

CAN CUT OUT THAT INTERFERENCE (See Page 1166)

Popular Wireless

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No. 402. Vol. XVI.

INCORPORATING "WIRELESS"

February 15th, 1930.



THE "B.P." REJECTOR DE-LUXE

*See
Inside*

OTHER SPECIAL FEATURES THIS WEEK

**RADIO IN AUSTRIA. ADDING VOLUME CONTROLS
SQUEEZING IN STATIONS. By Capt. P. P. Eckersley, M.I.E.E.**

**CHECKING DISTORTION. THE HEART OF THE VALVE
WHY REACTION ALTERS TUNING. LISTENING TO U.S. LOCALS**

PREDOMINANT IN ITS OWN SPHERE

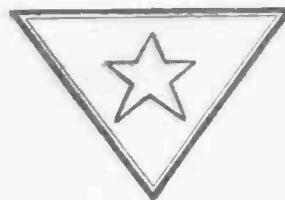


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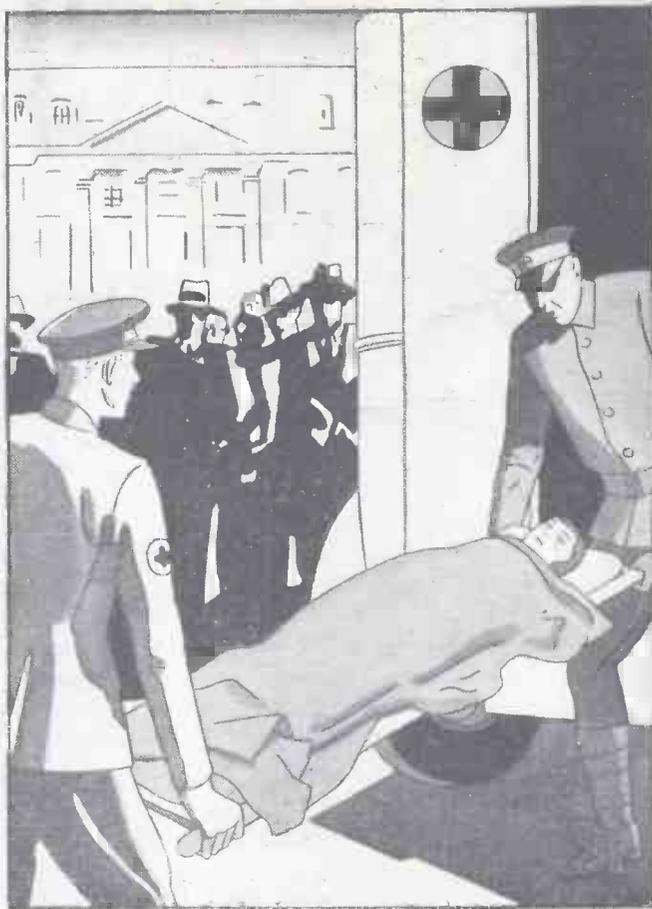
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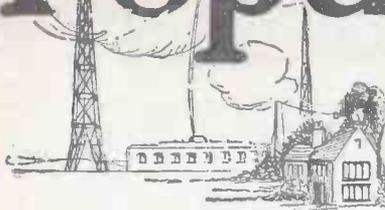
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SAFE-POWER UNITS.
 ZOOLOGICAL NOTE.
 HISTORY AND JUSTICE
 THE FROG'S LEG.

RADIO NOTES & NEWS

FOWL OF TURIN.
 A PITIFUL CASE.
 A CANDY FIDDLE.
 ESS OH ESS.

"P.W.'s" Safe-Power Units.
 GREAT interest has been aroused in our attack on mains unit problems, and the articles by Mr. Dowding and Mr. Kendall on this subject seemed to have been followed very closely by both amateur and trade readers.
 The first unit designed on the new lines will be described in "P.W." very shortly. It will be called "Safe-Power" Junior. Actually it has been built, and is now being tested on different mains in different localities.

The True Virtue of Radio.
 A FEW weeks ago I heard a man I know speak in an inspired manner about the architecture of a church. "I say, Blank," I protested, "where on earth did you get all that?" And he told me that five years ago a radio talk on the subject, of which he was quite ignorant, seemed to strike a responsive string in his mind. As a result, he found that he had a special aptitude for it, and thenceforth a new world opened for him. The virtue of radio lies not in what it tells you, but in what it detects in you.

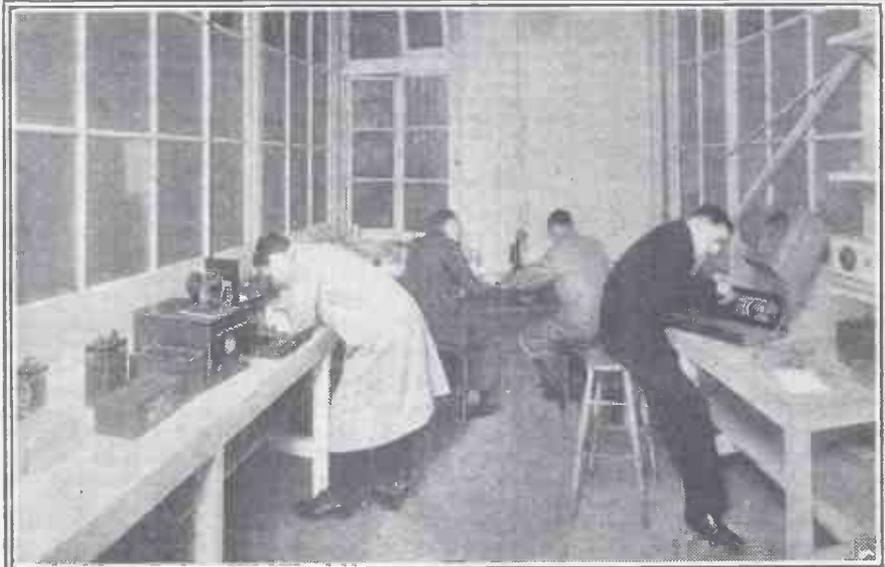
"Made in Germany."
 DOES the old reproach still exist, in spite of the war and the peace? A letter from Mr. Wilhelm Pollman, of Nairobi, advocates the use of a coil unit which employs parallel threaded rods on which the aerial and reaction coils move. He expresses surprise that these are not advertised by English manufacturers, and adds: "I import such from Germany." Elsewhere he states that he has supplied them for years. We thank Mr. W. P. for his letter.

Elementary Knowledge.
"DETECTOR," of the "Bradford Telegraph and Argus," says that an elementary knowledge of insulation is essential to every set owner. He demon-

strates what he means by "elementary," by adding: "Any substance which possesses the power to offer resistance to the passage of an electric current is termed an insulator." My goodness! it's a wonder my set works at all, considering how it is connected up with all those wires, with their resistance and whatnot! And just fancy how the "insulator" glows in a valve! I wonder what these "conductors" are we hear about!

Restraint of Trade?
FROM here, there, and everywhere one is constantly learning of attacks on loud speakers by borough councils. A bye-law prohibiting the broadcasting of radio programmes from shops is born every week. Is it really such a nuisance? Has

"P.W.'S" NEW ANNEXE.



You fellows keep writing to us to provide more "Magic," hotter hook-ups, selectivity like razor-blades, etc., and the upshot of it all is that "P.W." has had to expand its premises. Here is a new annex to our Research and Construction Department, where a fine crop of new designs is now under intensive cultivation.

anybody ever fainted because he heard an L.S. in full blast as he passed a shop? My experience has been that the other street noises have almost drowned the L.S. Doubtless there are isolated instances justifying complaint, but I consider that the anti-L.S. stunt is being overworked. As an example of well-balanced mentality observe that a member of a certain County Council has said that one complaint alone is sufficient to justify the making of a bye-law!

The Craze for Speed.
 A RARE piece of unconscious humour by the "Stockport Express." "Recent experiments with anti-motor-boating devices suggest that a 4 m.p.h. condenser is greatly preferable to the 2 m.f.d. usually employed."

This is simply "speeding." I suppose the next thing will be the suggestion that high-speed motor-boat condensers ought to be fitted with a vacuum brake to each microfarad, and even then should not be used on the broadcasting band. It is, however, better to stick to a safe 2 mfd. per hour and to use an outboard engine. Enough! Readers of "Pentode's" articles will see through my little jest.

Simple Explanation.
IN return for his letter I will present G. W. (Stockport) with a bit of information. A local schoolboy, writing about radio for his Christmas holiday task, announced: "If you want to shorten the wave-length you just increase its frequency. This is done by increasing the velocity of the ether and reducing the distance." This chap will soon be ready to write for the Sunday papers! By the way, G. W. (and others who have eyes on a Valve Bartship) might note that this title is earned by quality rather than by quantity. It is not the big list but the skilful capture of a rare fish that wins.

Zoological Note.
AS I squat, meditative, in my inky niche, pondering on the joke of life and the scandalous price of tobacco, news strange and varied tumbles in from all parts of the world. One unknown—yet how I know him!—Arielite feels that I ought to know that his sister's Pomeranian dog sleeps on his 180-volt H.T. battery. Tie it to a stick and dust the inside of your set. This man says that he has read "P.W." for "munce an' munce." Pity we have not
 (Continued on next page.)

NOTES AND NEWS.

(Continued from previous page.)

taught him to spell better. He means munson muntz! See how infectious humour is!

A Matter of History.

A. F. (Amsterdam), as befits a proud Netherlander, writes to contradict the statement made in "P.W.," January 18th, that the Leyden jar was invented by Cureus. He says that the credit is due to P. van Musschenbroek. Always 'anxious to run the truth to earth, I began to search many books and, oh dear! how hard it is to be sure of one's facts. Most of my books contented themselves by saying that the Leyden jar was invented at Leyden. Silly asses! Others mentioned Cureus only. Only one threw any light on the matter, and its story is worth repeating.

A Matter of Justice.

"ELEMENTARY Lessons in Electricity and Magnetism," by Professor Silvanus Thompson. 2nd Edition, 1902; page 73. "The discovery . . . arose from the attempt of Musschenbroek and his pupil Cureus to collect the supposed electric 'fluid' in a bottle half-filled with water, which was held in the hand and was provided with a nail to lead the 'fluid' down through the cork to the water. . . . Here the water served as an inner coating and the hand as an outer coating to the jar. Cureus, on touching the nail, received a shock." How plain it is! Cureus was actively helping. Cureus was the man who touched the nail and got paid out for doing so. Surely, if any man discovered the blessed thing, it was Cureus! I'll bet he thought he had discovered a mule's hind leg!

Frog's Leg Precedes Cat's-Whisker.

BEFORE closing Thompson's book I turned to see what he said about wireless. The only name mentioned in connection with its application to signalling is that of Sir O. Lodge, and I was surprised to see the attribution of the filings coherer detector to that scientist. I thought his detector involved a film of oil on mercury. In the year that this edition was printed the Marconi Co. was five years old. The only other detector mentioned by Thompson, besides the well-known tiny spark-gap, is "a prepared frog's leg."

The Biggest Broadcast.

NOT its severest critic could justly accuse the B.B.C. of inability to organise well. Their success in connection with the King's Speech was wonderful, some 270 to 280 stations rebroadcasting the original emission. One is rather inclined to wonder whether the King's voice or the substance of what he said was the major attraction, though I think I know the right answer. However, the point I want to emphasise is that if after thinking over every aspect of that broadcast, the Government don't hustle along with a big Empire station—then they are Devolutionists.

The Fowl of Turin.

THIS songster is fast becoming a tradition, and will in time no doubt be a myth. I notice in a contemporary a reference to the doubt expressed in the Irish press as to whether "the canary interval call from the Turin station is produced by a

real bird." No, Patrick, the nightingale is made of plaster! If this should meet the eye of the Turin station's Chief of Aviary perhaps he will be kind enough to ease all minds' on this subject, though if he is a business man he will foster the mystery.

Opportunity Knocking.

THOSE wondering "what to do with our boys" may be interested to know that the Royal Air Force has vacancies for 600 aircraft apprentices. Application should be made to the R.A.F. (Aircraft Apprentices' Dept.), Gwydyr House, Whitehall, London, S.W.1. The boys must be between 15 and 17 years old, and must enter competitively. The entrants are well-trained, and amongst other trades taught is that of wireless operator-mechanic.

SHORT WAVES.

WE DON'T KNOW.

A correspondent writes and asks us to find out if the expensive "star" programmes provided by the B.B.C. during radio week caused that institution to break into the ten shillings he paid for his licence.—"Vox."

Mother: "Johnny, how many times have I told you not to turn on the radio while father is trying to have his after-dinner sleep?"

Johnny: "Well, Mother, to be precise—eight!"

Struck by the fact that nearly every member of the engineering staff at a certain B.B.C. station was wearing spats, a visitor made some comment.

He was told: "A lot of wiring work is being done in the control room, necessitating frequent use of the soldering iron. The spats perform the useful function of keeping the solder off the engineers' shoes."—"News of the World."

So that's what we pay 10s. a year for!

SOME "HOWLERS."

Ether is a soothing smell that fills all space when you empty it.

Broadcasting programmes were invented by Marconi in a valve set, thus being made a sennatter in Italy, which is the same as a conservative at home.

Electric currents are what take place in wires. They are measured in hampers and shock you if you touch it. This is known as high voltage.

"Now, Tommy, let's see if you can count up to ten."

"No, Father, but I can tell you the wavelengths of all the European wireless stations."—"Review of Reviews."

A correspondent writes to ask if we can give him a good description of a Wipe Out.

Well, the best one we know so far is: "Good-night, everybody. Good-night."

Horrible Warning.

A GOOD deal of sympathy has been expressed for A. J. W. B., not because of his being short of an issue of "P.W." for the reasons already stated, but because he lacked the information he needed for making the "Magic" Three. W. G. T. G. (Bristol) kindly offers to send him the circuit diagram, etc. We thank him—but the fairies, of which "Ariel" is the boss, have already most appropriately produced what was wanted in the way of "Magic." A narrow escape, A. J. W. B.

A Pitiful Case.

THIS sad occurrence has brought a note from a much more pity-worthy person, one who lent the "Magic" copy of "P.W." to a friend who lost it. He appeals to me for more magic. Sorry! As I said, it works only once a century. Perhaps W.G.T.G. would be good enough to help E. Burgoyne (Umberley, N. Devon). By the way, the fairies have received no

acknowledgement from A. J. W. B. Hope the mailbag wasn't stolen!

Performing Fuses.

MY note about the fuses which make signals of various kinds to indicate their location, has elicited a letter from a Leicester man, who quite rightly points out that such fuses have been used in this country for a long time. The secret of their performance is simple. The wire is passed through a piece of fibre; at one end is a spring on which a coloured bead is mounted, and at the other end is another piece of spring, both being held under tension by the fuse wire. When the fuse "blows" the springs are released, the bead waggles furiously, and the other spring "makes" a circuit, operates a relay, and thus makes a signal by bell, lamp, or other suitable device.

A Candy Fiddle.

A PERUSAL of the American press invariably brings to light some novelty, not always of beauty or utility, but certainly always evidence that the stream of thought "over there" does not flow in the time-worn channels. I have just seen a photograph of a violin, presented to Mr. Max Donlin, which is made of sugar, except as to the chin rest and neck—and, I presume, the strings. It is stated that this instrument is often heard in the studios, and one wonders greatly how it sounds.

Ess Oh Ess.

IF this should meet the eye of Mr. Stanley W. Forsythe, or any friend of his, we should be glad if he would note that Mr. T. Burns, Cairo City Police, Muski Caracol, Cairo, is anxious to have a sketch of the set which was described by the first-mentioned in "P.W." last April, and would probably be glad to correspond about it. (Unfortunately, we have not the required address, T. B.)

The Simplest Set.

WHILST looking through the transactions of the Edinburgh and District Radio Society—always a pleasure, because they are so excellently produced—I noticed a "crystal" circuit which consisted of aerial, telephones, and earth. It is said that good reception was obtained with this just under a mile from the station. One tag of the 'phones is clamped under the "earth" terminal, and the other is laid lightly upon the "aerial" terminal. This news will no doubt make crystal die-hards dizzy with delight and curiosity. The first of them to get 7 L O on a similar circuit will be crowned King of Carborundum.

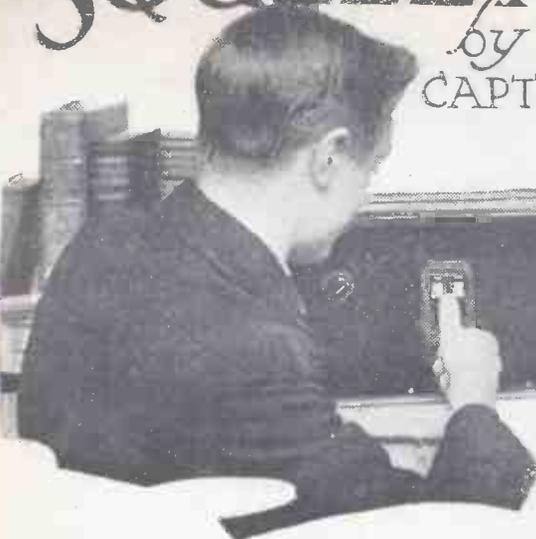
The Latest "Craze."

JUDGING from my reading in the Sunday press the "experts" appear to imagine that the father of selectivity was Brookmans Park. Hark to the scandalised innocence of "—s." "There is another craze, started by the Brookmans Park alternative programme, called selectivity." As Sir O. Lodge was laying the foundations of this new-fangled process about the year Dot, one must assume that it has been re-discovered by Fleet St., or the environs thereof. Our old friend of "—s" suggests that so long as selectivity is confined to shortening the aerial or putting a condenser in series with it, no harm will be done. Murder!

ARIEL.

SQUEEZING IN STATIONS

by
CAPT. P. P. ECKERSLEY M.I.E.E.



Our Radio Consultant-in-Chief has something to say about frequency modulation and other schemes which are claimed to provide solutions to the problem of finding more ether room for new radio stations. Captain Eckersley seems to be particularly happy with this subject, and we are sure readers will find this article, the first of two, especially readable and informative.

MILLIONS more stations! Frequency modulations! The dear old subject cropping up year after year! Is it possible? Is it—?!!

From time to time one reads that an inventor has solved the greatest problem in wireless; he has solved the problem of how to contain ten times as many stations in the ether than, on the basis of known technique, can be contained to-day.

I am perfectly sure that if anyone can and does solve this problem he will deserve the world's thanks (not mine, because he will put a stop to a tremendous number

I can hardly tell you what it will all mean, it's so lovely. I can't stop—just think, all sorts of people can solemnly sign protocols promising to keep their stations on an allotted wave-length and yet no one will notice (as we unfortunately must to-day without this invention) that they make not the slightest effort to do what they have promised.

The invention will sanction that glorious individuality of action which one admires so much but which, in so many cases, benefits practically nothing but the egotism of the individual. But I must stop, because I'm sure you will see that there will be very great benefits indeed conferred upon broadcasting when we can squeeze more stations in the omnipresent ether—God bless us all!

But Here's the Snag.

Now here is the problem, quite a simple one to state but terribly difficult to solve. I have set out in Fig. 1 a horizontal line and divided it up into frequencies and wave-lengths. I have drawn all the frequencies we use, from 30,000,000 (10 metres wave-length), up to 10,000 (30,000 metres wave-length).

Now we use wireless for communication, not just to keep a few amps. in the aerial quite steady. For communication by Morse we put energy into the aerial for a relatively short or long interval, and so make the dots and dashes of the Morse code.

Those Side-Bands.

For communication by speech we modulate the intensity of the waves in sympathy with the intensity of the sound of the speech. (This is done through a microphone which converts instantaneous speech energy into instantaneously electrical energy which, after amplification, modulates the intensity of energy instantaneously radiated by the aerial).

Without going into details, it can be proved mathematically as it can be demonstrated practically at any moment, that modulating the intensity of the transmitting aerial currents of a single high-frequency by disturbances of another lower-frequency produces other high-frequencies.

Thus, if we transmit with a carrier-wave frequency of a million a second and modulate this by the frequency of a note of a violin

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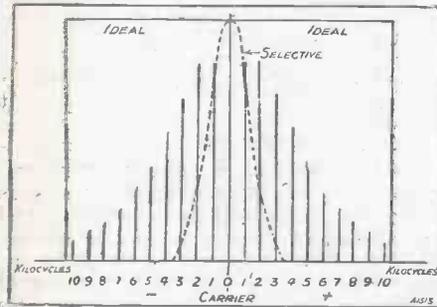


Fig. 2. The dotted line shows an ultra-selective receiver cutting out upper side-bands. The full line shows an ideal receiver response curve.

of my trips to the continent!). There will be no need for anything like so many world or continental conferences, we shall each have ten more programmes to choose from, we shall be able to speed up messages, we shall— Oh, we shall have a lovely time!

“It's So Lovely—!”

Even the military services will have enough waves to play with, and well-known Governmental stations will be able to fit in all their harmonics without disturbing innocent listeners. Ships will continue to be able to call each other with apparatus that was obsolete ten years ago, France can continue to occupy the unique position of having two long-wave broadcasting stations, while her official representatives at conferences condemn their use at all.

ROOM FOR 2999 STATIONS!

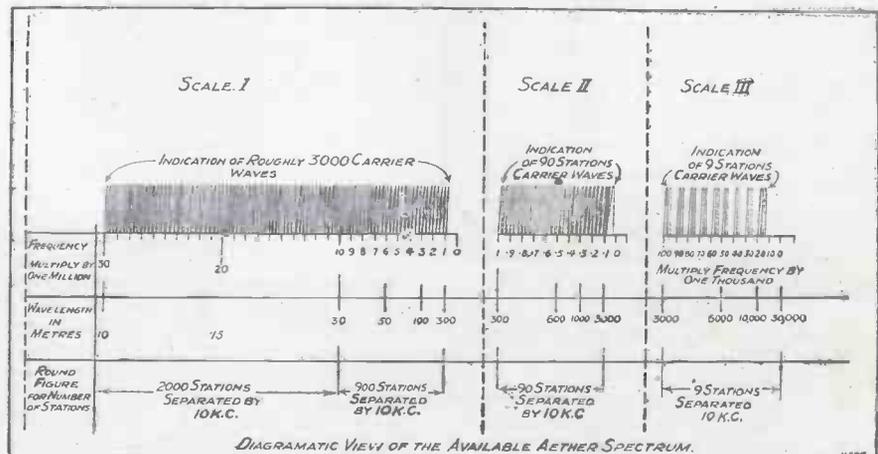


Fig. 1. As you will see, 2,000 stations can be accommodated between 10 and 30 metres and only 9 between 3,000 and 30,000 metres when a separation of 10 kc. is provided.

WHY REACTION ALTERS TUNING.

