh.

P.S.—I may say this letter is prompted by the paragraph in Mr. Dowding's article on "Modern Crystal Sets"—called "An Unfailing Standby." ("P.W." January 24th, 1931.)

It is not by any means a novel circuit, but we owe our thanks to Mr. Derham for reminding us of its existence and of its usefulness.—TECHNICAL EDITOR.

TWO "G.B" TIPS

For automatic grid bias the resistance necessary to produce a given value of bias can be found by dividing this figure by the anode current passing through the resistance concerned, the current being expressed in amps.

* * *

Great care should always be taken with grid bias wiring and connections, as a failure to provide sufficient bias means that the valves (especially power valves) are placed in jeopardy when H.T. is on.

DANISH RADIO DEVELOPMENTS

(Continued from previous page.)

are few countries which are more up-to-date in their radio practice than is our neighbouring land of Denmark.

Besides the broadcasting stations at Copenhagen and at Kalundborg, which transmit on 281 m. and 1,153 m. respectively there are at least three other stations transmitting regularly though not officially listed.

Hjoerring, on 1,250 m., Sorö, 2,400 m., and Odense, 950 m., are all stations which may sometimes be picked up here.

Hjoerring and Odense are chiefly relay stations taking the Copenhagen programmes. This fact should be borne in mind when what is obviously a Copenhagen programme is picked up on a long wavelength. Unfortunately, however, Hjoerring and Odense do not give their own calls, so that their identification is only to be made by an estimation of the wavelength on which the transmission is received.

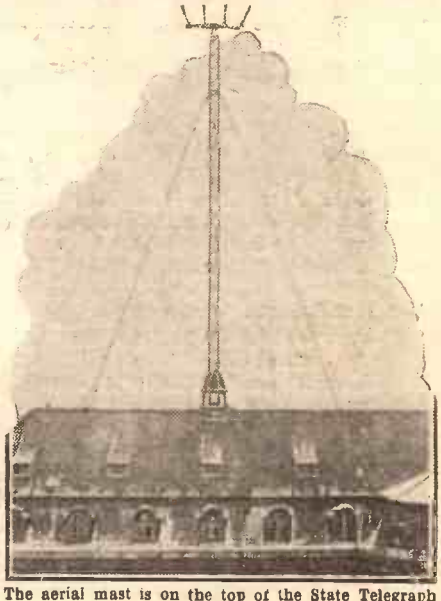
Relayed By Reykjavik.

Sorö relays from Copenhagen, through Kalundborg, but, at times, it radiates its own programmes.

There is also another small Danish station at Ryvang, a seaport on the Western side of Denmark. Mainly this is used as a military station, and it is not always in operation. Still, being one of the short-wave group, it is interesting to bear in mind when "working" Denmark on the ether.

Finally, it should be remembered by long-distance listeners that much of the matter transmitted by Copenhagen is relayed by radio link, from the broadcasting station at Reykjavik (pronounced Ray-kee-ar-veck) in Iceland. Reykjavik transmits on 1,200 metres, and, as if to attract the attention of a maximum number of listeners, it often makes its announcements in Danish, French, German—and *English*.

COPENHAGEN'S AERIALS



The aerial mast is on the top of the State Telegraph Buildings.

A Fine Example of Marconiphone Craftsmanship

The Marconiphone Pick-up in a comparatively short period has established itself, beyond all question, as supreme amongst electrical reproducers. It challenges comparison on the essentials of good electrical reproduction.

Perfect Realism. The ordinary listener, the experimenter and the music-lover alike agree that the Marconiphone Pick-up stands alone in this essential—it provides a re-creation of the original recording so amazing that it must be heard to be believed.

Technical Efficiency. The response curve compensates for deficiencies in recording by a proportionate increase in sensitivity on the lower frequencies, while maintaining surface noise at the lowest possible level; large output allows for full volume from a simple two-stage amplifier.

Freedom from Record Wear. The freedom of the movement, the accurate tracking and ball-bearing carrier arm ensure a remarkable absence of record wear.

New Features. The latest Marconiphone Pick-up is finished in neat brown, fitted with a slightly larger base for greater stability and quick-grip spring terminals for easy connection; the rotating head is retained.

£3·3·0

MARCONIPHONE PICK-UP

MADE BY THE MASTER CRAFTSMEN OF RADIO

G. Marconi

WIRELESS and the WIND

By G. H. DALY

Listening to the wintry blasts or to springtime breezes whistling by your aerial, have you ever wondered whether they affect your radio reception? If you have, you should find the following interestingly presented facts unusually good reading, for they tell you pretty well all there is to be known about this particular subject.

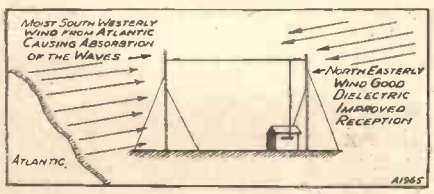
ON the face of it the ordinary common or garden wind that blows would not seem to have much effect on wireless reception. Yet this is not really the case, for now that investigators are becoming more precise and exact in their measurements and records they are learning that the type and the direction of the wind may have, in some cases, quite an appreciable effect on wireless communication.

A Form of "Fading."

It has, of course, long been known that fading can be caused by an aerial swaying in the wind, owing to the variations in the capacity of the wire as it sways nearer to or further away from the ground or earth—which may be represented by the roof or walls of a house. The obvious remedy is to see that the aerial is taut enough not to sway.

As a matter of fact—to revert to ancient history—it was a common practice in the case of the twin aerial used at one time on all ships—where the swaying aerial was always a possibility due to the motion of the boat, to hold both sides of the twin wire aerial taut by means of insulated guys on both sides of the spreader.

A PUZZLING POINT



Wireless reception should always be better when a dry wind is blowing, i.e. from the N.E.; but investigators are puzzled by some recent observations which indicate that occasionally exactly the reverse to the above statement occurs.

Twin wire aerials are not very common nowadays, either on ship or on shore, but where they are used they will always tend to sway in the wind more than the single wire type, and should, therefore, be guyed like the old kind of ships' aerials.

Their tendency to sway in the wind (added to the fact that the single wire is quite efficient) has caused the twin wire aerial to fall into disuse—and rightly so.

Where aerials are slung to trees it is usually necessary to allow the aerial to sag a little so that the swaying of the tree due to heavy wind will not snap the wire. For this reason the convenience of the tree as an aerial mast is counterbalanced by the possibility of the aerial swaying and consequent fading.

Such fading may not be very obvious where loud volume is obtainable, but is likely to be noticeable with weak signals from distant stations.

Nor is it possible to keep a respectable tautness on an aerial which is guyed by rope, as rope contracts in wet weather and loosens up in dry weather—wire guys, therefore, are to be preferred.

So much for the more obvious effects of the wind, but there are other less obvious results of the wind on wireless reception.

Dry and Damp Winds.

Wind, for instance, is a movement of a large volume of air and there are many varieties of wind and air. Warm air, for example, is vastly different from cold air, a moist wind is not the same as a dry wind, and it would appear that all treat the wireless waves which pass through them in a different manner.

A dry wind is a better dielectric than a moist wind—hence all other things being equal, wireless waves will tend to pass through the dry air more freely and be less dissipated or absorbed than if they were being propagated through moist air.

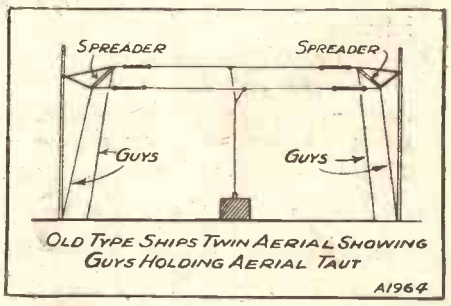
Unfortunately this is a damp country, the prevailing wind coming up from the Atlantic brings a certain portion of that ocean with it, and we do not experience the perpetually clear and crisp reception that we might enjoy if the prevailing wind came from the north-east.

Paradoxical Results.

Incidentally north-easterly winds should enable us to pick up continental stations better than if the south-westerly wind is blowing up from the Atlantic, not, of course, because of the direction of the N.E. wind, but because of its dryness.

Theoretically, that is what should always happen, and although observation shows that the above usually does happen, it has been found by observation on the American station K D K A that the reverse can take place, for signals from this transmitter are better when a depression is coming up—and a depression usually means wet weather; while, on the other hand, the approach of an anti-cyclone, i.e. dry weather, appears to have a damping effect on the signals, for they fall off in intensity. This is just the opposite of what might be expected to happen, so investigators are confronted with a mysterious paradox.

THOSE OLD GUYS



They used always to employ special guys to hold tightly in position the twin aerials that were at one time used on nearly all ships. This was to prevent swaying, which would be followed by fading.

However, wind is a very complex matter, being made up of a number of different gases of which nitrogen and oxygen preponderate, while water vapour and argon are among those also present. We have learnt by experience how the gases of the upper atmosphere affect our wireless waves by reflecting them back to earth, and so forth, but we are still rather hazy about the effect of the gases of the lower atmosphere on the wireless waves, yet there is little doubt that gases, in the form of moving air or wind, as we call it, do play their part in the propagation of wireless waves about the surface of our earth.

Effect on Short Waves.

In practice the only time that the effect of the wind on reception is likely to be noticeable is during short-wave reception. In this class of work we are dealing with very high frequencies, and a very small change in capacity may result in a comparatively large alteration in wave-length. For this reason it is usual to take special care in keeping a short-wave aerial taut.

STATIONS WORTH HEARING

Some practical distant-programme notes compiled by a special contributor who nightly searches the ether in order to obtain really practical and up-to-the-minute information for "P.W." Readers.

By R. W. H.

THE other day W. L. S., the short-wave man, paid me a visit and we spent a very interesting time in exchanging experiences of short, long and medium wave reception since the beginning of the year.

Some readers may not know that when a sun-spot outbreak is at its height it is usual for the greatest distances to be spanned by the shortest waves in general use. What we may call the "longer" short waves, that is, those over about 25 metres, give poorish results, whilst on the medium-wave broadcast band there is an all-round reduction in signal strength and ranges.

Touching the Spot.

As the sun-spots decline in size and number on the approach of a minimum period the shortest waves lose their former good qualities. The best region for long-distance reception moves gradually up the short-wave band.

Readers may remember how some years ago the 68-metre transmission of K D K A could be received at full loud-speaker strengthen this country on the simplest of apparatus.

Meantime another region of excellent reception develops in the neighbourhood of 180 metres. This also extends upwards until it reaches the lower part of the broadcast band. As time goes on more and more of the higher part of the broadcast band is included, and it may happen that stronger signals are obtained there than between, say, 200 and 300 metres.

Now all this is exactly what has been taking place during the past few months, and it is a very definite proof that the long-continued period of sun-spot activity is now definitely past, and that we can look forward to better and better conditions for broadcast reception. At the present time the best portion of the medium wave band for reception at very long ranges is unquestionably that between 200 and 300 metres. Quite small American stations such as W P G, whose power is only 5 kilowatts, are heard at enormous strength.

Between 300 and 400 metres conditions are moderate and are improving. We can hear the 50 kilowatt W G Y and W J Z, but they have never quite the strength of, say, W T I C, a station with a shorter wave-length.

Above 400 metres conditions are still not good for the long ranges. W L W and W E A F, for example, though both are rated at 50 kilowatts are seldom more than feeble signals. In a very short time we should find wonderful reception on wave-lengths between 300 and 400 metres, and that should be followed by similar experiences on the upper part of the band.

Atmospherics have been a bit of a nuisance on some recent nights, and there is at the moment rather more fading than there was a week or two ago.

