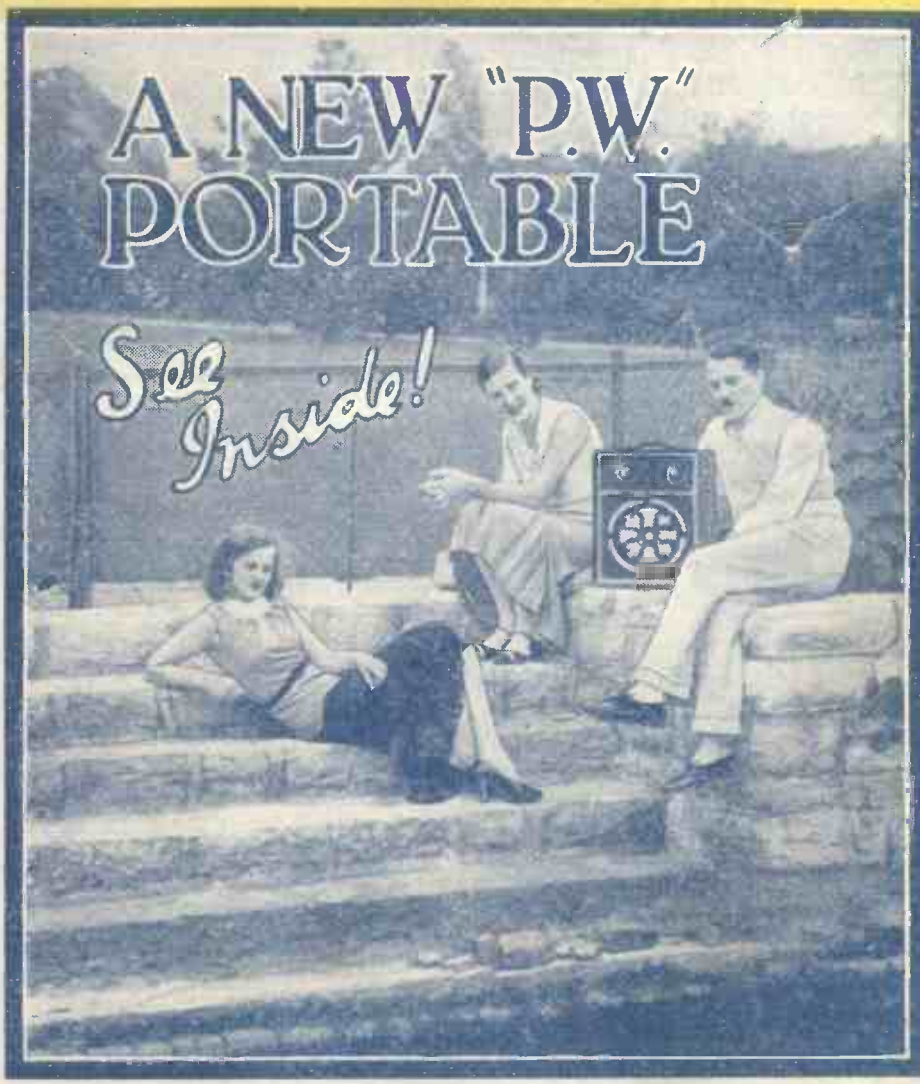
POPULAR WIRELESS, May 7th, 1932. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

FEATURED INSIDE— **LOUDSPEAKERS—By Capt. Eckersley** (See Page 239)

Popular Wireless

Every Thursday PRICE 3d.

No. 518. Vol. XXI. INCORPORATING "WIRELESS" May 7th, 1932.



ALSO THIS WEEK—

Lt.-Commdr. The Hon. J. M. KENWORTHY, R.N., writes on

The INVASION of ENGLAND

RADIOGRAM REMINDERS

WIRELESS IN WAR-TIME

More exciting extracts from the log of a wireless operator.

MODERN MAINS VALVES

READERS' RESULTS on the "COSMIC"

ETC., ETC., ETC.

RELIABLE RADIO from READY RADIO

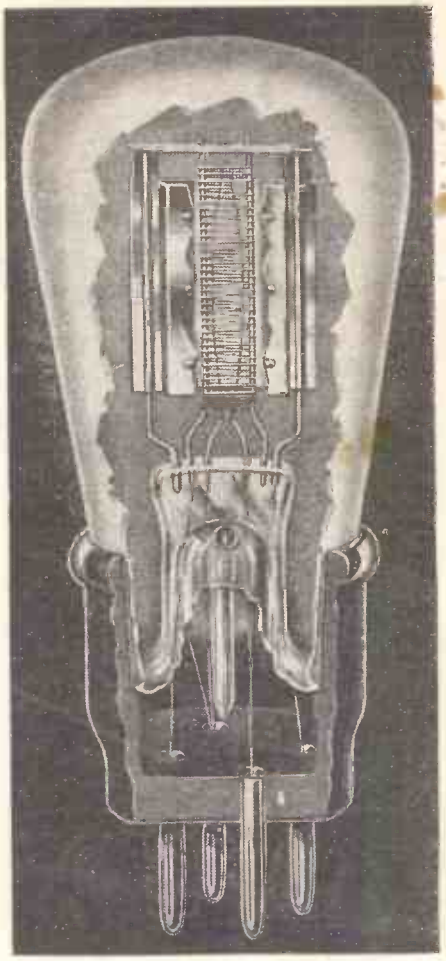
EASTNOR HOUSE, BLACKHEATH, LONDON, S.E.3.

Advt.

See Page 253

Multi-point Filament Suspension

Mica Bridge Mounting



—the two vital constructional features that make COSSOR Valves—

NON-MICROPHONIC

MICROPHONIC noises are definitely prevented in every Cossor Valve. Firstly by Cossor multi-point suspension — a system of construction which provides as many as four extra filament supports thereby eliminating all tendency to filament vibration.
Secondly by Mica Bridge Mounting, the Cossor constructional system under which all the elements are rigidly braced together in permanent alignment preventing individual movement, and vibration of the elements.
Thus, no part of the valve structure vibrates. And since vibration is the cause of microphonic noises it follows that Cossor Valves are proof against this trouble.

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Popular Wireless

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A. JOHNSON RANDALL.

HUMOURS OF RADIO
BRING THEM OUT
TELEVISION VISIONS
OLD NEEDLES

RADIO NOTES & NEWS

LEAGUE'S STATION
AN ATLANTIC VENTURE
A NEW ATTACK
THOSE PROMS.

Humours of Radio.

I AM given to understand that somebody has remarked upon the fact that radio has produced no humorists. Bless me, I should say that radio has produced more of them than any other subject, barring mothers-in-law, alcohol, and the "pictures."

Of course most of the humour has been perpetrated without malice aforethought, innocently, and in good faith; not professionally or under glass.

Bring Out Your Gems.

I HAVE heard many a fruity one in my time, most of them being too old to recount now, but the remark of the farmer that he liked Big Ben better than the Greenwich time because the first was "never more than ten minutes wrong by t'church clock, whereas they Greenwich 'uns always strikes foive"—that is worth recording.

Then, what about the lady who took her new battery back to the shop, indignantly explaining that she knew it should be filled with distilled water, whereas the thing they had sold to her had gone sour. Well, if you know any good ones, please let me hear from you.

A Vexed Question.

IN an article describing Broadcasting House in one of the American monthlies, the writer stated recently that American broadcasting leads the world. Without wishing it to be inferred that I claim the same honour for the B.B.C., I should like to know what gives rise to that opinion.

Are American stations better, technically, than ours or those of Germany? Do they play better music and employ better players? Do they deal with more aspects of learning, of interest, of culture, of amusement? Do their announcers speak better? (Oh, blasphemous thought!) Come on, ye Yanks, and let us know.

Development of the Valve.

CONSIDERABLE interest has been shown by a number of readers in the gear with which we "old hands" used to work our works years ago. The subject demands a series of articles, but I can give a few remarks upon it here which will perhaps amuse you.

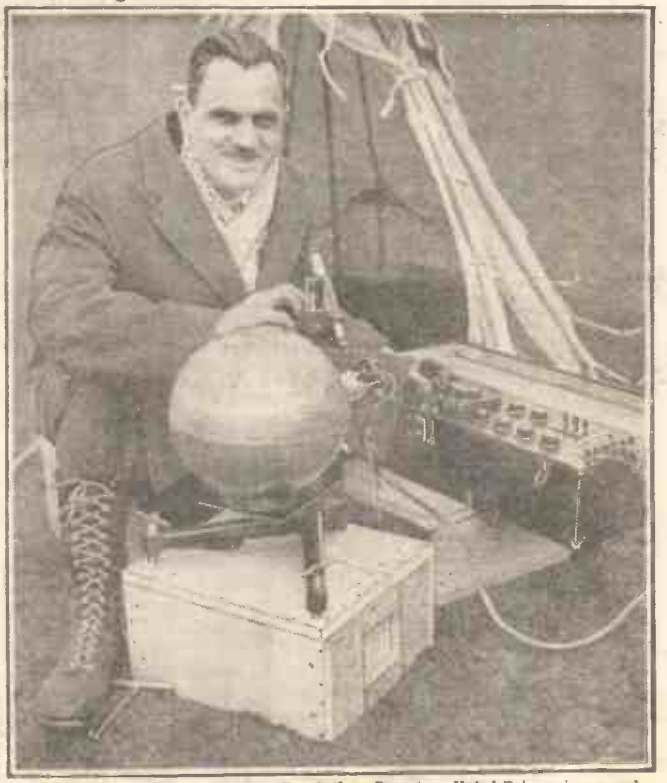
The Fleming valve was first; a diode "detector," mostly with carbon filament and cylindrical anode. Next, the De Forest "Audion": tungsten filament, plus "plate" and "grid." The Lieben valve came next; cost about £30; a triode, with platinum filament coated with alkaline earth oxides. Filament voltage about 30, and current about 4 amperes! Then came the Round valve (Captain Round), with filament coated with oxides of barium and strontium and surrounded by a thimble type grid which was surrounded by cylindrical anode.

Further Development of the Valve.

ALL these were "soft" valves and "bright emitters." The first "hard" valves here were Round's "Q" and "V.24" types, also "bright emitters," with tungsten filaments.

Then followed the "dull emitter," D.E.R.; thoriated tungsten; 0·4 amp. at 2 volts. Then came a spasm of alkaline earth-coated filaments, some with tungsten cores, copper-plated. This begins to look like a life-sized article, after all, so I had better turn off the flow of memories and release it on another occasion.

IN QUEST OF "COSMIC" RESULTS



Who is he? He is the famous Dr. Arthur Compton, Nobel Prize-winner and Professor of Physics at the University of Chicago. And the tripod-supported globe with its queer appendages is part of his newly-finished apparatus for investigating cosmic rays. To track these mysterious emanations from outer space he is taking this apparatus (and his little tent to shelter him!) to places as far apart as Panama, Peru, New Zealand, Hawaii, Australia and Alaska. Good luck, Dr. Compton, and may your "Cosmic" results be as gratifying as "P.W.'s"!

Visions of Television.

WHILST the scientists wrestle with nature in the laboratory, television in the great everyday world is represented by company promotion and the sparring for position by interested companies. I see that the De Forest Radio Company is purchasing the assets of the Jenkins Television Corporation. The Jenkins layout is, I believe, one of the "forrardest" of the American systems, though I do not know exactly where Zworykin stands — nor Alexanderson.

Commercial interests are competing for patents, priority, and all the rest of it! As a result, perhaps in our serene old age we shall see, at home, the Cup Tie of 1980!

Expanding Their Scope.

IN order to help towards that consummation the Anglo-American Radio Society has decided to insert in its title the words "and Television." Mr. Leslie W. Orton, the Hon. President, of "Kingsthorpe," Hawthorn Drive, Willowbank, Uxbridge, Middlesex, tells me that no change has been made in the Society's policy, and he adds that station W6CTT, Los Angeles, California, is broadcasting television programmes for the benefit of the A.A.R. and T.S., and others.

(*Continued on next page.*)

"ARIEL'S" RUNNING COMMENTARY ON RADIO *(Continued)*

Good for Sweden.

I READ that Swedish financiers and business firms have been expressing fears that the investigations which have been made into the affairs of the late Mr. Kreuger may cause doubts as to the probity of the Swedish nation. Nonsense! Is there any nation which has not in its archives the records of men who flew too high, lost their heads, and crashed?

Why, it is recorded that at the close of 1931 no less than 89·5 per cent of the Swedish people had paid for wireless licences. That's a good testimonial, surely!

Do Old Needles Ever Die?

FROM Switzerland comes the latest and longest-lived pattern of gramophone needle, called the "Dynamic Super Power Permanent." This needle is said to be capable of being played 50,000 times. Phew! 50,000 record "sides"; over 4,000 symphonies of average length; they ought to supply a slate for users to record the number of times the needle has played. The reproduction is done through a special alloy wire wound on a spool which is fitted with a milled knob for the control of volume by shortening or lengthening the wire. The needle is priced 7s. 6d.

The League's Radio Station.

LIKE the League of Nations itself, the League's radio station near Geneva is of an international character, though I think it is just to say that Britain's contribution, a Marconi short-wave transmitter and aerial, with telephone terminal gear by Standard Telephones is the most important. A French company supplied another transmitter; the Germans were responsible for receivers and aerials; Holland supplied valves, and most of the power gear is Swiss.

Prospectus Par Excellence.

ONCE upon a time, children, a radio set was described as so many "turns" of wire, a sliding contact, a bit of some crystalline substance and various plain condensers. Now—in America—the latest *cri* is said to possess: Super-het. circuit; rubber chassis mounting; continuous variable micro-tone control; impregnated condenser, laboratory sealed; noise-eliminating power transformer and tone-tested audio-transformer; super control valves; three-point shielding; acoustic synchronisation between chassis and cabinet; electro-dynamic type speaker, stethoscope-tested; and pentode for reserve power. What a pity that no epithets are applied to the acid in the accumulators which this set does not need!

D.F. in Atlantic Venture.

THIS spring two heroic souls are to attempt to cross the Atlantic in a small boat, the "Enterprise," which will carry direction-finding wireless gear. The boss of the show, a Canadian named C. P. Barber, who in the space of 29 days crossed from New York to Plymouth in a cockle-shell last year, has already proved how invaluable the D.F. apparatus is and now "swears by it." He hopes to travel via the Canary Islands, Trinidad, British Honduras, Cuba, and Miami to New York.

Explanation from Grimsby.

AN obliging reader sends me a note of the argument adduced by the Grimsby Town Council in support of its claim that radio "mains users" should pay four shillings a year for that privilege. He says that the town supply is to be changed from D.C. to A.C. at a cost of about £29,000, involving also a cost of £25,000 for converting D.C. wireless sets to A.C. As half the consumers do not use the mains for their sets, it was not fair, the Council thought, that they should be asked to pay the whole cost of the conversion.

The Council estimated the cost of conversion at about £5 per set; hence one calculates that Grimsby has 5,000 mains-operated sets in use—one for every four or five families or so. Pretty good!

"SHORT WAVES"

Complaint is made that a B.B.C. rendering of "The Ancient Mariner" was overpowered by the orchestral accompaniment.

"The listener-in, he cursed the din, for he heard the loud bassoon."—"Punch."

* * *

"I suppose you are enjoying your wireless?"

"Yes; the neighbours go out every evening now."—"Answers."

* * *

SUGGESTIONS FOR BRIGHTER BROADCASTING.

1. Giggle and Gag.—Brain-waves from two of the most entertaining comedians since Marcus Aurelius.
2. Readings from the Worst Poets.—By One of Them.
3. Competition Results.—Winner of the Disappointing Dialects Orgy.
4. A Debate on "Should Broadcasting be Broader?"

* * *

TRUTH IN ADVERTISING.

"Battery Trouble Free."—Radio Advt.
We shall decline the offer.—"Punch."

* * *

BROUGHT UP ON WIRELESS.

Sir Hamilton Harty tells a story of two children who were disappointed with their first concert, after being "brought up on wireless."

"It did not sound right," they said. "The tone was wrong."—"Daily Sketch."

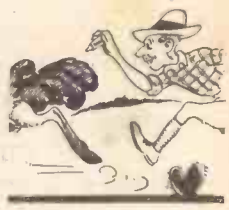
The Iron Bedstead is Sold.

THANK the stars! The iron bedstead fellow has got up and sold it. At a "roup," which I take to be Scots for "auction."

My sole prayer is now that he will not join forces with the bee bloke, who attributes the reduction in saccharine in honey to the London Regional. My private opinion is that bees don't care, but this bee fellow evidently thinks that bees' antennae are distracted by the Regional programmes and thus do not guide their wearers to the best kind of flower. Oh, Hertz! Oh, Marconi! Did you not think of all this?

New Attack on "Ariel."

MY goodness! I wish I were an agent for the sale of Dutch cheeses, or an ostrich-catcher. In my present position I am little more than a target. When the iron bedstead man and the bee-breeder hibernated I thought that I could count on peace till June at least: but here is someone (J. T., of *illegible*) who, having cast my horoscope, declares that I am going to be involved with a man who holds a mortgage on a snake farm in Florida. Cast the horoscope away, there's a nice fellow. Can't you cast something without mortgages and snakes?



The Queen's Hall "Proms."

THE famous Promenade concerts at the Queen's Hall will begin on August 6th and continue for eight weeks, thus concluding on October 1st. Sir Henry Wood is the conductor, of course; for the 38th year in succession.

Was there ever a record like that? Were there ever such magical concerts? If you have never attended one of them do try to do so this year, for it will be a fine and unforgettable experience.

But pick a night when music which you think you can enjoy is to be played—and book your seats *early*. You cannot promenade at a Prom. Packed!

Wireless Prevents Unusual Risk.

IN Salford Police Court, recently, it was revealed how radio helped a shipping company to avoid a risk of a heavy monetary loss. Two stowaways were found aboard the s.s. Trongate, Antwerp to Buenos Aires. Had the men been kept aboard till the vessel docked at Buenos Aires the authorities there would have demanded a £250 bond, to be forfeited if the men escaped from the ship. The Master sent a radio message to his owners and on their instructions asked another ship of the same line, bound to England, to take the culprits over, which was done.

Thank You!

A COLLECTIVE "Thanks" to all who wrote to me about O.K.N. Lots of the answers were different, but the goodwill is mighty warming.

Strange, how potent is a common hobby to keep the milk of human kindness fresh and creamy. Really, *men* are O.K.; it's the politicians and financiers who spoil things—what with wars and all.

ARIEL.

THESE RADIO COMPONENTS

A COMPLETE AND CRITICAL REVIEW

I SUPPOSE we know less about microphones and loudspeakers than about any other component in the long chain between original and reproduced sound.

What constitutes a good loudspeaker may, therefore, facilely be summed up as a loudspeaker which makes a pleasing noise.

But there are other qualities which require a good deal of consideration. Firstly, what of the characteristic of the set? May one not say quite easily, "Yes, I like that," and then on taking the speaker home to your set say "Um! now I *don't* like that." Secondly, what of the efficiency of the speaker? A point frequently missed. Thirdly, what of the loudspeaker's quality to continue to please? At first blush one may, for instance, revel in the deep bass "oomp" but may one not soon get very tired of a resonant bass?

Let us take these points in order. First, then, the question of the set with which the speaker is to be used. I have heard speakers on a straight-line input which were definitely deficient in bass. Put them on a good old peak tuned circuit and the result may well be better because the excess of bass in the input may compensate for the lack of bass in the reproducer. Nearly every speaker lacks true bass in some degree.

Showing up the Peaks.

The moving-coil designer, however, "puts in" lots of bass by making the whole diaphragm resonate around the 100-cycle mark. We all remember the early moving coils which went oomp—ssh—; very dreadful they were. If they were connected to a peak tuned set they "oomped" more dreadfully than ever. Then, again, moving-coil speakers frequently possess a high resonance peak among the 5 or 6 thousands.

A set with a moderately straight-line input characteristic allows this resonance full play. The 4, 5 to 6 thousand gamut is a band of frequencies which comprise the background frying noise which comes in when the station received is weak.

I once did the following experiment.

I took a set with a moderately straight-line characteristic. I tuned into 5 G B (in daylight) in London. I used a moving-coil speaker. The frying noise was awful. I could hardly hear the music through it. I changed the set to a detector and two-note mag. and forced reaction. The hiss died down a lot, but the "oomp" was awful. I then took the "straight-line" set and connected it to a moving-iron speaker with a characteristic which fell fairly rapidly after 5,000 cycles. The results were fair, but the bass was thin and there was still a little hiss.

LOUDSPEAKERS

In this third article of his special new series, our Chief Radio Consultant has some particularly outspoken comments to make regarding loudspeakers. But above all he is eminently practical and his words constitute constructively helpful criticism which should assist many readers in their endeavours to achieve satisfying radio reception.

Quite a Different Effect.

I then tried the detector and two L.F. with the moving-iron speaker and eliminated all frying, and put in a very satisfactory bass. So with a given set and given speaker I got a worth-while result, *but* it was a theoretically bad characteristic set and a theoretically bad characteristic loudspeaker. *The moving-coil and straight-line characteristic set was not acceptable.*

This is an illustration of the fact that you cannot, with things as they are, just talk about a good or bad loudspeaker. it is set plus loudspeaker which produces the final result. So when buying a new speaker test the speaker on the set you are to use.

Secondly, on the question of efficiency. I have frequently heard people say "Oh, but the X speaker is much more sensitive than the Y." The remark is as misleading as that which says "that lamp is much brighter than this one." Each time the question of efficiency is left out. A 200-volt 60-watt lamp is much brighter than a 200-volt 20-watt lamp, but obviously the 60-watt lamp takes much more power from the mains and so costs you more to run. Similarly the X speaker may make a far louder noise than the Y speaker, but perhaps the X speaker is much more greedy and absorbs more power.

Now, it's true you don't exactly pay for power directly, and provided your last valve will give the power it is quite allowable to use the apparently most sensitive speaker. You must be sure, however, that in fact the speaker is not so greedy as to overload your output and so produce distortion. As a sort of guide, but a very imperfect one, you should be aware of the D.C. resistance of the speaker.

Not an Obvious Point.

This is usually around 1,000 ohms. If a given speaker sounds much louder on a given output than another, verify the relative resistances. You may find one is only louder because it has a lower resistance. If you can get a 2,000-ohm loudspeaker, for example, to be as loud as a 1,000-ohm speaker, then you will know you've got something really efficient in the 2,000-ohm speaker.

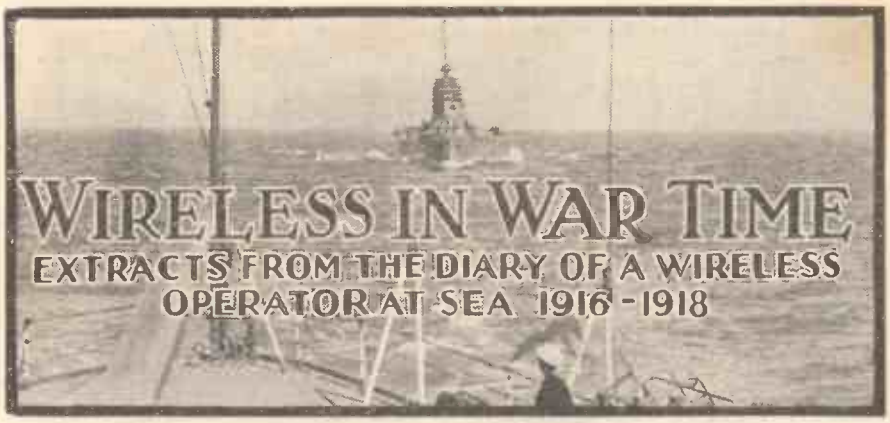
Lastly, as to quality itself. Walk into a shop, hear a speaker playing lunch-time music of the slow, swoopy and sentimental type—how lovely! How the bass comes out and what sweet music! You buy the speaker—quick, like that—you take it home. There's a harsh-voiced man talking about the salient characteristics of the lesser lepidoptera—that speaker? Do you like it so well? Wouldn't you like to remove some of the plums from the speaker's mouth?

Listen to Some Speech.

Never buy a speaker on a music test, always try both music and speech. Try jerky music, too, hot jazz (if the B.B.C. will let you in these days of sweet Hall). try attack by brass in a symphony orchestra in the studio, or the piano. Particularly try speech in comparison with music for "pleasingness."

We have at present no measure more accurate than our ears. So it really remains for you to choose, bearing in mind to test on your own set, to verify reasonable efficiency, and to make extended tests on all sorts of different items.

"P.P.E." WRITES TECHNICAL ARTICLES ONLY FOR "P.W." and "M.W."



DECEMBER 25TH, 1916.—Christmas Day. It's rather a strange experience to celebrate Christmas with the mercury at 72 deg. in the shade. The heat was so intense in the saloon to-day that we were unable to do justice to our Christmas dinner, although the menu included soup, fish, turkey, duck, ham, vegetables, plum pudding, mince pies, biscuits, cheese, nuts and fruit, coffee, ale, beer, whisky, port, etc. Last night I picked up a message sent by Rockefeller in Palm Beach to a lady in Baltimore wishing her a Merry Christmas. We are now in the Gulf Stream, and we hope to reach Key West by to-morrow evening.

The Gulf of Mexico.

DECEMBER 26TH.—We passed Palm Beach late last night, the great society resort of wealthy Americans. All we could see was a blaze of light on the horizon.

DECEMBER 27TH.—10 p.m. It is a little cooler. From below the sound of the steady beat of the engines keeps time to the loud choruses which some of the deck-hands are singing. "Where Was Robinson Crusoe with Friday on Saturday Night?" is the latest, but "My Old Kentucky Home" is a good second. Four days more and we arrive in Port Arthur. We can now hear the radio station at Miami (W S T) quite distinctly.

DECEMBER 30TH.—Sighted the harbour mouth of Port Arthur early this morning. On our way up the little river leading to the port we passed the hamlet of Sabine, which consists of a church, half-a-dozen houses, two pubs and a railway siding. The land is as flat as a pancake and is covered with long grass, with pools of dirty water dotted about. Seems an ideal breeding place for mosquitoes and fever. Port Arthur consists of oil tanks and machinery, wharves and store yards. It is rather a dismal haunt, and stinks indescribably of oil.

An Amusing Incident.

DECEMBER 31ST.—Went into town to-day with the Third Officer. We tramped back about 5 o'clock, having missed the last tram. Owing to the fact that the Third Officer had got a touch of malaria, he was pretty well raving by the time we got back to the ship, and old T——, thinking he was drunk, handled him pretty severely.

JANUARY 3RD, 1917.—The Captain came aboard about 5.30 with a fresh crew, all three parts drunk. One had the astounding nerve to go to the Bridge and demand that the Captain take his bed down to the fo'c'sle for him. However, he came down quicker than he went up. For the rest of the night this particular specimen prowled the ship on rather unsteady legs. He happened in his perambulations to bang into old T——.

"Hey!" he cried. "Be you the Mate?"

"I am the Mate," says old T——, very quietly.

Mr. "Tipsy" evidently didn't catch the warning note, for he continued as before. "If—hic—if my bed—hic—isn't—isn't taken to the fo'c'sle—hic—I shan't gonna watch. You take my—hic—bed to the fo'c'sle, or I'll—hic——"

"Here, Lazarus," cut in old T——, "you take up your own bed and walk, my lad. And don't come aft again."

JANUARY 5TH.—A large pelican in an exhausted condition came to rest on the ship to-day. The Captain had him caught, and the bird is now eating frozen fish. It has a beak nearly eighteen inches long, and looks like a gargoyle, or something out of a first-class nightmare.

JANUARY 6TH.—Had the Bradfield Insulator down this morning, as we have a bad fault somewhere. The sea is like glass and it is very hot. The engines broke down for about an hour to-day.

JANUARY 7TH.—The Captain let the pelican fly away to-day, as our supply of fish is evidently not to its liking. This afternoon the engines broke down again, and we had to lie to for a couple of hours while they were repaired. Apparently this was the last straw for old T——. He sat down on the after hatch and patiently explained his exact sentiments concerning the ship, the engineers and, finally, the whole business of navigation as a means of earning a living.

Before long he had an admiring audience, but as some of his remarks were personal, the group quickly faded away. There is a little betting going on as to whether old T—— repeated himself, but the odds are slightly in his favour. Passed a steamer sailing from Key West, Florida, to Havana, Cuba, to-day, also saw dozens of porpoises.

JANUARY 9TH.—All the navigation lights of Cuba, Jamaica, Tobago, and the British ports in the West Indies are extinguished, owing to the fact that our friend the German raider is still at large. Of course, everybody on this ship is wondering what's happened to the British Navy, and why some small cruiser can't be spared to chase this armed merchantman. It is these isolated raiders, which probably have a base in some part of South America, according to the Captain, that do all the damage. Witness the "Emden."

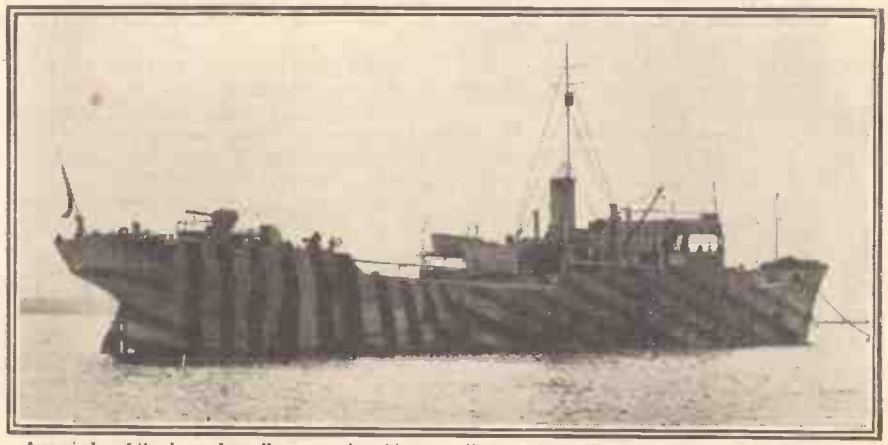
Some Interesting News.

We covered 262 miles yesterday and hope to reach Norfolk, Virginia, again on Friday. The news to-day includes a paragraph stating that General Carranza, the Mexican leader, has secured a sweeping victory over Villa, and that the latter has fled to Dubago. Our Captain was in El Passo a little while ago, and he describes the Mexican rebels as being the dirtiest and the most frightful blackguards he has ever seen in his life. There appears to be a Colonel for every ten men, and a General for every twenty. The officers wear long swords and go strutting about the streets like prize peacocks.

JANUARY 10TH.—Much cooler to-day, but still fine weather.

To be continued.

A CLEVERLY "CAMOUFLAGED" MERCHANTMAN



A reminder of the days when all ocean-going ships were "camouflaged" to make them less easily seen by submarines or enemy raiders. Our contributor started his sea life in a vessel of the same type as the "War Master" above.

Look out for a further instalment of this fascinating series—

NEXT WEEK.

Make sure of your "P.W." by placing a regular order.

Every Thursday. "P.W." Price 3d.

READERS RESULTS ON THE "COSMIC"

An analysis of our correspondence concerning "P.W.'s" star set.

FROM an exceptionally large "Cosmic" post bag we have selected a number of letters recording the most spectacular performances, and have published them in "P.W." as opportunities occurred.

But although the remainder of appreciations will not find their way into print, we assure their writers that we are grateful to them for letting us know how they fared "on air" with their "Cosmics."

Their letters and postcards make very pleasant reading for us, and not only gratifyingly prove that our confidence in the "Cosmic" was not ill-placed, but will serve to spur us on in an endeavour to accomplish even better things in the future—if that is possible, and it seems as though it is hardly so at present!

Anyway, our constructor readers can be certain that we shall not enter lightly into the task of producing a three to displace the "Cosmic." At the present moment we do not mind admitting that we have no immediate intention of trying to do so.

But let us pause a few moments and survey the "Cosmic" from the view-point of a few of our satisfied readers.

And remember, all the following remarks are perfectly spontaneous expressions of appreciation—not inspired or solicited!

NEVER HEARD SO MANY STATIONS BEFORE.

LONDON, BARNSBURY, N.7.

S. G.: "Never heard before so many stations on a three-valver of the Det. 2 L.F. type."

SELECTIVITY EXCEPTIONALLY GOOD.

MUTHILL, PERTHSHIRE.

ALEXANDER CROSS has carried out exhaustive tests and experiments, and is "extremely well pleased with the results. On the medium and long waves the volume and selectivity are exceptionally good." Mr. Cross tuned-in a medium-wave South American station with his "Cosmic," and on the short-waves has had programmes from Costa Rica, Porto Rico, Malay Straits, U.S.A., Java, Canada, Dutch E. Indies, and nearly every European country.

FOREIGNERS GALORE.

BRADFORD.

E. BESWICK built the "Cosmic" for a friend, and they and "everybody that has heard it agrees it is absolutely the best three-valve set yet heard." Mr. Beswick says he can easily cut out Moorside Edge (which is quite close) and tune-in "foreigners galore" at "full loudspeaker strength." He adds that the moderator is "like adding a couple of valves to the set when you operate it."

MORE EUROPEANS THAN HE THOUGHT POSSIBLE.

WICKEN.

STANLEY J. GRANFIELD: "I logged more European stations than I had believed possible."

THE BEST THREE-VALVER.

WEST EWELL, SURREY.

J. NASH "Cannot speak too highly of it, I think it is the best three-valve set that I have heard. . . . I do not think there is a set to touch it."

PRAISE FROM AN EXPERT.

THORNBURY, near BRISTOL.

W. J. BLIZZARD: "I cannot too highly praise your 'Cosmic' receiver. It is the best I have tested out as yet." Mr. Blizzard is a wireless engineer.

PERFECT SELECTIVITY—NO "BREAK THROUGH."

SKIPTON, YORKS.

E. WRATHALL: "All you claim it to be; it is just perfect in tone and selectivity . . . . there are short-wave stations at every turn of the dial." Mr. Wrathall says he can listen to the long waves "without a sign of the North Reg. breaking through."

SIXTY-FOUR STATIONS.

LONDON, KENSINGTON.

E. J. BANON has logged 64 stations on the loudspeaker. They comprise 6 long, 23 medium, and 35 short-wavers.

SEVENTY STATIONS!

COVENTRY.

H. B. BURTON logged 44 medium-wavers, 12 long-wavers, and 14 short-wavers, thus achieving a total of 70 without including a number of stations heard only on telephones. Mr. Burton says: "The selectivity is remarkable. . . . I can receive London Regional, Stuttgart and Algiers without background."

EIGHTY STATIONS!

HALE.

D. C. LUCY: "On the first night, with a low 20 ft. aerial, I got about 25 stations. The list has gradually grown until now I can get about 80 stations all at good entertainment strength on the loudspeaker. These are practically all long and medium wavers!"

ONE HUNDRED AND FORTY STATIONS!

LONDON, HAMPSTEAD.

P. M. CARMENT: "I am a 'Cosmic' enthusiast. A friend of mine has built it and up to date has identified about 140 stations on it."

Well, all our claims for the "Cosmic" are more than substantiated by the above impartial comments. Indeed, if you go back to our articles and re-read them, you will see that in no case have we ventured to suggest the certainty of such exceedingly fine performances as some of the above represent.

And we do not refer only to lists of stations, for other things are demanded of a modern set than high sensitivity.

But you will note that the "Cosmic" is "perfect in tone," "the selectivity is remarkable," the volume "exceptionally good," etc., etc.

A big "log" of stations is fine evidence of a set's capabilities, so long as it is not taken too literally. For instance, it is probable that Mr. Banon's 64 stations in London actually represents a finer performance than, say, Mr. Lucy's 80 in Hale.

Nevertheless, it must be admitted that both are magnificent indications of the merits of the "Cosmic," which, remember, is no complicated "super-het." or costly S.G. multi-valver, but an inexpensive "three" of the trouble-free, easy-to-operate Det. 2 L.F. variety.

But it is no standard text-book circuit faked up in new component dresses, but embodies original circuit conceptions. And when you come to think about it, that applies to all "P.W." "star" sets.

We may be setting a rather unnecessarily high standard, but, on the other hand, when we are able to earn letters of the nature of the above, the effort does seem very much worth while.

THE MIRROR OF THE B.B.C. By O.H.M.

FINISHING THE MOVE

B.B.C. AND THE POST OFFICE—A GREAT ARCHITECT—HENRY HALL'S PROGRESS.

So the B.B.C. has completed the move from Savoy Hill to Broadcasting House. So far, so good. I am glad to see meanwhile that there is not any longer the insensate reluctance to admit the necessity of expanding even at Broadcasting House.

It seems to have escaped the notice of our pundits that the May Committee in its attempt to extract £500,000 additional revenue from licence fees took into account that £50,000 would be required for the purchase of properties adjoining Broadcasting House in Portland Place. Therefore the announcement the other day, that numbers 10 and 12, Portland Place had been acquired as freehold does not surprise me as much as it seemed to surprise other commentators.

But I confess that I am not entirely satisfied that there is enough room for expansion. The B.B.C. would be better advised than it is at present if it took a longer view in this matter of accommodation. I hope No. 10 studio at Big Tree Wharf is retained.

B.B.C. and the Post Office.

In view of the Parliamentary Inquiry into the working of the Post Office, it is not surprising that the Postmaster-General and his permanent officials should be doing everything in their power to divert attention from their own activities. It is obvious to anyone who has watched the course of relations between the Post Office and the B.B.C. during the past five years or so that sooner or later there would come a vital challenge.

In addition to some personal equations, there is fundamental enmity between the Post Office way of handling affairs and the Public Utility way represented by the B.B.C. Fortunately, however, there are now more than four million five hundred thousand listeners who think it worth while to pay ten shillings a year to listen to broadcasting. It would be a sad day, not only for the listeners, but for the public purse were the Post Office view of the administration of broadcasting to succeed.

But it will not. Watch Sir John Reith.

A Great Architect.

In all the multifarious discussions about Broadcasting House there has been much too little credit for the work of the distinguished architect, Colonel Val Myer. I can say with personal knowledge that Colonel Val Myer, in the face of exceptional difficulties, has accomplished wonders.

Those who know the difficulties, and appreciate his triumph are hoping that he will receive the public recognition he deserves before long. And I hope that his zealous colleague, Mr. Marmaduke Tudsbery the Civil Engineer to the B.B.C. and noted yachtsman, will receive his share of recognition as well.

Henry Hall's Progress.

You will remember that I wrote a few weeks ago about Henry Hall and the B.B.C. Dance Orchestra, and said I thought listeners would soon get accustomed to the new style of dance music, and that as time went on they would appreciate it as much as they had got to like the playing of Jack Payne's Band.

Already the signs are working out in that way, and the number of letters from listeners in praise of Henry Hall and the B.B.C. Dance Orchestra gets bigger each week. It is not easy to start a dance band as Mr. Hall had to, from nothing, and listeners found that for a time the band's repertoire was decidedly restricted.

Hours of practice and rehearsals every day of the week have overcome that disadvantage, and to-day the band is able to choose from no fewer than 150 different items. Mr. Hall is encouraged by the B.B.C. in his idea that the band should do everything possible to encourage British composers, and eventually he will be able to give complete programmes of music written in this country.

ARE THEY EGGS?

This is one of "the moving scenes" in connection with the B.B.C.'s flit from Savoy Hill to Broadcasting House. And, judging by the care with which the case is being handled it must surely contain eggs — possibly sent by irate listeners to counter-balance the bouquets received by the B.B.C.

A MODERATED "MAGIC" THREE

The Editor, POPULAR WIRELESS.

Dear Sir,—I consider that I am one of the lucky ones in that the Moderator has given a new lease of life to my old reception-box. Originally a "Magic" Three, whilst overhauling it during the winter I pulled out one of the transformers and made the L.F. end according to that for the "Eckersley" Three, meaning to put a modern coil system in later on.

My old coils are still in place, however, and after reading about Moderating them in your issue of April 2nd, I straightway acquired the two little gadgets, quickly fitted them in place, and—well, I don't want anything better now.

I think one could almost hear a pin drop if it happened in the studio. My medium-wave plug-in coil is a 60X, and in order to bring the Moderator coil up to the same level I used an old condenser as a pedestal, and screwed the Moderator on to one of the terminals, on which it swivels easily.

The best position seems to be at about 45 deg. angle, and at this I get very good selectivity. Many thanks to everyone concerned in this innovation.

Yours faithfully,
G. ROSS WATT.

Orpington, Kent.

THE LISTENER'S NOTEBOOK

A rapid review of some of the recent radio programmes.

JACK PAYNE has already gone into training for his American tour if the hustle of his flying visits to Broadcasting House are anything to go by. Remember, one appointment at a time, Jack!

* * *

Simplicity, after all, can make a great appeal in radio plays. It is refreshing to hear a comedy like "The Little Ass," devoid of the artificiality of some of the Radio and Stage comedies. Here were real Cornish rustics who, in their simple way, painted a vivid picture illustrating perfectly what Mr. Mais has already given us in one of his "Unknown Island" talks.

* * *

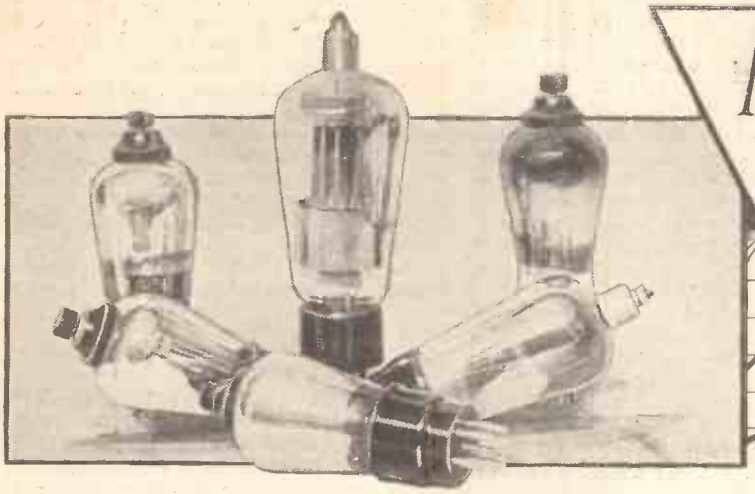
A recent programme of dance music from Berlin convinces me that the inclusion of extra brass in the band, and the exclusion of a vocalist are features we might well try in England. Billy Merrin, on the other hand, has a vocalist who both croons and wobbles. He was in good form (as a crooner and wobbler) in Sevilla Rosa, the other night.

