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No. 398. Vol. XVI.

INCORPORATING "WIRELESS"

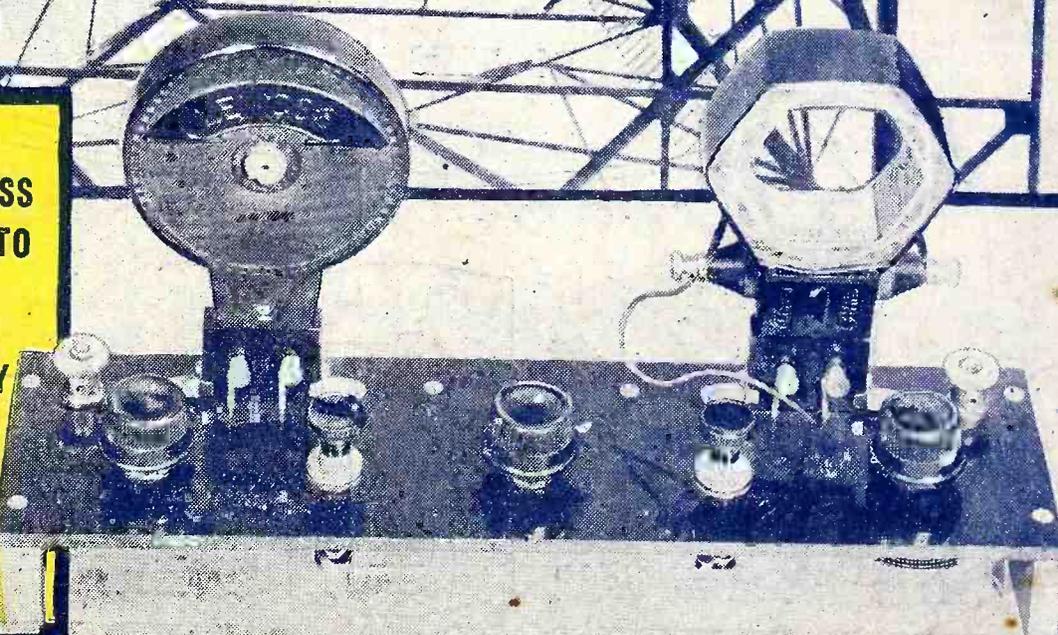
January 18th, 1930.

## A TWIN-WAVE "BROOKMANS" REJECTOR

*Full Details Inside*

### CONTENTS

THIS BASS BUSINESS  
WHEN TO LISTEN TO  
SHORT-WAVERS  
ANOTHER RADIO  
"STAR" LIFE STORY  
FITTING FILTERS  
DOES THE MOON  
AFFECT RADIO?  
Etc., Etc.,



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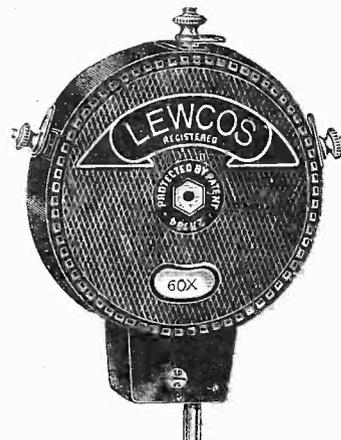


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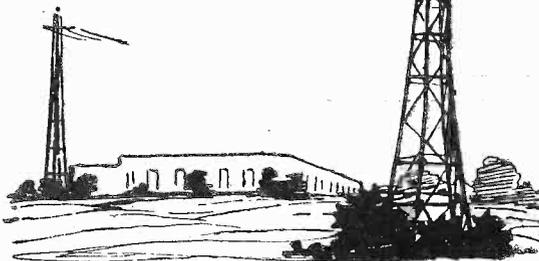
### "X" and Centre Tapped Coils



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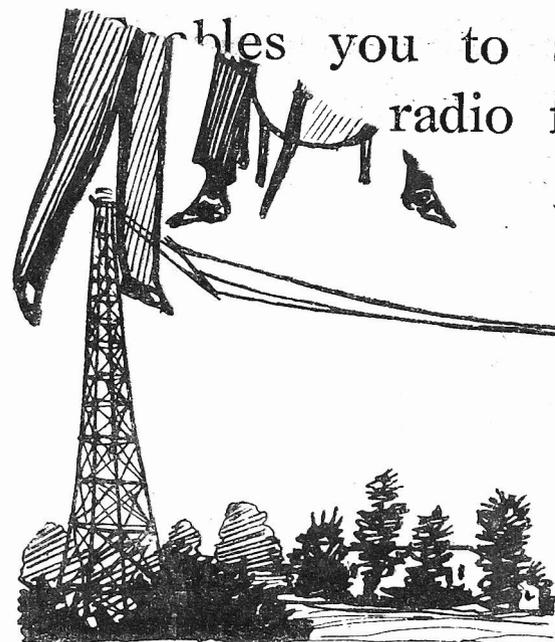
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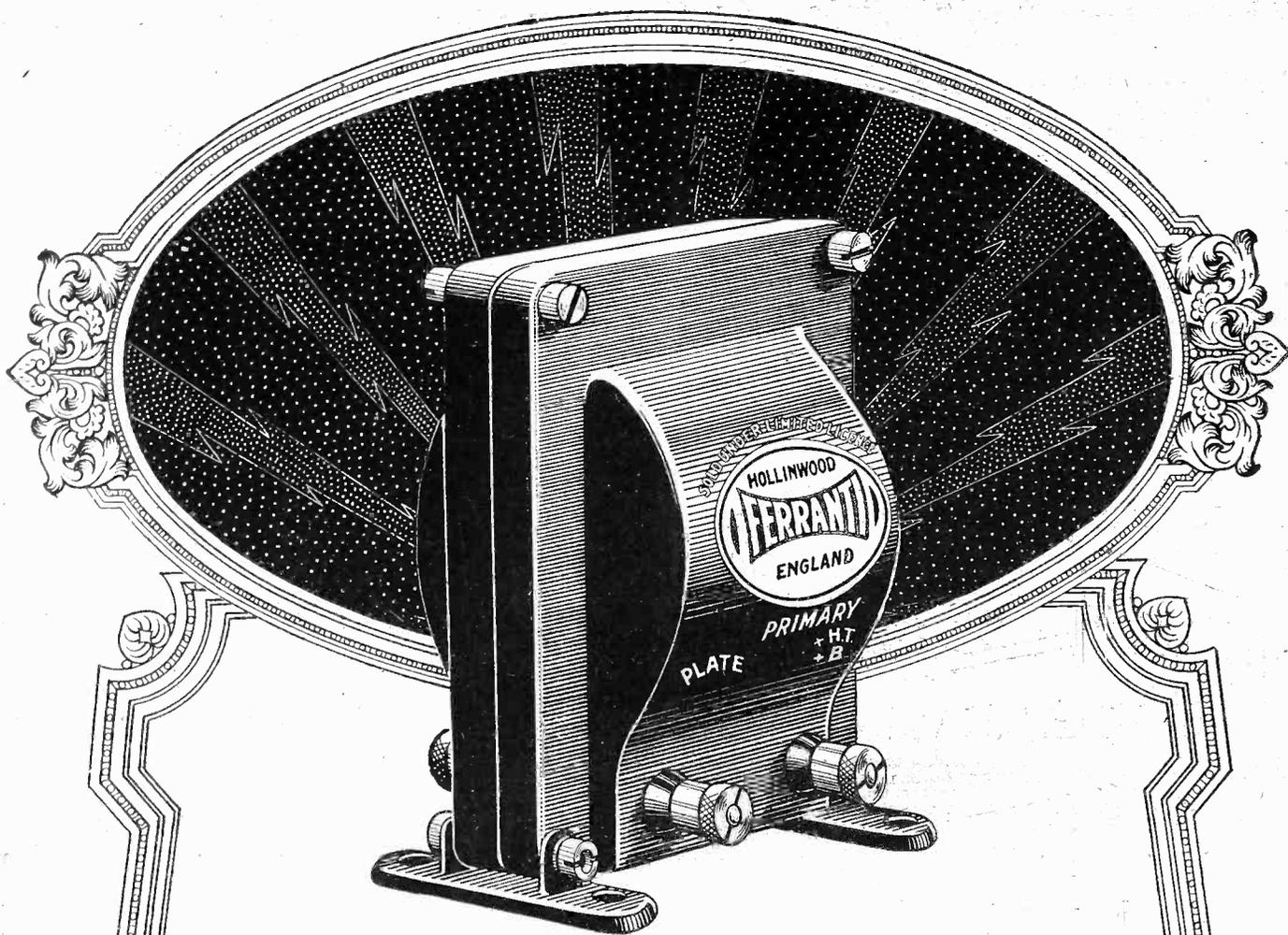
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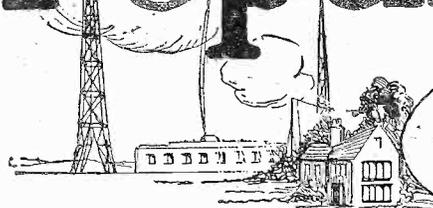
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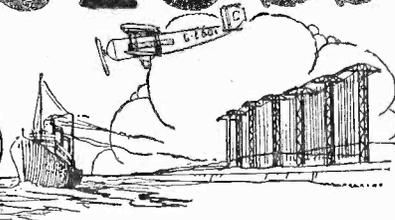
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# Popular Wireless



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**HORRIBLE WARNING!**  
**THE REMEDY.**  
**GRAMMY GROWL.**  
**WANTED—A SLEUTH.**

## RADIO NOTES & NEWS

**THE NOISE BOX.**  
**ARIEL'S TIP.**  
**BURIED TREASURE.**  
**THE NEW ORDER.**

### A Great Opportunity.

THIS country's contribution to physics is on a par with that of Germany to music, France to philosophy, and Italy to Art; and one of our greatest living physicists is Sir J. J. Thomson. If I were you I should make a point of hearing this great man lecture on Jan. 27th, for his name will be as familiar to your grandchildren as Faraday's is to you, and you will then be able proudly to tell them, "Oh, yes, I heard Thomson lecture!"

### Horrible Warning.

A. J. W. B. is one of those careless wights who gets his "P.W." casually. One day the ravens bring it; another he finds it like manna in the wilderness; the next he buys as an afterthought, and so on. Will he place an order with a bookseller and have us delivered every Thursday? Not he—not yet. Now he wants to make the "Magic" Three. But where are the details? Out of print! That's the position of A. J. W. B. Sticky!

### The Remedy.

BEING set on the "Magic" Three, our friend is now prospecting for the copies of "P.W." in which it is described, and asks us to give him a hand. Now, as Long John Silver says in "Treasure Island," "What is spoke to one is spoke to all." I counsel the seeker to put this matter right for the future by giving his newsagent a firm order for "P.W." and then to open his mouth and shut his eyes and see what the fairies send him. "Ariel" will do a little of his magic and produce the desired copies, a feat which he is able to perform only once a century.

### Gramophone Growl.

I FEAR that my grammy has become prematurely aged. A cold snap and it gets the rheumatics. It has been acting the idiot again lately and refusing to squeak at "concert pitch" unless warmed up in front of a fire. Considering that it was alleged to have been overhauled by the makers a month ago, I don't seem to be having much luck. What do they put in it? Treacle? I'll have to see our Mr. K. D. Rogers about this.

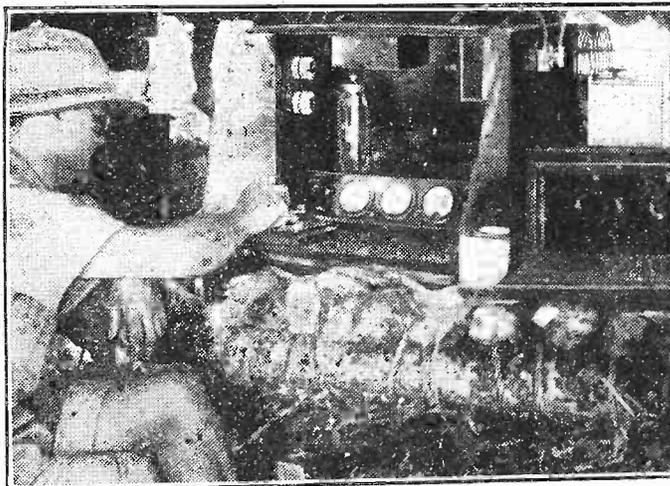
### Correspondent Required.

H. F. J., 9, Knox Road, Forest Gate, London, E.7, is one of those lads who almost compensate us for having to keep in order a drove of wild van boys. Just think! He has a copy of every number of "P.W." in his room, and has read them all thoroughly many times. A good start in life! However, his letter was inspired by his wish to have the name and address of someone in an English-speaking country who would like to communicate with England. I presume that the communication is to be by radio, though that is not quite clear from his letter. Will anyone who is interested write direct, please?

### Wanted—A Sleuth.

THE paragraph which appeared under this heading in our issue of December

### WHERE IT IS REALLY WARM!



This lightly-clad gentleman is one of a party engaged in taking African films. He is seated in an African jungle, but his 30-metre short-wave set, using low-power, was clearly heard in the U.S.A.

28th has brought me 741 (nearly) letters which have won my wager for me. 'Pon my word, it's a privilege to write for such a snappy gang of dial-twisters! Talk of hounds on a hot scent! Drop a comma and they are after you, noses down, rudders aloft, in full cry. As I said to the Editor, "I can't feed this public with Sunday newspaper radio. They'd lynch me." Well, those letters will bear analysis and further comment—especially concerning the nightingale. So, "watch this space"!

### The Schoolboys' Exhibition.

THE people who organise the "Daily Mail's" famous exhibitions certainly know their job from A to Hogmanay, and their Schoolboy Special at the Horticultural Hall this month was a work of genius. What topping rich uncles those men would make! And what a master-stroke—that Model Tuckshop! I came away wishing that I could be a boy again—except for cutting my knees so frequently!

### Wireless Trophy Won.

I HAVE pleasure in recording that the Wortley-Talbot silver trophy has been awarded to Mr. J. Noden, of Crewe, by the Radio Society of Great Britain, for having done the most advanced work on short-waves and research during last year. Mr. Noden recently received a silver cup for setting up a record in transmission on a wave-length of five metres.

### Twinkle, Twinkle.

MENTION of short-wave work reminds me of the news from Paris that a French scientist, Dr. Moineau, declares that all animals—in which term he includes you and me—emit oscillations of a definite wave-length, though the wave-length differs with the species. You and I, the doctor states, radiate waves of 22-45 millimetres and he has invented a wave-meter to prove it. I wonder whether the frequency increases when the Best Beloved approaches.

### Among the Experts.

I AM sorry to observe that my acute contemporary, "Mark Potter," of the "Leeds Mercury," has been playing with the idea that we may one day be able to tune in the sounds of the past. True, he imparts a tinge of satire to his remarks, but he omits to tell his unscientific readers that the sound waves of yesteryear have long since delivered up their energy in the form of heat. Jolly old "Reynolds" tells us that crystal users are "still the main support of the B.B.C." No wonder the programmes are so rickety. The "Stockport Express" warns its readers not to let

(Continued on next page.)

## NOTES AND NEWS.

(Continued from previous page.)

the acid in an accumulator get below the top of the "zinc plates." This gives me "That zincing feeling."

## Changes in the German System.

IT has been decided to reorganise the broadcasting system of Germany. The existing main stations are to be replaced by seven or eight super-stations built in the open country on the Langenberg model. There is also to be a system of low-power stations for single-wave working. As to power, the big stations will probably be of 60 kilowatts, and the cost will be about £800,000 each. European broadcasting seems likely to become a matter of friendly rivalry between Germany and Great Britain.

## New Appointment.

MR. W. S. NAYLOR, M.I.E.E., who has recently been appointed Chairman of the Board of The Chloride Electrical Storage Company, Ltd., is one of that band of lucky men who trained under the late Professor Sylvanus P. Thompson at Finsbury College, that breeding-ground of electrical engineers. Mr. Naylor has been with the C.E.S. Co. for more than a quarter of a century, and has risen from his first position as Assistant Manager.

## The Noise Box.

THE various contrivances which have been devised in order to imitate certain sounds required in broadcasting take up a lot of space and therefore, space being scarce in America, an ingenious gentleman has managed to put enough gadgets into a box to produce any noise from that of a hearty kiss to that of a railway collision. This terrible invention is said to be so diabolically complete that even several varieties of bells, whistles, motor-horns, wind, etc., can be counterfeited. Now I come to think, I feel sure that the little boy next door has a box like that.

## Hint for Jerry-builders.

WE fully understand that the high cost of labour will not allow a builder to make his party walls much thicker than paper, but if these walls could be built of some material which will not readily permit the transit of sound much annoyance would be prevented—and, of course, another £100 could be clapped on to the price of the shack. Thin walls are ruining the radio trade in Scotland, where thousands of men are waiting for their neighbours to buy a set. In the rest of the British Isles many people are suffering because they get their programmes second-hand.

## A Tip from "Ariel."

IN my quiet corner I sit and observe men and affairs. Nobody disturbs me, not even when a bottle of fizz strays into the office. They think that "Ariel" is above that sort of thing. Well, I have seen a new star arise in the already congested "P.W." galaxy, to wit, the writer of "For the Listener." Read and digest this feature, for it is excellent stuff. The hurling of

bouquets in Fleet Street and its environs is strictly forbidden, but I am allowed to break the rules. (*I have a blind side.*—Ed. "P.W.")

## A Good Word.

IS it the fascination of producing something—apparently from nothing, the craze for pleasure, the hunger for culture, or merely the worst of all crazes—that of being in step with the fashion of the moment, which induces the whole of society to acquire radio sets by fair means or otherwise? Look at the thefts of material and even of whole sets; think of the wholesale infringement of patents by "dabbling" manufacturers, and the "piracy"; think of the people who possess sets but not enough food or clothes! I thank the "Chatham News" for coining a word which fits to a T—"radiolatry."

## SHORT WAVES.

"Radio in heart of Arabian Desert," we read in a provincial newspaper.

Good heavens, are they going to start eating it now?

"Lend me your ears," Mark Antony said. A good line for Radio Week!

Father: "What! Another new radio set. Where on earth am I to get the money to pay for it?"

Son: "Good gracious, father. I'm your only son, not your financial adviser."

"What would most men be without their wireless sets and loud speakers?" asks a contemporary. At peace.

## A POLITE REQUEST.

Some little time ago 3LO (Melbourne) received the following letter:

"I have a kow that is going to have a car soon and I would like to broadcast a a-peel for a name because I want two kerlect stampss fore mi boi who is krazy on kerlecting them." So even people living in the wilds are able to appreciate broadcasting in some way or another.

## That Scrap of Paper.

YES it costs you ten shillings to get it and the Post Office one shilling and a penny to give it to you. This cost of issuing a wireless licence was revealed by the temporary head of the Post Office in the House of Commons recently. It seems a lot, but one must remember that in this cost is included not only a proportion of the expenses of detecting unlicensed sets but also provision for subsequent law expenses. And possibly a little bit is included to cover the loss on Rugby.

## Historic Broadcast.

IT is a thousand pities that for the sake of its moral effect on listeners of all nations the opening of the Conference on Naval Disarmament on January 21st has not been arranged to take place in the evening. As it is, however, most of us must miss this important broadcast item, and a great opportunity for impressing the world has been lost. Surely a merely formal and short opening ceremony after dinner would not be irregular or inappropriate!

## Buried Treasure.

ALL this talk about the Tobermory galleon will tickle the interest of listeners. Hence I take this opportunity of pointing out that the story of the Spanish Armada as told by J. A. Froude in

his history of England is one of the most stirring sea yarns ever written, as he declared he would make it. From the moment when the mighty fleet sailed from Lisbon to the day the stricken survivors crawled into Santander there is not a dull moment, and nothing in fiction can beat it. Just borrow Froude, read the yarn—and you will thank me for this paragraph, I think.

## The Latest Gleaning.

BROWSING amongst the columns of the Sunday "experts," I learn that if my L.T. battery is poor "dry batteries may take its place effectually if reduced to 2 volts output." But my L.T. is a 6-volt affair, and my neighbour uses a 4-volt battery. Awkward! Again, does not the "expert" know that "output" cannot be expressed in volts? A volt is not a thing. The last gem is: "Valves usually have a sudden death and a final." "Experts" may die temporarily, however, and rise again after it has blown over.

## M. M. M.

BLESS me, what do you think of young J. B. F. of Clapham, whose letter appears in "P.W." for January 4th. "He wants a Bartship," gasped someone in a scared tone. "Wot?" I ses. And then they printed the letter, leaving me to "hold the baby." Now, my dear young fruit—to use current parlance—what sort of a Bart do you, think you are? Why, I don't suppose that you have even laid the foundations of a whisker yet. Very good work, though! Let me see—m—m—m—"

## The New Order.

IT is evident that my baronetage is about full up. Moreover, "P.W." sets are so efficient that reception from the Antipodes, etc., is a commonplace occurrence. There must be a new Honour for the pullers-off of jolly good jobs such as described by J. B. F. Here beginneth the O.T.M., and J. B. F. is the first member. Meritorious Manufacture and Manipulation. Three M's. Hence the "Order of the Triple M." Patent applied for. Ancient lights. Beware of Imitations. (No H.A.C.'s need apply.)

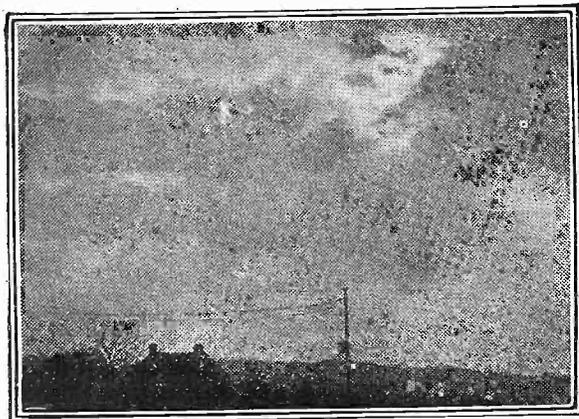
## The 1930 B.I.F.

HAVE you ever visited a B.I.F.? It is a show to make a Briton proud of the old Commonwealth. The British Industries Fair for 1930 will be held at Olympia each day from February 17th to 28th (inclusive) except Sunday, 23rd. Trade buyers admitted free from 10 a.m. to 9 p.m. each day; the general public from 4 p.m. to 8 p.m., on payment of a small fee. The Birmingham Section will be situated at Castle Bromwich. I recommend all to go and see what is one of the most remarkable shows of its kind it is possible to find.

## The Performing Fuse.

THOSE ingenious constructors who are fond of adding refinements to their sets in the shape of alarms, indicators, meters, and what not, will be inspired to hear about a wonderful fuse which has been developed by the Bell telephone people. This fuse rings an alarm bell, lights a lamp and throws out an individual signal when it is burned out. More than a million of these fuses are used every year on the U.S.A. telephone system.

ARIEL.

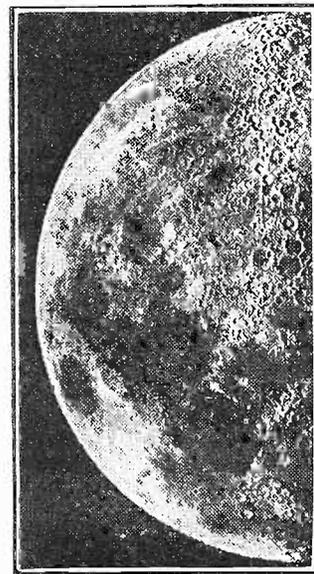


# Does the Moon Affect Radio?

THE Man in the Moon has been held responsible for a variety of things in his time, and, to me, it has always been a matter for some surprise that the possibility—and, indeed, in some cases it might seem the certainty—of the moon's

influence upon the transmission of radio signals has not been more fully discussed by our radio scientists.

Naturally, the radio amateur will regard the above possibility of the moon's interference with wireless waves with a great deal of scepticism, for has not nearly everything in the heavens



The half-moon as seen through a large astronomical telescope.

above and on the earth below been credited with some influence on wireless at one period or another?

Nevertheless, I am convinced that the whole matter is one which has not been fully thrashed out, and the investigation of the supposed influence on wireless signals by our satellite, the moon, would certainly provide an interesting field of experimental

A problem of special interest for the "long-distance man."  
By J. F. CORRIGAN, M.Sc., A.I.C.

work for confirmed long-distance reception enthusiasts.

The necessary conditions for the series of experiments would not be difficult to fulfil. A sensitive set capable of receiving a distant station with reasonable ease would be, of course, a *sine qua non* for the success of the experiments. So, also, would be an audibility meter or some other type of signal-strength measurer.

### A Three-Months Check.

Assuming, however, that these conditions can be fulfilled, the experimenter should proceed in his investigations by recording the mean nightly signal strength of one particular distant station over a period of at least three months. Naturally, a calendar giving the phases of the moon will be necessary in conjunction with the experimental observations.

In making a series of observations such as the above it will, of course, be vitally necessary to maintain the receiver and the local conditions under which it operates in as constant a condition as possible. That is to say, no alterations or modifications must be made to the receiver during the course of the investigation. Valves should remain unchanged, and the voltages of the L.T. and H.T. batteries should remain as uniform as possible.

The results obtained from the above series of observations when plotted on a chart against the phases of the moon will provide a record of much interest and, if modern assumptions are correct, the chart will indicate the fact that the period of the waning moon is the most favourable to DX reception.

### Watch the Weather.

Naturally, during this series of investigations, due allowance may possibly have to be made for other factors affecting long-distance reception; factors, for instance, such as severe storms, thundery weather, sudden climatic changes, and so on.

Now, assuming—and I think we may do so with safety—that the moon really does affect the transmission of wireless signals to some degree, we are faced with the question as to why these effects should be possible.