These slight setbacks, however, are to be expected at this time of the year, when the weather is in a rather unsettled condition, and when very big temperature changes frequently occur in the course of a few hours. We are bound to have a few poor periods, but conditions, on the whole, are improving; and the setbacks are only temporary.

Have You Heard Riga?

My big set during the week has bagged an extraordinary number of European stations all giving splendid loud-speaker reception. On the long waves Huizen, Radio-Paris, Zeesen, Warsaw, Motala, and Kalundborg are all in excellent form, and Lahti is strengthening up.

Further down, Budapest is a little off-colour, but Vienna is a fine signal, as are Brussels No. I, Milan and Langenberg. Prague is good at times, but may be heterodyned. Lyons Doua is always powerful.

A station which you may be able to add to your bag is Riga on 525 metres (572 Kcs.). You will find him just between Vienna and Munich. He is coming in very strongly on most evenings.

SHORT-WAVE NOTES

A weekly contribution for short-wave enthusiasts by W. L. S., "P.W.'s" short-wave expert, who operates a very well-known amateur station and is one of the leading experts on the subject.

I HAVE to thank my Bournemouth correspondent for cheering me up considerably by enclosing a cutting reading as follows: "Is Mars Trying to Signal? A well-known amateur who listens regularly on the ultra-short wave-lengths has for a long time been puzzled by mysterious signals on a wave-length, *as near as he can judge*, round about 10 metres. In an interview the amateur stated that the signals *must emanate from somewhere*, as there is a definite rhythm attached to them."

If anyone can explain why signals that are heard with a definite rhythm "round about 10 metres" justify the headline about Mars, I shall be glad.

The Pope's Station.

Personally, apart from wishing that some of the ultra-short-wave commercials that make the ether horrible *could* be relegated to Mars (or further) I am not very interested in the short waves as a means of inter-planetary communication.

The same correspondent reports that the Vatican station H V J is generally better on 50·26 metres than on 19·84 metres. The first transmission from the station that I heard was on 19·84 and very strong indeed, but I believe that the inaugural speeches were received in the United States on the other wave, and then sent back here to the B.B.C.

Incidentally, I should be glad to know why the whole transmission was received at infinitely better strength and quality from Mühlacker than from London Regional?

The query that interests us most this week is from "G. B.," of Honiton, who wants to know how to stop a station from fading every time the announcer speaks. Very difficult, "G. B.," but nevertheless intriguing. On the same lines is another, supplied by myself. What should be done to distant amateur stations who call "C Q" very clearly and distinctly for five minutes and then send their call sign twice, very fast and very badly?

"N. M.," of Sparkbrook, reports having heard the Leviathan working with W O O and W N D on about 80 metres. The exact wave, according to my information, should be 87·51 metres, but I know they have several alternative settings. This is another reader who finds the waves above 40 metres the best for D X reception at the moment.

Why Not Try This?

Incidentally, during the temporary suspension of the "weekly five," may I suggest that anyone who is proud of his receiver should listen on 80 metres any morning between 7 and 8 a.m., and see how many U.S.A. amateurs on *telephony* he can log. I have been on the trail for several mornings and have heard more than fifty different stations, mostly at excellent strength.

"N. M.," by the way, on his list of short-wave stations, qualifies for "H.A.C." membership. Two rather unusual DX stations logged are V K 6 W F, Perth, and Georgetown, British Guiana.

If "G. L.," "W. R. H.," and others who wish to get in touch with the International Short-Wave Radio League will send their letters to me, I will see that they are forwarded to the proper quarter.

A Tuning Suggestion.

So many correspondents appear to be interested in work on 5 metres that I am considering the idea of giving up this space to the *really* short waves about once each month. Unfortunately, if there is anything in this eleven-year cycle business, 5 metres will be absolutely useless except as a laboratory experiment for some years to come. Even 10 metres is absolutely unworkable at the present time.

A correspondent from Somerville, Rhodesia, wishes to know how best to use two ·0002 and two ·00005 condensers in the "Magic" Four for short waves. I suggest that as the tuning controls the ·0002's with direct drive and the ·00005's in parallel with them, *with slow-motion* dials, would be excellent. The larger condensers can then be used for "pre-setting" to something near the required wave-length, and the final tuning accomplished on the small ones.

L.F. CONTRO FOR YOUR "COMET"

Smooth control of volume is essential for the full enjoyment of reception with a powerful set like the "Comet," and here you have the necessary details for ensuring it. In addition, this progressive articl contains particulars for providing your set with an outpu filter, which is a refinement that greatly benefits loudspeake results, and will definitely improve your reproduction

By THE "P.W." RESEARCH & CONSTRUCTION DEPART

LAST week we showed you how to add a couple of refinements to what may be described as the H.F. end of the "Comet," and now we turn to the L.F. circuits with a view to adding just that touch of the "de luxe" to them which the more experienced operator demands.

There is a definite difference, therefore, between last week's refinements and those we are now going to consider.

Noteworthy Differences.

The former made noteworthy differences in the actual performance of the set, whereas this week's items do not increase its actual powers, but simply make it pleasanter to handle, and help you to use a mains unit for your H.T. supply, or a super power valve if you so desire.

Last week we gave you the necessary instructions for adding that truly remarkable "P.W." development, "Flexi-coupling," a potentiometer for the detector, and a panel indicator to show when the set is switched on.

The first of these transforms what was initially a very fine receiver into something altogether extraordinary, with selectivity and range never before approached by a set of the "detector and low frequency" type. The second adds just that extra touch of silkiness to the reaction control which means so much in long distance reception.

"Cannot be Equalled."

The control of reaction in the "foundation" model of the "Comet," i.e. the simplest version described at the beginning, is good, but when you add the simple little device of a potentiometer to adjust the grid potential of the detector valve, and set it the way we described, the controls becomes quite exceptionally progressive and effective.

With the aid of this remarkable "silkiness" and the power and selectivity given by "Flexi-coupling," the "Comet" will put up a performance on foreign stations which some three valvers with a screened-grid H.F. stage cannot equal. For sheer power and volume on the nearer stations, of course, the "Comet" cannot be equalled by any ordinary "three" using a screened grid valve.

A Valuable Refinement.

The third refinement described last week was a panel light, as we mentioned a few moments ago, and although this obviously had no effect upon the working of the set, it is not so unimportant as you might think.

In our experience it is a very desirable little adjunct upon a really de luxe outfit, for the risk of going to bed and leaving the set on all night is not a negligible one. This is particularly the case on Sunday nights, when the stations close down early, and then there is also the possibility of the set being left "on" after the lunch-time programme and much good "juice" wasted.

With a panel light the risk is completely removed, for all the time the set is turned on there is a red warning glow. It is not obtrusive, but it is sufficiently noticeable to catch the eye and remind anyone to switch off.

THE EXTRA PARTS YOU WILL NEED.

- 1 ½- or 1-megohm volume control, three-terminal type (Varley, or Igranic, Lissen, Gambrell, Sovereign, Wearite, Magnum, etc.).
- 1 Output-filter choke (any good choke of about 20 to 40 henries inductance and resistance not more than 500 ohms) (Lissen, or Varley, Ferranti, R.I., Igranic, Atlas, Wearite, Bulgin, etc.).
- 1 2-mfd. condenser (Ferranti, or Dubilier, T.C.C., Lissen, Igranic, Mullard, Hydra, Formo, Filta, etc.).

The refinements we are setting forth this week are two in number, and they will appeal mainly to the quality enthusiasts, and to those who desire to use a mains H.T. unit. The first is a volume control in the first L.F. circuit, which can be added so simply that we are going to describe it entirely in words, without a diagram.

Super-Quality.

Such a control is a considerable help in getting super-fine quality from your local station, because it makes it easy to adjust the volume to just the right level without overloading your last valve.

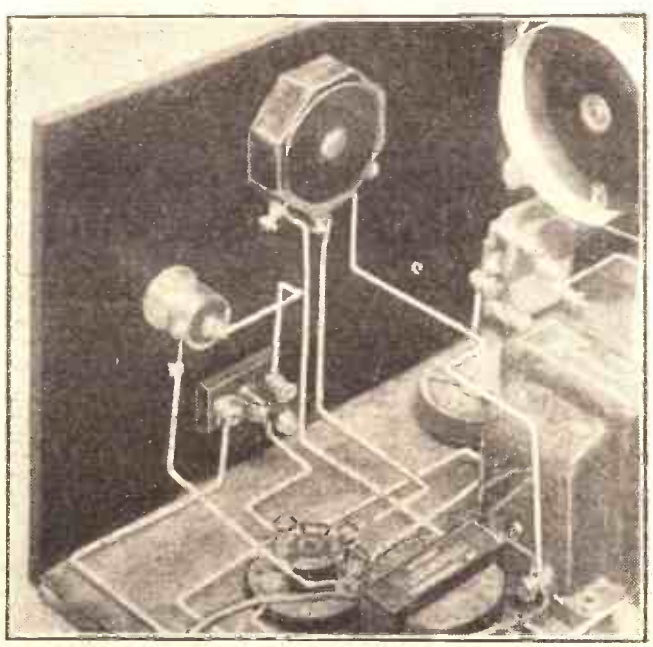
Of course, it is quite possible to do without it. With the simplest "foundation" model, for example, just unscrew the selectivity control knob fully, and then detune a little if the volume is still too great.

A Very Real Help.

When "Flexi-coupling" has been added, this no longer applies, so turn Selector knob fully to the left and tune on the variable condenser alone. This usually gives a suitable reduction of volume for the local work.

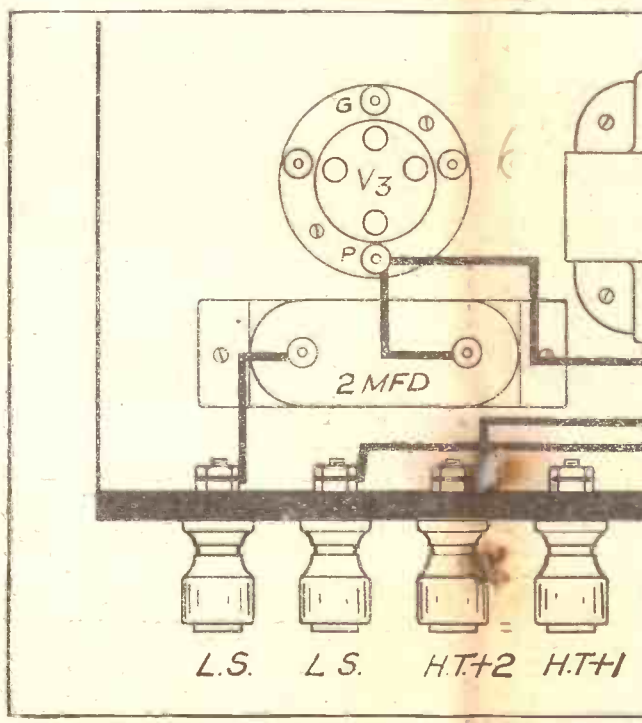
A proper L.F. volume control is a real help, however, especially if it is used as an adjunct to the methods already described. To set

HOW TO VARY THE VOLUME



Here is the volume control in position, with the wiring completed. It's a great convenience to be able to "tone down" the "Comet," for the punch it develops is often far too strong to be comfortable.

ANOTHER STEP ON THE WAY



This shows you the simple extra wiring that is necessary to give your rec has so many advantages both in loudspeaker

YOU CAN RANGE FRO

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about fitting one you want first of all a three-terminal type volume control, of either ½ or 1 megohm resistance.

Fit this to the panel, near the right-hand side, looking at the set from the front. The position is 4½ inches from the end of the panel, and 1½ inches down from the upper edge. It is easy enough to make the hole required if you mark out its position lightly in pencil and then run a ⅛-inch drill to provide a pilot hole.

Easily Fitted, Isn't It?