* * *

In view of the ever-growing number of S O S and police messages soliciting the help of the public, isn't it time for some simplification of police telephone numbers? Why, for instance, shouldn't *all* police-stations be Tel. No. 1, the number, of course, being prefixed with the name of the town?

Some Welsh police-stations have telephone numbers, which, for length, rival the name of the town itself. Christopher Stone might give his support to this suggestion, for he appears to be experiencing difficulty with the Decca Company's new lists. He made an awful hash the other day of a five-figured number.

(*Continued on page* 261.)



MODERN MAINS VALVES

A brief résumé of the present position of the mains valve market, with short descriptions of some of the latest arrivals in the valve-makers' catalogues.

By K. D. ROGERS.

GRADUALLY, though the process must necessarily be slow, we are becoming a country of mains-set owners. The gradual electrification of Great Britain is having its effect and battery sets are slowly (very slowly albeit) disappearing, their places being taken by the all-electric receiver.

The complete change-over will take many years, for at present a very small percentage of the country has mains of any description, and of the remainder a large proportion is on D.C. But the electrification is occurring, and it is interesting to note how the development is affecting the home-constructor.

The Path of Progress.

A few years ago there was no choice in the matter of radio sets—all were battery operated—though the mains H.T. unit was beginning to be known. Then followed a few attempts to operate sets direct from the D.C. mains (of which there are still about the same number as there are of the A.C. type) using ordinary battery valves with their filaments connected in series.

Results were fairly good, but the task of building such a set was not particularly easy, and one was bound down to a very narrow selection of valves.

So we saw the birth of the indirectly-heated cathode A.C. valve.

This is recent history, and you all remember how this developed through the usual detector and L.F. valve stage till we had the A.C. screened-grid valve, and then the wonderful A.C. pentode.

In fact, the advance of the A.C. valve has been phenomenal, and we have now such highly efficient output valves that mutual conductances of the order of 7·5 are available, the Cossor 41M.P. giving this figure with an impedance of only 2,500.

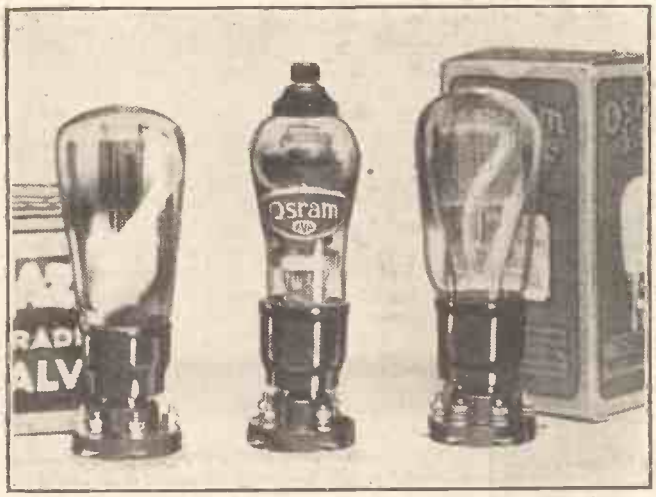
But about a year ago we began to hear that developments were expected in indirectly-heated valves for D.C. mains. These duly came along; first the ·5 amp. heater valves, and then the ·25 amp. type. (These are to be followed with a complete range of ·1 amp. valves, but at the moment the latter are held up.)

The characteristics of these valves are the same as those of the A.C. types, for their heater wattage consumption is identical. You know the valves, I expect; they are the Mazda ·5 amp. type, including the D.C.S.G., D.C.H.L., D.C.P., and D.C.P.T. Then we have the Marconi and the Osram ·25 amp. types; the D.S., D.S.B., D.H., D.L., and D.P.T.

But from a foreign country, to wit Austria, has been introduced another series of D.C. valves. These are not yet available on the British market, though I have some on test at the moment. They are particularly interesting, in that they do away with a very great drawback associated with the ordinary indirectly-heated D.C. valve.

(*Continued on next page.*)

THREE OF THE LATEST



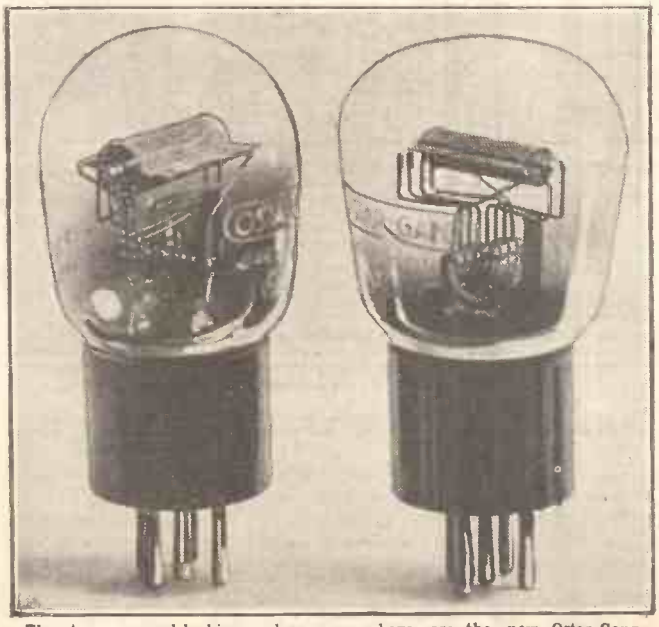
Here are three of the latest D.C. indirectly-heated mains valves. From left to right they are the Marconi D.H., an excellent detector; the Osram D.S., the D.C. version of the M.S.4; and the Mazda D.C./H.L., which is the direct-current counterpart of the famous A.C./H.L.

After this, although the mains H.T. unit was developed nothing was done in the way of furthering the interests of the D.C. user, all the efforts of the valve designers being directed to the problem of the all-electric A.C. receiver.

For D.C. Mains.

This was natural, as there had been a lot of publicity concerning the future of the "grid" system of A.C. supply.

NOVEL TYPE OF D.C. VALVE



The two unusual-looking valves seen above are the new Ostar-Ganz full-voltage indirectly-heated D.C. valves, which are discussed in the article. They are the detector and the power types. The S.G. of this series is not yet available.

MODERN MAINS VALVES

(Continued from previous page.)

I refer to the necessity of providing a series mains resistance to limit the voltage applied across the heaters of the valves. This means a very considerable waste of energy, for with, say, a couple of ·5 amp. valves we need a voltage across them of only 12 or 14 volts, and we have to dissipate the rest of the total pressure of the mains in heat. In other words, though the wattage of the valve heaters is only a total of 7, we have to use a wattage from the mains of 100 in the case of a 200-volt supply, and 120 in the case of a 240-volt supply.

Small Smoothing.

The new Ostar-Ganz valves from Austria are so designed that they are placed with their heaters right across the full mains voltage, and as their heater consumption is between ·03 and ·05 amp. the wattage dissipation in total is only a matter of some 5 or 6 watts. The heater current is arranged to decrease from ·05 in the case of the 110-volt valves to ·03 in the 220-volt valves.

So far no screened-grid or pentode valves are available in these types, but the mutual conductances of the detector and L.F. valves available are pretty good, being round about the 3 mark in the L.F. output valve.

The heaters do not need much attention as regards the smoothing of their supply, a small choke and a few microfarads being all that is necessary to obtain hum-free reproduction.

Far-Reaching Developments.

Naturally, the H.T. side of the set has to be smoothed in the usual way, but the development of this type of valve is bound to have far-reaching effects on the radio industry. It stands to reason that if these valves can be made as efficient and as robust as the present D.C. valves—and there does not appear to be any reason why they should not be—then the present wasteful method of providing D.C. sets with energy will be superseded. There is obviously no reason why a wastage of something like 13 to 14 times the energy usefully employed should be continued, when by means of the high-voltage valve the full consumption of energy can be turned to good account.

The drawback at present is, of course, that the valves are not made in this country, but I understand that negotiations regarding the patent situation are being made with a view to the production of the Ostar-Ganz valve in England. Whether it will be made by one of the present "ring" valve firms under licence, or whether a similar type of British valve will appear, cannot be stated at the moment, but I think we can expect some very interesting developments in the high-voltage D.C. valve in the near future.

The Twelve Types.

For those who are interested in the technical data of the Ostar valves, the following details will be appreciated. There are twelve valves available, in groups of three mains voltages. (These will be increased very shortly to fill up the gaps left at present.)

Thus we have valves for 110–120, 150–160, and 220–230 volts. In addition, indirectly-heated rectifier valves for A.C. are available for use with A.C. sets.

Returning to the D.C. valves, we have a rather peculiar range of impedances. The "A" type of valve has an impedance of 8,800 ohms with an amplification factor of 22, while the "W" valve has an impedance of 31,000 ohms and a factor of 32. This is rather high for detector purposes, and for a detector the "A" valve would be on the low side. Here, then, is room for a further model with an impedance between the two. The remaining valves are the "U" and the "L" types. These have impedances of 3,700 and 1,850, with amplification factors of 11 and 6·5 respectively.

So we have in these latter valves some useful L.F. amplifiers which could well be used in the average radio receiver. The lack of a screened-grid valve is a pity, but this type of valve will probably be forthcoming in the near future.

Altogether the high-voltage D.C. valve is a most interesting development, and it will be watched very closely by all radio enthusiasts throughout the world.

Interesting Additions.

But we have rather neglected the claims to distinction of the A.C. valve, to which class there have been some very interesting additions during the last few months.

For instance, there is the variable-mu screened-grid valve which has been specially introduced to help overcome the trouble known as cross-modulation, an annoying phenomenon that is associated with the screened-grid valve's liking to act sometimes as a rectifier when it is treated to a powerful radio input.

The variable-mu valve enables the mutual conductance of the valve to be varied by means of variation of the grid bias applied to the control grid of the valve. This naturally controls the stage magnification obtained.

The variable-mu valve has also been introduced into the ranks of the battery class, but with these valves we are not at the moment concerned. Volume control by means of the variable conductance valve is perhaps the best type of pre-detector control that can be obtained, as it has no noticeable effect upon the tuning of the grid or anode circuits, and also it does not upset the characteristics of the valve in the way that a voltage control of the screening grid of the ordinary S.G. valve does.

Another mains valve of special interest to super-het. enthusiasts is the Cossor double grid A.C. valve. This is known as the M.D.G. valve, and is of the metallised type specially constructed to act as a rectifier and oscillator in one. It acts, of course, in the same way as the battery double-grid valve, and is of the indirectly-heated cathode variety.

Pentodes for H.F.

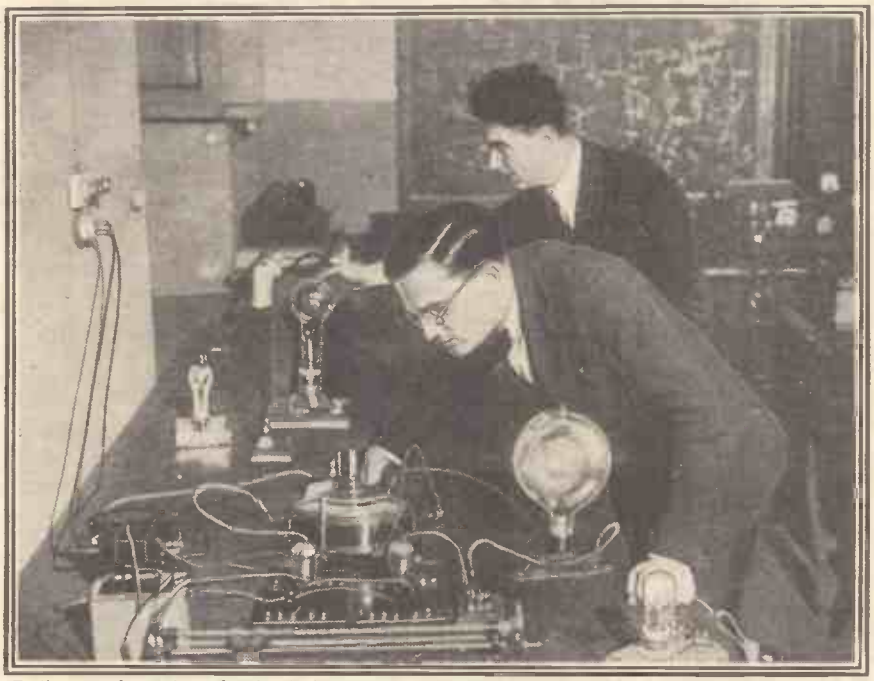
The H.F. mains pentode valve also has made a tentative appearance, though it is not yet certain that it will become a general addition to the standard valve lists.

The trend of valve design still seems to be to get as much as possible out of each valve, and the result is that we are getting the market flooded with all sorts of types, which are not at all clearly classified and which do not vary sufficiently between types to justify their existence.

(Whether or not it is better in the case of mains valves to try and get the most out of one stage, or to use two or more stages of lower amplification, is a point that I will not discuss here. I hold strong opinions on the subject myself, and deplore the race for supremacy in the valve world.)

It is rumoured that a really useful standardisation is being prepared, and that it will come into force in some twelve months' time. It is long overdue, and when, and if, it comes it will do a great deal to clear up the terrible mess that the multitudinous lists of valves have created.

TESTING THE "ELECTRIC EYE" IN ITALY



Testing some large photo-electric cells in the television laboratories at Milan, where continuous experiment in that branch of radio is in progress.

HOW WIRELESS WOULD HAVE ALTERED HISTORY

By Lt Commander the Hon J.M. Kenworthy R.N.

No. 4. THE INVASION OF ENGLAND.

What would have happened to England if Napoleon had had access to an efficient network of wireless stations? It is fairly certain that the French Dictator would have stood a good chance of achieving his life's ambition, and that he might have become King of England. There is little doubt that his failure successfully to invade our shores was due to the relatively slow means of communication at his disposal.

AFTER his narrow escape from the English and the frustration of his Eastern plans of invasion by Admiral Nelson, Bonaparte rose to the position of Dictator of the Continent of Europe. But he was determined to be revenged on England. He must humble the proud Islanders, or sooner or later they would be the cause of his downfall.

Preparations For War.

The Peace of Amiens, signed in October, 1801, was only a truce. War was declared again in May, 1803. Napoleon Bonaparte at once commenced preparations for the invasion of these Islands. At all the ports and places of embarkation along the French side of the Channel, camps were established, troops and artillery concentrated, and boats and barges got ready.

The harbour of Boulogne was deepened, enlarged and fortified to give shelter to the vessels to carry over the soldiers. At Ostend, Dunkirk, Calais and other ports similar preparations were made. A vast fleet of 2,300 vessels was specially constructed for the crossing.

Many of these had stalls for 50 cavalry horses, and all were heavily armed and numerously manned. Inland the country was one huge camp with over 150,000 troops, a gigantic army for those days, who were kept busy drilling and practising embarkation and landing.

The "Second Conqueror."

No wonder there was panic and apprehension in Britain. So perfect were the arrangements, so admirably were the soldiers drilled and organised that only two tides were needed to get clear of the ports into the open sea. Bonaparte reckoned that if only he could be master of the Narrow Seas for six hours the very existence of England would be ended. The first Emperor of the French began to see himself as the Second Conqueror of England, the emulator of the invasion of William of Normandy.

But how to obtain the six hours mastery?

The British fleet was stronger than the French. Even if more warships could be built, the English had the advantage in the quality of their officers and seamen. Bonaparte's Spanish allies were not to be depended upon. The British fleet must be avoided, not fought.

The plan was conceived, therefore, of drawing away our ships on a false errand; combining the French and Spanish Fleets, concentrating them in the English Channel and then pouring his thousands of seasoned troops upon the English shore.

When He Needed Radio.

But the plan failed because of the absence of a sure and swift system of communication. Bonaparte was thwarted in two ways through not having wireless. He could not concentrate his scattered squadrons lying in harbour at Brest, Ferrol, Cadiz, Cartagena and Toulon, even when he induced the English to chase across the Atlantic in defence of our threatened West Indian possessions; because he had no means of intercommunication between them except by horse-messengers on land or slow-sailing dispatch vessels at sea. And he had no means of knowing where the main British fleet was, or what it was doing.

Thus, when Nelson, for the second time in his career, dashed off to Egypt, suspecting the French squadron that had slipped out of having gone there, Bonaparte did not know this in time or he could have made his grand concentration at once.

England Saved.

And again, when Nelson and his fleet chased away to the West Indies, the news reached Bonaparte too late for him to act. It is true that the lack of wireless hampered the English Admirals also. But Bonaparte only needed a six hours clear run of the Channel for his fell purposes. Yet, first, he must concentrate his scattered warships. The uncertainty, therefore, favoured the English.

And it was this uncertainty which saved England from invasion. England, safe, was able to encourage her

(*Continued on next page.*)

THE EVE OF TRAFALGAR

This is a reproduction from a painting depicting Nelson in his cabin on board the "Victory" on the eve of the Battle of Trafalgar.

HOW WIRELESS WOULD HAVE ALTERED HISTORY

(Continued from previous page.)

allies on the Continent. And finally Bonaparte and his forces were worn down and defeated.

The First Emperor of the French would gaze on the white cliffs of England on clear days and long for some sure means of knowing what the dreaded English three-deckers were doing and where they were. It took days for him to learn whether his own ships had sailed. Opportunity after opportunity was lost. And the greatest soldier of his day never set foot on English soil.

Let us see how the affair worked out.

Blockading the Ports.

Wherever a detachment of French or Spanish ships was lying in harbour there was a blockading squadron of our men-of-war. But gales drove off our watching ships from time to time, darkness or thick weather gave opportunities for the ships in harbour to elude those at sea.

The trouble was that once the French and Spanish ships, seeking to escape and join forces, were out of sight of land their further movements were unknown to the great strategist who sought to combine them.

Off to the West Indies.

In the early days of 1805 the first movements of the would-be invaders began. The French ships stole out of Rochefort and made for the West Indies. Admiral Cochrane started in pursuit. Six days later, while Nelson was sheltering from a gale, the French squadron in Toulon escaped. Nelson supposed it had gone to Egypt and sailed for Alexandria, only to find that port empty.

In the meantime the Toulon squadron had been driven back to port by another gale, but sailed once more on March 30th. Five days later, Nelson, then in the Gulf of Palmas, heard of it and, still believing it would make for Egypt, waited off Sicily.

But on April 8th the Toulon squadron was passing Gibraltar, and not till eight days afterwards did Nelson receive the news. Admiral Villeneuve, who commanded the Toulon forces, in the meantime arrived at Cadiz, drove off the English blockading ships, picked up six Spanish three-deckers and sailed, on April 10th, for the West Indies. Thither, on May 11th, Nelson started in pursuit, one month behind, and with a weaker squadron.

The Battle of Trafalgar.

So far, Bonaparte's plan had succeeded. Nelson was fruitlessly cruising in the West Indies seeking Villeneuve, and that Admiral was on his way back to Europe. Villeneuve reached Ferrol after a sharp fight with the watching English ships under Admiral Calder. There he gathered more warships and sailed for the western Channel.

But the French Commander-in-Chief was uncertain of the whereabouts of Nelson. Bonaparte knew Nelson had gone to the West Indies through reports from dispatch vessels, but he had no means of informing Villeneuve, who had now 29 ships-of-the-line. If Villeneuve had sailed straight for the English Channel, picking up the Brest fleet and the Allied ships of Spain at Cadiz, the great plan for the invasion of England could have succeeded.

In the event, Villeneuve lost time and finally, through a false report that Nelson was near him, retreated into Cadiz. And there he waited, losing the precious days until ordered out to sea by Bonaparte, only to meet his fate at the battle of Trafalgar.

For, in the meantime, Nelson had returned from the West Indies to England. And when news, travelling slowly, that Villeneuve was waiting in uncertainty at Cadiz, reached London, Nelson was instantly dispatched with the available British forces to hold the combined French and Spanish fleets in check.

What Would Have Happened.

Yet, if Bonaparte had only had the means of long-distance signalling, in other words wireless, he would have diverted Villeneuve at sea on his way to Ferrol from the West Indies to make his rendezvous with the Brest squadron in the English Channel, and so cover the great flotilla and army of invasion for the precious six hours needed for the descent on the British coasts.

But Bonaparte had no means of signalling to his over-cautious Admiral. When messengers on horse-back reached him with the news that Villeneuve and his great fleet were still at Cadiz the Emperor was furious. Immediately dispatch riders were sent with orders to Villeneuve to proceed to sea and to carry out the plan of invasion. It was too late. Nelson was already sailing across the Bay of Biscay. And when Villeneuve finally sailed from Cadiz with 33 ships-of-the-line in order of battle, Nelson's advanced scouts were in the offing to observe and report his movements.

It Might Have Been.

Villeneuve was headed to the south, away from England; and two days later, the rival fleets never having lost touch with each other, the great battle of Trafalgar was fought and the combined French and Spanish Fleets beaten.

Bonaparte's hope of invasion was dashed by this defeat. The vast camps were deserted, the thousands of flat-boats left to rot on the shores, the specially constructed harbours gradually filled up with mud, the batteries for their defence were dismantled.

The "Army of England" was dispersed to other theatres of war and Bonaparte abandoned all further plans for the subjection of England by invasion. So ended the threat to this country conceived by the great strategist. And the plan failed because of lack of means of swift signalling over a distance. *If Bonaparte had had wireless at his disposal Britain might now be a French province.*

THE DEATH OF ENGLAND'S HERO

The scene when Nelson was fatally wounded by a bullet from one of the French ships at Trafalgar.

SHORT WAVES FOR MAINS SETS,

An Interesting Tip.

SHORT-WAVE adaptors that make it unnecessary to build a special set for receiving on this interesting band are very popular at the present, but so are all-mains sets with A.C. or unsmoothed D.C. on the filaments of the valves. Unfortunately, these sorts of current are not usually suitable in the ordinary way for an adaptor, which gets its filament current from the set via a plug that goes into the detector valve socket.

This does not mean that the owner of such a set must have a complete and separate multi-valve set for short-wave work. Most mains sets have provision for a pick-up, and a single valve set for short-waves with its own batteries can easily be arranged to "plug in" instead of the pick-up.

The output from the single-valver goes to the primary of an L.F. transformer, and the secondary goes across a suitable plug for the pick-up socket.

A. S. C.

FOR LONGER RANGE

FOR BIGGER VOLUME

FOR LIVELIER DETECTION

LISSEN POWER PENTODE

The Lissen Power Pentode Valve—P.T.225—puts new power into your loudspeaker, and new brilliance of tone, too. Use it instead of a power valve and at once you get a tremendous step-up in volume. Ask for Lissen P.T.225.

Price 12/6

NEW LISSEN METALLISED SCREENED GRID VALVE

will give you much higher amplification without instability. Lissen research has succeeded in reducing the inter-electrode capacity of this Screened Grid Valve to the minute figure of ·001 micro-microfarads. (Inter-electrode capacity causes instability and howling). The magnification figure of this valve has been increased to 1000. To get immensely increased range, ask for Lissen S.G.215.

Price 12/6

LISSEN DETECTOR VALVE

H.L.210—livens up your tuning, gives you greater sensitivity, passes a crisper, more powerful signal on to the L.F. stage of your receiver, and you get louder, clearer radio altogether.

Price 5/6

LISSEN LIMITED, WORPLE ROAD, ISLEWORTH, MIDDLESEX.

FROM THE TECHNICAL EDITOR'S NOTE BOOK.

Tested and Found—?

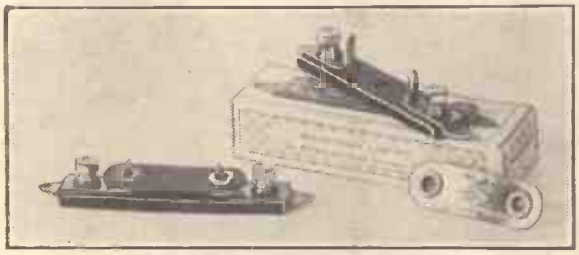
SAFEGUARDING YOUR SET.

ONE of the most important items in any electrical installation is the fuse. A wireless set is an electrical installation, but of a low-power order. Nevertheless, even a battery set can with advantage employ a fuse.

The usual plan is to insert a fuse in the negative feed from the H.T. supply in order to protect the valves against an accidental application of H.T. voltage.

It needs to be a fuse which will quickly "blow" at the relatively small current which represents the safety limit of a valve filament and which will not deteriorate with time.

GOLD-FILM FUSES



The Microfuse elements are incorrodible.

The "Microfuse," a product of Microfuses, Ltd., appears to me to fulfil these conditions adequately.

It embodies a thin, gold film which, of course, cannot depreciate, and it "blows" at a speed which does not give a valve filament even time to start warming up!

A condenser discharge will burn it out, as I have discovered myself in tests.

Microfuses are available in a wide range of types and ratings, from one which is designed to carry only 3 milliamperes up to ¾-ampere types suitable for mains sets.

A FIRST-CLASS "GANG."

The problems of variable condenser design are largely of a mechanical nature, especially with the ganged models. Successful ganging demands much more than a mere linking of similarly shaped groups of vanes.

The slightest "looseness" or whip is liable to drop the efficiency of the set in which the component is operating to a surprising extent—surprising, that is, to those unacquainted with the effect.

But there are no such faults in the "Lotus" gang, a two-section model of which is shown in the accompanying photograph.

Indeed, its construction is very robust and it has heavy vanes, strong spindles, and precision bearings. The slow-motion drive is as good as any we have encountered.

The screening is complete, and each section is shielded from the other. In spite of all this, however, the component is rather smaller than the average.

Dial illumination is arranged for, and the condenser can be obtained either with drum or dial drive in 2-, 3-, and 4-gang types.

I have also had the opportunity of testing the new "Lotus" Dual-Wave Coil, which can be obtained with or without shielding at 7s 6d, and 5s. 6d. respectively.

It is a good coil, and its performance on long waves equals that which it gives on medium waves.

A third "Lotus" component is an inexpensive output choke designed for the smaller kinds of sets. It maintains an inductance of just under twenty henries when a current of 12 milliamperes flows through it.

It retails at 5s. 6d., and should sell well among those constructors whose sets come within the implied limitation, although the possibility of a larger power valve being employed at a future date should always be remembered, in which case a somewhat "larger" choke (in an electrical sense, that is) would be needed.

However, at its price and for its purpose, this new "Lotus" choke is a good proposition.

A USEFUL LIST.

Messrs. The Watmel Wireless Co., Ltd., have published a new list concerning their complete range of fixed and variable resistances and their new T3 Volume Controls.

Incidentally, this list contains a page of diagrams on "How to Connect Volume Controls," which the constructor should find of interest and value.

"AERIALITE."

I like an outdoor aerial above all other forms of radio antenna. It may not be aesthetic in the eyes of some people, but for me there's no finer sight than a row of tiny houses each with its individual aerial.

They are the visible evidences of an entertainment and intellectual advancement. And don't they bring in the stations when they've got good little sets on the ends of them? All of which is by way of an introduction to "Aerialite," a product of the Aerialite Co., of Manchester, which should command big sales.

"Aerialite" is an insulated aerial wire, and it is, in my opinion, an excellent material. There are 7 good strands of copper enclosed within a tough, weatherproof insulating covering.

It ought to last for years and give good service even without insulation.

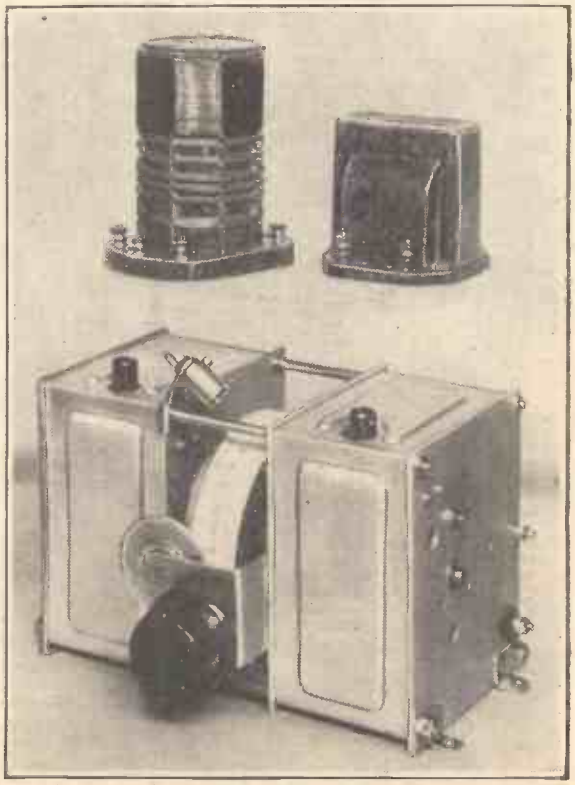
PLEASE NOTE.

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

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

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

THREE "LOTUS" COMPONENTS



The "Lotus" Two-Gang Condenser, Dual-Wave Coil and Output Choke.

FROM A WHISPER

TO FULL VOLUME

WITHOUT DISTORTION

Regentone built this magnificent all-electric receiver; Regentone, who have specialised in all-electric radio for over seven years. It is the receiver of truthful tone—from a whisper to full volume without distortion. It has a specially designed, engineer built modern circuit, built into a distinctive dual-tone walnut cabinet, and operating entirely from your electric light. It has a built-in moving coil speaker. Super-selective tuning. Only one switch for mains supply, medium and long waves, and gramophone pick-up. Illuminated tuning dial marked in wave-lengths. Completely self-contained.

Study its advantages for yourself, in your own home, or at your usual dealer's. He will be glad to arrange it. Or write to us for full details of this and other Regentone products.

16 GUINEAS

Or 39/6 down

including B.V.A. valves and royalties. For A.C. Mains 200/250 volts, 40/60 cycles. SPECIAL 25-CYCLE MODEL 14/- EXTRA.

Write for full particulars and hire purchase terms of this and other Regentone products. Mains Units from 7/6 down.

REGENTONE

REGENTONE LIMITED, Regentone House, 21, Bartlett's Buildings, E.C.4
Telephone: Central 8745 (5 lines).
Irish Free State Distributors: Kelly & Shiel, Ltd., 47, Fleet Street, Dublin.

The SHERLOCK HOLMES of RADIO

Even the novice can trace any Radio fault in a few minutes with this marvellous instrument

Solve any radio problem with a Pifco "All-in-One" Radiometer. Distortion, weakness, or even a complete fade-out—whatever the trouble, this marvellous instrument shows the cause in a few minutes. It is invaluable to every radio owner—novice or expert. Saves its first cost over and over again. No other instrument in the world like it.

Standard Model for Battery Sets only,

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De Luxe High Resistance Model for Electric Receivers and Mains Units,

£2-2-0

Ask to see the "All-in-One" Radiometer at your radio or electrical dealers. Leaflet on request from Patentees:
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PIFCO ALL IN ONE RADIOMETER

℗ S4

CAPT. ECKERSLEY'S QUERY CORNER

Under the above title, week by week, our Chief Radio Consultant comments upon radio queries submitted by "P.W." readers.

Don't address your letters direct to Capt. Eckersley; a selection of those received by the Query Department in the ordinary way will be answered by him.

Should Screens be Soldered?

C. W. (Winchester).—"I am building a set consisting of an S.G., detector and 1 L.F. stage. The H.F. stage is mounted in a copper box, but it has been necessary for me to extend the screening on one side of this box. This additional screening merely takes the form of a piece of copper bolted to the side of the box

"Will merely bolting this copper to the box be satisfactory, or would it be advisable to solder the two together so as to make perfect metallic contact?"

Bolted screening is not perfect screening unless it brings the surfaces into really good contact all the way, when, of course, it is the same as soldered screening. But prefect screening is not always necessary.

If you have a high gain per stage, if it is necessary to keep circuits very accurately matched (or ganged), then screening plays a very important part.

I know of a set where the lid is bolted on by means of a great many small screws. The designer found this necessary because performance was altered before he fitted these many screws simply by leaning on the top of the box.

In other designs, rough screening is quite satisfactory. There is no hard-and-fast rule. If you want to be sure, solder or bolt with lots and lots of bolts.

* * *

The Big Noise—A Very Interesting Question.

A. A. C. (Chigwell).—"I cannot understand why it is not possible to design a set employing ten or twelve valves, and, by so doing, increase the sensitivity to such a point that every station in the world will come in at full loudspeaker volume.

"Surely, if the addition of a single H.F. valve gives greater range and volume, there is no reason why one should not go on adding three or even four S.G. valves with the object of obtaining super-range and super-volume."

What would happen if you tried to hear a community singing concert in Hyde Park if you were in Regent's Park, a mile away? You wouldn't hear it!

But suppose you got a microphone and a ten-valve amplifier, and magnified your Regent's Park sensitivity 10,000 times?

You might hear the community singing but I should be sorry for you if a taxi tooted twenty yards from that microphone. And the roar of London! And a local sparrow or a cat sneezing on a local roof! What a row there'd be. Not much pleasure listening to that singing—it would all be drowned by the other noises!

No! The excellence of communication is determined by one simple ratio, the ratio of the intensity of the sounds you want to hear or the intensity of the sounds you don't want to hear.

If a station is weak, but there are no atmospherics or local trams or refrigerators or lifts, then you can magnify that station to full volume: if a station is very, very weak, but stronger than the interference, then your own set starts making a noise in itself, and you will get a roar drowning the very, very weak station.

If the station is strong but the interference strong, too, you must magnify interference and station together. You can never separate them.

Short wave technique in communicating with the Antipodes is only successful because the atmospherics are very weak with short waves. No other reason at all.

The excellence of a communication by sound, by telegraph, by broadcasting, by anything, is only determined by the signal to noise ratio.

* * *

Removing the Grid Leaks.

B. N. (Eltham).—"In my receiver, which has two resistance-coupled stages of L.F. amplification, I have noticed a peculiar effect. If I switch the set on and tune-in a loud station no difference in results can be observed when the grid leak in the first resistance coupling unit is removed.

"On the other hand, if the grid leak in the second unit (this is the one connected to the correct negative grid bias for the power valve) is removed, signals fade and become very distorted after a short interval. Does this behaviour indicate a defect, or, if not, what is the cause of this apparent contradiction?"

If you have a highish mag. valve requiring a small negative bias, you may for a time remove the grid leak, when either the grid holds its charge or stores it up as in leaky-grid rectification, and then this does not produce apparently awful effects.

Where you do the same nasty trick with a power valve wanting much more negative on the grid, the charge is not held, the current through the valve enormously increases, the power output is enormously reduced, and so on. The symptoms you describe are quite normal and you need not worry.

* * *

The Best Form of Aerial.

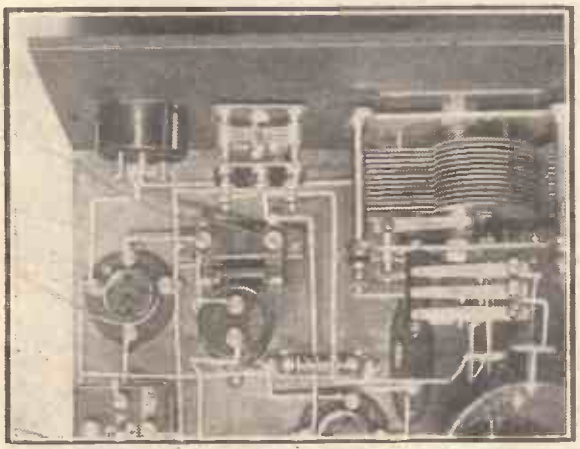
J. E. (Romford).—"My receiver is operated on the upper floor of a two-storied house. The aerial is in the loft, and consists of a single wire stretched from one end of the loft to the other, with a down-lead from the centre thereof. The down-lead comes through the ceiling direct to the set.

"Can you suggest any way of improving the aerial, as I do not think it is very efficient?"

It sounds to me to be a very good aerial. I used one just like it way back in 1921, when signals were pretty weak, and it did me very well.

You should be sure that it doesn't run too close to any water-pipes or cisterns in the attic, and if you have a good (damp) earth as well, I think your aerial arrangements should be first-class. Of course, I am suspecting that your house is brick-built, and is not damp at all. Sometimes, with an aerial completely inside a house, a rainstorm shields signals completely.

RATIONALISED SWITCHING



One reason for the high efficiency of modern sets as compared with their predecessors is the ratibnalised switching scheme now in vogue. Note how this Extenser, for instance, automatically does its own circuit changing in a strategic position between the coil and the condenser vanes.

ONLY IN "P.W."
can you read Capt. Eckersley's replies to listeners' own problems.
AND REMEMBER—
Captain Eckersley's technical articles appear only in
"POPULAR WIRELESS"
and **"MODERN WIRELESS."**

A NEW "P.W." PORTABLE

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

This week we are able to give the preliminary details of the "OUTDOOR" Three—just the set we feel sure many constructors have been waiting for. It is an up-to-the-minute portable set, which is inexpensive and simple in both construction and operation. Embodying a completely modern technique of design, it is an instrument capable of giving real service under the most exacting conditions.

I WANT to make it quite clear at the outset that this portable set is not a seasonal or "time-table" production. As I explained in a previous article, we do not work to a schedule, and I am entirely unable to say whether, for instance, there will be any set at all described in any one particular month, even in the near future.

I freely admit that there was a time when we ran set designs almost weekly. But that was when radio was younger, and when there were more new things to chronicle. But we have to face the fact that the pace of progress has slowed down into an even tempo.

Not that we are reaching an end of the road. There is not the slightest sign of that. There will be continued progress throughout the whole of *our* lifetimes: nothing is subject for safer prediction.

And if we have lost a tumultous speed of development, it must not be forgotten that we have gained stability. We know where we are these days, and to-morrows aren't a nightmare of flux, swirls and eddies of new this's and thats.

Which means a lot to the constructor. For one thing, it means that he can invest at decent intervals in a new set with the assurance that it won't be made a back-number almost before he has connected up the final wire of it.

A Splendid Example.

Take the "Cosmic" Three as an example. It was introduced some months ago. It still stands as the foremost "Three-band" three, and no rivals to its supremacy have yet appeared. I don't think they will for quite a while yet.

Certain it is that "P.W." is not feverishly scratching its metaphorical and corporate head for a "stunt" which will render the "Cosmic" obsolescent. Nevertheless, the Research Department is hard at work all day, every day, at its legitimate job of testing out a whole catalogue of ideas.

One could take the "Cosmic" circuit, change the first L.F. coupling, put in an output filter, shuffle the controls round, bring in a pretty cabinet idea and serve the whole up as the wonderful new "Colossal" Three, or something like that.

But it wouldn't give better results than the "Cosmic," wouldn't be easier and cheaper to build, and wouldn't have superior operating qualities. In short, it would be a fake.

Forgive me for labouring the point, but it is one which we of "P.W." feel very strongly about.

And it has a distinct bearing upon this new "P.W." Portable, which it is my purpose to introduce to you this week.

Result of Requests.

As I have said, this receiver is not a time-table or seasonal production. It is directly the result of many requests from readers themselves. "In which number of 'P.W.' can I obtain details of the construction of a portable set?" has been the theme of a considerable proportion of our correspondence during the past few months.

And we have been unable to refer these enquirers to any back number of "P.W." which would give them the required information. For one thing, there aren't usually many back numbers of "P.W." in existence, as "P.W." sells out too often for that.

And, in any case, we haven't given you a portable for nearly a year. And there have been quite a few developments in technique during that period of time. Not revolutionary developments, but little "spots of progress" here and there which, though perhaps insignificant individually, are important in the aggregate.

We ourselves have gained experience. It may interest readers to learn that the Research Department has built, and experimented with, no less than four entirely different portables during the past few months as a part of its routine of duties. (Mr. Rogers and his staff do quite a lot of work which has only an indirect bearing upon our published designs, for example, our trade friends may be interested in certain tests we have carried out with high-voltage mains valves.)

We claim nothing much in the way of circuit originality with our new "P.W." portable, but we do insist that it represents 1932 technique at its best. And that is saying quite a lot when you remember what the average portable of 1930 comprised.

A SCIENTIFICALLY "CLEAN" ASSEMBLY

Our new "P.W." Portable is a complete breakaway from the old-fashioned open layout type of design, where merely an ordinary baseboard and panel construction is slipped into a portable cabinet.

The "Ramp" Year.

Some 1930 portables were, of course, quite excellent pieces of work for their time, but others——! But 1930 was the portable "ramp" year, and some of the instruments offered to, and purchased by the poor public, were simply scandalously "done," in both conception and construction.

No wonder the portable has to some considerable extent lost favour with listeners. And no wonder so many ordinary types of sets were built and sold during 1931! A great deal of the

(*Continued on next page.*)

A NEW "P.W." PORTABLE

(Continued from previous page.)

overwhelming success of the radio industry during the last twelve months is due, in my opinion, to the public scrapping millions of inefficient 1930 portables.

You know the things. You could buy them at fantastically low prices at the "junk" merchants last year. Indeed, I believe tens of thousands were scrapped as absolutely unsaleable.

Let us extend our sympathies to those few firms who turned out what were first-class jobs for their time, and leap back once more into the present.

This new "P.W." portable is a tried and tested proposition which will give reliable service. It is not an expensive job, and it is not complicated.