A curious effect explained.
By E. J. MEREDITH.

I EXPECT most of you frequently get irritated at the effect which reaction has on tuning, especially when you are trying to bring in some weak distant station. You have probably manipulated the tuning dial very carefully, having already applied a certain amount of reaction, and then in order to increase the volume slightly, you have used more reaction.

Readjustment Necessary.

You have noticed that immediately you make this alteration in setting, in order to take full advantage of the additional reaction, it has been necessary for you to re-adjust the tuning dial. Then, again, you have added a little more reaction and have had to make yet another alteration in the tuning setting.

With a very critical adjustment of tuning, this can be very annoying, especially when, as I have already said, this change in tuning takes place on a distant station, which more likely than not is fading at intervals.

This alteration in tuning does not matter so much when the set is a large one, because in those circumstances there is a fair amount of available signal strength and the variation is not so noticeable.

If the set, however, is a one- or two-valver, without any H.F. amplification, and relying solely upon the intelligent application of reaction for its sensitivity, then one is apt to consider this constant readjustment of the tuning rather a nuisance.

Short-wave Difficulties.

The effect is more pronounced as the frequency increases, that is to say, as the wave-length gets lower. On the very short waves, this alteration in tuning is a serious

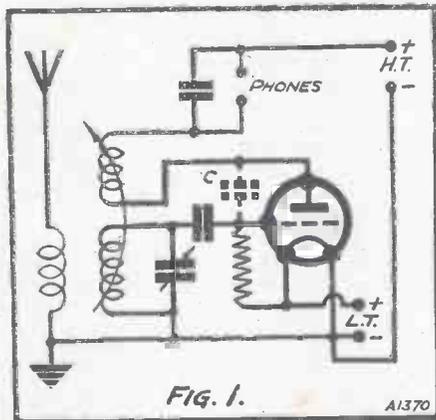


Fig. 1. The anode and grid of the valve form a small condenser, as shown by the dotted lines.

disadvantage, and many attempts have been made, with varying degrees of success, to overcome it.

Some of you may not have attempted any real short-wave reception. For the benefit of such listeners, I will state that tuning on 30 or 40 metres is extremely critical, and that most of the reception is carried out

with the set very near the oscillation point. In fact, it is doubtful whether many distant short-wave transmissions would be received without the use of a large amount of reaction.

It is interesting to see why this alteration in tuning occurs when reaction is applied. Take the case of the circuit shown in Fig. 1. This is a conventional arrangement in which a reaction coil of the "flip-flop" type is coupled magnetically to a tuning coil.

Reaction is applied by moving one coil nearer to the other. The reaction coil itself has a certain amount of distributed capacity or self-capacity, and the anode and grid of the valve has a definite capacity value, which I have shown as a small condenser marked (C).

Now the grid end of the secondary winding is coupled through this small capacity, through the reaction coil, via the 'phones, condenser and H.T. batteries, back to the earth end of the tuned circuit. Therefore, you have a number of small condensers in series which are virtually connected in parallel with the secondary winding.

The Reinartz Circuit.

When you bring the reaction coil nearer to the tuned circuit, you alter to some extent this small capacity and also the inductance of the tuning coil. You, thus, alter the tuning to a small degree.

On the long wave-lengths, this makes very little difference, but on the short waves the variation is marked, and may be two degrees on the tuning dial.

Next, take the case of the Reinartz reaction circuit shown in Fig. 2. Here, again, you have the small grid to anode capacity in series with the reaction condenser, and through the reaction winding, which is fixed, back to the earth side of the tuned circuit. Thus, you have a small capacity in parallel with the tuning condenser, and every time you alter the reaction condenser you also alter the value.

In practice, Reinartz reaction does not have so much effect upon tuning as magnetic reaction, possibly because the reaction control itself has such a small value—about .0005 to .0001 mfd.

A Better Method.

These days the differential method of reaction control as used in the "Magic" Three is becoming popular. One of the advantages is that the alteration in tuning with reaction adjustment is very small, and it is distinctly better from this point of view than the magnetic and conventional "Reinartz" schemes.

Several attempts have been made to reduce the effect on the short waves. In one case the grid condenser is chosen to have a small value and an additional small capacity, such as a "neutralising" condenser, is joined from the grid side of the grid condenser to L.T. negative. While this scheme is to some extent satisfactory, there is often a decrease in volume which is a disadvantage.

SQUEEZING IN STATIONS.

(Continued from previous page.)

(say 500 vibrations a second), then we radiate from the transmitting aerial not only the vibrations of 1,000,000 a second, but also vibrations of 1,000,000 + 500, and 1,000,000 - 500.

This is to say that as 1,000,000 vibrations means a wave-length of 300 metres we radiate disturbances, when we modulate the carrier-wave intensity by a note of 500 of 300.1 (about) and 299.9 (about) and 300. But we have to modulate up to 5,000 vibrations a second in broadcasting to get true quality, and so we radiate in this case 1,000,000 (300 metres wave-length) 1,000,000 + 5,000 (298 metres wave-length about), and 1,000,000 - 5,000 (302 wave-length about).

A Definite Limitation.

So that every modulated station sends out side-bands as they are called, meaning transmissions on wave-lengths near the carrier-wave wave-length, and we can draw a picture, as in Fig. 2, of a station with its side-bands photographed, as it were, instantaneously during modulation.

Now the side-bands sent out by different kinds of stations are of different widths. Thus a high speed telegraph station wants a spectrum +2,000 cycles wide about, broadcasting station +10,000 cycles, a television station for decent quality wants +100,000 cycles, and so on.

So if we turn to Fig. 1 again and show vertical lines as stations we see that (supposing to simplify the problem we can separate every station by not less than 10,000 cycles - 10 kilocycles) we have a limited number of stations we can possibly fit in the ether, otherwise the side-bands will overlap.

Where There Are Fallacies.

Now, if we had an ultra selective receiver, as in Fig. 2, which had a response curve, as shown, and we moved this response curve by tuning over the top of the spectrum of a typical broadcasting station we see at once that this receiver will not receive all the side-bands and we get only the bass notes.

It is no good in this connection saying that we will make the bass notes strong in the high-frequency spectrum, but then amplify the high-frequency notes afterwards in the low-frequency and so level it all up because, as a reductio ad absurdum, if the high-frequency response curve is narrow enough it would not get any high-frequency side-bands, and you cannot amplify anything. If you do in your high-frequency system reduce the outer side-bands to something very small but make them strong again in a low-frequency system, the receiver response curve is just the same.

In fact, it would seem as if you must have side-bands, and if you must have them you must amplify them, and so you must separate stations by a given amount. The subject, however, is of great interest because one can carry the discussion further and show how some people have argued differently and where, in my opinion, their fallacies lie. This I will do next week.

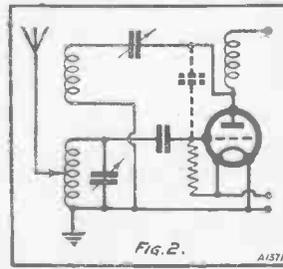


Fig. 2. This is a Reinartz reaction circuit.

LISTENING TO U.S. LOCALS



Have you ever heard the announcement from a famous American station, such as W G Y, K D K A, or W E A F? And have you wondered what it's like to be a listener "over there"? In any case, you will enjoy this inside account of broadcasting in the U.S.A., which reveals that for all its advertising stunts and "tell-the-world" tactics, there is an amazing similarity between the American system and our own.

By T. B. SANDERS
("P.W." Technical Staff).

RECENTLY I went to the United States. I lived for a time in New York, and became for a few brief weeks a local listener to—not my usual 2 LO, but W E A F. Like most of my fellow-countrymen who return from a visit to the land of "bigger and better" things, I have come home obsessed with an overwhelming conviction that my visit has peculiarly fitted me to speak with unquestioned authority on all things American.

That "Congestion" Myth.

A credulous British public seems to be able to put up with this sort of thing, and so I am hopeful that readers of POPULAR WIRELESS will find some entertainment in learning of some of my experiences in America, especially as we have been promised a regular interchange of programmes between England and America in the near future.

It is popularly supposed on this side of the Atlantic that, whenever the American listener switches on his "radio," his loud speaker immediately greets him with a vociferous babel of music, talks, running commentaries, advertising, etc., each emanating individually from a miscellany of closely adjacent broadcasting stations, the separation of which is entirely beyond the capabilities of the listener's set.

Speaking purely as an ordinary listener, I never found the congestion of the American ether at any time sufficiently troublesome to prevent me from listening to what I wanted to hear when I wanted to hear it. Neither was mine a set of super-selectivity.

One could, in point of fact, be perfectly happy in a Park Avenue apartment with a "Magic" Three, and there was, I noticed, at least one very representative British portable being featured by a New York store and selling well.

The Advertising Side.

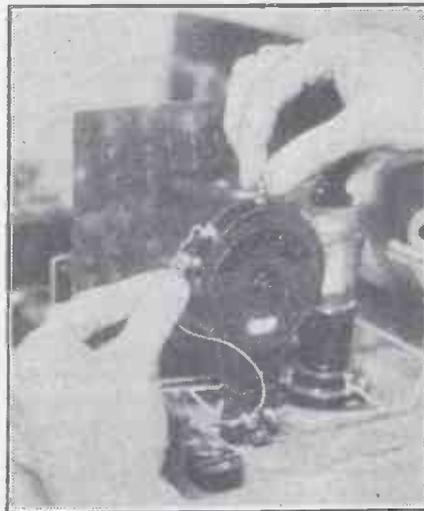
This is all the more surprising because there were, I was told, more than forty broadcasting stations in New York State alone. But the majority of them are privately owned by commercial and social organisations of various sorts, each with something "to tell the world."

Their propaganda is of a very specialised nature, and appeals only to a limited number of listeners. The stations whose broadcasts are of more general interest

operate on the principle that "if you want to be heard, you've got to speak up" and there are stations fairly evenly distributed throughout the country working with an aerial power of 50 kw.

One has to have only the temerity to mention American broadcasting to an ardent B.B.C. listener to be met with a look of insufferable scorn and the remark, "But they advertise!" And so they do. And it *does*, in my opinion, detract from the entertainment value of the programme. But not, I think, to the extent that is popularly supposed to be the case over

"EVERYBODY'S DOING IT!"



One good means of obtaining extra selectivity is to use an X-coil or other arrangement of tappings, adjusting the aerial lead until the best position for it is found.

here. The American broadcast advertisement is purely indirect.

A typical programme commences with an announcement something like this: "Each week at this hour, ladies and gentlemen, it is our pleasure to present to you the Hometown Repertory Players, who are sponsored by Hometown Accessories Incorporated, makers of fittings of distinction for your motor-car. This week the players have chosen for your entertainment a presentation of—"

The programme proceeds, usually for an hour, without further advertising interrup-

tion until its conclusion, when the announcer will say: "That, ladies and gentlemen, concludes the Hometown Repertory Players' contribution to this evening's programme, which has come to you by courtesy of Hometown Accessories Incorporated, makers of fittings of distinction for your motor-car."

Literally dozens of stations will be taking such a programme at one time from the N.B.C. network, and it is often quite impossible to know for certain to what station you are listening. To overcome this difficulty a system of station-identification is adopted which never failed to impress me with its superlative technical excellence.

Wonderful Precision.

Every quarter of an hour the studio announcer interrupts his programme to say, "There will now be a brief pause for station announcements." And, without a fraction of a second's loss of time, each transmitter is connected to its own studio and, almost before the last syllable of the word "announcements" has been spoken, a fresh voice says, "This is W B Z B, located at ——. Our programme continues from New York." To me, the faultless precision with which this procedure was invariably carried out was as beautiful as a symphony concert.

A noticeable feature of the majority of stations to which I listened was the absence of a news bulletin. There appears to be no regular broadcasting of news in the manner of the B.B.C. When, however, any event of world-wide importance is occupying the public's attention—such as, for instance, the recent flights of the Graf Zeppelin—programmes are interrupted immediately on receipt of any fresh news concerning the event, and an announcement is made to the listener with very great dramatic emphasis indeed.

I found the experience of listening in America very refreshing and vastly entertaining, but I do not know that I was impressed to the extent of wishing for any change in our own system.

The effect of advertising is, I feel sure, to over-emphasise the need for "popular appeal" in the programmes, so that they become very generalised in their scope. Still, the radio industry in America is stated to be the third largest in the country, so apparently the American listener is satisfied.

“ ALL ROUND THE DIAL. ”

A few words regarding the new high-power stations in general and the success of the “ P.W. ” “ Brookmans ” Rejector in particular.

By THE EDITOR.

ACCORDING to a “ Daily Mail ” wireless correspondent, “ London comes in all round the dial. ” This, says the “ Daily Mail, ” is the complaint from “ hundreds of thousands of wireless listeners in northern London, and is the first obvious effect of the new twin-wave broadcast test transmissions from Brookmans Park. ”

“ Millions of listeners are encountering the same difficulty, ” goes on the “ Daily Mail, ” “ as the scheme develops to include the whole country. Next on the list, for instance, will be the industrial North, which will have to face the same problem by this time next year. Scotland and the south-west of England will follow later, and the Midlands will be served by the existing 5 G B and 5 X X. ”

“ The Real Solution. . . ! ”

The wireless correspondent of the “ Morning Post ” says: “ On every side one hears complaints that when the two transmitters at the Brookmans Park station are broadcasting together it is not possible to receive one of the programmes clear of the other. ”

He then goes on to state that the real solution is a two-circuit filter, i.e. two coils tuned by a two-gang condenser, which will therefore not be difficult to tune.

“ With a cheap two-circuit filter it is possible to receive one station free from the other at distances of a few miles, with a large aerial; and, of course, the ability of the set to bring in distant stations is not affected. This is the real solution of the problem. In due course sets will be fitted with tuners of this type, or else will have high-frequency stages in themselves sufficiently selective. ”

With regard to the “ Daily Mail ” quotation, we doubt very much whether “ hundreds of thousands ” of wireless listeners in northern London are complaining, because we know from correspondence we have received that many thousands of them have built the “ Brookmans ” Rejector, and we are certainly convinced that the two-circuit filter recommended by the “ Morning Post ” correspondent is by no means the real solution.

The Famous “ P.W. ” Rejector.

The real solution, we maintain, is the “ Brookmans ” Rejector, of which Captain Eckersley wrote, after he had tested it: “ I was certainly struck with the ingenious design of the ‘ Brookmans ’ Rejector circuit, because this method would appear to give the most efficient performance I have ever come across. ”

We have published from time to time examples of letters we are receiving from one source or another concerning this now-famous Rejector. Many hundreds which we have received, we have not found room to publish, but we think we need not stress the point to our existing readers when we say that this Rejector has been a great

boon to many thousands who have suffered from the effect of the twin-wave transmissions.

We are always pleased, however, to receive critical letters from our readers concerning the various devices which we describe in this journal, and we were especially interested in a letter received the other day from Mr. Hennequin, of Seven Kings, Essex.

Mr. Hennequin refers to an article in which we stated that the 261-metre wave does not need such effective elimination

THE “ BROOKMANS ” REJECTOR.

Just one of the many appreciative letters we have received:

The Editor, POPULAR WIRELESS.

Dear Sir,—I feel I must write a few words of congratulation on your “ Brookmans ” Rejector. At first I thought it was just a bit of journalistic “ bluff. ” With the feeling of being had for a “ mug ” again, I bought a couple of the condensers and fixed it up roughly, and thinking there must be many more unfortunates in my position, may I give you my experience for their benefit.

I have a four-valve portable (1 S.G.) which, when the H.T. battery drops to under 100 volts, I use with a 40-ft. indoor aerial and an indifferent earth connection to a gas pipe. I am a quarter of a mile away from the local station, and a thoughtful Corporation has laid the tramway lines outside my front door, so that they point to Daventry, so you can imagine what I pick up when I turn my frame aerial to 5 X X; and when I want France or Germany I am pointing exactly at the local transmitter.

My set being a good one, I have plenty of foreign station reception, but your Rejector has given me all those stations lying between 2 L O and Rome, which I have wanted for some time and which I have never had before, except when the B.B.C. gives us a breather on Sunday afternoons.

I find not the slightest diminution in volume of stations previously received, and altogether it is a violent success. Much to my delight I listened for some time to Algiers for the first time, a few days ago.

Good luck to “ P.W. ” if it helps us in this way.

Yours faithfully,
C. STONE.

Bournemouth.

as the 356-metre one. Mr. Hennequin holds the opinion that a great many people in various districts are going to find the 261-metre wave three times as hard to eliminate as the 356-metre one.

This certainly seems to be Mr. Hennequin’s own experience, and the experience of several of his friends. In the course of his letter he says that some months ago, “ being bored stiff with deadly dull Sunday programmes, ” he spent a good deal of money in building a receiver (described in our contemporary, “ Modern Wireless ”) in the hope of obtaining more varied entertainment from abroad.

“ This set was a perfect joy to handle, until the 356-metre wave was transmitted from Brookmans Park, ” continues Mr. Hennequin. He then found that several stations for about 15 degrees each side of the dial reading were wiped out.

“ However, your ‘ Brookmans ’ Rejector came to the rescue, ” says Mr. Hennequin, “ and I congratulate you on the efficiency

of it. This was at my home in Seven Kings, which I suppose is about twelve or fourteen miles from Brookmans Park. ”

Mr. Hennequin goes on to say that if the 261-metre transmission is tuned in, it swamps out everything from 0 to 50 degrees. He admits he has not tried the set with the original Rejector yet, as he does not care to upset that setting now it is working on 356 metres, but he is certain that the 261 wave is coming in at two or three times the strength of the other.

“ To get rid of the 356 wave, ” says Mr. Hennequin, “ is easy, but 261 is the deuce of a job. It is no good throwing the old brick about the set’s not being selective enough, because the ‘ Forte ’ Five (Mr. Hennequin’s ‘ Modern Wireless ’ set), with the original ‘ Brookmans ’ Rejector in circuit, has tuned in 56 stations on the loud speaker, ” whilst two portable sets Mr. Hennequin has used have been able to cut out the 356 wave without a rejector in two degrees either way on the dial.

Help from Our Readers.

Mr. Hennequin ends his letter by congratulating us on the help we have given with the “ Brookmans ” Rejector, but appears to be very annoyed, judging by his concluding paragraph, which runs:

“ The action of the B.B.C. in monopolising the ether to force their dull and boring programmes down the throats of millions of people is an outrage on the British public. ”

Well, we shall be very pleased to hear from other readers who agree with Mr. Hennequin, or who happen to disagree with him. It is by detailed letters of this nature that we are able to work with more confidence of success on the job of helping our readers in every possible way.

Finally, in regard to the 261-metre transmitter, we would suggest that Mr. Hennequin give the Twin Rejector a thorough trial.

The “ Daily Mail ” correspondent, in one of his articles, says that wave-traps, when adjusted properly, will cut out the unwanted station, and a condenser in the aerial will do the rest. We doubt it! It is not every wave-trap that will do this, and the majority of our readers who have had experience of wave-traps seem to confirm the report that the ordinary standard wave-trap is not likely to prove satisfactory. The best solution of the problem, we maintain, is the “ Brookmans ” Rejector.

The “ Morning Post ” wireless correspondent, in another article, says, in reference to wave-traps, that relief “ unfortunately cannot be guaranteed. ”

Not a Wave-trap.

“ Sometimes a wave-trap will be of great assistance in removing the interfering station, but the best all-round results may be obtained by using it not for the purpose of rejecting a single station, but as an extra tuning circuit, connected to the set. ”

As we have pointed out before, the “ Brookmans ” Rejector comes hardly under the category of a wave-trap. It is a rejector circuit specially designed by the POPULAR WIRELESS Research Department for the express purpose of meeting the difficulty caused by the twin-wave transmissions. And if you are in difficulty, the best solution of all is the “ Brookmans ” Rejector.

ADDING VOLUME CONTROLS

By A. JOHNSON-RANDALL.

There are more methods than one of controlling the volume from your loud speaker. In this article the correct schemes for various cases are discussed and the necessary alterations are described.

WITH any good loud-speaker receiver a volume control of some sort is almost a necessity. In many sets in order to retain simplicity and to keep down the cost a strength control is omitted. In such cases it is usual to detune the receiver slightly if the local station is too strong. Now such a scheme has its disadvantages; for instance, with the present crowded state of the ether there is a danger of running into another transmission, with the result that a second programme is superimposed upon the one which is being received.

For example, it is very difficult to detune the London station even ever so slightly, without picking up one of the many Continental transmissions. Thus it is highly desirable that one should have some form of volume control which does not interfere with the selectivity, and which, moreover, does not introduce distortion in any degree.

H.F. or L.F. ?

In my opinion, the strength control should always be on the low-frequency side, and I do not favour those types which work on the high-frequency or detector end. Some designers prefer to incorporate a resistance in parallel with the aerial coil, or alternatively to insert a 400-ohm resistance in series with the tuned secondary circuit. The advantages they claim are that not only does the resistance control the volume, but in addition it introduces a damping effect which flattens tuning and by so doing, if anything, improves quality.

While I agree that this is all perfectly true, nevertheless, I do not think it desir-

intended for long-distance reception a fairly high degree of selectivity is essential and it need not be of such a character as to introduce distortion by cutting side-bands. I do not think that those designers who advocate this form of H.F. strength control are really catering for the average listener.

For the Local Station.

For the benefit of those who may have a set which they are working within a few miles of the local station, I have shown in Fig. 1 the method of inserting a variable resistance into the secondary circuit of a receiver. Incidentally, I should have

and it is very easy to insert this type of control into practically any set, because it only necessitates removing the existing grid resistance, the potentiometer taking its place.

The point to remember is that the grid lead, instead of going to the coupling condenser, now goes to the sliding arm. The alternative method, if the set incorporates a transformer-coupled stage is to place the potentiometer across the secondary winding of the transformer. This is shown in Fig. 2b.

Transformer Connections.

The lead, which normally goes from one side of the secondary winding to the grid of the valve, is removed. The two ends of the potentiometer, usually the two outside terminals, are connected one to each side of the transformer secondary. The arm of the instrument is taken straight to the grid of the valve. This, if anything, is more straightforward than the case of the resistance coupling. Neither method introduces distortion and both give a perfect control of volume.

It should not be forgotten that although there are other means by which the

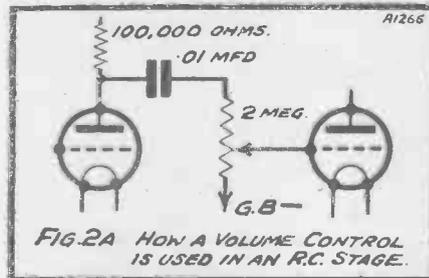


FIG. 2A HOW A VOLUME CONTROL IS USED IN AN R.C. STAGE.