It would seem that the moon's slight influence upon radio signals travel-

ling over long distances must be due, either to some atmospheric condition associated with the phases of the moon, or else to some effect which the moonlight may exert on the Heaviside Layer.

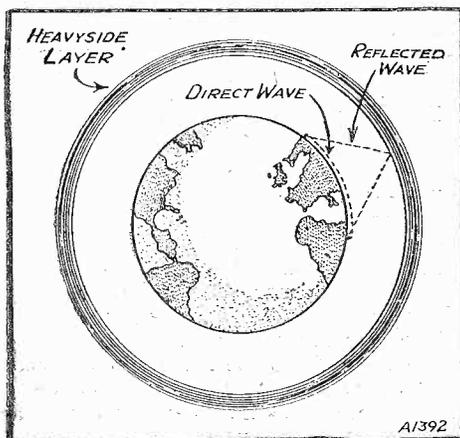
After all, the moon's rays are but reflected rays of sunlight, and although they possess but a mere fraction of the intensity of direct sunlight, they may possibly influence the Heaviside Layer in some way.

We know that there are two distinct routes via which a radio wave can travel from place to place on the earth—directly, and by means of reflection from the Heaviside Layer. Most long-distance transmission is accomplished by means of the reflected wave.

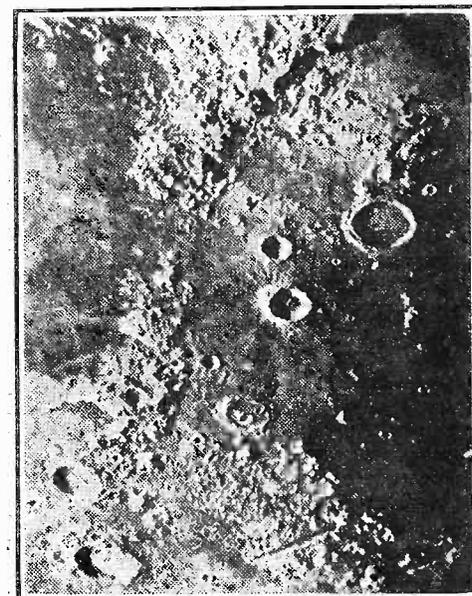
If now the moon's rays may cause some alteration in the normal nightly position of the Heaviside Layer, it is evident that the angle of reflection of the radio waves will change in consequence, thus setting up a variation in observed signal strength.

### Why Not Try It?

However, theory apart, there seems to be no doubt that long-distance transmissions are influenced in some slight way by the moon, or perhaps more accurately by the rays of light reflected by that body and, therefore, making this fact the subject of a series of experiments and observations, the keen long-distance worker cannot fail to derive many interesting results from his labours in this field of radio research.



Showing the two paths available to a radio wave—the direct and "reflected" routes.



A portion of the moon's surface, showing some of the extinct volcanoes.

# POINTS FOR AND AGAINST THE B.B.C.

A brief review of the broadcasting events of 1929.

By THE EDITOR.

IN a review of its work during 1929, the B.B.C. states that the year has been exceptionally eventful on the engineering side. We agree. It has. The most important activity was the completion of the first Regional station at Brookmans Park, designed to give London and the Home Counties a dual programme service. The station started in October on a single-wave basis; that is, only one transmitter was energised, making a single programme distribution. Tests on a two-programme basis were started on December 9th. And, so far—excellent! Congratulations!

## Engineering Progress.

In October, constructional work was started on a similar station for the Northern Region. The North Regional transmitter will serve the industrial districts of Lancashire and Yorkshire with a service similar to that provided for London, except that its range may be rather greater.

In September a new and more permanent station was opened at Tatsfield to replace the old temporary listening-post at Keston. The main purpose for which Keston was originally intended was the relaying of distant programmes; but latterly it had become a wave-length, or frequency, checking laboratory, working in conjunction with that of the Union Internationale de Radio-diffusion at Brussels. The carrying out of accurate calibration work rendered it necessary to find a new site upon which a suitable building could be erected. Tatsfield has been designed and equipped for relaying European stations' programmes if and when a landline is not available, as well as for the important work of wave-checking. Again—excellent!

Experimental transmissions of television were started in October and are still in progress. Here, comment is reserved. When we get the chance, we will be able to judge whether these experiments are worth while.

## Realistic Relays.

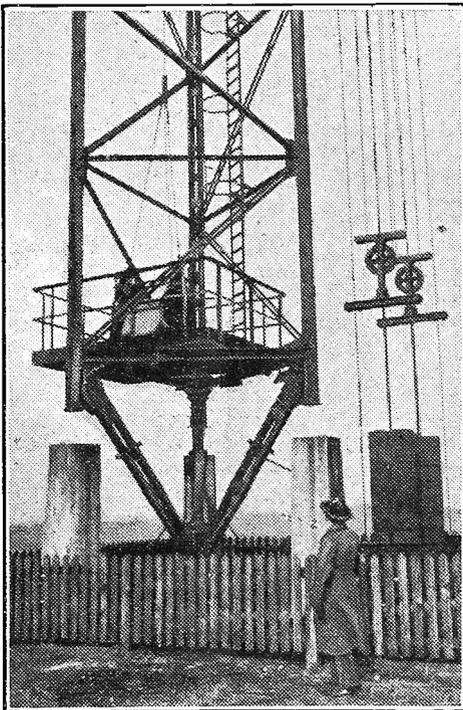
During the second half of the year relays from America by short waves exceeded in quality all previous efforts to facilitate satisfactory reception for British listeners. Two of the best transmissions were a running commentary on the landing of the Graf Zeppelin at Lakehurst and the reception accorded to the Prime Minister in New York. Another notable attempt to bridge the gap between England and America via the ether was the relaying of President Hoover's inaugural address. These successes were made possible by prolonged experimental work on the reception of telephony on ultra-short waves. Listeners will remember that this effort was really "the goods." More like it, please, in 1930.

The year has marked the gradual introduction of Continental broadcast programmes relayed by telephone cable as frequent items in the B.B.C. programmes. These relays have carried a practically unqualified guarantee of success owing to

the development in Europe of a comprehensive system of telephone cables which comprise circuits specially designed for broadcasting. A few years ago the possibility of the provision of telephone lines between Great Britain and the Continent of Europe which could be considered as suitable for the transmission of music was little else than a flight of the imagination. To-day it is an accomplished fact.

Early in the year work was started on the new B.B.C. headquarters in Portland Place, London, on a site occupying an area of about 20,000 square feet. This building, which will cost between £400,000 and £500,000 to erect, will provide more than 100,000 square feet

## POISED ON PORCELAIN!



One of the huge aerial masts at Nauen, Germany, the full weight of which rests on a giant porcelain insulator.

of floor space. The new home of broadcasting will be completed in 1931 and will contain some of the most modern engineering equipment in London.

In short, the year's technical progress made by the B.B.C. has been of a very high order, and no one will grudge the congratulations and thanks the B.B.C. have so rightly earned from all classes of listeners and amateurs. But—!

## Microphone Boosting.

Mr. Gladstone Murray—that popular B.B.C. personality who is Director of "Publicity, Publications and General Contacts" at Savoy Hill—recently wrote an article in the "World's Press-News," in which he expressed the opinion that "the relations between the B.B.C. and newspapers continue to improve," and that

"so far the microphone has not been used in a directly propagandist manner."

Both these statements are bound to provoke argument: in fact, they have already done so, and Mr. Washington Flatt, replying to Mr. Murray's article, asks how Mr. Murray squares his statement with the constant "boosting" of the "Radio Times," "World Radio," and "The Listener" via the microphone.

As Mr. Flatt justly remarks, "How terribly wearisome it becomes!"

"Immediately following the news comes something like this. . . . Here is a special announcement' . . . or 'In to-morrow's (or next week's, as the case may be) 'issue of the "Radio Times" will be found"—this, that and the other; and the announcer-salesman proceeds to sell us one or all of the journals mentioned. Similarly, most of the talks end with this tag: 'Mr. So-and-so's talk will be published in "The Listener" of such and such a date.'

## Too Much Puff Stuff.

"I am going to suggest," adds Mr. Flatt, "that these 'puffs,' or 'announcements'—call them what you like—are just as much advertising as any other kind of advertising. Remember that to 'make known' is to advertise. It is by no means necessary to ask prospects in so many words to buy something. I wonder what fee Lord Beaverbrook would consider adequate for five minutes at 2 L O in which he could broadcast to all stations on behalf of the 'Daily Express'?"

"Would Lord Rothermere think £50, or even £100, too much to pay for a few minutes' confidential talk on the merits of the 'Daily Mail' to a million or so men and women in the quiet of their homes?"

"The B.B.C. have all along taken unctuous pride in the fact that the microphone has been kept free from advertising. So it has . . . from all advertising *except their own!*"

Mr. Flatt has put the matter in a nutshell, and when he suggests that a re-opening of the whole question and a re-adjustment as between the B.B.C. and the Press is long overdue, we feel that most intelligent students of British broadcasting will agree.

## The Profit Fallacy.

Of course, the B.B.C. could reply to Mr. Flatt, and those critics who agree with him, that the publications emanating from Savoy Hill are *entirely* for the benefit of the listener—that every penny profit earned by the B.B.C. publications is spent, in one way or another, for the improvement of broadcasting and in the general interests of the listener. That is the B.B.C.'s big argument—and as far as it goes it is a good one. It breaks down, however, on the question of principle. There are many other things equally deserving of microphone publicity, because of the fact that the public would generally benefit: it could be argued that the manufacturers of "—" meat extract should have broadcasting publicity because doctors have declared the extract to be beneficial to consumers; it could be argued that publishers of high-class magazines and books should have microphone publicity because they help improve public taste, culture, etc., and thus enable the listener to appreciate high-class broadcasts.

But we drop into the facetious vein! And it is difficult not to when we consider the high-falutin' arguments advanced by the B.B.C. in the cause of radio advertising.

LIFE STORIES OF FAMOUS BROADCAST STARS N°8



# My Road to Radio

by RONALD FRANKAU

This popular entertainer, and well-known wireless star, contributes an interesting story to our series by telling how he first came to broadcast.

I COME from a family of writers. My mother was "Frank Danby," the author of "Pigs in Clover," and "The Heart of a Child." My uncle, Owen Hall, wrote "The Geisha," "The Little Cherub," and many other musical comedies, whilst my aunt, Mrs. Aria—Mrs. A. of "Truth"—edited the first woman's paper ever put on the market.

I am, alas, best known as the brother of Gilbert, who wrote "Peter Jackson, Cigar Merchant," but even I am not free from the family failing, for I have written hundreds of songs and over thirty sketches, and magazines have printed quite fifty short stories by me. It is not long since Frederick Warne published "Oh, Dear, Dear!" my book for children.

### How I Started Life.

I am just thirty-five and a self-educated man. I was at Eton. From there I proceeded to a German business school, but my inclinations were for the footlights rather than for commerce or the pen, and I wrote to my mother to tell her of my stage ambitions. I can still recall the letter she sent in reply:

"I am here to further my son's wishes," she said, "not to hinder them. But if you succeed in getting to the top of the tree, a little business knowledge will not come amiss in a profession where it seems a rarity."

These were wise words, so I completed my commercial studies, and finally entered my father's cigar-importing firm in London. After business hours, I attended the Guildhall School of Music, where I was training as a baritone under the late Franklyn Clive.

Against my father's wishes, I sang at a smoking concert, and was very pleased to receive an encore. But when the inferior comedian who followed me was recalled four times, I suffered my first pang of professional jealousy, and immediately gave up baritone singing.

### The War Intervenes.

Shortly afterwards I went to Canada for reasons of health, and stopped there eighteen months. Incidentally, had I complied with my mother's request to return to England on the same boat as Laurence Irving, I might never have had the worry of writing this article. The vessel

was wrecked, and Irving and many other passengers were drowned.

When I returned, I was given the choice of two good positions in prosperous business firms. I chose neither. Under the name of "Frank Ronalds" I braved an audition at Daly's Theatre, and was offered and accepted an immediate contract for a forthcoming production. Then came the war. In November, 1914, I was commissioned, and a few months later I went to France. I organised what I believe was the first professional concert on the other side, my star artistes being Dennis Neilson-Terry and the late Basil Hallam.

### Not a Success.

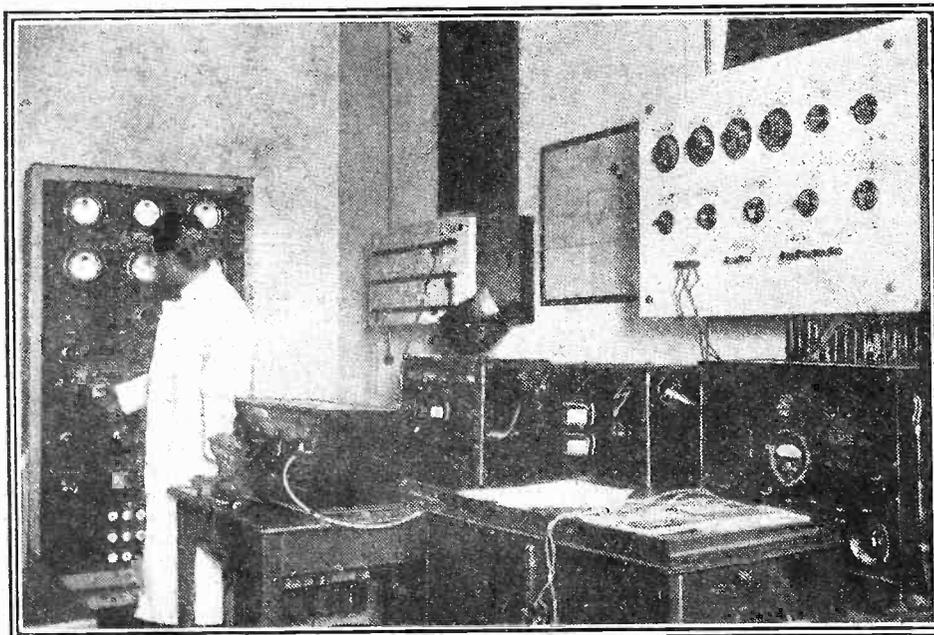
Nineteen-seventeen saw me in Mesopotamia, still running concerts in my spare time. Two years later I was in India. After helping with a concert for the Viceroy at the

small fame I had won in the East did not follow me, I took an engagement in an *al fresco* pierrot show at Eastbourne, under the name of "Danby Ronalds." To be quite honest, my performance was not as good as I thought it was, and the direct words of the proprietor of the troupe made me so despondent that I decided to drown my sorrows in the sea of stage-managership.

### I Try Stage-Managing.

I became assistant stage-manager for the late Mr. Hackett's production of "Macbeth" at the Aldwych Theatre, London. Most of my time in this position seemed to be spent in telling Lady Macbeth (Mrs. Patrick Campbell) that Macbeth (Mr. Hackett) was waiting for her on the stage, and returning with the reply that Lady Macbeth could not possibly attend for a minute or two as her plaits were not properly adjusted!

### ADJUSTING THE BROADCAST.



Although the performers in front of the microphone are not aware of it, an engineer is continually adjusting controls, which keep the volume right and the tone correct.

Viceregal Lodge, I left the Army and stage-managed for a touring repertory company, the proprietor of which had seen one or two of my productions.

On my return to England, whither the

At last I decided to try my luck on the stage again, and gave an audition before Mr. George Grossmith. My tests were evidently satisfactory, for I was sent on

(Continued on next page.)

## CONCERNING THE CONDENSER.

How the modern condenser has progressed from an accidental discovery.

THE condenser is quite a modern affair, although it is nearly a couple of centuries older than radio. Strange, isn't it, that scientists should have been dabbling with electricity for so long before "communication without wires" was made possible?

The earliest condenser was the Leyden Jar, an invention of a German student named Cunius (a curious name!).

He made the discovery quite accidentally in the year 1746. He was trying to electrify some water in a glass jar, and during the experiment he dipped a chain connected to a Wimshurst machine into the vessel.

### A "Shocking" Discovery.

After having pumped a fair amount of "juice" into the outfit he picked up the jar with one hand and took hold of the metal chain with the other. The result was a terrific electrical shock—and the discovery of the condenser.

By the way, whilst we are in the eighteenth century let us put in a word for that electrical stalwart, Stephen Grey. In 1729 this pioneer discovered the difference between insulators and conductors. 1729! Two hundred years ago, and the bi-centenary of this really important event passed unnoticed.

However, to return to the condenser. The Leyden Jar was in active use until the dawn of the twentieth century, and it is still to be seen in schools and laboratories.

Many of Sir Oliver Lodge's most important radio experiments were carried out with Leyden Jars that differed very little from the original jars of Cunius.

Until very recently indeed it was the practice to reckon the capacities of condensers not in microfarads but in jars, and I am not sure whether the Navy has even now relinquished that unit.

### "Measuring" Capacity.

Writing of jars reminds me of the experiments of Cavendish, who was, I believe, the first to discover that various metals offer different resistances to electrical currents.

Cavendish conducted his experiments in a rather novel manner. He charged a battery of Leyden Jars with a nice fat voltage and then connected wires of various kinds to their terminals.

He varied the lengths of these wires of different gauges until the shocks imparted through them appeared to give the same agony. It is no reflection on this scientist's

courage when it is said that his devoted assistant was the recipient of the shocks!

When you get a goodly jarful of volts handed out to you, you want someone else to observe the intensity of your contortions—you are too busy counting red stars and blue stripes to retain the balanced judgment necessary to calculate volts and amps!

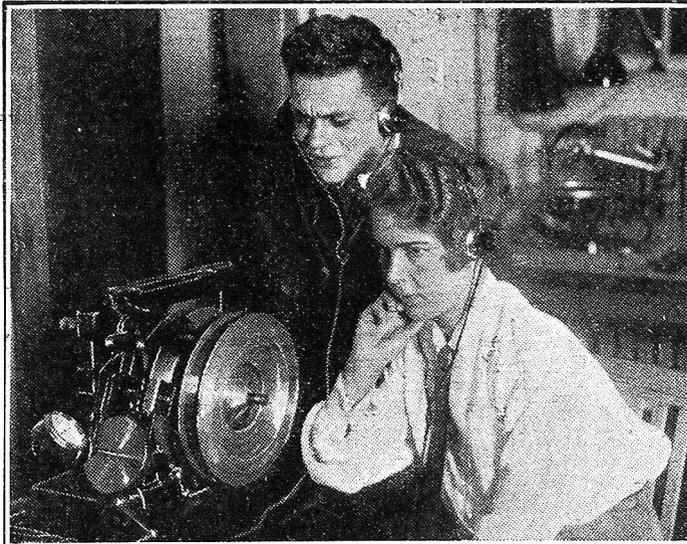
Probably there is not one reader of "P.W." who has not seen the word Mansbridge applied to certain of the larger types of fixed condensers in use to-day. Very frequently Mansbridge condensers are specified for particular purposes.

What does Mansbridge mean? And exactly what does constitute a Mansbridge condenser?

Up to the year 1900 large fixed condensers were built up of layers of waxed paper and tinfoil; many of the smaller fixed are still made that way. In 1900 a Mr. G. F. Mansbridge invented a scheme whereby large-capacity fixed condensers could be made much cheaper. His process makes use of tinfoil paper—that is paper that is coated with a thin film of tin.

This tinfoil paper is supplied on reels, and to make a condenser two strips are rolled up tightly together. Some 42 sq. ft. or so of this material is used in a 2-mfd. condenser.

## AUTOMATIC MUSIC ACADEMY.



At an Academy of Music in Berlin the lectures of the professors are recorded so that the students may hear them many times. An automatic piano is used to give the correct key movements.

Like most other electrical things, the condenser is ever developing—or perhaps I had better say continues to appear in new forms.

The differential reaction condenser is an important innovation, for its use imparts a wonderful regenerative control to a receiver, as "Magic" enthusiasts will know.

And in one form or another the condenser probably plays more parts in radio than any other component. What a pity Cunius did not live to see the full fruits of his accidental discovery.

When you handle your tuning controls or adjust the "compressions" of your "Brookmans" Rejector, or stick a condenser in a mains unit, think of poor Cunius somersaulting across his eighteenth-century laboratory or Cavendish's assistant howling away at the end of the leads from the Leyden Jars. Radio owes a great deal to these humble men of science. G. V. D.

## MY ROAD TO RADIO.

(Continued from previous page.)

tour as understudy to Mr. Leslie Henson's part in "A Night Out." When I returned to London I decided to run my own concert party, and did so badly that the £500 I invested in the scheme disappeared quicker than I thought possible.

### "The Cabaret Kittens."

I determined not to give in without a fight, however, and decided to form my own limited company. "The Cabaret Kittens" was started, and from that day my fortunes changed. Inside twelve months I had control over three concert party theatres, and four different companies. In 1925 I was asked to tour South Africa with "The Cabaret Kittens," and two years later went out again to tour the same circuit of theatres.

Wireless broadcasting opened a new field for me, and I obtained an engagement within an hour of giving my audition. I still find that performing before the "mike" is a most nerve-racking proceeding; in fact, it frightens me more than anything else I do.

Every broadcast engagement I receive means hours of thought, study, and writing. In addition, I make a point of learning all my words *by heart*, as though for a regular stage performance. Words that are read from a script always sound to me wooden and unreal, and although the memorising means a good deal of extra work, I feel that if a job has got to be done, it might just as well be done thoroughly (loud cheers!).

### There is NO Funny Side.

Friends have sometimes asked me to tell them of the funny side of broadcasting. To me, at any rate, it has no funny side. It is ten minutes of tragedy before the microphone, and a muttered prayer of relief when the ordeal is over. I have been told that unrehearsed incidents have occurred from time to time, but in this year of disgrace the B.B.C. is too well organised to permit of many such incidents.

Of course, there was the occasion when the announcer informed listeners that Gilbert Frankau would render a comic song. That almost made me smile. Those who know my brother will tell you that his knowledge of music is such that he once rose to his feet at the sound of "Rule, Britannia," under the impression it was the National Anthem!

## THREE TIPS.

Be careful not to splash flux about when soldering, as this not only spoils the appearance of a set, but leads to later trouble.

The running of aerial, earth, or battery leads too close to the electric light wiring is one sure way of inviting steady humming interference.

After a terminal has been affixed in a panel and then soldered, it will be necessary to tighten the fixing nut a little, as the heat will invariably soften the ebonite.

# CAPT. ECKERSLEY'S QUERY CORNER



Under the above title, week by week, Captain P. P. Eckersley, M.I.E.E., late Chief Engineer of the B.B.C. and now our Chief Radio Consultant, will comment upon radio queries submitted by "P.W." readers. But don't address your queries to Captain Eckersley—a selection of those received by the Query Department in the ordinary way will be dealt with by him.

### The Effects of Screening.

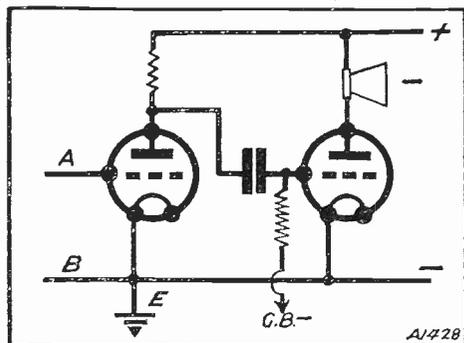
A. D. M. (Glasgow).—"Why is it that copper and aluminium are employed for screening when neither of these substances are magnetic. Surely they can have no effect on a magnetic field."

The immortal Faraday proved that there was no electric force inside a closed conductor. He made himself a copper kennel, got inside with his electrocope and shut the door, made all the electric forces he could outside, but he couldn't detect any inside!

The point is that a varying field creates currents in a conductor, and these currents oppose the field which is creating them and destroy it to all intents and purposes. Although a steady magnetic field can get through a conducting screen all right, a varying field cannot in any like amount because of the induction currents which build up an opposite field—when screening one coil from another we want to stop varying fields and any good conductor will do that.

### A Question of Earthing.

B. L. T. (Beddington).—"I understand that the reason why a radio set works with the earth removed is because the capacity of the batteries to earth is sufficient to provide an earth connection. If this is



Circuit details of the Amplifier.

so, why do I have to make an earth connection on my gramophone pick-up amplifier to keep it stable when using wireless batteries?"

Apart from other things, do you have to? You can quite well work an L.F. amplifier without any earth, provided the "earth" is not a name to signify the completion of a circuit, and provided you don't

mind risking a shock if you are using mains. Thus, a circuit of an L.F. amplifier is given above.

Apart from grid negatives, your pick-up must connect to A B. But B is the same as E and may be marked "Earth," so you must have an earth! Also, suppose (-) is not earthed, and suppose (+) touches the metal parts of the amplifier, and then suppose you do, too: then (+) goes to earth through you, and that is most uncomfortable, especially when there's a few kilovolts and kilowatts behind (+).

### "Doubled" Reception.

M. C. (Dulwich).—"On my set, a four-valver (H.F., det., 2 L.F. resis. trans.). I have noticed lately a sort of double effect. This is apparent only at times, and with certain items from 2 L.O.

"The voice of a singer seems to split into two, the natural note and an accompanying note an octave or so above. Otherwise, my set is perfectly satisfactory. Is this due to the transmitting station?"

I believe the effect is caused by the new transmitter at Brookmans Park, which modulates more deeply than the old, but does so without distortion.

The newer design enables the B.B.C. to put out much more deeply-modulated stuff, and since there is no distortion in so doing they are perfectly justified. But we must look to our sets and be sure that, particularly with our rectifying systems, we can take account of the better signals.

Grid-leak rectification is apt to be blameworthy in giving distortion on deeply-modulated "impulsive" transmission, and even bottom-bend, if not properly done, is apt to sin also. Advance by bottom-bend rectification (if you haven't already), or, in general, look to your detector and the linearity of all valves.