Good Reproduction.

It gives quite good quality, and will provide you with at least a pair of programmes wherever you may be in the country. Many will pick up a whole heap of stations on it, but we are not guaranteeing eve yone everywhere that they will find it possible to pick and choose among scores of programmes.

But I don't think they would expect, or want to do that. Our belief is that they would rather have a portable of a robust character that is capable of standing up to hard work, and which is not critical or temperamental or heavy on juice, and which is always ready at a moment's notice and without trouble.

Not that this new "P.W." portable has had limitations imposed upon it for sake of robustness. It is a very lively outfit, and its performance is above that given by some "fours," and quite a few "fives" of a year or so ago.

It has the advantage of newer and better components and valves for one thing.

Incorporates Many Improvements.

Also, it has the advantage of our greater knowledge of portable-set layout. Layout you know, plays a far greater part in the functioning of a portable than in any other kind of set. You see, all the batteries and components and the loudspeaker have to be compacted within a space surrounded by the necessarily small frame aerial, and that introduces all kinds of problems.

An Unusually Compact Design.

Many of the problems have, in this instance, been solved by the introduction of complete chassis screening. And the admitted losses due to shielding are amply compensated for by the greater stability achieved. That allows us to run the valves closer to the theoretical limits of their amplification than would otherwise be possible. And it hasn't been necessary to introduce artificial and wasteful damping methods.

It is going the wrong way to work, as is now plainly to be seen, to whack up the magnification in an attempt to make the most of the small aerial's restricted pick-up, and then have to "damp" down in order to prevent the whole circuit from "spilling over."

Well, we have successfully compacted the set into an unusually small case, and are able to present a set which is handy for transportation, and neat and unobtrusive for indoor use. If you examine the accompanying photos you will see that no space has been wasted in the interior of the set, and that it is a pleasant, even handsome instrument so far as externals go.

Home-Assembled Loudspeaker.

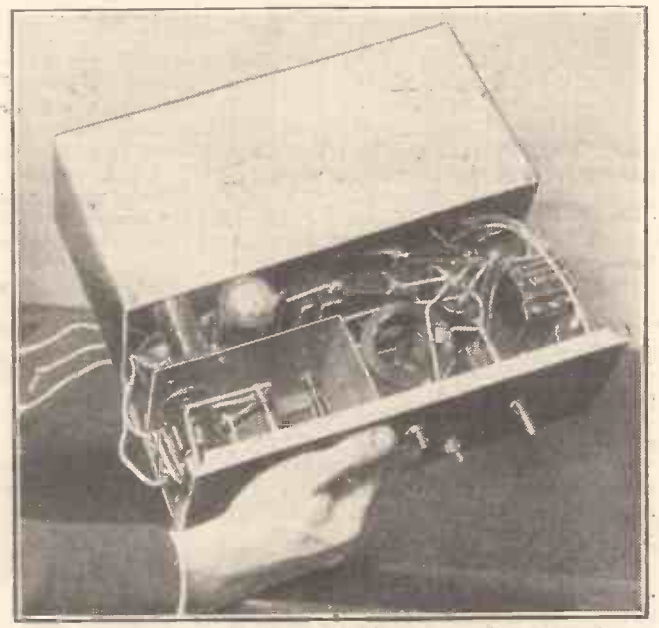
It is not a difficult set to build either. No doubt many of you may think that it looks rather complicated from the appearance of the various photographs, but as long as the job is tackled systematically even the novice should not experience the slightest difficulty.

For it is a real constructor's proposition with its home-assembled loudspeaker and intriguing layout. I think those of you who are attracted to it will find it interesting to build.

And I have no doubts at all as to yuro verdict when you switch on for the first time!

Next week Mr. Randall will take up the pen, and he will deal with the actual constructional details. So now I will leave you, but not before wishing you good luck with your new "P.W." Portable.

COMPLETE CHASSIS SCREENING



All the "works" are built into a completely screened unit. Nevertheless, the assembly is perfectly straightforward, and the metal chassis is available ready drilled at a price which is competitive with the more usual but less-efficient panel and baseboard arrangement.

THE PARTS YOU WILL NEED FOR THE "OUTDOOR" THREE

1 Aluminium box, screen, and baseboard (Magnum).
1 Portable case (Camco Carrier).
2 ·0005-mfd. variable condensers (Formo mid-log line).
1 ·0003-mfd. differential reaction solid-dielectric condenser (Polar, Ready Radio, Telsen).
1 On-off snap switch (Bulgin, B.A.T.).
1 2-gang on-off push-pull switch (Cordo).
1 H.F. choke (Sovereign Super, Ready Radio, Lissen Wearite).
2 ·0003-mfd. fixed condensers (Formo Mikadensor, and Dubilier 670, or small T.C.C., Igranic).
2 Horizontal valve holders (Parex and W.B., Lissen).
1 Standard valve holder (Lissen, W.B., Graham Farish, Wearite, Bulgin, Telsen, Lotus).
1 2-meg. grid leak with terminals or tags (Graham Farish "Ohmite," Lissen, Igranic, Dubilier).
2 20,000-ohm resistances as above (G raham Farish "Ohmite," etc.).
1 15,000-ohm resistance as above (Graham Farish, etc.).
Note.—These resistances can be of spaghetti type if desired (Lissen, Bulgin, Varley, Lewcos, Tunewell, Telsen, Sovereign).
1 ·01-mfd. fixed condenser (Lissen, T.C.C., Dubilier, Ferranti).
1 ·001-mfd. fixed condenser (Dubilier 670, T.C.C., Lissen, Sovereign, Ready Radio, Telsen, Ferranti, Graham Farish, Formo).
1 L.F. transformer (Lissen Hypernik, R.I. Hypermite, Varley Niclet, Igranic Midget, Lotus).
2 2-mfd. condensers (Dubilier type 9200).
1 Output choke (Varley Pentode Nichoke).
1 Cosmic dual-range coil (Goltone, Wearite, Telsen, Ready Radio, Sovereign, Peto-Scott).
2 2½-in. tuning dials (Ormond).
12 feet 18-gauge tinned-copper wire, and sleeving (Wearite), or Glazite, Soldawyre, Quickwyre, Jiffilinx.
Flex, screws, etc.
1 Sheet Kraft paper.
2 ozs. 24 D.C.C. Wire.
2 ozs. 32 D.S.C. Wire.

ACCESSORIES.

LOUDSPEAKER UNIT.—Blue Spot type 66K.

VALVES.—1 S.G. : Mullard P.M.12a, or P.M.12, Mazda S.215, Marconi S.22, Osram S.22, Tungsram S.210, Lissen S.G.215, Cossor 215S.G., Six-Sixty S.S. 215 S.G.
Det. : Marconi H.2, Cossor H.L.210, Mullard P.M.1H.L., Six-Sixty S.S. 210H.L. (Note.—Many valves will not go into the set owing to their height.)
Pentode: Mazda Pen. 220. Lissen P.T. 225, Marconi and Osram P.T. 2.

BATTERIES.—H.T. : 2 of Drydex Blue Triangle 63 v., Ever Ready Popular P. Portable 63 v., Siemens H. 1 60 v., Pertrix 237 60 v.
G.B. : 3 volts for 120 v. H.T.

ACCUMULATOR. — 2 volts (Exide PC2, Oldham JLV4, or other small portable type).

MAINS UNIT.—(Should be small and give 120 to 150 volts 15 m.a. max.) (Heayberd D. Minor, Atlas, R.I., Tunewell, Regentone, Formo, Tannoy, Ekco).

Get it from READY RADIO

Thousands of "Popular Wireless" readers buy their Kits, Receivers and Equipment from Ready Radio. There is no need to wait for the apparatus you want. You can order it at once and pay for it by small monthly instalments.

COSMIC STAR

The Cosmic Star covers all wavelengths—short, medium and long. It will bring you programmes from America, Australia, Africa and Asia with the same ease with which you tune in a Continental Station.

KIT "A" Complete Kit of Components together with panel (ready cut and drilled), baseboard, Jiffilinx for easy non-soldering wiring and free blue print. **89/6**

OR BY EASY PAYMENTS
10/3 down and 9 monthly payments of 10/3

KIT "B" Complete Kit of Components as Kit "A" together with specified Mullard valves and free blue print. **£5:12:3**

OR BY EASY PAYMENTS
10/6 down and 11 monthly payments of 10/6.

KIT "C" Complete Kit of Components as Kit "B" together with beautiful Table Cabinet and free blue print. **£6:13:3**

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TO INLAND CUSTOMERS.—Your goods are dispatched post free or carriage paid.

TO OVERSEAS CUSTOMERS.—Everything Radio can be supplied against cash. In case of doubt regarding the value of your order, a deposit of one-third of the approximate value will be accepted and the balance collected by our Agent upon delivery of the goods. All goods are very carefully packed for export and insured, all charges forward.

The OUTDOOR-3

A really up-to-date portable that will more than satisfy the outdoor listener. Wonderfully simple in design and operation, it will give first-class performance under the most exacting conditions.

KIT A Complete Kit of components, less valves and cabinet. **£4:11:0**

OR BY EASY PAYMENTS 8/6 down and 11 monthly payments of **8:6**

KIT B with valves less cabinet **£6:12:0**

KIT C with valves and cabinet **£8:7:0**

OR BY EASY PAYMENTS

12/3 down and 11 monthly payments of **12:3**

15/6 down and 11 monthly payments of **15:6**

RECOMMENDED ACCESSORIES

	£	s.	d.
2 Pertrix No. 237 60v. H.T. Batteries @ 8/- each		16	0
1 Exide Accumulator Type P.C.2		14	0
1 Pertrix Grid-Bias Battery		1	3
Ready Radio Eliminator Type B.S. supplies H.T. and keeps the L.T. accumulator fully charged	5	17	6

S.T. 300

The S.T. 300 is the finest screened-grid three ever designed. Its wonderful selectivity, sensitivity and power make station-finding the simplest of matters to the least experienced operator.

KIT "A" £3:18:6
less valves and cabinet. Free Blue Print.

OR BY EASY PAYMENTS
7/3 down and 11 monthly payments of 7/3.

KIT "B" £5:10:9
with valves less cabinet. Free Blue Print.

OR BY EASY PAYMENTS
10/3 down and 11 monthly payments of 10/3

KIT "C" £6:9:3
with valves and cabinet. Free Blue Print.

OR BY EASY PAYMENTS
12/- down and 11 monthly payments of 12/-

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EASTNOR HOUSE, BLACKHEATH, S.E.3.
'Phone: Lee Green 5678.
'Grams: Readirad, Blackvil.

Showrooms:
159, *Borough High Street, London Bridge, S.E.1.* *'Phone: Hop 3000*

READY RADIO

CASH or C.O.D ORDER FORM

To: READY RADIO, LTD., Eastnor House, Blackheath, S.E.3.

Please dispatch to me at once the following goods.....

for which { (a) I enclose / (b) I will pay on delivery } (cross out line not applicable) £.....

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P.W. 7/5/32.

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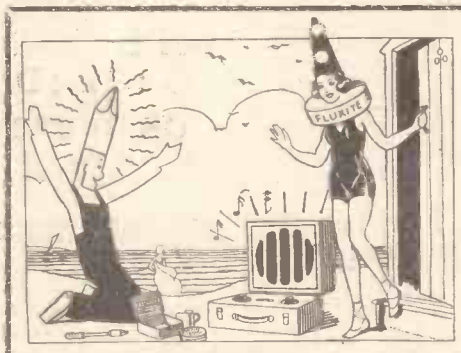

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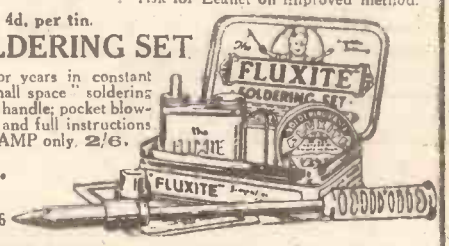

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STATIONS WORTH HEARING

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

THE period of inconsistency on the part of foreign stations which was reported at the beginning of the latter half of April came happily to an end before it had lasted very long. It was followed by a period (still going strong!) in which foreign stations showed a big all-round improvement. There has been, in fact, a remarkable increase both in the number of stations receivable and in the volume obtainable from the majority of them.

Despite the rather unsettled weather which followed the long, cold spell, atmospherics have not been much of a nuisance. Only at odd times, in fact, have they been really noticeable at all. In the old days, when there was hardly a foreign station with an output greater than 2 or 3 kilowatts, the very mildest atmospherics were sufficient to ruin reception, since the strength of the incoming transmission was insufficient to drown them.

Drowning the Atmospherics.

But nowadays the big fellows on the Continent are so powerful that they are pretty useful in drowning any but the most violent atmospherics. So powerful, in fact, are many of them received in this country that recent measurements show, at ranges of several hundred miles, field strengths that would be considered adequate in a service area!

Less Spark Interference.

There has, I think, been rather less spark interference towards the lower end of the medium wave-band, and relief from this enables some very interesting long-distance work to be done in the region between 220 and 265 metres. This part of the band contains a good many stations that are quite excellent when only they have a chance of making themselves heard.

If you cannot hear any spark interference with the wave-change switch in the "medium" position and the tuning dials down near the zero mark, it is always worth while to try for stations such as Fécamp, Nurnberg, Trieste, Gleiwitz, Toulouse P T T, Horby, Leipzig, Moravska-Ostrava and Lille. All of these are capable of providing good loudspeaker reception.

At the top of the medium wave-band, Vienna is still good on many nights, and Florence has now become one of the best received of Continental stations. Completely reliable also are Prague, Langenberg, Rome and Stockholm. Beromunster comes in with plenty of volume, but jamming has occurred on some recent occasions.

Witzleben is generally worth attention, though it is only on occasional nights that first-rate volume is obtainable from him. Belgrade is better heard now than he has been for a long time past, and I recommend him to your notice. Katowice, Sottens, Frankfurt, Toulouse, Lwow and Hamburg are all providing first-rate reception.

Some Good Stations.

Barcelona E A J 1 has strengthened up considerably, though there are evenings when he is not quite up to the mark. Strasbourg shows great improvement and Brno is at most times as good a station as you could desire. Brussels No. 2 is at the moment rather more powerfully received than his elder brother, No. 1.

Milan has not failed to provide good reception for some little time, and Breslau is just as good. Göteborg is generally to be found at good speaker strength.

SHORT-WAVE NOTES

News and views regarding an exciting and fascinating wave-band.

By W. L. S.

I HAVE so many letters and queries of general interest on hand that this must take the form of an "Answers to Correspondents" section just for this week. Next week we will revert to more technical matters.

First, "H. L. C." (Reading) passes into the H.A.C. Club with a good list of stations. Incidentally, he says that "L. M. V.'s" station on 21 metres is probably W 2 X B J, not W 2 X C J.

Shoals of letters deal with the two Italians on 42·9 and 44 metres, but I cleared them up in last week's notes as Coltano and Tripoli. It appears now, however, that the lower of the two is Rome himself, on a new wave-length.

How to Learn Morse.

"H. T. N." of Trowbridge badly wants to learn Morse, in order to identify the numerous signals that come in on his "S.G." Four without conveying anything at all to him! I have often said that the only way to learn Morse, in my opinion, is to read through the alphabet first, trying to memorise it, and then amusing oneself on a buzzer for a week or so. By that time you should begin to recognise the letters *by sound* sufficiently well to pick up stray letters and words from some of the slow commercial stations. After that it is just a matter of patience and perseverance.

Of course, a friend with plenty of spare time and a similar desire to learn is a great help, especially for buzzer-practice.

"E. C." writes from Port Elizabeth, South Africa, and gives an interesting log of short-wave signals. "British is best," says he, when it comes to short-wave receivers, although he is connected with an American firm!

"R. H. D." (Rhondda) is very pleased with his combination of a "Comet" Three and a short-wave adaptor. By the way, his list also gives him "H.A.C." and is very complete.

The "Bitza" Adaptor.

His adaptor is described as a "Bitza" set! I presume that he means that it is constructed from "Bitza this" and "Bitza that." Yes, "R. H. D.," sets of that kind usually work extraordinarily well. He claims to be the youngest "H.A.C." member, being 15 years old, but I fancy our friend J. R. B. of Edinburgh has him beaten.

Our third "H.A.C." aspirant is "W. J. P." (Redditch), who makes two guesses at my identity without getting very near it. I have told both the gentlemen involved, and made myself scarce!

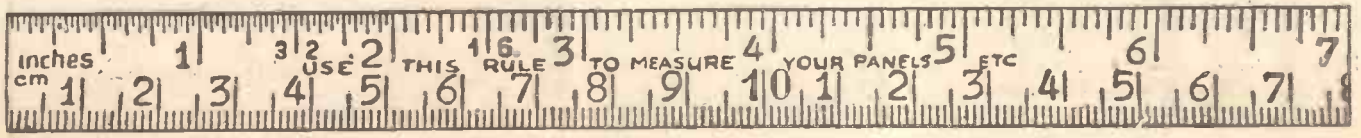
The "S.G." Four has now enhanced its "international" reputation by starting up in the Canary Islands, under the guiding hand of "O. N." This gentleman breaks one short-wave record by saying that he is in a spot that is "ideal for short-wave work."

Most people like to belittle their location and to point to the receiver as the reason for good reception, but "O. N." is more honest! He puts the Canaries as "No. 1" for DX reception, after having listened in several parts of Europe.

A Peculiarity of G 5 S W.

He mentions an interesting effect on G 5 S W. Normally Chelmsford vanishes after dark between November and March—owing to the usual "skip" effect. When, however, there is a strong S.E. wind, the station comes in well right up to "closing time." Doubtless there is some other local effect that goes hand in hand with a S.E. wind; I cannot believe that the wind alone can cause such variations in signals.

"O. N." winds up by remarking that W 2 X A D is always poor, and W 2 X A F better, but both are bad now that they have pointed their aerials towards South America (on behalf of the sales department!).



RADIOGRAM REMINDERS

Battery radiogram operation is discussed in this article of our "reminder" series, and some interesting details of one of the finest commercial all-electric 'grams are given.

I HAVE received a number of letters from readers concerning the various points I have raised in this "reminders" page and I want to deal with two of them this week.

The first takes me to task regarding something I said in the first notes concerning the difficulties which beset the constructor who wants to run a radiogramophone from batteries.

My correspondent points out that he gets very good results from H.T. accumulators, which he has charged regularly at the local charging station. I agree with him that excellent results can be obtained from such a source of H.T. But the majority do not want to be troubled with a battery of that nature, and it was with these in mind that I wrote the remarks to which he takes exception.

Two Alterations.

But there is a way of getting over the need for high H.T. voltage where battery H.T. is employed, and I was going to discuss that next time. As this reader has brought the point up, however, I will briefly state what I had in mind.

With the somewhat small power handling capabilities of most of the 150-volt H.T. valves there are two ways that can be employed to make the most of a battery-driven radiogram. The use of one or other of the new pentodes, such as the Mazda Pen 220a, or else the employment of push-pull amplification.

The use of dry H.T. supply having a voltage of more than 150 volts is an expensive matter, but excellent 150-volt high capacity batteries can be obtained, and with these and a good pentode (the one I have mentioned will give an undistorted output of something like 1,000 milliwatts), or with push-pull one can get an adequate output for really fine radiogram reproduction. But more of this later; I have mentioned it earlier than I intended because it has been raised by my correspondent.

A Fine Instrument.

The second letter asks a question that I cannot answer in these columns. It is blandly: Which is the best commercial radiogram, irrespective of price?

Obviously, that is impossible to answer, because it all depends from what point of view you look at the matter. But if my correspondent means which is the most up-to-date, the most powerful instrument, I should feel inclined to draw his attention to the de luxe H.M.V. machine, the super-het. model 531.

In fact this is such an interesting instrument that I feel I shall be well advised to give a brief description of it here and now. So here goes:

LEADING THE WORLD

This is a general view of the H.M.V. Model 531, a super-het. radiogramophone designed to lead the world in this class of receiver. It includes automatic record changing as one of its many outstanding features.

The photograph shows what the 531 looks like, and a very handsome instrument it is. But the inside is full of the most ingenious examples of set design, though it is so carefully carried out that the instrument is a paragon of accessibility.

The mains part consists of a six-valve super-heterodyne receiver mounted on a chassis at the top of the cabinet, directly under the electric motor. This is controlled by a multi-gang condenser which, with one knob, tunes a number of band-pass circuits.

A combination switch allows the set to be switched on or off and from radio to gramophone; it also provides a "local" and "distant" control which affects the sensitivity of the super-het. when radio is being received.

Below the super-het. chassis is a three-valve push-pull amplifier which acts as the gramophone amplifier, besides being in action on radio. Both it and the radio side of the set are mounted in block form on metal chassis so that they can be removed as units if required for servicing, and they are mounted on Sorbo rubber to absorb vibration that might cause trouble.

The Last Word.

In addition to the handsome walnut cabinet, and the powerful radio and gramophone set, model 531 is fitted with the H.M.V. automatic record changing device that allows up to eight, ten or twelve-inch records to be played without any attention to the machine.

The undistorted output power is of the order of 4 watts and the input that is needed from the electric power supply, even when the gramophone is operating, is only about 100 watts.

It is available for all voltages of A.C., and though it is only designed for use with A.C. mains it can be used on D.C. by means of a small rotary converter which turns the D.C. into A.C.

The 531 is a real de-luxe outfit, and is capable of bringing in something like 80 or 90 stations at full loudspeaker strength with only a small outdoor or indoor aerial. The price is 70 guineas, and the receiver represents the very last word in radiogramophone design, a design that does justice to the energies of what is recognised as one of the finest research laboratories in the country.

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MAGNUM ALUMINIUM BOX, SCREEN AND BASEBOARD

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This Short-Wave Adaptor can be used with any type of receiver (excluding D.C.) whether A.C. Mains, battery operated or super-het. irrespective of the circuit or the number of valves. Price complete with 40/80 metres coil, cord and plug 39/6

Extra Coil 18/40 metres, 3/-

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2 GNS Still Buys Our HANDSOME !!!! RADIO-GRAM CABINET OF EXCELLENT DESIGN AND QUALITY

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Gramophone Compartment	3½" CLEAR FOR PICK-UP 3¼" " MOTOR
Wireless Compartment	For PANEL up to 18" × 7" BASEBOARD 14½" deep.
Speaker Compartment	20" × 15" × 14" allowing ample room for speaker and batteries.

AND AT THE ASTOUNDING PRICE OF 2 GNS.!! PACKED FREE. CARR. PAID

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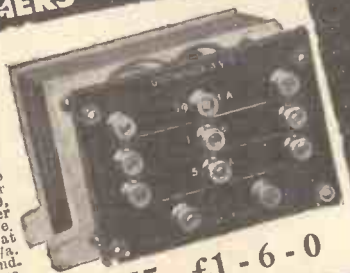

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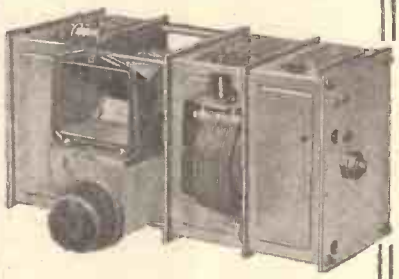

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The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts or photos. Every care will be taken to return MSS. not accepted for publication.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

QUESTIONS AND ANSWERS

"WHICH IS BETTER—MODERATING OR FLEXI-COUPLING?"

Many readers asked the above question, or were obviously in doubt as to the procedure with a set for which flexi-coupling had at one time been recommended.

"Could both methods (flexi-coupling and moderating) be used together?" was also asked.

The following brief explanation should clear up most of these difficulties:

FLEXI-COUPLING was, in effect, an earlier form of moderating; a somewhat similar effect of greater power and increased selectivity was obtainable, but it involved the use of rather more cumbersome apparatus.

In a flexi-coupled set the aerial tuning was carried out by means of a Selector Coil, and this was inevitably a rather bulky component. The coupling between the roughly-tuned aerial circuit and the tuned grid circuit was by a flexible lead that could be wound round in different places and quantities to provide different degrees of coupling.

MODERATING also comprises a tuned aerial circuit coupled to the tuned grid circuit. But moderating gives better tuning for the aerial circuit, which is one of its advantages. It also gives a wider variation in coupling between the two circuits, which is another advantage. And as it is more easily fixed, with less bulky and cheaper apparatus, it is definitely superior to flexi-coupling.

From the above it will be noted that these two systems of improving selectivity cannot be used together. Both moderating and flexi-coupling are methods of improving selectivity and conserving aerial energy, and moderating is the better and later method, and is generally advised in preference to flexi-coupling.

"FOR THE DUAL-RANGER."

L. R. C. (Coventry).—Undo the two leads that go to S_1 and join them instead to one side of the moderator coil and to one side of moderator condenser. Then the other side of coil and other side of condenser go to S_1, and you moderate as explained in the articles. It should greatly improve your selectivity on the medium waves.

THE ORIGINAL ARTICLES.

It is noted that large numbers of inquiries are still arriving about points that have already been answered in the articles on moderating. As space is strictly limited, the querists are requested to refer back to the articles, it being impossible to repeat information which has appeared before.

AERIAL EFFICIENCY.

"CRYSTAL" (Lower Edmonton).—"Could you give some hints on aerials, lead-in tubes, etc., in connection with a crystal set?

"The reason I ask is that in two different cases I know of where reception got rather weak and unsatisfactory it was improved immensely by putting up a new aerial and switches, etc. This seems to me to be an expensive way of going about it, and I should like to know why it is the old wires deteriorate, or for what reason it was that reception improved when the change was made?"

Probably the true explanation of this is summed up in the single word "contact." Usually, an aerial, lead-in joint, earth, etc., is subjected to exposure to the weather, and thus joints which at one time were good and clean become oxidised and develop high resistances.

Switch contacts are especially liable to this; and for that reason it is advisable to employ a cover for an earthing switch, and to inspect it regularly to see that the contact surfaces are bright and clean.

Good copper wire does not deteriorate noticeably with age in so far as conductivity goes, but it often happens that insulators get cracked with exposure to weather, etc., and a noticeable improvement in reception might be expected when these were replaced. However, this is not usually half so important as corroded joints, and the absence of unnecessary breaks in the wire.

One common cause of poor results is that the wire gets rubbed by the window, which cleans off the insulation, or some of the strands get severed owing to the window closing upon them. (Neither is it very helpful to use rubber-covered wire for this, as in that case the same effect occurs with the added disadvantage that the rubber covers up the breaks, although itself it may not be severed.)

Do not forget, also, that the aerial terminal on the set, the earth terminal, the lead from the earth to the earth plate, and the connection between that lead and the earth plate itself should be in good condition if maximum results are to be obtained.

A SELECTOR COIL FOR CRYSTAL SET.

C. S. W. (Birmingham).—"Is it possible to use a "P.W." Selector coil to make a crystal set? If so, I should like to try this, as I have a crystal detector and coil and I am told that with a tuner of this kind it would not be necessary to use a variable condenser.

"If this would be all right for Midland Regional (5 G.B.) please give me connections to the coil clips which are marked A, B and C."

The Selector coil is quite suitable, and can be used as suggested without a variable condenser, as the coil in question is tapped every few turns and, by rotating the switch, you get a tuning effect that will be quite sufficient for your purpose.

The connections are simplicity itself. Ignore terminal B altogether, join the aerial lead-in to terminal A, and connect this point also to one side of the crystal detector. The other side of the crystal detector then goes to one telephone terminal, and the remaining telephone terminal goes to C on the selector coil, and also to the earth lead.

That completes the necessary connections, and you should find this quite satisfactory for the station named.

"P.W." PANEL, No. 70. CRYSTAL CONTROL.

Quartz crystals have the curious property of altering slightly in shape when alternating current of suitable frequency is applied to them.

* * *

By the use of a carefully-ground quartz crystal the oscillations in a circuit can be limited to one particular frequency.

* * *

When the crystal is associated with a valve oscillator, an output of constant frequency can be assured, and an adaptation of this principle is used by many of the European broadcasting stations for the "crystal control" of wave-length.

HOW ARE YOUR RESULTS NOW?

Perhaps your switching doesn't work properly? Or some mysterious noise has appeared and is spoiling your radio reception? Or one of the batteries seems to run down much faster than formerly?

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

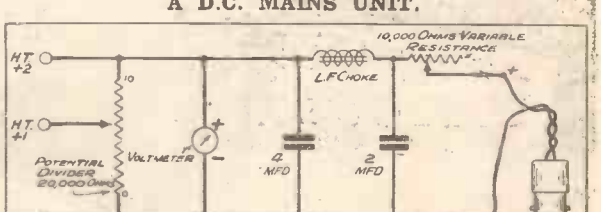
Full details, including scales of charges, can be obtained direct from the Technical Query Dept., POPULAR WIRELESS. The Fleetway House, Farringdon Street, London, E.C.4.

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

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

MISSING LINKS, No. 33

A D.C. MAINS UNIT.



The three "missing components" of last week's diagram have been inserted in the one given above. It will be seen that they were an L.F. choke and the two smoothing condensers.

The Second-time over

When you use Parke-Davis Shaving Cream, the "second-time-over" shave is just as comfortable as the first; and you can use the same brushful of lather to do it with. Parke-Davis Shaving Cream is the new perfected softener for stubborn beards. Prove it for yourself and enjoy a week of good shaving by sending for the liberal seven-day sample tube offered free for the asking. Large tube 1/6 from chemists only.

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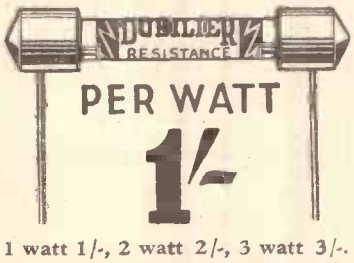
Dubilier Metallized Resistances are manufactured under a patent process and are worthy of that great reputation for reliability which goes with all products bearing the name Dubilier.

Whatever your Resistance requirements—ask for Dubilier.



PER WATT
1/-

1 watt 1/-, 2 watt 2/-, 3 watt 3/-.

D.2.

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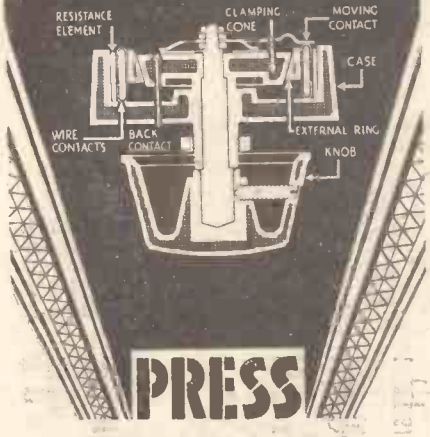

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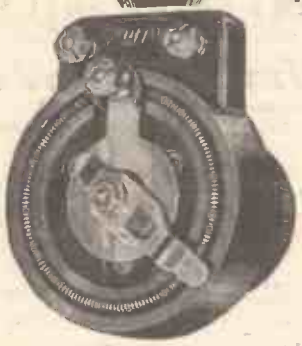

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"This component has been developed for use as a volume control in circuits where there is a negligible D.C. current flowing, as it embodies a composition-type resistance element (we have tested it to 10 milliamps—Watmel). Pressed firmly against the resistance and held in position by a specially shaped clamping cone is an annular ring carrying a large number of small wire contacts. The moving arm rides over these contacts, thus varying the resistance in steps. There are so many contact points, however, that for all practical purposes there is a continuous variation in resistance.
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"A most interesting constructional feature." "A very interesting resistance." "IT IS CERTAINLY ONE OF THE BEST WHICH WE HAVE TESTED." "Should prove popular."
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C. W. Maxim, 33, Broad Street.

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W. E. Wood, Sandyfields Wireless Stores, Bradford Road.

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John Young, 217, Upper Meadow Street.
The Wireless & Electrical Co., 32, Dublin Road.

BISHOP AUCKLAND.
A. M. Hunter, Evenwood House, Evenwood.

BLACKPOOL.
Tom Jones, 1A, Leopold Grove.

BURNLEY.
Northern Radio Exchange Co., 150, Trafalgar Street.

CHATHAM.
Chatham Radio, 220, High Street.

DEAL.
E. D. Newing, 138, High Street.

ELY, CAMBS.
E. Baines Cope, 30, Back Hill.

FROME.
Alec. G. Applegate, 47, Trinity Street.

GLASGOW.
Gordon & Smith, 669, Cathcart Road, S.2.
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Walker & Son, 1/2, Marine Terrace.

MORTIMER, BERKS.
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"The usual 7 strand type was tried first and the reading from Moorside Edge was 22 microamps. With 'AERIALITE' under same conditions the reading immediately jumped to 27 microamps."

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2 VOLT DARK EMITTER

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Big Packet of SCARLET FLAX Seeds
With TO-DAY'S
Popular Gardening
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THE LISTENER'S NOTEBOOK

(Continued from page 242.)

On the other hand, Christopher seems to revel in apparent tongue-twisters. They suit him, and any simplification in gramophone numbers might cramp his style and thus reduce his entertainment value. So we'll say no more about it!

* * *

On the whole I liked that "Cupid Plus Two" turn. It had Bobbie Comber in it, and he is always worth listening to. Betty and Bill were good when warbling alone, but they were hardly a pair of "birdies" when warbling together. Sounded like sand in the larynx!

* * *

There is little doubt that the Community singing at Wembley this year was a fiasco. Not that Mr. Ratcliffe was at fault, for he strained every nerve to get the crowd to open out. The fact is, Community singing, like a good many other things, has had its day.

Its novelty has worn off, and those who like providing the auspices for these great occasions have got to devise other schemes of entertainment where great crowds are concerned.

* * *

No less successful than the Newcastle players was Mr. George Allison in his capacity as commentator. I cannot remember when he was heard to better advantage. The way he kept up with the game, the clarity of his descriptions, and the detail thereof, his impartial enthusiasm and the excitement he aroused among listeners were almost as good as a seat in the stand.

Congratulations to Mr. Allison, and more especially as he was labouring under physical difficulties.

* * *

I hear that a man who lost a bob on the Arsenal got it back the same evening on 17 Doreens in the Children's Hour Birthdays.

* * *

With the passing of St. George's Day one hopes that selections from Merrie England will be given a rest now. To find it in two consecutive musical items is really more than one can stand. Aren't musical programmes ever submitted and examined before they are given?

* * *

To those lovers of English who are crying out for English talks, something on the lines of the "Foundations of Music" series, Milton's Comus and Shakespeare's Henry V. must have been welcome. Whether America liked Comus or not I don't know—it seemed to me an extraordinary choice—but if reception across the pond was good, our friends there must have appreciated Dr. Arne's delightful music.

* * *

Another boy singer has appeared in the person of Master Graham Payne. His voice has quality, but clearly he hasn't escaped the influence of the crooning vogue. With his second song—a French one about *le Printemps*—I thought he was too ambitious.

* * *

The B.B.C. has at last been awakened from its long sleep over the Sunday programme business! And starting next month we are going to have suitable music from 12.30 p.m. on Sundays.

It looks as though the complacency which could not be moved by listeners' requirements has been crumpled by cross-channel competition.

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8¾" × 5¾" × 5¼"
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TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio reception.

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

Transformer Breakdown.

INTER-VALVE and power transformers are so well made nowadays—that is, the good ones, at any rate—that a breakdown is really a very rare occurrence. It is only a matter of two or three years ago, however, that transformer breakdown was by no means uncommon, and many reasons were ascribed for it.

It was commonly put forward that there was some corrosion taking place in the wire, or some soldering flux or acid of some kind had got on to the insulation and gradually eaten it away. I doubt whether breakdown is due to this cause nearly so often as to the vibration of the laminations of the transformer and of the windings themselves.

If you come to think of it, the laminations are in almost precisely the same situation electrically as the armature of a loudspeaker, that is to say, they are situated in a strong alternating or varying magnetic field and are subject to forces which set them (or tend to set them) into vibration.

Core Vibrations.

If by any chance the bolts which keep the laminations together should have worked loose or should not have been properly tightened up in the first instance—this happens more often than you might think—one or more of the laminations will be free to vibrate and may quite well cause chafing of a lead-in wire from the coils, if one happens to touch the core.

As regards the coils themselves, I have seen cases in which these were so loose at some part that a few turns could vibrate. You will often notice that a transformer, at any rate a power transformer, will give a constant and quite audible hum which must be due to actual mechanical vibration of the parts, especially the laminations.

If you have a loudly humming transformer you should give it a thorough overhaul and tighten up all the bolts and make sure that the possible vibration is reduced to the absolute minimum.

Loudspeaker Experiments.

My remarks recently on different types of loudspeaker movements have brought mo a number of letters from readers, and one letter in particular, which I have before me, gives some interesting comparisons between different types of speakers.

My correspondent says that he has been comparing the performance of some well-known moving-coil and balanced-armature units, these being all priced about 50s. complete—this is an important point to bear in mind with regard to the moving-coil speakers tested.

The points particularly considered were (1) the ability to reproduce transients correctly and (2) the ability to reproduce the lower musical frequencies. The tests showed that the low-note response of the balanced-armature units was limited to some extent

(Continued on next page.)

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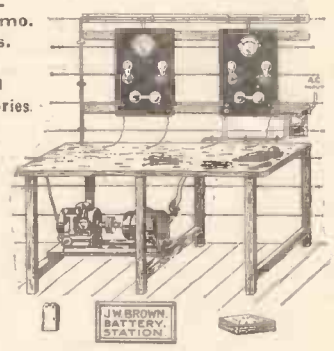

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TECHNICAL NOTES

(Continued from previous page.)

by rectification, according to the letter.

In three of the moving-coil units tried the flexible cone suspension was absent, the cone being relatively firmly fixed at its circumference. Consequently the coil was only capable of comparatively small movement and the bass response was definitely inferior in these cases to that of the balanced-armature type.

Furthermore, the reproduction was blurred and generally lacking in "attack."

Sensitivity of Moving Coil.

My correspondent considers that in the case of the comparatively cheap moving-coil speakers, in which a small magnet is used in an attempt to build the moving-coil speaker down to a price, the sensitivity was definitely below that of the balanced-armature type. Bear in mind, as I mentioned above, that this does not apply to moving-coil speakers in general, but only to the relatively low-priced speakers which were used in these comparative tests.

The letter goes on to say that the writer uses a balanced-armature unit, and sees no reason why this should not have as good a frequency-response as the moving coil.

Everyone is entitled to his own opinion of the relative merits of different types of loudspeaker, and there is as great a diversity of opinion as there is of speaker types. I should be interested to have other readers' views on these points.

(Continued on next page.)

TECHNICAL TWISTERS

No. 112.—CONTROL OF LOUDSPEAKER VOLUME

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* * *

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* * *

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* * *

Usually the resistance is . . . or . . . . . times the value of the loudspeaker's impedance.

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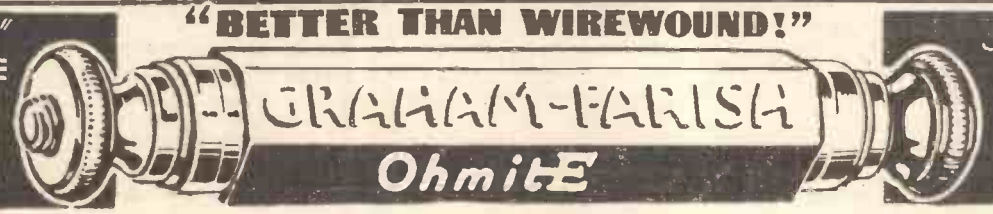

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Single-dial tuning, with reaction dial. Gets long and short-wave stations. Latest cone-type loud speaker. A clearly written instruction leaflet is given, so that anyone can secure perfect results immediately. Valves included—nothing extra to pay. Price 32/6, post free. C.O.D. 1/- extra. (Trade inquiries invited.)
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MICROFU GOLD FILM FUSES

NEW FLAT TYPE from 50 m/a upwards. Fuses 6d. Holders 6d. Complete 1/-.

This is a gold fuse—not wire. Put one in your set to protect valves.

See "Popular Wireless" Test Report in this issue.

MICROFU Absolutely Reliable. 100% British.

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LOUD SPEAKERS REPAIRED, 4/-

(Blue Spot a Speciality, 5/-)

Transformers **4/-**, Headphones **4/-**, all repairs magnetised free. Eliminator Repairs quoted for. 24 Hours Service.

Discount for Trade. *Clerkenwell 9069*
E. MASON, 44, EAST ROAD, N.1.

TECHNICAL NOTES

(Continued from previous page.)

Choke Characteristics.

I was talking in these Notes a little time back—or in an article in "P.W."—about chokes with an air-gap in the core, and about the relative efficiency of chokes of this kind. The air-gap has the effect of maintaining the inductance at a high value, notwithstanding the relatively heavy current in the windings.

If the air-gap is made extremely large, obviously the inductance will be virtually independent of the value of the anode current, but this is not really what we want; or rather, I should say this *is* what we want, but we do not want to achieve the result in this particular way, because it involves at the same time a very low inductance or a very high D.C. resistance.

It is necessary to have a low D.C. resistance and a reasonably high inductance, and this is where the cleverness in design comes in, because the design of the choke generally, and in particular the dimensions of the air-gap in relation to the rest of the design, have a very important influence upon the inductance and resistance.

THE NEW IRISH STATION

A Speed-up in Progress.

From A SPECIAL CORRESPONDENT.

IT has now been decided to speed up the construction of the high-power station near Athlone in the hope that it may be in operation in time to broadcast the Eucharistic Congress at Dublin in June. The Minister for Posts and Telegraphs of the Irish Free State has issued a statement that he is satisfied that by careful organisation the very considerable task of endeavouring in three months to do what was scheduled to take six months can almost certainly be achieved.