In the above case the potentiometer takes the place of the grid leak.

mentioned that this scheme certainly possesses the advantage of reducing any chance of the detector valve being overloaded by extremely powerful signals from the local transmitter. This is an important point in the case of those who are situated within four to six miles of a B.B.C. main or Regional station.

Potentiometer Positions.

Now the other and more popular schemes are those in which a potentiometer of the high resistance type is used in one of the L.F. stages. The potentiometer should have a resistance of not less than .5 megohm, and there are various types on the market between .5 and 2 megohms which are quite suitable. If the L.F. stage is resistance-coupled, the potentiometer is inserted in the place of the ordinary grid resistance, and it is advisable in this instance to use the .1- or 2-megohm values. The existing grid resistance is removed, and so also is the lead which joins one side of the coupling condenser to the grid of the following valve.

The two ends of the potentiometer resistance element are connected one to the coupling condenser, and the other to grid-bias negative. The sliding arm is then connected to the grid of the valve, and the volume is controlled simply by turning the knob.

The general scheme is shown in Fig. 2a,

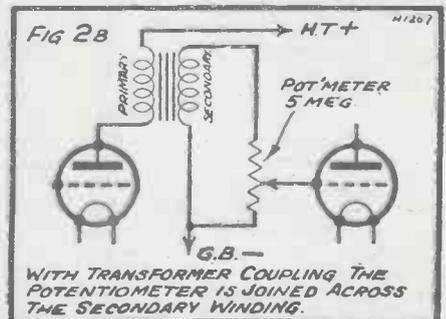


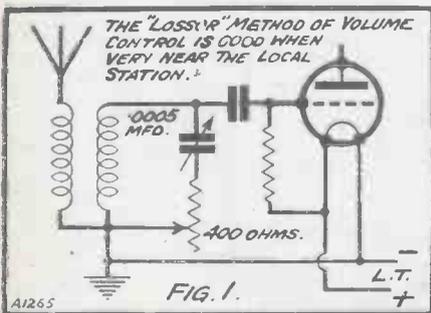
FIG. 2B WITH TRANSFORMER COUPLING THE POTENTIOMETER IS JOINED ACROSS THE SECONDARY WINDING.

If two L.F. transformers are used, the volume control should be connected to the secondary of the first one.

strength can be controlled, the introduction of a special volume control is the most logical and satisfactory method.

In most of the other schemes disadvantages appear in the form of distortion, but as stated above the fitting of a volume control retains quality, and is very easily effected.

Do not commit the error of using a low-resistance potentiometer on the L.F. side; I know of a recent case where a listener obtained a potentiometer having a value of about 300 ohms, which he joined across the transformer secondary winding. The net result: the secondary winding was short-circuited



THE "LOSSY" METHOD OF VOLUME CONTROL IS GOOD WHEN VERY NEAR THE LOCAL STATION.

FIG. 1.

With this scheme it is possible to avoid overloading the detector valve.

able to interfere in any way with the selectivity unless by chance the set is being operated very close to the local station and is intended for local reception only. It is also true that great selectivity and quality do not go hand in hand, but if the receiver is

"STATIONS ABSOLUTELY POUR IN."

The Editor, POPULAR WIRELESS.

Dear Sir,—I feel I must write and congratulate you on the wonderful performance of the "Magic" Three. Stations absolutely pour in all round the dial, although I have not yet bought the "X" coils and am still using the ordinary basket coils. I have heard many people say, time after time, in this city, that they cannot log in Cardiff (5 W.A.). It seems to be one of the most difficult stations to get. I can, however, log it in wonderfully well on my "Magic" Three.

Again wishing you and the technical staff of "P.W." every success in the future, as you have accomplished in the past.

Yours faithfully,

FREDERICK T. BARNES.

Gloucester.

THE "MAGIC" IN SOUTH AFRICA.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have a grievous complaint to make against the "Magic" Three—this set is impairing my good health! Yes, ever since I built it three weeks ago it has been robbing me of my sleep, for nearly every night I can find something worth listening to on the short waves, and also on the broadcast band when our three S.A. stations have closed down.

It has been keeping me up late; indeed on several occasions I have crawled into bed at 3 a.m. after listening to a really clear and enjoyable programme from WGY or KDKA. Of course, I shall not be able to sit up late like this every night, but as it happens I am on leave at the moment and can sleep late the morning following my explorations of the ether.

Joking aside, I wish to offer "P.W." my sincerest thanks and congratulations on having produced such a really fine set.

I am an ardent wireless enthusiast—my first set I built myself, and I have built several others since, including a 2 H.F., Det., 2 L.F. five-valver of the 1928-27 type, also your "Progressive" Three, with which I was really pleased.

However, the short-waves always held a fascination for me, but I really never troubled as I did not see the sense in building a separate set for same, to say nothing of the necessary expenditure required. I waited for something else to turn up in "P.W." (which I have taken regularly for four years), and it did turn up in the form of the "Magic" Three.

I was rather intrigued with the possibilities of your new reaction scheme, and forthwith my faithful "Progressive" Three was taken to pieces one night, the majority of the components being used to build up the "Magic" Three.

Then came a snag—I had no differential condenser, and not for love nor money was one to be obtained, although I tried every wireless firm in Cape Town. (They are still unobtainable, though why I couldn't

CORRESPONDENCE.

The "MAGIC" THREE.

STILL ANOTHER SELECTION FROM THE HOSTS OF LETTERS FROM READERS WHO HAVE BUILT THIS REMARKABLE RECEIVER.

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.

say). Anyhow, I broke up an old -0003 condenser and made a differential from that, and the same is still working splendidly in the set now. The tuning condenser in my "Magic" Three is an Ormond -0003, which I thought would be a good compromise between a -0005 and a -00025 required for short-wave work.

With a 60 C.T. Lewcos coil in L_1 and a 75 in L_2 I can get Cape Town at 120° on the dial, Durban at 140°, and Johannesburg at 170°. This condenser (fitted with a 60-1 slow-motion dial) serves me admirably on the short waves—so I do not use the -0005 fixed condenser in series as recommended. The trouble that would be incurred in connecting up the shunting bar across the -0005 condenser is also eliminated.

SURPRISING VOLUME.

My H.F. choke is a Lissen. In the first L.F. stage I use a Marconi Ideal Transformer 4-1. My valves are 2-volters—Mullard P.M. 1 H.F. in Det. socket, P.M. 2 in first L.F., and P.M. 252 in second L.F. socket. Voltage to L.F. valves 120. To Det.—anything from 90 to 128 gives me smooth reaction, but the higher the louder signals are. I am using a Marconi 75 cone speaker, and for Cape Town and Johannesburg find the use of the volume control necessary.

It is surprising what volume this set gives. I have picked up Rome, which I find a few degrees below J.B. on several occasions, and on the headphones it is really most enjoyable to listen to when conditions are favourable, the signals being audible well over 6 ft. from the 'phones. The other evening I rotated the dial, and from about 60° to 180° I found a station at nearly every degree—a dozen of which I could easily listen to on the 'phones. The local conditions were bad, but I recognised one station as Spanish

and two English, but unfortunately could not get hold of the call-signs.

On the short waves the set is delightfully smooth and easy to operate—indeed, I can tune in W 2 X A F on the loud speaker at about 12 o'clock (midnight) when conditions allow of that station being heard at all. I mounted the 400-ohm potentiometer on the panel as I find same invaluable when doing short-wave work. I have also picked up WGY and KDKA on several occasions, also a telephony station calling "JDS calling, California," and a French telephony station and several others unidentified.

Morse signals are as numerous as pebbles on the beach, but my knowledge of Morse code is too poor to allow me to decipher them.

On Monday night, the 6th ult., I picked up W 2 X A F on 19-36 metres at 11.30. At 12.30 I put same on loud speaker—the volume being really good and the quality excellent. The Hotel Vancouver Orchestra was playing, one of the numbers being "Hollywood." I held same till 1.30, when it got so loud I had to take off the speaker for fear of disturbing the neighbours, and I then listened on the 'phones till 2.30.

Well, I must not waste your time. You must be tired already of reading this letter. In conclusion let me state that I have handled many sets, commercial, and otherwise, but never one so delightfully easy to tune as the "Magic" Three. There is no other three-valver capable of such results, and very few four-valvers, either.

Indeed, a certain well-known commercial 1 H.F., 1 S.G.; Det. and Pentode set of the latest design, using 4v. valves in this town, cannot compare with the "Magic" Three!

Thanking everybody connected with the production of the set, and wishing "P.W." all the best and an ever-increasing circulation,

I am, Yours faithfully,

PETER E. KEEN.

Cape Province, South Africa.

"BEATS THEM ALL."

The Editor, POPULAR WIRELESS.

Dear Sir,—Having built the "Magic" Three, I feel I must write and thank you for such a good set. It truly is "Magic." I had a lot of trouble with it at first owing to cheap components, but these I have taken out and used only what you specified. Having made up several of your sets from "P.W.," I find this one beats them all for volume, distance, and above all quality of tone. I have also incorporated an output filter choke, which I believe helps me to get such good results in tone. I quite agree with what one of your readers says, that the volume control is a real necessity.

Yours,

AN OLD READER, S. COOK.

Dunstable, Beds.

I WONDER whether, in three years' time, the short-wave enthusiast will still have to put up with the large variety of objectionable noises that usually greet him nowadays whenever he ventures to put the 'phones on?

What with car ignition and 'bus magnetos in particular, vacuum cleaners, electric wringers, electric heating-pads, and the whole gamut of ultra-violet and X-ray apparatus, he does not have too happy a time compared with the broadcast listeners, who have merely a heterodyning station here and there, a foreign station off-wave occasionally, a dozen or so spark stations all calling G N F at once, and thirty or forty harmonics from Air Ministry stations giving weather forecasts!

Neighbourly Interference!

I am quite certain that if all the implements of torture I refer to made their din on the broadcast waves as well, they would have been made illegal by now unless they had some efficient screening round the sparking parts.

Personally, although I run the risk of being told to mind my own business, I think neighbours might deny themselves the pleasure of using their vacuum cleaners at such times as 1.30 p.m. on Sunday, and after 10 p.m. on weekdays! My own particular neighbours seem to save up all their cleaning for the hours mentioned.

Nothing whatever can be done about it at the receiving end, I am afraid—it is the "transmitting end" that must be

SHORT-WAVE NOTES.

By W. L. S.

modified in some way, and the fact that some cars coming along the road are quite inaudible on 20 or even 10 metres shows that it is possible to cure magneto or coil interference, at all events.

Cheap American cars with coil ignition are the worst offenders, and after them come the Renault, Trojan, Clyno, Fiat, and a whole batch of medium-powered British cars. Strangely enough the Morris and Austin are both very quiet, and a Singer that lives close by is quite inaudible!

Many readers have sent queries lately on the subject of international prefixes for amateur transmitters, and chiefly with regard to certain alterations that have been made recently. India has apparently decided to use VU, although one or two stations retain VT.

Ceylon has been allotted VS7, and the news has just arrived that Hong Kong amateurs have been officially licensed with call-signs beginning with VS6. VS6AE and VS6AG have both been heard here already. VS3 signifies the Malay States and Singapore, I believe, while the Kenya transmitters are sharing VQ with Northern Rhodesia.

The former all begin with a 4, the Nairobi

transmitters being VQ4CRA, VQ4CRB etc., while the Mombasa section use VQ4MSA, VQ4MSB, etc. The Northern Rhodesian stations are VQ2BH and VQ2NC, to mention the only two that I know of myself.

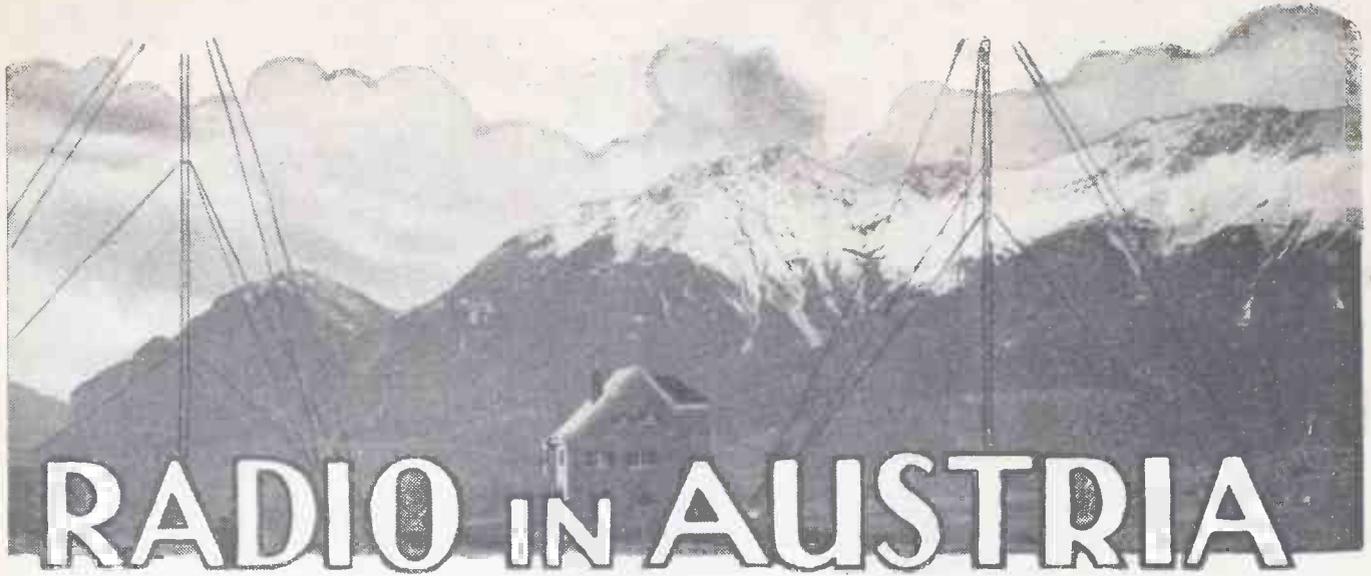
The Philippines have changed from K to K'A, their figures being anything from one to nine. K6 signifies Hawaii, K7 Alaska, and K4 Porto Rico.

All Continents Heard.

Now that the United States amateurs have been licensed to telephony in the 20-metre band we may expect to hear their voices over here occasionally. QST has recently been giving several layouts for low and high-power 'phone transmitters, and the "Yanks," although they have not been licensed in this particular band before, are no novices where telephony is concerned.

Freakish conditions continue on this band, and I recently heard all continents in the space of two hours, the Americans not being the usually powerful East Coast stations, but a 7th district man in Portland, Oregon, and a Canadian "4" in Edmonton, Alberta.

The other continents were represented by HC2JM (Ecuador), VS6AE (Hong Kong), VK6FT (Western Australia), ZS1P (South Africa), and a dozen or so Europeans. Within twenty minutes of logging the two Western Americans the whole band had gone "dead" and nothing more was heard the whole evening. The two hours were between 4 p.m. and 6 p.m.



RADIO IN AUSTRIA

AUSTRIA is a very small country now, and is a country with a totally disproportionate number of inhabitants living in the capital. Also this capital is most unfortunately situated, a few miles from two frontiers. Thus when building up a broadcasting organisation that was to supply listeners all over the country with good national programmes, one transmitter in the capital, where the bulk of the population live, would not cover the country districts, especially taking the mountainous structure of the country into consideration.

Centralised Organisation.

On the other hand the cultural and general centre of the land lies in the capital, in Vienna.

The "Österreichische Radio-Verkehrs-Aktien-Gesellschaft" was brought into being in 1924, just a little over five years ago. The Austrian Confederacy has about one-fifth of the shares, the town of Vienna another fifth, and the remainder is divided up among banks, industrial concerns and individuals.

The board of the company consists of representatives of these shareholders. A kind of consultative committee, the Beirat, consisting of representatives of the provincial governments, of numerous public institutions such as the Board of Trade, etc.,

Austria is a difficult country to supply with broadcast entertainment. How the various stations are arranged is shown in this article.

By A. A. GULLILAND.

etc., and of representatives of the radio clubs, acts in all matters of programme policy.

Before describing the actual net of transmitters in Austria, I would like to refer to the method by which the licence money of listeners is collected. Austria, like many other European countries, adheres to the licence system, but Austria is the only country in Europe making a difference between rich and poor as far as the fee is concerned. All listeners having an income that is larger than 700 sh. (about £20) a month pay 6 sh. (about 3s. 6d.) per month for their licence.

The others having an income below the stated figure only pay 2 sh. per month, or about 1s. 2d.

The First Transmitter.

The fees are collected by the post office, and are handed over in full to the broadcasting company. The broadcasting company then pass on 10 per cent of the total amount to the State as a fee for the broadcasting concession, and further, they pay

a nominal fee to the post office to cover their work and trouble for the collecting of the money.

The first Vienna transmitter was erected on the roof of the Ministry of War in the Stubenring. Then the transmitter was moved out to the Rosenhügel, where Vienna's water-supply originates, and later on still a third transmitter took the place of the lower-powered Rosenhügel station, the present 15-kw.-in-aerial transmitter, which we know so well.

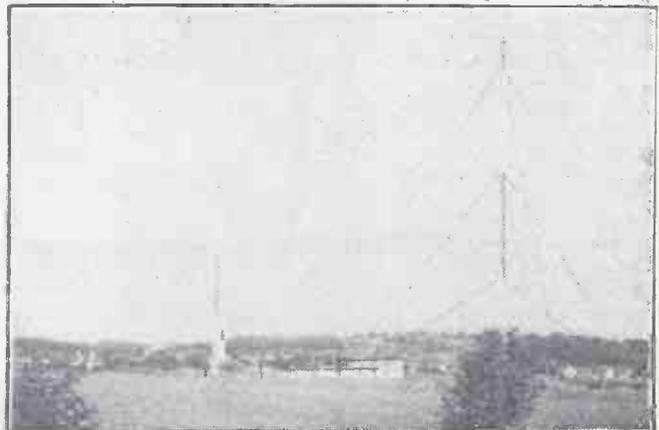
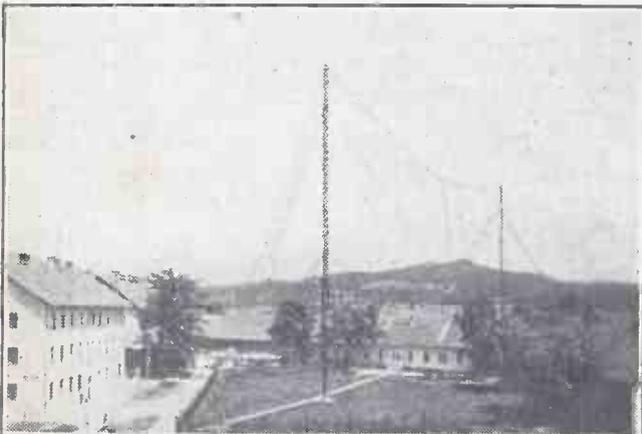
Vienna's Relay Stations.

The studios in Vienna are situated in the Johannesgasse, more or less in the centre of the city. As the continual expansion of broadcasting necessitated further studios a former dance hall, the "Parisien," was rented, and is now used for the orchestral broadcasts. The offices of the company are also situated in the Johannesgasse, and it was here that Direktor Kunstl, the head of the Information Department, gave me authoritative data on Austrian broadcasting.

Later on, I had an interesting talk with Professor Schwaiger, the Chief Engineer of the company. He told me of the extreme difficulty that had been experienced in the past of linking up the relay stations to Vienna. On the line Vienna-Linz-Inns-

(Continued on next page.)

TWO WELL-KNOWN AUSTRIAN RELAY STATIONS.



On the left we have Graz, a 7-kw. broadcaster, which operates on 352 metres and usually relays Vienna, while on the right we see the aerials of Klagenfurt (0.5 kw.), which is also a relay station for Vienna, and has a wave-length of 453 metres.

RADIO IN AUSTRIA.

(Continued from previous page.)

bruck-Switzerland, a new cable was being laid, and the railway was being electrified; in spite of this, broadcasting from the relays was continued without appreciable falling-off in quality, although for long periods horrible make-shifts had to be used.

At the time of writing, late in 1929, the position is at last clear. The cables have been completed and the new amplifiers have been installed. Thus Linz and Innsbruck relay Vienna by means of the special pupinised centre core of the cable, the line continues on to Switzerland and from there onwards to Western Europe making international relays possible. From Linz the cable connects up with the German system in Passau. The new Austrian cables, like the German cables, permit of distortionless transmission of all frequencies right up to 8,000 cycles. The greatest difficulty was experienced with the lines that lead from Vienna to Bruck an der Mur and to Graz and Klagenfurt.

The Second Main Station.

There are transmitters in Graz and Klagenfurt. In Graz the old 7-kw. Vienna transmitter has recently been installed, occupying the second Austrian exclusive wave-length, and in Klagenfurt, like in Linz and Innsbruck $\frac{1}{2}$ -kw. relays work on international common wave-lengths. The landline Vienna to Graz was already insufficient for postal work, so that the broadcasting frequency had to be sent along as high-frequency, and was then transformed back at the transmitter and then used to modulate it.



A general view of the Linz broadcasting station, another 0.5 kw. Austrian relay station, which works on 246 metres.

This kind of high-frequency telephony has been successfully used where there are not sufficient lines to carry the communications, but I think it is one of the few times when it has been used permanently in broadcasting. But now as the cable from Vienna to Graz has been completed, only the bit from Graz to Klagenfurt is bridged by high-frequency line telephony, and the modulating current from Vienna to Graz goes by cable.

Graz, by the way, is the only other Austrian station giving a programme of its own, Graz being the second largest city in Austria even with only 150,000 inhabitants to Vienna's two million. A special local programme is sent out twice a week. Then there is a local transmission from Linz consisting of agricultural talks, but otherwise it is only on special occasions that the Austrian stations take their programme from outside Vienna.

Austria had not quite 100,000 listeners at the end of 1924 and now it has over 360,000 listeners. This works out at 5.6 per cent of the total population, being slightly less than in Britain, but about 1 per cent more than in Germany.

Talking of Germany, the number of listeners decreased by 11,000 this summer, and although the number has already been caught up again this is the first time that the total number has ever shown a decrease in summer. In Austria the number of listeners increased by over 35,000 during the first eight months of 1929, being a further 11 per cent increase on the total number.

I feel that I am giving you too many figures, but I also feel that just one more will not constitute the last straw. Of Austria's 360,000 listeners 230,000 are in the capital, Vienna.

Programmes.

In closing, a few words on the programmes. Even foreign listeners have learnt to appreciate the Vienna programmes. Besides the studios, they originate from the opera, from the famous concert halls, from cafés for lighter fare, and from famous theatres. Apart from the daily programme, the listeners of Europe were able to witness Austrian programme enterprise by the famous Schubert festival relay last year, one of the largest international European relays ever carried out. Then, of course, Vienna is a member of the regular Central-European programme exchange group, consisting of Berlin, the



Part of the Marconi transmitter at Linz.