Next remove the present wire between the grid of the second valve and one secondary terminal of the first L.F. transformer. Instead, wire the grid of this valve to the middle terminal on the volume control.

Then wire the L.F. transformer terminal from which you have just removed a connection (it will be marked "G") to one of the outside terminals of the volume control. If the volume control has been fitted with its terminals downwards, as you see in the photo, the correct terminal for this lead is the left-hand one, looking at the panel from the back.

Progressive Control.

Now wire the remaining terminal of the volume control to the other secondary terminal of the same L.F. transformer. This is usually marked "G.B.," and from it a flex lead already goes off to the grid bias battery. This should naturally be left in place.

That completes the job, and you will now find that you will only get normal volume when the knob is turned fully to the right. When it is brought round to the left strength is cut down, and so you get your adjustment.

Now about the fitting of our second refinement, which takes the form of an output filter for the loudspeaker. Although it cannot strictly be said to have any effect on the volume or range of the set, it does help you to get better quality, it is very desirable when a super-power valve is used, and it is quite essential when the H.T. is supplied by a mains unit.

Few Parts.

The parts you will require are a low-frequency choke of about 20 henries, i.e. the type usually described as an "output filter choke," and a 2-mfd. condenser. Room has been left for these on the baseboard, as you will see when you examine the other photo showing them in place, but you may have to bend one or two wires out of the way to let them in.

The operation of wiring-in the filter is a little more extensive than that involved with the volume control, so we are giving a wiring diagram showing the work completed.

To help you to check it over, we will describe the job in words also. Get your choke and condenser in place, then turn to the wiring. Remove the present lead between the plate of the third valve and L.S.— (nearest end of strip) and the one from L.S.+ to H.T.+2.

Insulated From H.T.

Instead, run a new lead from H.T.+2 to one terminal of the output choke. Wire the other choke terminal to the plate of the third valve and to one terminal of the 2-mfd. condenser. Wire the other terminal of the condenser to L.S.— and wire L.S.+ to any convenient point on the negative side of the L.T. circuit, e.g. to L.T.—, to H.T.—, or to the negative filament terminal of the third valve holder.

That finishes the job, and you now have the satisfaction of knowing that your loud speaker is insulated from the H.T. current of the last valve. This means entire safety with an A.C. mains H.T. unit (a further precaution is needed with D.C., to be described later), no risk of damage to the loud speaker, whatever the source of H.T. supply, and no "voltage drop" in the speaker when a super-power valve is used.

Prevents Motor-Boating.

Another important advantage of the output filter is that it is a powerful preventive of motor-boating. That, of course is one reason why it is so essential with mains unit H.T. supply, the other being the safety factor.

On batteries it is not needed for stability reasons, because the anti-motor-boating filter in the detector circuit is sufficient by itself in such cases.

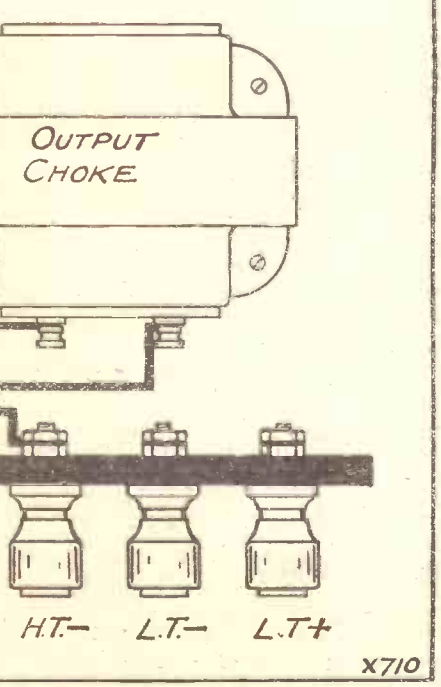
PROGRESS!

The details given here provide for

VOLUME CONTROL.—Smooth and silent variation from a mere whisper to full loudspeaker strength.

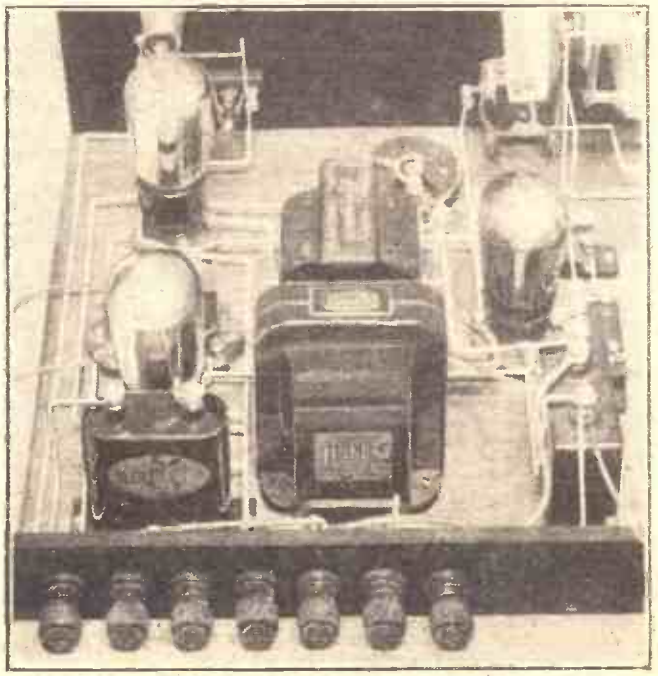
FILTERED OUTPUT.—Relieves the loudspeaker of all steady plate current. Conserves the H.T. Improves loudspeaker response. Facilitates the use of mains H.T. supply.

TO PERFECTION



ver that very desirable "filtered output" which and mains operation.

IMPROVED LOUDSPEAKER RESULTS



The low-frequency output choke and 2-mfd. condenser are here shown in position for filtering the loudspeaker output.

OM *ppp* TO *fff*

FROM THE TECHNICAL EDITOR'S NOTE BOOK.

Tested and Found—?

W. B. MOVING-COIL SPEAKER.

ONE of the very best permanent magnet type moving-coil loud speakers that we have to date heard, is the new W.B. It retails at six guineas for the unit assembled on a small baffle board, and it is a pity that it cannot be sold at a tenth of that price so that it could be brought within the reach of hundreds of thousands more listeners.

But there you are, it is one of those instances where "money talks!" Having discharged that subtle pun I must hastily add that I think the W.B. product is excellent value for money as judged by the prices of current accessories. Its response is wonderfully even, and it goes well down into the bass and up into the higher register and retains an admirable balance throughout. Additionally, it has the sensitivity of a quite sensitive electro-magnetic unit, and will work well on small sets.

One of the new W.B. switches.

Recently I have also been examining some of the new W.B. switches. These sell at 1s. 3d. for the two-point contact type, and 1s. 6d. for the three-point contact model. They incorporate a completely novel action. Instead of contact springs making a rubbing contact with the surface of a metal plunger, the contacts tuck themselves into a small metal cup fitted to the tip of the plunger. The action is most definite and a completely efficient contact is achieved.

PERMCOL PANELS.

These are new non-discolouring ebonite radio panels being made by the British Hard Rubber Co., Ltd. They are available in all the usual finishes and have unusually good surfaces. They consist of pure ebonite of good quality, and we have no hesitation in endorsing the claims quite modestly brought forward by the makers.

We have subjected various samples to different tests and find Permcol as good as, if not better than anything else we have come across in the way of panel materials. Among other things, it works excellently and does not easily chip and crack as do many of the cheap compositions that find their way into suburban radio stores.

THE "MIDGET" WANDER PLUG.

The Belling-Lee "Midget" Wander Plug, which sells at 2d., is a cute little device. It has a side fixing for the lead, and the wire and its covering are neatly held in the one grip. It is one of the neatest fixings I have ever come across.

The actual plug part has three separate tongues of hard, springy metal and fits into the most awkwardly made sockets snugly and tightly. I should think this Belling-Lee Midget wander plug will prove specially useful for those many portable sets where space is restricted.

AN INTERESTING BOOK.

Star Engineering of Manchester, announce that they have reserved 500 copies for free distribution of their book, "Moving Coil Loud Speakers Simply Explained." This book is priced 1s. 6d., but I must point out that there are only about a dozen pages of reading matter and diagrams. Nevertheless, it is a brochure well worth trying to get.

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.

CLIX ANODE CONNECTOR.

Messrs. Lectro Linx, Ltd., have sent me one of their new vertical types of Clix Anode Connectors. Its cost is only 3d., but it is one of those little devices, such as Lectro Linx produce by the dozen, that save no end of time and temper. Fitting the one part on the top of the S.G. valve you can then disconnect the S.G. anode lead in a matter of a moment, safely and without danger of the H.T. short circuiting should the lead be left loosely dangling in the set, for the part which terminates the lead is an insulated socket.

THE NEW FERRANTI TRANSFORMER.

Looking at the new Ferranti L.F. Transformer, the A.F.8, one can be forgiven for remarking "a chip of the old block!" In such circumstances, that "bromide" seems peculiarly apt. It is a small transformer but its shape is reminiscent of those huge transformers Ferranti can supply for handling the whole of the electrical energy needed for the lighting and power of a town.

I once saw a Ferranti transformer of that kind on a specially built road trolley, and I must say I felt like taking my hat off to it! Not so much for its own giant physical dimensions (it must have weighed a considerable number of tons) as for the potentialities of the colossal electrical energy it was destined to deal with.

One could visualise it as the "king-pin" a focal point of a vast network of thick cables snaking their ways underground and conveying "juice" to cinemas, tramways, street-lamps, domestic lights and fires, and even thousands of mains-driven radio outfits. And in these last, no doubt you would find miniature relations of that gigantic transformer in the form of Ferranti A.F.3's and A.F.5's.

SPEAKS FOR ITSELF!

And now comes the smallest one of the whole notable family. But although this "baby," the Ferranti A.F.8, may be relatively tiny, it can, if I may be permitted one more cliché, speak for itself in no uncertain voice. It does not require the support of the rest of the family.

If Ferranti wished to do so, they no doubt have resources at their command that would enable them to turn out an L.F. transformer for 3/6. As I've said before, a "reductio ad absurdum" in L.F. transformers is a couple of hanks of wire wound around a large iron nail!

But to get even passable results it is essential that various special factors in construction should be given close consideration. Ferranti have their own patented methods of transformer design, and the A.F.8 at 11/6, with a ratio of 1—3·5 (they don't style it 3·5—1, I note with distinct pleasure) represents Ferranti quality at a popular price, and it is far from being an English version of a "cheap imported."

The only regret I have in connection with this component is that I have not yet seen it, or any of its famous older brothers, being made; but perhaps I will be able to repair that omission one day.

Technically, the A.F.8 lines up excellently, and you can switch over to it from quite expensive representatives of this type of component and notice little or no depreciation in results.

This is the Ferranti A.F.8 L. F. transformer.

The Technical Editor of "P.W." praises the Ready Radio Kit

Read his letter!

TALLIS HOUSE,
TALLIS STREET.
LONDON, E.C.4.

POPULAR WIRELESS (Weekly)
MODERN WIRELESS (Monthly)
THE WIRELESS CONSTRUCTOR (Monthly)
"P.W." BLUE PRINTS
"BEST WAY" WIRELESS BOOKS

11th February, 1931.

Messrs. Ready Radio,
159, Borough High Street,
S.E.1.

Dear Sirs,

We have now completed our tests with a P.W. "Comet" Three embodying Flexi-Coupling and assembled from one of your kits.

We find that it equals our original model in every way, its selectivity and sensitivity both being excellent. Indeed, these qualities are so pronounced as to ensure loudspeaker reception of every station on the medium and long-wave bands of any real programme value.