### Reflected and Refracted Waves.

P. B. E. (Blackpool).—"Is it possible for signals on the normal broadcast wave-band to be reflected in a similar manner to those on the short waves?"

The phenomenon of reflection, refraction, diffraction, etc., observable with light waves takes place with so-called wireless waves, whatever their length.

With short waves of a metre or so in length one can build a large prism and show how the rays can be bent. With waves up to 30 metres, and reasonably high masts you can, as we know from the

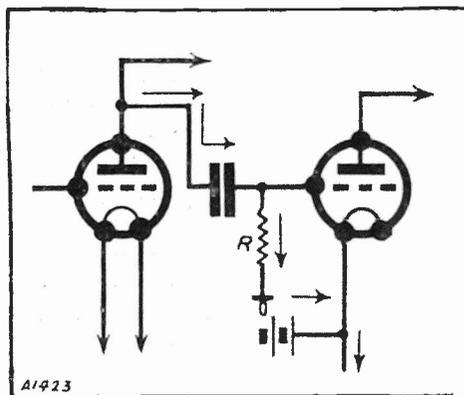
Beam system, put up a reflector and send the waves chiefly in one direction.

You cannot reflect or refract a wave of the order of 200 to 600 metres in length because it's physically impossible to build prisms or reflectors big enough. If you set about building masts several thousand feet high you could do something, but it's dimensionally absurd to try.

The layer of electricity some hundreds of miles above the earth's surface however reflects waves of any length we use quite adequately.

### Better Without Bias!

P. P. P. (Walthamstow).—"By removing the grid-bias plug which supplies the grid of the last valve, my signals become



Those Grid connections (see below).

considerably stronger than with it in position. Why should this be?"

If you imagine you are the penultimate valve, you will see that your job would be to put energy into the grid of the following valve.

You find that it's all very well putting stuff on to the grid when it's free, but you've also got to push some down a resistance (R) and through a battery to earth, as shown above by the arrows.

Thus, if someone disses the plug, you've not got to push anything down the resistance, and you have plenty to spare for the grid. Thus the signals get louder.

But the last valve has only a spurious leak to earth, and can only keep moderately negative by grid-leak effect, and doesn't like it.

Try using a larger resistance (R) up to a value where the signals are loud but undistorted, and while you are sure that all valve conditions are right.

**LATEST BROADCASTING NEWS.**

**THE CASE OF MR. HENTY.**

**RUGGER AND SOCCER RELAYS—Dr. BOULT ON 5 G B—NORTHERN NEWS—SCOTLAND'S G.O.M. OF SPORT—WOMEN'S WEEK**

It is understood that the resignation of Mr. E. C. Henty from the post of News Editor of the B.B.C. involved circumstances of intense dramatic interest. While Savoy Hill was even more silent than usual, Mr. Henty contented himself with the cryptic observation that the reasons for his leaving were "confidential" between him and Sir John Reith.

There was another version in some papers which read "a matter of confidence" and "a question of confidence." There is a disposition to deduce that this statement cloaks some sort of crisis of the nature of the historic Dunstan episode.

It may be that this change at Savoy Hill is one of the early results of the activity exclusively forecast in this column a fortnight ago. But it is not so easy to explain some other staff matters that have excited interest in the B.B.C. recently.

**Rugger and Soccer Relays.**

All stations are broadcasting a running commentary by Captain H. B. T. Wakelam on the first Rugby "international" of the season between Scotland and Wales, which takes place at Murrayfield, Edinburgh, on Saturday afternoon, February 1st.

The officials at Savoy Hill are hoping that the remainder of the football season will be productive of some interesting running commentaries both on the Rugby and Association games, but it is still too early to say definitely whether permission will be granted to broadcast a description of the F.A. Cup Tie Final from Wembley next April.

The indications are that the deadlock of last year will continue. The B.B.C. has repeated its offer of a substantial gift for any charity the F.A. cares to nominate; but the attitude of the latter is no less rigid than it was.

**Dr. Boulton on 5 G B.**

Dr. Adrian Boulton, who is succeeding Mr. Percy Pitt as Musical Director of the B.B.C., is to conduct the City of Birmingham Orchestra during a special children's concert to be relayed from the Town Hall, Birmingham, for 5 G B listeners on Saturday afternoon, February 1st.

The concert begins at 2.30 p.m. and the programme includes, among other things, the Overture to Humperdinck's "Hansel and Gretel," a suite from "Carmen," and the Nocturne from "A Midsummer Night's Dream."

**Northern News.**

George Robey is making one of his exceedingly rare appearances before the microphone on Sunday, January 26th, when he is to broadcast an appeal to Northern listeners on behalf of the Salford Royal Hospital.

Earlier the same evening Edward Isaacs, the celebrated pianist, is giving a half-hour recital from the Manchester Station, when he will be heard in works by Mozart, Brahms, Bach, Chopin, Liszt, Rubinstein and himself.

Another musical treat during the same week for listeners in the Northern Region will be a concert on Tuesday, January 28th, for which an excellent programme by the Liverpool Philharmonic Orchestra has been arranged with Tatiana Makushina, the well-known Russian soprano, as soloist.

**Scotland's G. O. M. of Sport.**

An important talk for Scottish listeners has been arranged for Tuesday, January 28th, when Mr. Leslie Balfour-Melville, who is often referred to as Scotland's "G. O. M. of Sport," is to relate his experiences in one of the "I Remember" feature programmes which are exciting so

much attention among listeners North of the Tweed.

Mr. Balfour-Melville has played six times in the semi-finals of the Amateur Golf Championship, being champion on one occasion and runner-up on another, while he has also been lawn tennis champion of Scotland; he has represented Scotland in cricket from 1870 until 1910, and has also played for Scotland against England in the Rugby football field.

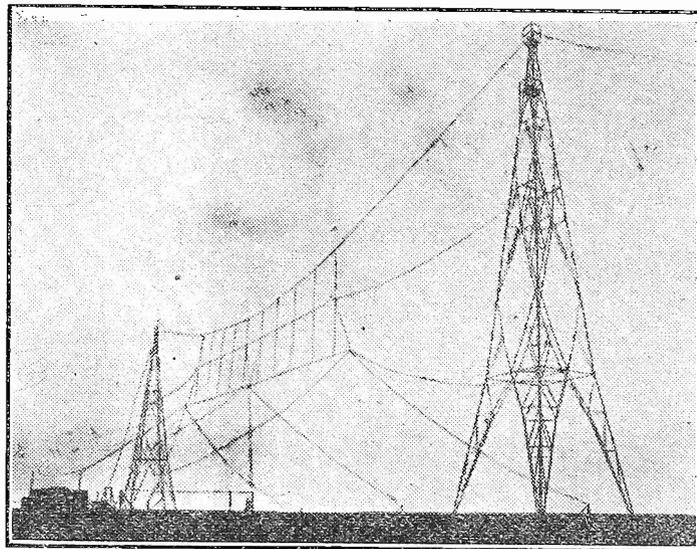
**Women's Week.**

National Radio Week is being followed by something that looks rather like Women's Week, so far as the talks are concerned.

Women occupy most of the time devoted to talks in the London programmes during the week beginning Monday, January 20th.

On that morning, at 10.45 a.m., Mrs. Emmet, daughter of Sir Rennell Rodd, is giving the third of the series of interesting

**AN UNUSUAL AERIAL.**



This remarkable aerial is the one in use at the Dutch station at Hülzen.

discussions on the Future of Domestic Service. Listeners will remember that on January 13th, Miss Grace Young, a maid at a large Belgravia house, gave a talk in which she expressed the views of a servant in a large household, and Mrs. Emmet will discuss the problem from the point of view of the mistress of a big establishment.

Mrs. Emmet is one of those modern housewives who is able to combine a public career with the efficient administration of family affairs. She has the distinction of being the youngest member of the London County Council.

**FOR THE LISTENER.**

A Specially Contributed Criticism of Current Broadcasting Events.

By PHILEMON.

(Who is deputising for Mr. Cecil Lewis while the latter is in America.)

At the turn of the year the Cathedral chimes were in tune, but it was rather a doleful tune. The Archbishop of Canterbury was asking, "Are we a Christian nation?" and the Bishop of Birmingham was asking the same thing almost at the same moment in another place.

Neither of them seemed particularly cheery about it. The answer to Dr. Lang's question is, of course, Yes and No. In sentiment and ethical foundation we are Christian all right; but in practice—!

Outside official circles, however, and without splitting too many hairs, the outlook at the beginning of the year may be regarded on the whole and considering everything, as being (as the sergeant used to say after a smart bit of drill) "not too bad." Tommy Handley is still with us!

Dr. McEwen of the Royal Academy of Music sounds as if he might be a Scot, but

certainly he is a Briton of the deepest, old-fashioned dye. He is peeved that foreign conductors should be asked to conduct British orchestras. He calls it "the ecstasy of ignorance and foolishness."

A stout fellow, with a pretty gift of speech! But I think he protests too much. These little international courtesies do a lot of good; and, after all, von Hoesslin (for example) is quite a useful conductor!

**Those British Conductors.**

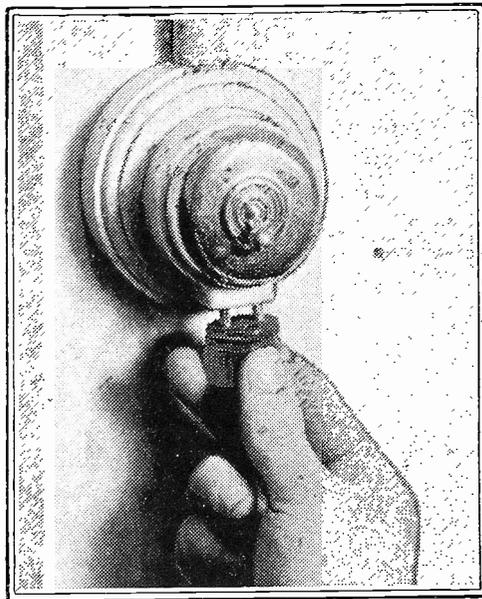
The B.B.C., in reply to the indignant Piet, stated that "during the remainder of the season, sixteen out of nineteen concerts will be conducted by British conductors."

I should like to see Dr. McEwen conducting one himself. Insularity of this type has "gone west" for good and all. Where would Scotsmen be if we clung to the slogan

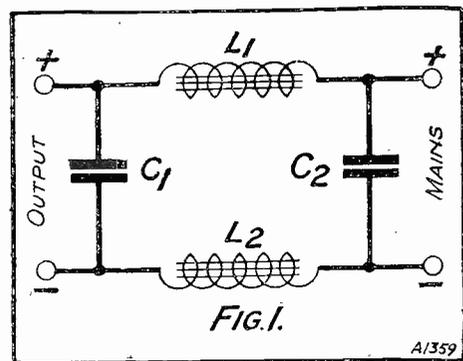
(Continued on page 1020.)

# The NEW "P.W." SAFE POWER UNITS

By G. P. KENDALL, B.Sc.



It was mentioned in the first of this series of articles that in the course of our review of the whole question of the mains supply of receiving sets, we have found a number of entirely fallacious assumptions in force which lead in many cases to a complete waste of components. This week it is proposed to explain some of the more interesting cases in which this has been found to happen, and to give some



idea of how one can either employ the same number of components to better effect, or else reduce them by the elimination of useless ones so as to obtain exactly the same effect as before in a more economical manner.

Naturally, within the limitations of space imposed in POPULAR WIRELESS it will not be possible to give you a very elaborate account of this "wasted components" question, and we must content ourselves with just giving you an outline and quoting some of the more interesting examples. Later on, when we are dealing with actual examples of mains units on the new rationalised lines, we shall deal with the other questions as they arise.

### A Glaring Example.

Now let us take a few examples, and see just how components can be wasted if we content ourselves by accepting many of the present conventional ideas about the arrangement of a mains unit. Remember, by the way, that we are still considering direct-current mains only, because things are rather different on A.C. mains.

We are dealing with direct-current mains

first, because we learn that in actual figures something like 60 per cent of the houses supplied with electric light in the British Isles receive this kind of current. The turn of readers with an alternating supply will come later.

The sketch which you see reproduced in Fig. 1 provides a very good example of the kind of component wastage which we have in mind. This diagram shows a very simple and commonly used type of smoothing filter consisting of two chokes,  $L_1$  and  $L_2$ , and two large condensers,  $C_1$  and  $C_2$ .

At first glance this looks on paper a perfectly satisfactory type of filter, and it is only when we begin to imagine it connected up to a receiving circuit upon the one side and the supply mains on the other that one or two things begin to strike us.

First of all, what about the condenser  $C_2$ ? This is on the input side of the filter and merely goes directly across the mains, and you will quite often see a condenser in this position in both commercial and home-constructed D.C. H.T. units. Space will not here permit us to explain exactly why it is, but readers will remember that the reason was discussed in the first article of this series which showed how useless this condenser was.

### What About the Chokes?

You can take it as a general rule that as far as ordinary low-frequency smoothing is concerned, condensers directly across the mains input terminals of the unit may just as well be omitted. Here is our first excellent example of a wasted component.

We must qualify this statement just a little, and mention that certain arrangements of condensers are sometimes provided across these points with a view to reducing interference from H.F. impulses travelling along the mains into the H.T. unit. This is rather a different matter, and it is to be understood that we are referring merely to the ordinary smoothing arrangement in which the condenser would be connected straight across from the positive to the negative main.

To do that is simply to waste a perfectly good component, and not a particularly cheap one at that, because a condenser for use in this position must be of the high voltage type, and is usually of somewhere about 4-mfd. capacity.

Next, what about the chokes? It may seem a thoroughly logical arrangement to place one in each lead, but unfortunately the

matter is not quite so simple when we come to join up this unit to our receiving set, with, of course, some form of voltage adjusting device to obtain the necessary different voltages for the various valves in our set.

When we do this we discover that in some cases the choke  $L_2$  in the negative lead may become almost entirely ineffective. The point is this. Your receiving set will

How many times have you or your friends built or purchased a mains unit and paid hard-earned money for COMPONENTS THAT ARE UNNECESSARY?

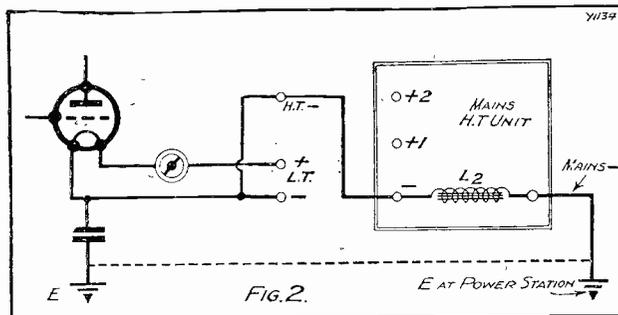
It may sound rather a wild statement, but it is undeniably true that many mains units contain parts that are completely unnecessary—"wasted components" in fact, of no use whatever in the manner in which they are employed.

This article, the third of a series describing "P.W.'s" investigations into the practical design of mains apparatus, shows how wasteful some of these designs are, and how unjustified have been some of the odd devices incorporated in many mains units.

### III.—"WASTED COMPONENTS."

be connected to earth, normally through a large fixed condenser, a common capacity for this being 2 mfd. This means that the negative terminal of your filter circuit, that is to say the negative terminal of the H.T. unit, will be connected to earth via the filament wiring of the set and through the aforesaid large condenser.

Now, one or other of your supply mains wires will almost certainly be connected to earth at the power station or elsewhere on the lighting system, and if it chanced to be the negative which is so earthed, the



choke in the negative lead of your smoothing circuit may be practically put out of action.

If you examine Fig. 2 you will see how this is. First of all there is the earth on the receiving set through a large condenser, and secondly there is the earth on the supply mains. This really amounts to connecting the large fixed condenser in the earth lead

(Continued on next page.)

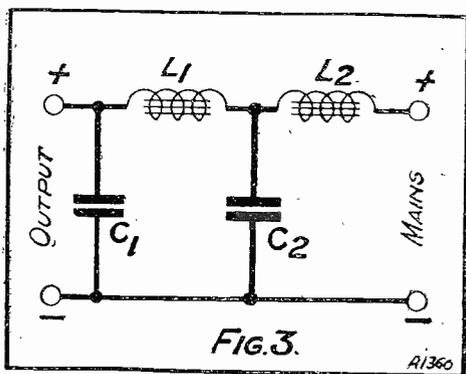
## SAFE POWER UNITS.

(Continued from previous page.)

across in parallel with the smoothing choke in the negative side of your filter, because you can consider that the two earth connections represent direct connection from one point to the other. This is indicated in Fig. 2 by means of a dotted line, and you will see the effect of this in bringing the series earth condenser across in parallel with the choke.

Obviously, to connect a large fixed condenser in parallel with a choke is to reduce the smoothing efficiency of that choke enormously and it may be regarded even as cutting it out of action altogether.

Now take another glance at Fig. 1 in the light of what we have just decided and you



will see that exactly half the components indicated therein are practically wasted! In other words, we can obtain just as good smoothing by using merely the condenser  $C_1$  and the choke  $L_1$ , leaving out  $C_2$  and  $L_2$ .

As a result of considering matters carefully, then, we are in a position to save exactly half the cost of our filter circuit and still get just the same results. Is it not extraordinary how far one can be led astray by accepting current practice without stopping to criticise it?

Next, what about using the same number of parts in order to obtain a more efficient filter circuit? Evidently, in order to allow for the fact that we shall sometimes find that the negative main is earthed, we should place all our chokes in the positive lead, and then we arrive at Fig. 3.

### Useful Work.

Here both the chokes are placed where they will do useful work, while the condenser  $C_2$  is no longer across the input terminals of the filter, but placed from positive to negative on the left hand side of the first choke, where it will really do some good.

A filter arranged like this is extraordinarily effective and will give a practically perfect output from almost any mains, provided, of course, that the chokes are of large inductance, and current-carrying capacity, and that the capacities of the condensers are adequate.

Filters arranged like this are being standardised for our future mains units of the more elaborate type, and they have the outstanding advantage that they can be depended upon to function in the same way on different types of mains, since the actual earthing arrangement has no effect upon them. The only cases we have discovered in which they fail to give entire suppression of hum are those where the mains carry an appreciable H.F. component, arising from sparking at dynamos and motor brushes, and so on. In these cases an additional H.F. filtering arrangement is required, since no ordinary low-frequency smoothing circuit appears to be capable of suppressing the hum or crackle which is otherwise heard.

In the course of our review we have come across another common method of wasting components, and this is to place additional bypass or reservoir condensers across the various separate output tappings of a mains unit, quite regardless of whether those terminals have already been adequately bypassed by the main smoothing condensers of the filter circuit.

### Another Wasted Component.

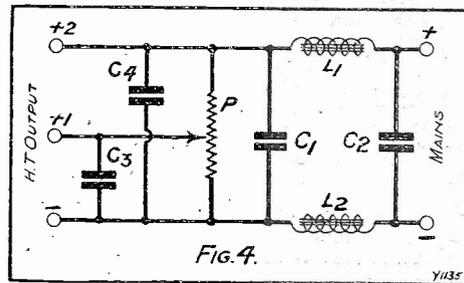
For example, in Fig. 4, you will see a simple arrangement of a filter circuit and potential divider such as would form a complete D.C. mains H.T. unit of the simpler type. Here you have the usual wasted condenser  $C_2$ , and the possibly wasted choke  $L_2$ , to which we have already referred, and in addition there is a condenser  $C_3$ , provided from the H.T. + 2 terminal to the negative side of the circuit.

The usual idea in providing such a condenser is to give a proper bypassing effect for the anode circuit of any valve or valves run from the + 2 terminal, the designer apparently forgetting that the condenser

$C_1$  is already performing this function adequately if it is of proper size for the desired smoothing.

All that  $C_4$  is really doing, as you will see, is increasing the capacity of  $C_1$  still further. Why not, then, be logical in the design of the unit and make  $C_1$  of such a capacity as to give the desired effect? As a matter of fact, it is no uncommon thing to see a capacity as large as 6 or 8 mfd. provided in the condenser  $C_1$ , and then a further 2 mfd. or so for  $C_4$ . Obviously an entire waste of a separate component.

Getting down a little nearer to the practical side of our subject, let us see how



we can set about rationalising the circuit of Fig. 4, in order to convert it into a complete circuit design for a mains unit in which every part does a job with all wasted ones eliminated.

First of all, we might decide to arrange the unit so as to obtain the same amount of smoothing as was given by the Fig. 4 arrangement with the maximum possible economy in parts. To do this we should omit the condenser  $C_2$ , and likewise leave out the choke  $L_2$ . Instead of using separate condensers for  $C_1$  and  $C_4$  we should simply see that  $C_1$  was large enough to give the desired effect, a capacity of 4 or 6 mfd. being usually quite sufficient for all sets of moderate size.

This scheme would give us probably just as much smoothing as the Fig. 4 arrangement when used on supply mains where the negative pole is earthed.

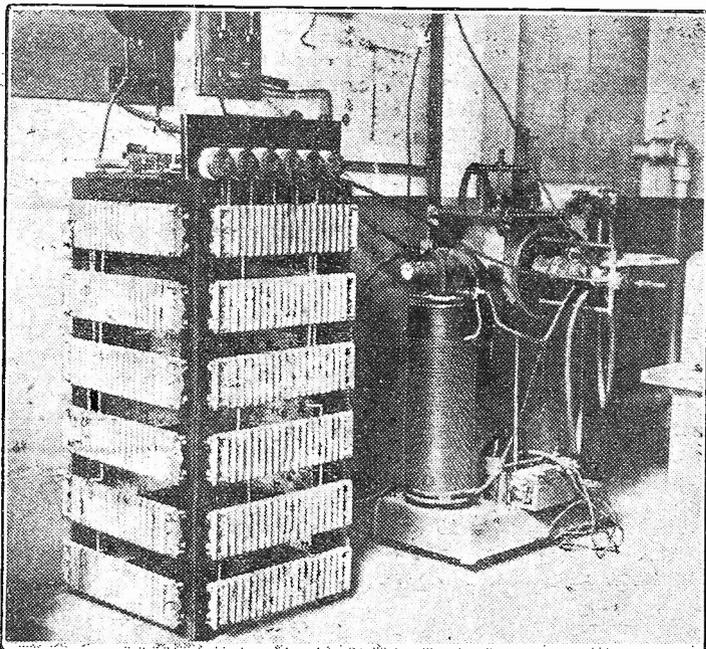
If, on the other hand, we decided that we would use just as many parts as before, but use them to better effect, this is how we should proceed. We should convert the arrangement of the two chokes and the two condensers to our Fig. 3 circuit, and so obtain very much more thorough smoothing, while we could combine condensers  $C_1$  and  $C_4$  in a single component.

### The Question of Motor-Boating.

This would give us a unit of quite a practical type capable of providing a very nicely smoothed output, but it would still suffer from certain drawbacks as regards the prevention of motor-boating, which point we shall be considering in a future article in this series. This question of motor-boating and its prevention really calls for separate treatment, since it is a very large subject indeed, and one, moreover, which has been given only scant attention in the past.

Here again we shall be able to show, we think, that by merely rearranging our parts in a more logical manner we can get much better prevention of those coupling effects which produce motor-boating than is obtained in the more conventional schemes, and show once again that by a simple process of subjecting current practice to reasoned criticism we can get the effect we want without making our designs more elaborate or more expensive.

## AN "ALL-MAINS" SET.



Part of the experimental radio transmitting apparatus installed in the Physics Department of Harvard University. The photo shows a Poulsen arc transmitter.

# It's like bringing into the room the massed orchestra —

## that was previously playing in the distance

When you put this new Lissen Power Pentode Valve into any set with one stage only of L.F. amplification, what was previously a whisper becomes a great volume of sound. Yet this new Lissen Valve is battery driven—it takes only 7 milliamps of current, and your existing batteries are therefore all it requires, and they will last you just as long as with ordinary valves. Put this new Lissen Power Pentode Valve into any set with one stage of L.F. amplification and the increase in volume will surprise you.

You will get very big volume from your local station and fine loud-speaker strength from distant stations previously heard only on headphones. Ask for Lissen Power Pentode—the only Power Pentode Valve you can drive off batteries—and learn the difference this new valve makes to your set.

**FOR ANY SET WITH ONE L.F. STAGE USE**

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THAT WORKS OFF BATTERIES

P. T. 225 **17'6**

**OTHER TYPES AND PRICES:**

- H.210—R.C. and H.F. 10/6.
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P.220.—Power Valve 12/6. All other types available shortly.

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Worples Road, Isleworth, Middlesex.  
(Managing Director: T. N. Cole).

Factories also at Richmond (Surrey) and Edmonton.



**A YOUNG "MAGIC" ENTHUSIAST.**

The Editor, POPULAR WIRELESS.

Dear Sir.—It may interest you to know that I have just finished constructing the "Magic" Three, using it in conjunction with something like the "Brookmans" Receptor I obtained afterwards excellent results. At first I could only get 2 L O very poorly. Thinking there was something wrong I went over the whole set, but all appeared to be right. I was just going to give it up as a bad job when it struck me that I only had a cheap 60X coil in L1. After a laborious hunt among my gear I found a Lewco 60 C.T. coil. On inserting this the set went splendidly. It may also interest you to know that I obtain best results with the grid leak taken out of its holder and about 3 volts on H.T. +1.

Yours truly,

D. NEWTON

(Age 11 years).

Ealing, W.13.

**THE "MAGIC" THREE.**

The Editor, POPULAR WIRELESS.

Dear Sir.—You will probably be interested to know that I logged Perth, Australia (6 W F), at loud-speaker strength on a recent Sunday afternoon between 2.30 and 3 o'clock.