"Given reasonably good weather," he states, "between now and June there is every hope that the ceremony of the Eucharistic Congress will be broadcast from our own high-power station. The Eucharistic Congress is an event of outstanding interest and importance.

"It is manifestly most desirable that the resources of modern scientific attainments, such as broadcasting, should be utilised to the full to enable the world at large to participate actually, and not in the spirit only, in the inspiring religious ceremonies of the Congress."

NEXT WEEK

In next Thursday's "P.W."

How to make

THE "OUTDOOR" THREE

Capt. Eckersley on

"THE VALVE"

WIRELESS IN WAR-TIME
ETC. ETC. ETC.

ORDER NOW **3d.** NEXT THURSDAY

INSTAL WATES STANDARD

and end H.T. battery expense

THE continual drain on your pocket ends when you instal the 'Standard' which is PERMANENT. Made on the famous Leclanché principle—ensuring an ideal silent H.T. supply—the 'Standard' RECHARGES ITSELF when the set is shut down. No recharging required: the eventual replacement being merely a matter of changing cartridges. Thousands of enthusiastic users. Write for

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Lightning strikes through wireless aerials. Make your home safe!

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The 19th Edition of "ENGINEERING OPPORTUNITIES" is now ready for distribution. This is not merely a pamphlet, but a 200-page book of unique reference that you cannot well afford to miss. By reading it you will know us, our work, our aims and how we can alter your entire outlook and earning power, whatever your age or experience. Among other things, the Handbook shows the easiest way of preparing for B.Sc., A.M.I. Mech. E., I.E.E., G.P.O., etc., Exams., outlines Modern Home-Study Courses in all branches of Civil, Mech., Elec., Motor, Aero, Radio and "Talkie" Engineering, and explains the unique advantages of our Employment Department. "ENGINEERING OPPORTUNITIES" has shown the way to better things to over 120,000 of your fellows. Send for your copy to-day—Free and without obligation.

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you must join the Radialaddin Club

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Every set-owner who wants to get the best possible reproduction should get the May number of "Modern Wireless," which contains

A COMPREHENSIVE SURVEY OF LOUDSPEAKERS of TO-DAY

A CONCISE GUIDE

The MAY Number of

A COMPLETE REVIEW

MODERN WIRELESS

provides in one complete supplement a Review of Loudspeaker Technique, a Survey of All Modern Types, and details of The Link Between Set and Speaker—i.e. The Output Circuit.

See also

THE WORLD'S PROGRAMMES

A SPECIAL SUPPLEMENT FOR THE LONG-DISTANCE MAN:

Broadcasting a Volcano!—Long-Wave Listening—Station Alterations—Those Short Waves—Listen for Poland—What the Distant Stations are Doing, etc., etc.

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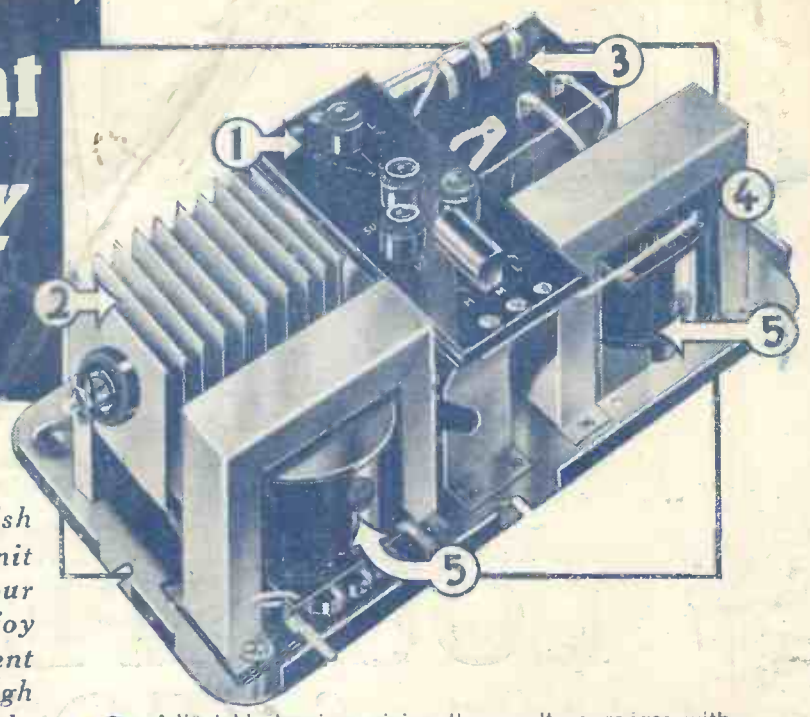


Change to an EKCO Unit and finish with batteries for ever! An EKCO Unit connected to your set in place of your usual battery means that you will enjoy all the advantages of an ample, silent and unvarying current supply at high voltage at a cost of only a penny a month.

There is an EKCO Unit waiting to give you better radio at the lowest possible cost. Choose the Unit suitable for your set from the Table or post coupon now for full details.

All EKCO Units are obtainable on Easy Payments.

1. Adjustable tappings giving three voltage ranges with perfect, noiseless contact. Patented plugs and socket for quick and easy connection of wires.
2. Westinghouse Metal Rectification.
3. Condensers tested to 500 volts.
4. All metal parts cadmium plated to prevent rust.
5. Choke and transformer coils wound on moulded bakelite bobbins.

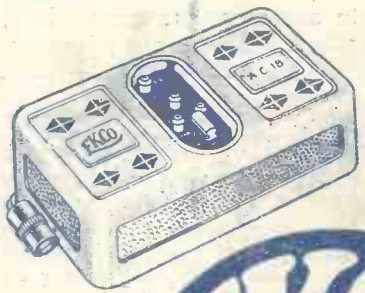
EKCO H.T. UNITS

Model	Current Output	Voltage Tappings	Price
A.C. 12	12 m/A	80; 120/150	£2.15.0
A.C. 18	18 m/A	S.G.*; 50/80*; 120/150	£3. 7.6
A.C. 25	25 m/A	S.G.*; 50/80*; 120/150	£3.17.6
D.C. 15/25	15 or 25 m/A	S.G.*; 50/80*; 120/150	£1.19.6

Combined H.T. & L.T. Charger Units (for A.C. Mains)

Model	Current & Voltage	L.T. Output (*for charging accumulators*)	Price
K. 12	Current Output and Voltage Tappings same as Models A.C.12, A.C.18 and A.C.25.	½ amp. at 2, 4 or 6 volts	£3.19.6
K. 18		¼ amp. at 2, 4 or 6 volts	£4.12.6
K. 25		½ amp. at 2, 4 or 6 volts	£5. 7.6

Tappings marked * are adjustable.



Housed in solid drawn steel case, oxidised copper finish. Connecting plugs recessed below surface of case.

Size, 9 × 5 × 3¼ (K,25 and 25 cycle models 9⅛ × 5⅛ × 3¾).

To E. K. Cole, Ltd., Dept. A.9,
Ekco Works, Southend-on-Sea.

Please send me particulars of EKCO Power Units.

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POPULAR WIRELESS, May 14th, 1932. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

THE VALVE—By Capt. P. P. Eckersley (See Page 269)

Popular Wireless

Every Thursday PRICE 3d.

No. 519. Vol. XXI. INCORPORATING "WIRELESS" May 14th, 1932.

ALSO THIS WEEK:

RADIO in GERMANY

HOW WIRELESS DID ALTER HISTORY

THAT FINAL RIPPLE

An article by G. V. Dowding of interest to all mains set owners.

NOTES FROM THE NORTH

AIR TAXI RADIO

Etc., Etc.

That Kit you want!

Get it from READY RADIO

Eastnor House, Blackheath, S.E.3

(See Page 283)

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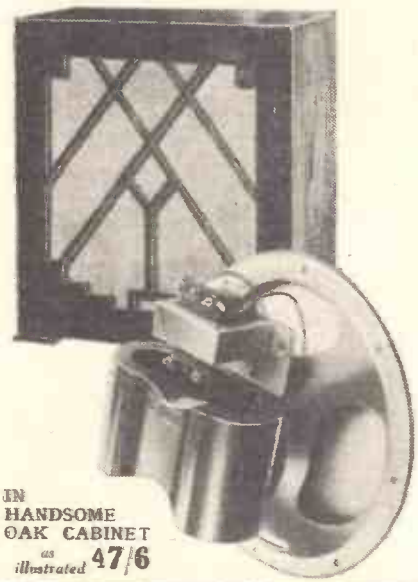
NEW 20th CENTURY MODEL

P.M. MOVING COIL SPEAKER

There are plenty of Moving Coil Speakers but none so good, at anywhere near the price, as the NEW Epoch 20th Century Model.



IN HANDSOME OAK CABINET as illustrated 47/6

This NEW Epoch gives perfect reproduction of both speech and music, with brilliance unequalled in its class. Its extreme sensitivity renders it suitable to work with even a 2-valve set. Handling capacity undistorted, input 150 milliwatts to 5 watts.

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USE THESE WEARITE COMPONENTS

THE FIRST NAME IN RADIO COMPONENTS

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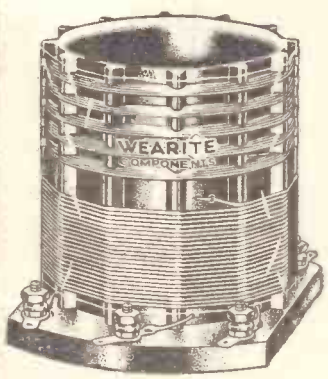

Above is illustrated the Dual Range "Cosmic" Coil (Price 5/6). For the "Cosmic" series of receivers a pair are available to cover long, medium and short-wave bands.

Remember, all Wearite Coils are subjected to an exclusive H.F. test apparatus—no other coils made are so rigorously checked. Insist on Wearite.

9/- per pair, or 5/6 for the Dual Range, and 3/6 for the Ultra Short-Wave range.

USE THIS WEARITE EARTH TUBE!

No Screwdriver. No Spanner. Just a Match.

PRICE 3/6

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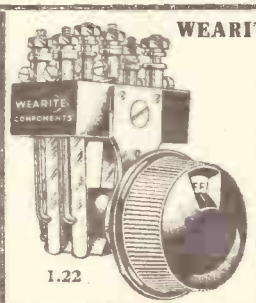

Here is just one from our vast range of switches—the "1.22" complete with terminals and indicator window. 3/6

Made in 1, 2, 3, 4, 5 and 6 way (D.T.). Prices from 3/3 to 6/3.

If you have any technical query — write to "Service Dept."

WRIGHT & WEAIRE Ltd.,
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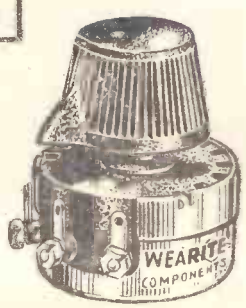
WEARITE VOLUME CONTROL



Wire-wound volume controls of thoroughly workmanlike and robust construction. To carry 5 M/A. Resistances 5,000 to 50,000 ohms. 4/-

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BLOT-ON-AVON!
HENRY PROGRESSES
"ALL MAINS"
THE WHIRLIGIG

RADIO NOTES & NEWS

GOING NORTH
A SCREEN PAINTER
THE TRUTH
THOSE RECORDS

Blot-on-Avon.

THE broadcast running commentary on the opening of the Shakespeare Memorial Theatre was, I thought, charmingly done. The acoustic properties of the inside of the theatre have received praise and the general interior design and fittings appear to have won unstinted approval. None of the speeches, however, had anything to say about the building as a sample of architecture, and I am not surprised at that. It is a red blot by the riverside, a typical new Soviet-factory. Goodness alone knows what our foreign guests thought of it—or what Shakespeare would have said of it!

Henry Progresses.

HENRY HALL and the new dance orchestra are gaining ground. Of that I am sure. Henry is developing a "mike" personality and is mastering what appeared to be nervousness.

Besides, he is showing that he is a thinker. And better still, he is giving British dance music a sporting chance to fight trans-Atlantic "blues" and tom-tom rackets; in one week recently he got to within 0·8 of 60 per cent British. However, I still think that the orchestra would be improved by a touch of heavier brass, and the vocalist by singing like a 100 per cent man.

Not Yet All Mains.

A CONTEMPORARY has just given a few striking figures about the state of affairs in regard to "all-mains" users in this country. Nearly 4,000,000 homes have an electric supply of some sort; over 8,000,000 have no supply at all. There are some 2,830,665 on A.C. as compared with about 1,120,092 on D.C. This shows the balance to be on the right side, but there's a mighty lot of conversion to be done yet.

The Amateur Intervenes.

YET another feather in the cap of the amateur radio man was inserted last month by Mr. Springthorpe, of Reading, who while "on the job" with his short-waver, intercepted an S O S from an R.A.F. aeroplane which had developed engine trouble and lost itself at 10,000 feet altitude.

Our ready-witted "fan" switched over to see whether Croydon answered, and finding that station to be silent, cycled to a telephone call-box and told Reading Exchange about the matter. Croydon was then advised and said that a machine was overdue.

A 'plane was then heard over Reading, and the local Woodley Aerodrome was called up. Cars were requisitioned and their headlamps enabled the pilot to land safely. A smart bit of work.

Time's Strange Whirligig.

ONE of the most exciting "Hazard" talks will be that which is to be given by the former Zeppelin Commander, Captain Breithaupt. Once he dropped bombs on England; now he is going to tell us how *he* felt during the process. Probably the Zepp fellows had about as rough a time of it as did we underneath, only in other ways.

However, the Commander will no doubt let us know the details. He was brought down, by the way, at Rainham, and enjoyed our hospitality as a prisoner of war.

A New Society.

SOMEWHAT too late to send a message of good will to be read at the first public meeting of the Kettering Radio and Physical Society, its secretary's letter has just filtered through to me. Well, here is a whole paragraph—as compensation. May the Heaviside Layer be kind to all members of this new society, and may its secretary be positively embarrassed by sackfuls of applications for membership—which should be addressed to 9, Shakespeare Road, Kettering. Good luck to you, from "P.W.," "Ariel," and all the boys here.

Rest in Peace!

A CHARMING correspondent, to wit, "Gentle," of Huddersfield, asks us to reprint a Unidyne circuit. Much as we should like to please him, we must

(*Continued on next page*)

THE KING OF JAZZ MAKES MERRY

To the right is Paul Whiteman, hailed in America as "The King of Jazz," with a soloist whom he has found in a recent contest for new talent. They certainly seem to be enjoying themselves, don't they?

CONTINUING ARIEL'S NEWS AND VIEWS

deprive ourselves of that pleasure in the interests of the majority of our readers and at the command of Old Pa Progress.

The Unidyne, like every old dog, has had its day, but it could not compete against the performance of the modern valves, which demand High Tension. No special unidyne valves of up-to-date type are available now; so why not be a "Cosmic" missionary amongst your friends?

The Second "Movement."

I REFER not to a symphony but to scores of them. Not even Schubert was guilty of such a mighty movement as that of the B.B.C. when recently it shifted its music library from Savoy Hill to Thingummy House, Portland Place.

The first movement was a few bars from Marconi House to Savoy Hill, when, I suppose, Uncle Jeff took "In a Monastery Garden," and Uncle Rex carried "Abide With Me." Altogether, so they say, about 60 tons of paper was moved this time—10,000 bags of orchestral; 4,000 bags of vocal; 12,000 bags of pianoforte, and 2,000 bags of part-songs and anthems.

Distinction for "P.W." Single Dual Super.

THIS notable "P.W." production, described in No. 512 (other relevant articles in Nos. 505, 511 and 513), is proving an outstanding success. Messrs. Ward & Goldstone, who have designed the "Goltone Oscillator" specially for use in this receiver, and who have made a detailed study of the other components with a view to the compilation of a complete list of those recommended, have been rewarded with such an excellent volume of business that they have reprinted all the main constructional diagrams from "P.W." for free distribution to their customers. Rather an unusual distinction! "One touch of 'P.W.' brings the whole world in," eh?

The Professor Goes North.

DURING the present year two expeditions are going to the Arctic regions for meteorological and allied purposes, and I understand that Professor E. V. Appleton is to lead the one which goes to Tromsø to specialise in radio research. The professor, who is known to all our readers for his work on the problems of radio wave propagation and for his illuminating expositions of the vagaries of the "layers" with which our atmosphere is apparently endowed, may be relied upon to secure some interesting data, and we wish him (warm weather and) a safe return.

The Screen Painter.

D. J. (Forest Hill), offers the following tip for screening valves. It appears that one can procure tubes of liquid solder which is alleged to work without heat. Good! You get one or more tubes of this dope and apply a coating of it to the bulb, thereafter leading a streak of it to the filament pin which is "earthed" when the valve is in its socket.

D. J. says that when the stuff is dry it does not flake off. I should have betted that it would do so—but he has tried it!

A Successful Society.

I AM very glad to learn that the Croydon Wireless and Physical Society is still quite well, thank you, and is, as ever, ready to welcome visitors and new members.

"SHORT WAVES"

SOS

Nervous new announcer: "Will the deep depression which left Iceland a few days ago and was last heard of moving along our Eastern Seaboard return home at once, as his twin brother is dangerously ill."—"Punch."

* * *

Smith: "It's a curious thing, but since I've had a radio set my wife has acquired the habit of talking in her sleep."

Brown: "Well, that's probably the only chance she gets now."

* * *

BROADCAST DEPRESSION.

"I am all for the Buy British movement—except as regards wireless programmes.

"On Saturday night, while it was pouring with rain . . . I switched on my wireless to find the best the B.B.C. pundits could do was an hour of 'Elijah' and a lecture on singing mice!"—Correspondent in "Daily Mirror."

* * *

A miner recently affirmed that he can play ten musical instruments at once.

We hope the B.B.C. won't get to hear of this.

* * *

"The Marconi Company had equipped its stations with the spark type of apparatus which furnished DAMP waves," we read in an American paper.

It would be interesting to know more about this.

* * *

An eminent man recently broadcast the fact that while in Devon last year he saved the life of a wireless announcer.

He probably thought it a good idea at the time.

* * *

THE HIGH-BROW.

The High-Brow will lap up a Talk (and never even snore),
On "Some Aspects of the Orchid in Assyrian Decor,"
Or rave when Phamnimnovsky's Neo-Celtic Mass in B
At seven in the morning is transmitted over-sea.

The next meeting will be held on May 23rd.

Particulars about membership can be obtained from the Hon. Secretary, Mr. H. T. P. Gee, Staple House, 51-52, Chancery Lane, W.C.2. We wish the society a successful summer session, with plenty of sun for its field days.

Wake Up, England!

OF all the complaints which I get from overseas readers about the slackness of English makers of radio apparatus, those from South Africa are the bitterest and most numerous.

Here's a letter from J. G. H. (Barberton), and the burden of his lament is the same old story—only American, German and Dutch sets and components to be had, no English advertising (with one exception), and no particular attention paid by home firms to enquiries. He suggests that we should use the slogan "Supply British."

For reception of the Empire station he wants us to design a 4-valver with S.G. stage—a request which will no doubt have the sympathetic consideration of the technical department.

Insulated Tax Collectors?

WELL, well! If C. S. P. (Wembley), the man who had the nerve to send me a real live lemon, hasn't moved to Shortlands, Kent! So near to me that I should love to show him the best hostelry round-about—but my anonymity forbids!

He has come to the finest county in England! I had seen the clipping which he sends me about the shocks received by toll-collectors on the new bridge at Sydney Harbour and about their having to wear rubber gloves in which to grasp the fees from motorists whose cars leak electricity.

Now, about those hostels, C. S. P.—there's the *Bell*, the *White Hart*, the *Goat and Compasses*, and the *Five Bells* (*all right, Mr. Editor, I was only telling him!*).

The Truth, the Whole Truth, etc.

AT Bridge the other evening I was telling a golf story to an angler who was describing his giant conger-eel to an amateur cucumber-grower. The magnitude of the prevailing lies alarmed me—and that's saying a mouthful.

Almost instinctively I looked round for a radio man, and under Providence, he was there. "Yes," he said, "and I got the Falkland Islands so strong that the B.B.C. telephoned to say that my re-radiation was pushing back their waves so that the microphones were giving back-chat to the announcers!"

Broadcasts of Records.

HOW sickening! Here we are, just settling down to enjoy the gramophone record broadcasts from French stations, when some sensitive creature must think fit to protest to the French authorities against the use of French stations to advertise British commercial interests! However, I know my Frenchman; he thinks that a franc is a franc, no matter whose money it may be. And I do not anticipate an early ban on the enterprise of the gramophone record companies.

ARIEL.

HOW WIRELESS DID ALTER HISTORY

BY Lt.Commander the Hon. J.M.Kenworthy R.N.

ONLY a handful of people know the secrets of the wireless war of 1914 to 1918. For while the battles of the greatest war in history were being waged with bullets and shells and poison gas and submarines and torpedoes and aeroplanes, and all the other devilish devices of modern science, a secret, silent war was being waged in the ether. Wireless played a far greater part in the terrible struggle than is even now realised. *And the British were victorious all along the line.*

"Intelligence" at Work.

The Naval Intelligence Division at the Admiralty was one of the most efficient departments of State before the war. But during it a new branch of activities was developed. This was the science of decoding and deciphering messages sent by any and every means in hidden language.

Whether found in intercepted secret documents captured in neutral steamers or on the bodies of discovered spies, or over the "neutral" submarine cables to America, used for many months by the Central Powers and "tapped" by the Allies, or sent out through the ether from the German wireless stations, all were decoded and deciphered and made to yield up their secrets. And of all these means of intercepting the enemy's messages, that of reading his wireless signals was the most important.

The Ether Blockade.

On the War Staff we called it the "ether blockade." And the most vital and secret work was done by a team of learned and astute men consisting of Professors of Mathematics from Cambridge University, Dons steeped in the Greek classics from Oxford, Astronomers, Biologists, Teachers of foreign languages, and a diplomat of studious habits, who resigned his post because of the war, but repented soon afterwards and joined this strange band of eavesdroppers of the ether.

They worked in a closely guarded suite of rooms in the Admiralty building at Whitehall. We called this secret territory "Japan"—why, I never discovered, though for some hectic months it was my duty to make use of their discoveries.

Here is an incomplete list of the achievements of this hidden romantic service.

Great interest has been evinced in our unique series of articles on "How Wireless Would Have Altered History." Last week our contributor dealt with the "Invasion of England" and now, in bringing the series up to date, he shows the opposite aspect, and what great effects radio had during the Great War.

(1) The discovery and frustration of the German plot to land armies for the fostering of rebellion in Southern Ireland under the late Sir Roger Casement, shot as a renegade in the Tower.

(2) The unravelling of a plot to raise a nationalist revolt in Persia against Russia and Britain.

(3) The decoding of the wireless messages sent from Germany to her agents in neutral Mexico. These agents were engaged in egging on Mexico to war with the United States of America and the invasion of Texas in the not unexpected event of Washington deciding to bring the Republic into the war on the side of the Allies.

The disclosure of this treachery to President Wilson, with irrefutable proofs, finally decided the wavering State Department of the United States Government that the Monroe Doctrine was being assailed, and it was the duty of the American people to join in the war against Kaiserism.

(4) The reading of the messages from the German Admiralty in Berlin to the High Sea Fleet at sea which caused the Grand Fleet of Britain to speed across the North Sea to the Battle of Jutland.

THE AUTHOR

A recent portrait of Lt.-Commdr. the Hon. J. M. Kenworthy, R.N., who is well-known for the keen interest he takes in the political side of Radio.

Capture of a Code.

The development of this wireless war was gradual. A lucky chance delivered into our hands, early in the war, the wireless signal books of the German Navy. A German torpedo-boat, operating in the Baltic, struck a Russian mine and sank.

Her signal petty officer took the precious signal-code books in his arms before going down with his ship. Faithful unto death, his body was washed up on the Russian coast, the books still clutched to his breast.

They were sent to Petersburg, where the Russian Staff Officers laid little store upon their prize. But our Naval Attaché, sensing their value, begged the loan of the books and rushed them to London. The Germans, ignorant of their loss, continued to use the same codes and cyphers for some weeks longer.

Gentlemen of "Japan."

Their wireless messages were intercepted, and being compared with the captured codes, the secret system in use was laid bare. Later the codes and cyphers were changed. But always they were made to deliver up their secrets.

Every code message sent over the cables by our enemies, every wireless message intercepted in the ether was taken to "Japan." There gentle-looking, studious scientists sorted, dissected, compared the often jumbled groups of numerals and letters.

Sooner or later some recurring combination of Morse code would give the key. Often

(*Continued on next page.*)

WHAT READERS SAY—

Including some specially interesting comments on the Moderator.

VALVE GLOW.

The Editor, POPULAR WIRELESS.

Dear Sir,—With reference to a query which appeared in "Captain Eckersley's Corner" in a recent issue re a pentode valve, I should like to state that I have experienced practically the same as A. N., except the glow in the valve remained constant whether signals were tuned in or not, also a slight whistling sound could be heard. I took the valve back to the dealer, who tested it and passed O.K.

On returning, I again tried it out and, hey presto, it worked splendidly! Whether the vibration of the journey had done the trick I could never explain. I have also seen the same in a screen-grid valve, without the whistling effect however. It all seemed very mysterious, and I have never heard of a similar instance till now. Wishing your paper every success, also the "Cosmic," which is O.K.

CHARLES GUITE.

Castle Eden, Co. Durham.

CAN YOU BEAT IT?

The Editor, POPULAR WIRELESS.

Dear Sir,—Can you beat this? My set, a four-valver (S.G. Det., L.F., Power) is run off the D.C. mains (positive earthed, I think) by an eliminator. A rather deep-noted hum was present. While experimenting I disconnected all the condensers, 6 mfd. total, in the eliminator. Immediately all trace of hum disappeared, and now I run the set off the mains with but a smoothing choke and a resistance as an eliminator!

Yours truly,
R. E. LEWIS.

Shrewsbury.

THE "MODERATOR."

The Editor, POPULAR WIRELESS.

Dear Sir,—You will no doubt be interested to know that as a result of fitting the Moderator Coil and Condenser, the following results can be obtained:

Above London Regional.—Nine stations can now be brought in at full loudspeaker strength while London is operating, but without London interfering.

Below London National.—Three stations at loudspeaker strength free of National. Several stations at quiet loudspeaker strength can be tuned in, not yet identified.

Between the two above-mentioned London stations.—Eleven can be tuned in at loudspeaker strength providing one London station is not working. At this point either London station can be cut out, but only to bring the other in.

On the Long-Wave Band.—Three worth-while stations in addition to Daventry National can be tuned in at full loudspeaker strength.

If Daventry National only is operating it can be cut out with the Moderator, but if London Regional is also on, then for some unknown reason it comes through on the long wave-length and then the foreign stations cannot be separated from one or other of them. Very much like the short-wave band between London Regional and National. Perhaps a new push-pull switch is required.

Very good quality can be obtained in all cases and I am well satisfied with the results of this experiment. Particularly as the set I am running—i.e. Ediswan R.C. Threesome—is not considered selective. Because of its quality, which is still superior to the latest "———" Four-Valve Radiogram, I did not want to discard it, and now will not need to.

Quite a dozen different methods and positions for coil and condenser were tried, logical and otherwise, but the best was as illustrated in "P.W." with this exception: Louder results and slightly better selectivity was obtained by mounting the condenser over the Moderator Coil with the control on top, say, on the lid of the set, not on the usual positions at side or front panels. Further, a remarkable difference in quality was noticed according to which terminal of the Moderator Coil the aerial lead was connected to. The lower terminal seems to be essential for quality.

The only fault that I have to find is that the set seems to be more sensitive to outside interference or abuse of reaction by others than was previously noticed.

Hoping the foregoing may prove of interest to you.

Yours faithfully,
C. F. HENLEY.

25, Gainsborough Rd., Woodside Park, N. 12.

[Naturally the set will to some extent be more sensitive to outside interference as well as to broadcasting stations, but the ratio of wanted to unwanted energy is probably quite high.—Tech. Editor.]

HOW WIRELESS DID ALTER HISTORY

(Continued from previous page.)

days and nights would be spent in "trial and error." But always in the end, and sometimes very quickly, the cipher would be de-ciphered, the code de-coded.

For example, a series of numerals, daily extracted from the ether of the Balkans without further indication of their source or system, was disclosed as the instructions of the Bulgarian General Staff, in Bulgar words, coded into casual number groups, these latter transformed by a cipher, which changed daily!

We Knew First!

Yet, after a few days, the cipher-experts, with the aid of Bulgarian-speaking linguists, had solved the riddle, and could read the instructions of Sofia to the Bulgarian troops on the Salonika front—information of vital importance to our own army in the field.

Sometimes when the Germans, with some inkling of what was going on, invented new cipher systems of extraordinary complexity they puzzled and flummoxed their own agents, official and unofficial, abroad.

And then the inhabitants of "Japan," having solved the riddle before the less expert recipients for whom the messages were intended could understand their own codes, would "listen-in" to a wireless wrangle between the German cipher experts trying to untie their own knots and asking angrily for "repeats."

Some Inside Facts.

Space will hardly allow of a description of all the services performed by these patient students or the results of their researches. That they contributed materially to the final victory is beyond doubt. In my next article I will deal with the way in which wireless was used in an episode of the sea-blockade itself, and how it brought on the Battle of Jutland, the only occasion on which the great Battle Fleets met in combat during the whole of the campaign.

THE ANTENNAE AT THE ADMIRALTY

These well-known buildings in Whitehall are the "Home" of the Navy, and the radio apparatus enables contact to be made with ships in any part of the world.

GRID-BIAS SUGGESTIONS

A method of solving a little trouble that sometimes crops up, and a note on H.F. bias connections.

Housing the G.B. Battery.

ON wiring diagrams for sets which use a dry battery to provide the grid bias for the output valve and intermediate L.F. valve, (if one is used) will be seen two or three flex leads labelled for the grid-bias battery. On some such diagrams a G.B. battery holding clip is shown, or a space allowed on the baseboard for the battery.

On others, however, there is simply no room on the baseboard for the battery, and you may wonder if this means the leads must be taken through a hole in the cabinet to an external battery. This is not necessary. You are bound to find one spot at least where there is ample room for the battery to be fixed to one of the sides of the cabinet on the inside. It will be just as convenient there as on the baseboard. Special clips for the purpose are easily and inexpensively obtainable or can be fashioned from stout tin-plate or aluminium sheet. Additionally, there are G.B. batteries having supporting flaps on them by which they can be fixed with drawing pins.

Shorted H.F. Cells.

Although it is not advised as the best safety scheme and method of earthing the aerial when it is not in use, an ordinary single-pole one-way switch is sometimes employed. The aerial and earth are left permanently connected to the set and to the switch, and just shorted together when the switch is closed.

On some sets with biased H.F. valves, such a switch may short the G.B. battery via the tuning coil when the switch is closed. This happens because very often the positive of the 1½-volt cell is joined up with earth and the negative goes to the tuning coil, which is connected to the aerial; this, in its turn, being shorted by the switch back to earth and the battery positive.

THESE RADIO COMPONENTS

A COMPLETE AND CRITICAL REVIEW

AS I said in my introductory article, you cannot say "this is a good valve" or "this is a bad valve" without qualifying the statement.

There are different valves for different purposes. Therefore you can say "this is a good valve for this purpose," or "this is a bad valve for that purpose" without meaning that the valve *qua* valve is good or bad.

Again, you may say: "This is a very good valve, but it isn't giving good results, because its associated circuits are wrongly designed."

How, then, may we compare valves *qua* valves?

Obviously, we must compare different makes of valves designed for the same function. And we must be fair to the valve by assuming that the associated circuits are correctly designed for the particular valve the performance of which we are discussing.

How To Compare Them.

So it strikes me, when we are discussing valves *qua* valves, we must compare them as to:

(1) Length of life.
(2) Price.
(3) Stability, and
(4) Suitability for practical circuit design.

(1) and (2).

The manufacturers of valves for big power transmission work will usually guarantee the life of a valve and, if the valve fails to complete the guarantee, the makers will pay a bonus to the user. It would be impossible to make such a guarantee for reception valves used by the general public, but I often wonder if a generous attitude towards the conscientious user of valves might not increase a much-needed goodwill between manufacturer and consumer. It is perhaps unnecessary to point out that the longer a valve lasts the less pleased the manufacturer, the more pleased the customer. Money is made out of the valve trade because:

(*a*) There is a price ring.
(*b*) The valve is a necessity.
(*c*) It is a consumable store.

THE VALVE.

"A valve is a component. And, therefore, in this series I must write about the valve. It's a rather important component, but it's got no particular mystical significance, it is *only* a component . . ."

So says "P.P.E.", who must have thoroughly enjoyed writing this illuminative and provocative article.

I cannot, therefore, give the user a great deal of advice on the subject of life and price because these mostly rule about the same. The prices of valves certainly seem too high if one compares them with those ruling in America and on the Continent.

(3).

By stability I mean:

(*a*) Does the valve "stay put"?
(*b*) Do valves of the same make and mark perform identically?

One may say that the valve (particularly the high mu) is an unstable product. Take at random any six high-frequency valves of the same make, compare them, and you may be surprised at the results. A good tip in this respect is to adjust high-frequency valves performing similar functions to the same feed current and let everything else go hang. But——

(4).

A word to the wise: *If* you can afford it, use two lower mutual conductance, more stable valves, instead of one very "efficient" valve.

The Real Amplification.

Take an instance. You have a high-frequency valve with an effective impedance of 500,000 ohms, let us say. In the anode circuit of that valve you have a tuned circuit having an effective impedance with a moderate amount of retroaction applied of 100,000 ohms. The theoretical magnification is 200 (say). Then the actual magnification will be:

$$\frac{200 \times 100{,}000}{500{,}000 + 100{,}000} = 33\tfrac{1}{3}$$

There is a considerable Miller effect, and the resulting effective mag. may be only 20.

Now take a valve with a 100,000-ohm effective impedance, a theoretical magnification of 40, and the same anode circuit. Then the magnification is:

$$\frac{40 \times 100{,}000}{100{,}000 + 100{,}000} = 20$$

or, say, with Miller effect = 15.

There isn't much difference. If you take two low-impedance valves against the one high, you get a magnification of $15^2 = 225$, against a possible 30!

And by using two valves you get a better selectivity. You probably do not want a magnification of 200, and so you can cut down input and gain at any rate the same stability as with the one valve. The figures above are chosen at random to illustrate the principle.

Some Practical Points.

For detection use a valve around the 15,000-ohm mark, and put as much high-tension as possible on to the anode. Remember, the detector is the first note magnifier, and so if you are using mains valves choose always a separately heated cathode, because these give far less mains hum. Obviously, any hum in the detector is magnified by the whole low-frequency chain.

For output valves try and use the most powerful valves of low impedance. You may find the pentode a greater economy, of course, but I have yet to meet a pentode valve which gives linear amplification within specified limits. It may interest you to know that in my opinion a loudspeaker giving only a sensible volume demands ½ a watt from the last valve. At a 20 per cent efficiency this means that the valve anode should be able to dissipate 2·5 watts, or at 200 volts H.T., an anode current of 12·5 milliamps. This is for just ordinary listening.

If you want real volume I should quadruple this figure and ask for low impedance valves in push-pull, the anodes each dissipating 5 watts.

(*Continued on page* 294.)

"P.P.E." WRITES TECHNICAL ARTICLES ONLY FOR "P.W." and "M.W."

THE MIRROR OF THE B.B.C. By O.H.M.

"B.H." INSPECTED

THE DINGWALL AFFAIR—SIR JOHN SAYS "GOOD-BYE"—THE ALDERSHOT TATTOO—SOME COMING "PEAKS."

NOW that the B.B.C. has allowed representatives of the Press to inspect the new headquarters in Portland Place there is a chance for more detailed and better informed criticism of the place than there was previously.

The view of those who know enough of conditions abroad to justify comparison is that in studios and studio equipment the B.B.C. is well in advance of foreign broadcasting. Nor will it be challenged in this matter of studio equipment until Roxy's famous Radio City in New York is ready.

With regard to offices, there is hardly the same unanimous approval of arrangements at Broadcasting House. Of course, the place is too small, and there was lack of foresight in planning it three years ago. Then there is far too much difference between the magnificent apartments which will house the principal officials and the almost coffin-like cubby holes where most of the rank and file will have to toil; also, there is much too much difference in the quality of furnishing between seniors and juniors.

On the whole, however, and having regard to the main purpose, which is, of course, programmes, we all have reason to be proud of the new headquarters of the B.B.C.

The Dingwall Affair.

The energetic Provost Murray of Dingwall has thrown down the gage of battle to the B.B.C. For nearly a year he has been arguing with various B.B.C. officials, from Sir John Reith himself to Mr. Cleghorn Thompson, the B.B.C. Director in Scotland.

The complaint, of course, is the absence of adequate service in the far North of Scotland, where it is felt that the industrial areas both of Scotland and of England are being outrageously favoured with duplicate programme services at the expense of such outlying areas as the Highlands.

The matter came to a head with the admission by the B.B.C. that the new twin-wave transmitter near Falkirk would not make the situation materially better in the far north. Provost Murray has now determined on Parliamentary action and is seeking the support of Sir Archibald Sinclair, Secretary for Scotland.

AN EYE FOR BEAUTY!

This happy snap shows Norman Long, the versatile entertainer, filming the bride and bridegroom at a recent wedding in Langham Place.

Sir John Says "Good-bye."

I have just heard an account of Sir John Reith's "Farewell" to Savoy Hill, on Friday afternoon, April 29th. Having completed his work, he proceeded down the staircase to the famous west entrance, where he was greeted in the customary way by Mr. Plater, the doyen of B.B.C. Commissionaires, who had been with Sir John since the first few days of the formation of the old Broadcasting Company at the end of 1922.

Sir John was handed the key, and as he locked the door for the last time his act symbolised the passing of an epoch in broadcasting. I believe the ceremony was photographed but not for publication.

The Aldershot Tattoo.

Long days and hot nights are conjured in the mind by the news that a broadcast of the Aldershot Command Military Searchlight Tattoo is to be included in the National programme on Saturday, June 11th. Yes, it is some way ahead, I know, but time flies, particularly between May and September, and especially the few weeks during which most of us hope to get away from the toil of the rest of the year.

It is, of course, too early to say more about this year's relay of the Aldershot Tattoo, but I mention it now because the function always provides one of the finest outside broadcasts of the whole year if the enormous number of appreciations from listeners is any indication of programme popularity.

Some Coming "Peaks."

Another June broadcast of which I am able to give early intimation is a performance of "Hamlet" in the afternoon of Sunday, June 5th. In a future issue I shall tell you more about the notable cast which is being engaged. Now let us get back to the merry month of May, during which all the National listeners are to hear a Spanish sentimental comedy called "A Hundred Years Old," by Serafin and Joaquin

(*Continued on page* 288.)

THE "COSMIC" THREE.

The Editor, POPULAR WIRELESS.

Dear Sir,—As a rule, whenever a circuit appears in "P.W." which appeals to me, I generally try it out, and, of course, you may be sure that an interesting circuit like the "Cosmic" Three has not been overlooked by me. My leisure hours are so limited—only a few on Fridays and Sundays—and I was so bent on getting the set built at Easter that I commenced about 7 p.m. Easter Sunday night and kept on until I had it completed, which was 5 a.m. Monday morning.

I have always been enthusiastic about short waves, and the "Night Flight" Three has afforded me hours of amusement. The "Cosmic" has brought me in several S.W. stations, but only Pittsburg and Schenectady from America at present. I have received ten long-wave stations and thirty-five medium, all on speaker.

As regards the short-wave stations, I think it might be more interesting to give dial readings to compare with other readers. These are what I received on April 17th; last Sunday, April 10th; and Friday, April 15th:

177	Speech not clear.	80	Vatican.
175	Music.	79	Moscow.
160	Moscow.	72	French Amateur.
159	Music.	70	Ditto.
151	Call, "Branto," "Branto."	69	Ditto.
		66	Rome, news in English re Siamese rice crop and American wheat estimate.
148	Not clear.		
146	Rome.		
144	French.		
140	Moscow.		
124	Maroc.	42	Maroc.
116	Paris Colonial, news in English.	40	W G Y relaying programme to Switzerland.
113	Chelmsford.		
106	Moscow?	20	Pittsburg.

Wishing "P.W." every success.

Yours faithfully,

W. F. WILBEE.

Botley, Hants.

THE LISTENER'S NOTEBOOK

A rapid review of some of the recent radio programmes.

WHY I welcome the interchange of programmes with America is because it may introduce some novelty and variety into our programmes. The thing we, as listeners, are suffering from most is staleness: this is partly our own fault, and partly the B.B.C.'s. It is our own fault in that we try and force three hundred and sixty-five days' entertainment on ourselves every year. Now this amount is far in excess of our needs, and there must come a time when we answer *every* turn with a grumble.

Where the B.B.C. is to blame is that whereas it pretends to offer something novel, in point of fact it doesn't. For instance, its special journal gave us to expect something quite different when it presented "From Tibet to Timbuctoo." What was this but the *usual* vaudeville hour?

Those taking part were all old friends, all doing the same old stuff. Leonard Henry, too, amusing as he was, dished up his *usual* delightful nonsense. It is because of this desire for something novel that we are mildly thrilled at the prospect of the coming series of talks, labelled "Hazard." It was for no other reason that we enjoyed the "Escape" talks so much, and that we haven't yet finished discussing or recapitulating them.

* * *

Arthur Bliss's "Colour Symphony" was food only for the highbrow. The lowbrow must have been left floundering in a state of bewilderment, and wondering what the symphony was all about. But how often this

(*Continued on page* 294.)

That Final Ripple

by G.V. DOWDING
ASSOCIATE I.E.E.