Czech stations, Budapest, the Polish stations, and the Yugoslavian stations.

Apart from the broadcasting stations, the Ravag began experimental broadcast work on the short waves last year. A small 20-watt transmitter is used working on the two Austrian waves 49.4 and 25.42 metres.

Vienna has carried out many interesting experiments in the past and intends continuing these. For instance, the heartbeats of a man have been broadcast, and if I am not mistaken, the sound made by grass growing was broadcast, also the noise made by your eyelashes when winking.

Apart from these stunts, a new system of home-talkies has been developed with the co-operation of the Ravag, the "Selenophone." Five years of broadcasting still shows it going full speed ahead in Austria.

SOME PRACTICAL RADIO HINTS.

When undoing the leads to the H.T. or L.T. battery always remember that they should be undone at the battery end, and not at the set end of the leads.

It is a good plan to keep moving-coil loud speakers (or, indeed, any loud speaker with a diaphragm that is susceptible to the influence of the atmosphere) well away from fires, stoves, etc., as heat is sure to affect them adversely.

If you wear a pair of telephones and hold one of the little metal tags between the lips, gently rubbing the other tag on a key, you will hear a faint scraping sound in the 'phones corresponding with the rubbing, if the 'phones are in good order.

When wiring up the house for loud speakers in different rooms remember that the wiring must be kept short unless an output filter is employed, and even in this case should be kept as short as possible.

A RAPID GUIDE TO RADIO

A JUMPING-OFF SERIES FOR THE NEW AMATEUR

By "Pentode"



AN L.F. transformer consists of two windings of wire on an iron core. Special iron alloys are generally used in order to intensify the magnetic effect. The one winding bears a definite relation to the other.

If both windings were equal in their numbers of turns current variations of a certain voltage fed into the one would be reproduced in the other at the same voltage, minus a certain percentage which would be lost in the wastage that is inevitable in any electrical or mechanical process.

When the primary winding (the winding into which the current is fed) is smaller than the secondary winding there is a "step-up" of voltage. On the other hand, if the secondary winding is the smaller, there is a step-down of voltage.

The L.F. Transformer.

In the case of an L.F. transformer stated to have a step-up ratio of 1-3, we know that the secondary winding of the device is the larger, and has three times the number of turns of the primary.

An L.F. transformer has four terminals; one for each end of each winding. Sometimes these are marked I.P., O.P., I.S., O.S., which indicate "in" and "out" primary and secondary.

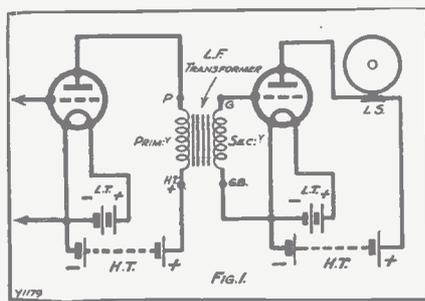
More often the terminals of modern transformers bear direct indications as to their circuit connections. Thus "G." indicates that the terminal so marked should be joined to the grid of a valve. You will be able to trace out these connections in any set diagram, and they are shown in the illustrations appearing on this page.

One of the objects of an L.F. transformer is to pass the rectified energy in the plate

the grid circuit of the L.F. amplifying valve, as you will see at Fig. 1.

I have shown separate L.T. and H.T. batteries for each valve, so that you can the more clearly visualise the circuits, although, in practice, the one L.T. battery and the one H.T. battery are used for any number of valves.

Now what happens is this. There is a fluctuating current in the plate circuit of



the detector due to the voltage variations impressed on its grid. This fluctuating current passes through the primary winding of the L.F. transformer and induces another fluctuating current in the secondary winding.

And this new current is impressed on the grid of the L.F. valve. The voltage of this new current depends primarily upon the

why don't we increase the step-up ratio of the transformer beyond 3 or 4-1? you might ask.

The answer is that there are a number of things that tend to render about 4-1 the highest practical ratio, and of these things you will read in other articles in "P.W." which I hope you will now be able to follow with greater appreciation!

Now Fig. 1 is not a circuit that will give the highest quality of reproduction. It has no grid bias on the L.F. valve, and grid bias is essential.

What Grid Bias Does.

This term "grid bias" is self-explanatory. It means exactly what it says, and that is much more than do many radio terms! The Fig. 3 circuit has grid bias. A small battery is inserted in the grid circuit of the valve, and this makes the grid so many volts negative in respect of the filament. You want the voltage variations due to the speech and music to cause even current variations in the plate circuit or distortion will occur.

Look at Fig. 2, which we will presume to be the characteristic curve of our L.F. valve. Without grid bias the "grid volts"

This week our popular contributor deals with L.F. Amplification. In the simplest possible manner he explains how the radio energy is magnified after it has been handled by the detector stage.

19. L.F. AMPLIFICATION.

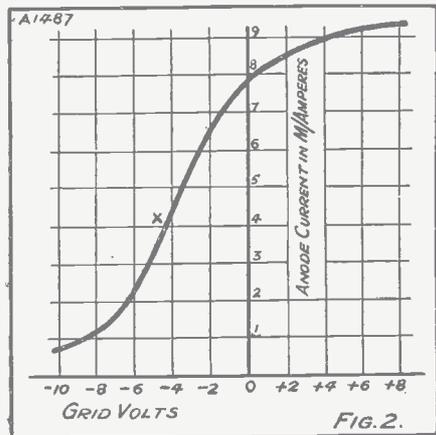
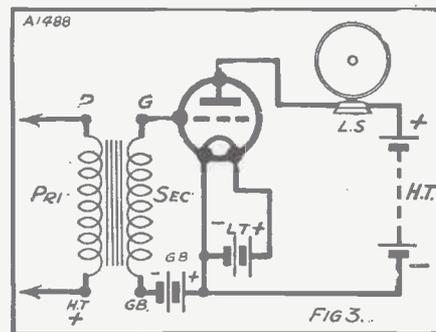
voltage of the current flowing through the primary winding and the step-up effect of the transformer, which is, of course, definitely specified in its ratio. The most usual ratios are 1-3, 1-3½, and 1-4.

The Valve Wants Volts.

You will notice that the transformer plays a very definite part in the amplification effect. It doesn't amplify by itself, but it can increase the voltage of energy fed into it. This doesn't imply that it increases power, because, coincident with the step-up of voltage, there will be a step-down of current (amperes). The "overall" power in watts (volts x amperes) will remain the same, minus that "conversion" loss I referred to above.

But the valve wants volts—it is a voltage-operated device, and thus we don't mind losing amperes!

Our object is to produce the largest possible voltage variations between the grid and filament of the L.F. valve. Then



circuit of a detector valve to another valve for further amplification.

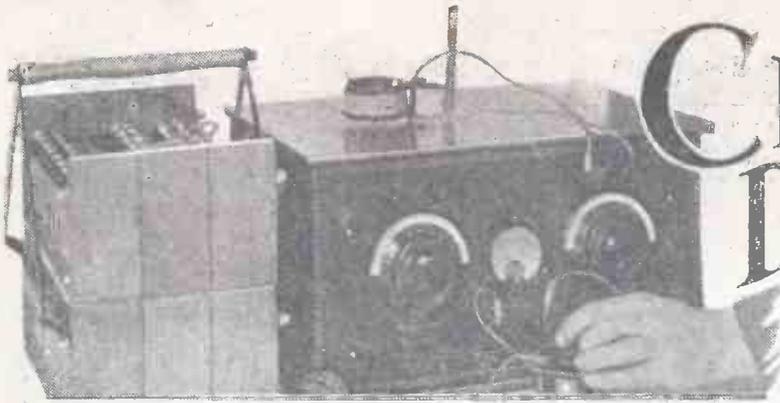
The primary winding is included in the detector's plate circuit instead of a pair of telephone receivers, and the secondary in

will be "0" when nothing is happening. A 3-volts positive fluctuation would alter the plate current less than a 3-volts negative fluctuation, and that is all wrong.

We don't want a rectification effect as in the anode-bend detector circuit, we are now dealing with current of the right frequency for loud-speaker operating.

Therefore, we give the grid an initial bias so that it starts off at a point in about the middle of the straight part of the "curve" (X in Fig. 2). Then equal grid voltage variations either side up to the ends of the straight part of the curve are followed by equal anode current variations. Sorry if I'm hustling you, but we are now very near the end of this series.

Next week, in my last article, I am going briefly to deal with choke-capacity and "R.C.C." L.F. circuits.



CHECKING DISTORTION

Get to know your set really intimately, and see that it is never allowed to go off colour. As this interesting article shows, there are always snags around the corner awaiting the unwary amateur.

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

YOURS may be a marvellous set. I am not being sarcastic; I repeat, yours may be a really wonderful receiver. By some combination of happy circumstances you may have achieved something pretty near that 100 per cent which is the goal towards which so many hundreds of thousands of amateurs are striving, i.e. tremendous power and marvellous purity, plus everything in the way of selectivity, ease of control, stability, and so on.

Should you be so fortunate in your radio possessions, I first of all envy you, and then would ask you not to be impatient if you see rather a lot about set ailments in "P.W."

A Difficult Business.

The word "distortion" has been used very considerably and numerous articles have been written around it. It crops up in articles about L.F. instability, "howling," "squealing," "popping," "fizzing," "fuzziness," and numerous other unhappy conditions.

You see thousands, if not hundreds of thousands, of sets are apt to cause their owners dire distress by developing one or other of the many radio ailments.

And it is quite impossible to cover all the causes and cures in a score, let alone one article. The job of the expert would be vastly simplified if a complete "trouble tracker" could be condensed to one page of "P.W." Indeed, there would be no need to have experts if this were possible!

Wireless receivers are much smaller than motor-cars, but their troubles can be infinitely harder to diagnose. There are no elementary rules of thumb. A thorough understanding of radio theory and practice and a few years of experience are necessary before one can go straight to any faulty set and locate and rectify the trouble.

A Wide Appeal!

Sometimes obscure faults develop that even experts have to refer to "second opinions." Such faults very seldom come to light these days, it is true, and this is mainly due to a general wider knowledge of practical radio, and an interchange of ideas and experiences.

Even so, how is the listener, who has no such pool of knowledge, to deal with the little peccadilloes of his set? Well, I'll answer that question with another: Need there be such a listener these days?

Those before mentioned "P.W." articles are published not only to help those readers who are actually troubled by the faults dealt with, but to enable all readers to gain a comprehensive knowledge of all the things that *might* happen to their sets.

Common faults, obscure faults, all kinds of troubles are covered by such contributions, and there are always the "Radiotorial" columns to add to the sum total of information available.

I am frequently asked why we cannot deal with fault location in a systematic manner. This is not as easy as it sounds, for the simple reason that any symptom may be due to any one of dozens of faults or any combination of dozens of faults.

That may sound alarming and it is alarming. But I am going to bring forward that excellent adage. "Prevention is Better than Cure" and ask all set-owners, however complacently they may at present regard their splendid sets to inscribe "Prevention is Better than Cure" on the insides of their sets' lids. Gold lettering wouldn't be a scrap too good for those words!

Few Words of Guidance.

And thus the title of this article "Checking Distortion." I am not going to say that one can guarantee to forestall every radio set fault, but if one keeps well in mind that, at any time, perhaps in the middle of our favourite broadcast "turn," the best and the most carefully-maintained set can develop a fault, one can prepare for the eventuality by reading about the troubles of others and learning how they were able to overcome them.

And now for a few words of guidance. You must learn how to determine whether a fault is internal or external. All the noises that accompany a faulty H.T.

battery or a broken-down transformer, or anything else of a like nature, can be duplicated almost exactly by atmospherics or by faults in the transmission.

Then you must acquire the little skill needed to narrow down the location of any trouble to certain of the accessories or to a certain definite part of a set.

Get the meter habit. There is nothing like the regular use of meters to give one a real insight into the working of one's set. Especially is the use of a milliammeter a real education. You can check the H.T. current supplied to each valve and can watch its variations as the set's operating conditions or the health of the batteries vary.

Working a radio set without meters is working in the dark. You can't say for certain that the H.T. battery you bought only a few days ago will retain a respectable voltage for even two weeks. For instance, a really first-class battery won't stand up against just a tiny little accidental short circuit of long duration.

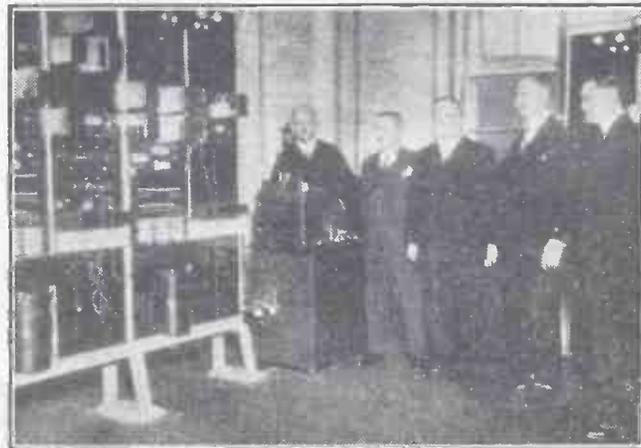
Tracking the Trouble.

I feel that this article will not be quite as helpful as I had intended it to be, and little that will be new to my "P.W." readers has been said. But here is an idea worth developing which, if not new, has been somewhat neglected.

If your set ever develops a really striking fault use a pair of telephone receivers, and track the music through from the detector to the loud speaker, noting its condition and relative volume at each point.

If you can do that systematically you will possibly locate the trouble, and most probably you will learn a lot about the working of the set. But be careful you don't touch high potential points with your fingers. To do so certainly might nullify your efforts, or give you a serious electrical shock.

NEW PICTURE SERVICE.



Officials of the German Post Office attending a demonstration of the new Berlin picture transmitter. This picture itself was telegraphed from Berlin to London via the apparatus shown.



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This is a new valve that will give you big volume with purity and yet works off batteries. It takes only 7 milliamps of current. Your existing batteries are therefore all it requires, and they will last you just as long as with ordinary valves.

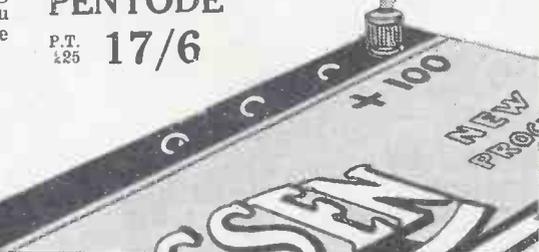
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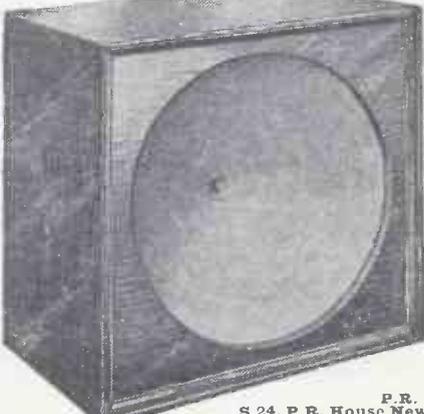
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THE HEART of the VALVE



THE life stream of the valve is centred in the filament, which supplies in a manner that is still not thoroughly understood the apparently-unending flow of electrons which gives the system as a whole its power of doing useful work.

The primary source of energy is, of course, the filament battery, which, first of all, "vitalises" the filament by making it red hot. In this condition a certain proportion of the electrons passing through the wire lose their grip, so to speak, on the metal conductor and escape into the surrounding vacuum.



A modern dull-emitter valve.

Here they come under the influence of the grid and plate voltages, and are pumped or forced into the circulatory path through the valve and into the outside circuit, where they perform their necessary duty on the succeeding valve, or loud-speaker, as the case may be, before returning to the battery reservoir from which they first came.

The thermionic valve came along to harness and control its operation in the thorough-going fashion so familiar to us to-day. Physicists had, in fact, already discovered that a coating of lime or calcium oxide furnished a more copious emission of electrons, when heated by an electric current, than could be obtained from a bare platinum or nickel wire.

Coated Filaments.

The Wehnelt or oxide-coated filament was accordingly fitted to the early Lieben-Reisz and Round valves, although there was a period when ordinary plain-metal, such as platinum or nickel and even carbon, filaments were used with some success.

The demand for economy in battery consumption soon displaced these high-temperature filaments in favour of the so-called dull-emitters. At this stage of development manufacturers were for a time divided between the merits of the thoriated-tungsten and the oxide-coated filaments. In the former type a small percentage of thorium is alloyed with a

The vital centre of the valve is, of course, the filament, and the following facts about that thinnest of threads will be of especial interest to all valve-set owners.

By J. C. JEVONS.

tungsten core, and constitutes the activating element. Under the influence of the heating current the thorium content drifts and there becomes an active centre of electron emission.

After prolonged use the thorium content appears to lose its potency as an electron-liberator and the sensitivity of the filament accordingly falls off. It is supposed that this is due to the occlusion of the thorium in the centre of the filament wire, so that a prolonged heating, without the application of any plate potential, will often drive fresh thorium to the outer surface of the wire and restore some of the emissivity.

In the case of the oxide-coated filament, it was thought at one time that the barium oxide was itself the seat of emission, and that the creation of the electron stream was primarily due to some chemical action which accompanied the disintegration of the oxide into its constituent parts.

Oxygen Set Free.

This theory is not consistent with the "mechanism" of electron emission from a plain tungsten wire. Here it has been definitely proved that the production of electrons cannot be due to chemical action, since the total mass of electrons liberated during the life of the filament is greater than the amount of matter contained in the wire itself.

The modern theory of the action of the oxide-coated filament regards the chemical action, which undoubtedly takes place, not as the actual source of supply but merely as a stimulating centre for the liberation of electrons from the current stream passing through the filament.

Under the combined action of the heating current and the application of plate voltage, an initial liberation of electrons sets in from the filament towards the plate. This reacts electrolytically upon the oxide coating of the film, and decomposes it into oxygen and the pure metal. The former diffuses into the vacuum of the bulb, and the latter drifts to the outer surface of the filament where it forms a series of active spots or emission centres, from which electrons can escape in large quantities. These "colonies" of barium atoms

distributed over the surface of the filament form, as it were, funnels or openings through which the electrons passing through the wire can readily escape into the vacuum of the bulb, and so come under the controlling influence of the grid and plate.

There are several alternative methods of preparing the coated filament, all of them calling for considerable skill and careful technique. In one up-to-date system the barium element is applied to the wire core *in vacuo*.

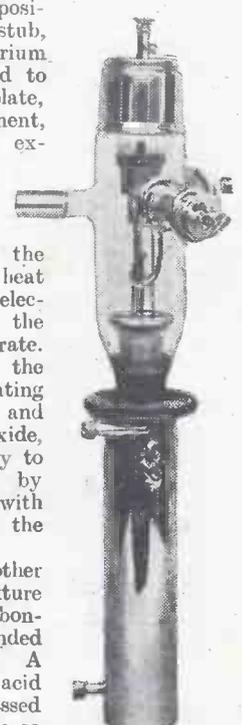
Preparation.

A prepared nickel or tungsten wire is first mounted in position on the valve stub, and a "blob" of barium metal is then fixed to the surface of the plate, facing the filament, before the bulb is exhausted. After pumping, the valve is placed inside a high-frequency induction coil, where the induced currents heat the whole of the electrodes and cause the barium to evaporate. The latter attacks the tungsten oxide coating on the filament and forms barium oxide, which is then ready to be "activated" by running the valve with a high voltage on the plate.

According to another recent process, a mixture of alkaline-earth carbonates is first suspended in methyl alcohol. A stream of carbonic acid gas is then passed through the mixture so as to deposit a compound, which, when mixed with water, forms a solution of carbonates.

The wire core is now immersed in this very finely-divided mixture and an electric current is passed through the wire forming one electrode and the containing vessel the other.

The applied current causes the colloidal particles to drift electrolytically towards the wire, on to which they adhere as a firm coating. After drying, the carbonate coating is "glowed" to convert it into the oxide.



This 20-kw. water-cooled transmitter has something like a filament.

FROM THE TECHNICAL EDITOR'S NOTE BOOK

Tested and Found-?



DUBILIER ANTI-INTERFERENCE UNIT.

THE Dubilier anti-interference unit embodies what I consider to be a particularly attractive idea. Its adjustment controls and its terminals are enclosed by a cover which is screwed down when the instrument is set and the connections made.

Generally one wants a wave-trap to suppress only the one station so that it is unnecessary to make continual

This is the Dubilier Anti-Interference Unit, with its protective cover removed. The device is adjusted with a screwdriver, as shown. Note the aperture in the cover, through which the leads can pass.



reference to its adjustment and connections. Indeed, once satisfactorily adjusted, there should be no need to think of the device again. That is, unless the station should happen to alter its wave-length.

Further, the provision of a protective covering prevents any accidental movement of the control. The Dubilier anti-interference Unit is a high-class production, and its appearance is well above the average. It is completely enclosed in a handsome moulded casing with two substantial feet, which are provided for screwing down purposes. Its trapping action is effective, a powerful local being confined to within but two or three degrees on the tuning dial of an ordinarily insensitive set.

PHOTO-ELECTRIC CELLS.
This is the title of a book just published by Sir Isaac Pitman and Sons, Ltd., at 15s. net, and written by Dr. Norman R. Campbell and Dorothy Ritchie, who are members of the research staff of the General Electric Co., Ltd., at Wembley. It is an authoritative work and should be on the bookshelves of all radio picture or television experimenters.

USEFUL FOR TRADERS.

The Wireless and Gramophone Traders Year Book and Diary for 1930, which retails at 5s. 6d., should be in the hands of all traders. It gives, among many other things, very complete lists of manufacturers, manufacturers' agents, and factors. There is also a very comprehensive gramophone section.

LOEWE FIXED CONDENSERS.

The Loewe Radio Co., Ltd., are now manufacturing fixed condensers in metal cases for use in mains units and mains sets. The standard values available range from 1 to 10 mfd., and all these are obtainable tested to 500, 700, 1,000 and 1,200 volts D.C. The sample sent for test is of 1 mfd. capacity tested to 500 volts D.C.

I like its neat aluminium coloured metal case and its compactness, for it is rather smaller than the usual 1 mfd. condenser. Also, electrically, I found it perfectly satisfactory. I gave it 500 volts A.C., and it stood up even to this unfair strain.

The present sample has soldering tags, but these are not too popular among home constructors. I would advise the Loewe people to place terminal models of their excellent condensers on the market, for it is undoubtedly these that get the widest sale among amateurs.

NEW SHOWROOMS.