Our experiences with the Ready Radio "Comet" provided conclusive proof of the soundness of design of this remarkable receiver; and its operation, with stations coming in at practically every degree on the dial, remained delightfully simple - a high tribute in every sense to Flexi-Coupling.

The Ready Radio components in the kit have definitely established their claims for places in a receiver of this outstanding nature, and constructors need have no hesitation in taking advantage of the very easy method of obtaining the required parts provided by your excellent service.

Yours faithfully,

L. V. Bowden

Technical Editor.

Reasons why you should build your Comet with a Ready Radio Kit

1. Every Ready Radio Kit is approved and guaranteed to give satisfaction.
2. You have the benefit of free technical advice from Ready Radio experts.
3. You save time and trouble, and get perfect contact with Ready Radio non-soldering kits.
4. Immediate dispatch.

PRICE LISTS ON PAGE 1153

Ready Radio

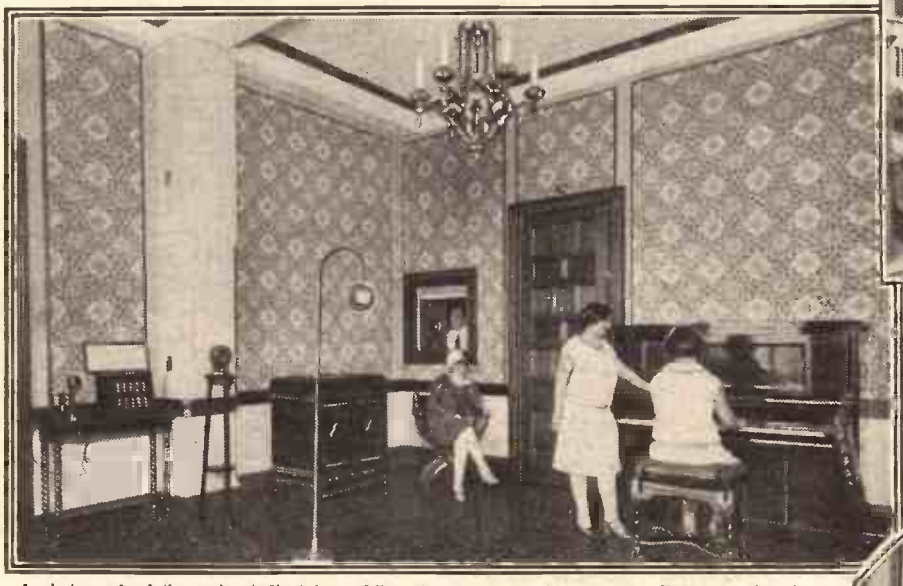
159, BOROUGH HIGH STREET,
LONDON BRIDGE, S.E.1.

Telephone: Hop 5555 (Private Exchange). Telegrams: READIRAD, SEDIST.

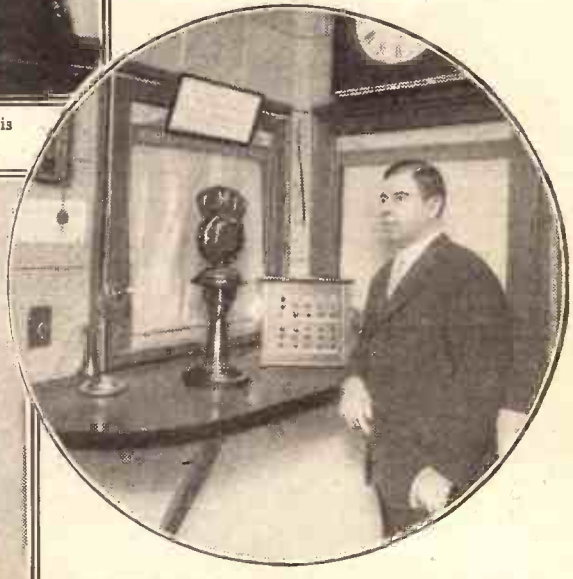
CMC HAVANA

CUBA'S LEADING BROADCASTING STATION

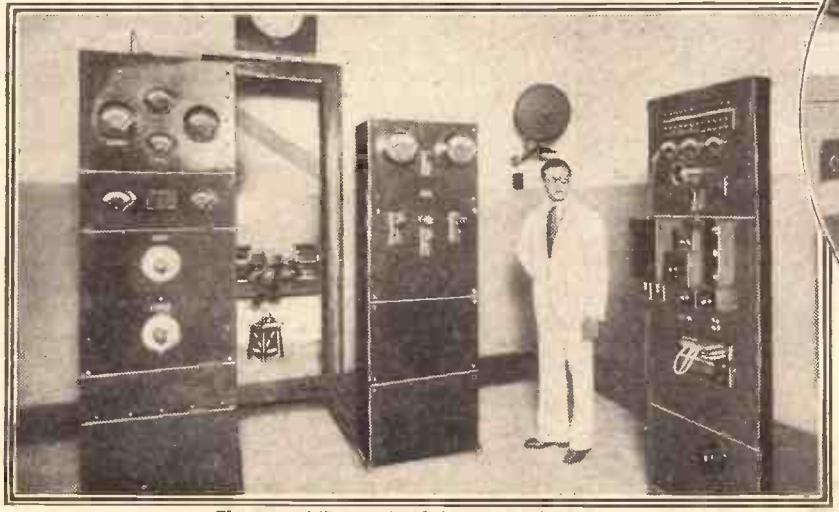
The C M C station is at the Headquarters of the Radio Corporation, which is located in the fine building owned by the Cuban Telephone Co. The studios are situated on the sixth floor.



A photograph of the main studio taken while a broadcast was in progress. The announcer is watching the proceedings through the window in the corner.



Senor Romberto O'Farrill, the popular announcer of C M C, addressing the microphone.



The transmitting plant and the engineer-in-charge.

CAPT. ECKERSLEY'S QUERY CORNER

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

RESULTS FROM INDOOR WIRES—THE LIMIT OF H.F. AMPLIFICATION—THE SHAPE OF THE AERIAL.

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.

Results from Indoor Wires.

M. H. (Earl's Court).—"I live in a flat, and my set is situated two stories above ground level, whilst the lead-in to my receiver from the aerial—which is on the roof of the building—is approximately 40 ft. long.

On the main wall at the back of this block of flats, and running parallel with my lead-in, are numerous metal pipes, all joined to earth. Would it be better if I used an insulated, instead of the present bare wire, for the lead-in?"

It will not make the slightest difference if you use the insulated wire for your aerial in the circumstances you give, provided always the aerial does not touch the various earthed metal conductors which you mention. The earthed metal work surrounding your aerial has the effect of making your aerial less effective due to the electric capacity between the sensitive parts of your aerial and earth.

Except to a slight theoretical degree, the insulation to the aerial wire makes no difference; your aerial will only be made more efficient as it is run clear of earthed metal work.

The Limit of H.F. Amplification.

J. N. (Stafford).—"I want to make up a super long-distance receiver with as many H.F. stages as possible. I notice that none of the designs published ever seem to have more than two stages of H.F. amplification.

"Is there any reason why I should not have three or even four? The number of valves and the cost is immaterial."

It is theoretically possible to have 5, 6, seven, or 8 high-frequency stages of magnification, but you would gain nothing, even if you could practically achieve stability.

There are two points in the answer to this question:

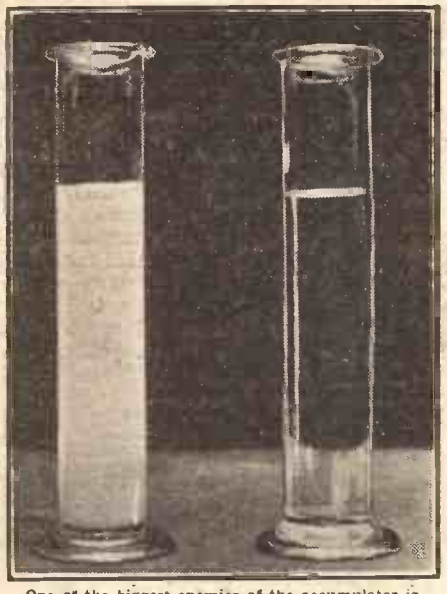
(1) Is it necessary to have 3 or 4 stages of high frequency?

(2) Could one design a set with 3 or 4 stages of high frequency?

In all wireless reception you are bound to pick up not only the signal you want to receive, but also what is called background noise, due to atmospherics, oscillations, side-band jamming, electric machinery and so on. The only way in which this unwanted background noise can be overcome—assuming a proper design of receiver—is to make the wanted signal so strong that it is very powerful relative to the disturbance.

If the signal is weak in the first case a very sensitive receiver may indeed pick it up, but it must pick it up plus a lot of background noise. Hence 3 or 4 stages of high frequency gains nothing in the picking up of clear broadcasting, provided the overall magnification is so much greater than in conventional design.

SULPHATE IN SOLUTION



One of the biggest enemies of the accumulator is sulphate, and, on the right, is a tube with impure sulphuric acid, containing lead sulphate in solution. On the left some of the same acid is shown diluted with water. The white cloudy appearance is due to precipitated lead sulphate. The best way of combating sulphation is regular re-charging of the battery.

There is of course an advantage in having many tuned circuits in that you get selectivity—a very desirable quality, but in commercial practice this can be done without using 3 or 4 stages of high frequency.

Three stages are perhaps just justified, but they involve a very complicated design to achieve the necessary stability.

Thus the answer to the first question is that except for selectivity, which can be achieved in other ways, 4 stages of high frequency is unnecessary.

The answer to the second question is that 4 stages of high frequency are extremely difficult. Suppose the magnification per stage was of the order of 20, then the overall of magnification with 4 stages is 160,000.

With magnification of this order it is obvious that the slightest inter-stage coupling will produce instability. Screen as you may there is still a coupling due to residual capacity between anode and grid in spite of the interposed earthed metallic grid, and this is quite enough to produce serious instability.

This instability can, it is true, be overcome by neutrodyne connection, but in dealing with a large range of wave-lengths this neutrodyne does not apply at all frequencies if set correctly for one.

Thus, although it is theoretically possible to design 4 stages of high-frequency magnification it would be impossible commercially and practically to design such a set, because of the inherent instability of such an enormous overall magnification.

This all assumes that it is necessary to cover a large wave-band. With a superheterodyne the difficulties largely disappear, but then the sensitivity is still too great for practical purposes, assuming conventional post-detector connection.

The Shape of the Aerial.

D. T. (Nelson.)—"Will you please tell me whether there is any difference in efficiency between aerials of the inverted "L" and "T" types as far as broadcast reception is concerned. Is the "L" type aerial directional?"

There is a theoretical difference between the T and L aerials, and the T is probably the more efficient for general use in broadcasting.

That is to say, if we deal with transmitters—and the same thing in the end applies to receivers—speaking purely from the point of view of theory, we find the T aerial superior to the L aerial.

But in the practice of receiving one has an enormous advantage in being able to amplify the signal by tens of hundreds of times, and the efficiency of the aerial does not therefore make any very great deal of difference.

Certainly it does not come into account enough to make one worry whether one uses an L or a T aerial.

CONCERNING COIL CONSTRUCTION

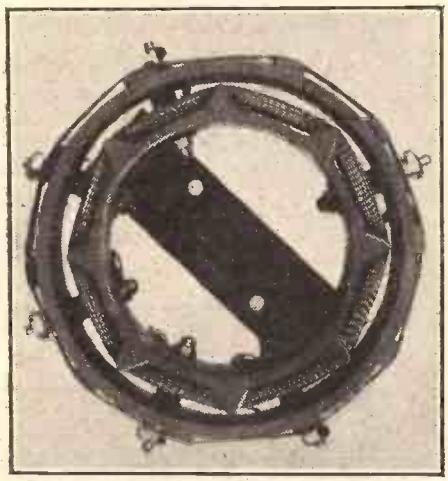
Some practical pointers for constructors who wind their own coils.