The announcer gave the call on one occasion as "Six William Frederick," and quite recently I was able to enjoy a programme on loud speaker from Eindhoven, Holland, relaying Huizen on 31.4 metres. My set is the "Magic" Three, which I constructed from "P.W." The short-wave coils are home-made, and I am very pleased with the set, which I think is the best in every respect, and speaks volumes for the skill of your staff.

Yours truly,

WM. H. MILLS.

Eastbourne.

The Editor, POPULAR WIRELESS.

Dear Sir.—Since last writing you I have fitted a differential reaction condenser and have logged altogether 42 stations on my "Magic" Three. I have also used same with gramophone pick-up and it is very fine indeed and is certainly the best 3-valve set that I have ever handled.

In common with your Port Talbot correspondent, I use 300 coil for reaction on high waves, and 70-coil on medium waves. I also find that for a given aerial coil the reaction coil is very critical as to number of turns—in fact, I had to take 5 turns off a 75-turn coil before being O.K. for medium band.

Wishing you further "star" circuits in 1930.

Yours faithfully,

J. H. PIPER.

Tunbridge Wells.

**"PENTODE'S" ARTICLES.**

The Editor, POPULAR WIRELESS.

Dear Sir.—May I say that I am highly satisfied with "Pentode's" articles. Until taking your valuable paper, I was absolutely ignorant of wireless, and could not tell the difference between resistance and current, or anything else. I hope to see many more of these

OF all the queries I have had put to me lately, I think that sent in by a correspondent this week is the stiffest by several lengths. It reads, "Please tell me as concisely and in as few words as possible—what is *mush*?" Just that! If I knew what *mush* was, "J.C.," I should have fewer grey hairs on my head than I have at present.

I don't pretend to know, but here is my humble opinion. I am afraid it is neither simple nor concise.

*Mush* is a combination of the following: outside interference from such sources as leaky power mains, electric trains and electrical devices of all kinds; harmonics and "backwash" from long-wave commercial stations; harmonics from 600-metre spark traffic; noises from your own detector valve; and further noises due to the grid leak, the H.T. battery, and possibly the transformer windings.

**Overcoming Mush.**

Sort out which of these are within your control, and which aren't, and it may help you slightly to quieten your set, which appears to be worrying you unduly. I myself have taken much care to eliminate the possible sources of "mush" that might be within my set, but I still receive a considerable amount more than I like, and much more than one or two friends whose sets, though good, have really not

**CORRESPONDENCE.****A YOUNG "MAGIC" ENTHUSIAST**

THE "MAGIC" THREE—"PENTODE'S" ARTICLES—BETTER THAN PLIERS—THE "TITAN" THREE—"JUDY."

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

useful articles dealing with stages and the various parts that make the set. With good wishes to you and your staff.

Yours truly,

E. W. COATES.

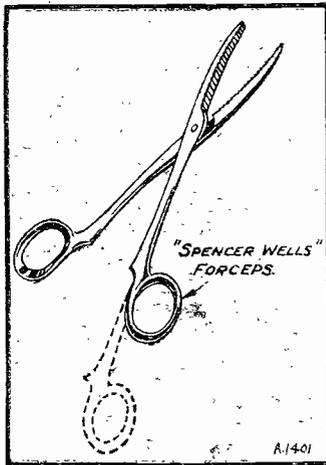
Whitby.

**BETTER THAN PLIERS.**

The Editor, POPULAR WIRELESS.

Dear Sir.—The enclosed sketch is of a pair of "Spencer Wells" artery forceps. I consider there is no more handier tool, and am surprised that there is no such tool in the wireless trade. The advantages are enormous and far surpass the clumsy pliers, and the

offer of ten pairs of pliers would not compensate me for my forceps. There is a better pair, on which there are long handles, called, I believe, "Sinus forceps," and still more ideal. The advantages are quick tightening of nuts and screws, which fit the edge, and the "diving" into a set without fear of them slipping in, while for making loops in wire there is none better.



Mr. Wite suggests these instruments for radio work.

**SHORT-WAVE NOTES.**

By W. L. S.

had an enormous amount of trouble spent on them in this particular direction.

I am, of course, speaking of the *mush* that one receives when the set is just on the verge of oscillation, not the continuous hiss sometimes heard when the set is not oscillating, for which there is no excuse whatever on a respectable set.

I am so convinced that all my "mush" is arriving via the aerial that I have hitherto been too lazy to carry out the suggestion that I build my entire receiver in a metal box and earth it.

I really think I will try it out, though, since I do know enough about matters wireless to realise that the correct solution is always the one you don't think it worth while trying.

In an early number I hope to give a short description of a good heterodyne wavemeter for short-wave work, with photographs and diagrams. Everyone prefers his own arrangement, of course, but this particular wavemeter is one that does not merely cover the amateur bands, but takes in the

There is no more indispensable tool I think. The only disadvantage is they cannot cut wire, which is the only use I ever put pliers to.

Yours faithfully,

West Ham, E.15.

P. WITE.

**THE "TITAN" THREE.**

The Editor, POPULAR WIRELESS.

Dear Sir.—I beg a few moments of your time to read an appreciation of this splendid receiver, which I recently built up from a kit of parts supplied by a well-known London house, every component being worthy of the set. As a "raw" amateur in the field of radio, I feel I may congratulate myself on the fact that the set worked A1 immediately I switched on. Compelled to use an indoor aerial, I think you will agree that an average of 21 stations at loud speaker strength is good. Not being a "knob twiddler," I am satisfied with two or three programmes, but was anxious to test the capabilities of the set. Permit me to congratulate your staff on a powerful circuit, made so easy to assemble from your instructions.

I may say I am only a new reader of your paper. I saw the issue containing the original details at a friend's house, some time ago, and determined to have a "shot" at the "Titan" at some future date. I happen to be using a Det. and also an L.F. valve that have been in use for over a year; so, to my mind, the results obtained speak "volumes" for the volume obtained. With all good wishes for your future success.

Yours faithfully,

F. SYSON.

Sheffield.

**"JUDY."**

The Editor, POPULAR WIRELESS.

Dear Sir.—I feel it my duty to congratulate you on a marvellous little set in the shape of "Judy." I just hooked it up one afternoon when feeling bored and having nothing to do, and I was simply amazed with the result. I did not construct it exactly to specification, as I omitted the .0005-mfd. condenser across the 'phone terminals, and I used a .0003 large variable for reaction control. I found tuning quite sharp enough to be pleasant, and the volume on the 'phones was all one could desire. Then, more out of fun than anything else, I connected up the speaker, and I was amazed to find the volume quite sufficient to be comfortable. I showed the set to a technical friend of mine, and he was quite surprised with the results. I have since built the "Magic" Three, but I have not as yet had any opportunity of testing it properly as my "X" coils have not arrived yet, but with the coils I have managed to get 2 L O and 5 G B at excellent speaker strength. I have omitted the anti-motor-boating unit, but think I shall put it in as I am troubled with a low whistle continuously, and I think this may be caused by battery coupling. A friend of mine who got my components for me has decided to build it also. He was not a bit keen at first, but has now fallen for the circuit, which I think is a real marvel. Thanking you for an excellent set and paper.

Yours faithfully,

GERARD S. IRVINE.

Chippenham, Wilts.

whole short-wave spectrum, and is therefore useful for identifying broadcast stations.

Building a wavemeter is all very well, but the new hand is generally hopelessly lost at first and doesn't know whether the wave on which he hears the beat note is say 20, 40, 60, or 80 metres!

With some rough idea of coil and condenser sizes, however, one can tell unquestionably just where one is, and it is perfectly simple to build a wavemeter out of ordinary receiving components which will not shift appreciably although the H.T. battery may drop 10 volts, and which will always be ready for service.

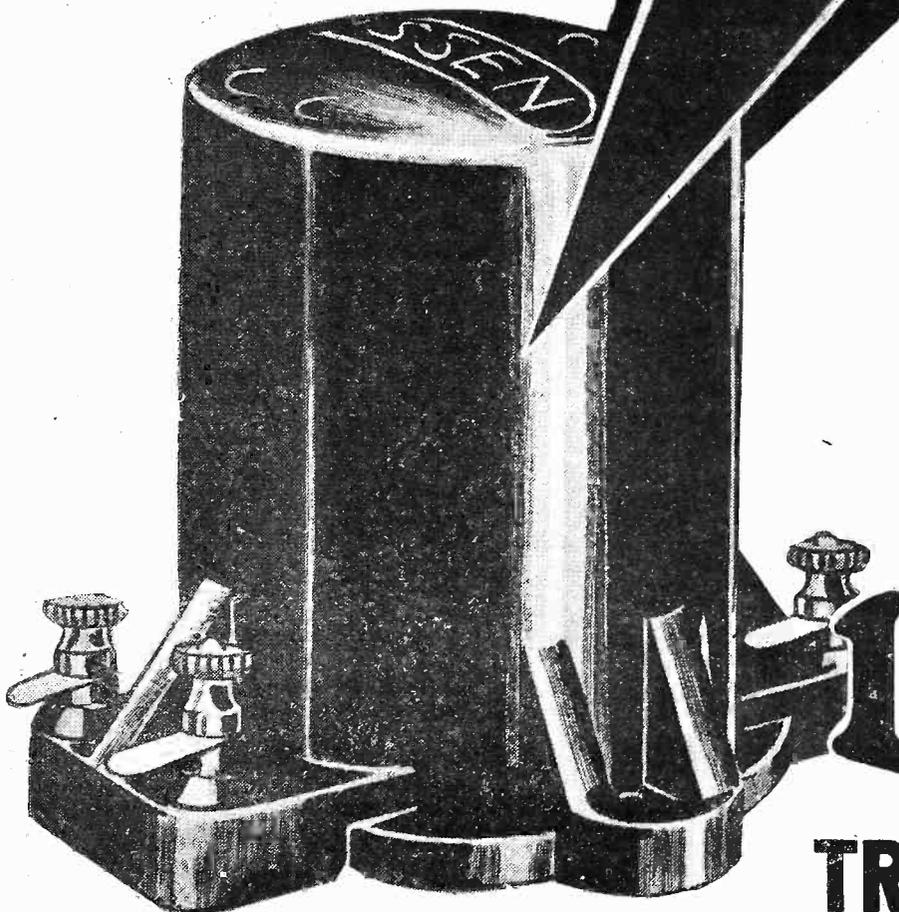
**Short-waves on Frame Aerials.**

Incidentally, I recently came across a scheme which I rather liked, namely that of using raw A.C. on the filament of the valve in the heterodyne wavemeter. This naturally gives a "French" type of note which is easily identifiable from carrier waves coming from outside, and at the same time can be tuned in just as accurately as a pure C.W. emission.

Another "stunt" that I intend to carry further and write more about is that of using a short-waver on a frame aerial. So far as I can see from preliminary tests, the directional properties of the latter all go completely wrong, and sensitivity is considerably higher than one can ever obtain on the broadcast wave-lengths with a similar aerial.

# AMPLIFIES A WHISPER TO A GREAT DEGREE OF LOUDNESS IN A BACKGROUND OF SILENCE

Lissen Transformers give you better reproduction of music because they amplify in a background of silence—the notes are sharp and clear, the harmonics and over-tones retained, so that the individual character of every instrument is recognised. In orchestral works, in dance music, in even the most simple melody, this makes all the difference, because it makes the reproduction so much more true and natural. That is why a set embodying Lissen Transformers always wins the praise of musical experts as well as others with a critical ear.



## THE FAMOUS LISSEN 8/6 TRANSFORMER

The famous 8/6 Lissen Transformer has won for itself the reputation of "The Transformer that will never break down." Suitable for all ordinary purposes. Turns ratio 3 to 1. Resistance ratio 4 to 1. **8/6**

## THE LISSEN SUPER TRANSFORMER

This Super LISSEN Transformer is made in two ratios,  $3\frac{1}{2}$  to 1 and also  $2\frac{1}{2}$  to 1. The  $3\frac{1}{2}$  to 1 is suitable for use in either the first or the second stage of an L.F. amplifier, or can be used in cascade for both stages, and with practically any valve. The  $2\frac{1}{2}$  to 1 transformer is suitable for use after a high-impedance rectifier valve without fear of distortion or loss of high notes and overtones. The price is **19/** the same for both ratios.

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# TRANSFORMERS

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(Managing Director : Thos. N. Cole).

# A RAPID GUIDE TO RADIO

## A JUMPING-OFF SERIES FOR THE NEW AMATEUR

### By "Pentode"



YOU might think that, having guided the aerial energy on to the grid of the valve and in this way controlled the current flowing from the H.T. battery, all you would have to do to get your speech and music would be to insert telephone receivers as in Fig. 1.

But this is not the case. The valve may not be *rectifying*. The current flowing from the H.T. battery rises and falls as with the fluctuations on the grid at High Frequency.

There are two common methods of making a valve rectify, and the most

currents grouped in one of those "trains" of H.F. impulses comprising an Audio-Frequency impressed by modulation. (See Fig. 2a.)

And when the Grid has these accumulations built up in accordance with the speech and music frequencies, it is obvious that the H.T. current is controlled so that it can operate the telephone receivers.

Also these H.T. current variations are greater in power than the aerial energy, so that some amplification is carried out.

Although the grid is accumulating "trains" of negative impulses it must not

You will notice an arrow passing through the two coils, and this indicates that their mutual coupling is variable so that the *feed-back* can be adjusted to a nicety.

#### How the Circuit Works.

Of course, the two coils act as an H.F. transformer. The H.F. energy flowing backwards and forwards in the *Reaction Coil* causes a magnetic field to rise and fall around it. This cuts through the Aerial Coil and induces energy in this; energy which supplements that which is already flowing in that component and a proportion

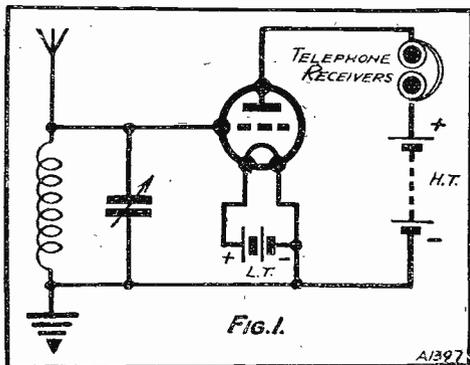


Fig. 1.

There is no reason why new readers should not read these fascinating and instructive articles. Of course, they will have missed a great deal of helpful information, but the articles have been prepared so that they fall into self-contained groups. For instance, this week the operation of a valve detector is discussed in such a way that readers who missed the foregoing articles should still be able to gain quite a clear insight into the operation of a simple valve set.

15. A SIMPLE VALVE SET.

popular consists of using a Grid Condenser and Grid Leak. These two items are connected up as shown at Fig. 2.

Their operation is rather complicated, but I will explain it as simply as I can.

First of all, I must tell you what these new components are. The Grid Condenser is quite an ordinary fixed condenser of rather small capacity (usually .0002 mfd. or .0003 mfd.), which breaks the direct conduction path between the grid and filament.

The Grid Leak is a small article which has a high electrical resistance. A common value is 2 megohms—that is two million ohms. To achieve this colossal resistance without using miles of wire a special material is used. The early radio constructor used to make his own Grid Leaks by taking a piece of paper and drawing a thick lead-pencil line on it.

#### The Grid Leak.

If the circuit illustrated in Fig. 2 had no Grid Leak there would be a tendency for an accumulation of electrons to choke the grid. By bringing in the Grid Leak a high-resistance path is provided through which the electrons can *leak* back to the filament.

When the grid is made more negative (given more electrons) by the aerial energy flowing in the one direction, the store of electrons on the grid is increased and the accumulation continues so to do until the completion of the burst of energy subsides. Then it has a breathing space, as it were, to clear itself through the grid leak.

By "burst of energy" I mean the larger waves and correspondingly larger aerial

be forgotten that the positive impulses are occurring at the same time, so that it is inevitable that some current change at High Frequency is occurring in the anode circuit of the valve.

#### Now We Have Reaction.

We can make use of these. By connecting a coil in series in the anode circuit, as at Fig. 3, and taking it close to the aerial coil we can feed some of this H.F. energy back to the grid of the valve for further amplification. And it is obvious that a proportion of this amplified energy again

goes back to the grid for still further magnification. This *Reaction* provides a very effective amplification, but unless carefully controlled the energy builds up and up till the telephones scream and howl and the music and speech vanishes in the *oscillation*.

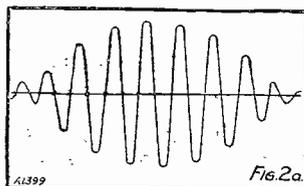


Fig. 2a.

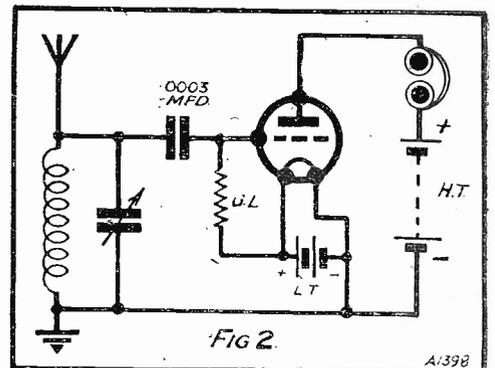


Fig. 2.

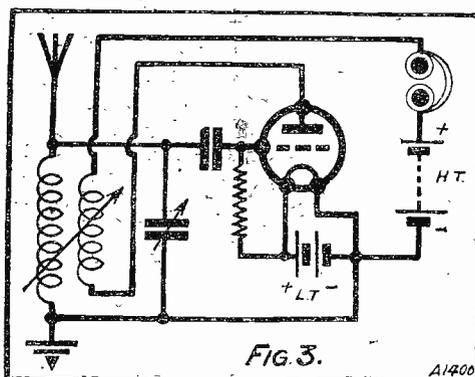


Fig. 3.

of which is being passed to the grid of the valve.

I am pressing you forward now because we have got to that point where our path tends to run parallel with many of the ordinary "P.W." articles.

Next week I am going to deal with the valve in more detail and discuss anode-bend rectification and show you how easy it is to read valve curves.

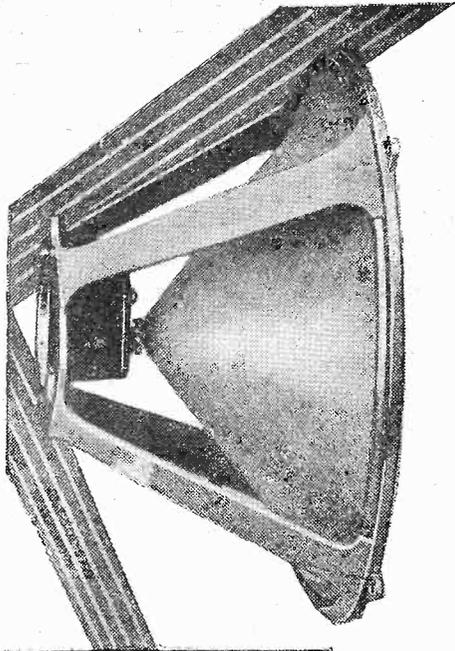
For the present, let me repeat the cycle of operations in Fig. 3. Ether waves are causing energy to oscillate in the aerial circuit. It may seem that the grid should be made alternatively Negative and Positive, but in this circuit it will always be more Negative owing to a tendency for the electrons from the Filament to accumulate on it.

These accumulations periodically clear through the grid leak (at the ends of wave "trains") so that the anode current periodically rises in sympathy. Thus, impulses of Audio Frequency are passing through the telephone receivers.

#### Further Stimulation.

Simultaneously, there is an H.F. variation in the current and a proportion is fed back to the grid via the reaction coil to give further stimulation to the glowing amplifier of radio impulses.

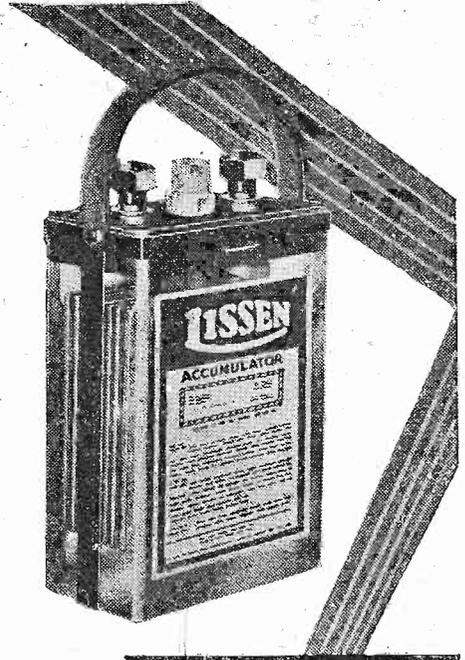
It is all very theoretical and rather dry, isn't it? But wait till you get to those valve curves next week, you will find them quite fascinating.



# LISSEN

A.C. or D.C.

## ELIMINATORS



Lissen H.T. Eliminators deliver smooth steady current from your house electric supply, and cheaply. The Lissen Eliminators can be put into your set as easily as any battery. From the four types made there will be one to suit you. Send a deposit of 5/- and state voltage of your mains supply and whether A.C. or D.C. You can instal it yourself in a few moments.

Suitable for all ordinary sets up to four valves.

D.C. MODEL "A." 110-250 v. Cash Price 27/6, or 5/- down and 5 monthly payments of 5/6.

D.C. MODEL "B." 110-250 v. Cash Price 39/6, or 5/- down and 8 monthly payments of 5/.

A.C. MODEL "A." 100-110, 200-210, 220-230, 240-250 v. Cash Price 60/-, or 5/- down and 10 monthly payments of 6/6.

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### BUILD A CONE WITH MOVING COIL TONE



The Lissen 4-Pole Balanced Armature Unit brings something approaching loud-speaker perfection within the reach of everybody who owns a radio set. You

can build any type of cone loud speaker with it; you can use it with a big baffle board, or put it in a cabinet. You can build a linen diaphragm loud speaker with it, or you can buy it completely assembled and ready to connect up to your set. It has a fine adjustment, and you therefore get the utmost volume from it without chatter.

In brown moulded case with attachment for fitting to any type of cone. PRICE 12/6

Cast aluminium Chassis, specially designed to give the best results from the Unit. PRICE 7/6

13-in. cone for use with the above, 2/6.

#### COMPLETE ASSEMBLY

ready for use or to mount in a cabinet. PRICE 22/6

**LISSEN**

ADJUSTABLE BALANCED ARMATURE UNIT.

### HOLDS ITS CHARGE STUBBORNLY

yet delivers current **FREELY**

The range of Lissen accumulators is one more triumph of Lissen organisation — one more example of Lissen value-for-money. They are sturdily built to give absolute satisfaction in use and long life. The plates of Lissen accumulators are very thick, the containers are strongly made, so that they give trouble-free service always. Buy a Lissen accumulator and hold it in reserve. Then you will never know the annoyance of finding yourself without L.T. supply because the Lissen accumulator holds its charge for a very long time, yet delivers it freely when in use.

All Lissen accumulators listed below are supplied with strong carrier, free.

#### DULL EMITTER (Type G.M.)

L.N.503 2-volt, 20 amp. hours	4/6
L.N.504 2-volt, 20 amp. hours	8/6
Multiple plate type, glass containers.	
L.N.500 2-volt, 20 actual amp. hours	9/6
L.N.502 2-volt, 45 actual amp. hours	13/6
L.N.560 2-volt, 60 actual amp. hours	17/6

#### EXTRA CAPACITY

L.N.555 2-volt, 24 actual amp. hours	10/6
L.N.557 2-volt, 48 actual amp. hours	14/6
L.N.559 2-volt, 72 actual amp. hours	18/6

**LISSEN**

ACCUMULATORS



WELL, we have most of us had a taste of the second wave from Brookmans Park by now, and so we have come face to face with the most difficult interference problem the ordinary listener has ever had to tackle.

What is to be done about it? Something has evidently got to be done, and the most unpopular person around town just now is the superior sort of individual who makes some blithe remark about building a new and more selective set. We want something less costly than that if we can possibly get it.

**A Tough Proposition.**

You may be sure that the "P.W." Research Dept. has not been idle all this time. We saw the problem coming, so to speak, and directly the test transmissions on the second wave began we commenced intensive experimental work. We had also, as a matter of fact, made some preliminary tests with the aid of the 356-metre transmission and our own "artificial" transmission, and obtained some useful information before the tests actually started, and so had got the situation fairly well sized up in advance.

Since the 261-metre wave transmission began we have put in many arduous days, and have tested and rejected innumerable schemes for overcoming the interference problem which it is bringing with it. It has

receiver employing such aerial coupling arrangements as are always used in "P.W." designs. (This latter point is mentioned because the Rejector does not always work satisfactorily with the old-fashioned type of direct aerial coupling and parallel tuning.)

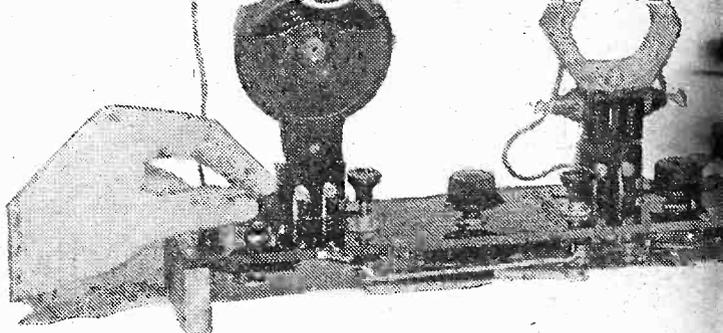
So far as local work is concerned that is enough, no doubt, and will enable you to get either transmission without interference from the other, but what about the foreign stations? Obviously, it won't do, because if you can only eliminate one of the waves the other may still spread over the dial and cause trouble.