Messrs. Burndept Wireless (1928), Ltd., have opened showrooms and a demonstration salon at Roxburgh House, 283, Regent Street, W.1, where the scheme of decoration has been planned with the view to combining art with commerce.

THE "MAGIC" FOUR.

Igranic Electric Co., Ltd., have published a pamphlet dealing with the "P.W." "Magic" Four and the Igranic radio devices that are suitable for this popular receiver.

MICROFU FUSES.

In officially advising us that they are the sole distributors of Messrs. Microfuses.

Ltd.'s, products, Microfu Fuses, the Telegraph Condenser Co., Ltd., ask us to make it known that all inquiries, technical and otherwise, concerning Microfu fuses should now be sent to the Microfu section at the T.C.C. North Acton address.

THE R.I. "HYPERMITE."

And so we go on! First the "Hypermu," which, in all conscience, was a triumph of compactness and electrical efficiency, and now the "Hypermite," which is, I suppose, the world's smallest L.F. transformer. At least, there may be smaller articles that purport to be L.F. transformers, but with the R.I. Hypermite, no excuses have to be offered in regard to its performance.

Two and a half inches will cover it in any direction, and it weighs a mere seven ounces.

In these circumstances it really is extraordinary that 50 henries of primary inductance has been achieved, for that value is

WHEN YOU ARE BUYING—

(1) A VARIABLE CONDENSER—

see that it is O.K. in regard to the following important points:

- Vanes rigidly locked in their respective groups.
- Vanes made of stiff material.
- Vanes do not scrape even when pressure is applied in any direction to the control knob, spindle or dial.
- Terminals are widely spaced and accessibly placed.
- Movement is smooth and free from "backlash," and moving vanes do not move by themselves whatever way you hold the condenser.
- Bearings are true and spindle does not wobble.

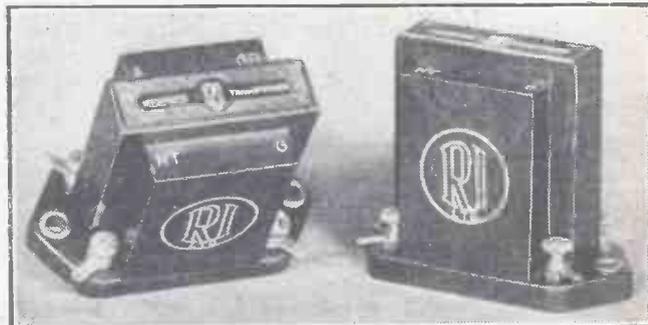
good for any transformer, whatever its size and price. Of course, a high primary inductance is one of the hall-marks of a high-class L.F. transformer.

It should be mentioned before these facts lose their emphasis that the price of the Hypermite is 12s. 6d. Thus it becomes the cheapest of all the transformers embodying the new type of nickel-iron alloy cores.

Of course, its performance doesn't equal that of the "Hypermu," but, in the ordinary smaller kind of set, the difference would not be appreciated by the average constructor.

Indeed, the Hypermite functions astonishingly well, and its amplification curve is one that would grace a component costing much more.

By the way, the Hypermite is the ideal transformer for the portable set on account of its lightness and compactness.



Two of the remarkable little R.I. "Hypermites."



The outstanding feature of the FERRANTI All Electric Receiver is the reproduction, which is very nearly true to life. The volume and richness of tone satisfy the critical listener.

This quality is attained by the use of the finest audio frequency components available and the close attention to detail which is expected from FERRANTI. Every component has been designed or chosen for the purpose it has to fulfil.

We have considered quality before price. Quality tells in the long run, and the first cost is the last cost when the best is bought.

The Set is handsome, too. You have the choice of three woods to tone with any scheme of furnishing.

Available for Alternating Current only, voltages 200 to 250; 40 cycles or over. Any high-class dealer will demonstrate this set to you and many will supply it on H.P. terms, if desired.

Price, including valves :
In Oak, £25. In Mahogany, £26. In Walnut, £26.

Royalty £1 extra.

FERRANTI

ALL ELECTRIC RECEIVER

FERRANTI LTD.

HOLLINWOOD

LANCASHIRE

FERRANTI

ON the good old principle that you cannot have too much of a good thing, here is yet another version of that valuable little interference remover, the Brookmans Rejector. The fact is that we feel that this rejector is so good

a "last word" version, with specially accurate and easily operated controls, and the power to cut out one or other of two interfering stations at will.

It is not a double rejector in the sense of rejecting two stations at once, but it is a double one in as much as it will reject either of two stations by operating a change-over switch. It is not intended, therefore, to meet the needs of those who find they must have a means of eliminating the signals of both the Brookmans Park transmitters in order that they may receive foreigners.

Cut It Out!

It is intended to serve those who only require to eliminate one of them at a time, and possess a sufficiently selective receiver or are sufficiently far from Brookmans Park to be able to pick up foreigners without much difficulty, so long as one or other of the Regional transmissions is removed from the dial.

This de luxe version, then, is meant chiefly for people who do not live particularly close to Brookmans Park and in the other broadcasting centres where there is only one interfering station.

In the latter case, it is intended that they should set one of the rejector circuits to remove 5 X X, and the other one to remove interference on the long wave-band and be able to receive 5 X X, Königswusterhausen, Eiffel Tower, and so on without the usual background of the long-wave Daventry station.

The Circuit.

Now let us take a look at the circuit. First of all, you will note that there is the usual variable coupling condenser C_3 , and above this there is the change-over switch which gives you either the rejector circuit C_2-L_2 , or the other one composed of the coil L_1 and the two condensers C_1 and C_4 , these two latter being connected in parallel in a way which gives you a rather larger capacity than could be obtained by means of the variable C_1 alone.

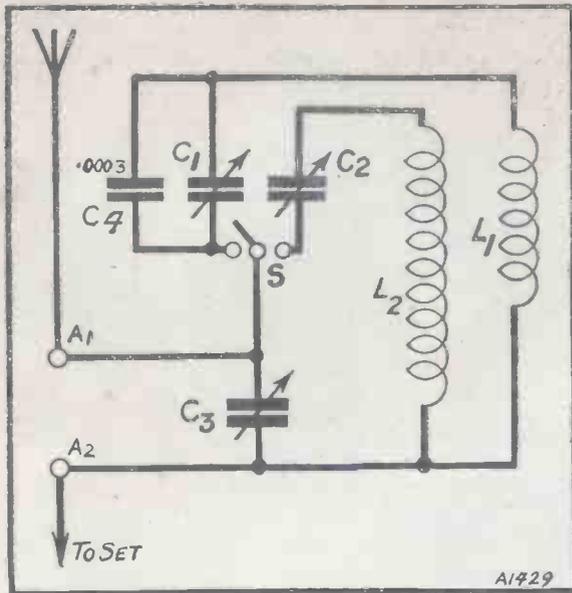
The idea is that you shall set the circuit

The "B.P." REJECTOR DE LUXE

composed of C_2 and L_2 (in conjunction with a suitable adjustment of the coupling condenser C_3) so that it eliminates one of

With this amazing rejector you can cut out either of the Regional programmes, or other interfering stations, on either high or low wave-length, simply by a touch of the switch. Absolutely essential to all who are troubled by powerful and interfering "locals," or who cannot separate the 5 X X, Radio Paris and Eiffel Tower transmissions.

Designed and Described by THE "P.W." RESEARCH DEPARTMENT.



By a touch of the switch S, either one or other of your interfering transmissions completely vanishes, leaving the other clear for the station you want.

that it should be produced in quite a number of different forms, so that practically every one of our readers may be able to pick out one exactly to suit his particular taste, and so we are providing designs of all sorts of different types.

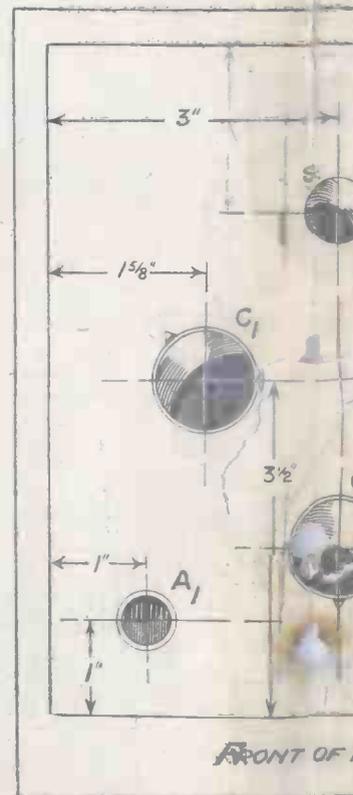
The present one is intended to meet the needs of the man who wants something of

your interfering stations. Then, on moving the change-over switch so as to bring the

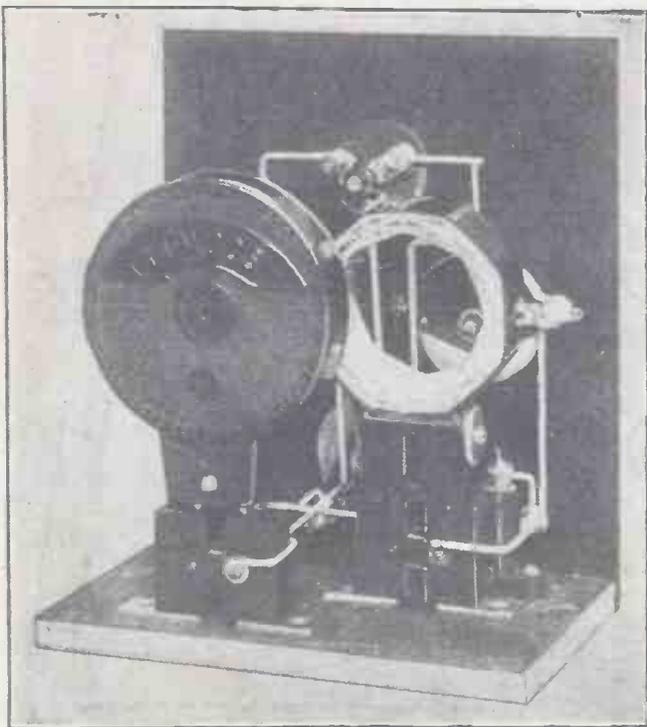
other rejector into circuit, this is adjusted to remove your other jamming transmission and, thereafter, by moving the switch to one position or the other you can get rid of whichever one is annoying you at the moment.

For example, in one of the provincial broadcasting centres you would set the circuit composed of L_1 and the condensers C_1 and C_4 so that it removes the local transmission, the circuit composed of C_2 and L_2 being set to remove 5 X X. Then, by working the switch, you can deal with the interference on either wave-band.

Again, in the London area one would set the C_2, L_2 circuit to remove the 261-metre transmission, and the C_1, C_4, L_1 circuit to shut out the 356-metre one, dealing



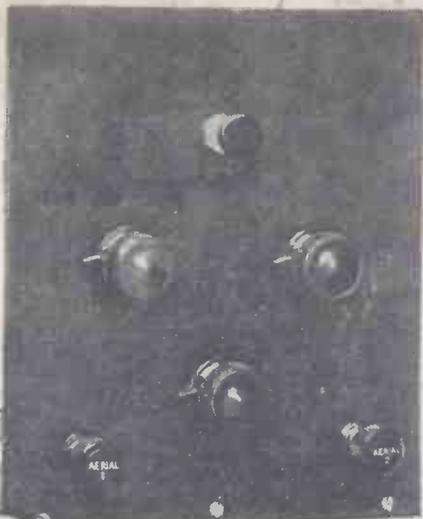
Three condensers and a switch. The ordinary purposes, the switch enabling you another in a



Either short- or long-wave interference can be removed by this ingenious unit, while heterodyne whistles can frequently be wiped out by careful adjustment of the condensers on the panel.

"THE MOST EFFICIENT PERFORMANCE I HA

OR
KE



Messrs. Ready Radio, Ltd., and a single-pole change-over switch, together with the necessary pair of aerial terminals.

The two terminals in question, by the way, are to be used as follows. The actual aerial lead is to be connected to the terminal marked "Aerial 1," while terminal "Aerial 2" is to be wired to the ordinary aerial terminal on your receiving set, so bringing the unit in series between the aerial and the aerial terminal of the set.

The Change-over Switch.

These are all single-hole fixing components, and it will not take you long to get them all in position, with the aid of the dimensioned diagram for panel drilling which you will find in these pages.

Just a word or two about the change-over switch. This should be of the push-pull variety, and we must explain exactly what is meant by the lettering on the wiring diagram, referring to this component. First of all, there is the terminal marked "contact on disc." This will be quite clear to you if you use the actual make of switch employed in our original unit, but we will state exactly what it means in case you use any other type.

to get the two coil holders in roughly the correct position. They were placed with some care to prevent any appreciable amount of interaction between the two coils, and just a little caution at making a good copy is worth while.

LIST OF COMPONENTS.

- 1 Panel, 6 in. x 7 in. (Becol, Trolite, Resiston, Goltone, Trelleborg, "Kay-Ray," Keystone, etc.).
 - 1 Cabinet, if desired (see text), and baseboard about 4 in. deep.
 - 3 .00075-mfd. "Brookmans" condensers (Ready Radio).
 - 1 Single-pole change-over switch, push-pull type (Bulgin, Lissen, etc.).
 - 2 Terminals (Belling and Lee, Eelex, Burton, Igranic, etc.).
 - 2 Baseboard-mounting single-coil sockets (Wearite, Ready Radio, Lissen, Lotus, Magnum, Igranic, Raymond, etc.).
 - 1 .0003-mfd. fixed condenser (T.C.C., Lissen, Mullard, Dubilier, Clarke, Goltone, Wearite, Magnum, Graham-Farrish, etc.).
- Coils according to notes in text.
Wire, screws, etc.

with one or the other thereafter by means of the change-over switch as required. Again, in this area it is very often found that the only serious interference is from the 356-metre transmission, the 261-metre one being fairly easily tuned out as a rule.

In such circumstances you would set one of the rejector circuits to cut out the 356-metre Brookmans Park wave and the other one to deal with 5 X X and so proceed very much as we have just mentioned in the case of a provincial location.

So much for the general idea of this "de luxe" version of the Brookmans Rejector. We shall have a little more to say about its actual use later on, but now let us take a look at it as a constructional job. Well, the first thing to do is to take a piece of ebonite, 7 in. by 6 in., and mount thereon the three variable condensers, which are of a special very reasonably priced type brought out for this particular circuit by

This is a terminal which applies to the actual moving element or plunger of the switch. You should look out for the terminal which obviously is in contact with the moving plunger in whatever position the switch happens to be set at the moment. Then there is another terminal marked "small pillar." This is the contact with which the moving plunger comes into connection when the knob is pulled outwards.

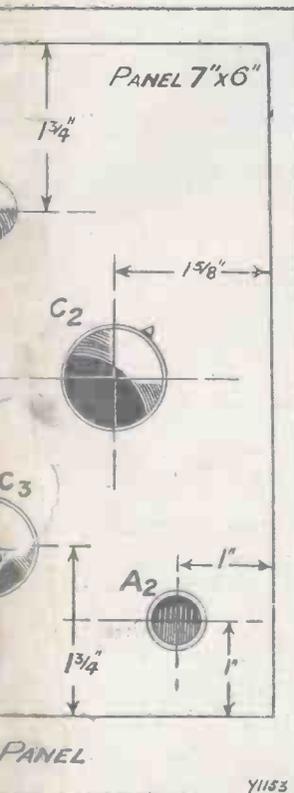
The other terminal is marked "tallest pillar," and this is the point with which the moving plunger makes contact when the knob is pushed inwards. With the aid of these notes we think you will be able to make the correct connections to any type of change-over switch you may happen to employ.

A Handy Unit.

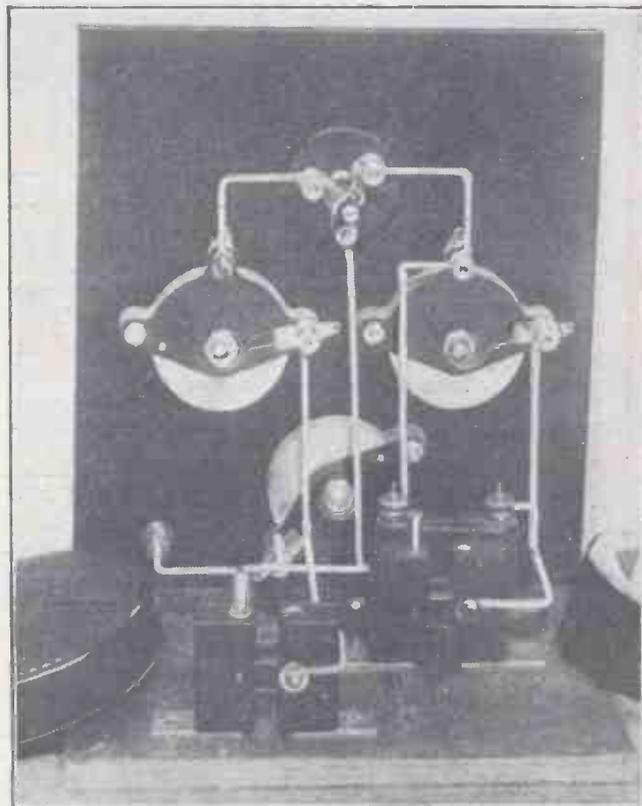
Attached to the lower edge of the panel in the usual way with a row of small screws is a shallow baseboard, measuring about 7 in. by 4 in., on which the remainder of the components are mounted. These consist of two single-coil holders and a fixed condenser of .0003 mfd., and we would point out that it is rather important

The idea of the whole unit is that it may be placed in a small vertical front cabinet like a receiving set, or, alternatively, it can just stand upon the table without any form of cabinet if you care to use it in this way.

Here are the point-to-point connections for the unit, which you may find useful in wiring up. Terminal Aerial 1 to one side of condenser C₃ and small pillar on switch S. (Continued on next page.)



former are set and left set for all you to go from one wave-length to second.



Very little in it, is there? But that little does a tremendous lot. It keeps your ether clear and acts as an impassable barrier to unwanted signals.

HAVE EVER COME ACROSS."- Capt. Eckersley

THE "B.P." REJECTOR DE-LUXE.

(Continued from previous page.)

Terminal Aerial 2 to other side of condenser C_3 , one side of coil L_1 , and one side of L_2 . Other side of coil holder L_2 to one side of condenser C_2 . Other side of condenser C_2 to tallest pillar on switch. Remaining side of coil holder L_1 to one side of fixed condenser C_1 , and one side of variable condenser C_1 . Remaining side of fixed

condenser C_1 to remaining side of variable condenser C_1 and contact on disc or body of switch. That completes the wiring.

Now for some practical instructions for the use of the unit. Supposing first of all that you want to use it for the elimination of one or other of the Brookmans Park transmissions. Insert a No. 50 coil in each of the coil holders and proceed as follows. First of all, set condenser C_3 to maximum, and condensers C_1 and C_2 to minimum (moving vanes right out of engagement with fixed vanes). Set switch with its knob pushed inwards.

Wiping out the Local.

Now tune in the 261-transmission on your set, and detune a little below it so as to reduce the volume a trifle. (If your set will not tune below, tune just a trifle above.) Now operate condenser C_2 until you come upon the rejection point which causes the signals practically to vanish, and on either side of which they reappear. Probably they will not disappear altogether at first, so then try reducing condenser C_2 a little, and again retune on C_2 . Continue in this way until you find you can only just find the rejection point when condenser C_2 is full in. This usually requires condenser C_3 to be set to some value nearly half-way in.

Having found this rejection point as accurately as possible, turn your attention

"I was particularly struck with the ingenious design of the Brookmans Rejector Circuit, because this method does appear to give the most efficient performance I have ever come across."
Capt. P. P. ECKERSLEY.

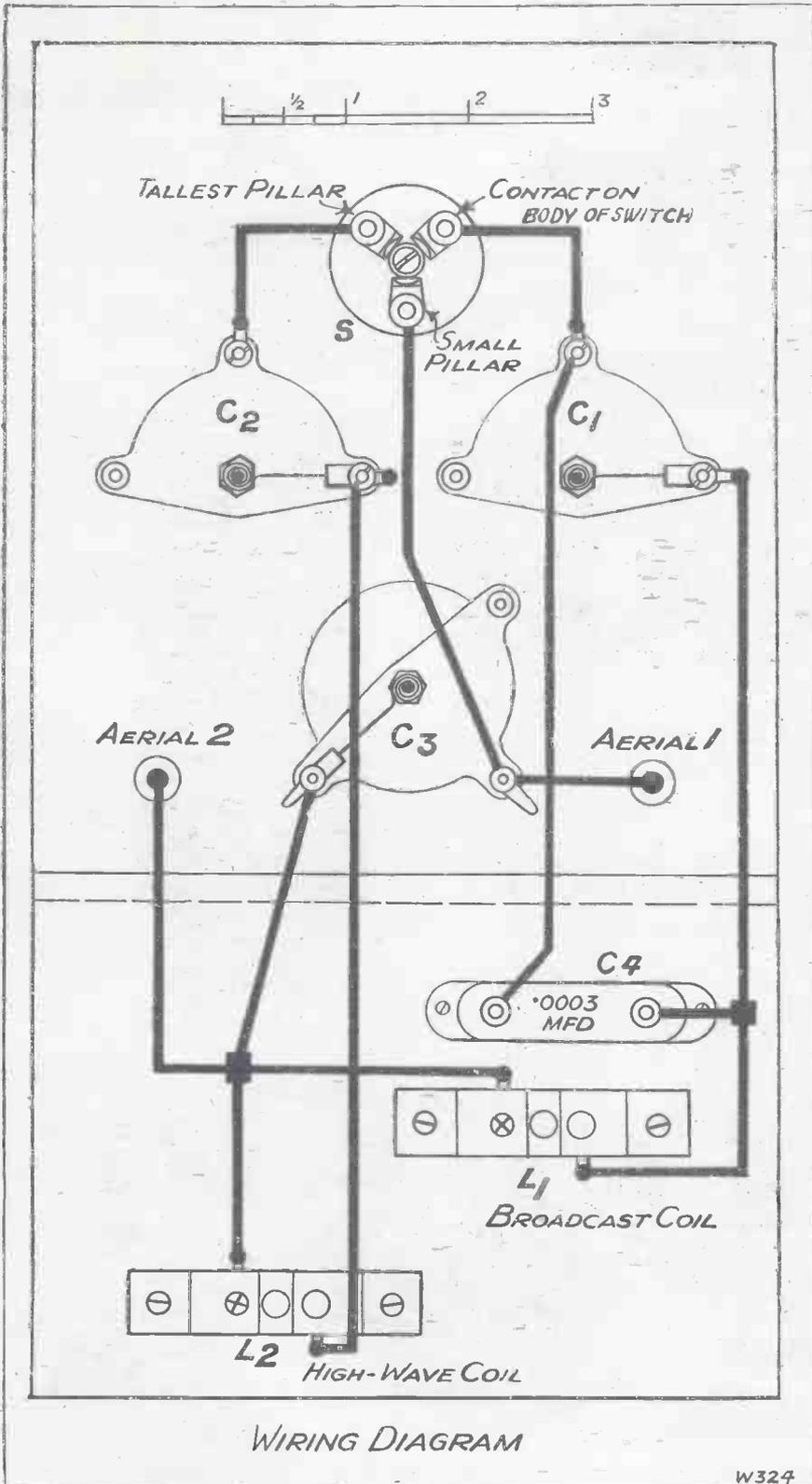
to the 356-metre transmission. In order to do this, leave condenser C_2 set (you will not need to touch it again) and pull the knob of switch S outwards. Tune in the 356-metre transmission on your set, and turn your attention then to condenser C_1 . Find the rejection point for the signals on this, and then the task is done. Thereafter all you will have to do in order to remove one or other of the stations will be to work the switch as may be required.