It seems to be widely believed that if you use a mains set, and even only a mains unit, a fair amount of hum is inevitable. But this is not, in fact, the case. Hum can be completely eliminated, although, in cases, it is difficult to do so. In the following article some methods of attacking the problem externally to the set are described for the benefit of those possessing inadequately "smoothed" sets and units.

ONE of the healthiest signs of worthwhile progress is keen public criticism.

In the earlier days of radio it was an axiom of the less reputable section of the trade of the time (R.I.P.), that the public would absorb without question almost anything in the way of radio apparatus.

Listeners marvelled that they were able to get results at all and, marvelling, they were in no condition seriously to question either the quality of what they got or the quality of the gear with which they were able to get it.

And if they were able to make comparisons, they did so rather on the lines of "this set is wonderful—so much better than So-and-so's," than "What a *rotten set* is *So-and-so's*."

But it didn't take long before familiarity began to breed discontent—a discontent which grew sharper as honestly-made sets and accessories rapidly improved and junk was shown as junk.

And so, with a jump, to to-day, when hardly anyone forgives the sins of a bad set simply because it is so marvellous that it can wheedle something, however thin and distorted, from the ether.

The "Above Criticism" Standard.

Mains sets are comparatively modern innovations, and because of that they started fairly high up the scale of all-round efficiency. Nevertheless, it is an indisputable fact that it is only within the last few months that, on the whole, they have reached a standard approaching the "above criticism" class in respect of that *bête noire* of the musical listener—"hum."

But as I pointed out in a recent "P.W." article, it is far from being an easy matter even now to obtain a "silent background." Some mains are so bad that the smoothing needed is costly and its application a complicated business.

Where the hum is steady in pitch and volume, it is quite possible for many to tolerate it, even should it be audible through speech and music. The human ear is very selective, and after a while is often able almost completely to ignore a sound of distinctive character.

A listener who hears music as merely an agreeable noise can accommodate himself in such a manner without the slightest effort. But there is a growing body of listeners who hear their radio music analytically and follow with great appreciation the patterning and composition of orchestral and solo works.

It is these who are irritated by anything in the nature of audible hum. And they find that "hum" is liable to make itself more prominent when they fit newer and better loudspeakers to their mains sets.

There isn't much that can be done about it in the case of a commercial all-A.C. receiver, although with a home-constructed model additional smoothing and screening is fairly easily carried out.

Where Constructors Score.

But constructors are in the habit of dismantling old receivers at intervals and using many of the existing parts for new designs, and this is, of course, where the constructor scores, for his new set may cost practically nothing.

Generally speaking it is the D.C. set that gives the most trouble in respect of "hum." Some D.C. mains are really horrible, and in places like Margate and Ramsgate, where A.C. rectified by mercury arc rectifiers is distributed to the inhabitants, very special methods have to be adopted in order to make all-mains radio worth listening to.

Where the "hum" is due to meagre smoothing in the set itself (as is frequently the case with the earlier commercial models) it is possible to add extra smoothing additionally to the set, and so make it unnecessary to scrap the instrument in favour of one of more modern design which may only be markedly superior in its freedom from "hum."

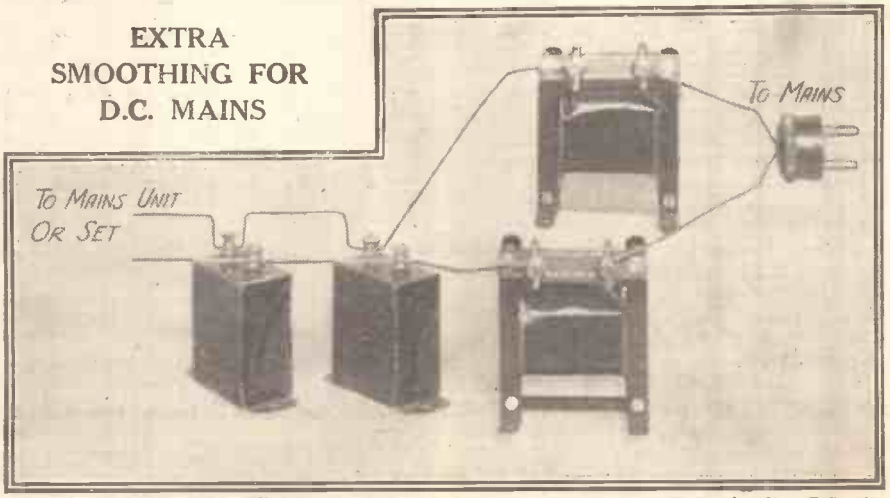
An Effective Arrangement.

Two mains chokes able to carry all the current required by the set, and at least two 4-microfarad fixed condensers tested at a voltage exceeding that of the mains are needed.

But nothing under about one henry of inductance in each choke will be of any value. There are mains chokes able to carry half an ampere and having inductances of twenty henries, but these are specialised productions and cost at least two or three pounds each.

The above-mentioned components should be made up as a complete smoothing unit and preferably built into a ventilated metal

(*Continued on next page.*)



Two special chokes and two condensers connected up as a supplementary smoothing filter for a D.C. set. These components should be housed in a protective casing.

THAT FINAL RIPPLE

(*Continued from previous page.*)

case or on to a wooden baseboard protected by a cage of perforated zinc.

A socket is fitted so that the set plug which normally plugs into a light or power point can be accommodated. A short length of lead, terminating with a plug for the power or light point represents the input to the unit as shown in one of the accompanying photos.

The unit should be placed as near the power point as possible, and its lead to this kept correspondingly short.

Easier with A.C.

I am unable to say that the above is always a complete cure for "hum" in D.C. sets, but it is a fact that the scheme has been employed with marked success in numerous instances.

I can be decidedly more positive in regard to the treatment of "hum" where only a mains unit is concerned—and this time a unit of either the A.C. or D.C. variety.

There are so many really powerful sets with and without S.G. valves being operated by commercial mains units of "thinly-smoothed" natures, that it is no wonder that our "Queries" post contains letters asking for assistance in suppressing "hum."

Not an Expensive Business.

Happily it is both an inexpensive and an easy matter to apply additional smoothing. All that you need is a good smoothing choke and a 2- or 4-microfarad fixed condenser, a 4 microfarad being about twice as good as a 2.

Inasmuch as the R.I. Dux "Audirad" smoothing choke also "chokes" H.F. irregularities, I must say that it is most suitable for such a task.

It should also be mentioned that both components are widely used and are not likely to constitute "white elephants" should this particular scheme fail to give completely satisfactory results.

The second photo shows exactly how the extra smoothing is applied. You join the L.F. choke in series with one of the wires from the mains unit and connect the fixed condenser from one terminal of the choke to the H.T. minus terminal—or L.T. minus or earth.

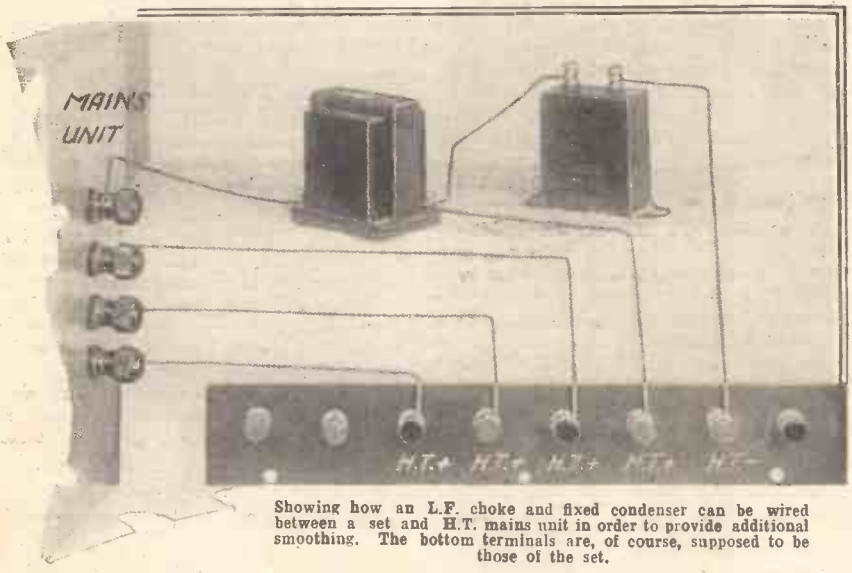
The feed to the detector valve should be tried first, although it is possible that the greatest benefit will be derived from additional smoothing in one of the other H.T. leads.

Use Short Leads.

The choke and condenser can easily be built into a small case provided with the necessary three terminals for external connections. And it will be quite unnecessary for me to stress the fact that the shorter the connecting wires between the set and this device, and the device and the mains unit, the better.

Should one H.T. terminal on the set be feeding two of the valve stages, it is worth trying the experiment of separating them and inserting the simple smoothing components in one or other of the separated feeds—or if there is a spare output terminal on the mains unit, try taking the new point to this with or without the "outside" smoothing.

AN INEXPENSIVE BUT EFFECTIVE ADDITION



Showing how an L.F. choke and fixed condenser can be wired between a set and H.T. mains unit in order to provide additional smoothing. The bottom terminals are, of course, supposed to be those of the set.

"P.W." SETS ABROAD

A "S.G. Four" in India and a "P.W." Set in New Zealand.

A "S.G. FOUR" IN INDIA.

The Editor, POPULAR WIRELESS.

Dear Sir,—Never having made a wireless set before, I ordered the "P.W." and became interested in your "S.G. Four," so I borrowed the back number with the set in.

I had difficulty getting the parts at a big expense, a Lissen P.T.225 retailed at home 12s. 6d. cost me Rs. 14 (over £1).

I receive regularly on loudspeaker Blue Spot 66R. Saigon, Java, Moscow, Zeesen, Nairobi, Rome and Chelmsford 6 to 7 p.m. I.S.T.

I cannot find Chelmsford in the night. As you will have noted, I am using a pentode, my H.T. is 140 volts.

Having read your remarks about tuning up the detector valve only, but being such a novice, I would like to know how and where to connect up the earphones.

Is it possible to get coils for medium bands?

I must say people here with superhets say mine is excellent.

I have just had Zeesen on music, he is talking now, 10.30 p.m.—5 p.m. at home.

Just changed over to Rome on 25 metres.

Many thanks for producing the "S.G. Four," and good luck to all in the "P.W."

Yours sincerely,

A. D. LEVER.

Campbell Barracks, Quetta,
Baluchistan, India.

A "P.W." SET IN NEW ZEALAND.

The Editor, POPULAR WIRELESS,

Dear Sir,—I have had fine results with the "Three-Coil Three" described in your paper, that I feel I must write a compliment to you on a very fine set. It may be surprising to your readers that European broadcasting stations are now regularly heard in this country in the early morning, 4 a.m.-6-30 a.m.

I have heard the following at very good strength: *Graz (Austria) 352 metres, *Bratislava (Czechoslovakia) 279 metres, *Heilsberg (Germany) 276 metres, *Leipzig (Germany) 253 metres, Barcelona (Spain) 349 metres, Strasbourg (France) 345·2 metres, Brno (Czechoslovakia) 342 metres, Lwow (Poland) 381 metres, Muhlacker (Germany) 360 metres, Hilversum (Holland) 298·8 metres, Prague (Poland) 486 metres, Brussels No. 1 (Belgium) 509 metres.

I have heard the following Americans, all verified by letter and card: KGMB, WTAM, WENR, KTHS, KFWB, KMOX, KRLD, KNX, KFOX, KGER, KEX, KTM, KFI, KDYL, KTAB, KVOO, KSL, KGO, KFBI, WBBM, KECA, KPO, KOL, WABC, KYW, WDAG, KFSD, KGA, KHJ, KGRS, KMTR, and about 25 more not confirmed. I have heard about 26 New Zealand stations and 39 Australian. The following Japanese stations have been heard and verified by letter and card: JOGK, JOFK, JOCK, JOAK. Five more not confirmed. Canadian, verified by letter, CJOR Sea Island, B. C. Mexican verified, XEW, XER, (75 kw.). Total 133.

All these have been received on the "Three-Coil Three," using a Mullard P.M.16 as S.G. (with 100 volts B.). Philips A.615 as det., Diatron U.X.112A as Audio.

Most of the parts, condensers, chokes, grid-leak and condensers etc, are Telsen. The transformer is a Ferranti. I am using a 40 ft. aerial single wire, inverted L type, about 98 ft. long. The distance to U.S.A. is about 8,000 miles; to Australia 2,500 miles, and Europe 11,000. It is evident that the set works well; by the way, most of these stations are received on Brandes' phones, excepting KFOX, KFI, KMOX, KYW, WENR, KGMB, which have all been heard on the speaker.

Once again congratulations on such a fine set.

Yours sincerely,

H. F. ADCOCK.

39, Opaki Road, Lansdowne,
Masterton, Wairarafa, New Zealand.

* Have written to, and received a letter of verification.

TRICKS OF THE TRADE

Here are a few useful tips worth remembering.

When the diaphragm of one of the pair of telephones is bent, it sometimes restores sensitivity if the cap is unscrewed and the diaphragm is turned over to face the other way, but this requires knowledgeable handling, and the novice is not recommended to try it.

* * *

Always screw up the nuts on the underside of a valve holder before fixing it to the baseboard, or otherwise you may find the terminals "turning" and failing to connect properly when the rest of the wiring is complete.

* * *

The voltage actually on the plate of a valve is never as high as the voltage at the H.T.+ terminal which is supplying it on account of voltage drop in the intermediate wiring. In resistance capacity coupled sets the drop of voltage in such circumstances is very large.

* * *

If you have not a pipe-cleaner in the house and wish to remove dust from variable condenser vanes, remember that there is much to be said for a pair of bellows, or even a vacuum cleaner, for this class of work.

* * *

Never throw away an old shaving brush—it is invaluable for dusting inside a set, or for cleaning coils, and keeping similar components in good condition.

STATIONS WORTH HEARING

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

WE are going through rather an "atmospherick" period at the moment, and really one cannot wonder, for after the long cold spell, which was alleged to be spring, weather conditions have taken some little time to settle down, and we can hardly yet call them thoroughly settled. Long-distance weather prophets foretell, I believe, a fine hot summer, but since Old Sol is still prone to rather violent attacks of spots at intervals, I am rather wondering whether these predictions will be fulfilled.

What I expect myself in the way of "wireless weather" is that we shall have, on the whole, a pretty good time, but that there will be periods of two or three days in some cases, and of only an hour or two in others, during which atmospheric interference will be something of a nuisance.

Effect of Sunspot Minimum.

One particularly interesting change, due, I think, to the approach of a sunspot minimum, is to be seen at work on the medium wave-lengths.

On the medium band, readers will probably have observed that stations up at the top are not quite so good as they were, whilst those down near bottom are becoming stronger and stronger. It would seem, then, that there is a tendency—and that it is undoubtedly due to the sunspot business—for wave-lengths below, say, 250 metres, to give better and better results at long ranges, whilst those above 450 metres show a falling off.

The Long-Wave Stations.

The long waves continue to be good, though a certain slight patchiness has been noticeable of late. Motala, for instance, has days when he is not up to the mark; Oslo, though generally excellent, has been weakish once or twice, and I was astounded the other afternoon to find the Eiffel Tower markedly below power. On the other hand, some stations seem to be better than ever. Amongst these are Huizen, Zeesen, Warsaw and Kalundborg.

As I suggested just now, the top of the medium wave-band is showing signs of the times. Budapest and Munich stations at the very top are often difficult to receive at all; Vienna, on the other hand, is so powerful at times that one wonders whether alterations have not been made in the Rosenhugel transmitter.

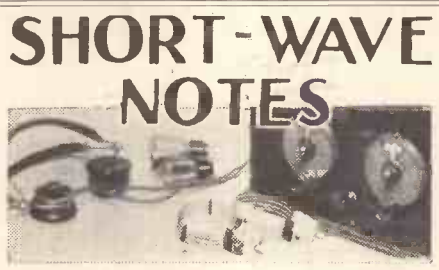
Florence, Prague and Langenberg are all quite reliable, and Brussels No. 1 is generally good. Beromunster has been varying very greatly of late. Rome and Stockholm are always to be found and Berlin (Witzleben), a weak transmission during the greater part of the winter, is now providing quite phenomenal volume.

Some More of the Best.

Sottens is frequently very disappointing, though when he is in good form splendid reception is assured. Katowice still shows a fine record, and Toulouse never fails the listener. Frankfurt and Hamburg are both usually good, though the former is liable to occasional "off" nights. Brussels No. 2 is also given to variations, but Milan has become most reliable.

On 328·2 metres, the new Poste Parisien station is now at work. The power will eventually reach 60 kilowatts, and from what I have heard of him already, this station is sure to be a standby.

SHORT-WAVE NOTES



News and views regarding an exciting and fascinating wave-band.

By W. L. S.

ROME'S change in wave-length has had a dire effect upon my correspondence basket, for everyone seems to be writing to me with the belated news that Rome is now working on 42·9 metres. Needless to say, these suppositions are quite correct—he is, and with what a signal! What C T 1 A A intends to do about it I am anxiously waiting to see.

"H. L." (Prestwick) obliges with a long letter full of information. No, "H. L.," I have no connection with the "Short-Wave Listening Station," although I certainly own one! But I haven't the nerve to call it "*The*" listening station.

In the Mountains with "Buzz."

Interesting notes by "H. L." include reception of Warsaw (S P 1 A X) on 40·4 metres; E A Q on 30·4; Rugby on 60 metres odd working with the "Empress of Britain"; and the enclosure of some nice stranded wire that he is using for short-wave coils. Thanks for the wire, "H. L."—I have made a one-turn coil from it!

Regarding the problem of "pongs" between 23 and 27 metres, I would suggest that you wind coils of a different size, both for reaction and grid coils. Or possibly, you have an indoor aerial that tunes to that wave-length?

"W. H. C." (Virginia Water) reports that the "Short-wave" One is already going strong. He is rapidly becoming converted from an "S.G." Four fan to a lover of silent backgrounds.

"G. P. A." (Mill Hill) and "M. S." (Harlow) both send similar reports. As a matter of fact, at the time you read this I shall be in the wilds of North Wales, together with "Bonzo" (the car) and "Buzz" (the one-valver). I am going to do a lot of short-wave listening in different parts of the mountain country, and see what the screening effects really are like.

Watching for Directional Effects.

A 20-ft. length of rubber-covered flex will serve for an aerial, the far end being hitched to a tree, or a bamboo pole, and I shall therefore be in a position to see what sort of directional effects I can observe. You will hear all about it later on.

"H. H. B." (Simla) makes some interesting remarks about atmospherics on short waves. He finds that he can reduce them considerably by putting his hand "in series" with the aerial—holding the wire and touching the aerial terminal with his little finger!

I think the best cure for them is the connection of a small H.F. choke between aerial and earth, across the tuning coil. The winding must be found experimentally, but it is possible to devise one that will reduce atmospherics without having any noticeable effect upon signals.

"G. E. C." (nice initials!) of Sheffield, asks a ticklish question, but raises an interesting point. "Which station on short waves," he asks, "is most consistently received by 'P.W.' readers?"

What About Trying This?

He has logged the percentage of times at which he has heard various stations when they are assumed to be on the air. C T 1 A A heads the list with 90 per cent, Rabat comes second with 75 per cent, and Moscow is third with 55 per cent.

By far the highest among the "Yanks" is W 2 X A F with 30 per cent, closely followed by W 3 X A L and W 1 X A Z. V K 2 M E comes at the 9 per cent mark, and Radio Coloniale and some others are at the bottom with 1·4 per cent. W 2 X A D only gets 5 per cent, which seems to me a rather low figure for him.

Suppose a few more readers try this out for a fortnight or so, and send me their logs? They would make very interesting reading, and the comparisons should teach us quite a lot.

"C. E. M." (Nairobi) has built both the "S.G." Four and my 1932 Two-Valver, and finds the little one more efficient at picking up stations, although he can't get them off his chest like his big brother.

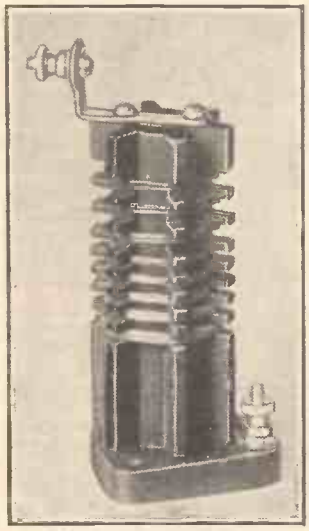
FROM THE TECHNICAL EDITOR'S NOTE BOOK.

Tested and Found—?

A SHORT-WAVE CHOKE.

SOME of the radio components I receive for test give me the impression that they have been designed by engineers who know nothing about wireless. Others seem to suggest that their designers are quite well up in radio but are the veriest tyros at engineering—mechanical engineering, that is.

LOW CAPACITY



Owing to its special form of winding, this Ward and Goldstone H.F. Choke has a very low self-capacity.

There is a third and rare class of component that does not leave one with a feeling of vague incompleteness—you instinctively realise the moment you see it that it is the work of a man or men who are excellent mechanics, have imagination, and a knowledge and love of radio.

I feel all that about the Ward and Goldstone Short Wave Choke; a small, inexpensive component; but note these points:

It can be mounted on either baseboard or panel, or suspended in wiring. Remove the terminal from the lug and it can, alternatively, be fixed under a valve-holder terminal, the lug being stout enough not to vibrate.

And then note the cunningly divided winding, which is broken up into different-sized sections. Some of the slots have only a turn or two in them, and others have quite a bunch.

That means very low self-capacity and an absence of resonance peaks. (Ten to one hundred metres without the slightest choke trouble!)

Yes, I like this little Goltone Choke. It retails at 2s. 6d., and I can recommend it to the attention of all short-wave "fans."

LECTRO LINX'S LATEST.

Radio enthusiasts who have experienced trouble from soft-pronged or too-rigid plugs and tapered H.T. battery sockets will welcome the Clix "Master" plug.

It has sprung prongs which enable it to get a firm grip on the sides of practically any of the smaller sockets—at any rate, all of those met with on G.B. and H.T. batteries.

It is marketed in two models, (A) with long shank and insulator; this type is recommended for plug and socket work and for H.T. batteries having cardboard platforms. (B) With short shank and insulator—for ordinary H.T. batteries.

Either model, in red or black, is available in a full range of markings at 1½d. each.

There is also a "Clix" Chassis Mounting Valve Holder, complete with screw terminals, and so the home-constructor is enabled to use, without soldering, a component of a type which has hitherto been restricted to manufacturers. The price of this component is 8d. for the 4-pin type, and 9d. for the 5-pin type.

THE "ATLASTAT."

It must be five or six years ago that I showed in a "P.W." article how desirable it was to have a graduated movement in a variable resistance instead of the conventional direct relation between resistance variation and control movement in certain circumstances.

The particular circumstances on that occasion were the control of valve filament temperatures. Filament rheostats were, at that time, in universal use, and most sets had separate rheostats for each valve.

In those days valves were temperamental things, and the conditions in which they worked needed careful adjustment if satisfactory results were to be obtained.

And in my article I showed that an even variation of filament temperature was not given unless the rheostat was of special construction and was designed on logarithmic lines.

This principle of logarithmic resistance variation no longer fulfils a pressing requirement in filament circuits, but it has a valuable application in volume controlling.

Many of you will have noticed a tendency in volume controls to have little effect on volume over a large part of their adjustments, while the volume is greatly affected over a small "area" of the control.

In the "Atlastat," a new Clarke product, there is a logarithmic increase of resistance for equal movements of the control knob—just what is wanted.

The "Atlastat" is, of course, a potentiometer, and is designed to carry up to 2 watts, and thus can be used in all the usual positions.

It is very small and neat and operates very attractively. The retail price is 8s. 6d

PLEASE NOTE.

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

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

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

AN EFFICIENT SWITCH.

Charles G. Chalkley, of Wellingborough, recently sent me one of his new combined Wave-Change and On-Off Switches. It sells at 2s. 9d. complete with dial and knob, in black, walnut or mahogany finishes.

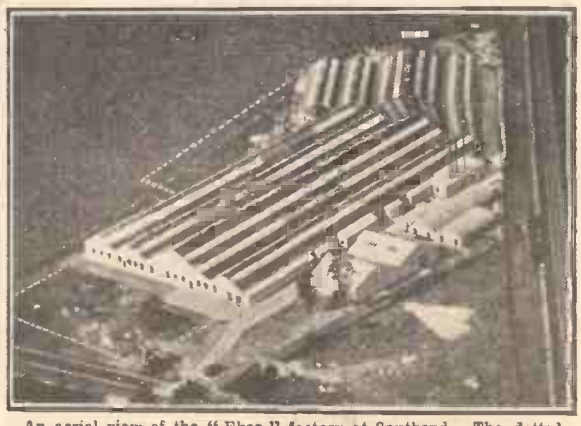
It is of the one-knob fixing rotary type, and its construction is particularly robust. The contacts are self-cleaning, and of very generous dimensions. I should imagine that it would give trouble-free service for an indefinite period, and one cannot say much more of any switch than that!

A LOUDSPEAKER CABINET.

The Express Engineering Co., Ltd., of Poole, are making a fine loudspeaker cabinet for moving-coil or other units, which retails at 16s. 9d. It is of distinctively handsome appearance, and has a large, artistic fret on the front, which is backed by a golden-coloured gauze material.

The fitting of the unit is facilitated by the provision of a removable baffle, and this is, of course, concealed by the gauze. Constructors would be well advised to obtain details of this cabinet.

"EKCO" STILL EXPANDING



An aerial view of the "Ekco" factory at Southend. The dotted lines indicate the area which is to be covered by contemplated extensions.

AIR-TAXI RADIO

For some years large air-liners have made use of transmitting and receiving apparatus, and now a special lightweight outfit is available for small machines, the advantages of which for air-taxi work are here described.

By A. S. CLARK.

"HALLO, Heston! Hallo, Heston! This is air-taxi X Y Z A calling! What are conditions like over London? I am making for Croydon. Over . . ." Thus comes a voice out of the sky to the operator listening on the ground.

In a few moments his reply is being picked up in the snug three-seater cabin of the Puss-Moth monoplane, as it speeds along in bright sunshine above the clouds that darken the cities below.

The pilot inclines his head slightly towards his "fare," sitting back in his seat quite unconcernedly, and remarks, "I'm afraid we shall have to land at Heston, sir."

Radio to the Rescue

"Tut, tut!" comes from the business man as he clicks his tongue. "All right, then." (It seems a pity that he must spend nearly an hour getting right across London to view that factory site near Croydon, when it has taken him little more to come right down from the North).

After a few moments the air-taxi slides noiselessly through the clouds to make a faultless landing and taxi up to the control tower. Our business magnate steps nonchalantly out, for all the world as though he were about to pay off a taxi outside the Ritz.

What a difference radio makes to this flying business. It takes all the "ifs" and "buts" away, so that no longer is it a high adventure to charter an aeroplane to make a journey across the country.

Take the scene that we have envisaged. In the case of an "ordinary air-taxi," that is to say, one without complete radio receiving and transmitting apparatus, it would not be half such an ordinary business.

It would not be possible for the pilot to be told of changing conditions, or whether he could "make" his destination. Or if he lost his way he could not be advised of his exact position in a few moments. In fact, the radio apparatus makes all the difference in the world, and it need not take up very much room either.

Fitted Behind the Seats

Take for instance the set illustrated by the photograph on this page. It packs neatly out of the way behind the seats, but at the same time is fully controllable by the pilot while he is flying.

This is accomplished by Bowden-wire type remote controls, of which there are four, conveniently placed for operation by the pilot's left hand. Captain Lawrence Hope, of Air Taxis, Ltd., is seen in the leading picture with his hand on these controls.

The machine is a Puss-Moth monoplane, and is largely used for newspaper work where speed is of great importance. Consequently radio is doubly advantageous.

For instance, should he encounter conditions of bad visibility during flight, he can call up the nearest suitable ground station, confirm his position, and learn whether the conditions are local or general, and so decide with confidence if it is wise or not to continue to his destination. Such services are, of course, continually performed for passenger-carrying aircraft on the air-routes, and are available for any suitably equipped private machine.

This type of information is particularly useful in connection with newspaper work, for it enables the pilot to decide while still in the air the quickest and safest means of delivering his photographs or other press matter. Also, waiting colleagues on the ground may be kept informed of his manœuvres and intentions so that undesirable delays can be entirely eliminated.

The Marconi telephone apparatus as used by Captain Hope is eminently suitable for private aircraft. If more convenient it may be supplied without the remote control device.

REMOTE CONTROL PROVIDED

The gear may be stowed out of the way of the pilot, who can manipulate it with the aid of special wire-controls.

A Well Tried Design

It is of a type known as A.D.22, and is really a light-weight and smaller-powered edition of the more elaborate and powerful apparatus used on the giant passenger and mail planes of Imperial Airways, Ltd., and also other air-lines.

Normally, the transmitter and receiver are set to work on the International air wave-band of 850 to 950 metres. But it is also capable of working on the 600-metre band set aside for shipping.

The change from one band to the other is effected by means of a simple switch. The usefulness of this 600-metre band to the pilot is when he is crossing the Channel or is flying elsewhere in the neighbourhood of shipping, which could be of assistance in the case of emergency.

The whole of the apparatus is contained in one compact instrument box, and, as already explained, may be arranged for operation by means of remote control when found necessary. The whole of the power is obtained from one generator, fixed to the machine in a position where it is driven by the slipstream.

Wind Driven Dynamo

A miniature propeller is attached to the dynamo for this purpose, and it is so governed that a constant speed is maintained the whole time. This generator can be arranged to supply not only the power for wireless, but by a special switching scheme to charge a 12-volt accumulator that can be used to light the navigation lights as well as run the radio apparatus.

This, of course, produces a definite saving in weight over a scheme where entirely separate supplies are provided for the two jobs.

NOTES FROM THE NORTH

A well-informed bulletin of information and comment on B.B.C. activities in the North of England and in Scotland. Among other things our Northern Correspondent deals with the two widely separated groups of Scottish listeners.

THE most important current event in the North is, of course, the coming into action of the Scottish Regional transmitter.

To listeners in England (except a few in the extreme north of Cumberland and Northumberland, who are getting an excellent signal from the new station), this event is of little importance and represents merely another station on the dial—where it may, indeed, be more bother than anything else, especially as Hamburg, its next-door neighbour, is to increase power. There is only 9 kc. separation between the two.

The Two Views.

But to Scottish listeners this is the most important event since broadcasting began. Those very ancient transmitters at Glasgow, Edinburgh, and Dundee will shortly be succeeded by the two magnificent modern transmitters at Westerglen. And the Scottish programme situation, which has been hopelessly tangled in recent times, will be straightened out.

In Scotland the B.B.C. has had to meet the demands of two entirely different publics, and of course it couldn't be done. The 100 per cent Scots were furious when large chunks of London material were relayed from their local transmitters; and yet when the B.B.C. pacified these enthusiasts by local programmes another public immediately rose up in wrath and demanded London programmes!

The Scottish Regional B.B.C. officials suggest that the two publics are approximately equal in numbers. My own impression is that the enthusiasts for Scots music, Scots plays, Scots talks, etc., are in the minority, but are gaining adherents.

"Sliding In."

However that may be, the important fact is that both sides will be satisfied when the twin transmitters at Westerglen are eventually in full service. How soon that will be even the B.B.C. itself cannot say. The present "sliding-in" process with Scottish Regional will be repeated to introduce Scottish National to the public.

Mr. Cleghorn Thomson and his colleagues are taking very seriously their task of producing Scottish programme material in increasing quantities, and a booklet is to be issued concerning the forthcoming programme developments.

The design of the station at Westerglen is similar to that of the London Regional and North Regional, except that the engineers have managed to combine economy with efficiency by hanging the aerials on two masts instead of four (as at Brookmans Park), or three (as at Moorside Edge).

Aerial Ingenuity.

The original intention was, as stated in POPULAR WIRELESS, to suspend one aerial between the two masts, and split the other aerial into two halves, each running from a mast-top to the ground. After experiments, however, it has been decided to use two "umbrella" aerials, each supported by one of the 500-ft. masts.

As the first Regional station, London Regional was opened with a blaze of glory; North Regional achieved enormous publicity owing to its unique position in one of the bleakest spots in these Isles; but Scottish Regional has no such means of attracting the limelight. The most interesting fact about it is, in fact, quite incidental to the actual opening of the station.

This arises out of the decision to work Scottish National on the British common wavelength (288·5 metres). This is itself a most interesting experiment, but it also produces the even more interesting venture of working Aberdeen and Newcastle on international common wavelengths.

Newcastle's New Chance.

These transmitters are at present on 288·5 metres, but could not so remain in company with Scottish National. Accordingly, they will each have a wavelength in the region of 210 metres—wavelengths used by other stations abroad, but not by any other B.B.C. stations. This means that Aberdeen and Newcastle will be able to indulge their own fancies in programmes.

On 288·5 metres they have been tied down to the National programme. Details are not yet fixed of what programme they will transmit in future, but it is probable that Aberdeen will include a large amount of Scottish Regional matter, while Newcastle will radiate a composite programme of North Regional, London Regional, and National items.

And this means that after a lapse of a considerable time the Newcastle transmitter will be able, again, to broadcast programmes produced in the Newcastle studio.

An important point for English listeners is that with the opening of the Westerglen transmitters Scotland becomes a fully-fledged Region and will join with the Midland, London, and North Regions in the interchange of programmes. English listeners will sometimes hear Scottish programmes from their local Regional station.

"Made in Scotland."

Scottish listeners will find a considerable amount of material relayed from other Regions on the Scottish Regional wavelength. In fact, the proportions of "local" to "relayed" material on this wavelength will, I gather, be roughly similar to the ratio in the present North Regional programme.

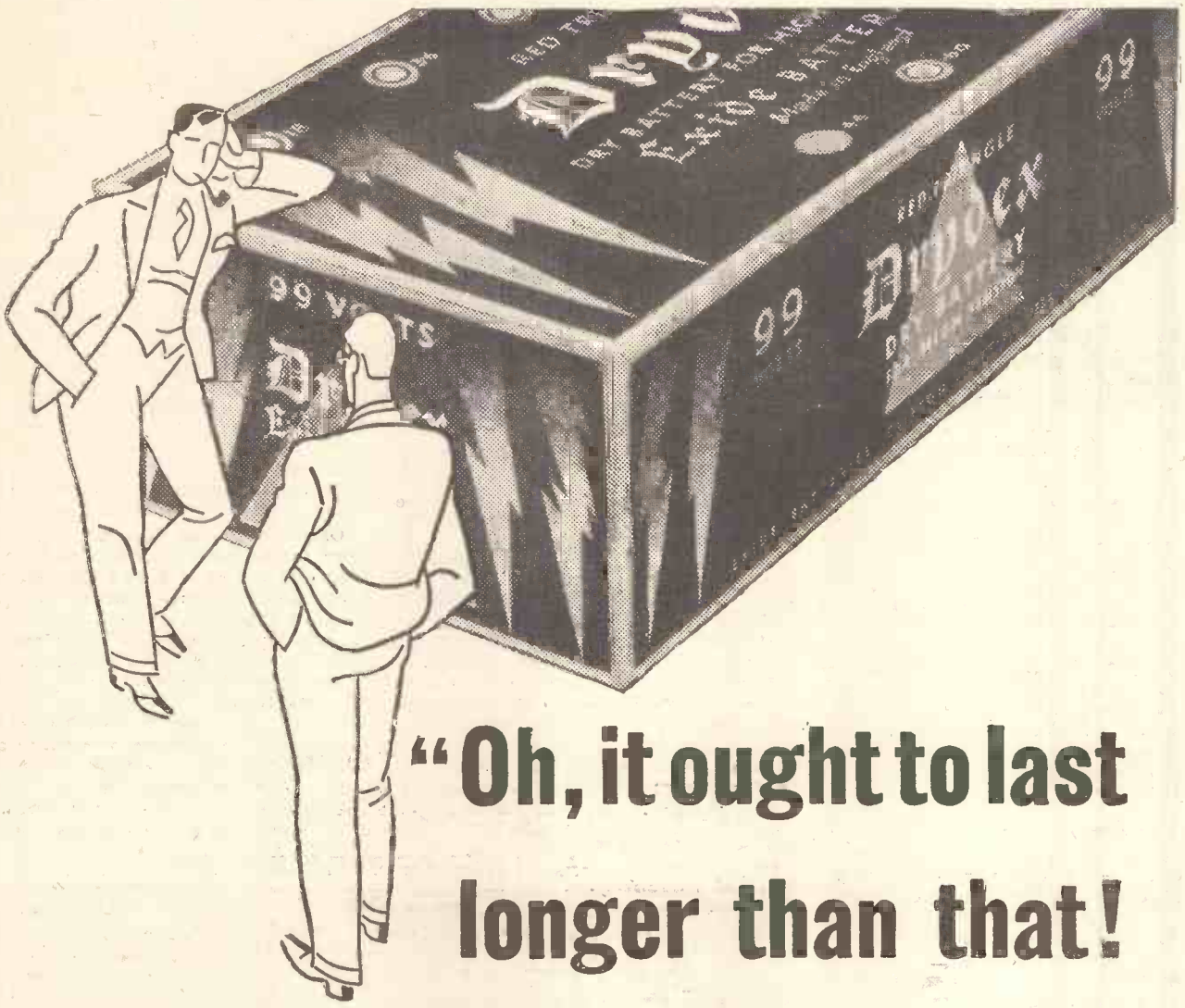
The idea of a few super-Scots that the Scottish Regional wavelength should carry nothing but programmes "made in Scotland" is, of course, absurd. There is not the talent in Scotland to support such a 100 per cent Scots programme without serious deterioration of the standard.

And amidst all this excitement in the far north how are Mr. Edward Liveing and his staff at Manchester and Leeds going on? When these Notes appear they will have launched yet another season of "Relays

(*Continued on page* 294.)

THE DUCHESS APPEALS FROM 5NO

The Duchess of Northumberland at the microphone of the Newcastle station, where she recently made a broadcast appeal on behalf of the Durham and Newcastle Eye Hospital.



"Oh, it ought to last longer than that!

Why don't you get a "Drydex"

● THE Exide DRY BATTERY

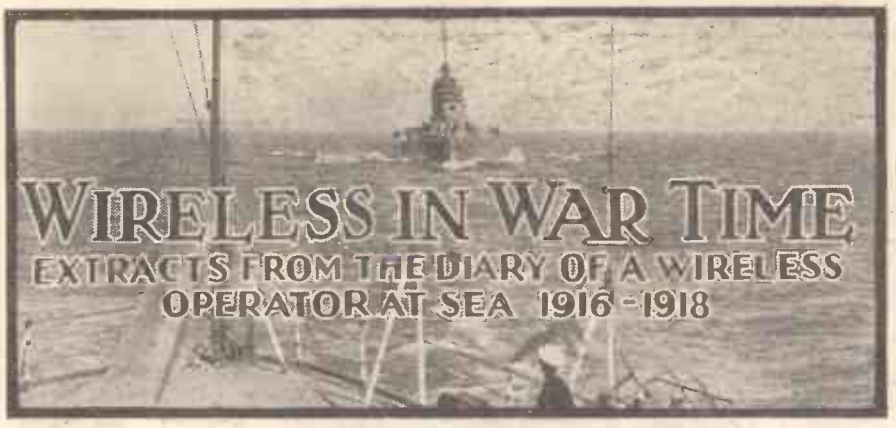
Made entirely in England, employing British labour & British capital.

Obtainable everywhere from all good dealers in sizes and types to suit every wireless set. Also for torches, pocket lamps, cycle lamps and bells. For wireless low tension use Exide Batteries.

Mr. C. C. E. of Worthing, wrote:—"On March 30th, 1931, I purchased and installed in my five valve 'Pye' transportable wireless set one of your 108-volt DRYDEX high tension batteries. I am about to discard same after over six months' use."

Exide Batteries, Exide Works, Clifton Junction, nr. Manchester. Branches at London, Manchester, Birmingham, Bristol, Glasgow, Dublin and Belfast

Dx 67



JANUARY 11TH.—To-day has been most exciting. We have met the German raider! Directly it got dark this evening, large rain clouds seemed to gather in massed attack over our heads, and very soon we had a first-class storm raging. The sea was continually bursting on the decks, and owing to the wind, set up spirals of spray which made the atmosphere very misty.

When on duty about 9 p.m., old T—— looked into my cabin for a chat. Going out on the Bridge again he came back to remark on the eccentric behaviour of a light about three miles away on the port bow. For some time this light, which evidently belonged to a ship's masthead, had appeared to be keeping company with us, and now it was making direct for the ship.

Old T—— at once warned the Captain. From time to time, vivid flashes of lightning helped us to get a blurred image of the ship. She certainly corresponded with the description of the raider which had been sent out in various war warnings. The Captain immediately ordered all our lights to be doused and the gunners to stand by.

Hit by the Raider.

By this time the mysterious ship was much nearer. The Captain ordered the men at the wheel to steer a zig-zag course, in accordance with Admiralty instructions. All I could do was to stand at the door of the cabin, with the other operator, and wonder what the devil was going to happen next.

Several lights were now noticeable aboard the approaching ship, and I noted that one winked persistently. Pulling my wits together, I realised that the ship was Morsing us. She kept on sending "Stand to"; but you bet we didn't, and I've never known this ship go so fast. The stokers wanted no inducement, especially when, all of a sudden, there was a flash, and then a loud report.

We were no longer left in doubt. Our two gunners—ex-Navy men, and as keen as mustard—retaliated with our 4·7 (which is mounted on the poop), but I don't think they made a hit. The second shot from the raider carried away a part of our boat deck, and one man was knocked overboard, but the damage to the ship was not serious.