**Free Your Dial.**

At this point let us digress a moment, and explain that our tests lead us to believe that this will only happen in the really difficult area included in a radius of perhaps eight miles or so round the station. Naturally, the exact extent of this swamp-out area will depend upon the selectivity of the set, aerial size, and other factors.

Beyond this area it appears that it is only the 356-metre wave which spreads

# A TWIN-WAVE "BROOKMAN"



Can both the new twin-wave high-power transmission and the old 356-metre wave be received simultaneously, sometimes the Regional, unit that will do

Designed and built by THE "POPULAR WIRELESS"

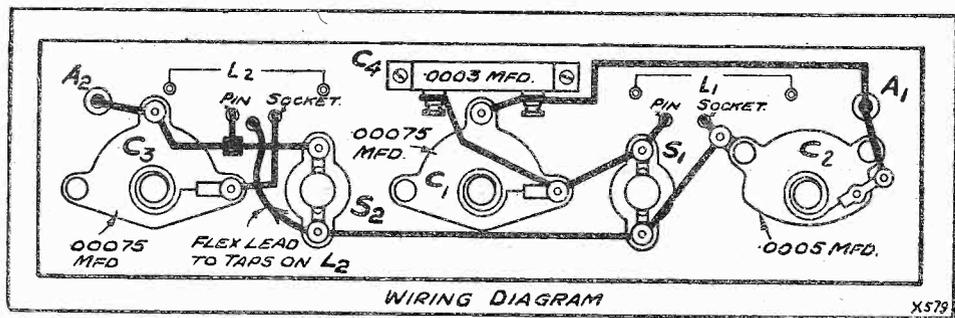
truly a tough problem. He is liable to find that one station interferes with the other, and that if he "rejects" one the other still spreads a lot and wipes out most of the foreigners, and even 5 G B as well in bad cases.

What he wants, as we have said, is a gadget which will cut out either or both of the transmissions, and it is the "both-at-once" business which is so extraordinarily difficult. An obvious way of doing it would be to connect two ordinary standard Brookmans Rejectors in series in the aerial, with one set to eliminate the 261-metre transmission and the other the 356-metre one, and switches to cut either out of circuit when it is desired to hear one or other of the transmissions.

**Our Way Out.**

Unfortunately, this simple way out has some very awkward practical drawbacks, and we soon abandoned it. We will not weary you by taking you along all the devious highways and by-ways we traversed in search of a satisfactory solution, but will tell you instead the expedient we have finally adopted.

You will see it embodied in the twin rejector device illustrated on these pages, and you will observe that it is comparatively simple, bearing in mind what it



The wiring is simple enough, isn't it? But make sure that you get all the condenser connections right, as shown above.

proved a real tough proposition, because what we wanted was some sort of gadget which could be added to any ordinary set, and not merely a design for a completely new receiver of the super-selective type.

You see, what is wanted in the difficult areas fairly near the new station is a device which will cut out either or both of the two transmissions.

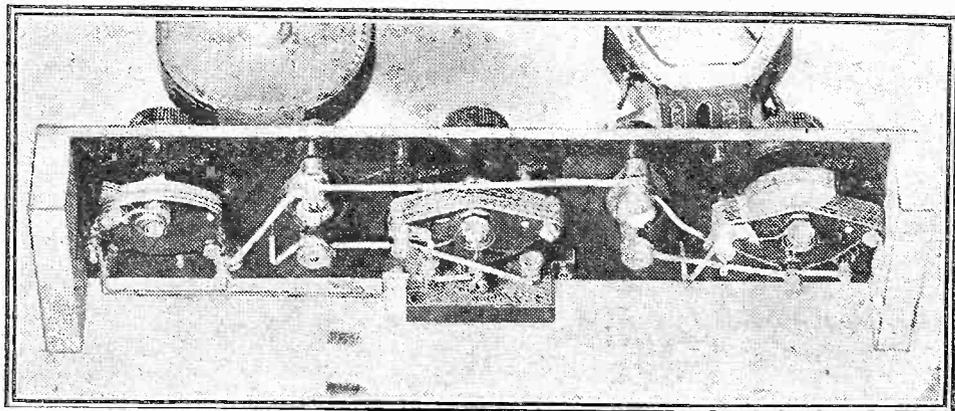
**What About Foreigners?**

To cut out merely either of them is easy; the ordinary Brookmans Rejector will do it with remarkable completeness on any

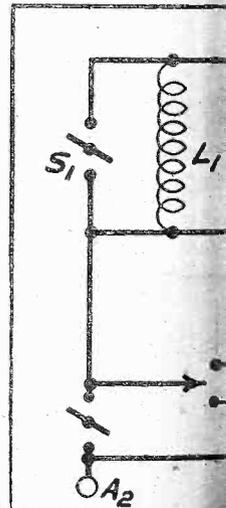
badly. The 261-metre one seems likely to cover only the bottom portion of the dial and not to spread nearly so much.

We believe, therefore, that in most cases listeners possessing reasonably selective sets will find that all they need is just the standard Brookmans Rejector. If they set it to eliminate the 356-metre transmission the other should only cover the lower part of the dial, leaving the rest free for other stations.

There remains, however, the question of the listener who is in the really difficult area, or whose set is of lower selectivity, and this is



This illustrates the under-panel wiring, and the wooden side supports on which the panel rests.



Here is the circuit, shown in a simplified form.

**COMPONENTS**

- 1 Piece of ebonite, 11 1/2 in. x 3 in. or 12 in. x 3 in.
- 2 Pieces of wood, 3 in. x 1 in., or shallow wooden box to take panel (see text).
- 2 Terminals (Eelox, Igranice, Belling & Lee, etc.).
- 1 Fixed condenser of .0003 mfd. (Lissen, Dubilier, T.C.C., Clarke, Mullard, Igranice, etc.).
- 2 Single-coil sockets (Lotus,

The circuit gives efficient operation once it is completed. P. P. M.

# WAVE REJECTOR

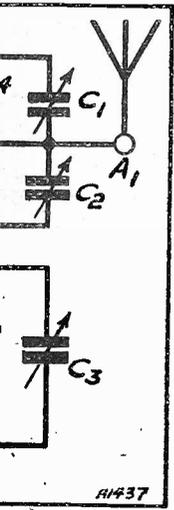


... can be muzzled? Sometimes you may want the sometimes neither—and here is the only little trick for you!

... described by RESEARCH DEPARTMENT.

... will do. It consists of two quite separate rejecting devices connected up in series, the whole device being intended to be placed in series between the aerial and the aerial terminal of the receiver.

Each rejector circuit has an "outing" switch, to put it out of action when desired. The idea is that one shall be set to remove the 261-metre wave and the other the 356-metre transmission, and then by working the switches you can hear either station as desired without interference from the other, or cut them both out and get foreigners or 5 G B.



### In Harmony.

The whole problem in producing a satisfactory device of this kind is to find two rejector circuits which will work in harmony in the way required, will not upset the receiver, and will be easy to adjust.

We have found that for the 356-metre transmission the Brookmans Rejector is called for, on account of its powerful eliminating action. It would be very pleasant to be able

to use another of the same type for the 261-metre transmission, but as we have mentioned, two do not work very satisfactorily together.

Eventually we discovered that the old auto-coupled rejector used in the "P.W." Standard Wave-trap exactly fills the bill. It

works excellently in conjunction with the Brookmans Rejector type, and is quite adequate to remove the 261-metre wave with sufficient thoroughness to serve all normal purposes.

It is less drastic in its action, and is really less efficient as a remover of interference than the "Brookmans" type; but the 261-metre wave does not need such effective elimination, as we have seen, because it does not tend to spread so heavily. Hence much less thorough trapping will still serve perfectly.

### Easy to Make.

The unit we are recommending consists, then, of a Brookmans Rejector circuit to remove the 356-metre wave and an ordinary auto-coupled trap to deal with the shorter wave.

Each is provided with a switch to put it out of action when it is desired to hear that particular station, in a manner we will explain more in detail later on.

There, that has given you a general idea of the new unit and its working. Now for some practical details of its make-up and

detail you will be able to follow from the photos.

Mounted in the usual way on the ebonite are the two terminals, two on-off type switches, and the three "Ready Radio" variable condensers. Attached to the underside of the panel is a .0003-mfd. fixed condenser, and to the upper surface two ordinary coil sockets. These parts are best fixed with some small brass screws and nuts.

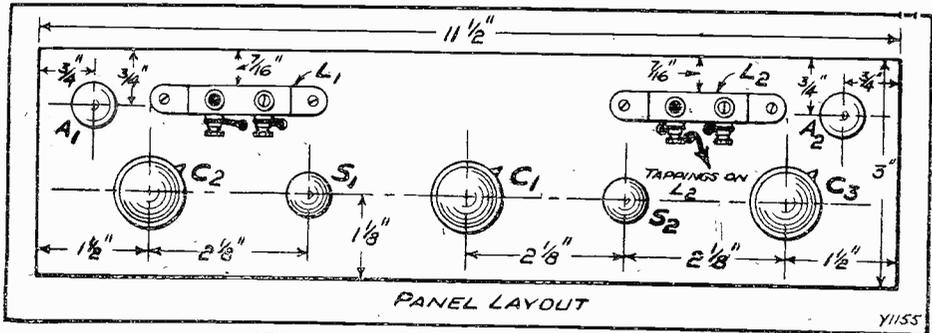
### How the Switches Work.

The coil  $L_1$  and condensers  $C_1$ ,  $C_2$  and  $C_3$  form the Brookmans Rejector circuit which deals with the 356-metre transmission, and the switch  $S_1$  puts it out of action when it is desired to hear this programme.

Coil  $L_2$  and condenser  $C_3$  makes up the auto-coupled rejector circuit which is intended to cut out interference from the 261-metre wave. Switch  $S_2$  "outs" this part of the unit when you want to hear the lower-wave transmission.

This is how the switches work: When the knob is lifted up the particular rejector controlled by that switch is put out of action, and the station it was previously rejecting can be tuned in.

Suppose that you have set the rejectors correctly, so that each deals with one of the



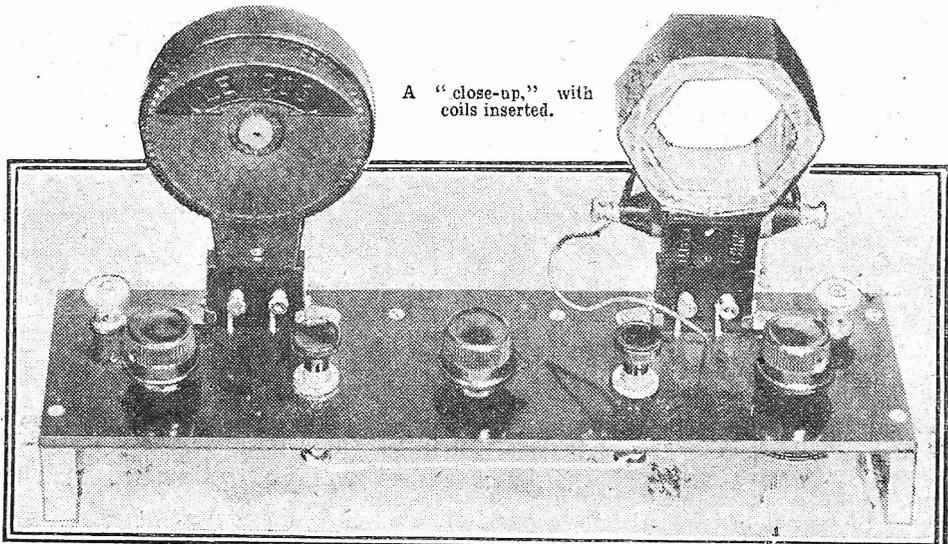
All the necessary drilling dimensions are given here.

actual use. After some cogitation we decided that since it would presumably stand against the left-hand end of the set, a convenient form for the unit would be a long, narrow strip.

Accordingly we have assembled all the parts on a narrow piece of ebonite, which can form the lid of a shallow box if you like. We did not make up a box for our own model, and merely fitted a piece of wood at each end to act as a support, a

transmissions, if you push both knobs downwards both waves will be cut out, and you can tune in foreigners or 5 G B. Then suppose you want to hear the 356-metre transmission, all you must do is to pull up the knob of  $S_1$ . To hear the 261-metre transmission, push  $S_1$  down again and raise the knob of  $S_2$ . Very simple!

To connect the unit to your set, proceed as follows: Remove the aerial lead from (Continued on page 1018.)



A "close-up," with coils inserted.

### MATERIALS.

- Ebonite, Igranite, Lissen, Diamond, Magnum, Wearite, etc.
- On-off type switches (Lissen, Wearite, Benjamin, etc.)
- Coil sockets (Twin-Wave Rejector)
- Condensers (Ready Radio), consisting of one .0005 mfd. and one .00075 mfd.
- Small brass screws, etc.

FROM THE TECHNICAL EDITOR'S NOTE BOOK.

# Tested and Found-?



nice loud click, which gives you definite audible indication that the switching action is accomplished.

It is the sort of switch that tempts you to work it unnecessarily merely to hear the nice click when it goes over! Despite its special construction, the switch is quite small in size, certainly no larger than the majority of push-pull switches. The retail price is 3s. 6d., which is rather more than one usually likes to pay for a device of this kind, but I think it is well worth it. For one thing, there can never be any doubt about the contact it makes. There is no half-way condition; when the Igranic Q.M.B. goes over you have the effect almost of an unbroken piece of metal for the current to pass through!

**WORLD-TIME INDICATOR.**

Readers will probably remember the Willis World Time Indicator due to J. H. Willis & Co., of Ipswich Road, Norwich, that I referred to on this page some time ago. It is an almanack of the hours and, by rotating a small dial in the centre of the device, one can immediately ascertain the time in any part of the world and the corresponding time anywhere else. A new model has now been issued embodying improvements. The price is 1s. 6d. It is a very useful article and one that short-wave enthusiasts particularly should find most helpful.

**THE MADRIGAL.**

The R.I. Madrigal Transportable All-Mains Receiver comprises the R.I. standard three-valve mains set mounted on a cabinet with rubber-tired castors, containing a moving-coil loud speaker. It completes a magnificent outfit.

**A FINE FEAT.**

Here are two interesting newspaper cuttings that have been passed on to me:

FROM THE SOUTH AUSTRALIAN "ADVERTISER."

Adelaide Listens to San Francisco.

An enquiry for a missing boy mounted on a red bicycle somewhere in Oakland, California, and San Francisco general news were among the features of a highly successful re-broadcast yesterday afternoon by 5 C L Adelaide, of station K G O, San Francisco. The transmission from K G O was on a wave-length of 23 metres and was picked up by 5 C L's engineers on a three-valve *Cossor Melody Maker Set*, and then put through the Adelaide Station transmitter.

The re-broadcast began about 3.40 p.m. and continued until 5.20 p.m. During the transmission Adelaide listeners heard the *Spotlight Revue Company* and dance band numbers from the San Francisco studio.

A feature of the reception of the transmission in Adelaide was a lessening of the surging which formerly characterised short-wave transmission and this is taken as an indication that the American engineers are overcoming this weakness of short-wave work.

There was little static interference to mar the transmission. The management of Central Broadcasters, Ltd., stated last night that yesterday's transmission was one of the tests being conducted by 5 C L prior to the re-broadcasting of talks from Hollywood by leading motion-picture artists.

FROM THE S.A. "REGISTER NEWS-PICTORIAL."

5 C L Re-broadcasts America.

Yesterday afternoon 5 C L re-broadcast K G O, San Francisco. The transmission from K G O was

on a wave-length of 23 metres, and was picked up by 5 C L's engineers on a three-valve *Cossor Melody Maker Set* and then put through the Adelaide station's transmitter.

The re-broadcast began at about 3.40 p.m. and continued until 5.20 p.m. and during the transmission Adelaide listeners heard the *Spotlight Revue Company* and dance band numbers from the San Francisco studio. 5 C L intends shortly to re-broadcast talks from Hollywood by leading film artists.

**"DUBILIER RADIO PRODUCTS."**

This is a handy descriptive brochure dealing with the popular Dubilier radio products.

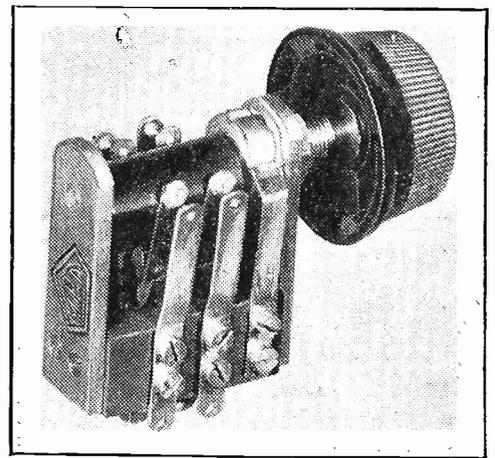
Traders and manufacturers are invited to submit radio sets, components, and accessories to the "P.W." Technical Department for test. All tests are carried out with strict impartiality under the personal supervision of the Technical Editor, and readers are asked to note that this weekly feature is intended as a reliable and unbiased guide as to what to buy and what to avoid.

**M.P.A. CHANGE-OVER SWITCH.**

If switches have to be used in a set one should choose them very carefully. A faulty switch can cause a lot of trouble and introduce faults that are difficult to trace. And the more complicated the type of switch the more the discrimination that should be used in its choice.

Many of the switches sold for radio sets are flimsy little articles. Quite different from these, however, is the M.P.A. change-over switch. This really is a sound engineering job. It is constructed on most substantial lines and once embodied in an outfit, one could have no doubts as to its successful working.

Its structure comprises solid block ebonite and stout brass fittings. The springs are of hard brass and large contacts are fitted on them. The action is most definite. In the open position there is a very wide separation of contacts and the contacts close firmly with a self-cleaning action. The M.P.A. change-over switch is a one-hole panel-mounting device, although it is of the complete double-pole, double-throw type.



"A sound engineering job" . . . the M.P.A. switch.

**THAT GOOD ADHESIVE.**

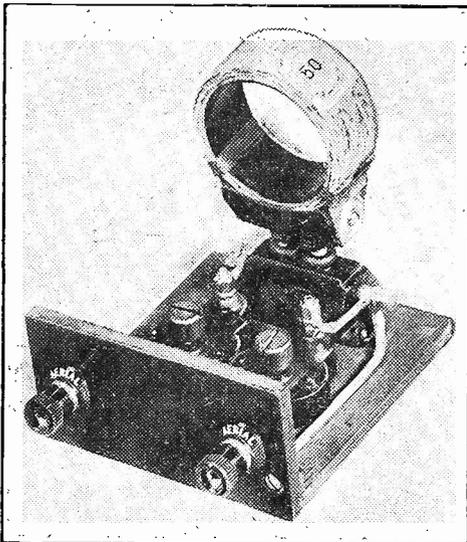
By the way, the makers of Le Page's Glue are the Russia Cement Co., not "Russian," as I incorrectly stated. It is, of course, a very well-known American firm of the highest standing.

**IGRANIC PRE-SET CONDENSERS.**

THE Igranic people are now manufacturing Pre-set condensers which are entirely suitable for our "Brookmans Rejector."

Quite recently they sent us one of these instruments made up in their works, and using their own productions throughout—not forgetting a No. 50 Igranic coil.

It was completely successful, and I have not tested a better version. Brookmans Park was easy to deal with, and 5 X X



A version of the famous "P.W." "Brookmans Rejector," made up by the Igranic people and incorporating two of their Pre-set condensers.

could be wiped out in favour of Radio-Paris on any set. The Pre-sets provide an excellently wide and smooth control.

**FERRANTI SCREENED-GRID THREE.**

With the coils that are now being supplied with the H.F. kit for the Ferranti Screened-Grid Three, it is necessary to use .0005-mfd. tuning condensers in place of the .00035-mfd. condensers previously specified. The recent wave-length changes make this alteration necessary.

**IGRANIC Q.M.B. SWITCH.**

A feature of the Igranic Q.M.B. switch which will particularly interest constructors is that it can be either one-hole panel mounted or mounted on a baseboard. The letters Q.M.B. stand for "quick make and break." The action is push-pull, but push-pull of quite an unique character. The knob comes out or goes in easily enough, but the movement is accompanied by a

# Ready Radio

## FOR THE "MAGIC" THREE



OUR COMPLETE KITS  
ARE OFFICIALLY APPROVED  
BY "POPULAR WIRELESS"

**KIT A** less valves and cabinet £6 : 13 : 0

**KIT B** with valves less cabinet £8 : 6 : 6

**KIT C** with valves and cabinet £9 : 16 : 6

All Kits include special Ready Radio connecting links.

Official Blue Print and full wiring and operating instructions free of charge with all kits.

**NO SOLDERING REQUIRED!**

**EASY PAYMENTS**  
**NO DEPOSIT SYSTEM**

## COMPLETE SET "MAGIC" THREE

All parts as specified, including Valves, Cabinet, Short-Wave Coils, Ready Radio connecting links and official Blue Print with full wiring and operating instructions.

**12** equal monthly payments of **18/3**

## "MAGIC" FOUR

**KIT A** less valves and cabinet £9:19:6

**KIT B** with valves less cabinet £12:15:6

**KIT C** with valves and cabinet £14: 8:0

1 Set of Short-Wave Coils (20-50 metres) can be supplied separately if desired. Price 7/10. For full list of approved components see issue dated November 30th.

All kits include special Ready Radio connecting links.

**NO SOLDERING REQUIRED**

### EASY PAYMENTS

All parts as specified, including Valves, Cabinet, SHORT-WAVE COILS, and Ready Radio connecting links.

**NO DEPOSIT REQUIRED**

**12** equal monthly payments of **27/3**

## "MAGIC" TWO

**KIT A** less valves and cabinet £4:17:0

**KIT B** with valves less cabinet £6: 0:0

**KIT C** with valves and cabinet £7: 2:6

All kits include special Ready Radio connecting links.

**NO SOLDERING REQUIRED**

### EASY PAYMENTS

All parts as specified, including Valves, Cabinet, Short-Wave Coils, and Ready Radio connecting links.

**12** equal monthly payments of **13/3**

### READY RADIO IMMEDIATE DESPATCH SERVICE

When you buy radio parts you naturally want them quickly. You also would be happier with the knowledge that in the event of subsequent difficulties you can obtain technical advice without trouble.

#### TO HOME CUSTOMERS

Your goods are despatched post free in sealed cartons or carriage paid by rail. Note.—You can if you desire avail yourself of the C.O.D. system.

#### TO OVERSEAS CUSTOMERS

All your goods are very carefully packed for export and insured, all charges forward.

## BROOKMANS

### TWIN-WAVE

## REJECTOR

DESCRIBED IN THIS ISSUE.

### PRICE LIST OF PARTS

Ready For Immediate Despatch.

	s.	d.
1 Drilled ebonite panel (12" x 3")	2	3
2 Wooden mounting pieces	5	
2 Terminals (1 red, 1 white)	6	
1 '0003 fixed condenser	1	0
2 coil sockets	1	4
2 on-off switches	2	0
1 Set Ready Radio Twin-Wave Rejector Condensers (1—'0005 and 2—'00075)	10	6
2 Lewcos coils (No. 50 and No. 60 X)	8	3
Quantity of Screws and Connecting Wire		3
<b>Total (Including Coils)</b>	<b>£1</b>	<b>6 6</b>

Any of the above components can be supplied separately if desired.

**KIT A** WITHOUT COILS £0:18:3

**KIT B** INCLUDING COILS £1: 6:6

## BROOKMANS

### TWIN-WAVE

## CONDENSERS

SET OF 3 CONDENSERS AS USED IN ORIGINAL SET **10/6**

These condensers enable you to obtain the fine control essential for the ELIMINATION of EITHER or BOTH Brookmans Park stations.

### CASH, C.O.D. or EASY PAYMENTS

A new addition to the well-known Ready Radio Service is our Hire-Purchase NO DEPOSIT SYSTEM for complete Kits of parts, etc., etc. Our close attention to customers detailed requirements and the well-known Ready Radio After Sales Service ensure complete satisfaction whichever way you buy.

Telephone No.  
Hop 5555  
Private Exchange.

# Ready Radio

Telegrams:  
Ready Hop 5555  
London.

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

(Three minutes from London Bridge Station.)

# THE NEW CELESTION LOUD SPEAKER MODEL Z.20

PERCY HARRIS, a foremost radio expert, writes in the "Wireless Constructor"—"Z20, renowned for brilliancy and quality . . . speech and music particularly good . . . a handsome instrument."

Gloriously realistic in tone . . . holding undisputed rank as the finest of all loud speakers

*Model Z.20 is designed specifically to give the finest possible results with any set from a Two-Valve to a Power Amplifier. Crowned with the Celestion hall-mark—a beautifully designed and hand-polished cabinet.*

- In Oak . . . . . £7 . 15 . 0.
- Mahogany . . . . . £8 . 5 . 0.
- Walnut (to order) . . . £9 . 0 . 0.
- Other Celestion models from £3.15.0.

# CELESTION

The Very Soul of Music

WRITE FOR AN ABSORBING FREE BOOK ON "SOUND RE-CREATION"

London Showrooms:  
106, Victoria Street, S.W.1

Write to: Celestion Ltd.,  
Dept. B  
Kingslon-on-Thames

# DUBILIER FOR STAUNCH RESISTANCES

## DUMETOHMS

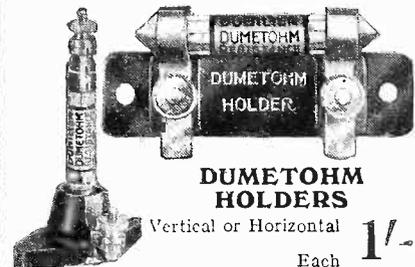


'25, '5, 1, 1'5, 2, 3, 4, 5 and 10 Megohms. Other Higher Values specially to order. Each **2/6**

## RESISTORS



Any standard value. Each **1/-** Holder (Horizontal or Vertical). Each **1/-**



## DUMETOHM HOLDERS

Vertical or Horizontal  
Each **1/-**

## DUWIROHMS



(Horizontal type.)  
10,000 to 100,000 ohms **5/-**  
150,000 and 200,000 ohms **8/-**  
250,000 ohms **9/9**  
300,000 ohms **11/6**  
Holder for Horizontal type **1/6**

**FREE**

for the asking—  
the Dubilier Book—  
let entitled "A Bit  
about a Battery."  
Get a copy from  
your dealer.