On the Long Waves.

Now, suppose that you wish to remove just one station on the lower wave-band and one on the upper band (5 X X in all probability). You will now require a No. 50 in the L_1 socket as before, and a No. 200 or preferably 250 in the L_2 socket. Start off with the switch knob pulled outwards and find the rejection point for your local station (the lower wave one) on the condenser C_1 exactly as before.

Next go over to long waves, push the switch knob inwards and find the correct rejection setting for 5 X X on condenser C_2 . In order to get the best effect you should start off in the first place with condenser C_3 set to somewhere about half its full capacity and then find the rejection point on C_1 . When you go over to the long waves leave C_3 alone and carry out the rejection on condenser C_2 .

There, that sounded pretty simple, didn't it? You will find in actual practice it is just as simple as it looks on paper, and the ease with which you can cut out an interfering station is even more surprising and remarkable.



WIRING DIAGRAM

W324

Eight wires, that's all, and the job is done, and you are ready to waylay any trespassing station and to wipe it out completely.



NEW! A.C. Mains SCREEN GRID OSRAM M.S.4



(Indirectly Heated)

This valve has the lowest internal self-capacity of any screen grid valve — 0.0025 micro-microfarads when adequately screened. The characteristic "slope" is 1.1 ma/volt.

Small bulb. More magnification—easier to stabilize.

Characteristics

- Filament Volts 4.0
- Filament Current ... 1.0 amp. approx.
- Amplification Factor 550
- Impedance 500,000 ohms.
(at screen volts 70)
- Mutual Conductance 1.1
- Anode Volts 200 max.

PRICE 25/-

Osram Valves

MADE IN ENGLAND

Sold by all Wireless Dealers.

Best way to
All Stations



The new Dario Valves will improve your radio set—at a lower price, because Dario Valves are made in large quantities by one of the biggest Valve Factories in the world and sold free from any price control. Dario Valves have the New Coated Filament—the New Super-Strength Grid and the new Large-Size Anode—points that mean greater all-round efficiency—points that prove Dario Supremacy.

SCREENODION	SUPER POWER PENTODION
15⁶/₆	18⁶/₆
<p>TWO VOLT Prices Universal .1 amp 5/6 Resistron .1 amp 5/6 Super H.F. .15 amps 5/6 Super Power .18 amps 7/6 Hyper Power .3 amps 9/6</p> <p>FOUR VOLT Prices Universal .075 amps 5/6 Resistron .075 amps 5/6 Super H.F. .08 amps 5/6 Super Power .1 amp 7/6 Hyper Power .15 amps 9/6</p>	<p>2 v. .3 amp. 4 v. .15 amp.</p>



Best way to all Stations

Ask your dealer for the Dario Folder or write direct to:

IMPEX ELECTRICAL LTD.,
 Dept. B, 538, High Road, Leytonstone, London, E.11.

HOW TO MAKE
a first rate
CONE SPEAKER
at low cost!



EDISWAN CONE UNIT
 PRICE **15⁶/₆**

EDISWAN CONE ASSEMBLY
 PRICE **12⁶/₆**

The Amateur who appreciates good results will be delighted with the reproduction given by this low priced but highly efficient combination.

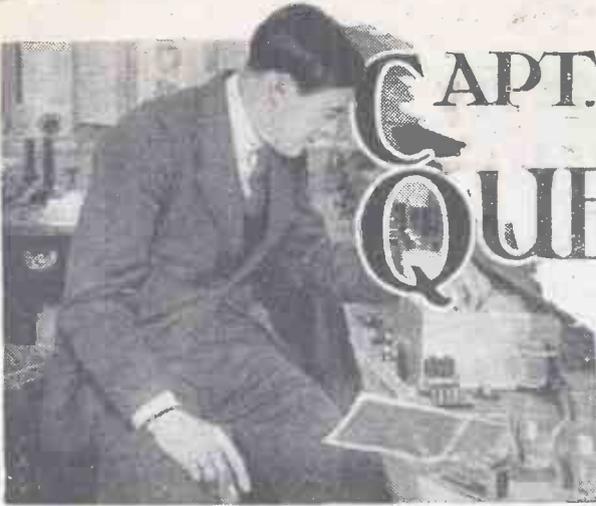
Used together the cone unit and assembly give results that compare favourably with many high priced cones or, if you prefer it, you can attach the cone unit to a home-made cone assembly with good results.



THE EDISON SWAN ELECTRIC CO., LTD.,
 Radio Division,
 1a, Newman Street, Oxford Street, W.1.
 Branches in all the Principal Towns.

EDISWAN W.75.

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 coming to the Query Department in the ordinary way will be dealt with by him.

An Aerial Problem.

C. T. (Paisley).—"With my frame aerial it is difficult to decide which is the position for maximum volume, but it is easy to find a point where signals either disappear or are at a minimum. Is it safe to assume that loudest results will be obtained at right angles to this minimum position?"

The loudest results are truly where the frame is at right angles to its minimum sensitivity position on a given station. But the gain of signal by turning it from 10 degrees off minimum to 90 degrees off minimum is very slight, and practically anywhere off 10 degrees either side of minimum is a satisfactory working position.

Using S.G.'s and Anode Bend.

L. T. A. (Newark).—"Is there any disadvantage in the use of anode-bend rectification after one or two S.G. stages? I have been given to understand that reaction troubles are rather more difficult to cure than with leaky-grid detection. Or should I not need to use reaction?"

I think it's just that reaction conditions with bottom-bend rectification are difficult, so don't use it. You ought to get plenty of power to your detector with a reasonable aerial and 2 S.G. stages.

Stopping "Scratch."

L. F. P. (Baron's Court).—"I have a three-valve set with which I use a gramophone pick-up. Unfortunately, the amount of scratch is so great as to make results unbearable. Can you, therefore, suggest a cure?"

One would say that your amplifier and/or loud speaker and a pick-up is giving a predominance of the high frequencies to the detriment of the low; this would produce scratch in any record, old or new.

The best cure is to produce a straight-line overall system by choosing all components for their correct values for the circuits you are using.

Too Much Current.

Y. B. (Sevenoaks).—"For the last week or so, I have been troubled with 'woofy' signals, and I find that the anode current to my last valve is more than twice what it should be, despite the fact that I am using the correct grid bias. What is likely to have happened?"

Soft valve, or a partly short-circuited

impedance (loud speaker, loud-speaker transformer primary, etc.) in the anode circuit of the last valve would both do what you complain of. Try a new transformer loud speaker, choke, or whatever it is in your anode circuit, or a new valve.

WELL DRILLED!



A light, steady pressure and an upright drill are the secrets of success in drilling.

The Earth Condenser.

W. B. A. (Kensington).—"Whilst studying some diagrams of D.C. mains sets, I noticed a great difference in the capacity of the series-earth condenser. Is there a correct value for this condenser, or is its capacity immaterial?"

Provided it's above, say, 0.01 mfd., it's all right. The point is that it must have a very good insulation value to stand against the D.C. pressure, and not short-circuit the mains.

Mica or Paper?

G. T. S. (Cambridge).—"What is the real reason why it is necessary to employ mica dielectric condensers in R.C.C. units in preference to condensers with paper dielectric?"

Mica dielectric is used because it is easier to make a small condenser with this insulation than with paper. Proper paper would do perfectly well, except that the condenser would be very bulky.

H.F. and D.C. Resistance.

D. B. A. (Canterbury).—"Why does the direct-current resistance of a length of wire differ from the high-frequency resistance of a similar length and type of wire?"

When you start a current in a piece of wire you must imagine it as starting first in the outer skin of the wire, and then sinking into the centre until a steady state is obtained.

High-frequency currents reverse direction so rapidly that the current never has time to sink into the centre, and all conduction is on the skin of the wire. There is a smaller conductive path, therefore, and so the apparent resistance of a wire is greater the greater the frequency of alternating current, and for very high frequencies a tube has the same apparent resistance as a rod.

With stranded wire you get more skin and less centre, and so a stranded wire approximates to the same H.F. as D.C. resistance.

Reversing the Secondary.

M. C. (Sydenham).—"My two-valve transformer-coupled amplifier howls continuously, in spite of the fact that an 'anti-mobo' device is connected in series with the detector H.T. I find that if I reverse the leads to the secondary of the second transformer, the howling ceases. Is there any harm in doing this?"

None; you have done just the right thing and stopped the reaction effects.

Series Condenser or Coil Tap?

T. K. L. (Colchester).—"I have a directly-coupled aerial circuit on my set. Which is the more efficient way of obtaining a given degree of selectivity—by series aerial condenser, or tap on the coil?"

Both work equally well if conditions are properly adjusted; but it's far simpler to use an aerial series condenser.

LATEST BROADCASTING NEWS.

ST. DAVID'S DAY

MR. THOMAS TO BROADCAST—RADIO REVUES—MORE MORNING TALKS.

MARCH 1st, St. David's Day, this year falls on a Saturday, so that the audience of Welshmen and others all over the country who hear the special programmes, which the B.B.C. is, as usual, preparing in honour of the Patron Saint of the Principality, will probably be greater than ever before.

Both the Cardiff and Swansea transmitters will, of course, be radiating these programmes, and arrangements have also been made for their re-diffusion by Daventry (5 X X). Professor E. T. Davies of the University College of North Wales, Bangor, will be responsible for the early part of the evening programme from the Cardiff Studio, where a concert representative of all parts of Wales will be given. The programme consists of Welsh nursery rhymes and folk songs sung by Mabel Parry (soprano), who comes from Caernarvon; while mid-Wales is represented by Tom Pickering (tenor), who is Tutor at the School of Music, Aberystwyth; and South Wales by the National Orchestra whose members reside in Cardiff.

Mr. Thomas to Broadcast.

Among the items by the Orchestra is an unfinished work by Vincent Thomas entitled "Elegy on a Dead Poet," introducing the tune Crugybar, the music being in march time. It is a tribute to the military service of the author who won the Bardic Chair in 1917 with "Yr Arwr" which he wrote in the trenches. When the award was announced, however, the Chair was empty, the young soldier-poet having been killed after sending his Awdl to the Eistedfodd.

The concert will be followed at 9 p.m. by a relay of the speeches at the St. David's Day Banquet of the Cardiff Cymrodion Society, which is to take place at the City Hall. The toasts include that of "Our Guest," proposed by the President, Dr. H. M. Hughes and replied to by the Rt. Hon. J. H. Thomas, M.P., Lord Privy Seal, and "Wales" proposed by Principal J. F. Rees and responded to by Alderman Jenkins, M.P. The proceedings will also include songs in Welsh by Clervyn Davies (tenor).

An Important Talk.

Earlier the same evening Welsh stations will broadcast a talk by the Rev. Dr. Hartwell Jones on "St. David's Ideals and the Welsh People." This talk will take the place of the usual Saturday discussion on Current Events affecting Both Sides of the Bristol Channel.

Dr. Jones, who since 1892 has been Rector of Nutfield in Surrey, is the son of the late Rev. Edward Jones, Vicar of Llanrhadr, Oswestry, where the Bible was translated into Welsh by Bishop Morgan.

He was formerly Professor of Latin at

University College, Cardiff, and besides being a Doctor of Divinity and Doctor of Literature, is a fellow of the Society of Antiquaries, and Chairman of the Honourable Society of Cymrodion in London.

Radio Revues.

A second edition of the revue entitled "A Piccadilly Dally," written by Mr. Gordon McConnel, a member of the staff at Savoy Hill, who in the past has been responsible for the production of many excellent light programmes, will be broadcast to 5 G B listeners on Thursday, February 27th, and again to London listeners on the following evening.

The cast includes Leonard Henry, Leslie French, Wynn Ajello, Dora Gregory, Frank Denton, Foster Richardson, Henry S. Pepper, and Doris Arnold. They will be assisted by the Revue Chorus who will be conducted by Stanford Robinson.

5 G B listeners will also hear another revue during the same week, on Tuesday, February 25th, when "Skylarks," a new revue by Charles Brewer, a member of the B.B.C. staff at Birmingham, will be produced in the Midland Studio. The cast in this show includes Charles Herbert, Alfred Butler, Mary Wyndham and James Podger.

More Morning Talks.

More man comes back to his own in the

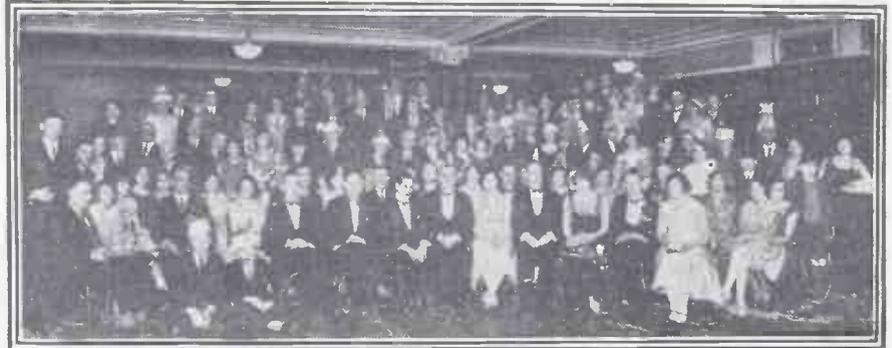
morning talks during the week beginning Monday, February 24th, when at 10.45 a.m., Mr. J. W. Robertson Scott begins a new series of eight talks entitled "A Hundred Years Ago."

It will be remembered that Mr. Robertson Scott recently concluded a series of talks on life in Our Great-Grandfathers' Days, and in the new series he will delve even farther back into history and, as the talks progress, come still further forward with the progress of such things as education and women's rights that have taken place during the last century.

This series of talks is particularly interesting as it is the subject chosen this year for study by the National Federation of Women's Institutes, and should therefore, make a strong appeal to listeners in the country districts as well as to those in the cities and towns.

Miss Helen Wilkinson, M.P., returns to the microphone on Wednesday morning, February 26th, to give the second of her parts, in the talks entitled "The Week in Westminster." Miss Wilkinson will also be broadcasting to Northern listeners on the previous day when she is giving a talk in the series entitled "Towards Utopia," in which she will deal with the question "Can Men and Women be Really Equal."

The talk on the morning of Thursday, February 27th, is also of particular interest as it deals with listeners' recipes.

A RADIO "GATHER-ROUND."

This photograph shows the Peto-Scott "family" on the occasion of the annual staff dinner.

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.)

The High Jump.

SIR JOHN REITH has raised a hornet's nest about his ears. The policy of the B.B.C., he says, is to give the people not what they like, but what they ought to like. He would pitch the level of entertainment slightly higher than the popular demand. But surely he is right.

If you can clear four feet easily in a high jump, you must put the tape up a notch; and the only way of improving your jump is to keep the tape slightly above what you know you can do. You rise to it. The leader must always be just ahead of his men; not too far, but a little.

If you never got anything but just what you liked, your standard would drop. The

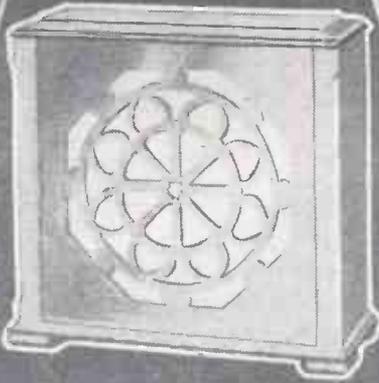
modern music hall is (or was!) better than the old one, because somebody had the courage to offer an entertainment slightly higher than the popular level; and the people found they liked it.

Improvement and Pleasure.

Of course, nobody likes being improved; and if a man comes to me and says, "Sec, I will make you better," I shall tell him to go to blazes. Perhaps Sir John was unwise to show his hand. But he isn't really out to improve us, but to give us more pleasure.

The capacity for pleasure increases with every other capacity. The better workman

(Continued on page 1180.)



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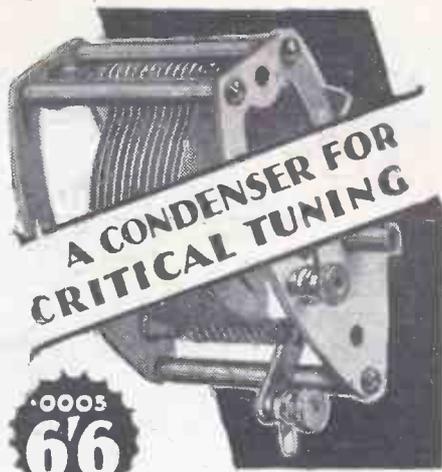
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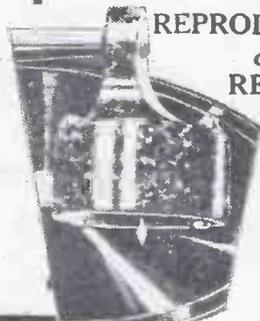


0005
6/6

The new Lissen Variable Condenser enables you to enjoy a new standard of tuning—a new sense of smooth control—a new ease in separating stations close together—simply because there is no condenser loss, and incoming signals are retained at full strength. See the unmistakable rigidity of its construction; see the long bearing and the extended spindle for ganging purposes. Notice that there is no end pressure, no tendency to distortion of the vanes. The fixed vane terminal is in a new and convenient position well away from the end plates. There are feet for baseboard mounting, or standard one-hole-fixing for panel mounting.

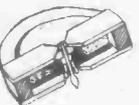
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If you want every single record to sound much better than those you hear at demonstrations—if you want radio-gramophone reproduction that comes so near to reality that in a darkened room you would suspect the presence of the artist—get this new Lissen Pick-up and learn what perfection means. Any Lissen radio dealer will demonstrate it for you.

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

The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts or photos. Every care will be taken to return MSS not accepted for publication. A stamped and addressed envelope must be sent with every article. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C. 4.

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

QUESTIONS AND ANSWERS.

GETTING RID OF HUM.

F. L. E. (near Hayes, Kent).—"The only disadvantage that followed scrapping the batteries and using the mains is the fact that there is a small hum in the set.

"It is very slight and hardly worth considering, but although I am nervous of the mains in the ordinary way I should like to tackle the removal of it if this can be done by any simple means. Can you suggest any way?"

One very simple alteration of which no listener need be afraid is the reversal of the low-frequency transformer connections. It often happens that a small hum will disappear completely if either the primary connections of the transformer, or its secondary connections, are reversed. (These two are merely

"P.W." TECHNICAL QUERY DEPARTMENT

Is Your Set "Going Good" ?

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

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

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

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

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continuous windings, so that the reversal of one or of the other will not radically affect the working of the set although it may do a great deal towards making the hum disappear.)

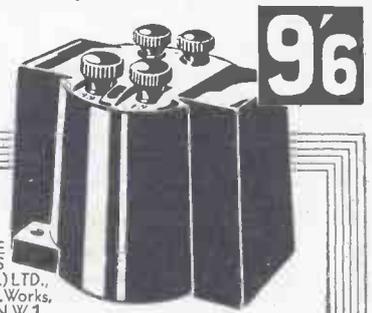
Another very simple precaution to take is to make sure that the aerial or earth lead, or the set itself, has not been brought too close to the electric-light mains. Often the house wiring is concealed in the walls of the house, so that if an aerial or earth lead runs close to this an irritating hum will be present which the mere shifting of the lead will remove immediately.

Another very simple alteration is to fit a large condenser in series with the earth lead, the aerial lead, or with both, if two condensers are on hand. Better still, you can altogether avoid direct connection of the receiving apparatus to the aerial, using instead a magnetic coupling between two coils placed in a two-coil holder (in which case variable coupling can be obtained).

(Continued on next page.)

'POPULAR' TRANSFORMER

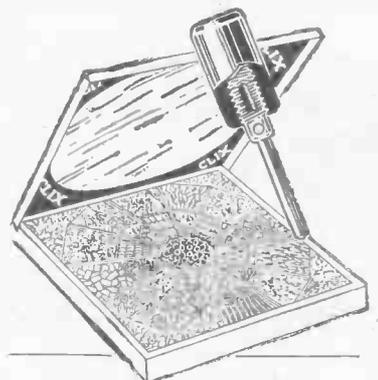
Make your new set a better set with the Brownie **POPULAR** Transformer. Although it costs only 9/6, its purity of amplification gives a more vivid clarity of reproduction throughout the musical scale, while its sturdy British build ensures that once it is fitted the words "transformer troubles" can be eliminated from your list of worries.



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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

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Alternatively two separate single-coil holders can be used, in which case the degree of coupling can be varied by alternating the numbers of turns in the primary (aerial) coil. Another easily tried stunt which often gives excellent results is to use a well-insulated counterpoise instead.

HOW TO NEUTRALISE.

P. E. (King's Norton).—"I do not seem to be able to get proper results because I cannot neutralise the set properly. What is the best way for an inexperienced listener to do this? None of my friends have an H.F. set of this kind so I am at a loss as to the best means of making this stable."

The following method of neutralising is recommended in sets with only one stage of high-frequency amplification and provided with a reaction control. Set the reaction control at minimum and likewise the neutralising condenser. Now, on setting the tuning condensers so that the two tuned circuits are in step with each other, it will probably be found that the set is oscillating.

To test for oscillation touch one or other of the sets of plates of the tuning condensers (this may be either the fixed or moving, according to the particular set). You will probably find that the set will oscillate under the above conditions only when the two circuits are in tune with each other, and this can be used as an indication. It is convenient to perform the operation at some point near the middle of the tuning range. Now, increase the capacity of the neutralising condenser. (In the case of such condensers as the Gambrell "Neutrovornia" this means screwing downwards.) Test at intervals for oscillation as this is done, and you will presently find that the set has ceased to oscillate and will not recommence even when the tuning dials are slightly readjusted.

Now increase the reaction a little, until the set once more oscillates, and again increase the neutralising condenser setting until oscillation ceases. Slightly readjust the tuning condensers again to make sure that the set is completely stable once more.