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

THE maximum wave-length to which a coil will tune depends upon the maximum capacity that the variable condenser will contribute and the inductance of the coil. Obviously, if your so-called ·0005 mfds. variable in reality can only scrape up ·0004 mfds. or so in the way of a maximum capacity, you will not, with a given coil, be able to tune up so high. You might drop fifty or so metres on the ordinary broadcasting wave-band through such a discrepancy.

Now in regard to the coil itself. Its inductance will depend upon quite a number of things. These are, the diameter of the

CORRECT DIMENSIONS



One of the most vital factors in a coil is the diameter of its former. Here is a commercial "P.W." Dual Range Coil unit correctly made. Compare its dimensions with those of the other two illustrated.

former on which it is wound, the number of turns of wire you wind on it, and the ratio of the length of former occupied by the winding to the diameter of the former. This ratio depends, in its turn, on the gauge of wire used and its covering and the tightness or looseness with which the turns are packed together.

Alter any one of the above factors and the inductance of the coil is altered. So when you make your own coils in accordance with a specification, keep as closely as you can to the given details, more particularly in regard to the diameter of former and the kind of wire recommended.

Small Items of Great Importance.

A variation of a quarter of an inch in the one regard or the use of a cotton-covered wire instead of silk-covered in the other will make quite a bit of difference. And wind the turns on just as neatly and just as closely together as you possibly can. And don't use shellac or paraffin wax to bind the winding together unless you are told to do so, because to do that may affect your results quite seriously too.

When you are constructing a more complex coil arrangement than the simple "solenoid" having a single winding, a certain amount of additional care is needed.

Take the "P.W." Dual-Range coil, for example. This comprises no less than four windings. And the coil has been so designed that these windings are, to a large extent, inter-dependent. That means that a discrepancy in one winding may not upset very seriously the primary job of that winding, but may very seriously interfere with the operations of one of the other windings.

Effect of Parallel Windings.

Take for instance. that long-wave winding which is carried by a ribbed former that is fixed inside the plain tubing former. This long-wave winding is placed in parallel with the medium wave winding when the set is switched over to medium waves.

The two coils are placed in parallel like that so as to eliminate dead-end losses. But an incidental effect is that the inductance of the medium wave winding is reduced because when two inductances are joined in parallel the resultant inductance will be less than that of the smaller individual inductance.

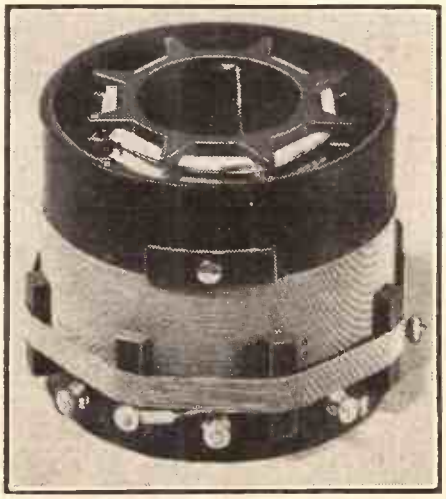
And the effect is quite an appreciable one, although it is of course allowed for in the design of the dual coil. The smaller coil is made just a bit bigger than it would ordinarily have to be so that the loss can be made good.

Tuning Range Upset.

If the inductance of the long-wave coil is less than it should be, it might still enable 5 X X and some other long-wave stations to be tuned-in, but reduce the inductance of the medium-wave coil so that the tuning of this is seriously affected.

In the ordinary way you lose about twenty metres by bringing that long-wave coil in parallel. This is compensated for,

VERY NICE, BUT . . .



Some careful and clever work was put into this coil unit, but, unfortunately, the ribbed former is too small in diameter.

but you can no doubt clearly see now that an undersized ribbed former or an insufficient number of turns on that long-wave section will result in a paring off of a slice of the wave-length maximum to which the set will tune on the medium (or low as they are sometimes called) waves.

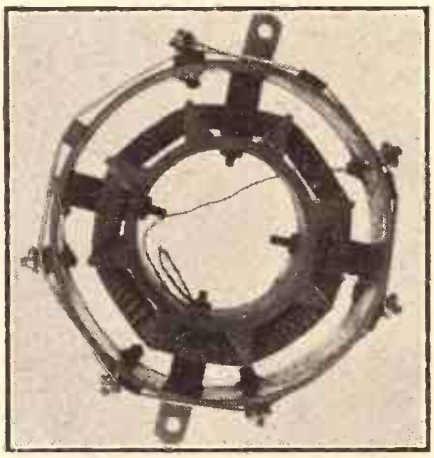
I make a special point of this because we have come across quite a few "P.W." dual-coil units which have had faulty long-wave windings and some of these have been commercially made.

Reaction Easily Upset.

Now the "P.W." Dual-Range coil also embodies a reaction winding. This operates with either the long-wave winding or with the paralleled long-wave-medium-wave winding, according to the position of the wave-change switch.

It has been very carefully arranged so as to give first-class reaction in both cases. But it obviously cannot do this if its relations to either are changed in any way. And this may happen if this reaction winding does not receive as much care as the other windings.

JUST AS BAD



A commercial version of our coil unit that is not particularly well made, and which also has an undersized ribbed former.

Probably the long-waves suffer worse, although, of course, there are other things removed from the actual coils that can upset reaction effects.

So far I have said nothing about direction of winding. But that matter can quickly be disposed of. The direction of winding is vital where reaction is concerned. If the direction is wrong there cannot be any reaction.

'PHONE FAILURES

MOST users of telephone receivers fairly soon learn to recognise the symptoms of broken cords—scraping sounds and intermittent periods of dead silences.

But it sometimes happens that exactly similar effects result from nothing but a loose terminal screw inside one or other of the earpieces.

Remembering this, don't start taking the 'phone cords off until you have made certain the more simply remedied trouble is not at the back of the failure to get proper results.

Ready Radio

GUARANTEED APPROVED KITS

COMET 3

IMMEDIATE DISPATCH

THE COMET THREE

(FOUNDATION CIRCUIT.)

KIT A ... £4 : 5 : 0
or 12 monthly payments of **7/9**
Complete kit of components as specified.

KIT B ... £5 : 12 : 6
or 12 monthly payments of **10/4**
Complete kit of components as specified with set of three Mullard Valves.

KIT C ... £7 : 2 : 6
or 12 monthly payments of **13/-**
Complete kit of components as specified with set of three Mullard Valves and attractive oak cabinet.

ADDITIONAL COMPONENTS FOR FLEXI-COUPLING COMET

	s.	d.
1 ReadiRad 1931 "Star-Turn" Coil	12	6
1 ReadiRad 400-ohm Potentiometer	2	9
1 Bulgin Signal Lamp (D.9)	2	6
1 Low Consumption Bulb 2, 4 or 6 volts (*when ordering please state which voltage is required*)		6
	18	3

APPROVED COMPONENTS FOR THE COMET THREE

	s.	d.
1 Ebonite panel, 18 in. × 7 in. (drilled to specification) ..	6	0
1 J.B. or Cyldon ·0005-mfd. "thumb-control" variable condenser	11	6
1 ReadiRad ·00015 differential reaction condenser	5	0
1 ReadiRad L.T. Switch		10
1 ReadiRad 3-point on-and-off wave-change switch	1	6
1 ReadiRad "P.W." dual-range coil	12	6
3 Telsen valve holders	3	0
1 ReadiRad ·0003-mfd. fixed condenser		10
1 T.C.C. 2-mfd. condenser ..	3	10
1 ReadiRad 2-meg. grid leak and holder	1	4
2 L.F. Transformers: Telsen "Radiogrand"	12	6
and Igranic "Midget" ..	10	6
1 ReadiRad 10,000-ohms spaghetti resistance	1	0
1 ReadiRad 25,000-ohms spaghetti resistance	1	6
1 Lewcos ·001 mfd. maximum compression type adjustable condenser	2	6
1 Formo ·002-mfd. maximum compression type adjustable condenser	2	3
1 ReadiRad drilled terminal strip, 18 in. × 2 in.	1	9
1 ReadiRad sheet of copper foil, 18 in. × 10 in.	1	6
9 Belling-Lee terminals Type 'R'	2	3
3 Belling-Lee G.B. plugs		6
1 Packet of Jiffilinx, for "wiring-up"	2	6
	£4	5	0

Any part may be purchased separately.

FLEXI-COUPLED COMET THREE

KIT A ... £5 : 3 : 3
or 12 monthly payments of **9/5**
As Kit A above but with additional components specified for Flexi-Coupling.

KIT B ... £6 : 10 : 9
or 12 monthly payments of **12/-**
As Kit B above but with additional components specified for Flexi-Coupling.

KIT C ... £8 : 0 : 9
or 12 monthly payments of **14/8**
As Kit C above but with additional components specified for Flexi-Coupling.

ADDITIONAL COMPONENTS FOR COMET L.F. CONTROL

	£	s.	d.
1 Varley ½ meg. Volume Control		6	0
1 Atlas L.F. Choke	1	1	0
1 T.C.C. 2 mfd. Fixed Condenser		3	10
	1	10	10

THE COMPLETELY ASSEMBLED FLEXI-COUPLED COMET — **£9-5-9** or 12 monthly payments of **17/-**
Ready for Use—Aerial Tested—Including royalties. With Flexi-Coupling tuning, valves and cabinet.

L.F. CONTROL When the components for L.F. Control are required with any of the above Kits or complete Receiver add **£1 - 10 - 10** to the cash price or 2/9 per month to the monthly payments.

ORDER FORM

To READY RADIO (R.R.), LTD., 159, Borough High Street, London Bridge, S.E.1
Telephone: Hop 5555 (Private Exchange). *Telegrams: READIRAD, SEDIST.*

CASH ORDER FORM
Please dispatch to me at once the item marked above for which I enclose payment in full of
£.....

C.O.D. ORDER FORM
Please dispatch to me at once the goods specified for which I will pay in full on delivery the sum of
£.....

HIRE PURCHASE ORDER FORM
Please dispatch my Hire Purchase Order for the item marked above for which I enclose first deposit of
£.....

Please send me—

ONE COMET THREE
*Kit A at £4 - 5 - 0 or 12 monthly payments of 7/9.
*Kit B at £5 - 12 - 6 payments of 10/4.
*Kit C at £7 - 2 - 6 of 13/-.

ONE FLEXI-COUPLED COMET
*Kit A at £5 - 3 - 3 or 12 monthly payments of 9/5.
*Kit B at £6 - 10 - 9 payments of 12/-.
*Kit C at £8 - 0 - 9 of 14/8.

***1 Flexi-Coupled Comet Receiver, complete at £9 - 5 - 9.** or 12 monthly payments of **17/-**.

Additional components for Flexi-Coupled Comet at 18/3.
Additional components for Comet L.F Control at £1 - 10 - 10.
*If required with L.F. Control put a X here and add £1 - 10 - 10 or 2/9 monthly.
(Cross out items not required.)

Name.....

Address.....

.....

Nearest Railway Station.....

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

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. Lile, 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

REVERSING THE LEADS TO THE ACCUMULATOR.

H. G. (Shorcham).—"I find that by reversing the wires to the L.T. accumulator I get better and plainer reception. Can you give me the reason why this should be so? Also, would it cause my batteries to run down quicker, as the H.T.— and L.T.— are coupled together through the H.T. fuse? Otherwise it is wired exactly as the blue print and recommended components."

You will not be doing the slightest damage, and if it works better round this way there is no reason why you should not leave it permanently connected thus.