# DUBILIER RESISTANCES

If you have any difficulty in obtaining Dubilier Products, please write direct, giving your Dealer's name and address, to

DUBILIER CONDENSER CO. (1925), LTD.,  
Ducon Works, Victoria Road, N. Acton, London, W.3

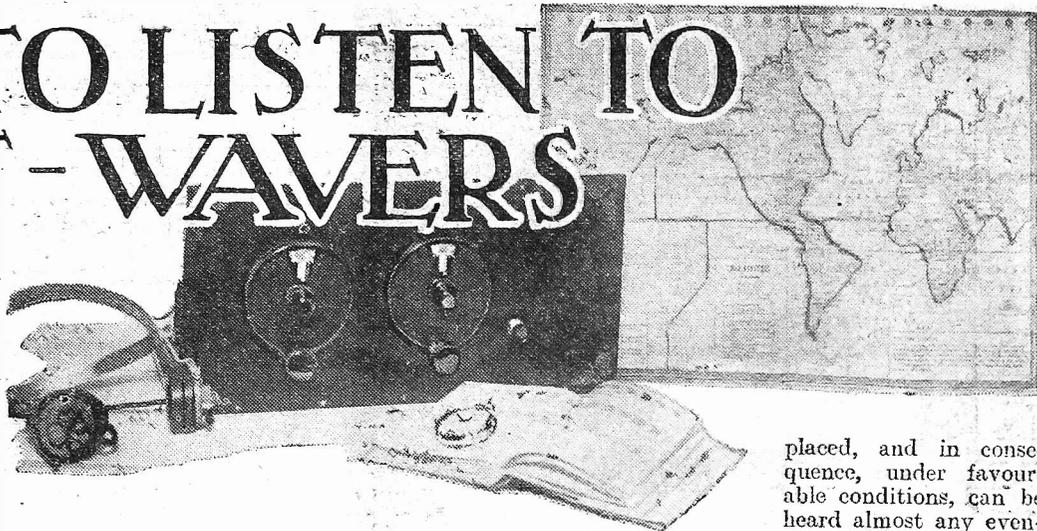
"Go Home and Listen."

Radio Week, Jan. 12-18.

# WHEN TO LISTEN TO SHORT-WAVERS

The question of "time" is an all-important one to the short-wave listener, and this short article will be of value to many who do not quite know when to listen for any particular station or country.

By G. T. KELSEY.



ONE of the really exasperating points about short-wave reception—at least, as far as the beginner is concerned—is the fact that it so very often is short—not only in terms of wave-length, but rather more from the point of view of stations.

Possibly the whole root of the trouble lies in the fact that this old world of ours is round, and that, in consequence, so as not to have the sun shining at midnight, or, equally fantastic, the stars illuminating midday in New Zealand, it is necessary to advance in time as one travels East.

In other words, although there are plenty of stations—dozens of them, in fact—to be tuned in between 15 and 40 metres, they are not always to be found at the convenient English hours between dinner and supper-time.

## Watch the Clock.

In this connection, from our point of view, it would, of course, be particularly convenient if all short-wave transmissions were based on the time we observe. But it is reasonable to suppose that the station staffs at, for instance, the Australian stations would have something to say about commencing work at 5.30 in the morning in order to provide us with after-dinner entertainment at 7.30 on what would be, as far as the Antipodes are concerned, the previous evening! (That is quite a sober statement, although, I agree, it sounds a bit doubtful!)

Is it surprising in view of the time differences—which so often in the excitement of testing a new, and possibly the first, short-wave set, are completely ignored—that there should be an apparent shortage of stations?

## The Right Times.

What, in any case, is the remedy? Until the advent of automatic engineers and announcers, we can rule out as impossible the agreement of all short-wave transmission times with Greenwich, and since there is no immediate prospect of the sun altering its path of travel, there is only one way in which to hear the Antipodes and other really worth-while distant transmissions, and that is by listening at the right times.

Those of you, therefore, that have just taken upon yourselves the building of a short-wave set, and are desirous of hearing signals from "down under" or "way back,"

must prepare yourselves for a few all-night sittings.

Bearing in mind that the majority of the countries of the world have programmes based very much on the lines of our own—that is to say, an evening session, and, in many cases, an afternoon transmission—you can, with the aid of the "world clock" shown in Fig. 1, get a good idea of when to listen. For instance, let us assume that the stations at New York commence the evening session at 7 p.m.

## Listening for Australia.

We find, upon reference to the "clock," that New York time is five hours behind our own, and that therefore in order to hear the 7 p.m. transmission, it will be necessary to commence searching at midnight here.

Similarly, it will be of little use searching for Australian C.W. and telephony stations except between the hours of 7 a.m. and

of 5 and 8 p.m., G.M.T. (Actually, the time difference between London and Nairobi is about 2½ hours.)

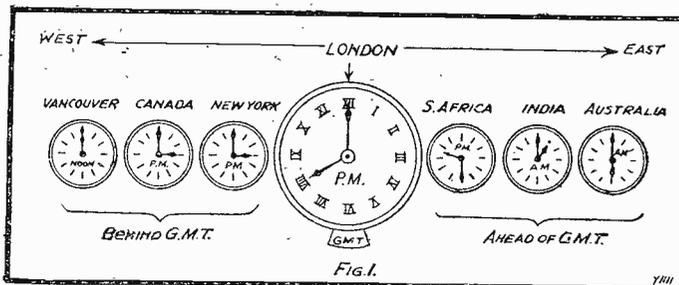
Of the American stations there are several which can be tuned in during the early evening according to G.M.T. The station on 19.56 metres at Schenectady, with the call-sign W 2 X A D is often to be heard, particularly on Sunday evenings after about 7 p.m., and the same applies to W 8 X K at Pittsburg.

These transmissions are, of course, taking place in the afternoon as far as American time is concerned, and the Sunday transmission at this time from W 8 X K is often a relay of a Church service.

It has been the intention in the foregoing paragraphs not by any means to incline you away from having anything to do with short-wave reception, but rather to save you hours of unnecessary listening.

Perhaps, therefore, as a concluding (and comforting) remark it would be appropriate

to mention that, quite apart from these really distant transmissions for which it is so very necessary to study carefully the time schedules, there is something of interest to be heard on almost any evening from the Continent, and many of these comparatively nearby transmissions are certainly well worth hearing.



This little picture shows how various countries are situated as regards time when it is eight o'clock in this country.

10 a.m., G.M.T. At this time it will be daylight over the shortest direct route (as the crow flies, across Russia and India), and as the signals will probably come over the dark half of the world (via America) they may be on the weak side.

Among the Australian stations there was one which commenced transmission at some unearthly hour in the morning in order that we might hear Antipodes signals between 6 and 8 p.m. on Sunday evening. I refer, of course, to the station known as 3 L O at Melbourne, but, unfortunately, transmissions from this station are temporarily suspended, and at the present, therefore, the only hope of hearing the Antipodes is under conditions of Australian local time.

Nairobi, the popular East African station, known as 7 L O, is on a longitudinal line near to that upon which London is

## SOME OPERATING HINTS.

If the aerial is linked too closely with a short-wave grid circuit its damping is often sufficient to prevent oscillation.

Among the cures for the overcoming of threshold howl are: a reduction of the filament voltage on the detector; changing the value of the detector grid leak; and a one- or two-megohm leak connected across the transformer secondary.

The use of a filter output circuit for 'phones, of a different L.F. transformer, and small H.F. chokes in the 'phone leads, will often tend to prevent threshold howl in a short-wave set.



# THIS BASS BUSINESS

Are we right in endeavouring to reproduce all the lower musical frequencies?

Is the perfect L.F. side necessary in the average set? Below these two points are dealt with from a new angle which cannot fail to be of interest to all listeners.

By E. J. MEREDITH.

**B**ASS has become almost a fetish, and one of the essentials in the design of modern sets seems to be the attainment of a standard of reproduction far in advance of some broadcast loud speakers, and higher than that of ordinary transmissions. It is no uncommon thing to see transformers advertised which are capable of giving a very nearly perfect response curve, which on the lower frequencies goes down to something like 30 cycles. Thus we have receivers with an L.F. side which will give a degree of bass far beyond the capabilities of the average loud speaker.

## Getting True Bass.

We go to great lengths to get this true bass in our amplifiers, and we use every conceivable type of circuit combination in order to ensure quality. Thus we have combinations of resistance capacity and transformer coupling, pure resistance-capacity coupling, and two transformer stages coupled together with carefully chosen components, the transformers being carefully chosen because of the high inductance primaries, and so forth.

Now, from the point of view of the average listener with a not too-well lined pocket, we should ask ourselves whether this search for perfect quality is worth while. I know the answer the enthusiast will give. He will say, yes, our aim is to get the perfect reproduction of every note in the musical scale.

Suppose, however, we look at things from the common-sense point of view and consider the other links in the chain. Vast strides have been made at the transmitting end, and soon all stations may transmit every frequency right down to the lowest fundamentals. At the other end of the chain we have the loud speaker. How many loud speakers give the true fundamentals below 100 cycles? Not many. I could name one or two. There may be half a dozen, but I do not know them.

## The Average 'Speaker.

If you take the average speaker, such as the ordinary listener uses, you will, I think, find that there is not very much true bass if by this one is considering those frequencies round about 100 cycles and below. Perhaps the loud speaker will reproduce the harmonics of some of the lower fundamentals. Some speakers will not even do this. Yet in spite of this the reproduction can be exceedingly good, and this absence of the lower fundamentals does not spoil one's enjoyment of the broadcast

programme. The reason is that the average ear does not miss them, and in any case derives an impression of the fundamental so long as it can hear a few of the harmonics. The ear is a very accommodating sort of organ, and it is only when direct comparison is made with the real thing that any difference is observed. Even so, the comparison must be instantaneous. As a matter of interest it is generally acknowledged that the average ear cannot detect difference in volume of any particular note of less than 20 per cent.

Bearing this in mind, what is the good of developing an amplifier capable of amplifying frequencies which, with a few exceptions, may not be transmitted, and, furthermore, in the second place not reproduced by the loud speaker? Possibly some of my readers will say, "Ah, but what about the moving coil: surely that gives you the true bass?" Yes, to a certain extent it does,

of lower impedance, and so forth, in their efforts to amplify notes of 25 or so cycles.

I wonder if it would surprise some of these listeners if I told them that very often their experiments to "improve" the bass result in a loss of the higher notes, and frequently what they think is an improvement as far as the bass goes is merely an oral effect caused by the loss of certain of the higher musical frequencies? This is what can very easily happen in an amplifier. In our efforts to obtain the low notes we seem to have forgotten the higher frequencies which go to make up the brilliancy of music. Practically everything in a wireless set from the aerial end to the output end, tends to promote a falling characteristic, that is to say, a falling away at the upper end of the response curve.

It would be much better to concentrate on improving the higher frequencies at the upper end of the response curve. After all, it is the upper end of the response curve which makes for intelligibility in speech and general brightness.

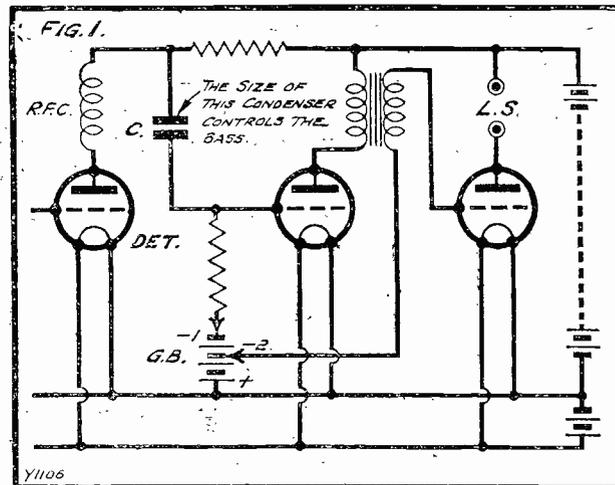
## Irritating Rattles.

There is another point, and that is that if you cut out some of the bass there is probably less risk of distortion and true "motor-boating." I always think that we have not paid half enough attention to the upper register. The average loud-speaker would, I believe, be much improved if a bigger effort were made to obtain a level or slightly rising characteristic. This would give greater brilliancy.

Why, then, try to deal with this bass in the amplifier when the loud speaker will not repro-

duce? Then again, I have heard speakers which when used with a super-amplifier have given a most irritating rattle or buzz on the bass notes. This is most unpleasant to listen to, and the obvious thing to do is to cut it out.

Take the type of R.C.-transformer combination shown in Fig. 1. In many cases the coupling condenser has a capacity of .05 or .1 mfd., a value much too "good" for the type of loud speaker to which I am referring. Let the enthusiast reduce the value of this coupling condenser to .005 mfd. and I guarantee that he will not be able to tell the difference.

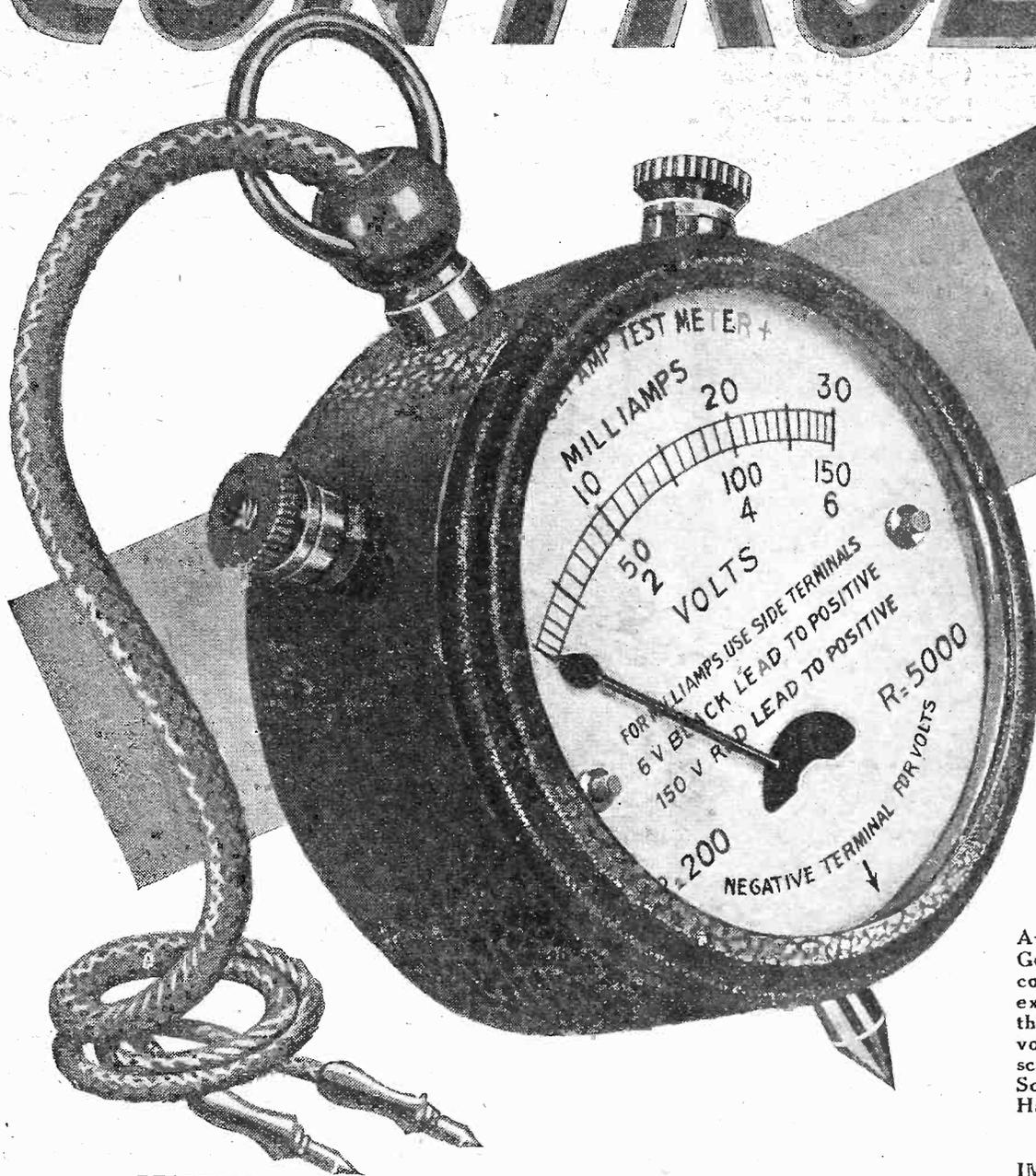


In a resistance-coupled circuit, decreasing the size of C will cut out some of the bass.

but I have yet to hear one that will give a true note of much below 50 cycles.

However, I am not referring to moving-coil speakers or other special designs, but to the class of instrument used by the average listener. I do not think that any manufacturer in his right senses would claim that his speaker retailing at perhaps two or three pounds, can possibly go down even to 150 cycles. I know of several otherwise excellent little speakers which have a cut-off commencing roundabout 200 cycles, and yet all the time we have enthusiasts experimenting with larger coupling condensers in their R.C. stages and with valves

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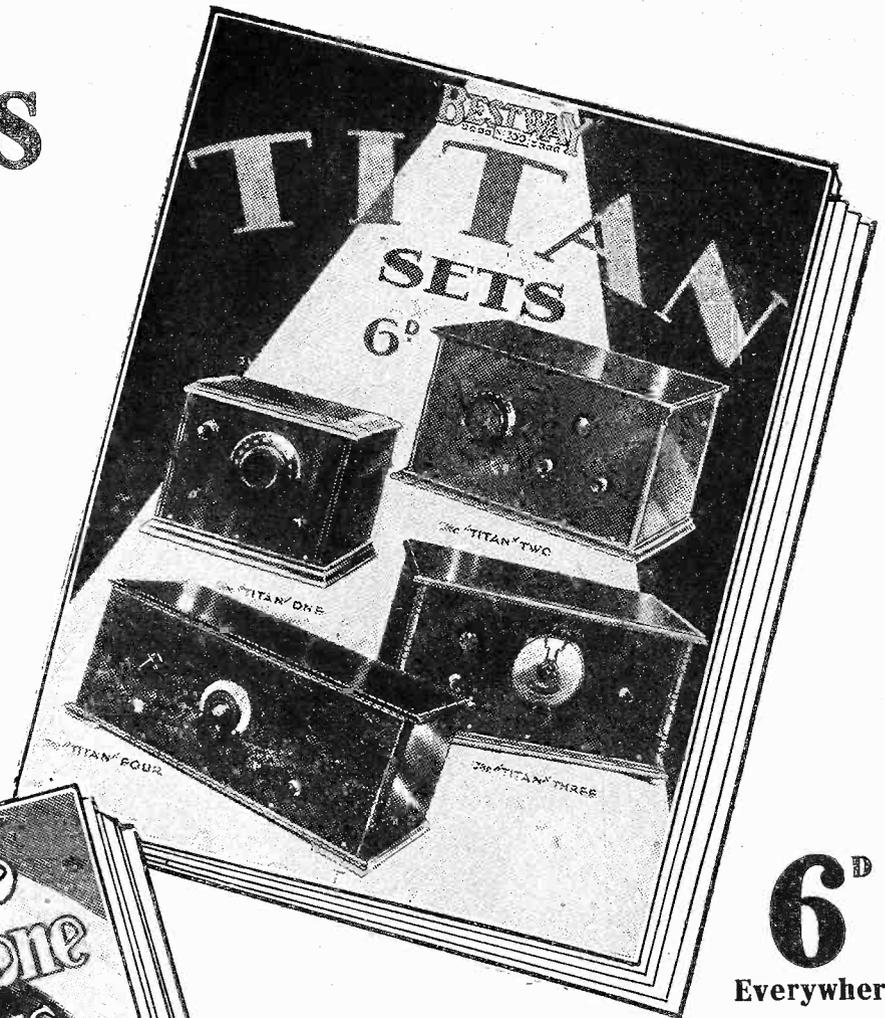
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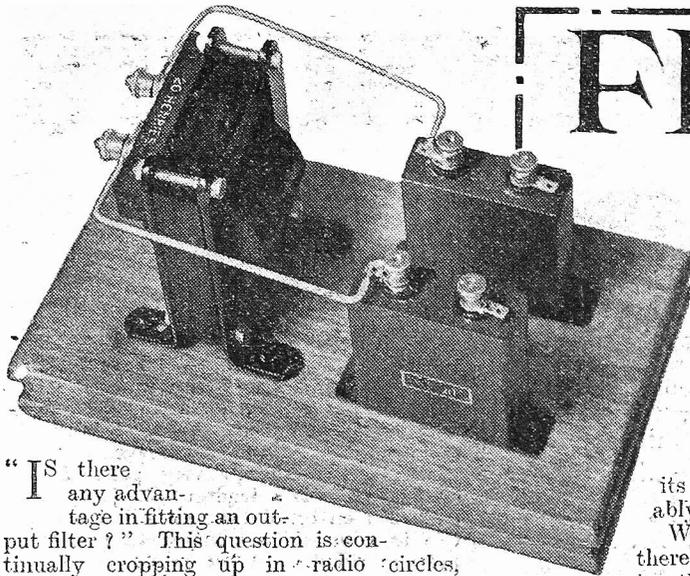
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# You can easily build them

# FITTING FILTERS



Do you know why an output choke is desirable? Apart from explaining the advantages of a loud-speaker filter, this article describes the correct way of fitting one.

By A. S. CLARK.

“IS there any advantage in fitting an output filter?” This question is continually cropping up in radio circles, but it is an easy one to answer. In all cases where a loud speaker is employed an output filter is desirable, although when the volume is small, quality will not be improved much.

Better quality, however, is not the only advantage of an output filter. When telephones are used an output filter is useful, and also with long loud-speaker leads, and as a safety precaution if D.C. mains are employed.

All loud-speaker sets have a power valve or super-power valve in the last position. Such valves take a fairly large current from the H.T. supply, which will generally be between 10 and 30 milliamps. If we assume that the power valve is taking 20 milliamps and the resistance of the loud speaker is 2,000 ohms, we shall find by Ohm's Law that the voltage required to force this current through the loud speaker is 40.

### Serious Voltage Loss.

This voltage is being completely lost, and if the H.T. battery is giving, say, 120 volts, there will be only 80 on the plate of the

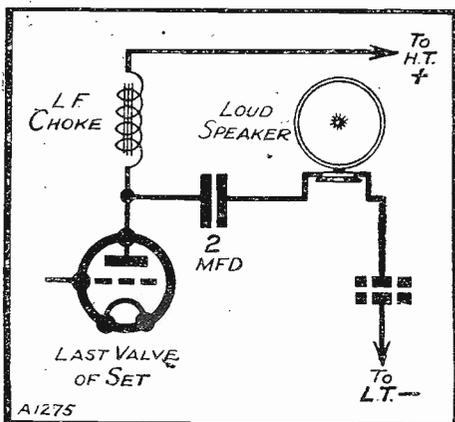


Fig. 1—The fixed condenser shown dotted is necessary when working the set with a D.C. mains unit.

valve. Since the resistance of a really good output choke would be about 200 ohms, only 4 volts H.T. would be lost. A small voltage drop is obviously a great advantage since every available volt is wanted for the last valve.

Although the D.C. resistance of an L.F. choke for output purposes is much lower than that of the windings of a loud speaker,

its impedance is considerably higher.

With an output filter in use there is no direct current flowing through the loud speaker, the only currents being the varying ones produced by the speech or music. The speaker is thus completely isolated from the H.T. supply, which avoids the possibility of shocks being obtained from it when D.C. mains are employed.

### Protects the Speaker.

Another advantage of this isolation is that it prevents the loud speaker from becoming saturated. The magnets of a loud speaker are capable of carrying only a certain number of lines of magnetic force, and once this point has been reached, extra current will not produce much effect.

Therefore if the current from the last valve were sufficient to saturate the loud speaker the speech currents would not have their proper effect. This latter point does not, of course, apply to moving-coil types of loud speakers.

When extension leads are in use the output choke prevents any leaks to earth causing damage to the H.T. supply. Also the resistance of the extension leads does not cause a drop in the H.T. voltage, and if long leads are employed, one side of the loud speaker may be earthed instead of being connected to L.T. —

If the full effect of the advantages of an output filter is to be obtained an L.F. choke of the correct type must be employed. The type of choke that is intended for interval coupling is not suitable, nor is the primary of an ordinary transformer of much use.

The choke must have a high impedance when carrying a fairly large current, since the inductance falls off as the current increases. The usual value is between about 20 and 32 henries.

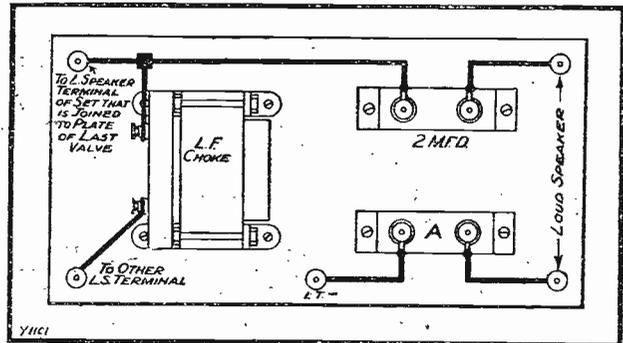
### Low Resistance Important.