Proceed in this way until it is found that the correct adjustment of the neutrodyne condenser has been over-shot. Once this point has been passed it will be observed that further increases of the neutrodyne condenser setting no longer stop oscillation but cause it to become stronger.

The object is to find such an adjustment of the neutralising condenser as will permit the greatest setting of the reaction condenser to be used without producing oscillation. It will then be observed that when the two tuned circuits are in step and the set is brought to the verge of oscillation a slight movement in either direction of the neutrodyne condenser will cause the receiver to break into oscillation.

It is to be understood that in the preceding notes, where a reaction condenser is spoken of, any form of reaction control may be understood.

DIFFERENTIAL REACTION CONNECTIONS.

H. B. (near Leamington).—"The first valve was a screen-grid H.F. with a tuned-anode coupling to the detector and reaction on to the tuned anode. With the idea of improving the smoothness of this and imparting the 'Magic' touch to it, I inserted a differential condenser as reaction control instead of the ordinary type of condenser, which I had been using, but the results are very disappointing, one feature being that instead of reaction being better it seems to be far more erratic than before and has a marked effect upon tuning. What would be the cause of this?"

We are afraid that you have connected the differential condenser up wrongly, and as your circuit particulars are rather meagre you had better send us a diagram showing the arrangement and the present connections to the differential condenser. Theoretically the method is quite applicable in your case, and we would expect it to effect a great improvement upon the ordinary type of reaction condenser, where long distance listening is being undertaken.

ADJUSTING THE CRYSTAL.

M. D. (Newmarket).—"With the old type crystal detector I could see what the cat's-whisker was doing, but the new one is a closed-in tube with a handle sticking out. How should this be adjusted?"

Inside the tube are two different crystals (not one crystal and one cat's-whisker), and they are so arranged that the opposite faces can be brought into

(Continued on next page.)



DELIVERS ALL ITS STORED-UP ENERGY!

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Lissen Resistance Capacity Coupling Unit embodies a .01 Lissen Fixed Condenser, which is leak-proof and unvarying in capacity and which delivers all its stored-up energy. There is therefore no loss of volume, no loss of purity. The Lissen Fixed Resistances are silent; they never vary, no matter what the current load. Values incorporated have been selected as the most suitable for general use, but the resistances are easily inter-changeable. May be mounted upright or flat. **PRICE 4/-**

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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

contact with one another at many different points. To do this you must first pull out the knob slightly, then turn it to a new position, and then gently return it to the contact position.

Do not forget to separate the crystals before turning the adjusting knob, or otherwise they will grind one another to powder.

THE "P.W." LIFE STORIES

B. O. (Northwood).—"I am a new reader of 'P.W.' and should be much obliged if you could publish the names of the famous broadcast stars whose life-stories have already been printed. I am looking forward to the continuation of this interesting series, and hope to secure some back numbers of 'P.W.'"

The following are the "Life Stories" already printed, with dates of issue.

- (1) "Flotsam and Jetsam." 2/11/29.
- (2) Helena Millars. 9/11/29.
- (3) Gracie Fields. 10/11/29.
- (4) Ronald Goulay. 30/11/29.
- (5) J. H. Squire. 14/12/29.
- (6) Teddy Brown. 21/12/29.
- (7) Ernest Butcher. 11/1/30.
- (8) Ronald Frankau. 18/1/30.
- (9) Albert Sandler. 25/1/30.
- (10) Reginald Foort. 1/2/30.
- (11) Norman Long. 8/2/30.

OPERATING THE "MAGIC" THREE.

G. M. (Portland).—"I suppose you cannot help your circuits being popular, but I had an awful difficulty in building up the 'Magic' Three. The dealer said the components were out of stock and snapped up when they did come in!

"Finally when I got it all made up I found that the number of 'P.W.' containing the hints, etc., was out of print owing to the great demand, so I was unable to take advantage of anything you may have said regarding the operating of the set. Has this number been

reprinted, and what are the points to watch?"

There were no special points to watch with regard to any of the "Magic" sets, but a summary of the working data, coils to use, arrangement of H.T. windings, etc., was published in "Radiotorial" in our January 25th issue.

IMPROVING A CRYSTAL SET.

C. M. W. (Buckingham).—"We often see hints for improving a valve set and getting better results from it, but not much is said about crystals. Why can you not tell us some

Although, as stated, all the power to work a crystal set must in the first instance be derived direct from a broadcasting station, there are several ways of making the best of it, instead of letting some of it dribble away and be lost.

First and foremost you must have a good aerial and earth connection. If you have not tried experimenting in this direction we should certainly try some of the hints, etc., which appear in "P.W." from time to time, so as to get the maximum efficiency on this side of the set. It stands to reason that the more energy you can pick up from the station the more you will receive in the 'phones, so be sure to have a really good conductivity aerial, as high as you can get it, keeping it far away from screening buildings, trees, etc., as possible, and get a really good earth connection to damp soil.

Keep the leads to the earth as short as possible without in any way getting bad joints in the leads, dirty terminals, etc., and in the aerial circuit beware of dirty insulators.

Finally, in order to get the best possible reception with your crystal set make sure that the aerial wire and aerial lead do not come in close proximity to any metal pipes, gutters, etc., as this is a sure way of short circuiting some of your power to earth instead of using it via the set.

BETTER SELECTIVITY.

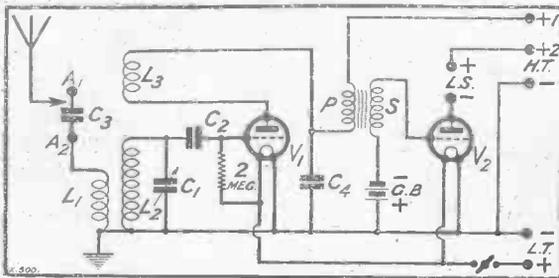
T. S. (Buntingford, Herts).—"I quite appreciate what you said about using a separate coil for aerial and earth, and coupling this to the grid coil (which is tuned by the aerial tuning condenser), but when I came to carry out the alteration in my set I found it a little difficult. So I am enclosing a sketch herewith showing the aerial and earth terminals and the old aerial coil.

"You will see from this that the earth terminal is joined to the socket of the aerial coil holder, to the low-tension wiring, and to the moving vanes of the tuning condenser. The plug

(Continued on page 1178.)

POPULAR "WIRELETS"

HERE IS THE ANSWER TO No. 2.



DID YOU GET IT RIGHT?

Popular "Wirelets" No. 3 will appear next week.

method whereby we can get loud-speaker reception without having to go to the expense of valves?"

The truth is that any crystal set, no matter how good, is always under a disadvantage when compared with a valve. It has this great drawback—all the energy you use to work your crystal set has to come from the broadcasting station.

There is no supply of local energy of any type, such as batteries, etc., which can help you to get loud signals. Thus, no matter what you do to the set you soon get to its limits if it is a crystal set.

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There is no supply of local energy of any type, such as batteries, etc., which can help you to get loud signals. Thus, no matter what you do to the set you soon get to its limits if it is a crystal set.

Polar "Ideal."

POPULAR

WIDE TUNING RANGE

Because Polar Condensers are scientifically designed—have accurately spaced vanes and low minimum self capacity—they give you a definitely wider range of tuning.

There is no need to sacrifice listening to 5GB (479 metres) because you want Brookman's Park (261 metres) transmission. The Polar "Ideal" or Polar "No. 3" Condenser of .0005 capacity will tune them all in on any standard circuit receiver. Polar Condensers give velvet smooth control, and the "Ideal" with both fast and slow motion gives knife-edge selectivity. Both the Polar "Ideal" and "No. 3" will make a wonderful difference to your range of reception.

POLAR "IDEAL" .0005, 12/6 **POLAR "No. 3" .0005, 5/9**
 .0003, 12/- (as illustrated) .0003, 5/6 (Dial 1/- extra)

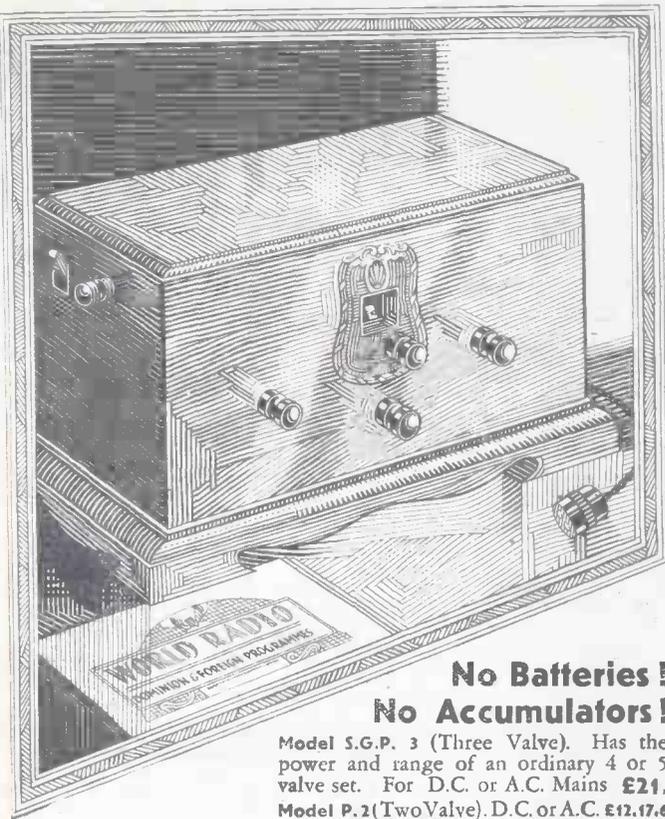
POPULAR CONDENSERS

Obtainable from all dealers. Write for Free Copy of "Polar" Catalogue (P)

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 188-9, STRAND, LONDON, W.C.2.

Polar Works: Mill Lane, Old Swan, Liverpool.

**This superb
"Ekco" Set
works entirely from
the Electric Supply**



**No Batteries!
No Accumulators!**

Model S.G.P. 3 (Three Valve). Has the power and range of an ordinary 4 or 5 valve set. For D.C. or A.C. Mains **£21.**
Model P. 2 (Two Valve). D.C. or A.C. **£12.17.6**
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Plug-in the "Ekco" adaptor to your electric light or power—switch on—and know what it means to receive radio in the modern way. No batteries to run down—no accumulators to recharge—no bother—no mess. "Ekco-Lectric" Radio Receivers are in hand-polished Walnut cabinets—with volume and selectivity controls—sockets for gramophone pick-up—Westinghouse Valveless Rectification in A.C. models—and they are British made.

EKCO

Plug-in—That's all!

"EKCO-LECTRIC"

RADIO RECEIVERS

There are also "Ekco" Power Supply Units for electrifying or partly electrifying your present set. Write for Free Booklet, including particulars of the above receivers, and details of Easy Payments to—

E. K. Cole, Ltd., Dept. A., "EKCO" Works, Leigh-on-Sea.

**Your set
deserves the best
Components**



CLEARERTONE.
The original anti-microphonic valve holder, often imitated, never duplicated.

2/-



VIBROLIDER.
The self-aligning feature ensures positive contact with all 4-pin valves.

1/6



5-PIN HOLDER.
For 5-pin valves with centre leg. Can also be used with standard 4-pin valves.

1/9



ROTARY SWITCH.
An effective alternative to the push-pull type. All insulated and with indicating dial.

1/9

Whatever type of circuit you are building there are Benjamin components to suit your purpose. To those of you who are building portable sets, or gramophone amplifiers, Benjamin valve holders are essential, as the vibration and jolting in these two types of sets will not only give rise to unwanted noises, but may mean the complete breakdown of expensive valves. The patent anti-microphonic and self-aligning features ensure positive contact with all types of valves.

**THREE MORE
POPULAR COMPONENTS**

PUSH-PULL SWITCH.
Double-contact and with terminals. It's "off when it's in."

1/3

TURNTABLE.
Ball-bearing and equipped with hinged and folding legs, enabling set to be used either in or outdoors.

7/6

PENTODE HOLDER.
The standard Clearer-tone model, with flexible attachment for terminal on pentode valves

2/3

Write for Illustrated Leaflets of all Benjamin Radio Products.

Buy

BENJAMIN
the Best!

THE BENJAMIN ELECTRIC LTD. BRANTWOOD WORKS, TOTTENHAM N.12

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1176.)

connection of this coil holder is joined to the fixed vanes of the tuning condenser and to the grid of the valve via the grid condenser, and also to the aerial terminal.

"Would you mind telling me in words exactly how I can fit up the additional coil holder, which is to be placed close beside the original one?"

All you have to do is to disconnect the aerial terminal from the plug of the present coil holder, leaving this latter point connected as before to the fixed vanes of the tuning condenser and to the grid condenser, etc.

Now join a short wire from the earth terminal to the socket of the new coil holder. Thus, all you have done at present is to disconnect the aerial terminal and to put in a short extra lead on to the earth terminal.

The final connection is simply to take a short lead, flexible, if you like, from the aerial to the plug of the new coil holder, and when that is done plug in a suitable coil. You will find that the smaller this coil is the sharper the tuning, i.e. the greater the selectivity.

A SIMPLER METHOD.

J. L. (Mansfield, Notts).—"I want to make the set a bit sharper in tuning, and I understand this can be done by means of another coil placed beside my present one. I am not quite sure if I have room for a coil in the set, and also I am not very clear about the connections, and I wondered if there was a simple way (preferably without buying a condenser or extra parts). Can you tell me of anything which will improve selectivity in this way?"

If you have room in your set for it, the fitting of a new coil holder and rewiring this is a very simple matter, as explained in another query this week. (See above.) But if you like, an even simpler job can be made of it.

All you need for the purpose is a few ounces of insulated wire (say No. 24 D.C.C. or any similar wire) suitable for making a small tuning coil. Instead

of purchasing a coil all you have to do is to wind a bank of wire, say 20 or 25 turns of it, making a winding of about the same area as the coil in your set.

Suppose, for instance, your present coil is 2½ inches across, get a cardboard tube of this size, a thick round piece of wood, or any former of about

WHAT DO YOU THINK ABOUT THIS?

Here is a puzzling portable fault, reported from Southampton.

The set was a 4-valver. Usually it worked well, but it was subject to "sulkingness." For no apparent reason strength would go down to about one-third, to suddenly resume again at full strength (still with no apparent cause) if the set were moved.

As the intermittent nature of the trouble indicated a faulty contact, all the leads, switches, wiring, batteries, coils, frame aerial and loud speaker were overhauled without effecting a cure.

WHERE WAS THE FAULT?

N.B.—There is no prize for answering this, but from time to time we shall give a radio problem (followed the next week by the answer) in the hope that readers will find them both interesting and instructive. (Look out for the answer to above next week.)

In the case of the Herefordshire reader whose failure to get selectivity with an X coil was described last week, the fault was found to be in the wiring to the X coil holder. In his set the socket of this coil-holder was joined to earth, instead of the pin, which is the standard method.

equal diameter, and wind on this the requisite number (20 or 25 turns) of wire. Gently slip it off the former, and secure it at three or four points by string or cotton, so that it remains tight and there

is no danger of the turns coming apart. All you have to do is to fit it into your set, is to tie it to your aerial coil and fix one of its ends to the earth terminal. The other end of this new coil goes to the aerial lead and nowhere else. So if your aerial terminal has only one wire coming from it, cut this, bend it back, and take your aerial lead to the aerial terminal, and the end of the new coil to the aerial terminal, thus joining them but leaving the rest of the set intact.

If several leads go from your aerial terminal, and you are not quite certain what to do, you can ignore the present aerial terminal altogether and fix a new aerial terminal beside it, taking the aerial end of your new coil to this and also the aerial lead to this, thus not using your old aerial terminal at all.

You will find that the fewer turns you use on your extra coil the sharper will your tuning be and the greater the selectivity the arrangement will give you, and as there are no extra parts to buy, except the wire, this is one of the cheapest as well as one of the most effective methods of improving selectivity.

THE IMPORTANCE OF SPACING.

M. G. S. (Tamworth).—"I must say I was a bit disappointed with your answer as it seemed to me that as I have got all the components you mention, and connected them up in the order you suggest, the set should give the results you claim for it. Is it really a fact that simply because my base-board is that much smaller the results are so far below standard? Why should the empty space round the components make any difference to the set?"

The space around the components is not necessarily "empty" as you suggest, but as a matter of fact, is full of magnetic activity.

We have investigated hundreds of thousands of cases of poor results where the whole trouble was due to inadequate spacing. Generally it is the high-frequency stages which are more liable to this trouble than the low-frequency, but over and over again we have found not only weak reception (or sometimes fierceness of unwanted oscillation) but also flat tuning, inefficient wave-trapping, and poor volume, all due to inadequate spacing of the wires or of components. (Many readers have written to thank us for the great difference it makes when this hint is acted upon, and if we published all the letters we received on the subject our "Correspondence" columns would overflow on to several pages.)

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WONDERFUL RESULTS. With the MULLARD "ORGOLA" 3 Circuit using

"GOLSTONE" COMPONENTS

and MULLARD VALVES. Supplied in sealed Kit with diagrams of wiring and instructions for easy assembly. Do you realise the extraordinary range and volume of this set, combining three mighty valves. Screened Grid, Detector and Pentode. "GOLSTONE" Orgola Kit "A.C." complete with superb Cabinet as illustrated. Price **£6 : 15 : 0**

Full particulars on request.

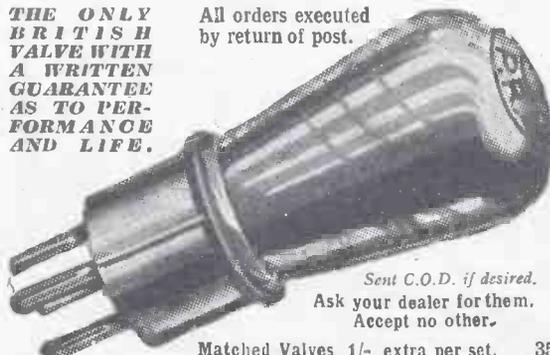
Let us send you our Radio catalogue with particulars of Kit.



Illustration shows completed Model constructed from "GOLSTONE" KIT "A.C."

THE ONLY BRITISH VALVE WITH A WRITTEN GUARANTEE AS TO PERFORMANCE AND LIFE.

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Sent C.O.D. if desired. Ask your dealer for them. Accept no other.

Matched Valves 1/- extra per set.

Why pay fancy prices when you can get a perfectly finished British made valve with a superior coating giving astonishing selectivity with a minimum H.T. consumption, which is the general opinion of the thousands who use P.R. valves. There are many valves on the market, but none are guaranteed. Ask yourself why. The P.R. guarantee covers seven months with the right—not a favour, remember—but a right to exchange the valve under the guarantee. All you have to do is to post any defective valve to us, complying, of course, with the terms of the guarantee which is attached and enclose a note stating defect—You will receive a new valve by return of post.

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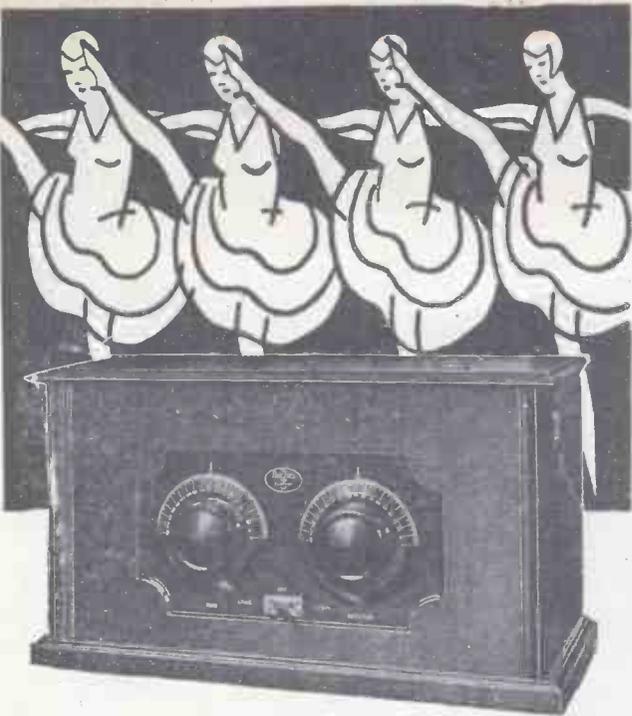
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LIST OF DULL EMITTERS.

Type	Fil. Volts	Amp.	Imp. Ohms.	Amp. Fac.		
3/6 EACH Post 4d.	PR 2	2	0.95	28,000	13	H.F. Det.
	PR 3	2	0.95	15,000	8	L.F.
	PR 4	2	0.95	60,000	32	R.C.
	PR 9	3.5-4	0.63	24,000	14	H.F. Det.
	PR10	3.5-4	0.63	15,000	8.7	L.F.
	PR11	3.5-4	0.63	65,000	40	R.C.
	PR17	5-6	1	24,000	17	H.F. Det.
	PR18	5-6	1	15,000	9	L.F.
	PR19	5-6	1	80,000	40	R.C.
6/6 EACH Post 4d.	PR20	2	15	7,000	6	Power
	PR40	4	15	8,000	6	"
	PR60	6	1	8,000	6	"
SUPER POWER 10/6 EACH Post 4d.	PR120	2	3	3,800	4	Super Power
	PR140	4	2	4,000	4	"
Screened Grid 15/- EACH Post 4d.	SG 25	2	2	220,000	150	S.G.

2 Valves or more sent POST FREE.



TEAM WORK —THE PERFECT ENSEMBLE!

All together, perfect smoothness, perfect unity . . . the result—*perfection!*

That is the secret of the "Empire 3"—*team work!* Every part is a BurTon part, working together with perfect smoothness, in perfect unity . . . the result—*perfection;* perfection in radio reproduction.

£5. 10

Valves, Batteries and Royalties extra.

ALL MAINS MODEL

(self-contained)

Price of Set **£11 : 5 : 0**

Price of Valves (Mullard A.C.) **£3 : 10 : 0**

(Royalties extra)

Identical in appearance to the Battery Model.