The reason is that your required detector bias is not the same as most people's. In nearly all sets the better method of connecting is as shown on the blue print, but occasionally some particular valve is found which is more sensitive when worked with the accumulator connected round the other way.

Generally, it means that the negative grid bias to the low-frequency valves should be increased, in each case, by a voltage equal to that of the accumulator.

In other words, if the first grid bias should have 1½ volts negative, with a reversed accumulator, it should have 1½ + accumulator volts = 3½ volts neg. with a 2-volt accumulator; 5½ volts with a 4-volt accumulator, etc.

DUD H.F. CHOKE.

B. C. C. (Elstree, Herts).—"I went round to help a friend who had been having a miserable time with his 'Three' which wouldn't work, and had to leave him to it, with 2 L O not really loud enough to hear what was said. But later on a neighbour of his went in and fixed it.

"It was a dud H.F. choke, and this chap found it by using 'phones and a G.B. battery. He said it was a 'P.W.' test, and you would give all particulars."

(*Continued on page* 1156.)

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.

LONDON READERS PLEASE NOTE: Inquiries should NOT be made by 'phone or in person at Fleetway House or Tallis House.

CORRESPONDENCE.

REMOVING ONE PUSH-PULL VALVE

THE "CLEAR-CUT" CONE—THE "THIRTY—SHILLING" TWO, ETC.

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

REMOVING ONE PUSH-PULL VALVE.

The Editor, POPULAR WIRELESS.

Dear Sir,—With reference to the comments under the above heading on page 959 of your issue for January 31st, may I suggest the following explanation for the fact that under certain circumstances the removal of one valve in the output stage of a receiver or amplifier does not make any appreciable difference to the amount of volume.

The removal of one valve has the following effects:

1. It reduces the step-up ratio of the preceding audio transformer by half of its normal ratio.
2. It halves the ratio of the output transformer.
3. It halves the output valve impedance.

If, in the first instance, the ratio of the output transformer were such that the maximum output was not obtained, the changed conditions resulting from the removal of one valve may enable a greater output to be provided, since whilst the output valve impedance is halved the impedance at a given frequency of the primary of the output transformer is reduced to a quarter, and it is easy to see that under certain conditions this might result in a greater power output than when both valves were used.

A further point is that your correspondent mentions that an inductor type of speaker was used and does not indicate whether any output transformer was employed, so that it is very probable, in fact almost certain, that the impedance of the speaker was not initially suited to the output valves.

In any case, it should be remembered that a speaker of that kind, in fact, any speaker except the moving-coil type, varies greatly in impedance with frequency, that it is impossible to ensure that the speaker impedance always has the correct relation to the valve impedance so that a compromise is necessary.

Another possibility is that the reduction in the inductance and consequent impedance of the winding connected to the output stage of the receiver when using only one valve was such that the maximum power input was obtained at a materially high audio frequency, resulting in an increased response at that frequency and so a greater apparent loudness of the reproduction owing to the better response of the ear to the higher audio frequencies.

Yours faithfully,
F. BAGGS.

Manchester.

THE "CLEAR-CUT" CONE.

The Editor, POPULAR WIRELESS.

Dear Sir,—Having made up the "Clear-Cut" Cone given in "P.W." 447, and also Baffle Board given in "P.W." 450. I was more than pleased with the results. Every item as clear as a bell, but instead of putting paper strips on the back cone, I put cotton on by simply pricking two holes at the top, two at the bottom and one each side, threading the cotton through each hole, then tying it on the cardboard ring. My unit was a Triotron, which played better than ever it did.

Wishing your paper every success for years.

Yours faithfully,
G. W. BLOOMFIELD.

Norwich.

THE "THIRTY-SHILLING" TWO.

The Editor, POPULAR WIRELESS.

Dear Sir,—It may interest you to know that a friend and myself constructed the 30s, two-valve set, as described in your well-known magazine "P.W." of January 17th last.

The set is very easy to construct, and apart from drilling holes in the panel, it took about two hours to assemble.

On Tuesday, January 20th, I had the set working, and I was surprised beyond words at the number of stations I received at full loud-speaker strength. The list is as follows: Radio Paris, Daventry, Eiffel Tower, Motala, and Kalundborg on the long wave, and some four stations whose call I could not identify, Budapest, Vienna, Brussels (No. 1), Midland Regional, Langenberg, Rome, Stockholm, Frankfurt, Toulouse, Hamburg, Mühlacker, London Regional, Cardiff, Edinburgh, Heilsberg, Turin, London National, Leipzig, Nurenberg, Cologne, Cork, and Fécamp, besides ten stations who were broadcasting in a language whose call I could not understand. This set therefore gives a choice of about twenty-seven stations and I expect to find others later. Since returning from abroad some four months ago I have had at least four receiving sets, and some very expensive ones—but I have failed to get the same reception from any of them as I have got from the 30s. one.

In my opinion, large valve sets are of little use these days, since the power of the transmitting stations has been increased, I use both an inside and outdoor aerial on different occasions, and I find that the reception on the 30-ft. indoor aerial is just as good as the outside one of 70 ft.

I have had an oak case made divided into two parts, the machine itself being in the upper portion and the batteries and accumulator in the lower portion, and when closed only the four terminals are visible, and it thus becomes like a portable set.

Some of your correspondents who do not think that "Foreign Listening is worth while" would do well to construct this cheap and efficient set, and prove what foreign reception can be like.

Yours faithfully,
R. E. TOOMBS.

Hurstpierpoint, Sussex.

CONCERNING MAINS UNITS.

The Editor, POPULAR WIRELESS.

Dear Sir,—Quite recently you have published a few letters in "P.W." relating to mains units, and I notice a few people condemning them—a point on which I do not agree with. For instance, I have an all-mains unit and it has given me every satisfaction, but before I purchased it I found out how many milliamps my valves were taking in H.T. current so therefore I bought a unit which supplied me enough current in m/a to work my valves comfortably. This is just the trouble with people who buy mains units, they study the volts, but do not trouble about the milliamps. the consequence is they buy a unit giving about 20 milliamps of current and in some cases their power valve alone takes more than that. This statement is based on actual experience I had with a fellow's set. The set in question when read with a milliammeter took over 30 m/a—the unit was rated at 20 m/a, and you can guess how the set worked—the same way as some of those people who condemn mains units do.

My advice to would-be purchasers of mains units is to study the milliamps and let the volts look after themselves.

Yours truly,
F. G. SMITH.

Haverstock Hill, N.W.5.

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 1154.)

Faulty parts or defects in wiring of a set may often be detected by a very simple series of tests with a pair of 'phones and a dry cell.

One tag of the 'phones should be connected to one terminal of the dry cell and two flex leads should be connected, one to the remaining 'phone tag and the other to the remaining terminal of the dry cell (a flash-lamp battery is quite satisfactory).

These two flex leads, if now touched lightly together, will produce a strong double click in the 'phones, one click when they make contact with each other, and another when they are separated again. They may thus be used for testing for a break in leads, etc., since the loud double click is ample evidence that everything is satisfactory.

A fault on the coil holder, for instance, such as a break between the terminal and the plug or socket to which it is connected, may now easily be detected, since if one flex lead is connected to the terminal and the other to the side of the holder to which the terminal should make connection, absence of the double click is positive evidence that the component is faulty.

On the other hand, if one of the flex leads is connected to the socket of the coil holder and the other to the plug, if a double click is heard, there is a short-circuit across the holder.

Similar tests may be made with valve holders, both for testing for a connection between each terminal and its socket, and for testing for short-circuits between the sockets.

Variable condensers may also be tested by this method, a short-circuit between the plates giving rise in the usual double click, which should not be present in the usual way.

It is, of course, essential to see that all leads are removed from the components under test, and also that no coils are in position in the coil sockets, when these are tested.

It will be seen from the foregoing that this method may be extended to tests for almost any component or circuit.

THE "DOUBLE-TRAPPER."

F. W. W. (Manchester).—"It looked easy enough to make, and the coils were home-made. He called it the 'Double-Trapper,' and said it was the best thing 'P.W.' had ever put out. Where can I get particulars or blue print how to make it?"

The "Double-Trapper" was fully described in "P.W." No. 445 (December 13th issue).

NOTE.—Back numbers of "P.W." which are still in print can be obtained from your newsagent, or direct from The Amalgamated Press, Ltd.

"COME AND GO" RADIO!

"MANOR PARK." (London, E.12).—"I was going to listen to dance music from Ciro's Club at 10.30 on London Regional (Wednesday).

"I could get nothing from there until 11.40 or thereabouts. I naturally thought at last my set was broken down, and tested valves, etc., and found everything O.K. on voltmeter, 140 milliamp meter passing 20, and accumulator O.K.

"After turning reaction knob I could hear something faint in the distance—until about 11.40 came in full volume without touching anything at time in set.

"As my trouble was from the outside, could anyone oscillating cut me right out, as I have often found the volume reduced, but never completely blanketed like this.

"The set is working the same as usual to-day and nothing has been done to it."

Very queer indeed! We should not like to have to say what was the trouble, but we are not so sure as you seem to be that it came from outside.

We have known of queer cases of intermittent contact, and of grid choking, which gave results something like this.

In any case we are afraid you can't do anything about it, as such a fault needs an expert on the spot if it is to be traced. We can only hope yours doesn't reappear, as it would probably be a most troublesome fault to find, and one which would tax your patience beyond measure.

REACTANCE OF A CONDENSER.

F. T. (Hythe, Kent).—"In an answer to a correspondent in your issue of January 17th Captain Eckersley gives the formula for calculating the impedance of a condenser, i.e. the reciprocal of the frequency $\times 6 \times$ the value of the condenser in farads. He also gives the impedance of a ·001-mfd. condenser at 4,000 cycles as 50,000 ohms.

"I have tried by the above method to calculate the impedance of a ·001 condenser, but can only make the answer a minute fraction of an ohm, so I must therefore have made some ridiculous mistake; so would Captain Eckersley or one of your technical staff be kind enough to give an example, so that I can see where I have made such an awful blunder?"

The impedance (which is more strictly termed reactance) is roughly found as stated from the formula:

$$\frac{1}{6 \times F \times C}$$

where F is the frequency, and C the capacity in farads.

(*Continued on page* 1158.)

"P.W." PANELS. No. 8.—THE POWER VALVE

—Usually takes more current from the H.T. battery than all the rest of the valves put together.

Consequently the use of a "larger" power valve generally means the use of a larger H.T. battery.

Removal of the G.B. plug from its socket whilst H.T. and L.T. are on the power valve will damage the filament, so ALWAYS switch off the L.T. first.

As a break in the power valve grid-circuit wiring takes the bias off the valve, such a break must never be allowed while the set is switched on.

FOR TEN YEARS PILOT RADIO KITS

Immediate Delivery

"COMET 3"

C.O.D. YOU PAY THE POSTMAN WE PAY ALL CHARGES.

CASH or H.P. STRICT PRIVACY GUARANTEED.

The official list of specified parts FOR KIT "C" approved by "Popular Wireless."