Thank the Lord the spray and the mist made an excellent curtain, and as we were now shifting for all we were worth, we soon noticed that we were drawing clear. The raider fired about twelve shots altogether but, beyond the one which hit part of the boat deck, the shooting was pretty futile.

It's now about ten to midnight and for two hours we have seen nothing of the raider. The weather has got steadily worse, and it is 7° below freezing. Later: It is just dawn (January 12th) as I scribble these notes. There is no sign of our pursuer. We are a good deal out of our course, and I don't suppose we shall reach Norfolk, Virginia, until late to-morrow evening. Well, it's all over now; but it's been a most exciting night.

JANUARY 12TH (8 p.m.).—Two hours ago the engines broke down for twenty-five minutes. We are all wondering what would have happened if they had broken down when we met the raider. As old T—— says, we should certainly have "copped it." The weather has moderated a good deal, but it is 5° below freezing, and the mercury is now dropping. We sent out a code message to-day, briefly describing our encounter with the raider.

JANUARY 13TH.—Arrived at Norfolk, Virginia, early this morning.

JANUARY 17TH.—Two of our new crew deserted last night on one of the ship's life-saving rafts, and I had to send a message to the Norfolk authorities asking them to look out for them. I forgot to mention that we have heard news here that our sister ship, the s.s. "———," has been sunk by the raider. By the way, another raider is reported from Pernambuco, South America. An Italian ship has been sunk 450 miles from here, and a Belgian relief ship has been held up about 500 miles from the Irish coast.

JANUARY 19TH.—We had further information regarding the raider to-day. As so much depends on these war warnings, I'll reproduce one here:

"To all British Merchant Vessels. Government War Warning. Enemy raider last reported January 16th in latitude 7° S., longitude 25° W. About 4,000 tons. Well armed. Fitted with torpedo tubes. One squat black funnel, capable of extension, and possibly second dummy funnel. Two masts. Straight stem. Probably high speed. Take all precautions and show no unnecessary lights."

Another message runs as follows:

"British steamer s.s. Theodore captured and armed by raider. Is now operating on Atlantic routes. Take all precautions, etc."

It is estimated that this particular raider has caught over a dozen ships already.

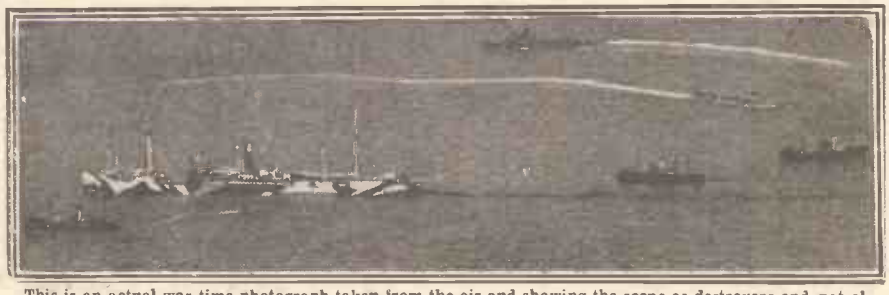
Another Alarm.

JANUARY 20TH.—More trouble last night. The second mate got an attack of the "jim-jams" and fetched the captain out of his bed at two in the morning, because he said he had seen suspicious lights. The captain stopped up until four, but didn't see anything.

JANUARY 21ST.—Here's an extract about the Kaiser from "Life," which is a sort of American "Punch":

"On the victorious field, he was buoyant, active, jovial, simple. He stood leaning on a cane that might have cost a dollar, and he spoke to the soldiers with the simple heartiness of a brother-in-arms."—German Press Agency. "Life's" comment was:

A VICTIM OF THE SUBMARINES



This is an actual war-time photograph taken from the air and showing the scene as destroyers and patrol-boats rush to the aid of a torpedoed merchant vessel. Notice her gay paint—a camouflage device to render sighting difficult to the enemy. She is listing only slightly to starboard in the picture, but is badly holed and sinking rapidly.

Twirling a dollar cane,
Jovial appraiser,
Of some ten thousand slain—
Simple, hearty Kaiser.

Jovial, so might grin
A headsman, neath his visor,
Damn the cost so that we win—
Buoyant, hearty Kaiser.

The dead stare stupidly.
Who would wish them wiser?
Their dull eyes cannot see
Their jovial, hearty Kaiser.

Cannon food they from birth,
Now—just fertiliser,
Food for their mother earth—
Simple, jovial Kaiser.

Some day, when from the sod,
Like a wrathful geyser,
Bursts forth the seed—then God
Help the jovial Kaiser.

(To be continued.)

BETTER "O.B.'s"

The Outside Broadcast engineers at B.B.C. headquarters have been very busy of late preparing for the new season's O.B.'s. This article is the result of a chat with one of them.

By OUR SPECIAL CORRESPONDENT.

IT is a curious state of affairs that, with twenty-two fine studios in London, and with a total of about thirty spread all over the country, the B.B.C. is having to rely now, more than ever, on Outside Broadcasts. The reason is that people want topical events in the programmes, and this is bound to mean an increase in the number of running commentaries and similar microphone adventures.

There are so many things, too, which cannot be done in the studio. Cinema organs are popular and the rigging up of the microphones for this is an "O.B." job. Brass band concerts are popular in Northern programmes. Often it is easier to take these as a relay from a large local hall in which the band is playing, rather than crowd the members into a small studio.

An Important Department.

Relays of Church services feature on two Sundays of every month. This, again, is an "O.B." matter. Even Queen's Hall broadcasts are under the direction of the Outside Broadcasts engineers. So it is inevitable that the O.B. Department should get more important as the scope of broadcasting increases.

The O.B. engineers have a special department at Broadcasting House. One man is in charge of the microphone arrangements and every place from which an Outside Broadcast has been made is recorded on graph paper in a large book.

If a note comes through from the Programme Department to fix up a broadcast from a church from which a broadcast was made, say, two years ago, the engineers can be on their way in half an hour, with exact details and measurements in feet of the microphone positions.

Testing Out New Places.

Another section is devoted to the vans side of the work. There are special lorries carrying amplifier and landline gear. Often it is not easy to get the control apparatus and amplifiers near the point from which the broadcasting is being made. One of the vans is then drawn up as close as possible, long leads are quickly run out with two or three microphones and connection is made to the nearest telephone point.

There is, in the O.B. Department, a "hush-hush" time-table, giving details of advance O.B.'s and of places to be tested for their microphone suitability. Every morning one or other of the vans go out with two or three microphones, drums of cable, an amplifier box and a listening panel.

Perhaps there is a new place to be tested for a forthcoming O.B., and the programme staff are simply waiting for the engineers' O.K. before fixing up the business side of the broadcast. Or perhaps one of the stock Outside Broadcast centres—an hotel from which dance band broadcasts are made once or twice a week—needs an overhaul.

The microphones may need shifting as the result of some suggestion by a keen dance listener or the batteries or amplifier boxes may be in need of attention. A new O.B. development is the four-channel unit, nicknamed the "fader" by B.B.C. engineers.

GETTING READY FOR THE NIGHTINGALE

B.B.C. engineers getting ready for one of the nightingale broadcasts, which have been so popular in recent years. This year's relays are to come from a wood in Berkshire.

The Use of "Fader" Boxes.

These faders, made by the B.B.C. engineers themselves, are simply boxes containing very elaborate switching devices and potentiometers. At one end are the input points, two from each microphone and at the other are the output points for connecting up to the three-valve microphone amplifier and to another fade unit, if two are used simultaneously on one transmission.

A good example of a fade unit is that special one in the control-room for switching in the microphone which picks up the noise of the electric clock for the interval signal. By touching a relay button on the unit the engineer switches in and polarises the microphone, switches on the L.T. circuit of the amplifier and by the potentiometer of the fader connects up the interval signal microphone to the control panel.

Several Microphones.

Even for straightforward dance broadcasts, it is general to use, nowadays, more than one microphone. A good gramophone company in one of its new studios uses six microphones at a time. The O.B. engineers are following suit and are realising that it is much easier to follow an Outside Broadcast if more than one microphone is used.

Even in running commentaries the engineers generally rig up two microphones, so that there is none of that annoying fading, as the commentator turns his head.

The O.B. engineers now have a listening panel in addition to the amplifier boxes This carries meters for the microphone amplifier, and also a volume indicator, working step by step with the master volume indicator in the station control-room.

The "OUT

A GOOD portable set possesses a number of advantages over a straight receiver of the "ordinary aerial" type.

There are, however, certain difficulties which have to be overcome in designing an efficient self-contained portable. First of all, comes the question of size.

Secondly, the number of valves used must be sufficient to provide adequate sensitivity, bearing in mind the fact that the pick-up properties of a frame aerial are considerably less than those of a normal outdoor or indoor aerial.

Daylight Results.

Thirdly, since the H.T. is limited to small-sized dry cells it is desirable to keep the current consumption down to a minimum, because constant replenishments will quickly raise the "running costs" to an impossible figure.

With these facts in mind, the "P.W." Research staff got to work, and they have undoubtedly achieved a high degree of success and of the amplification possible with three valves.

I am writing this article with the receiver beside me on the table. I live in the London district. It is the early afternoon, and as I write Radio-Paris is coming through at *full* loudspeaker strength, the volume and quality being comparable with the local.

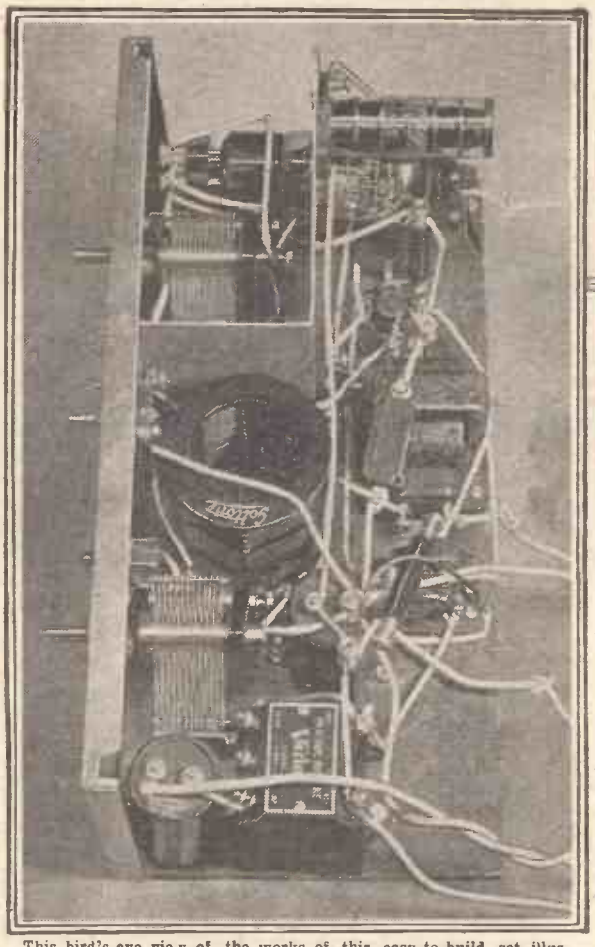
Not so bad for a small portable in daylight, is it?

Daventry 5 X X and the Brookmans twins can be brought in at terrific strength without the slightest difficulty.

The Midland and Northern Regionals are both receivable at good volume (in South-East London) in daylight with the help of reaction.

You will notice that I have only mentioned the *daylight* results, since at night-time reception conditions are vastly improved by the indirect rays of various distant stations, which produce a greater *apparent* sensitivity, and thus sometimes tend to give a misleading impression of a set's amplifying powers.

NO SOLDERING NECESSARY



This bird's-eye view of the works of this easy-to-build set illustrates an important wiring point concerning the position of the horizontal valve holder, which can be seen on the right of the baseboard just under the "Ohmite" resistance. Before screwing down this particular valve holder, care should be taken to see that ample room is left for accommodating the valve.

Remarkable Amplifying Properties.

The first stage comprises a screened-grid high-frequency valve. This is followed by a grid-leak detector and a transformer-coupled low-frequency magnifier with pentode output.

The remarkable amplifying properties of the design have been achieved by a judicious choice of valves and component values, the valve characteristics being matched up so as to enable each stage to give the greatest possible "punch" combined with stability.

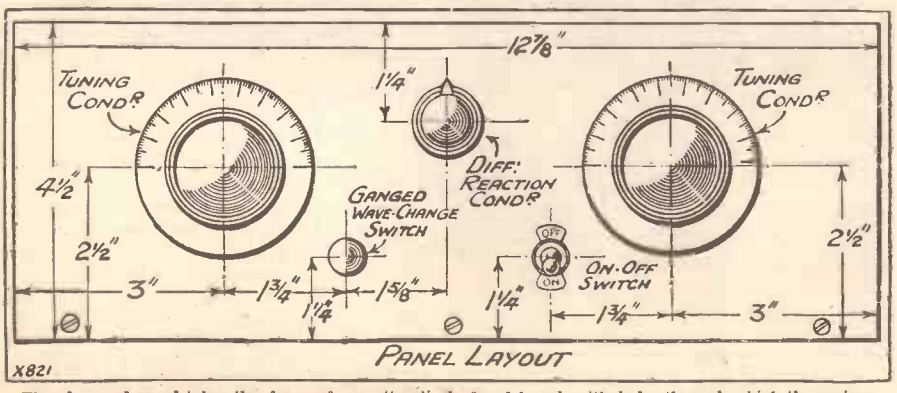
The frame aerial is wound round the outside of the set and is split into two portions which are connected in series.

For medium-wave working one portion of the frame winding is short-circuited, and on the long waves the whole of the winding is brought into use. The same idea is employed in the case of the intermediate

Following on article which app we now give the tional details of markable light receiver. It is straightforward being no neces single connectio desc

By A. JOHNS

AN ATTRACTIVE PLY-WOOD PANEL



The ply-wood panel takes the form of an attractively-faced board, with holes through which the various controls pass. The components themselves are mounted on the front of the metal screening box.

THE PARTS YOU REQUIRE

- 1 Aluminium box, screen and baseboard (Magnum).
- 1 Portable case (Camco Carrier).
- 2 ·0005-mfd. variable condensers (Formo midlog line).
- 1 ·0003-mfd. differential reaction solid-dielectric condenser (Polar, Ready Radio, Telsen).
- 1 On-off snap switch (Bulgin, B.A.T.).
- 1 2-gang on-off push-pull switch (Cordo).
- 1 H.F. choke (Sovereign Super, Ready Radio, Lissen, Wearite).
- 2 ·0003-mfd. fixed condensers (Formo Mikadensor, and Dubilier 670, or small T.C.C., Igranic).
- 2 Horizontal valve holders (Parex and W.B., Lissen).
- 1 Standard valve holder (Lissen, W.B., Graham Farish, Wearite, Bulgin, Telsen, Lotus).
- 1 2-meg. grid leak with terminals or tags (Graham Farish "Ohmite," Lissen, Igranic, Dubilier).
- 2 20,000-ohm resistances as above (Graham Farish "Ohmite," etc.).
- 1 15,000-ohm resistance as above (Graham Farish, etc.).

  Note.—These resistances can be of spaghetti type if desired (Lissen, Bulgin, Varley, Lewcos, Tunewell, Telsen, Sovereign).
- 1 ·01-mfd. fixed condenser (Lissen, T.C.C., Dubilier, Ferranti).
- 1 ·001-mfd. fixed condenser (Dubilier 670, T.C.C., Lissen, Sovereign, Ready Radio, Telsen, Ferranti, Graham Farish, Formo).
- 1 L.F. transformer (Lissen Hypernik, R.I. Hypermite, Varley Niclet, Igranic Midget, Lotus).

"DOOR" THREE

the introductory
peared last week,
e first construc-
f this really re-
weight portable
s an amazingly
set to build, there
sity to solder a
on! It is here
ribed
ON-RANDALL.

coil, except for the fact that reaction is applied to this winding.

The intermediate unit, by the way, is a standard "Cosmic" coil, and the existing primary winding is not used.

There are a number of firms who make the "Cosmic" coil, and although the numbering of the terminals may vary with different makes this should not be taken to imply that such coils are not suitable. Actually, it merely means that in order to keep the price of the coil unit as low as possible the makers have employed their existing bases.

For the benefit of readers who may be supplied with other markings, a list of equivalent connections will be given next week.

The two wave-change switches have been "ganged" for simplicity's sake, and are operable from one knob on the cabinet.

Perfectly Stable.

The detector portion of the circuit follows standard practice and is coupled to prevent instability. The L.F. transformer has a lowish ratio (3 or 3½ : 1) and is coupled to a pentode having a high inductance tapped choke in its anode circuit.

This choke is essential if the full amplifying properties of the pentode are to be obtained.

The tappings provide a simple method of correctly matching the loudspeaker windings.

Across the choke are joined a resistance and fixed condenser in series for tone-balancing.

And now a few words about the valves.

Although any 2-volt S.G. valve can be used, the particular valve employed in the original set is a Mullard P.M.12A, which is specially designed for portables and will work satisfactorily on a maximum H.T. voltage of 100.

Suitable Valve Types.

This valve will not be released to the public until the end of May, but those who wish to get the best results with economy in current consumption will do well to wait until they can obtain one of these valves.

But remember—other S.G. valves can be used.

The detector is a steep slope "H" or "H.L." type, and the choice should be confined to those valves which are designed to be non-microphonic. This is a point which has to be watched in a portable. The valve used in the original was a Marconi H.2.

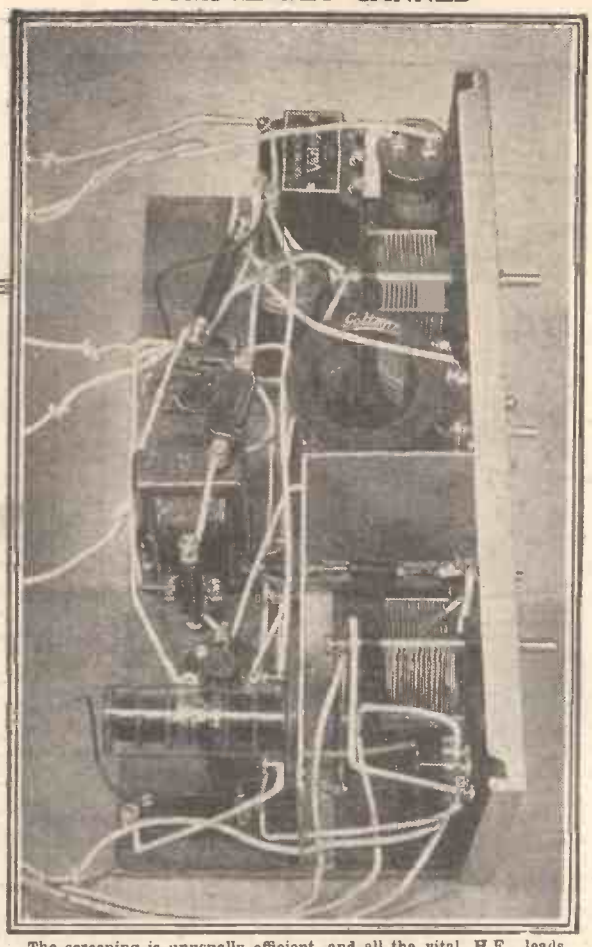
Lastly, the Pentode. This is a Mazda Pen. 220, or any equivalent "portable" type.

The total anode current consumption of the set is approximately 6½ milliamps.

Now I want to pass on to the construction, and from this point of view the receiver can be divided into three parts, viz., the main set comprising the three valve stages, the frame aerial, and the loudspeaker.

(Please turn to page 295 for continuation of this article; the wiring diagram is on the next page.)

COMPLETELY CANNED



The screening is unusually efficient, and all the vital H.F. leads are specially enclosed in a separate compartment to prevent instability and interaction. The metal "lid" fits over this when the set is completed.

FOR THIS FINE PORTABLE

2 2-mfd. condensers (Dubilier type 9200).
1 Output choke (Varley Pentode Nichoke).
1 Cosmic dual-range coil (Goltone, Wearite, Telsen, Ready Radio, Sovereign, Peto-Scott).
2 2½-in. tuning dials (Ormond).
12 feet 18-gauge tinned-copper wire, and sleeving (Wearite), or Glazite, Soldawyre, Quickwyre, Jifflinx.
Flex, screws, etc.
1 Sheet Kraft paper.
2 ozs. 24 D.C.C. Wire.
2 ozs. 32 D.S.C. Wire.

ACCESSORIES.

LOUDSPEAKER UNIT.—Blue Spot, Lissen, Telsen, Ormond.

VALVES.—1 S.G.: Mullard P.M.12A, or P.M.12, Mazda S.215, Marconi S.22, Osram S.22, Tungsram S.210, Lissen S.G.215, Cossor 215S.G., Six-Sixty S.S. 215S.G.

Det.: Marconi H.2, Cossor H.L.210, Mullard P.M.1H.L., Six-Sixty S.S. 210H.L. (Note.—Many valves will not go into the set owing to their height.)

Pentode: Mazda Pen. 220. Lissen P.T. 225, Marconi and Osram P.T. 2.

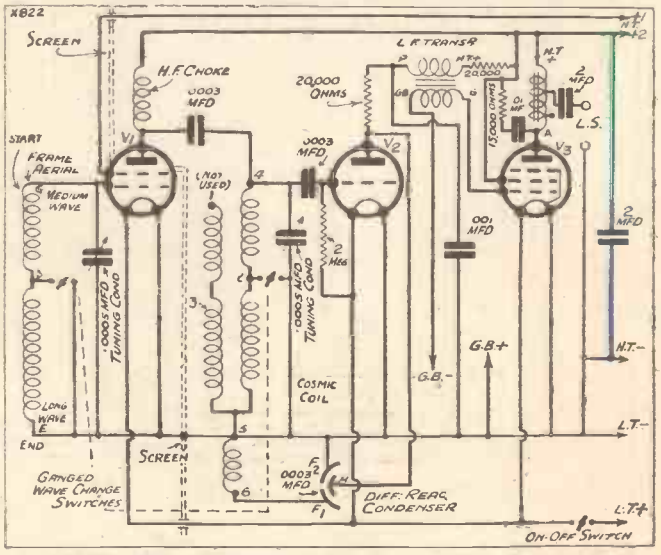
BATTERIES.—H.T.: 2 of Drydex Blue Triangle 63 v., Ever Ready Popular P. Portable 63 v., Siemens H. 1 60 v., Pertrix 237 60 v.

G.B.: 3 volts for 120 v. H.T.

ACCUMULATOR.—2 volts (Exide PC2, Oldham JLV4, or other small portable type).

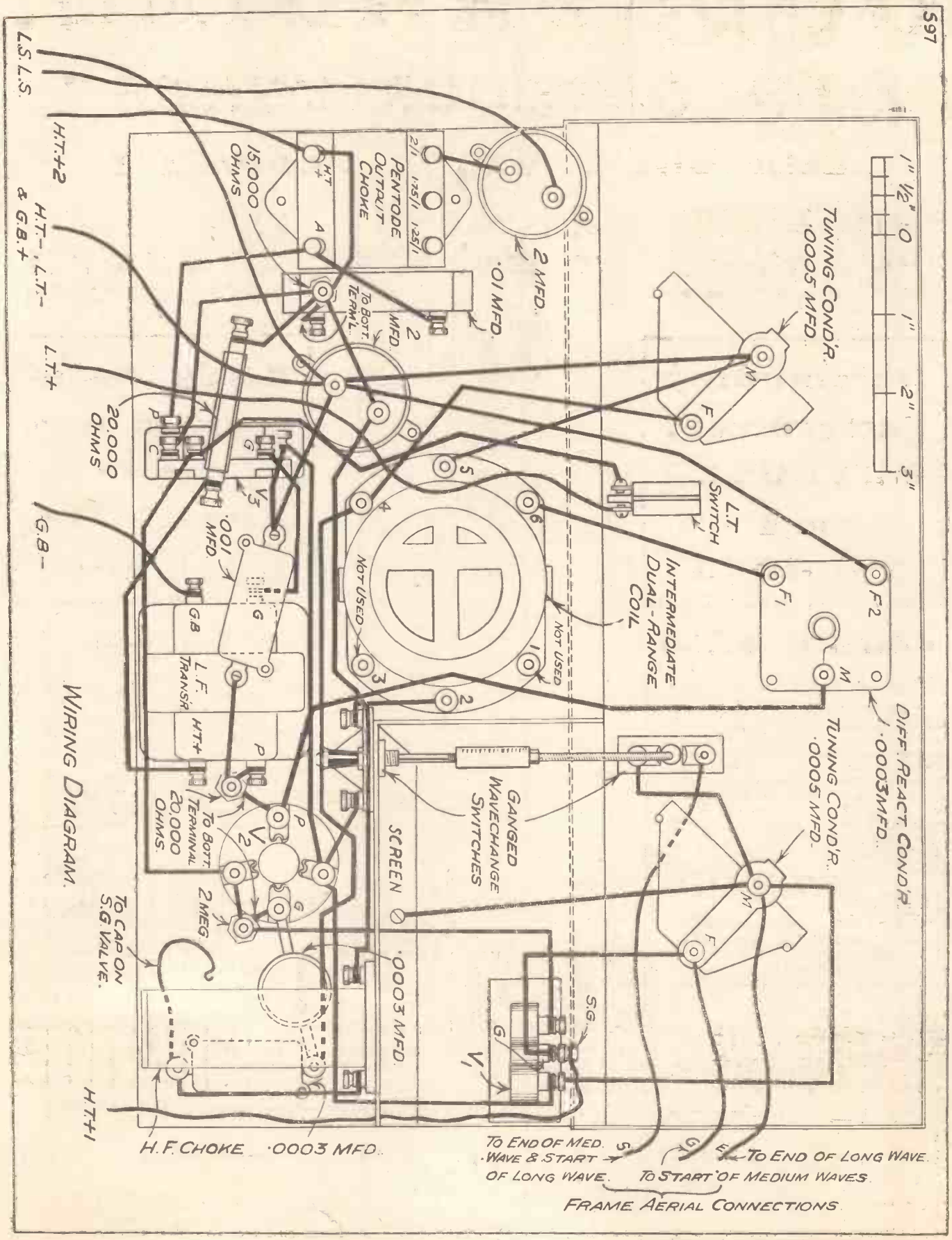
MAINS UNIT.—(Should be small and give 120 to 150 volts 15 m.a. max.) (Heayberd D.Minor, Atlas, R.I., Tunewell, Regentone, Formo, Tannoy, Ekco).

THE THEORETICAL CIRCUIT DIAGRAM



A straight circuit, comprising an S.G. H.F. amplifier, followed by a grid detector and a powerful pentode output stage, are the secrets of success in this up-to-the-minute portable. And, think of it—the H.T. consumption is only about 7 milliamperes!

THE "OUTDOOR" THREE WIRING GUIDE



OUTSTANDING!

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£4:11:0 OR BY EASY PAYMENTS
8/6 down and 11 monthly payments of **8:6**

KIT "B" with valves less cabinet.
£6:12:0 OR BY EASY PAYMENTS
12/3 down and 11 monthly payments of **12:3**

KIT "C" with valves and cabinet.
£8:7:0 OR BY EASY PAYMENTS
15/6 down and 11 monthly payments of **15:6**

Outstanding Performance OUTDOORS and INDOORS

		£	s.	d.
1	Polished Oak Cabinet	1	15	0
1	Aluminium Box Screen and Baseboard		8	6
2	Formo ·0005 Log Mid-line Variable Condensers		8	0
1	ReadiRad ·0003 Differential Condenser		3	6
1	ReadiRad Snap Switch		2	9
1	ReadiRad 2-gang "On-off" Push-pull Switch		3	6
1	Sovereign Super H.F. Choke		3	6
2	W.B. Horizontal Valve Holders		2	0
1	Standard Valve Holder			6
1	2-megohm Leak, with Terminals		1	6
1	Lewcos 15,000-ohm Spaghetti Resistance		1	6
2	Lewcos 20,000-ohm Spaghetti Resistances		3	0
2	T.C.C. ·0003 Fixed Condensers, Type "M"		2	0
1	T.C.C. ·01-mfd. Fixed Condenser, Type "S"		1	9
1	T.C.C. ·001-mfd. Fixed Condenser, Type "S"		1	6
1	R.I. Hypermite L.F. Transformer		12	6
2	Dubilier 2-mfd. Fixed Condensers, Type "BB"		7	6
1	ReadiRad Cosmic Dual Range Coil		6	6
1	Varley Output Pentode Nichoke		12	6
1	Packet of Jiffilinx for wiring		2	6
2	Ormond 2" Tuning Dials		2	0
2	ozs. 24 D.C. Wire			8
2	ozs. 32 D.S. Wire		1	10
3	Valves as specified (Cossor 210 DET., PM.12, Mazda PEN.220	2	1	0
	Flex, Screws, etc.		1	6
		£8	7	0

Any component can be purchased separately.

KIT "A" (less Valves and Cabinet), **£4.11.0.** Or deposit 8/6 and 11 monthly payments of 8/6.

KIT "B" (with Valves, less Cabinet), **£6.12.0.** Or deposit 12/3 and 11 monthly payments of 12/3.

KIT "C" (with Valves and Cabinet), **£8.7.0.** Or deposit 15/6 and 11 monthly payments of 15/6.

RECOMMENDED ACCESSORIES.

		£	s.	d.
2	Pertrix 237 60-v. H.T. Batteries at 8/-		16	0
1	Exide P.C.2 Accumulator		14	0
1	Pertrix G.B. Battery		1	3
1	Ready Radio Eliminator, Type B.S.	5	17	6

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KIT "A" Complete Kit of Components and free blue print. **89/6**
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KIT "C" with valves and cabinet **£6:9:3**
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Please dispatch to me at once the following goods.....

.....

for which { (a) I enclose / (b) I will pay on delivery } (cross out line not applicable) £.....

Name.....

Address.....

..... P.W. 14/5/32.

To: READY RADIO, LTD., Eastnor House, Blackheath, S.E.3.

EASY PAYMENT ORDER FORM

Please dispatch to me the following goods.....

.....

for which I enclose first deposit of £.....

Name.....

Address.....

P.W. 14/5/32.....

RADIO IN GERMANY

An exclusive interview with Dr. Kurt Magnus, managing director of the Reichs-Rundfunk-Gesellschaft, Berlin.

By A. A. GULLILAND.

MAY I introduce you to Dr. Magnus, the managing director of the German broadcasting company? He is comparatively young, and looks even younger. He is responsible for the smooth working of the financial and administrative side of German broadcasting, and the German press very often terms him Director-General of German broadcasting. Actually, he is the managing director of the Reichs-Rundfunk-Gesellschaft, the mother company of nine of the German regional companies, the tenth, the Bavarian Company, is independent.

A Man of Action.

Sitting opposite Dr. Magnus in his spacious office in the Masurenallee, I was struck by the modern furniture; without, however, the effect being ultra-modern. The windows set high in the wall and the soft light ensuing from this arrangement agreeably impress the visitor. The room was designed to suit his taste, so we can take it that Dr. Magnus is a man of modern outlook, taking advantage of modern achievement and making use of the latest technical developments.

We spoke of German broadcasting, of its intricate and complicated organisation, of the difficulties countering all endeavour to simplify it. Dr. Magnus said that it must be much easier to run a broadcasting service in Britain, where one man alone is responsible for the entire service to one board of governors.

In Germany the managing director of a regional company is responsible to his board, but also has to follow instructions given by a political and a cultural control commission. On the other hand, he is responsible to the Reichs-Rundfunk-Gesellschaft, as this company holds the majority vote on his board.

This mother company is directly responsible to stock-holders, the majority being in the hands of the Post Office. The Post Office is dependent on the Minister of the moment, the Minister to the majority of Parliament. German broadcasting is thus actually controlled by the political majority of the moment, even if its influence has to pass through endless offices, or as the Germans would term it, "Instanzen."

The Licence Question.

But apart from this financial and administrative control, every regional company has two separate commissions appointed by the government, one generally to censure programmes and another to give advice as regards cultural improvement. The news bulletins broadcast by all German stations are compiled by an independent company called the "Dradag" for short. Here the special commission consists of one member of all the more important political parties, making a rather unwieldy affair of over fifteen members.

My leading question to Dr. Magnus was: "Why do German listeners have to pay one and a half times more than British listeners for their licence, although prices are all going down in Germany, and the public are clamouring for a reduction?"

Dr. Magnus stopped a moment to think, and his answer was as follows: "Everybody has been putting similar questions to me for the past few weeks, and I answered them by broadcasting official figures." According to these, reparations and foreign debt have nothing whatever to do with it.

Dividing the "Spoil."

"Of the eighty-eight million marks (about five and a half million pounds sterling) that German listeners will pay during 1932, only three millions will be passed on to the Treasury and only ten millions will be used to cover the deficits in other Post Office departments. So that actually 75 million marks could be used for broadcasting, but I have to deduct a further 7 million here as the cost of the collection, so that of 88 million marks, 68 million, or about 75 per cent., are used for broadcasting.

"But of this the German post office spends thirty million marks on technical transmitter development, on new stations, and on the operation of the German broadcasting stations. The remaining thirty-eight million, i.e. 43 per cent of the total sum, has to be enough for the administration and programme expenses of all the German broadcasting companies, including operation and installation of microphone, studio and line output amplification plant, together with the necessary development and laboratory work to keep this up to date."

Dr. Magnus told me that of the remaining 38 millions ten companies with ten director-generals, ten programme directors, ten programme staffs, a number of orchestras, and nine broadcasting houses had to be paid for. This is because German towns and regions were politically independent up till some hundred years ago.

Every little German State had its own opera house, with permanent orchestra and singers, its own university, its special circle of scientists. And nowadays, even though Berlin has become the main centre, Munich, Dresden, Cologne and Hamburg still have a certain amount of individual culture, and are still individual centres, much more so than, for instance, Manchester compared with London.

The Ideal Arrangement.

But Dr. Magnus quite agrees that it would greatly simplify matters, and also reduce licence fees, if the ten companies could be merged into one big central company with ten more or less independent programme offices, instead of the present state of things, where the permanent staff numbers some 1,600, not counting the Post Office engineers out at the transmitters.

The German public want a reduction in licence fees, but they do not want to give up their ten companies. So, as Dr. Magnus smilingly asked, what was to be done?

THE "SIR JOHN" OF GERMANY

This is a recent portrait of Dr. Kurt Magnus, who, as Managing Director of the R.R.G. (Germany's B.B.C.), holds in Berlin a position equivalent to that of Sir John Reith in London.

SHORTS FOR CONSTRUCTORS

Adjusting a Mains Set—Mounting Coils—Battery Hints, etc.

Never use a metal screw-driver in a mains unit or mains set unless you have taken the mains connecting plug right away from its socket. It is not sufficient to switch off, as sometimes the switch disconnects only one side of the mains.

* * *

When mounting coils on a metal baseboard remember that they should be arranged above this, an inch or so, unless the coil windings are at least that distance from the bottom of the former.

* * *

Even when an L.T. battery is standing idle a certain amount of evaporation goes on, and it is important to renew the loss regularly with distilled water. (The process is known as "topping up.")

* * *

The liquid in an accumulator should never be allowed to evaporate so far that it uncovers the tops of the plates, but should always be kept about a quarter of an inch above these.

* * *

It is a good plan to have your old battery acid turned out and the battery filled with new acid once every year.

* * *

Do not forget to switch off your set when you change the grid bias to the power valve; and, if you use a pentode, when you make any alteration to the loudspeaker connections.

* * *

To take out the H.T. negative plug from the battery every time you make adjustments inside the set is one of the best insurances against a radio accident.

* * *

When making a note of dial readings, remember that if an Eckersley Tuner is in use the second dial position should be noted, and not the first, as this latter alters according to the setting of the selectivity condenser.

CAPT. ECKERSLEY'S QUERY CORNER

Under the above title, week by week, our Chief Radio Consultant comments upon radio queries submitted by "P.W." readers.

Don't address your letters direct to Capt. Eckersley; a selection of those received by the Query Department in the ordinary way will be answered by him.

Aerial's Effect on Oscillation.

G. R. (Hayes).—"Having recently erected a good aerial about 100 ft. in length, I found that it was impossible to obtain reaction on my two-valve receiver. I was advised to try connecting a ·0001-mfd. condenser in series with the aerial lead, and upon doing so found that the reaction worked normally.

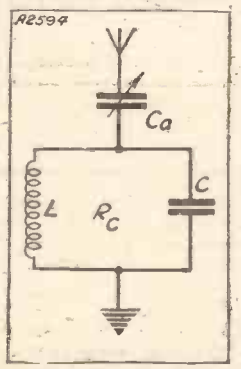
"I am somewhat puzzled by this, and should be pleased if you could explain this very simply."

I should be pleased to—if there was a simple explanation!

In effect one may say that if you have a small series condenser C_a then the closed circuit L.C. is only prevented from oscillating by its own internal resistance R_c, whereas if you remove C_a the damping in the circuit is greater.

There is also the question of the phase between the feed-back voltage and the signal voltage, which with the non aerial series condenser connection may not be equal and is more inclined with conventional circuits to be equal if you loose-couple the aerial circuit.

LOOSER COUPLING



The effect of using a small series condenser in the aerial is to reduce damping and thereby to assist selectivity and the application of reaction.

The insertion of C_a is in effect loosening the coupling and thereby reduces the damping. I have made a lot of true statements but are you any clearer?

What is Cross-Modulation?

N. M. T. (Woolwich).—"Just recently I heard a friend of mine mention the term 'cross modulation.' He was saying that this effect frequently occurred with multi-H.F. receivers, but when I asked him to tell me what cross modulation was he did not seem to be able to explain it clearly.

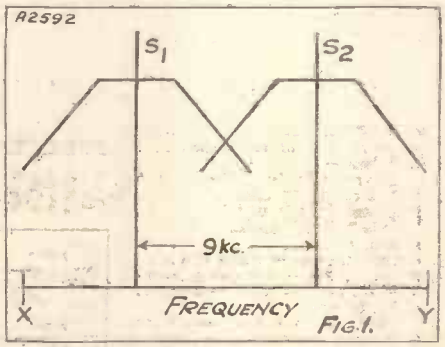
"Perhaps you could tell me in simple language?"

I understand cross modulation like this: Fig. 1 is a diagrammatic representation of two broadcasting stations having frequencies S_1 and S_2. The tent-shaped drawing around each represents the intensity and frequency of their sidebands at same instant.

They are equal powered stations. If you had a receiver which responded equally over the full frequency band X to Y you would hear both stations at once, each as a separate programme. This is quite obvious.

Now suppose you got a selective receiver. Then, if you selected by tuning S_1, S_2 would,

THE INTERFERENCE FRINGE



Every two powerful neighbouring stations have overlapping fringes of sidebands, as shown here.

as far as detector voltage is concerned, look much smaller than S_1 (Fig. 2). But at a frequency Z you would have two sidebands of frequency difference OZ from S_1 and PZ from S_2.

Now would you have a frequency OZ as a modulation of the carrier S_1, or a frequency PZ (less than OZ) as a modulation of carrier S_2, or both at once, or what?

Well, if your tuning had made S_1's carrier about five times greater than S_2's carrier, demodulation would take place and all sidebands created by S_2 would appear as modulations of S_1. If the stations are 9 kc. apart then a 2,000 modulation of S_2 becomes a 7,000 modulation of S_1, a 6,000 modulation of S_2 a 3,000 modulation of S_1, always provided S_1's carrier is made by tuning 5 or 6 times greater (apparently to the detector valve of the receiver) than S_2's carrier.

Cross modulation is then the heterodyning of the jamming station's sidebands with the carrier of the station to which you are most strongly tuned.

ONLY IN "P.W."
can you read Capt. Eckersley's replies to listeners' own problems.
AND REMEMBER—
Captain Eckersley's technical articles appear only in
"POPULAR WIRELESS"
and **"MODERN WIRELESS."**

Using Up Old Valves.

V. C. (Stoke Newington).—"I have two LS5A valves which were given to me eight years ago. They had only been used for less than 50 hours previous to my acquiring them, and have since not been used at all.

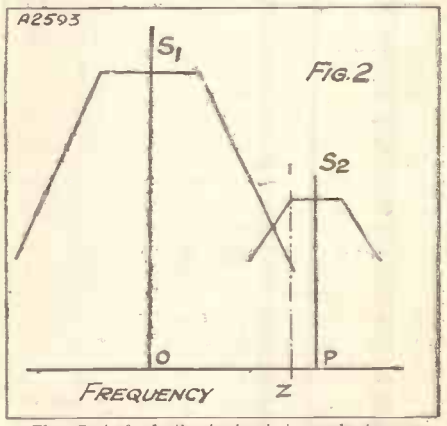
"I now contemplate making a large set, using my two valves in a push-pull output stage. Are the valves likely to be in good order after such a long period of lying idle? Or can they deteriorate even when not used?"

I do not think the valves will have deteriorated at all. But it's just a question whether any air's got in by this time! Surely not! We have examples of a vacuum being kept up in an exhausted vessel almost indefinitely.

A valve wears out because its filament wears out, and its filament wears out because you pass current through the filament which makes it hot and allows you to suck electrons out of it.

A valve (or a lamp) is more likely to wear out if it is constantly switched on and off than if it is kept burning continuously—the expanding and contracting of the

TAMED BY TUNING



The effect of selective tuning is to emphasise one station at the expense of the other, but there will still be a certain "overlapping" producing a cross-modulation effect.

filament does a lot of harm in wearing out things.

I suppose, incidentally, your valves have never been dropped or damaged. I mean anode, grid, and filament are all isolated all right?

You can try this with a cell and a milliammeter and a resistance—just to see if any two pins (except filament) have a circuit between them.

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

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

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

QUESTIONS AND ANSWERS

SWITCHING OUT THE L.F. VALVE.