The choke must also have a low resistance and be capable of carrying the current from large power valves. The reasons for these two points has already been shown in the earlier part of the article. In actual practice the inductance is really limited by the question of practical proportions for the choke, and also cost.

More inductance means more wire, and since the resistance has to be kept low and current carrying capacity is fixed, the size of wire required and consequently the size and cost of the transformer will increase with the inductance. Therefore a compromise has to be made, and the usual inductance has been quoted already.

Many receivers, particularly multi-valve sets, have an output filter incorporated in them, but when this is not the case one can always be added externally. A theoretical circuit of the arrangement of the components is shown in Fig. 1.

It will be seen that the L.F. choke replaces the loud speaker, and that the loud



A practical wiring diagram of an output filter. It is important to connect the "L.S." terminals of the set the correct way round.

speaker is now connected to the plate via a 2-mfd. fixed condenser, its other side going to L.T. — Only the direct current flows through the choke, the pulsating speech currents being shunted by it round the fixed condenser and the winding of the loud speaker.

### The Second Condenser.

The extra fixed condenser that is shown dotted is only required when the set is employed with an eliminator that is run from D.C. mains. As already mentioned the object of this condenser is to avoid the possibility of shocks.

It is really desirable to use two 4-mfd. condensers with this arrangement, since the condensers are virtually in series and therefore the effective value will be 2 mfd., which is the same as when one condenser is being used.

The practical details for an output filter are given in a wiring diagram. If only one condenser is required the one marked "A" should be omitted, and the wires that are shown joined to it connected together.



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

## QUESTIONS AND ANSWERS.

### LOOKING AFTER THE 'PHONES.

H. P. W. (near Abingdon, Berks).—"I enjoy reading about all these excellent circuits, though I must admit I do not understand them very well! There is another thing I do not understand, and that is why you do not cater for we poor crystal users? Why not tell us how to look after our telephones, for instance?"

"It's not everybody has a valve set, and if you could help crystal users to make our telephones last longer, it would make us look forward to Thursday even more than now, if it is possible."

We are glad you raised this question, because, although it has often been dealt with in "P.W." in the past, it is liable to be overlooked unless somebody raises the point. As a matter of fact, there is quite a lot which can be said about the general care of telephones, and the following points are all important:

First and foremost, do not forget that telephones are remarkably sensitive, and indeed wonderful instruments, so that they should not be thrown about like an old pair of slippers or just dumped down anywhere until they are wanted again. If (or, rather, when) you read "Pentode's" articles, you will find that 'phones do extraordinarily interesting work, and the least that you can do for them is to treat them properly.

If they are left permanently connected to the set, make sure that they are perfectly dry and placed in a dry, airy place, for dampness or excessive heat will be certain to affect them adversely; and they should not be stowed away for long periods where they can be attacked by rust, etc., but should be carefully wiped dry after use and kept in a cupboard in a living-room, or some other dust-free situation in an even temperature.

When used with a valve set, telephones must be connected in circuit the right way round. 'Phone earpieces are marked with a red cord or with a +, to denote which side of them should be connected towards the H.T. +. If they are connected so that the current goes in the wrong direction, in the course of time they become insensitive.

Most valve sets have one red (or +) L.S. terminal, and it is this one to which the red 'phone tag (or the one marked +) must be joined, if the 'phones are to be given a fair chance in life.

On no account drop the telephones on the floor or knock them off the table, but treat them as you would any other sensitive electrical instrument. The diaphragms should not be removed, or the inside of the instrument interfered with by an inexperienced person, as it is very easy to bend the diaphragms, which will result in insensitivity.

If 'phones are worn for long periods, they should be gently wiped over with a soft cloth, to remove all traces of perspiration, etc., and should the diaphragm become rusty through long use, the experienced listener can prevent a repetition of this trouble by carefully removing the cap, sliding off the diaphragm, and cleaning it, and then lightly smearing it with petroleum jelly, the greatest care

being taken not to bend the diaphragm during the operation.

So easy is it to bend the diaphragm, and thus to decrease the sensitivity of the 'phones, that it is not good practice when removing it to pull it straight off from the magnet, as the magnetic pull alone is quite sufficient to cause harm in some cases. A better plan is to slide it sideways off the earcap so that there is no direct magnetic pull at the centre.

Do not allow kinks to form in the cords, and do not hang the 'phones up by them. Do not poke the diaphragm with a duster on the end of a penholder in an endeavour to clean it, as rust will do it less harm than a robust "remedy" of this form! Remember that the little flat disc has to speak to you, sing to you, and play every instrument in the band for you, and that the least you can do for it is to treat it with respect.

### AN EASY ALTERATION.

M. F. (near Reading).—"It's been going for over three years and gave every satisfaction, but the only trouble now is that it is not

## "P.W." TECHNICAL QUERY DEPARTMENT

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quite selective enough. Brookmans Park is very strong, and seems to overlap on other stations, even when I do not want it.

"I don't wish to do much to the set, but is there any simple way by which I can alter it, such as plugging in a different aerial?"

Your best plan is to examine the set and note where the present aerial terminal goes. You may find it joined to one end of the aerial coil holder, to the tuning condenser, and to the grid condenser. If this is the case (and it was common practice a year or two ago) you can easily improve matters by using a centre-tapped plug-in coil, instead of the type you use at present.

Instead of bringing your aerial lead to the aerial terminal, lead it inside the set to the centre tapping on the new coil by means of a flexible lead. All other connections will remain the same, and probably you will find that this simple alteration is quite sufficient to sharpen your selectivity to the required degree, and to rid you of Brookmans Park interference.

### A MATTER OF HISTORY.

"LECTURER" (Builth Wells).—"How many years ago were ether waves or wireless waves first produced, and by whom?"

The German experimenter Hertz first produced and demonstrated these waves in 1888.

### CUTTING OUT MOTOR-BOATING.

H. N. F. (Warrington).—"I have a 50,000-ohm anode resistance (wire wound) and I should like to use this for anti-motor-boating purposes in a three-valve set. The circuit is detector with two low-frequency transformers, and although very powerful and efficient there is a tendency for jarring and distortion on certain notes which I think is due to a certain amount of back coupling between circuits. What would be the connections for the resistance?"

In addition to the resistance you will need a large fixed condenser of about 4 mfd. or a little less and you will probably find that the resistance will best be inserted in the detector's plate wiring.

The procedure is to disconnect the H.T. lead which goes to the primary of the first L.F. transformer and take this wire to one side of the 50,000-ohm wire-wound resistance. The other side of the anode resistance then goes to this transformer primary, thus completing the circuit again, but with the resistance in series.

In addition, you will need to connect that terminal on the resistance which is now joined to the primary on the transformer to one terminal on the 4-mfd. condenser. The other terminal of this condenser goes to L.T.—and this completes the alteration.

Do not forget that you may need to use a little more H.T. on the detector than formerly owing to the increased resistance in circuit.

### ARE THE 'PHONES O.K. ?

M. R. (Market Rasen).—"I was greatly helped by the account I saw in 'P.W.' of a method of testing with 'phones and dry cell for the continuity of windings in the set itself, and the components, etc. But is there any other method of testing the telephones themselves, as the dry cell seems to give a very powerful click. Would a lower voltage be a more delicate test?"

The best test is to use no battery at all except the one provided by your own body. To do this, wear the telephones as usual but disconnect them from the set, and place one of the tags at the ends of the leads between your lips.

Now take a key, nail or similar piece of metal and rub the other tag, when you will hear scraping or scratching noises corresponding with the rubbing of the key. Test each earpiece in turn in this way and notice whether they are of equal strength, or whether one appears to be weaker than the other.

Only a sensitive pair of 'phones will respond to this test, as the current flowing is a very minute one.

### CONTROL OF LOUD-SPEAKER VOLUME.

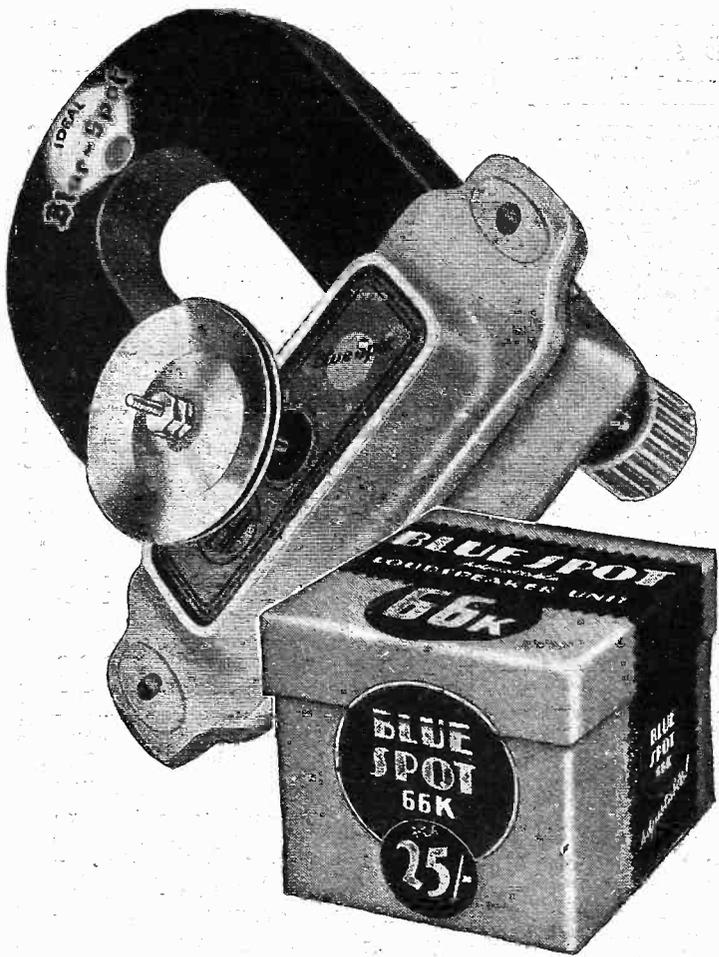
S. H. M. (Salford).—"I do not wish to go to the expense of a special 'volume control,' but should like to do this by means of the grid-bias and H.T. adjustments, or by varying the filaments, as I have old filament resistances on hand. Or else by de-tuning. Which method is best? (Set details enclosed)"

The three first-named methods are all so bad that we do not find here is any "best" among them. To control volume by means of grid-bias or H.T. variation means that instead of working the valve as recommended by the makers you are operating it under conditions which are certain to introduce distortion.

Dimming the filament of either a detector or a low-frequency valve has an effect somewhat similar, though the method is comparatively harmless in the case of H.F. valves. Neither can we recommend de-tuning, because with the advent of the Regional scheme it will not be easy with a simple circuit to greatly reduce one transmission without the risk of bringing in another.

If we were in your place we would reconsider the question and we think that you will come to the conclusion that in a set of the type named to omit the volume control will be "spoiling the ship for a ha'porth of tar."

(Continued on page 1016.)



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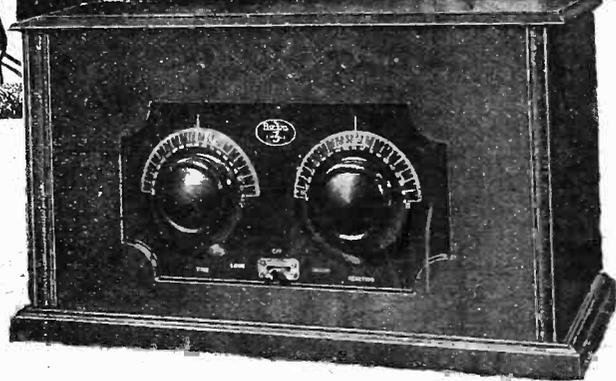
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# RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1014.)

## IS IT NECESSARY TO SWITCH OFF H.T.?

A. W. T. (nr. Rugby).—"I always thought my set was a trifle rough on H.T. batteries, and recently this view is confirmed by the fact that I have found a neighbour who uses the same sort of set with similar valves. By comparing notes with him I find that on the average my H.T. battery renewals are about four to his three, which seems to show that something is the matter with the insulation."

"Once before I had trouble with the insulation of a set and in the end I had to re-build the whole thing because I was unable to find the leak. As this present set is perfectly satisfactory in every other way I do not want any expensive alteration of this kind, but thought of disconnecting the H.T. battery."

"This would be simple enough if I always did it myself, but unfortunately I am away from home on business, sometimes for a period of ten days or so, and I want to leave the set so that it can be switched on and off without trouble. Can you suggest a simple way of switching off the H.T. battery? (I presume it would not be necessary to switch off grid bias as well?)"

There would probably be no advantage in switching off the grid bias, but we should certainly agree that it would be beneficial to cut off the H.T. battery in the circumstances. This can be done quite easily if the H.T. negative lead is broken, and when this is done there is generally no need to break the separate positive leads, so all that will be necessary is to fit a simple switch (such as a filament on-off switch) in the H.T. negative lead.

Probably it would be a good plan to have a switch similar to your present filament switch so that there is never any doubt as to which position it is in. And in all probability it could be wired close to the filament switch, so that when one is opened or closed the other could be worked at the same time.

One side of it will be connected to the H.T. negative terminal of the set and the other side to L.T. negative.

## LOUD-SPEAKER CONNECTIONS WITH OUTPUT-FILTER CIRCUIT.

R. M. (Bournemouth).—"Nearly twelve months ago I fitted an output-filter circuit to the set, and was very pleased with the results in the different rooms where loud speakers were fixed. Recently I had occasion to examine one of the upstairs loud speakers and found that its connections had become reversed, the plug connector having at some time been removed, turned round and replaced."

"The instrument seems all right and I am wondering whether any damage has been done in view of the fact that the output is filtered?"

The positive and negative markings on the loud speaker are placed there by the manufacturer to indicate the right way round for the connections when the instrument is carrying the plate current. If the loud-speaker filter output is employed no such

(Continued on page 1918.)

## HAVE YOU GOT YOUR COPY OF THE JANUARY MODERN WIRELESS?

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With such new sets, and simple additions for old sets, you can listen to what you want when you want it.

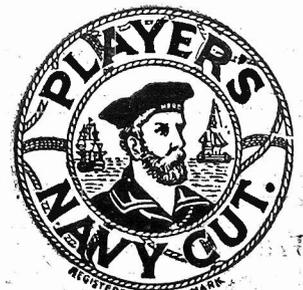
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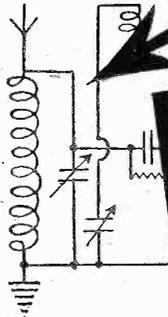
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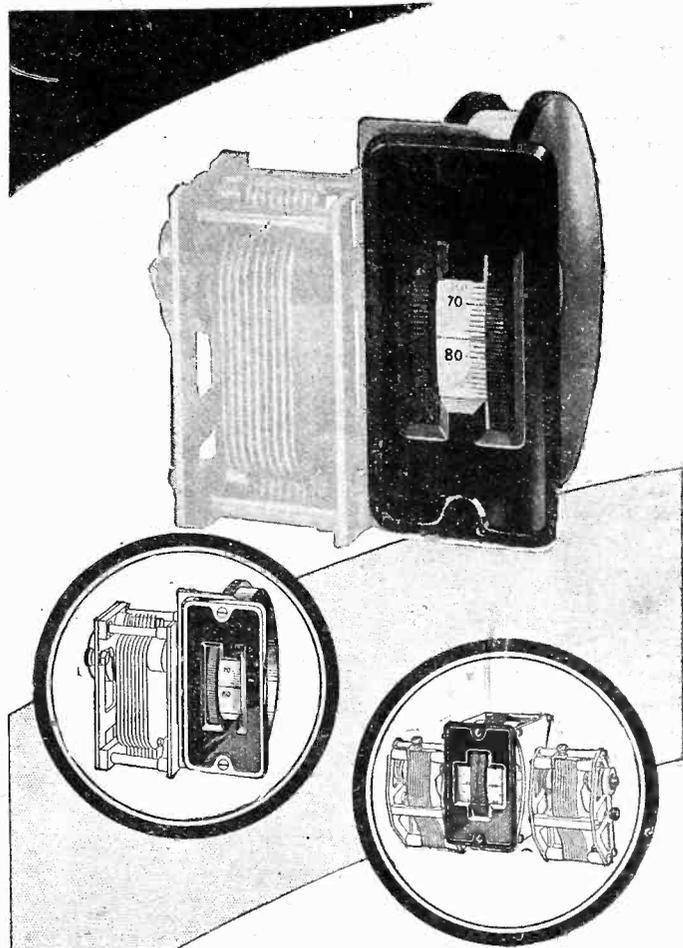
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DUAL WAVE COIL  
MOST EFFICIENT  
PRODUCED  
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Designed and recommended to obtain maximum selectivity, to comply with new Regional requirements.  
More efficient and convenient than old-fashioned Plug-in-coils. Just switch over from High to Low Wave band. Reaction on High and Low Wave lengths is fully obtained.  
Range 200-600 and 1000-2000 metres.  
No. D.W/8 8/- each.  
From all first-class Radio Dealers.  
Refuse substitutes. If any difficulty write direct.



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PENDLETON, MANCHESTER, ENGL.



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These latest examples of J.B. design and workmanship are typical of their many Precision Instruments. Each of the Thumb Control models is supplied with aluminium anti-capacity screen.

The Plain type allows any J.B. Condenser to be mounted on it. The Vernier type is similar, save that it has a second Thumb Rim to attach to Vernier Control Spindle of any J.B. Slow Motion Condenser. The Dual type may be used with two J.B. Universal Condensers, one mounted each side.

All three models provide the smoothest and most accurate tuning that could be desired, and are thoroughly well-finished in the very finest materials.

**PRICES:**

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Dual Type, 8/6

*All models priced without condenser.*



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# CAUTION

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and specified for

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**THE WAVE-CHANGE REJECTOR**  
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**THE FORMO CO., CROWN WORKS,  
CRICKLEWOOD LANE, LONDON, N.W.2.**

## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1016.)

current is carried by the loud speaker and it does not, in the least matter which way round the speaker is connected in such circumstances.

### TOP-OF-DIAL TROUBLE.

D. G. G. (Colchester, Essex).—"All the parts used were old ones, some of them being four or five years in active service, but results were far beyond my expectations and, in fact, were excellent except for one peculiarity.

"That is, violent oscillation above any wavelength of round about 500 metres. In fact, 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—and such chokes were all too common a few years ago—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 more modern choke of greater inductive value.

Alternatively a large plug-in coil could be employed, if it could replace the present choke without spacing troubles arising.

### THE "ANTIPODES ADAPTOR."

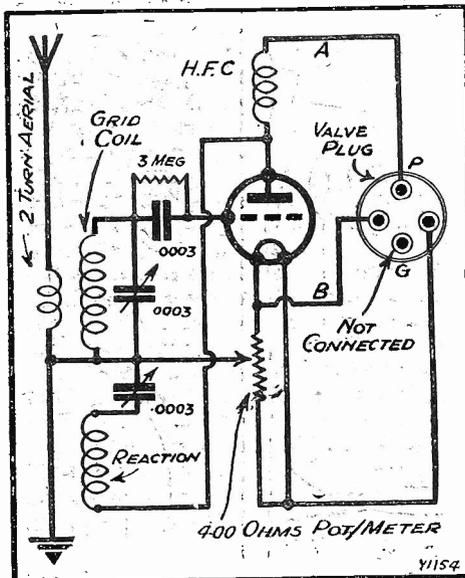
"OUT FOR AUSTRALIA" (Penarth).—I want to build up a separate S.W. tuner with a valve-plug attached, which I can push into my detector valve's socket, and so go over to hear short waves on my loud speaker. As a matter of fact, I tried the scheme for myself tentatively, but came up against the difficulty of keeping leads short. What leads are

arranged in the multiple-cord to which the valve-plug is attached?

"I should be pleased if you could let me know the connections, capacities required, etc."

The values are shown on the accompanying circuit diagram of the "Antipodes Adaptor," the original and best of these plug-in short-wave adaptors.

The valve-plug is shown to the right of the diagram, and one of its pins is left blank; the others are joined as shown, so the leads marked A, B and C are the ones



that are embodied in the cord, and these can be as long as necessary without undue troubles from coupling appearing.

All the other leads should follow standard short-wave practice, special care being taken with grid-circuit and reaction-circuit wiring.

Usually the set's ordinary detector valve is perfectly satisfactory on short waves, so to change over all you have to do is to pull out the detector valve, insert the new plug in its socket, and then replace the detector valve into the plug.

## A TWIN-WAVE "BROOKMANS" REJECTOR.

(Continued from page 1005.)

its usual terminal on the receiver and place it instead on A<sub>1</sub> on the unit. Connect A<sub>2</sub> on the unit to the aerial terminal on your set (keep this lead short) and the job is complete.

Now for the preliminary adjustments, i.e. the setting of each rejector to deal with the appropriate station. The first step is to set the Brookmans Rejector circuit to eliminate the 356-metre transmission, and it is best to perform this operation when the 261-metre station is not working.

### Knocking Out No. 1.

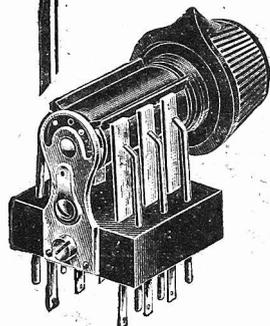
Place S<sub>2</sub> to its "outing" position, i.e. knob pulled upwards, and push the S<sub>1</sub> knob downwards. Put a No. 50 plug-in coil of good make in the L<sub>1</sub> socket, set C<sub>1</sub> to minimum (moving vanes all out), and C<sub>2</sub> to about a half-way position. Now tune in the station, then turn to C<sub>1</sub> and adjust it until you find a setting which causes the signals to go down suddenly, practically to nothing (on many sets they will vanish completely unless a good bit of reaction is being used), and on either side of which they reappear.

You will find that you can put C<sub>2</sub> at various positions, then reset C<sub>1</sub> to find the rejection point. In general, those combinations in which C<sub>2</sub> is fairly small and C<sub>1</sub> large (vanes well engaged) give the most complete rejection. No doubt you will have seen the fuller details we gave on these points in our earlier articles on the Brookmans Rejector.

(Continued on next page.)

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WEARITE FOR BEST RESULTS  
WEARITE FOR BESTWAY SETS  
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Titan Coil Unit - - - 15/-  
Loading Coil Unit - - - 7/6  
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Panel Mounting Rheostats and Potentiometers, 4, 7, or 15 ohms, 1/6 each; 30 ohms, 1/9 each; 50 ohms, 2/- each.

Potentiometers, 300 or 400 ohms, 2/6 each.

Volume Controls, 0.5, 1, 2 megohms, 4/- each.

Baseboard Mounting, 3d. each extra.

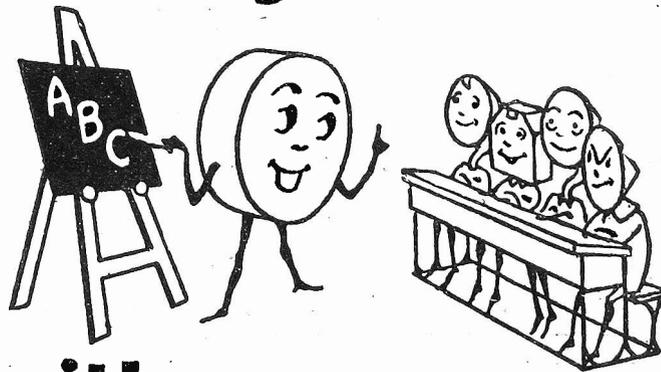
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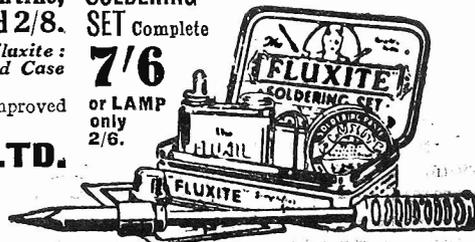
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**- IT SIMPLIFIES ALL SOLDERING**

## A TWIN-WAVE "BROOKMANS" REJECTOR.

(Continued from previous page.)

So much for that. Now for the setting of the auto-coupled rejector to cut out the 261-metre wave. To do this, choose a time when this station is working, push  $S_1$  downwards and pull  $S_2$  upwards, and tune in the station.

Next, place a No. 60 Lissenagon "X" coil or Lewcos triple-tapped coil in the  $L_2$  socket and attach the flex lead to one of the tapping points on the coil. (Try each re-setting the circuit each time, and see which is best.) Now de-tune your set so that the station is heard at rather reduced volume.

Next, push  $S_2$  downwards and turn to  $C_3$ , and adjust it until you find the rejection point where signals go down almost to nothing. They will not disappear completely, because this type of rejector is less drastic than the other; but they should go down so much that they will only be heard when fully tuned in, and so will cease to trouble you.

There, that's all, and when you have done that there is no further adjustment, and all you have to do is to work the switches to remove interference from either or both of the stations just as you wish.

## NORTHERN PROGRAMMES.

I AM able to reveal some of the Northern Region's plans for programmes during 1930. There will be a very considerable amount of "O.B." work, and a good start has been made with the broadcasting of the pantomime "Mother Goose" from Leeds, and of the running commentary on the England v. Australia Rugby League Test Match from Swinton.

The relays of music and entertainment from the seaside and inland resorts of the North (such as Scarborough, Blackpool and Harrogate) which have been such a successful feature in the programmes during the past two summers are to be continued and possibly extended.

### New Isle of Man Cable.

The new telephone cable between England and the Isle of Man will be found useful by the B.B.C., and it is expected that it will come into use for the relaying of the ancient Tynwald ceremony, when the laws of the island are promulgated, on July 5th. The T.T. motor-cycle races will also find a place in the programmes.