		£	s.	d.
1	Cabinet to specification	1	0	0
1	Red Triangle ebonite panel, 18" × 7", ready drilled and slotted to specification		6	0
1	Baseboard, 10" deep		1	6
1	Cyldon ·0005-mfd "thumb control" variable condenser		11	6
1	·00013-mfd. differential reaction condenser, J.B.		4	6
1	Keystone 3-point wave-change switch		1	6
1	Keystone L.T. switch		1	3
1	Keystone P.W. dual-range coil		12	6
3	Telsen valve holders		3	0
1	Sovereign ·0003-mfd. fixed condenser			10
1	Franklin 2-mfd. fixed condenser		3	0
1	Lissen 2-meg grid leak and holder		1	6
2	L.F. transformers (Telsen "Radiogrand" and Igranic "Midget")	1	3	0
2	Keystone spaghetti resistances, 10,000 and 25,000 ohms		3	0
1	Formo or Sovereign ·001-mfd. (max.) compression type condenser		1	6
1	Formo or Sovereign ·002-mfd. (max.) compression type condenser		2	3
1	Terminal strip, 18" × 2"		2	0
1	Sheet of aluminium foil, 18" × 10", for covering underside of baseboard		1	0
9	Belling-Lee terminals		2	3
1	Konecterkit, comprising Keystone angle brackets, wire for connecting, wood screws, G.B. plugs, etc.	GRATIS		
3	Mullard valves—P.M.1 H.F., or P.M.2DX, P.M.1 L.F. and P.M.2 or P.M.2A	1	7	6
	Total	6	7	6

Any parts supplied separately.
If over 10/-, sent C.O.D.

OFFICIALLY APPROVED BY "POPULAR WIRELESS"

KIT A PAY THE POSTMAN **£4-0-0** or 12 monthly payments of **7/4**
(Less valves and cabinet)

KIT B PAY THE POSTMAN **£5-7-6** or 12 monthly payments of **9/10**
(With valves, but less cabinet)

KIT C PAY THE POSTMAN **£6-7-6** or 12 monthly payments of **11/8**
(Complete with valves and cabinet)

FLEXI-COUPLED & L. F. Controlled "Comet 3"
Add 38/6 to each Cash price or 3/6 to each monthly payment. N.B. When ordering please state your requirements clearly as shown in the special order form printed in this advertisement.

Any parts supplied separately. If value over 10/-, sent C.O.D. We pay all charges.

FINISHED INSTRUMENT
Complete with Flexi-Coupling and L.F. Control,
PAY THE POSTMAN **£9-17-6**
or 12 monthly payments of **18/-**
(Ready built, exactly as specified. French polished Oak cabinet. Aerial Tested. Mullard valves. Royalties paid.)

FLEXI-COUPLED
(Described, P.W. 21/2/31).
EXTRA COMPONENTS:
1 Keystone Star-Turn Selector Coil 12/6
1 400 ohm B.M. Potentiometer 1/6
1 Bulgin Panel Light (without bulb) 2/6
N.B. Add 16/6 to each C.O.D. or Cash Price or 1/6 to each monthly payment below. When ordering "Comet 3" Kit, please state if the panel is to be drilled for Pilot Light, Selector Coil or both.

L.F. CONTROLLED
(Described "P.W." 28/2/31).
EXTRA COMPONENTS:
1-2 Megohm Volume Control (Igranic or Sovereign) 6/-
Output Filter Choke (Pye or Lissen) 12/6
2 mfd. Condenser (Dubilier or Lissen) 3/6
N.B. Add 22/- to each C.O.D. or Cash Price or 2/- to each monthly payment.

Endorsement from "Popular Wireless."

3rd February, 1931

Dear Sirs,

"We have completed our tests on a model of the 'Popular Wireless' 'Comet 3' Receiver made up from your kits of parts, and have pleasure in informing you that the results obtained were fully up to the standard set by the original instrument.

(Signed) G. P. Kendall,
Research & Constructional Dept."

FREE Every "Comet 3" Pilot Radio Kit contains a **FREE KONECTERKIT**, comprising Panel Brackets (Keystone Die-cast Aluminium Brackets with patent slots), wire for connecting, wood screws, G.B. plugs, etc. Worth 5/-

FREE Every purchaser of the Pilot "Comet 3" Kit will receive Free a full-sized blue print and a copy of "Popular Wireless" containing full constructional details.

FREE The owner of a Pilot "Comet 3" becomes automatically entitled to Free Technical Advice and Assistance.

POST THIS SPECIAL "P.W." ORDER FORM

To Messrs. PETO-SCOTT Co., Ltd., 77, City Road, London, E.C.1.

Please send me C.O.D. CASH or H.P. (strike out that which does not apply) "COMET 3"

.....

(fill in particulars of Kit or Instrument required)

for which I enclose.....s.....d.

Name .....

Address.....

..... P.W. 28/2/31

CARRIAGE PAID ON ALL ORDERS

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HAVE ECLIPSED ALL OTHERS

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 1156.)

In the case of a ·001 condenser, at 4,000 cycles the formula becomes:

$$\frac{1}{6 \times 4000 \times \cdot000000001} = \frac{1}{\cdot000024} = 41{,}666 \text{ ohms.}$$

This is (near enough) the figure quoted, and you got a very much smaller figure because—we think you will find—you forgot that the "·001" was not ·001 of a farad, but of a *micro*farad.

If you made that particular mistake (which nearly everybody makes at first!) your answer would, of course, be a million times too small.

"BROOKMANS COUPLING."

S. E. R. (Oakham).—"Using the new 'P.W.' coil on the long waves—'Brookmans Coupling'—I find that increasing the value of the semi-fixed condenser reduces strength, and vice versa. This seems wrong. Is it?"

No. It is right as you say. The energy to be applied is limited by what comes from the distant transmitter, and it is merely a case of applying it to a large or small coupling condenser.

Naturally it will charge the latter to a higher voltage, giving greater coupling. A very large coupling condenser would be so little affected that it would amount to a short circuit across this part of the circuit.

RESISTANCE FOR THE "COMET."

H. R. S. (Atherton).—"After a disappointing wait till the week-end I could only get *one* spaghetti resistance, and I decided to build the 'Comet' without the 25,000-ohms spaghetti, but using instead a 25,000 fixed resistance, which I had left over from a previous set.

"I mounted this near the H.T.1 terminal, and all the other wiring exactly as in the 'Comet' blue print. And I must say it is a wonder!

"As it goes so well do you think it is worth while going to the trouble of removing this resistance and putting in a spaghetti, or would you leave well alone? I do not think results could possibly be improved on, but I am quite willing to try if you give the word."

We chose the usual spaghetti resistance for the reason that it would be much more convenient for most constructors, and with a view to the fact that by its flexible nature it allows alterations to adjacent wiring to be carried out with the utmost ease. Considered as a resistance pure and simple, one of the spaghetti type works no better than any other kind, providing the makes are equally stable and reliable, so in the circumstances we do not think you need bother to alter it, unless you eventually want the extra space.

HOW MUCH WIRE FOR THE "P.W." DUAL-RANGE COIL?

H. J. C. (Chadwell Heath, Essex).—"What are the approximate amounts of the various gauges of wire required to make up your dual-range coil for the 'Comet'?"

The approximate lengths on the coil are as follows: 55 yards of 26 D.S.C. 6½ yards of 30 D.S.C., 17 yards of 24 D.S.C. Wire is usually sold by weight, and approximate weights for the above, with an ample margin, are 3 oz. of 26 D.S.C., ¼ oz. of 30 D.S.C., and 1½ oz. of 24 D.S.C.

DOES RESISTANCE AFFECT WAVE-LENGTH?

"ARTHUR" (Ringwood, Hants).—"I am interested in the behaviour of oscillating circuits from a theoretical point of view, and am familiar with the ordinary equations showing the relation of frequency to the square root of capacity, inductance, etc. But what is the effect of *resistance?*

"I believe I have seen this mentioned as a factor in determining frequency, although it is usually so small as to be negligible, and I fancy the reference was in an article by Sir Oliver Lodge, possibly in 'P.W.'

"Can you tell me if the effect of adding a little extra resistance to an oscillatory circuit would be to alter frequency? Or put me on to where it was dealt with?"

The effect of adding a little resistance is somewhat to reduce the natural frequency of a circuit, and this was explained by Sir Oliver Lodge in an article in "P.W.," April 5th, 1930 ("P.W." No. 409).

In that article our Scientific Adviser gives a very clear diagram showing exactly how the conditions are altered when resistance is added. The alteration, of course, is very slight and for practical purposes, as you say, the effect of resistance in an oscillatory circuit is quite overshadowed by that of the capacity and inductance.

DISTORTION WITHOUT A HOWL.

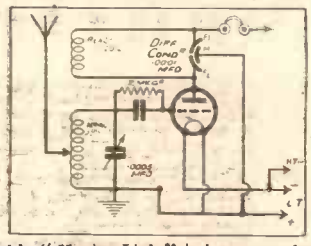
N. E. (Gillingham, Kent).—"I can understand how a neighbour's set when oscillating will set up a howl by being adjusted near to the frequency of the carrier-wave frequency, i.e. by heterodyning. But what about when it is adjusted so that the howl goes lower and lower and finally *disappears* altogether?

"Why is the quality then bad, at the silent point?"

The "silent point" is really a misnomer, for it only seems perfectly silent when the receiver and distant transmitter are emitting a perfectly constant

(*Continued on page* 1160.)

MISSING LINKS, No. 2.



Last week's "Missing Link" is here reproduced, but with the incomplete sections filled in. It will be seen that a 2-meg. grid leak and a fixed condenser were necessary to complete the diagram. The latter has a capacity of ·0003 mfd.

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 1158.)

frequency—in other words, when the distant station is not modulating!

You can get very nasty distortion from a near-by receiver even when it is adjusted to what is called the "silent point." If it is adjusted to not quite the same initial frequency as the carrier-wave, when it oscillates it creates a note of heterodyne with the carrier-wave, the frequency of this note depending upon the separation of the two frequencies.

As the oscillations caused by the receiver are brought nearer and nearer to the frequeney of the transmitter, the beat note caused by the interference gets lower and lower. Finally it can get so low as to be inaudible, but the existence of this extra transmission is enough to set up distortion of the field caused by the broadcasting transmitter, and this will give the effect of local distortion and bad quality.

RADIO SYMBOLS
No. 3.

THE ON-OFF SWITCH

is the simplest of all "controls" in common use, and rarely gives trouble in action.

* * *

Sometimes it may cause "fading" or crackling owing to poor contact. This can usually be cured by strengthening the springs.

* * *

It is a good plan to examine spring tension, etc., before mounting a new switch, as a fault can very easily be remedied before the switch is mounted.

THE SATURATION CURRENT.

"CURIOUS" (Canterbury, Kent).—"What is meant by the saturation current of a valve? And how is it used?"

The term saturation current is applied to the valve to describe that current which is flowing when further increases of H.T.+ to the plate do not result in increased current.

As you know, the increasing of H.T. usually means an increase of anode current, but there is a limit to this effect, beyond which current fails to rise, however much H.T. is applied.

The reason is, of course, that once the H.T. is sufficiently high to attract all the electrons emitted from the filament to the plate, no increase of H.T can attract more electrons. The current, in fact, has reached saturation point.

Not much use is made of this particular condition in modern radio practice, but it sometimes appears as a limiting device in specialised types of detectors. It could, for instance, prevent very bad X's from increasing detector-response beyond a certain level.

WAVE-LENGTH WANDERING.

R. L. (Rome).—"Trying for 5 X X one day I was astonished to hear a Turkish station announcing. Who could that be on 5 X X wavelength?"

Probably you heard Ankara, which is supposed to work on 1961 metres, but has recently been wobbling, and once moved down to a wave-length just below Daventry 5 X X.

FOR THE LISTENER

(*Continued from page* 1138.)

best funereal manner, with a deeper dye of mournfulness than his S.O.S. manner!

"The Planets."

Gustav Holst is a Cotswold man. I remember him when he played the trombone. He has become one of the great ones among modern composers.

I listened to his splendid musical pageant "The Planets" with double interest, because I, too, have often watched from a Cotswold height Jupiter chasing Venus down the western sky. He is a man of the highest imagination, and his orchestral colouring matches with it.

I think I liked "Venus" best, with its lovely sounds of flute, hautboy, and horn. "Jupiter" is gloriously English, full of country merry-making. But in "Uranus" the youth with the trombone becomes the

(*Continued on page* 1162.)