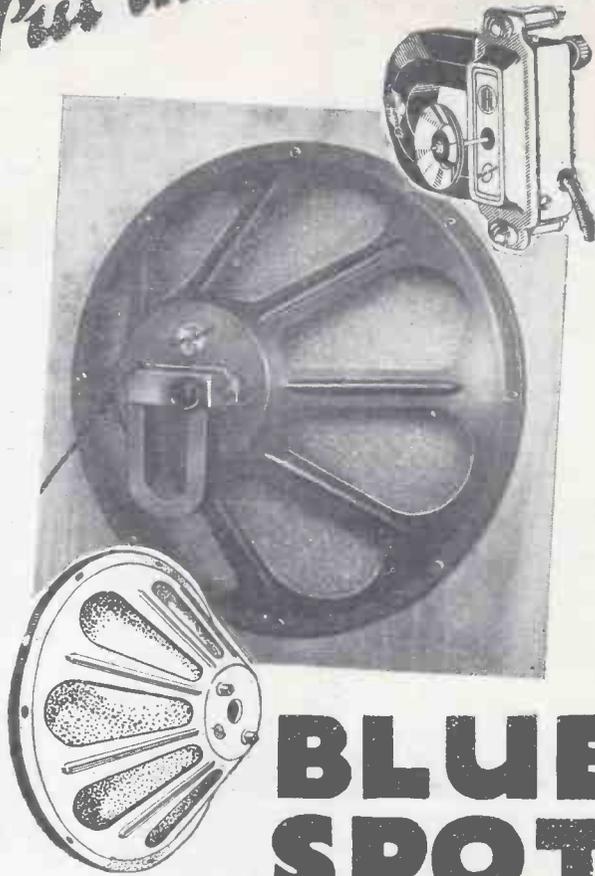
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EVERY PART A BURTON PART

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GET THEM TOGETHER

Put them together!



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When getting your 66K Unit, see the Blue Spot Chassis specially designed for it.

It's a simple matter to bolt the chassis to the unit—and the result is a complete speaker ready to play.

We are not exaggerating when we say you will be astounded at the purity of reproduction that your Blue Spot assembly will give—even the trade was, when it first heard it.

Look for the "Blue Spot" on all genuine Blue Spot products.

The 66K Unit is 25/-, sold under guarantee in special carton.

The Chassis is made in two sizes: the "Major," as illustrated, with 13-in. cone, price 15/-; and the "Minor," with 9½-in. cone, price 12/6.

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204.6, Great Portland Street, London, W.1

'Phone: Museum 8630 (4 lines).

Distributors for Northern England, Scotland and North Wales: H. G. Rawson (Sheffield & London) Ltd., 100 London Road, Sheffield ('Phone: Sheffield 26006); 22 St. Mary's Parsonage, Manchester ('Phone: Manchester City 3329).

FOR THE LISTENER.

(Continued from page 1172.)

gets more pleasure out of his work. There is more pleasure in listening to good music than to poor music, when once you have the hang of it.

Besides!

In any case, my lad, there is quite enough poor stuff in the programmes as yet to satisfy you, if you happen to be built that way!

Speed Records.

No, I don't mean Lindrum, nor yet Kaye Don! I mean Mr. George Allison broadcasting a commentary on the Arsenal v. Birmingham match. I believe he got more w.p.m.—"words per minute"—over the wireless than anybody has ever done before. The play was fast, but he was faster; for while the players have two legs, Mr. Allison has only one tongue.

At one time the game went from one end of the field to the other in thirty seconds, and in that period he mentioned ten men and told us in detail what they were doing! If any man earned his lemon at half-time, he did! I hope it was a long one! It sounded a long one!

A Pinkish Jelly.

Mr. H. W. Nevinson, I thought, was very good indeed. I simply loved the old war-correspondent-horse! His modesty was too engaging.

"P.W." "SAFE-POWER" UNITS.

The first of these new mains devices has now been completed, and it will be described in "P.W." very shortly.

They had asked him to tell some of his adventures, but he would scarcely admit that he had had any.

But one day, he said, when he was standing watching an engagement in Gallipoli, "a shell dropped on the top of my head, and bumped off! A sort of pinkish jelly came gliding down my face, and, for a moment, I thought it was my poor brains!" May we all be as calm and as humorous when our "close call" comes!

He sounded regretful when he spoke of the days when war might be no more! This "Looking Backwards" is a good series.

My Fancy.

As you probably have suspected, I am rather low-brow in my tastes, and I confess that of all the items in the programmes I like the "Male Voice Choir" sort. "Songs by the Fire," or "Helmet and Knapsack," when the boys gather round and sing good old rousing songs, with me joining in on the hearth at home. It gives me a cosy feeling somehow; and at times I almost "pipe my eye"! So that my pick of the week, this week, was The Templars singing their madrigals. It was a long time since I had heard "Strawberry Fair." A fine bout of part-singing which warmed the cockles of the old heart!

ENGINEERS!

Can't we get together?



All we ask is the chance to prove that you can earn £300, £400, £500, per year or more. Other men are doing it, and you can do the same

WRITE FOR THIS BOOK TO-DAY IT'S FREE!

We have an unrivalled and world wide organization waiting to help you whether you be novice or expert. If you wish for something more than a "bread and butter" job you owe it to yourself to investigate our Service.

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What do you want to KNOW?

THIS AND THAT tells you each week just what you want to know, gives you out-of-the-way information on almost every subject under the sun, brightly, clearly and entertainingly with a wealth of pictures.

Here are just three of the many fine features of this week's issue—

SHALL WE TAKE LONG CRUISES IN THE AIR?

ARE PIRATES ON THE INCREASE?

COULD ENGLAND GROW ALL ITS OWN FOOD?

Ask

This and That

Now on Sale. :: TWOPENCE



NOW YOU CAN USE AN ELIMINATOR JUST LIKE A BATTERY

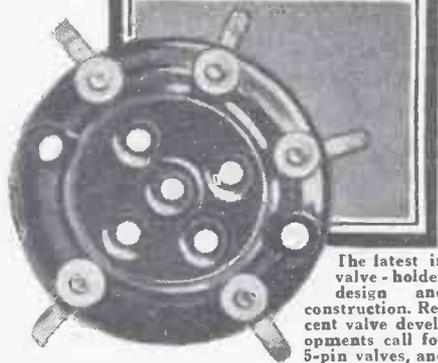
27'6

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 we will arrange for delivery of the Eliminator to suit you and for it to be properly installed. Send 5/- only. Leave the rest to us. You pay the balance in one sum after installation or by extended instalments.

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ELIMINATORS

D.C. MODEL "A" 100-110 or 200-250 v. Cash price 27/6, or 5/- down and 5 monthly payments of 5/6.
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The latest in valve-holder design and construction. Recent valve developments call for 5-pin valves, and this tendency will without doubt be extended. Save expense by fitting 5-pin holders now. Exceptionally strong, with springs entirely independent and cannot short-circuit. A glove-like fit to any standard valve, with positive terminal connection to valve pins.

IN BROWN MOULDED CASE

LISSEN
FIVE-PIN
VALVE-HOLDER

LISSEN-LTD., Worples Road, Isleworth, Middlesex.

HAVE YOU HEARD
The **LISSEN**
 ADJUSTABLE
BALANCED ARMATURE SPEAKER
 WITH
MOVING COIL TONE!



Complete Assembly **22/6**

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.

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 lissen 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.

LISSEN
 ADJUSTABLE
BALANCED ARMATURE UNIT

SWITCHES
 for
EVERY PURPOSE!



PRICES

Filament Switch,	1/-
3 Point Wave-Change Switch,	1/6
2-way Switch,	1/6
5-point Switch,	2/6
D.P.D.T. Switch,	2/6

There is a Lissen Switch for every radio switching purpose. All Lissen Switches are fitted with terminals for convenience in wiring, and all contacts are positive and self-cleaning. Whatever purpose you want a switch for, consider value for money and you will decide upon these low-loss Lissen Switches.

LISSEN
SWITCHES

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

Choke-Coupled L.F.
 WHEN using a screen-grid stage, choke-coupled, with a high-frequency choke coil of the ordinary type, you will often find that the arrangement is not nearly so efficient as if you use a special H.F. choke designed for the purpose.

At first sight you might think that there was little difference between using an H.F. choke of the ordinary type and one specially designed for these conditions, but in practice the difference is often quite considerable.

For really good amplification, of course, many experimenters favour the use of a tuned stage. But by using a choke-coupled stage, especially when two stages of high-frequency amplification are used, extra magnification can very conveniently be obtained, and this without adding any tuning difficulties.

For example, when two H.F. stages are used it is a simple and convenient arrangement to make one of these stages of the choke-coupled variety.

Shielding.
 Talking about the question of high-frequency chokes in general, it is important to remember the fact that the passage of the H.F. currents in the choke may produce a coupling effect in neighbouring units.

This can be avoided either by shielding the unit or by placing it so that it is not in too close proximity to other parts liable to be affected. If it is possible to do without the shielding it is better, but in cases where compactness is an important consideration, shielding may be the only available method.

Television Progress.
 For many years television has been struggling to free itself from the confines of the laboratory and to enter the home, and so to provide a welcome addition to the radio receiver. Up to the present time, however, attempts in this direction appear to have been unavailing.

It is true that there are a number of experimental television receivers in use, particularly in the United States, operated by those who have the time and inclination to make a special study of the system, but even this is properly to be regarded as a step in the laboratory process of development and not really as "public" use in the general sense of the word.

American Models.
 The Jenkins Television Corporation, of Jersey City, U.S.A., have installed television transmitting equipment which is claimed to be the most modern and efficient up to date. At the same time, a comparatively simple form of television receiver has been designed in which compactness and simplicity of operation are the main features.

In this Jenkins' unit a simple form of scanning drum is used and within this is situated a large-plate neon tube. The quartz or plated glass rods which were previously used have now been discarded,

(Continued on page 1184.)

BUILD YOUR KIT INTO



Takes any set having panel up to 18" x 8" (Register design)

THIS MAGNIFICENT VOXKIT CONSOLE

Holds both Speaker and Set!

Combines this advantage with unusually attractive appearance. Handsome overlays are supplied to suit almost any receiver. With or without speaker. Attractive art brown silk is fitted in either case. When ordering, specify type of set you propose fitting into cabinet. The speaker is the famous ULTRA Double Linnen Diaphragm Air Chrome type K. Chassis, giving superb results at all frequencies.

PRICES:

With Speaker.	Without Speaker.
Oak - - £8 17 6	Oak - - £4 4 0
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Stockists all over England. Write for full details and name of nearest stockist to:

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 FOR EVERY RADIO CONNECTION

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EVERY Amateur
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THE
"POPULAR WIRELESS"
AND
"MODERN WIRELESS"
BLUE PRINTS
OF
TESTED CIRCUITS

PRICE 6d. EACH

The following is a list of the 6d. Blue Prints for Constructors in stock, showing the different circuits available:

"P.W." BLUE PRINT

- Number
1. DETECTOR VALVE WITH REACTION.
 3. 1-VALVE L.F. AMPLIFIER.
 4. CRYSTAL DETECTOR WITH L.F. AMPLIFIER.
 5. H.F. (Tuned Anode) AND CRYSTAL WITH REACTION.
 6. H.F. AND CRYSTAL (Transformer Coupled, without Reaction).
 7. 1-VALVE REFLEX AND CRYSTAL DETECTOR (Tuned Anode).
 8. 1-VALVE REFLEX AND CRYSTAL DETECTOR (Employing H.F. Transformer, without Reaction).
 9. H.F. AND DETECTOR (Tuned Anode Coupling, with Reaction on Anode).
 13. 2-VALVE REFLEX (Employing Valve Detector).
 15. H.F. (Tuned Anode), CRYSTAL DETECTOR AND L.F. (With Switch for Last Valve).
 17. CRYSTAL DETECTOR WITH TWO L.F. AMPLIFIERS (With Switching).
 18. 1-VALVE REFLEX AND CRYSTAL DETECTOR, with 1-VALVE L.F. AMPLIFIER, Controlled by Switch.
 21. THE 2-VALVE LODGE "N."
 22. "THE GUARANTEED REFLEX."
 23. THE 1-VALVE "CHITOS."
 24. THE "SPANSACE THREE." Three-Valve Receiver employing 1 Neutralised H.F. Valve, Detector with Non-Radiating Reaction Control, and 1 L.F. Valve.
 26. A "STRAIGHT" 4-VALVER (H.F., Det. and 2 L.F. with Switching).
 28. A "MODERN WIRELESS" 5-VALVER (H.F., Det. and 3 L.F.).
 29. AN H.T. UNIT FOR DIRECT CURRENT MAINS.
 30. A REINARTZ ONE-VALVER.
 32. THE "CUBE SCREEN" THREE (H.F. Det. and L.F.).
 33. A "KNIFE EDGE" CRYSTAL SET.
 34. AN H.F. AND DETECTOR TWO-VALVER.
 35. THE "UNIVERSAL THREE" (Det. and 2 L.F. stages resistance-coupled).
 36. THE "SPANSACE FOUR" (H.F., Det. and 2 L.F.).
 37. THE "LONG SHORT" CRYSTAL SET.
 38. A TWO-VALVE L.F. AMPLIFIER.
 39. THE "SYDNEY" TWO.
 40. THE "SUPER SCREEN" THREE.
 41. THIS YEAR'S "CHITOS" ONE-VALVER.
 42. THE "Q AND A" THREE. A simple set (Det. and 2 L.F.).
 43. THE "INEXPENSIVE FOUR."
 44. THE "ECONOMY FIVE." For long-range loud-speaker work
 45. A SIMPLE A.C. H.T. UNIT.
 46. THE "REGIONAL" THREE.
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TECHNICAL NOTES.

(Continued from page 1182.)

as also the four-plate neon tube and the selector switch.

In the latest model a slotted rotary shutter allows vision through only one of the holes at a time. Synchronisation is accomplished by the use of synchronous motors operated on 60-cycle alternating current.

Loud-speaker Impedance.

A number of loud speakers now on the market are arranged with the windings tapped, so that the instrument may be readily adapted for use with different types of valve in the last or output stage of the receiver. The importance of this point is not always fully recognised.

A loud speaker, for instance, which has a high internal resistance, or impedance, may give comparatively poor results when, used with a low-impedance power valve capable of delivering a fairly heavy output anode current.

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I have often been struck with the remarkable difference in the reproduction which is obtained when different tapplings are brought into operation.

Output Transformer.

Of course, I am speaking now of the loud speaker connected direct to the output of the receiver. If, however, an output transformer is used, especially if this be a tapped transformer, it is easily possible to adjust the conditions for best results.

Many amateurs do not want to go to the extra expense of having an output transformer, but personally I think it is much better to employ this unit if possible, as in addition to its balancing or adjusting function, it keeps the steady current out of the loud-speaker windings and this in itself is often an important advantage.

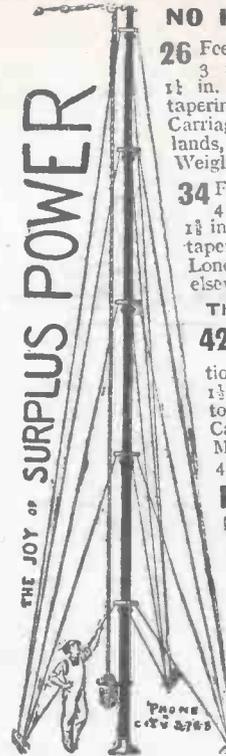
(Continued on page 1186.)

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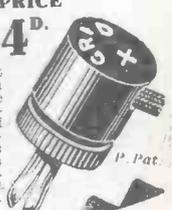
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TECHNICAL NOTES.

(Continued from page 1184.)

Overloading the Transformer.

With regard to this last point, I should mention that the transformer, if it be used, should be well able to carry the steady current without approaching magnetic saturation. This means, in turn, that the magnetic core should be sufficiently generous, which is unfortunately not true of some of the cheaper and inferior types of output transformer.

If the transformer is overloaded when in operation, distortion will be introduced into the reproduction precisely as though the transformer were not used and the output were passed into an overloaded loud speaker.

In other words, the mere insertion of the output transformer does not necessarily ensure the results which you are seeking unless the transformer is up to the requirements of the situation.

Improving Cells.

I have been asked from time to time whether it is possible to do anything to improve, or prolong the life of, dry cells when these are beginning to deteriorate. One correspondent suggests that they should be baked, and wants to know whether this would be suitable treatment.

Generally speaking, there is little that can be done to improve small dry cells (of the H.T. battery type), and this is a further reason why it is important to buy only high-quality batteries in the first instance.

The two principal causes of the deterioration of dry cells are, first, if the cells are much used, the chemical reaction between the elements of the cell resulting in the formation of chemical products which militate against the continued action of the cell and lower its voltage; and, second, the gradual drying up of the small amount of moisture which is present in the cell when first made.

As you know perfectly well, a "dry" cell is not dry at all, but is only "dry" in the sense that it is sealed up, and therefore that the moisture within it cannot easily escape. If it were truly dry it would not operate as a cell at all.

"Shelf Life."

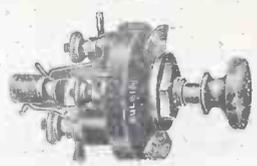
The first of the above-mentioned causes is naturally due to the use of the cell in the ordinary way, but the second cause is one which operates continuously whether a cell be in use or not; for this reason some cells which are improperly made or sealed will deteriorate considerably whilst in stock, and will, therefore, not be up to standard, even when actually purchased. They are said, in the trade, to have a poor "shelf life" meaning, of course, the life whilst lying on the dealer's shelf waiting to be sold.

Reviving the Electrolyte.

There is nothing much the amateur himself can do to overcome the first-mentioned effect. The second effect, however, that is, the drying up the interior of the cell, can sometimes be overcome by piercing small holes through the zinc container of the cell, and then immersing the cell for a few hours in water, or a solution of sal ammoniac, the depth being such that the top of the

(Continued on next page.)

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TECHNICAL NOTES.

(Continued from previous page.)

cell stands clear above the liquid. In this way additional moisture, or electrolyte, is introduced into the interior of the cell, and sometimes this will cause a marked revival in its activity. With an H.T. battery, however, it is obviously impossible to get at the cells without pulling the battery to pieces, and therefore you generally find that the whole business is not worth the trouble.

Where the larger dry cells for filament lighting are used, however, it is sometimes worth while rejuvenating the cells in this way, and often a fair extension of the life can be obtained.

Not Recommended.

As to the baking proposition, although this sounds rather curious at first, it does, in fact, sometimes stimulate the cell, but only for a short period. It necessarily results in the driving out still further of the moisture and, although it may liven up the chemical activity, in the end it probably does more harm than good, and is, therefore, not to be recommended.

Local Interference.

With the ordinary type of battery-operated set, particularly when fairly sensitive or of certain special types, all kinds of interference noises may be picked up from local sources, such as electric trams and trains, electrical generating plant, a vacuum-cleaner in the house, and so on.

In fact, even the ignition systems of passing motor-cars may cause quite a lot of trouble with certain types of receiver. This type of trouble can often be got over, or at any rate reduced, by means of a suitable filter condenser.

Protecting the Listener.

With the growth of broadcast reception it is probable that measures will have to be taken to protect the broadcast listener from the more severe types of interference and, indeed, it has been urged in one European country that legislation should be introduced to ensure that, so far as possible, electrical machinery and all other types of electrical apparatus shall be made incapable of interfering seriously with broadcast reception.

Mains Operation.

But the sensitiveness of a battery-operated set to local interference is nothing compared with that of the all-mains receiver or that which is operated by mains units. The direct connection to the mains brings in all kinds of interference which the battery-operated set escapes.

For instance, the mere switching on or off of the electric light will cause a loud "plop" in the receiver, and in the same way the running of any electric motor on the mains, however small, will often set up perfectly impossible noises in the loud speaker.

These interferences, in case of mains-operated sets, can be, to some extent, got over, and are, in fact, being more and more obviated as the design of these sets is improved, but at the same time there is at present very noticeable difference in the two types of set as regards the liability to local interference, and, unfortunately at the moment, the convenience of the mains-operated receiver is to some extent off-set by the trouble just mentioned above.

(Continued on next page.)



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TECHNICAL NOTES.

(Continued from previous page.)

Screening.

A reader asks me various questions with regard to screening, and, in particular, wants to know whether it would not be better to use thick sheets of iron for screening instead of thin sheets of copper.

He expresses the opinion that copper, being non-magnetic, can only be effective in preventing electrical disturbances and can have no influence upon the passage of magnetic effects.

This question, in one form or another, is constantly cropping up, and at first sight it is quite natural that the amateur should assume that a non-magnetic metal like copper can have no influence in obstructing magnetic effects. An important point, however, to bear in mind, is that we are not dealing with an ordinary stationary magnetic field, as produced by a permanent magnet, but with a rapidly alternating electro-magnetic field.

Steady Flux.

If you want to shield a certain region from the steady flux of a magnet or an electro-magnet (as one sometimes has to do in certain scientific experiments), it is necessary to use very thick iron or other magnetic material, or a number of thin sheets, to make up the thickness.

This provides an easier path for the magnetic flux, and so deflects it from the region which you want to keep free. Incidentally, it only deflects it in part and it is, as a matter of fact, very difficult to shield completely from a steady magnetic influence in the immediate neighbourhood.

Alternating Flux.

But in the cases we meet with in ordinary radio reception we are not dealing with steady magnetic fields but with rapidly alternating electro-magnetic fields. Any conductor placed in such a field (for example, an aerial) has rapidly alternating electric currents induced in it, and these in turn set up corresponding electro-magnetic fields.

The better the conductivity of the metal (or, rather, the lower the resistance or impedance) the more readily will these currents and fields be set up.

The electric currents represent the dissipation of the electrical energy in the electro-magnetic field, and the magnetic fields thereby set up tend to counter or oppose those which accompany the electric effects in the incoming radiation.

The net result of all this is that the disturbing power of the electro-magnetic radiation (wireless waves) is dissipated or destroyed partly in the shield and partly in the region of the shield. This explains the rather curious result that, although the shield itself may be non-magnetic, it is able in these special circumstances to set up magnetic effects due to the currents in it, and these magnetic effects are able to neutralise the incoming magnetic effects.

So although the shield may be made of a non-magnetic metal like copper, it is nevertheless able, when excited in the way we have just been discussing, to act in some ways as if it were in fact magnetic.

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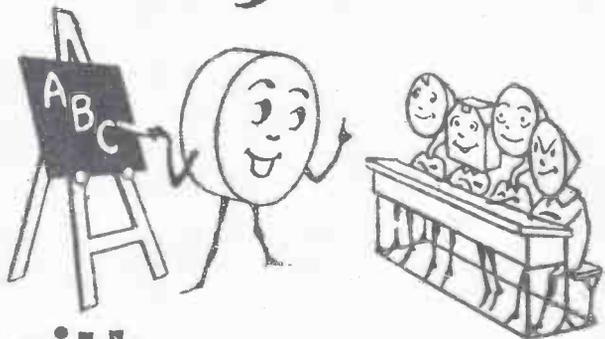
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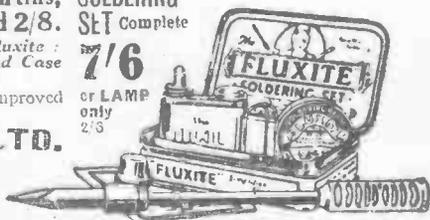
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