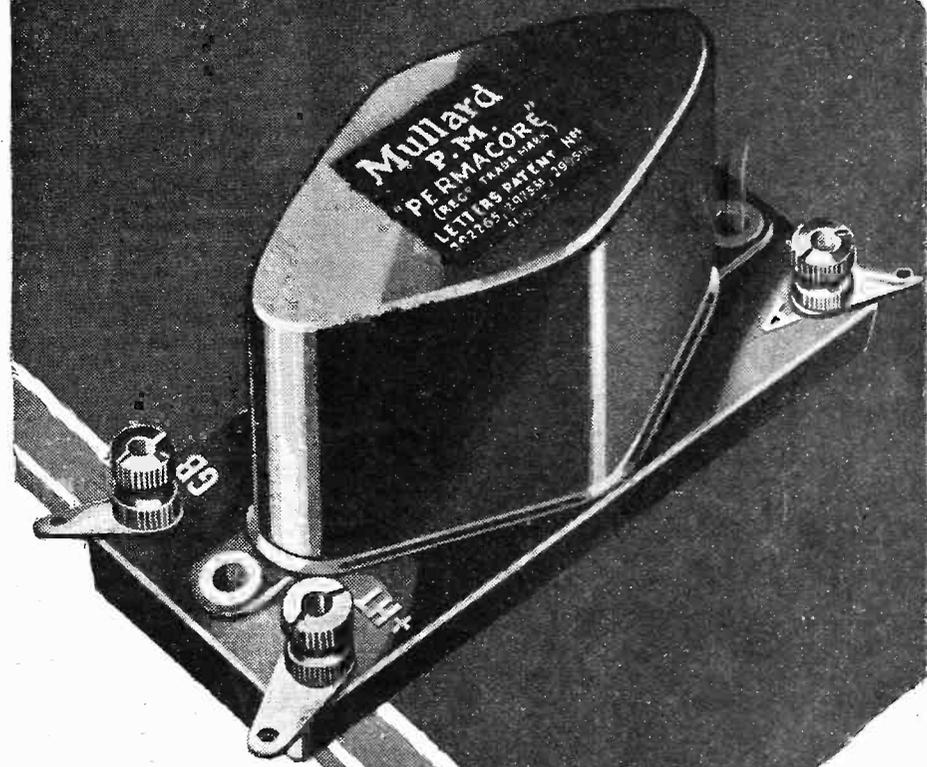
The Isle of Man will have further representation in the North Regional programmes when the centenary of the birth of the Manx poet, T. E. Brown, will be celebrated by the B.B.C. on May 5th.

There will probably be a "Lakeland Week" in August and a number of Northern towns may find themselves in the radio limelight during coming months as the subjects of "pageant" programmes.

Some time ago a "Port of Liverpool" programme was broadcast, and the idea of broadcasting special programmes representative of other towns has arisen from this.

(Continued on next page)

# THE MULLARD "PERMACORE" TRANSFORMER



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PRICE  
**25/-**

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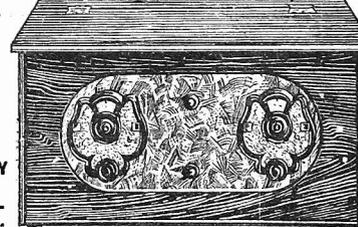
.0005 Variable, S.M. Dial, L.T. Switch, 2 Sockets, .001 Fixed, 1 V/Holder, P.W. Screen, B.B. Coil Socket, Raymond Special Choke (as used in set, 6/-), B.B. Neutralising Two 1 mfd. 600-ohm Resistance, Strip, Terminals Wire, Clip, Screws, Panel, etc Post/3

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**KIT OF PARTS**—18 x 7 Panel, .0005 Variable S.M. Dial, Reaction (Differential), L.T. Switch, 3 Sprung V.H., 2 Coil Sockets, 400-ohm B.M. Potentiometer, Neutrodyne B.B., Lewcos H.F. Choke (or R.L. Dual), Hypermu and Igranio "J" L.F., .0003 Fixed, 2 mfd., 2-meg. Leak and Holder, 25,000-ohm Wirewound, 16 x 2 Strip, 10 Terminals, Wire, Screws, Baseboard Carriage and Packing, 7/- (U.K.) Nett Cash

**79/6** Ultra Short Wave Coils 17/6

**95/-** 3 Mullard 33/6 Dario 2, 4, 6-9 Triotron 18/6 Tungram Set Post 6d.

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## NORTHERN PROGRAMMES.

(Continued from previous page.)

A Leeds programme is at present under consideration.

Events which will find representation in future programmes include the Lancashire Cotton Fair at Manchester in February, the celebration of the bicentenary of the birth of Josiah Wedgwood at Burslem in May, the centenary of the opening of the Liverpool-Manchester Railway in September, and the Royal Show at Manchester in July.

A new weekly series of talks will commence on February 4th. Under the title of "Towards Utopia," they will deal with many of the urgent social problems which are being solved or are awaiting solution in the North of England.

In this series the B.B.C. is putting all its faith in women, the speakers so far arranged being Lady Trevelyan (who will give the first talk), Miss Eleanor Rathbone, M.P., Mrs. Stocks, Miss Ellen Wilkinson, M.P., Mrs. E. D. Simon, and Miss Margaret Beavan.

Mr. W. P. Crozier's monthly talks on "How the North Moves" are to be continued during 1930.

## FOR THE LISTENER.

(Continued from page 996.)

"England for the English"? No doubt somebody objects to Burlington House offering hospitality to Italian pictures!

Talking of that marvellous exhibition, listeners have been lucky in having the guidance of Mr. Roger Fry. Most of us are not experts and, seeing everything, we may see nothing. Moreover, in an exhibition of this kind, it is as easy to get fed up as it is for a child let loose in a strawberry patch or a sweet-shop.

There is a glut of masterpieces. Almost all the asterisks in Europe are there! It is a maze of loveliness, a Milky Way of genius. A guide is needed, a little knowledge at any rate; and Mr. Fry's talks were just the thing, simple, lucid, and covering with broad lines most of the enchanted ground.

## Many Interesting Talks.

Lately, by the way, the talks have seemed to me to be very good; so much so that I was surprised to hear the official "apologia" for them under the queer title of "Broadcasting and the Spoken Word." I have noticed that, just as the pictures in "Punch" are often most amusing when the letter-press is comparatively feeble, the B.B.C. talks are often first-rate when the music (let us say) is slightly below par.

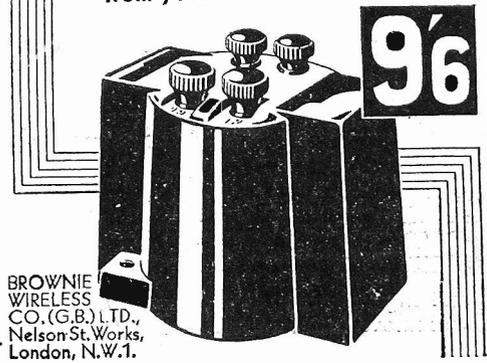
Recent talks have been most interesting. Mr. Basil Maine on "A Day in a Film Studio," Nigel Playfair on "Charades," Mr. Arundell Esdaile on "The Epigram," Mr.—I beg his pardon!—the Hon. Harold Nicholson opening a six months series on "People and Things." Such wine needs no bush. It is varied and entertaining in the highest degree.

I singled out Mr. E. V. Knox on "Diaries" because it was so very amusing, and so very wise. His tale of how the Tompkins' Diary wandered round and finally came home to roost, and his "imaginary diary" of King Solomon, were in his happiest vein.

We are promised, or (if you will) threatened with, more talks; but if they (Continued on next page.)

# 'POPULAR' TRANSFORMER

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BROWNIE WIRELESS CO. (G.B.) LTD., Nelson St. Works, London, N.W.1.

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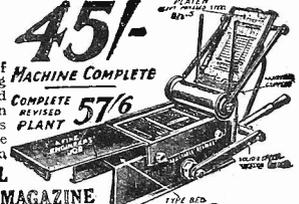
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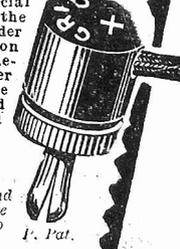
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## THE WANDER PLUG WITH THE POWERFUL GRIP

Look at its prongs of special spring-metal that grip the socket—its insulated holder—the neat engravings on the head—its finish. Replace your old wander plugs with Belling-Lee to-day, and put an end to bad contacts and loose plugs.



**4d.** Ask your dealer, or send to us, for Belling-Lee Handbook, "Radio Connections."

## BELLING-LEE FOR EVERY RADIO CONNECTION

Advertisement of Belling and Lee's Ltd., Queensway Works, Ponders End, Middlesex.

**FOR THE LISTENER.**

(Continued from previous page.)

are up to this standard, only the churlish fellow will complain. What, for instance, could be jollier than the series now running on the quest for Buried Treasure? On January 18th, when we go hunting for the "Tobermory Gallcon," I shall be there! So will you, if you are wise, and still young!

In February and March there are to be more "Points of View." The standard set by the Shaw-Wells-Lodge-Haldane troop last time was so high that, if the next symposium gets anywhere near it, I will drink Miss Matheson's health in the best champagne I can afford at the moment!

**International Honours.**

Not that the music has really been uninteresting. The International Concert—Germany, Belgium, and Ourselves—easily put the rest into the shade, and reflected the greatest credit on all concerned, artistes and engineers alike.

Our own contribution, from the "Fairy Queen" of the ever-blessed and so utterly English Purcell, put us well in the running for international honours. I was very pleased with the Wireless Chorus. They sang with such attack and dash and merry gusto that listeners in Cologne and Brussels must have agreed with Dr. McEwen that, if English music is to be sung, let it be sung by an English chorus!

January 16th, "Songs round the Camp Fire," soldier songs reminiscent of Waterloo, the South African War, and our little affair in Flanders a few years ago! January 18th, "Mother Goose," from Leeds. January 24th, the "Mikado." Somebody is catering pretty well, don't you think, for everybody?

I am easily surprised, but never was quite so surprised as when I discovered who owned the voice which sang "The Driver of the 8.15" in a recent surprise item. A rousing Weatherly sort of song, a robustious voice slightly shaky in the upper register and a little weary in the final fortissimo—and, when the fog had cleared away, Tommy Handley stood bowing his modest acknowledgments to an astounded world!

**SOME USEFUL REMINDERS.**

If you use a High Tension mains unit for your set, it is a good plan to take the connecting plug out of its socket when this is not in use to prevent inexperienced or unauthorised persons from accidentally switching on.

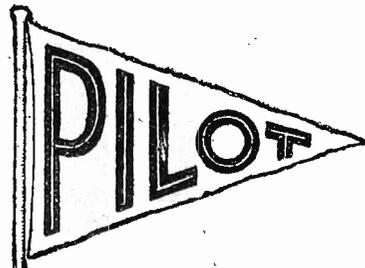
If you are reluctant to throw away an old H.T. battery which has only just started to "go," you will sometimes find it can satisfactorily take over the work of supplying the H.T. positive terminal, its neg. being joined to the H.T. neg. terminal.

When filing a terminal or other piece of metal, remember to hold the work so that the brass dust, etc., falls straight on to the floor or out of the way of all other components.

A good voltmeter enables you to run the set economically and not only indicates when renewal or recharge are necessary, but enables you to check the work of the recharging station.



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1920-1930

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**66 Stations on The "MAGIC" FOUR!**

Read this testimonial just received from a customer who assembled his own set from a PETO SCOTT Kit:—

"I feel I must write and tell you what wonderful results I have obtained with my 'Magic' Four. I only finished it three evenings ago and already I have received a total of 66 stations, the majority of which have come in at fine loud-speaker strength. The tone is excellent and it is certainly the best set I have made yet. Again thanking you for your excellent service, I remain—Yours faithfully, J. D. A. (Ealing)."

**COMPLETE KIT**, including cabinet, panel, valves, and all coils. Cash £13 11 0 or 12 monthly instalments of £1 5 8.  
**FINISHED INSTRUMENT**, in table model cabinet of polished mahogany. Aerial tested and guaranteed. Valves and Royalty included. Cash £15 15 0 or send only 55/-, balance in 11 monthly instalments of 26/-.

**THE "MAGIC" THREE**

**COMPLETE KIT**, including cabinet, panel, coils and valves. Cash £9 8 1, or 12 monthly instalments of 17/3.  
**FINISHED INSTRUMENT**, aerial tested and guaranteed, valves, coils, and Royalty included:  
In Table Model Cabinet. Cash £10 17 6, or send only 37/6 and balance in 11 monthly instalments of 18/-.  
In Oak Console Cabinet with Ultra double linen diaphragm Air Chrome Speaker. Cash £15 15 0, or 55/- down and balance in 12 monthly payments of 26/-.

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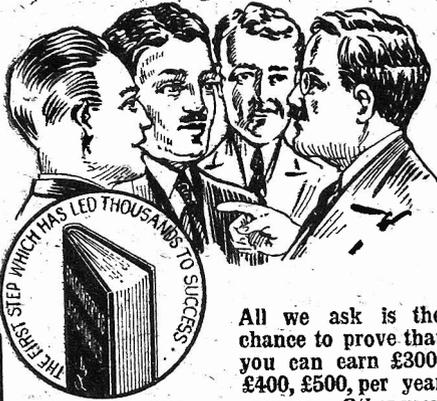
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## TECHNICAL NOTES

### Constant Reaction.

EVERYBODY knows that the reaction setting, using the ordinary type of reaction, will need to be adjusted for different wave-lengths owing to the fact that the regenerative or reaction effect between the grid and anode coils rises with rising frequency, that is with decreasing wave-length of the incoming waves.

It is for this reason that a set which works well on ordinary broadcast wave-lengths may become difficult to control when adjusted for very much shorter wave-lengths.

It is obviously a great convenience if we can arrange reaction so that it requires little or no adjustment over a fairly wide wave-length range and for this reason many experimenters have tried out methods intended to achieve this result. Readers will remember some time back I gave a description of the Loftin-White circuit which was devised by two well-known American radio experts and which, in certain circumstances, gives a reasonably constant reaction-coupling.

### A Simple Method.

A simpler method is one which has recently been introduced by the B.T.H. Company, which consists in making a modification to the anode reaction coil in such a way that its effective inductance diminishes as the frequency is raised.

In actual practice one method of carrying out this system is to connect a resistance and condenser across the anode reaction coil, the values being so chosen in relation to the coil that the coupling between the anode coil and the grid coil is reasonably constant, at any rate, over the desired range of wave-length.

In other words, the characteristics of the anode coil (with this shunt across it) are such that they counterbalance the variation in the coupling due to variation in frequency.

Regarding constant reaction, regular "P.W." readers will remember Mr. Dowding's very simple and quite successful "Conreac" system. The "Conreac" circuits incorporated, in each case, two compression type variable condensers which, once adjusted, gave constant reaction effects over a wide wave-length band.

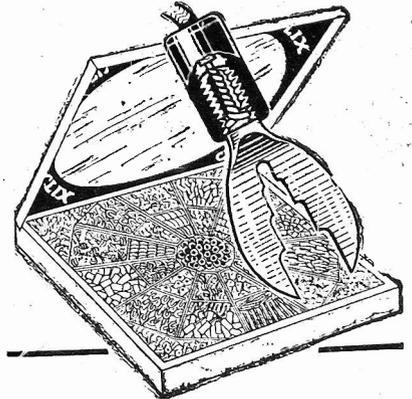
### Wiring a Set.

If you use ordinary tinned copper wire instead of square busbar for wiring up a set, as many constructors do, you will often find it necessary to straighten-out short lengths of wire and, to preserve the appearance of the wiring, these should be entirely free from twists or kinks of any kind. Indeed, almost the only advantage of busbar is its straightness and the appearance which it gives to the finished set.

Perhaps some of you may not know that it is a very simple matter to make ordinary copper wire dead straight. All you have to do is to take the length of wire, secure one end in the vice and, holding the other end in the jaws of a fairly powerful pair of

(Continued on next page.)

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## TECHNICAL NOTES.

(Continued from previous page.)

pliers, give the wire two or three heavy tugs—not sharp jerks but heavy tugs with the weight of the body. You will presently feel a distinct “give” or “flow” of the wire, and the moment this happens you will find that all kinks and bends have completely disappeared and the wire is dead straight.

If it is then laid on a table and the required pieces carefully snipped off you will have these quite as straight as lengths of busbar. If at any time a piece should be badly bent, it is quite a simple matter to straighten it out again by the same process. I should add that the part which has been secured in the vice, and generally also the part which has been held in the jaws of the pliers, will have to be discarded.

### Soldering.

I often receive queries from readers for hints on soldering, and although I have given one or two hints of this kind in the past, I suppose there are always newcomers to radio coming along to “get their hand in” at constructional work.

Soldering, as a matter of fact, if you go the right way about it, is an extremely simple operation, and a nicely soldered job leaves behind it a curious feeling of satisfaction.

Of the metals which you are likely to meet with, the easiest to solder are copper and brass; iron is not quite so easy, although with a little care it is not difficult; if it happens to be tinned iron (commonly called “tin” or tinplate), it is extremely easy to solder, as the surface has already been prepared.

### Some Special Hints.

I have not the space here to give full instructions for soldering in the various cases you are likely to meet with; these have been given more than once in excellent articles on this subject by other contributors to this Journal.

But there are just one or two special points which I should mention. The first point is that a suitable flux is absolutely essential for a successful soldering job. For electrical work it is usually recommended to use either rosin or some soldering paste such as fluxite.

Fluxes of this kind are considered safer than soldering spirit, since they do not cause corrosion of the joint afterwards. Soldering spirit is a very powerful flux and makes for quick and ready soldering, but you must take care that it is not allowed to sputter upon surrounding objects and that the joint is properly cleaned after completion.

The next point is that the parts to be joined should be carefully cleaned; the solder makes a metallic joint between two metal surfaces and, clearly, if there is any non-metallic substance (dirt) intervening, the solder cannot possibly get access to the metal, and so it is impossible to make a joint. Cleanliness is half the battle in successful soldering.

### Proper Temperatures.

A third point is that the soldering iron should be at the correct temperature; many experimenters make the mistake of

(Continued on next page.)



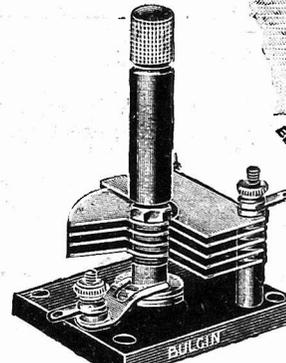
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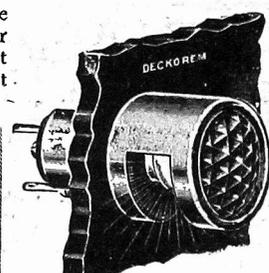
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## TECHNICAL NOTES.

(Continued from previous page.)

having the soldering iron either too cold or too hot. If the iron is too cold the solder will be pasty and it will be quite impossible to get it to flow and make a successful and good-looking joint.

If, on the other hand, the iron is too hot, it will be burned, and the tip, which ought to be clean and silvery, will be oxidised and, in severe cases, covered with "scale." Of the two, I would prefer to have the iron too hot rather than too cold, because if the iron is too hot you can, at any rate, quickly clean the tip with a coarse file and get on with the work. The iron should be heated in a blue gas flame rather than in a coal fire.

When heated in this way it is very easy to tell when the iron is at the right temperature, as the flame will begin to show a greenish-yellow tinge; this tinge should not be allowed to become pronounced. It is much better to give the iron continual slight re-heatings rather than to get it enormously hot and hope to get through with the work before it cools.

An electrical soldering iron is very handy in some cases, but my experience of electrical irons has always been that many of the makers err on the side of safety, with the result that the irons never get really sufficiently hot.

### Condenser Experiments.

Experimenters are continually requiring condensers of various capacities and, although it is often possible to achieve the desired result by means of a variable condenser, at the same time it is cheaper and generally more satisfactory to use fixed condensers; for one thing, when using fixed condensers you know (or you can easily find out) what is the actual capacity you are using, whereas this is not at all easy with a variable condenser, and for another thing the fixed condensers occupy a much smaller space.

If you have a variety of fixed condensers of different capacities on hand, and you want to increase the capacity for a certain purpose, it is a perfectly simple matter to put two or more of these condensers in parallel; the total capacity is then simply equal to the sum of the capacities of the individual condensers.

### Calculating Capacities.

The paralleling of fixed condensers is therefore a perfectly straightforward matter, but if you want to obtain a capacity below the capacity of one of the fixed condensers—that is, in effect, if you want to reduce the capacity of the condenser—you must do it by putting condensers in series.

The calculation of the resultant capacity with condensers joined together in series is not quite so simple as when they are joined together in parallel.

It is not, however, a difficult matter, and all you have to do, when two condensers are placed in series, is to multiply the capacity of the two condensers, then add the two capacities together, and then divide the first result by the second; that is to say, the resultant capacity is equal to the product (that is, the multiplication) of the two capacities divided by the sum (that is, the addition) of the two capacities.

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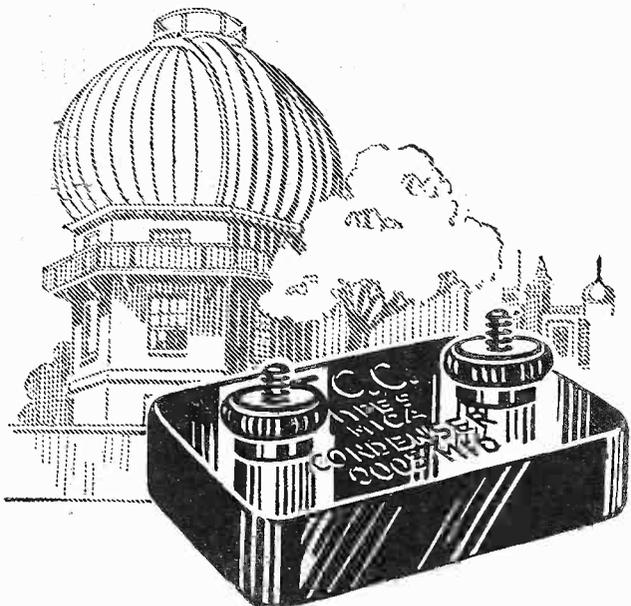
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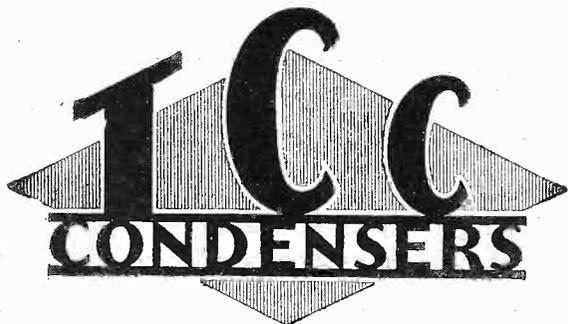
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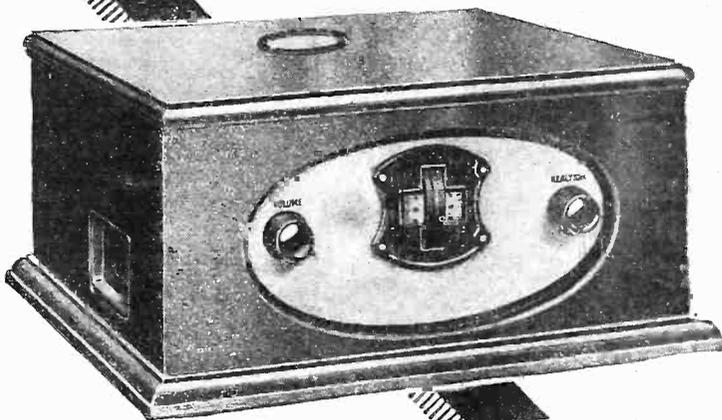
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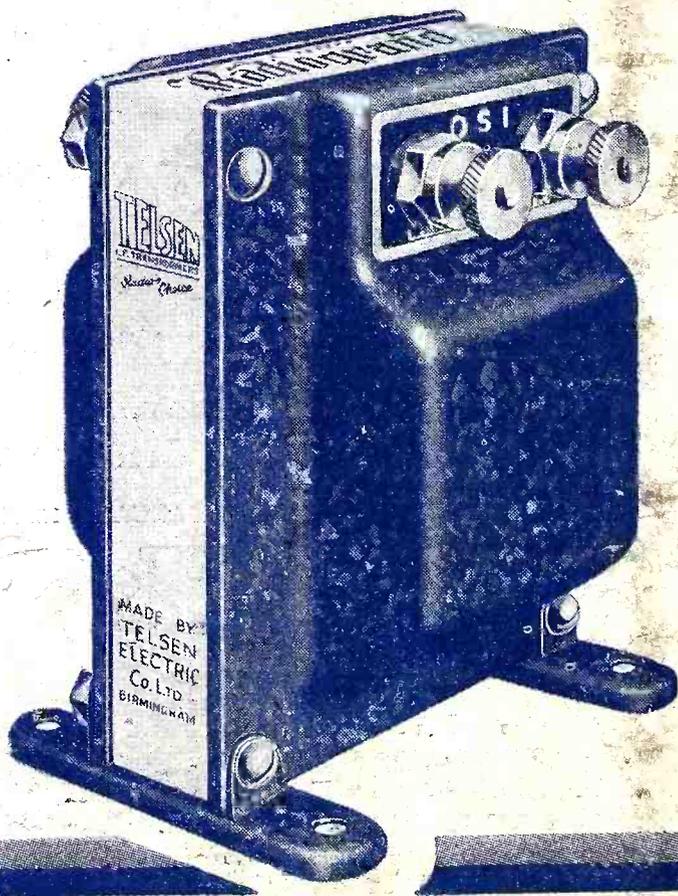
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