T. S. B. (Sussex).—"Could you give me the connections for a three-point double-pole switch to cut out one valve in the 'Comet' Three? The circuit was given some time ago in a letter in 'P.W.,' and I believe it was a clergyman writing.

"I put aside the back number containing this, but unfortunately have now mislaid this, and should like to know what the connections were."

The arrangement referred to was described in "P.W." No. 484, and referred to a "Comet" that had been modified in various ways. You may be unable to obtain this back number of "P.W." so we will repeat the connections to the switch as they would apply to the original "Comet" Three.

The type of switch required is one of the three-pole double-throw type, with three central contacts, which make connection with three other contacts in one position, and when thrown over to the other position with another set of three contacts. For the purposes of description it will be necessary to "number" the various contact points, so we will assume you have the switch before you and that you have numbered 1, 2 and 3 against the *central* contacts (those which are in use all the time).

First of all, throw the switch in the "up" or "off" position, when each central contact will be joined up with a different one. Mark these as follows; the one connected to No. 1 mark 4, the one connected to No. 2 mark 5, and that which is connected to No. 3 mark 6.

Now throw the switch in the "down" or "on" position, which will disconnect 4, 5 and 6, and will be joining up three other contacts to 1, 2 and 3. That contact, which is now connected to No. 1, should be marked 7, the next one 8, and that which is connected to No. 3 should be marked 9.

Having numbered the switch you can now permanently connect No. 5 to No 1 contact.

Disconnect the first L.F. transformer's P terminal from the 10,000-ohm spaghetti (or H.F. choke), leaving reaction connection as before. Also, disconnect the plate of the second valve from P of the second L.F. transformer.

This second valve is the one that will be cut out of circuit, so one of its filament leads will have to be "made" and "broken" by the switch, as necessary. The most convenient way of doing this is by removing the — filament wire of V2 (that joins it to the — filament of V3, to earth, H.T.—, etc.).

Then join up the switch as follows: That end of the 10,000-ohm spaghetti (or end of the H.F. choke), which does not go to the reaction and plate of the detector valve, goes to No. 5 and No. 1 contacts.

No. 4 contact is not used, No. 6 is not used.

No. 2 contact goes to the "P" terminal of the 2nd L.F. transformer (formerly connected to the plate of the second valve). No. 3 goes direct to earth via the nearest earthed lead.

Contact No. 7 goes to the "P" terminal on the first L.F. transformer. Contact No. 8 goes to the plate of the second valve.

The No. 9 switch contact goes to the vacant filament terminal on the V2 valve holder. This completes the alterations.

SHUNT-FED L.F. TRANSFORMER.

T. C. (Paddington, London, W.1.)—"In the circuit diagram for shunt-feeding the L.F. transformer it shows that the condenser between resistance and L.F.T. should be a ·5 mfd., but I put in a ·1 mfd. and it works perfectly. Does this make any difference?"

The correct value for the coupling condenser depends upon several factors. It is primarily a question of passing L.F. without too much loss, and secondarily of matching the coupling value with that of the other components.

As your ·1 mfd. is working well there is no reason to change it unless you change your L.F. transformer as well, in which case a different capacity may be needed.

ADDING EXTRA TUNING CAPACITY.

"REGIONAL FOUR" (Edgware).—"Not long ago in 'P.W.' a hint was given about adding a small condenser to a tuning condenser to bring the wavelength up above the present top station (Budapest).

"I want to try this in the 'Regional' Four, which has *two* tuning condensers. Would the following method be O.K. to use two ·0001 fixed condensers I have on hand?

"Proposed connections: One side of both condensers to earth. Then other side of each to the respective 'fixed' vanes of tuning condenser.

"And would a clip connection be as satisfactory as a permanent wire with switch. I do not want to go to the trouble of proper 'fixed' wiring if it is not really necessary, and I only want to tune up higher as a matter of curiosity, so a permanent switch seems hardly necessary."

The proposed connections would be perfectly satisfactory, and so would flex leads and (strong) clips. You could, in fact, use a short length of twisted flex for each, with the ·0001 fixed across one end of it, and clips at the other end.

Then the clips go to moving and fixed vanes of the variable condenser, thus temporarily increasing its capacity.

POOR RECEPTION ON LONG WAVES.

"MOZART" (Huddersfield).—"When I got the Eckersley Tuner going I said good-bye to trouble—at least, I thought so! Selectivity was A1—almost unbelievable compared with my other set—and strength and tone left nothing to be desired.

"Just this past fortnight, however, long waves have been poor, and looking over the aerial and coil connections I noticed that the aerial series condenser 'tension' seems very weak.

"Would a 'dud' shorting action be likely to cause the long wavers to drop in strength?"

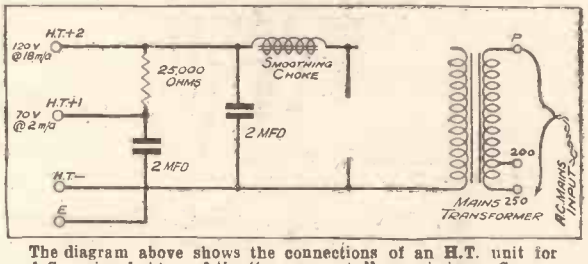
Yes. It is one of the likeliest causes. You can test to make sure this is the cause of your trouble by joining a piece of flex across the aerial "selectivity" condenser's terminals. If you find this clears up the weakness, poor "shorting" is the cause of your trouble.

Incidentally, if you want to save buying another condenser, you might fit a clip on one end of the piece of flex wire and use it permanently to short out the condenser on long waves. It is quite a sound method.

(*Continued on page* 288.)

MISSING LINKS, No. 34

AN A.C. H.T. UNIT.



The diagram above shows the connections of an H.T. unit for A.C. mains, but two of the "components" are missing. Can you fill them in?

LOOK OUT FOR THE ANSWERING DIAGRAM NEXT WEEK.

HOW ARE YOUR RESULTS NOW?

Perhaps your switching doesn't work properly? Or some mysterious noise has appeared and is spoiling your radio reception? Or one of the batteries seems to run down much faster than formerly?

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

Full details, including scales 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 post free immediately. This application will place you under no obligation whatever, but, having the form, you will know exactly what information we require to have before us in order to solve your problems.

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

"P.W." PANEL, No. 71. SHORT-WAVE ADAPTORS.

One of the simplest and most effective methods of enjoying short-wave reception is to use your ordinary broadcasting set in conjunction with a short-wave adaptor.

* * *

This ingenious device consists of a complete short-wave tuning unit, with a flexible lead, ending in a plug that replaces the set's detector valve.

* * *

It can be inserted into any ordinary set in a moment, and the adaptor's controls then replace the main controls, and the short-wave programmes are amplified and reproduced from the loudspeaker.

AGAIN REDUCED!

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PERMANENT MAGNET MOVING COIL REPRODUCER

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page 286.*)

WHAT IS THE MAXIMUM RANGE ON MEDIUM WAVES?

"OH YEAH" (Salisbury).—"Please do not think I am one of those who ask innumerable questions with ulterior motives. My question is quite a simple one, and yet I do not think I have ever seen it replied to in any wireless paper. It is this: What is the range of an ordinary wireless set on medium wave-lengths?

"Perhaps I am not situated very well for reception, as my aerial at home is fastened to one of a thick line of trees. However, I get plenty of continental stations, and was very satisfied with them until I read of people who get America!

"When I first heard this claimed, I was very, very sceptical; but, being a reasonable sort of person and one who is reluctant to believe the world is full of strangers to the truth, I eventually came to the conclusion that it was sometimes possible to pick up America.

Receiving South Americans.

"I think you will agree this was stretching a point, considering that the ordinary wireless set gives service over quite short distances. As a rule, hundreds of miles are rather exceptional, and America is three thousand miles away at least.

"But now I see that claims are being made of receiving Buenos Aires and other South American stations—not straight across the Atlantic, but straight down across the Equator and well down in the southern hemisphere! And not across water all the way, as over the Atlantic, but across bits of Spain and Brazil!

"Where will it end? I am willing to give you anything you like on short waves, because there conditions are quite different, but on medium waves I should like to know what is the maximum range of an ordinary set?"

Your own experience of reception of continental stations will have made you quite familiar with the fact that "the range of the set," as applied to very long distance stations which you pick up, is rather difficult to define; for on some occasions you may have the greatest difficulty in getting, perhaps, Berlin, which is about six hundred miles away, and yet find it very easy to pick up Wilno, which is about eleven hundred miles away.

In fact, if you have given much thought to the matter at all, you will be prepared to admit that neither the power employed nor the distance away from the point of reception are so important, within limits, as the mysterious fluctuations and variations which are known as good and bad conditions.

On some nights the foreign stations seem fairly difficult to get, while on other nights, or even at a different hour on the same night, the set seems easily capable of giving long-distance reception. So the fairest way to define the range of a set is to make a note of the stations which have definitely and without doubt been tuned in on it, look up the distances, and call the farthest one the maximum range of the receiver.

Thus, if you have definitely picked up and identified without a doubt Naples programmes, you can call your set a one-thousand-mile set, because Naples is about 1,000 miles away (although possibly you may not be able to do 1,000 miles again just when called upon!). On the other hand, you might surprise yourself with a station which is much farther away than this.

Many "P.W." readers have tuned in American stations on quite simple sets, so that there is nothing extraordinary about a set having a range of 3,000 miles.

The past few months, however, have admittedly been unusually good for reception in this country, and on many different occasions—too many for doubt in any reasonable mind—*South* American stations have been picked up in this country.

We expect you noticed the letter from Mr. Cross in "P.W." No. 511, reporting the reception of South America on the "Cosmic." This would be a wonderful feat for even the most expensive set—and, as you know, the "Cosmic" is not that—but we know from experience that, although such results are comparatively rare, they *are* obtained, and the proud owner of such a set can truthfully claim that his "Cosmic" is capable of a range of 6,000 or more miles.

WAS IT THE BATTERY?

"WORRIED" (Watford).—"It was exactly five weeks ago to-day that I made up the 'Cosmic' Star—my first three-valve set. Prior to that I had used a two and thought the world of it, but somehow the 'Cosmic' made me weaken when I saw it covered short waves as well, so I tried it.

"I must say it was an eye-opener for power—I could not go back to the two again with any pleasure. Especially regarding quality. It was better on foreigners than I had ever before found with the Brookmans twins, which are no distance from here across country. But it only lasted three weeks before a whistle started.

"Messing about to see what was wrong I found I could cut the whistle out by reducing H.T. So I did so, not understanding why, and next day the whistle started again.

"So I cut down H.T. a bit more and stopped it, but it restarted once more, and of course the lower H.T. I put on the less power I had, and poor quality.

"To cut a long story short I am now desperate. It cannot be the H.T. battery, as that was quite new for the 'Cosmic'—120 volts triple capacity. And I do not know where to look for the fault. Please help."

We are very much afraid that it *is* that H.T. battery, although it was supposed to be a new one. Can you borrow a similar one, just to try?

In all probability you will find that is the trouble. And, of course, the battery should have lasted very, very much longer than it did.

Either you had a dud battery, or else you have got a bad short somewhere. Are you sure no pliers, wire, scissors, or other metal has been placed across the battery terminals by accident?

Failing some such catastrophe you may have a bad "leak" in one of the components. And the best test for that is to borrow a sensitive milliammeter, connect it in the negative H.T. lead, and see if it drops right down to zero reading when the L.T. is switched off.

If it does, proving that the set's insulation is O.K., it will be safe to use a new battery, which should then have a good long life.

TECHNICAL TWISTERS

No. 113.

THE PRAGUE PLAN.

CAN YOU FILL IN THE MISSING LETTERS?

In order to avoid the possibility of mutual . . . . . most of the European broadcasting stations work on wavelengths allotted to them under the Prague Plan.

* * *

This wavelength co-operation is voluntary, but has been remarkably successful on the whole, the basis of the plan being a separation between adjacent carrier-frequencies of . . . . kilocycles.

* * *

As there are insufficient frequencies for the number of stations, some of them are shared by low-power stations, which are therefore said to work on a . . . . . wavelength (instance the British Relays, working on 288·5 metres).

Last week's missing words (in order) were: Resistance. Potentiometer. Slider. Two, Three.

NEXT WEEK.

Don't Miss Capt. P. P. Eckersley's Article on

BATTERIES

MIRROR OF THE B.B.C.

(*Continued from page 270.*)

Quintero, the English translation of which has been made by Granville Barker. Dulcima Glasby, a member of the B.B.C. staff, has adapted the play for the microphone, and Howard Rose will produce it.

A party of students from Bonn University are visiting the London studio on Saturday, May 28th, to contribute some German students' songs to the National programme.

I have already mentioned that Sir Thomas Beecham is to conduct the studio broadcast of Delius' opera "A Village Romeo and Juliet" on Friday, May 20th. The performance will be given in the large No. 10 studio at Big Tree Wharf, which, as I told you last week, is being retained by the B.B.C. on lease from the L.C.C. for another two years. The cast for the opera includes Kate Winter, Dora Labbette, Dennis Noble, Jan van der Gucht, and Arthur Cranmer.

New Type Vaudeville.

On the following evening there is the second of the new type of vaudeville entertainments, also given in No. 10 studio, under the style of "Music Hall." There is no doubt that a change in vaudeville presentation was long overdue, because the "intimate" type of artiste hardly fulfilled all the requirements of those who like their vaudeville more on the lines of a stage production.

That is the whole idea of this new "Music Hall" entertainment. A stage is erected in the studio and the artistes take their curtains in the approved style before a big audience. The first programme gave Gus Elen an opportunity of making his microphone debut, and now on May 21st Lily Morris, the well-known comedienne, who tops the "bill," will also make her first appearance in the studio.

An Able Combination.

Sonatas by Grieg and Beethoven will be included in a recital to be given on Monday, May 23rd, by Arthur Catterall (violin) and Victor Hely-Hutchinson (pianoforte). As most listeners know, Mr. Catterall is leader of the B.B.C. Symphony Orchestra, and Mr. Hutchinson, who is a member of the Musical Department staff at Broadcasting House, is now giving an important series of illustrated talks on Music Old and New.

The Three Valleys Festival.

The Three Valleys Festival is becoming an important musical event in South Wales, and for the third year in succession it is to take place at the Pavilion, Mountain Ash, the dates selected being Thursday, Friday and Saturday, May 26th, 27th and 28th respectively. The festival, as some listeners will remember, was started to provide some relaxation and forgetfulness of trouble to the miners in the depressed colliery areas of the Rhondda, Aberdare and Merthyr Valleys, a grant being made by the Carnegie Trust for the purpose.

The main object was to give the unemployed miners something to think about, and there is nothing that Welshmen would rather bring their attention to than singing. Sixteen choirs have been rehearsing for this year's festival since last October, and this year the guest-conductor will be Dr. Malcolm Sargent.

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"Reproduction of the very highest quality."
"Reproduction of speech is quite up to the high standard you have set with your more expensive speakers."
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"Reproduction of broadcast music is excellent."

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"WIRELESS WORLD" TEST REPORT on the "SPECIAL SENIOR" Model, price £3:3:0

Magnet system . . . of generous dimensions . . . improved sensitivity . . . Characteristic, which is practically level between 100 and 1,000 cycles, actually rises about 5 decibels from 100 down to 50 cycles. This imparts a full, round tone to the reproduction . . . Speech is of the natural and unforced quality associated with Lanchester Speakers . . . rendering of music is entirely satisfying. "*Wireless World*," *April* 13.

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P.W.35.

TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio reception.

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

Pentode Hints.

I SAID something the other day about tone-control devices, and a reader sends me some observations about this in relation to the pentode valve. Most manufacturers of pentode valves recommend that a filter, consisting generally of a resistance and condenser in series, should be used with the anode circuit.

This, as you will remember, is in effect a tone control, and it has the advantage first of all that it counteracts the tendency to over-emphasis of the higher audio-frequencies and in the second place that it comes in useful in case the loudspeaker should be disconnected.

Generally with a pentode, unless some filter or corresponding counterbalancing circuit is used, the quality with most ordinary loudspeakers is apt to be poor. In view of this, and also in view of the rather peculiar character of the pentode valve, the instruction sheet supplied with the valve should be very carefully studied. As I have said before in these notes, often enough people using a pentode valve are disappointed with the results simply because they have not taken the trouble to consider carefully the special conditions which the valve requires.

Any component in a wireless circuit, if you are to get the best out of it, must be operated in correct or reasonably correct conditions, and this applies possibly more to the pentode valve than to any other component.

In some cases the output of the set prior to the pentode—or perhaps I should say the *input* into the pentode—is lacking in strength of the upper audio-frequencies, in which case the pentode, by its natural characteristics, will tend to bring up the higher notes. It is a very good plan, however, always to use a protective resistance arrangement.

A Good Sample.

I have recently been making some tests with a very good sample of commercial choke, which is specified by the makers at 20 henries inductance with 50 milliamps flowing. If the current is reduced the inductance, of course, goes up and at a current of about 10 milliamps the inductance was about 26 henries, the D.C. resistance of the choke being just over 300 ohms.

This is obviously quite a good characteristic curve, for the choke and the inductance value can be considered quite reasonably constant over a fair working range of D.C. values.

This compares very well with some of the chokes which I have examined from time to time, most of them giving a much more rapid variation.

Ganged Condenser Construction.

Ganged condensers ought not only to be well made but also they ought to be free from gradual or accidental changes in the ganging adjustment. I have sometimes found cases where the construction of the chassis was not sufficiently substantial, with the result that the ganging was apt to get slightly out, due to accidental causes.

This means that the tuning will become flat, and although it is true that the trimming condensers will enable matters to be put right, this is often inconvenient, and in any case is hardly the right way to make up for unstable framework.

Multiple Tuning.

If very good circuits are used and these are sharply tuned, it is obvious that the ganging must be very accurate indeed, otherwise the advantage of the circuits will be lost. If the ganging of the condensers is not accurate you will get broad instead of sharp tuning, and you may find that a station will come in at two or three closely adjacent points, which is very irritating. In fact, unless the tuning condenser is really a precision job, it is better in some ways not to have the circuits too good in themselves.

You cannot always judge a ganged condenser by its size or apparent massiveness

(*Continued on page* 292.)

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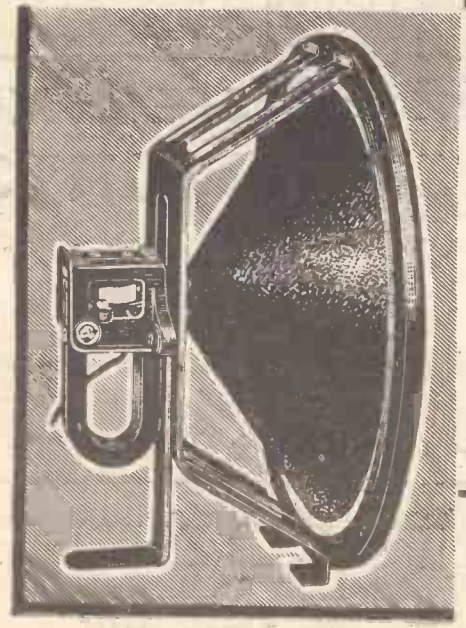

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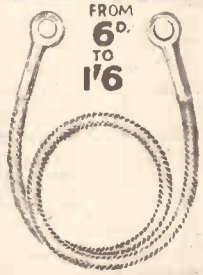

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TECHNICAL NOTES

(Continued from page 290.)

of construction. Even when the whole of the framework is apparently very solid and rigid there may be play or "lost motion" between the moving parts, which will render the operation of the component pretty well hopeless.

Changing Impedance.

When a valve is getting old, the change in its impedance may cause the set to whistle, due to interaction between the circuits. This is more especially liable to happen when transformer-coupling is used between the power valve and the detector, the transformer being not perhaps up to the mark.

It follows that a detector valve of too high impedance will in these circumstances produce the same results. I mention this because when a high-pitched whistle is produced in a receiver, many people jump to the conclusion either that it is being received from the aerial system, owing to oscillation on the part of a neighbour, or that it is due to the coupling set up by a defective high-tension battery.

Both of these may, of course, produce the trouble, but it may also, as I say, be brought about by too high an impedance of the valve and the mere fact that a valve when first put into use operated satisfactorily must not be taken to mean that it will go on indefinitely doing so.

About Whistling.

As regards any high-pitched sound which may be received from external sources, this can easily be investigated by the simple process of disconnecting the aerial and earth of the set. Incidentally, it is a well-known dodge to try reversing the connections to the transformer secondary, as this sometimes makes a considerable improvement in a set which is liable to whistle.

Screening a Wave-trap.

I have been more than once asked about the screening of a wave-trap—whether this is a very definite advantage or whether it depends upon the set itself. As a matter of fact, generally speaking, there is not much use in screening the wave-trap, unless the receiver as a whole is screened.

Sometimes you will find that a powerful station nearby will produce a sort of "shock" effect, and this may be avoided by screening the whole of the receiver and also the wave-trap, if one is used. But, as I say, there is really no point in screening the wave-trap alone and, in fact, it is more important to screen the receiver than the wave-trap, if you are going to screen only one of them.

A completely screened receiver and wave-trap is very useful if you are troubled by powerful local station effects and you want to reach out further afield for distant reception.

Tuning with a Frame.

The winding of a frame aerial appears at first sight to be a very simple job. So it is, in some ways, but like many other simple things, there is a right and a wrong way of doing it. It is important to have the high-frequency resistance of the frame as low as possible, as upon this depends not only the sharpness of the tuning but also the actual value of the voltage delivered from the aerial. Furthermore, you will find that the directional effect of the frame aerial is distinctly more definite when the aerial is properly constructed and is of relatively low resistance.

You can wind a frame aerial with ordinary solid wire, but it is as a rule better to use finely-stranded wire; this makes a better job and enables you to wind on the turns more taut, and also gives a lower high-frequency resistance, with the consequent advantages mentioned above.

Effect with Super-het.

If you use a super-heterodyne set it is interesting to try different types of frame aerial, and you will find that the results which you get differ quite a lot with different kinds of frame. In fact, it is surprising what a difference there is when you use a properly made frame aerial with stranded wire.

The insulated stranded wire, especially if enamelled, is a bit awkward to deal with at the ends, where you clean off the insulation. There is no short way of doing it, and you must set to work patiently to separate the strands and clean each one individually. Having got them all nicely cleaned, you then twist them together again, but if some of the strands are not making contact with the remainder you will lose the advantage to some extent. So you want to take care that they are separately and individually cleaned and then twisted together so that they are all making contact.

Voltage Constancy.

It is surprising what a number of people there are who have electric supply available and who still use battery operation for their receivers. Sometimes this is under the mistaken notion that battery operation, although perhaps more troublesome in replacements and so on, gives better results than mains operation.

This may have been true in the earlier days of mains operation, some three or four years ago, but it is certainly not true to-day, and not only is the use of the mains admittedly so much more convenient, but actually the results which can be obtained now are indistinguishable—with proper precautions—from those gained by equivalent battery operation.

I might even go further and say that in some ways they are superior, because once you have made the necessary arrangements to cut out hum and so on with mains operation, you have the very important advantage that the voltages you are dealing with, once the conditions are fixed, remain virtually constant and you are not troubled with declining voltages and all sorts of unknown factors of that kind, as you are with battery operation.

Personally, although I use battery-operated sets for experimental purposes, I cannot understand any ordinary listener, who has electric supply available, sticking to battery operation in preference to mains operation.

Cost of Mains Operation.

On the question of cost, again mains operation has the definite advantage, because apart from the initial outlay, the actual running cost is much smaller than with batteries.

(Continued on next page.)

TECHNICAL NOTES

(Continued from previous page.)

By the way, if you are going in for a mains unit to work a set which was previously battery operated, it is always a good plan to buy a unit which has a distinctly bigger capacity than you require at the moment.

The extra cost will not be anything very appreciable, and the unit—possibly with an artificial load to prevent excessive voltage-rise—will be all the better for working your present set; on the other hand, as you get more ambitious and you go in for a larger or more elaborate set, your mains supply requirements will be correspondingly increased. When that time comes you will be glad you bought the bigger unit in the first instance.

Detector Stability.

I have spoken once or twice about the stabilising of the detector stage of a receiver, and I would like to say something about the use of high-frequency and low-frequency filters in this connection.

If you are troubled with high frequency getting past this stage you may have to resort to a high-frequency filter, which consists of an H.F. choke and a pair of condensers. The choke, of course, is in the high-tension anode feed and the condensers are connected respectively across the two ends of the choke and to the low-tension circuit.

The capacity of these condensers depends naturally upon the value of the choke which is used, but an average capacity would be, say, ·0002 mfd. each. In passing, I should say that these condensers should not be of *too* large capacity as, if so, they may tend to cut off the higher notes.

Sometimes there is an advantage in introducing a fairly high resistance also in the grid lead to the next valve, that is, to the first L.F. amplifier or, if there is only one valve following the detector, this will be the power valve. This resistance may conveniently be about 100,000 ohms.

The above-mentioned arrangement constitutes a high-frequency filter, and sometimes makes a great difference to the working of the set. Incidentally, it is often used in commercially-built sets.

Low-Frequency Filter.

Now as regards the low-frequency filter which is used for the purpose of avoiding A.C. hum. Two resistances are used, these two resistances being in series with each other in the high-tension anode feed, the second one having a pair of condensers connected across its ends, the opposite sides of these two condensers being connected to the low-tension circuit.

These two resistances may conveniently be of, say, 20,000 ohms each, whilst the condensers should be of, say, 1-mfd. each, or even 2-mfd. if you happen to have the latter condensers available. This arrangement constitutes a low-frequency filter, as I mentioned above, and should cut out any hum or motor-boating.

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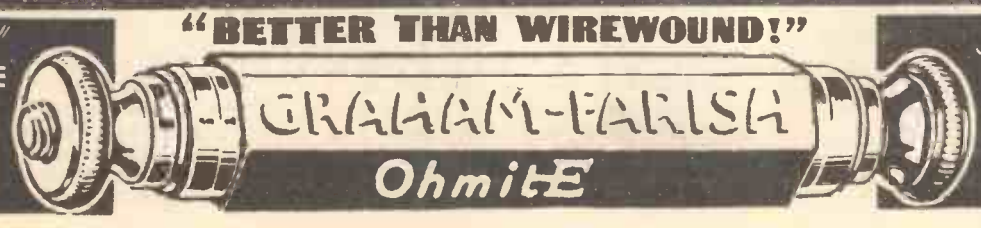

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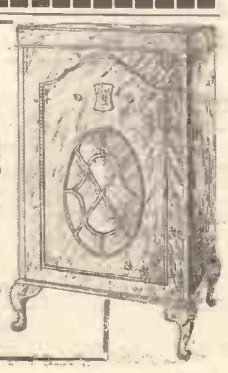

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NOTES FROM THE NORTH

(*Continued from page 276.*)

From the Resorts" for North Regional listeners.

This summer they will tap Whitby, Buxton, Blackpool, Scarborough, Bridlington, St. Anne's, and Blackpool, with a possibility of Harrogate later in the season.

Musical programmes will not be relayed from the Isle of Man this year. As an entirely independent observer, I must say that musical relays over the submarine cable which links Manchester with the Isle of Man and goes on to Belfast have not been a great success in the past.

Isle of Man Relays.

I consider that the B.B.C. is wise to go easy on these relays, and I suggest that the next time the Post Office has a cable ship wanting a job it should send her off with a new cable, specially designed for music, to be laid on the bed of the Irish Sea. I don't envy Belfast listeners, who have regularly to receive music from London over the present cable.

Omitting music, however, there will be several interesting relays from the Isle of Man—a running commentary on the Tynwald Ceremony, another on the Senior Tourist Trophy motor-cycle race (June 10th), and an eye-witness account on the Junior race, two days earlier, relayed from Douglas immediately after the event.

Other sports are to figure in the North Regional programme. The Northumberland Plate, or "Pitmen's Derby," will be relayed from Gosforth Park, Newcastle, on June 22nd. A series of eye-witness accounts of Northern tennis tournaments will be given by Mr. E. J. Sampson, tennis correspondent of "The Manchester Guardian." They will be as follows:

May 28th.—Northern tournament at Manchester.
June 4th.—Northern tournament at Liverpool.
June 16th.—Northern eliminating trials for Wimbledon, at Manchester.
August 20th.—Northern tournament at Scarborough.

THESE RADIO COMPONENTS

(*Continued from page 269.*)

I think that the designer is badly served by the valve manufacturer on two counts, price and performance—the primary difficulty being price.

The Designer's Difficulty.

I am sure that the high price of valves forces the designer to try and get more out of one valve than is technically justifiable. So we get these ridiculous high mu valves, whose magnification can never be realised except by forcing retroaction, using distorting-brutalities like pentodes, and an instability of circuit due to non-matching of similar types of valve. If the price of valves were halved we might find designers inclined to do a proper job, and use the valve as it was meant to be used. We would improve selectivity and we should have a better stability, and in the end a better quality.

Now, Mr. V. M. A., I hope you are annoyed, and will reply and tell us why your prices are higher than in most other countries.

THE LISTENER'S NOTEBOOK

(*Continued from page 270.*)

is the case with the so-called works of art! I would like to know what the highbrow has to say about it.

* * *

There is no doubt that Troise and His Mandoliers are a clever combination. Their turn is really first-class, both in choice of programme and in execution. It is refreshing, too, to hear a vocalist who sings. By his remarkable singing of "Speak To Me of Love," Don Carlos demonstrated that there is a better way of singing this sort of song than that adopted by our crooners.

* * *

Miss Eileen Pilcher may be an accomplished singer, but Saturday night is *not* the night for her—at any rate immediately after a Sports Bulletin. Can't the B.B.C. visualise the discussions that follow the announcement of cricket results? Brahms is not good background music, whereas a good deal of the music we get over the ether is. All that is necessary is a little rearrangement.

* * *

M. Stephan told the schools the other afternoon that he was born at Guingamp. This suggests to me that a talk (in English) by him on the Bretons in an evening programme wouldn't come amiss. What about it, Monsieur?

* * *

It is clear from the number of pieces of real music, all written by English schoolchildren and played by Sir Walford Davies last week, that there will never be a dearth of new music in this country if these young composers carry on the good work now begun. What an inspiration Sir Walford is!

* * *

Henry Hall's policy of fresh tunes before the old ones begin to sicken is one which places him above his fellows. The Savoy Hotel Orpheans, on the other hand, find it hard to part with old friends. Their new ones of recent programmes haven't been very bright, either, while their treatment of "A Little Rose" amounts almost to sacrilege. I wish they would leave such tunes alone!

* * *

The contributions of the Headmaster of Mill Hill School to the American Series "Public School Life in Britain" must have interested many British listeners, but none more than Public School boys themselves. Their younger brothers still at their prep. schools unfortunately missed the encouragement it had for them, as they were in bed at the time of the talk. The Headmaster didn't seem to possess a good microphone voice, I thought.

* * *

Mr. Winston Churchill was in marvellous form at the Royal Academy's "do" the other night. In characteristic fashion he presented a report of the activities of *his* National Academy at Westminster. His observation that the Prime Minister's works contain less vermilion than they used to was typical of the many picturesque things he said. I couldn't help feeling that Winston was in the wrong programme that evening. Though his report carried the proceedings twelve minutes beyond scheduled time I bore him no ill-will, but he will probably hear about it from dance-music fans.

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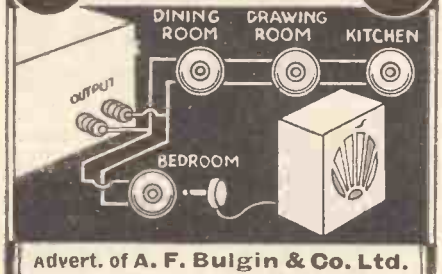

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THE "OUTDOOR" THREE

(*Continued from page 281.*)

The H.F., detector and L.F. stages are totally enclosed in an aluminium box, which can be obtained ready drilled from Messrs. Burne-Jones & Co., Ltd. The lid of this metal box forms the panel and has attached to it a wooden baseboard of conventional type.

When the layout and wiring are finished the remainder of the box is placed into position, the various flexible leads first of all being threaded through the holes in the back of the box.

I will now go over the various constructional points in detail. Suppose we start from the beginning. On the bench in front of us we have the metal box and baseboard, together with the different components required for building the receiver.

Arrangement of the Controls.

The front of the box forms the panel and to this we attach the wooden baseboard, fixing it in position with the aid of three wood screws along the lower edge of the front.

Next, the front and baseboard are placed in position in the cabinet (there are two wooden runners which act as bearers), so that the front of the box comes up against the front of the cabinet.

The idea is this. Since the spindles of tuning controls, reaction condenser, wave-change and L.T. switches have to project through the front of the cabinet for purposes of adjustment, it is, of course, necessary to drill clearance holes in the cabinet front itself.

The positions for these holes can be readily obtained by using the "panel" as a template, because it is already drilled. The centres can then be marked off on the back of the cabinet front and the clearance holes drilled with a carpenter's brace and bit.

The job is easier to carry out in practice than to explain in words, and the general idea will be self-evident upon inspection.

When this part of the work is completed, the next item is to secure the controls to the box front.

Insulating the Reaction Condenser.

The spindles of the wave-change switch, two tuning condensers, and the casing of the L.T. switch are at earth potential.

That is to say, they make contact with the metal box. The reaction condenser, however, does not make connection with the box and is supplied with an insulating bush which must be inserted between the spindle and the metal work. This point is important and failure to observe it will prevent the set from functioning properly and also produce a leakage of H.T.

When the components have been secured to the box front it is a good scheme to join one or two of the leads in position, because as you will see from the wiring diagram and photographs it is no easy matter to carry out the wiring after those parts which are immediately behind the front, have been screwed down to the baseboard.

For example, the wire from the reaction condenser to the intermediate coil unit and the flexible lead from the L.T. switch are two which suggest themselves.

The remaining components may now be laid out on the baseboard, bearing in mind

(*Continued on next page.*)

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THE "OUTDOOR" THREE

(*Continued from previous page.*)

the whole time the question of wiring. If you employ fairly thin tinned copper wire and run it through systoflex sleeving, you will find that it is semi-flexible and you can quite easily secure one end to any of the "awkward" terminals in readiness for the final connecting up.

Make sure that you screw down the "Cosmic" intermediate coil with due regard to the numbering on the base.

You will notice from the photographs that the screened-grid valve passes through a metal shield bent at right angles. This also serves as an anchorage for the second wave-change switch and you should place this shield in position before you screw down the L.F. transformer and the other components in its immediate vicinity.

Wire As You Go Along.

Do your wiring up as you go along. Then you will not discover later that your fingers are "all thumbs" and therefore much too clumsy to find their way to some of the terminals near the baseboard.

Remember to allow plenty of length for the flexible leads, because these have to be threaded through the holes in the box, and the longer you make the leads the easier the task.

With regard to the transformer, the one used in the original set is a Lissen "Hypernik." Its size is convenient and many other transformers will not go into the limited space available. This applies to a number of the components, which have been chosen on account of their compactness in addition to efficiency.

OFFICIAL "P.W." EXHIBITORS

Readers are reminded that further information regarding the components for the "Outdoor" Three can be obtained from official "P.W." exhibitors and they are, therefore, advised to refer to the lists of retailers acting as such which have been appearing in these columns during the past few weeks.

As soon as the wiring is completed it should be checked by the wiring diagram.

There is one point I am reminded of at this stage, that is, the positions of the S.G. and Pentode valve holders.

When you screw down these two valve holders see that they are positioned so that the two valves do not overlap the edges of the baseboard. This is highly important in view of the fact that the remainder of the metal box has to totally enclose the whole of the components and it is, of course, a sliding fit on the baseboard.

Finishing Off the "Box."

All being well you can proceed to "box" up the set, having first of all threaded the flexible leads through the holes and marked each for identification purposes.

Then the main portion of the receiver is finished. The box is now placed in the cabinet so that it rests upon the two bearers.

The control spindles will now project through the front of the cabinet and the various dials and knobs can be screwed on. With regard to the L.T. switch, the indicator is slipped on to the projecting thread and the fixing ring screwed down.

Next week I shall give full details of the frame aerial windings, and the construction of the loudspeaker cone.

TYPE "B" (*Patent.*) **Non-rotating name. Extra large clamping area. Cross-hole for solid tags or wire. Slot and nut to eliminate soldering. 2 B.A. stem.**
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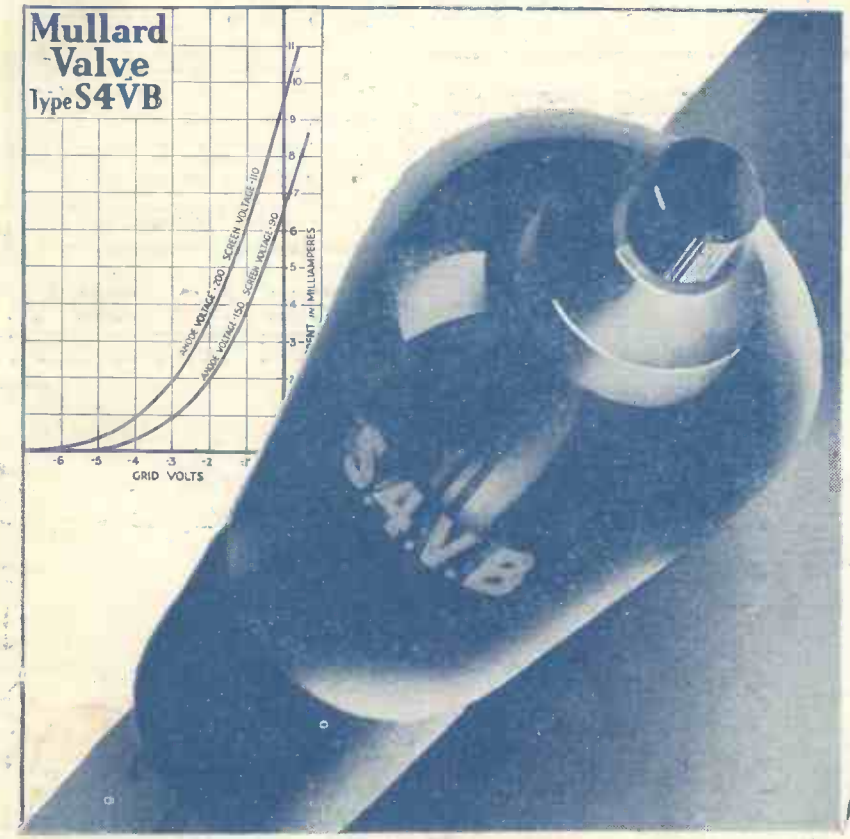

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Heater Current	1.0A
Max. Anode Voltage	200V

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POPULAR WIRELESS, May 21st, 1932. REGISTERED AT THE G.P.O. AS A NEWSPAPER

CAPT. ECKERSLEY ON BATTERIES (See Page 299)

Popular Wireless

Every Thursday PRICE 3d.

No. 520. Vol. XXI. INCORPORATING "WIRELESS" May 21st, 1932.

BUILD THE OUTDOOR THREE

See Inside

OTHER SPECIAL FEATURES THIS WEEK:

DECOUPLING FOR YOUR SET

ALTERING AERIAL INPUT

THE SIDE-BAND STRUGGLE
By VICTOR KING.

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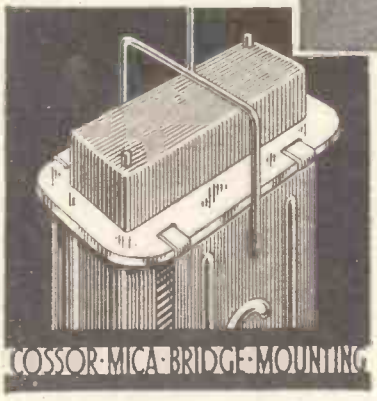

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JUST THINK!
THE GANGSTERS
ARIEL'S DEBATE
CONSTRUCTIONAL

RADIO NOTES & NEWS

A NOVEL IDEA
AFRICA SPEAKS
OUR CAT
BEDTIME STORY

The Spring Contest.

IT is just about now that there begins the annual contest between radio and the garden. Slugs woo me from the dial to the salt-cellar. The lady of the garden points out that if the gladioli don't soon get planted they will flower on the day that we leave for the seaside. *And* the lawn wants to be mowed. So I sadly switch off and prepare myself for the rude labours of the horticulturist.

If anyone can destroy weeds in a lawn by radio I will invest untold gold in his patent. All my clumsy attempts to destroy daisies and dandelia by means of chemical poisons serves but to stimulate the growth of those plants. S.O.S.

Just Think of It.

STATISTICS from America show that at least every other American home has a radio set. Doubtless the other half are looking for work, because the U.S.A. has so cutely cornered most of the world's gold in its safe deposits. I myself would not exchange all the gold which America has taken from Europe for an acre of English ground and a cottage on it.

There is more human joy to be derived by an Englishman from an English marrow than from all the feverish American continent.

The Radio Relay Business.

I USED to give regular news of the progress of the "radio relay" enterprise, because I felt that it is a business which supplies a necessity and has a big future awaiting it. Besides, I thought that an attempt was being made to scream it down. However, the thing grew too big for my little bulletins, but I may say that some 120 radio relay exchanges are now working, with a total of about 50,000 subscribers.

Have the Gangsters Really Arrived?

IT would seem so, indeed. A Manchester firm who were offering radio receivers at specially reduced prices, as salvage stock, has received the following warning in an unstamped envelope:

"Close this shop within one month or you will stand the racket. You are a danger to other business. Your firm will suffer same as Blackpool if you don't. 1st Warning."

The firm's shop in Blackpool had been burnt down! If this sort of thing continues we shall have to pipe down a bit when we poke fun at the U.S.A.