FOR THE LISTENER

(Continued from page 1160.)

full-grown man, making riot with trumpets and tubas and drums.

Altogether it was an "hour of glorious life."

The Census.

We are to have six weekly talks on the Census. It is odd that this should be necessary. Odd, I mean, that a Form which must have been constructed with a view to the average intelligence of people should take six gentlemen to explain it.

Having tried their hand at this, the B.B.C. will, no doubt, on some future occasion, explain to us the Income Tax Form; and follow it up with a series explaining how one may acquire sufficient income to make the filling up of the form necessary!

Plato.

You needn't be highbrow to enjoy Mr. Lowes Dickenson who lectures on "Plato" on Sunday afternoons. Lesser men have done much to render Plato difficult to understand; but he is really very simple. He is also very modern.

You may be astonished to find how many things in his Dialogues are acutely to the point in present-day affairs. To go back to first principles usually means to go back to these famous Greeks. In mechanical science we are far ahead of them; but in clear thinking we have not proceeded far beyond the point where they stood nearly 25 centuries ago.

Pursuit of Pleasure.

Mr. Lance Sieveking must have had the time of his life at the Control Panel when he took us the other evening through three centuries of fun. It was a brave conception; and, except that I thought we got rather too much for our money, it seemed to me extraordinarily well thought out.

I felt that, while the machinery of fun had changed considerably, the spirit of fun was pretty much the same all through. The question "What shall we do to-night?" must date back to the Garden of Eden; and that other recurring question about the "young gazelles" must have come in pretty soon afterwards, although it didn't trouble Adam!

I liked the cockfight; and Grimaldi. Altogether it was a very interesting peep-show; and, naturally enough, I had a "head" next morning!

"A Happy Man."

Well, and how did you like the little play, you highbrow rascals (as Gillie Potter would say)! Hamar Grisewood did me proud in the title part; and if you really liked it, why, I'll do you another!

Saying of the Week.

Arthur Prince: "Who are the Esquimaux?"

Jim: "God's frozen people."

TECHNICAL NOTES

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

All-Electric Comparisons.

I HAVE been experimenting lately with a number of all-electric mains sets, and have been comparing the different features introduced by different manufacturers. It is surprising what a great variety of different designs have been adopted in what Americans call "custom built" all-electric receivers, not only, of course, in the radio and amplifying circuits, but also in the power-supply circuits, where you might imagine that some sort of standardisation would by now have been reached.

I hope to give you in these Notes from time to time some of the results of these comparative tests, as they may perhaps be useful to those of you who contemplate investing in an all-electric receiver, and who are not quite sure as to the various points to look out for. Incidentally, three of the sets in question are of unspecified origin, but have a strong suggestion of the Fatherland, whilst another was sent to me from Czecho-Slovakia.

Some European Receivers.

Generally, indirectly-heated A.C. valves are used, a transformer being provided to supply the current for the heater filaments and the anode and grid-bias voltages.

In some of these receivers an astonishing compactness has been achieved, and in one particular case the whole of the "works" of the receiver, including the transformers, smoothing circuits and radio and amplifying circuits, are enclosed in a space about 3 in. by 3 in. by 9 in.

Compactness.

The valves and loudspeaker are, of course, additional to this, but even with the complete cone loudspeaker the whole business is included in a neat cabinet about 10 in. square and 5 in. from front to back. This particular receiver has three wavelength ranges, and when used with an indoor aerial brings in quite a large number of stations.

A Switching Point.

There is a point which I should like to mention with regard to mains receivers (and, for that matter, with regard to receivers in general), and that is the question of switching off the receiver when not required.

Let us take the case of an electric receiver in which the on-off is included in the electric supply from the mains. When you switch on, of course, the anode voltage comes on immediately, but the valves take a few seconds, sometimes as much as half a minute, to heat up (I am referring, for the moment, to indirectly-heated valves), and so the

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anode current actually comes on very gradually although the anode *voltage* is there all the time.

In this way there is no danger of any harm being done to any of the components in the circuit, in particular to the loud speaker.

Watch Your Components.

When, however, it comes to switching *off*, the anode voltage is removed whilst the filaments are still full on, with the result that you sometimes get a terrific plop in the loud speaker, with a corresponding shock to other components in the circuit unless an efficient by-passing scheme is arranged.

Even so, it can, however, be perfectly easily overcome by switching off the filaments first and the anode current last, or alternatively by using a high-resistance rheostat in series with the supply, this being adapted so that after the full resistance is in series the slider moves to the "off" position.

Blowing a Fuse.

Advice of this sort is often given with regard to ordinary battery-driven receivers, and I mention it now particularly because I have had a lot of trouble with one of the mains receivers mentioned above from this very cause.

In this particular receiver the only on-and-off switch is one which is in series with the input from the mains to the transformer, and in at least one case out of five, when operating the switch, the fuse in series with the supply would be blown.

In this case the fuse was a small ½-amp. one, of a special type not used in this country, although very convenient and accessible. The makers had supplied a number of extra fuses, but this supply was very soon used up.

I then had to resort to fitting in a pea-lamp-socket with pea-lamp as a fuse, and eventually had to add another of the same kind in parallel with the first. Even this was not satisfactory, as the two pea-lamps were frequently burnt out together. Finally, I arranged matters on the lines indicated above, so that the main input was switched on and off gradually instead of suddenly, and no further trouble has been experienced since.

Protecting the Speaker.

Before this was done the loud speaker used to get a terrific kick every time the receiver was switched off (not when switched on), and altogether apart from doing any damage within the receiver itself I always had grave fears for the safety of the loud-speaker windings.

However, as I say, the whole trouble was overcome by making the on-and-off switch gradual instead of sudden, and what surprised me was that the makers of the set should have supplied half a dozen fuses with it instead of adopting the simple arrangement which I have described.

A Curious Effect.

Talking about fuses—which, of course, can always be included in mains sets or mains units—have you ever noticed how on A.C. current a fuse will seem to be

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quite equal to the load thrown upon it on switching on or off the set, but will suddenly flash out as though it had had a kick several times above normal? I have often noticed this, especially when using flash lamps as fuses in battery chargers, and so on, and generally when experimenting with mains-transformers.

You can switch on and off repeatedly, perhaps 10 or 20 times, and the pea-lamp will scarcely light up at all, and then one time it will flash out brilliantly and be gone. It seems as though you just strike a certain part of the wave and get an extra heavy inductive back-kick. I should be interested to know how many of my readers have noticed this effect.

Don't Trust to Memory.

Talking about chargers, although we are constantly advised to "top-up" the battery with distilled water, and also the charger (if this is of the liquid type) I am afraid one is very apt to neglect this precaution, and to assume that the rate of loss of the electrolyte is much slower than it really is.

I had an instance of this the other day, when I was using a heavy-duty battery for lighting the filaments of a large low-frequency amplifier. In the middle of a performance, the battery started to give out. As it had been on charge for a couple of days previously, the whole thing seemed very surprising.

But on testing the charging current with an ammeter I found that this was only a small fraction of an amp., whereas it ought to have been (and had been assumed to be) about 2 amps. The charger (of the tantalum type) was then examined, and I found that this was almost completely devoid of electrolyte, or, at any rate, the electrolyte was down to the bottom of the lead electrode, and a strong "hydrogen smell" (actually acid spray) was noticeable.

That "Hydrogen" Smell.

The charger was filled up with distilled water, and the charging current immediately returned to normal.

I had, of course, for some time previously been making a mental calculation of the amount of use the charger had had, and reckoning when it would probably require attention, but the above incident shows how little you can rely upon mental notes in this way, and how very much better it is to examine both batteries and charger from time to time, whether you calculate that they need examination or not. The fact was of course, that the poor old battery had been getting scarcely any charging at all, whilst it had been doing quite heavy duty for some time.

A "Subdued Plop."

I mentioned in these Notes some little time back the question of loudspeaker connections, and I have a letter here from a reader who wants to know why it is that

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when he switches on his receiver he often notices a "subdued plop" in his loud speaker.

He goes on to explain that the diaphragm of the loud speaker is free, since the speaker operates quite all right without any adjustment, although it sounds as though the diaphragm had gone against the poles of the magnet.

I dare say many of you have experienced the same sort of thing. It is due to the loud speaker being connected the wrong way round, and you will find that if you reverse the connections the effect will disappear.

Incidentally, the connections should be reversed because the effect in question will only happen when the loudspeaker is connected in the inefficient direction, that is, with the anode current tending to weaken the magnetism of the permanent magnet.

The effect comes about in this way. Suppose the set is in full operation and you adjust the loud speaker so that the diaphragm touches the poles and then slightly reverse the adjustment until the diaphragm just goes out of engagement with the poles, and is in the most sensitive condition.

Question of Connections.

Now if the anode current is opposing the magnetism of the permanent magnet, then when you switch off, the diaphragm will quite probably go into contact with the poles. When you switch on again the diaphragm will go out of contact with the poles thus causing the "subdued plop" referred to above.

If you reverse the connections to the loudspeaker, so that the anode current is assisting the permanent magnetism, you will not get this effect at all because you necessarily make the adjustment of the loudspeaker whilst it is in operation, and if the diaphragm is not pulled into contact with the poles when the current is *on* it will be still less so when the current is *off*.

An Interesting Temperature Indicator.

I had an instance of this with one of the mains sets mentioned already when by some accident the loudspeaker was connected the wrong way round. In the case of the mains set—using indirectly-heated valves—the anode current did not come "on" until the cathodes were heated up, which took about 20 seconds (the anode *voltage* was on but there was, of course, no *current*).

It was rather interesting to notice that the arrival of the cathodes at their operating temperature was heralded by a plop in the loudspeaker, indicating the *release* of the diaphragm from the poles.

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Motor-Boating Devices.

When you are using a low-frequency amplifier, whether as part of a radio receiver or as a separate amplifier for other purposes, for example, in connection with gramophone reproduction, you may be liable, especially if the amplifier is a powerful one, to get into motor-boating and similar low-frequency oscillation troubles.

There are various devices which you can use, designed to counteract the tendency to motor-boating (or low-frequency instability, to give it a more correct designation) and any of these, particularly with the use of an output filter, should as a rule cure the trouble.

Some Causes of L.F. Trouble.

I should also mention that one of the commonest causes of motor-boating is the use of an insufficient amount of grid-bias. Bearing in mind that some power and super-power valves may need very high values of grid bias, you will see that any ordinary amount, such as 9 volts or even 18 volts, may be much below what is required.

If you have any doubt on this point, you may care to try disconnecting the positive terminal and seeing what happens. Almost certainly you will get violent motor-boating.

But I should not *really* advise you to do this because, as I mentioned a week or two back, to leave a high value of H.T. voltage on the valves without proper grid-bias voltage applied to the grids is to ask for trouble with the filaments.

So perhaps it is much better to take my word for it than actually to try it and, in fact, I would advise you to take great care *not* to disconnect the grid-bias voltage whilst the valves are in operation.

If the ordinary methods of preventing motor-boating do not seem to be satisfactory, and an output filter does not cure distortion, then remember to make sure the grid-bias is correct.

TECHNICAL TWISTERS

No. 50.—DIFFERENTIAL REACTION.

CAN YOU FILL IN THE MISSING LETTERS?

The special feature of the differential reaction condenser is that it has one set of moving and . . . . . of . . . . plates.

* * *

When one set of . . . . . plates is connected to the filament, and the other to the . . . . . circuit, the plate-to-filament capacity is kept substantially constant whether reaction is on or off.

* * *

The connections to the moving vanes are such that increased capacity in the reaction circuit is counterbalanced by . . . . . capacity in the plate-to . . . . . bypass.

Last week's missing words (in order) were:

Positive. Positive. Cathode. Negative, Sensitive.

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