EIFFEL TOWER'S SPRING CLEAN

Paris has decided that the famous Eiffel Tower deserves a new coat of paint, and here is a picture of French roof tops and of one of the workmen with his paint-pot and big brush. The Eiffel Tower transmissions go out on a wavelength of 1445·7 metres.

My Radio Advertising Debate.

THIS, as you may recall, is between me and W. W. of San Diego, California.

We exchange a wallop about every quarter. Bill's latest is to ask me why, if radio advertising does not pay, "stone-hearted Britishers" advertise gramophone records over European stations. That, my dear old Californian, is an exceptional instance and gets you nowhere. In these programmes the advertising matter is not spoken boosts of goods, but the broadcasting of the records themselves. If the listeners like one of the records some of them will probably buy it; they wouldn't buy a record of a bit of dance music, however, if the makers paid an orchestra to play some of the finest music extant.

A Voice from America.

WELL, have it your own way! Let's change the wave-length and tune-in your own Dr. Lee de Forest, miscalled "the father of broadcasting." As reported in Canadian papers, he told the Canadian Radio League: "We find [in America] to-day, radio broadcasts given over largely to dull salesmanship, its music insistently interrupted by staccato announcement, its 'Old Sweet Song' crooningly degraded.

"Paying nothing to the people's government for their priceless franchises, these etheric squatters continue to mar imaginable highlands of beauty with gargantuan signboards. Culture and education have been shouldered out." And lots more of the same kind. Well, if the U.S.A. stands for it, there's only one explanation possible—*it pays!*

News of the "P.P.E.3."

I SELECT a pretty letter from many which have tumbled in about this fine set, to wit, that of W. F. B. (Cardiff). He thinks that his results are "perfectly splendid," and he has tuned-in "no less than 40 foreign stations," without interference, and with perfect clarity. Sir, we thank you and so would P. P. E. if he were here—which he is not, being off to "furrin" parts at the moment.

(*Continued on next page.*)

"ARIEL'S" RUNNING COMMENTARY ON RADIO *(Continued)*

Constructional Tip.

VERY nice of E. J. B. (Kensington) to point out this dodge for fixing a Moderator coil to a baseboard. One takes the cap off a useless S.G. valve and drills a couple of holes through it, one on each side of the terminal. The coil sits comfortably and can be turned on the pin at will. Neatish!

Plymouth Calling.

MY threat to trample about on Dartmoor this summer—well, you know what I mean!—has brought such a hearty invitation from F. W. (Plymouth) to call on him and go a-pillion on his mo-bike or else to sweat and gasp behind him as he scales his native tors. that I am feeling frightfully uppish to-day. Radio seems to be in the hands of all the nicest people.

Now. I am going to busy myself in the writing-room of my club and write F. W. a real letter, just as though I were a regular fellow and not merely the Spirit of "P.W." I'll send his charming photographs back and answer his question about the loudspeaker.

But I'll be blowed if I get on his pillion. He can keep that for some more resilient person—a Devon girl or what not!

Novel Idea for Radio Club.

RADIALADDIN, LTD., have founded the "Radialaddin Club," which seems to me to offer some novel advantages to its members. Besides offering solutions of technical problems this Club places half the member's subscription to a "Member's Purchases Account," facilities being available for the purchase of used "Kits" or radio-gramophones at very large reductions of the list prices.

For particulars write to the Club at Berners House, Berners Street, London, W.1.

Africa Speaks.

A JOLLY letter from A. B. I. in far-off Toro, Uganda, who begins with a complaint about a British firm. I have dropped a word to them, my friend, and hope that it will bear fruit, instanter! Technical 'ounds have been notified of your thirst for an all-wave super-het.

"Ariel," on the outer walls of Broadcasting House, is not of the same family; we never speak—and *my* bags have beautiful creases. My love to the mosquitos. I used to smite 'em with the butt end of a leather glove. Do yours carry special net-cutting shears, like the Singapore varieties?

Cheerio! Keep smiling and thinking of "leave" and the English countryside and the smell of the wet woods in autumn.

"Ariel" Steals Mr. Punch's Thunder.

IN reply to D. R. (Clonmel) and to any other young man who seeks to enter the radio trade at this time on the strength of having passed through a training as wireless operator, I would say, "Don't"—thus plagiarising "Punch's" famous advice to those about to marry. The broadcasting receiver trade is overcrowded and certainly does not require men trained as wireless operators, anyway. I don't know whether any of the well-known radio firms take apprentices, but I should think not. To D. R. I would say, "Try for the P.M.G's Certificate again." And good luck!

Another Spanish Revolution.

HAPPILY this new revolution is not political. It concerns the abolition of the existing order—of radio affairs in Spain. For the young Republic is planning to put Spain on the radio map in no uncertain manner, with stations at Barcelona, Bilbao, Corunna and Valencia, plus a whopper of 120 kw. near Madrid. The Madrid station is expected to work on 1395 metres and to "get over" to South America so that the Spanish American republics may hear the voice of their mother country.

SHORT WAVES.

"How do you like your wife's new wireless set?"

"Turned off!" snapped the husband.

* * *

One thrill that we always get out of both our new-style 'phone and our radio—we never know what we'll get when we dial.—"Judge."

* * *

We read that Sir Hamilton Harty, who doesn't like broadcasting, has presented his wireless set to his cook.

He'll probably like it still less if she starts making up some of the recipes which are frequently broadcast.

* * *

"6 Children: Joan and Betty's Bible Story—Paul returns to Jerusalem, from Cardiff."—Wireless programme in daily paper.

Who will blame him?—"Punch."

* * *

"Wireless in Public Houses. A Sobering Influence," runs a headline in one of the North-country papers.

And not only in *Public* Houses, either.

* * *

To-day's wireless appeal: John Bloop, missing since 6 p.m. Last seen entering Pig and Whistle. It is feared he may be suffering from loss of speech. Will anyone who knows his whereabouts please keep it dark from his wife.—"Pictorial Weekly."

* * *

How doth the busy B.B.C.
Improve the shining hour,
By putting people into touch
With men of verve and power!
"Punch."

British Cat Claims Priority.

MY note about the American cat which assisted an electrician to get a cable through a house by a channel where a man could not crawl has brought F. F. E. (Blackpool) into the arena prepared to contest the credit for the originality of the feat on behalf of a British cat, formerly resident in Blackburn. F. F. E. proudly states that one of his own assistants got a wire passed under the floor of a fried fish shop by the aid of this pussy, nine years ago. I have much pleasure in recording this evidence of the superiority of British cats.

The Inexplicable Wire.

A YOUNG relation who is retreading the path I trod years ago, and who is doing commercial radio in some part of Darkest Africa, writes to say that the replacement of telegraph wires by radio has caused the indigenous population to sorrow, because wire stealing, from the very poles themselves, had become a fine art, copper wire being to most Africans what nose powder is to European ladies.

But what the jet gentry cannot understand is why the white man can, by his black arts, dispense with wire for a thousand miles, and must yet use it to link the radio station with the Post Office in the town, some five miles distant!

Supreme Achievement.

ON April 21st Sir Oliver Lodge was presented with the Faraday Medal of the Institution of Electrical Engineers. In making the presentation the President of the Institution paid what I think is the greatest tribute possible in respect of a man's achievement. for he said that it would be superfluous for him to refer to Sir Oliver's work.

The great scientist, in returning thanks, remarked that it would be the last medal which he would receive, but we must all hope that he will, in this instance, be as unsuccessful in prophecy as he is renowned in science.

Bedtime Story.

A. H. (Croydon), who confesses that "P.W." has made of him a keen and successful listener to trans-atlantic stations, found that his listening followed him into bed and up to three o' the morning. (What a *fan*!)

This impelled him to devise a means of switching off his set without leaving the cosy bed, though I am bound to remark that the "rigour of the game" demands that one shall sit up and see it through, rather than lounge, long-distantly, luxuriously, and sybarite-like, upon and within one's nocturnal couch.

Beyond the Witching Hour.

HOWEVER, for the benefit of those who are Barkis in spirit but weak in the flesh, here is A. H.'s method.

You take the bell of a common alarm clock. One accumulator lead is connected to any part of the clock's case except the alarm winder; from the other terminal a springy piece of wire goes to the alarm winder and is so adjusted thereon that when the alarm "goes" at the appointed hour it "springs" off the revolving winder and breaks the L.T. circuit. Now, what about a device for switching off "mains-driven sets," eh?

ARIEL.

THESE RADIO COMPONENTS

A COMPLETE AND CRITICAL REVIEW

THEY tell me only one-third of the population of Great Britain and Northern Ireland uses electric light. We are, I suppose, among so-called first-class Powers, greatly behind in this respect. We have now largely socialised electricity, and there must be soon a great increase in the percentage of consumers.

How silly it is not to have electricity if it can be afforded. I know of a man who lives in Yorkshire, near a big town, who for £29 a year lights and warms his house, cooks his meals, keeps his bath water hot, dries his towels, and his clothes and runs his wireless set all from electricity.

I can understand the conservatively minded sticking to the absurdity of freezing his back while he overcooks his front because a fire "looks so comforting" (savagery will out!), but I cannot understand anyone *wanting* to use batteries to energise a wireless set if he could easily get the mains to do it for him.

Thanks to the Trade.

But some are forced to use batteries, and we must congratulate and thank the accumulator and dry battery manufacturers for all they have done in the way of development, realising meanwhile that they have done pretty well by someone else's failure to provide us with electric power "laid on."

Of course, if I lived in a town where there was a rediffusion or wireless relay scheme going, and I hadn't got mains, I wouldn't hesitate for a moment—the battery man wouldn't get any of my money. If it wasn't for the fact that our B.B.C. programmes are really becoming intolerable, I would take a rediffusion service in any case.

Even then, I'd take a rediffusion service if I got some good foreign programmes as an alternative. But this is about batteries, and I'm just saying in all this that I wouldn't have a battery at all unless I was forced to.

Because, as I've said under "eliminators," to get really good quality you want 60-70 milliamps at 200 volts before you begin to feel safe and nicely within the stride of the music and the speech. And batteries run down too fast at 60-70 milliamps—too fast, that is, for my pocket.

BATTERIES

Continuing his special series, our Radio Consultant-in-Chief deals with the power supplies of radio sets, with particular reference to H.T. batteries.

While I favour sets designed with plenty of valves and small gain per stage and stability and robustness, I could not indulge my fancies if I had to use battery H.T. power. Yes! I could use wet accumulators and for experimental work have done so, but have always found that they didn't last long enough.

No, it seems sane to economise in the set and look out valves with the lowest possible anode consumption consistent with sufficient power.

It is here that valves such as the pentode types are valuable. True, the pentode distorts usually more than that allowable 5 per cent in voltage; true, the high-frequency valve is probably too much "mu" and too little effective "mu" and too much instability and too little reliable work. And then the detector, to work with a really straight characteristic, wants 200 volts and 6 milliamps (about). But compromise and compromise, and thank heaven the grid leak reduces the feed by the signal.

One Hundred Volts H.T.

I believe that a set can give quite fair results with a 100-volt battery provided we use choke capacity (or transformer) low-frequency intervalve coupling. It's no use thinking of very loud undistorted signals, though; you just cannot get them. It's no use hoping for push-pull; it's too wasteful in accumulator power chiefly. But if you are content with a small room signal, go to it, and good luck.

About the "care" of accumulators. Test both your H.T. and L.T. if you can afford it (and heaven knows I sympathise with you over the cost of anything good); get something with a decent factor of safety. Of course, there's a limit to what we can carry—the limit being just about the weight of a portable set—but I think something in the 20-ampere-hour range is worth while whatever the consumption.

It is rather a good idea to have those tell-tale things which indicate whether the accumulator has been properly charged or not, and to keep a log to know whether you are getting proper battery service.

Check the Charging.

For instance, if you have a 20-ampere-hour accumulator and your set takes 2 amperes (you can find out how much it does take from the valve catalogues) and knowing your valves, then the accumulator should last $\frac{20}{2} = 10$ hours.

If it doesn't, there's something wrong, and that something may well be that the man who has charged the accumulator for you has taken it off too early. I do not say that all accumulator people do this. But I think it is fair to say that the temptation to do so exists, and that not everyone resists the temptation, and that there *is* a way of checking.

An H.T. battery can sometimes be kept going a bit longer by exploring its exposed innards with a voltmeter (preferably while the set is working and the battery discharging) when, testing cell to cell, it may be found that two or three out of all the fifty or so are dud.

Take these sad boys and short them out. That will kill them for ever, and allow the healthy cells to go on pushing out current through low-resistance "shorts" rather than high-resistance dead cells. I should never advise anyone to do this with a *wet* battery—in a wet battery take the cell out unless it is permanently soldered in.

By the way, if you have D.C. mains, some people use them direct, others charge a battery H.T. accumulator from them. I should always use the mains even down to 100 volts if I just wanted an ordinary result. I should know that for louder and better results I should either (and preferably) have to buy a rotary converter (a machine to run 100 volts D.C. into A.C., costing several pounds) or use H.T. accumulators charged from the mains.

ALTERING AERIAL INPUT

An article which tells you how to increase the programme-pulling powers of your set at times when the B.B.C. stations are not working.

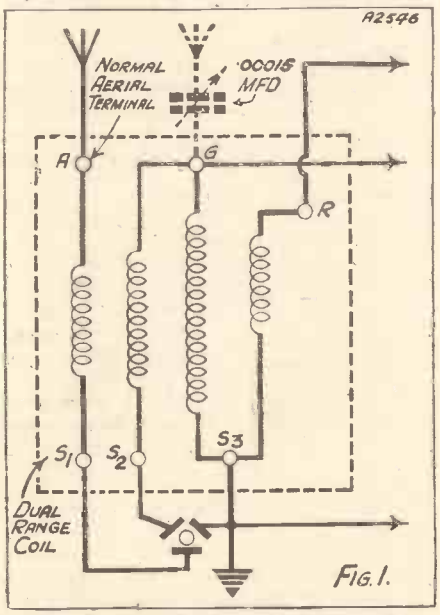
By FRANK BRIGGS.

IN these days of high power and closely crowded stations the cry is for more and more selectivity. But it is a well-known fact that as the selectivity is increased, the H.F. input (for a given transmission) to the first valve is decreased. The amount of this decrease, of course, varies with different types of circuits. But nevertheless it is there.

A simple illustration of this can easily be effected by joining a small capacity variable condenser, about ·0001 mfd., in series with your aerial, and noting the effect as the capacity is gradually reduced. As the knob is turned towards the minimum position the tuning of stations will become sharper, but at the same time their strength will be reduced.

In many cases this reduction is no disadvantage, for it is better to receive a distant transmission at only moderate strength than have the receiver adjusted to its most sensitive condition and get half a dozen programmes at once. There are, however, certain circumstances in which extreme selectivity is not required.

IMPROVING LONG WAVES



If you have an old dual-range coil in your set, and you want a little less selectivity but more volume on medium waves when the B.B.C. stations are not working, try shifting the aerial lead as indicated above. This arrangement often has the effect of improving long-wave results as well.

When the Ether is Quiet.

Take, for instance, the before-breakfast period. Not that there are many readers who indulge in "knob twiddling" at this hour, but doubtless there are a few.

Then there is that peaceful period on Sunday mornings when all good station engineers are at church. And last, but by no means least, there is the listener whose "local" is fifty miles or more away.

Many commercial receivers are provided with two or more aerial terminals to suit the selectivity requirements of various localities. And in this short article I propose to outline a method whereby this scheme can be applied to home constructed sets.

The Alternative Connection.

Fig. 1 shows the essentials of a detector circuit employing the famous "P.W." dual-range coil. When this well-known coil is used the aerial is coupled to the tuned grid circuit through a small untuned inductance. The size of this coil was chosen to meet average conditions, and in most cases it will want a lot of beating.

Now if you look at this particular circuit again you will see that a second aerial arrangement is possible. It can be connected direct to the top end of the grid coil through a small variable condenser. (The connections are shown dotted so as not to confuse them with the ordinary wiring.)

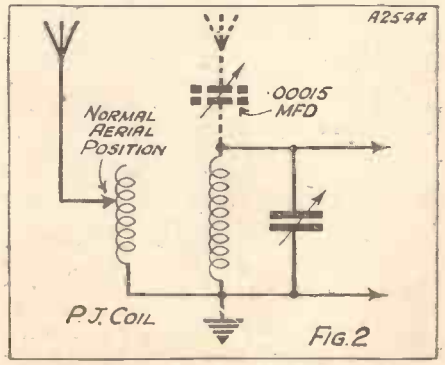
This is purely an addition, and there is no need to alter any of the normal connections. On occasions when the full selectivity is not required, such as those mentioned previously, the aerial can be joined to this additional terminal. This has the effect of bringing the aerial on to the tuned circuit and enabling tighter coupling to be obtained.

Value of Series Condenser.

The condenser should have a capacity of about ·00015 mfd., or in cases where a small outdoor or indoor aerial is used it could be very well increased to ·0003 mfd. With an average P.M.G. aerial about 70 feet long a condenser of the first type would be better, with the vanes about halfway in.

At times when interference is not bad, such as when the British stations have closed down, connecting the aerial in this manner will improve the pulling powers of the set tremendously. The exact setting of the series condenser will have to be found by experiment; but, after all, this is not a very difficult job.

MORE VOLUME



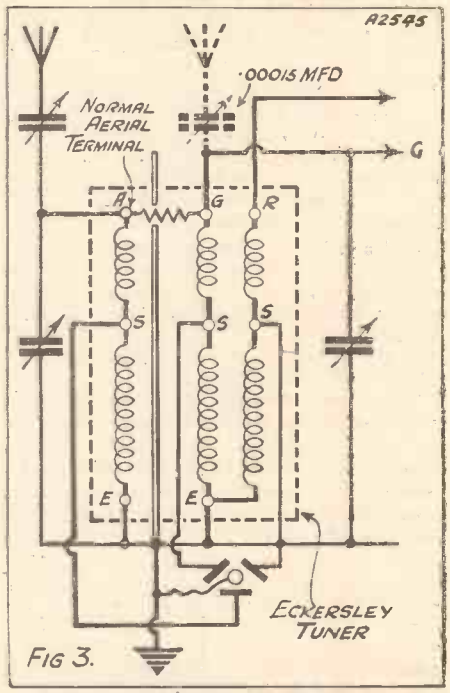
This shows how the same scheme as Fig. 1 can be applied to the famous P.J. coils. Just move the aerial lead to the top of the grid coil, through a small variable condenser, and you will be surprised at the difference.

This scheme can be applied to almost any coil on the market, the exceptions being those that have already adopted it, and Fig. 2 illustrates how it could be done in the popular P.J. and P.V. series. Then in a few cases it might even be tried with Captain Eckersley's well-known tuner. This is clearly shown in Fig. 3.

About the Dial Readings.

There is one slight disadvantage to the scheme from the ordinary reader's point of view, however. That is, that as soon as the aerial is shifted over to the extra terminal, stations will not be found at their usual settings on the dial. This is due to the extra load created by the aerial, and as a general rule it will be found that the readings will be slightly lower. But the more the series aerial condenser is reduced in capacity, the nearer these readings will be to normal.

EASIER TUNING



Perhaps you have an Eckersley Tuner in your set. The idea can be applied to this coil in exactly the same manner, as shown in the above diagram. It will give you more volume, and also broaden the tuning which is sometimes useful if interference is not too bad.

All the foregoing remarks apply principally to reception on the medium wave-band, and although it may not always be so, it will generally happen that on the longer waves the normal method of connection will give better results. This is because of the higher impedance offered to the lower frequency currents by the small series aerial condenser.

Don't get these series condenser arrangements mixed up with that mentioned in the first part of this article. In that case the aerial was still connected to the normal aerial terminal, and serve only to illustrate how the volume was decreased as the tuning was sharpened.

In the schemes suggested here, the purpose of the condenser is to reduce the capacity of the aerial, so that it will not upset the tuning range of the coil to any great extent. The input is bound to be a little less, but this is made up for by connecting it to the top of the grid coil.

HOW WIRELESS DID ALTER HISTORY

BY Lt. Commander the Hon. J. M. Kenworthy R.N.

In his final article Lt.-Commander Kenworthy reveals, for the first time, how narrowly friction between the U.S. and Great Britain was averted by radio during the Great War. He also describes the parts played by wireless in the North Sea Campaign and in the combating of German Armed Cruisers and Zeppelins.

IN the previous article I described the wonderful secret work, for the most part even now unknown to the world at large, of a team of professors and scientists in worming out the secrets and discovering the keys of the wireless codes and ciphers of our opponents in the Great War.

But apart from this wireless blockade, for it amounted to this, the use of the ether played a great part in the campaign. Wireless led directly to the destruction of the cruiser "Emden."

Dodging the Patrols.

This notorious destroyer of commerce on the trade routes managed to escape from our cruiser patrols for some weeks at the beginning of the war, during which she wrought great havoc among unarmed merchant ships flying the flags of Britain and her Allies.

She was well handled; and in the vast stretches of the Pacific and Indian Oceans it was like looking for a needle in a haystack to try and locate her. The "Emden" coaled and obtained provisions among uninhabited islands from collier-transports and store ships sent to these secret rendezvous on a preconceived plan.

An S.O.S.

How long she would have remained at large it is impossible to tell. But her Commander made the mistake of attacking the lonely Cocos Islands in the Pacific. Here was a British wireless station, and the operator, although being bombarded, sent out his S.O.S.

Unbeknown to the "Emden" a convoy of Australian troopships bound for Europe was within less than a hundred miles. It was escorted by a couple of Japanese warships and the Australian cruiser "Sydney." The S.O.S. was read and the "Sydney" dispatched with all speed to the Islands, clearing for action the while. The "Emden" saw her coming, and made off as fast as her engines could drive her. But the "Sydney" had the legs of the German cruiser, caught up with her, and destroyed her with gun-fire.

So ended the career of this raider, encompassed by a wireless signal.

Radio Saves the Situation.

Of the general use of wireless in the Great War it is unnecessary to say much. Its utility is generally known. But one or two unusual episodes demonstrating its value will be of interest.

And in one of these episodes it lessened the danger of bringing America into the war, not on the side of Britain, but against her, because of the irritation felt at our blockade, and the damage it inevitably caused to American trade. For our blockade started at once, but the illegal and violent submarine blockade by Germany only commenced later in the war.

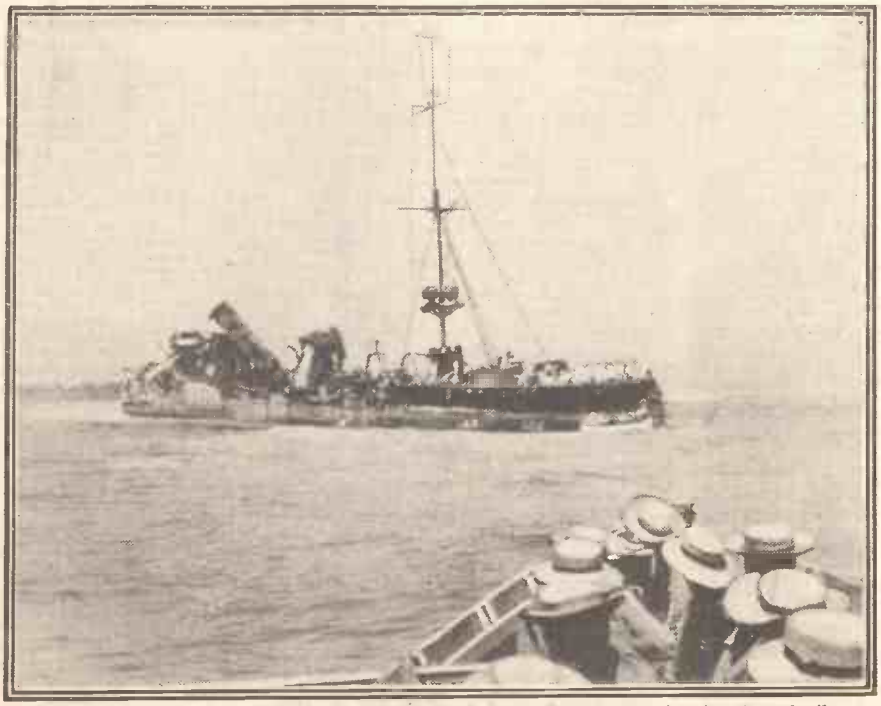
Opinion Changes.

Before Germany resorted, in desperation, to unlimited submarine warfare against merchant shipping, and alienated American opinon by sinking steamers flying the Stars and Stripes with torpedoes without warning, and drowning their American crews, there was much friction between Great Britain and the United States over our more regular and legal interruption of supplies useful for war purposes to the Central Powers.

More than once relations were so

(*Cont. on next page.*)

THE END OF THE EMDEN



One of the most noted of the German raiders after having been battered into impotence by the Australian cruiser "Sydney." Wireless led directly to this victory, as our contributor shows.

HOW WIRELESS DID ALTER HISTORY

(*Continued from previous page.*)

strained that there was a real danger of the United States declaring war not upon Germany but upon Great Britain. United States citizens desired to trade with all nations, our enemies included.

And they objected to our cruisers interfering with this trade. Cotton was one of those border-line commodities which we desired to treat as contraband but which the Americans, and the Southern States in particular, maintained was an ordinary raw material of peaceful commerce.

A Bright Idea.

In August, 1915, matters were nearly brought to a head by the dispatch of a steamer loaded with cotton from the United States to Bremen. If a British cruiser had seized her, every pro-German propagandist on the other side of the Atlantic would have shouted aloud. If we had let the ship go, she would have been followed by a fleet of others, and our blockade broken.

But there was warm sympathy for France in the United States. And the name of Lafayette was, and is, one to conjure with. So we hit on a bright idea. A French cruiser, fortunately called the "Lafayette," was attached to the tenth cruiser squadron operating between Scotland and Norway, and holding up all traffic for Germany.

THE RAIDER

A German airship crossing East Anglia on its deadly mission—the bombing of London.

The plan was to have the cotton-ship arrested by the "Lafayette" flying the beloved tricolour. But how to ensure this? The cotton-ship would be lost once she had cleared New Orleans, and we dare not "shadow" her. Wireless came to the rescue.

On the cotton-ship approaching the patrol line off Norway a signal was sent to the "Lafayette" ready waiting among the Shetland Islands. The English cruisers allowed the blockade runner through without interference, but only to be intercepted by our French ally to be taken before a French Prize Court. The great propaganda plot failed. The danger was past. Without wireless this arrangement could never have been carried out.

I must conclude with a description of the directional wireless stations and the part they played in the North Sea campaign.

A directional station, picking up a signal, can tell, within a degree or two, the line on which is the sending ship or station. Another direction-finding station can calculate the bearing from *its* position simultaneously. The two lines of direction plotted on a chart will show the exact position of the sender of the signal at the point of intersection.

For this reason, and knowing that our opponents had directional wireless, and also might be able to decipher our signals, the "silence" signal used to be made whenever the Grand Fleet went to sea. No wireless was allowed to be used except in case of emergency such as the sighting of enemy warships by a detached cruiser.

Locating the "Zepps."

When the German Zeppelins were flying to England to bomb our towns they could check their positions by making a signal which the German stations would pick up, calculate the position of the airship, and transmit it back to the Zeppelin commander.

But so could our wireless directional stations! They used to receive the "position signal," too. And they would pass on the information, obtained after plotting the Zeppelin's position on a chart, to our fast interceptor squadrons of fighting aeroplanes waiting ready on their shore aerodromes. Several Zeppelins were successfully located in this way, and eventually the Germans decided that it was too unhealthy to send any more.

In the same way, if German warships used their wireless apparatus at sea our directional stations could calculate their positions. And we could read their signals, too, as already described. Thus it was that the presence of the German battle-cruisers at sea was discovered prior to the Battle of Jutland.

Now the Germans played a trick on this occasion. Suspecting the efficiency of our Wireless Intelligence Service, they transferred the call-sign of their High Sea Fleet Flagship, a super-dreadnought battleship, to a small gunboat lying in the Jade River near the flagship's usual mooring place.

Deceiving Our Direction Finders.

The gunboat made signals at intervals and led us to believe that the German flagship, and therefore the German battleships, were still in harbour and that the cruisers were at sea by themselves.

When Admiral Beatty engaged the German cruisers in the historic action, he did not know that the German main fleet was near at hand. Fortunately, on this occasion, the Grand Fleet was also at sea and was informed by wireless of the preliminary cruiser engagement.

Admiral Jellicoe hurried up with the Grand Fleet, and it was now the German Admiral's turn to be surprised. For he suddenly found himself heading straight for the middle of the more powerful British Battle Fleet. Mist, smoke, torpedo counter-attacks and gathering darkness enabled him, it is true, to escape destruction.

But the High Sea Fleet never went to sea in battle array again over towards our coasts.

REVIVING AN OLD CIRCUIT

A READER'S EXPERIENCES

The Editor, POPULAR WIRELESS.

Dear Sir,—The article by Captain Eckersley on band-pass tuning, plug-in coils, peak-tuning and quality, so bears out my own experience that I cannot resist the temptation to "write to the press" (as represented by POPULAR WIRELESS) about it; and if, incidentally, it enables interested readers to obtain the step forward in the search for selectivity, volume and quality which so many desire, my "writing to the press" about it will not have been in vain.

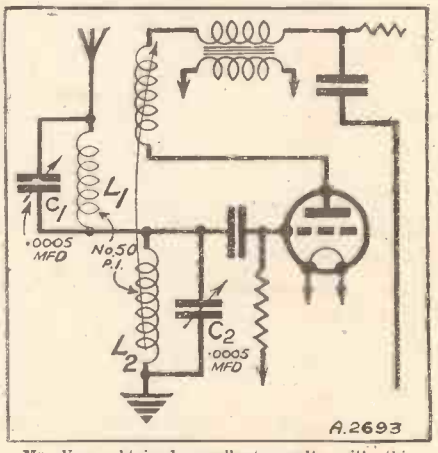
I use a straight three with plug-in coils, the detector being decoupled with the usual resistance and condenser, the transformer leading to the second note-mag. connected up "parafeed," and a large metal plate fixed to the top of my radio table (in turn covered by cartridge paper and then a fancy cloth to camouflage it) is connected to earth.

Having thus "tied the brute down," I then have matters so arranged on the side of the set nearest the lead-in that I can use aperiodic coupling (just four turns tied to the grid-coil), so that I can tune the aerial system by means of an inductance, so that I can use a simple tuned circuit by clipping the lead-in on the top end of grid-coil, so that I can auto-couple by clipping the lead-in on a terminal which goes to a tapping on the grid-coil—in fact, the whole contraptiou is so flexible that I can try out almost anything one could reasonably desire.

Now, as Captain Eckersley very truly states, you have to "learn to handle" such a set—you have to "learn to play on it" just as a musician learns to play on an instrument. If you want to get the best out of your own particular outfit, it is perfectly ridiculous to get fed-up and say "the set won't do it." Your set may be excellent and, perhaps, all the time it is *you*. Then, again, a flexible outfit calls for a flexible mind in the noddle of the operator, and this latter is a very important point, because we are so apt to condemn what appears to be a defect when it might be a stepping-stone in the right direction if utilised.

This being the case it may be interesting to consider how a very, very simple and apparently defective circuit may be used and be productive of rather surprising results:

PEAK TUNING



Mr. Vass obtained excellent results with this simple circuit.

At first sight we may expect C1 and L1 to constitute nothing else but a poor form of wave-trap, which simply confuses us by shifting about the peak tuning-point on C2. Quite so! But what of it? Why not utilise it? How? Well, if by increasing C1 you shift the peak tuning-point of the longer wave interfering local lower down the dial of C2, then on the top half of C2 stations from about Toulouse or Sottens up to Vienna or Budapest may be tuned in with the minimum of reaction (just keep her gently breathing) one after the other at good volume and with good quality. Then, by reversing the process, decreasing C1 until the shorter-wave interfering local has its peak tuning-point well up C2, we can go "on tour" round the lower half of C2, and that flat tuning we used to hit up against in the case of the shorter-wave local has disappeared!

The beauty of it is this—that once you have set C1 so as to leave a given half of C2 free from interference, there is then genuine one-dial tuning on C2 and no bunk about it, because there is no further need to touch C1.

Sincerely yours,
ERNEST H. VASS.

Kennington Cross, S.E.11.

The SIDE-BAND STRUGGLE

by VICTOR KING

An absorbing article by a popular contributor, with a long P.S. by "P.W.'s" Technical Editor. Is it another of those Dowding-King arguments? Well, Victor says of an inventor he mentions:

"But in advancing his claims he asked for, and got, the inevitable criticism, disparagement . . . and even derision! Some said the idea was as old as the hills, others that theory plainly showed it was impracticable."

On the other hand, G.V.D. gives it as his opinion that:

"If anyone has the temerity to suggest he has invented something which 'smashes existing practice,' then he must expect responsible scientists to tear the so-called 'new principle' to pieces in search of snags. That's their job, for they are the public's guardians against irresponsible claims which by their mere existence are liable further to ruffle the already troubled waters of economic progress."

So it does seem that THESE two experts are not quite in full agreement!

AT this very moment, rival factions of radio experts are engaged in a bitter struggle; although, in the main, the arguments are so academic that there is not much "meat" in them for the layman.

The war is being waged in the highly technical press, and one cannot help concluding that some fair proportion of the verbiage is pure pedantry.

It rather reminds one of the story of the two nineteenth-century professors who were fiercely arguing in a railway carriage as to whether certain microscopic particles, known generally as diatoms, were animal or vegetable in nature. For over an hour the worthy scientists simply boiled over with "isms" and "idiums," each trying to batter the other into submission by sheer weight of abstruse words. Finally, one of them turned to the third passenger in the compartment, a stranger who had been listening with puzzled awe, and said: "Surely *you* can see, sir, that I have convincingly proved that the diatoms belong to the Vegetable Kingdom in that I show ——" (and here followed a stream of technical data).

The third passenger wrinkled his brows.

What Did it Matter?

"Did I understand you to say as how these what-you-call-'ems is so small you can't see them without a microscope?" he asked.

"In many cases they are invisible to the naked eye," agreed the professor.

The third passenger thought awhile, and then delivered his considered judgment in the following words:

"Well, good sirs, if these things what you are argufying about is so small you can't see 'em, it stands to reason you can't eat 'em, so I don't see as how it matters whether they is vegetables or animals!"

And, if I had been there, I should have felt like saying "Hear, hear!" I'm not denying that there is great value in scientific controversy even in regard to abstract principles, but, all the same, I reserve my hat-lifting for that quiet kind of worker who disappears into a "hut on the moors" for a few years and then emerges with a new theory or a new discovery or a new technique, rather than for the hordes of vocal scientific publicists who will leap from their library chairs to try and tear it to bits.

These scientific wolves have two general methods of attack. One is to endeavour to disprove the originality of the idea or scheme, and the other to try and prove it is wrong or can't work.

We have many illustrations of both methods in the latest radio controversy. But many of you won't have the faintest idea as to what the "bone of contention" is, so I had better explain it.

A broadcasting station occupies more than one definite wave-length of ether space. Although the London National transmitter is officially listed at 261·6 metres, it is unable to confine its programme to just that wave-length.

In actual fact, it spreads a little above and a little below.

Side-band Spread.

The spread is occupied by what are called side-bands, and the wave-lengths of these bear a direct relation to the 261·6 metres. They are caused by the modulation of the carrier wave by speech and music frequencies.

If you could reduce this side-band spread you could squeeze more stations into a given band of wave-lengths, but you cannot do so merely by making a transmitter more selective, as it were, for that would merely result in cutting off speech and music frequencies.

But even when broadcasting stations are given tiny *bands* of wave-lengths to themselves, as at present, it is still difficult to prevent their side-bands overlapping for various reasons. For example, it is impossible to allocate anything but meagre bands to the individual stations and, what is more important, it is difficult to keep every station in its own band.

It has been proposed that a radio receiver should be made extremely selective and the loss in speech and music frequencies that results by so doing compensated for by tone correction.

The system has its strongest modern advocate in Dr. J. Robinson, whose Stenode is by now quite well known.

He claims that his Stenode is so selective that it hardly takes in any side-band wave-lengths at all, and yet he achieves good quality by intense L.F. compensation.

Disparagement

But in advancing his claims he asked for, and got, the inevitable criticism, disparagement—and even derision! Some said the idea was as old as the hills (comparatively speaking!); others, that theory plainly showed you couldn't carve off side-bands in such a summary fashion without ruining the quality of reception. But after demonstrations these latter altered their tune slightly and grudgingly admitted that passable results might be obtainable, but "look at the complexity of the apparatus—the difficulty of keeping broadcasting stations sufficiently steady in regard to their wave-lengths, so that they didn't wander in and out of the knife-edge Stenode tuning," etc.

The arguments have been going on for nearly two years now, and one wonders for how much longer they will continue!

I suggest it would be fairer to assess the value of such innovations mainly on their practical merits. If a man claims he can do something with new apparatus he has invented, I would invite him to give a practical demonstration.

If this were successful, then the next step would be to examine the apparatus for such qualities as reliability, economy, and so on.

Criticism of a purely academic nature ought to be punishable by law, for it has been the cause of killing the enthusiasm of countless inventors and the repression of innumerable brilliant ideas!

(*Continued on next page.*)

The Side-Band Struggle

THE OTHER SIDE OF THE PICTURE

A postcript by G. V. DOWDING, Associate I.E.E. (*Technical Editor*).

Mr. Victor King's readable article lucidly expounds some very popular sentiments, and in joining issue with him, I am quite aware that I am inviting the wrath of innumerable correspondents. However, he has given me the excuse to record in print certain definite views I hold, and I am going to seize the opportunity and take the consequences!

Reading between the lines of his contribution, one has no difficulty in discerning that his *motif* is the championship of the "struggling inventor." But it is my opinion that, in reality, the "struggling inventor" belongs to the nineteenth century, although he still lives in fiction and the press.

Worth-while discoveries and inventions do not emerge from "huts on the moors" or from garrets these days, but are born in well-conducted laboratories: and, if there do happen to be isolated exceptions, then these are merely the exceptions which prove the rule.

The reason for this "promotion" of invention is plain. At the beginning of the scientific industrial age in which we are now living, way back in the middle of the nineteenth century, or even earlier if you like, there was everything to find out and very few qualified scientists and technicians engaged in the finding.

Scientific Pioneers.

But, even so, remarkably few great scientific discoveries or inventions can be credited to "laymen." Your Lodges, Maxwells, Fessendens, Einthovens, Eversheds, Ferrantis, etc., were all skilled engineers and scientists (I confine my arguments to electricity and radio because I can claim to know a good bit about these).

It is true that the majority of these pioneers had great difficulty in convincing their contemporaries of the value of their work, but the same tardiness of recognition is not, in my view, the lot of the modern research worker and inventor.

It is my experience that modern men of science and industry are only too willing to listen to anyone who says he has something new to impart or show. And I use the term "too willing" advisedly, for there are times when one is amazed at the gullibility of men whose scientific training should have taught them better!

There are, it is true, minor mathematicians who seem to delight in destructive criticism, but no one pays much attention to them.

Open discussion and *constructive* criticism are all to the good, and an inventor should welcome them if he has the courage of his convictions.

And now let us take a quick peep back into the history of radio. What are the great radio inventions of the past twenty years? The three-electrode valve stands out, and then there are, perhaps, neutralising and the screened-grid valve. But these were rapidly absorbed—and you can find no picture of a "struggling inventor" fighting for his just dues there; rather is there a vague picture in one's mind of wealthy scientists fighting patent actions in the high courts!

Leaving aside *great* inventions, what of the hordes of very useful minor inventions which accompany the development of radio like a cloud of locusts? Looking through my patent records I find that the vast majority of these are due to well-known industrial corporations, their employees, and independent but well-known engineers. I fail to see many unknown "Harry Smiths of Tooting" and "Jim Joneses of Bradford" in the lists!

But what exactly constitutes an invention? I fear the popular idea is that it is merely an elaborate excursion into ingenious mechanics. An "engine" of complicated construction which will do several jobs at once seems to be the best candidate for newspaper honours in invention.

MARCHESA MARCONI

A charming new portrait of Marconi's wife.

The blunt truth is that any engineer with the slightest imagination can fashion weird and wonderful instruments, but he knows, or ought to know, that although they may have novelty appeal, their intrinsic value to the public and the industry which serves it will be mighty small if they can claim no other qualities.

On the other hand, the radio industry is able to absorb *worth-while* ideas almost as quickly as they come along.

During my ten years as Technical Editor of POPULAR WIRELESS I have received the confidence of hundreds of would-be inventors, but it is notable that I have not yet encountered one who had anything valuable to sell. I never rely only upon my own judgment in such matters. Even though an idea seems to me to be quite hopeless, I always, with the inventor's ready consent, pass it on to one of my trade friends, and I have many who are just as eager as I always am to find something that is really worth-while in the way of a new radio gadget, idea or system.

The Inventor's Viewpoint.

There is little demand in this modern age for things that are merely spectacular, or have nothing but mechanical ingenuity to warrant their claim to "newness." But there is an assured welcome for devices which will do their work better and cheaper than anything else of a like nature.

Let me now write as an inventor in order to illustrate the truth of all this. During the last fifteen years, I suppose, I have taken out well over one hundred patents.

The first thirty or forty are mainly of a highly ingenious nature, and I well remember how I used to burn with indignation when they were turned down, nearly all of them, by what I considered to be "blind, unimaginative men of business."

But I didn't know as much about such matters as "costs of production," "public demand," etc., as I do now. It seemed inconceivable to me then that merchant princes did not cluster round me like flies and fight for my "brilliant" ideas!

My latest invention (patent applied for less than six months ago) is easy to produce in mass-production and simple in conception. But, and these facts are right to the point, it does do something which no single device could do before, something which the public wants done, too, and it can be sold cheaply.—Result, there was no need to hawk the idea round—I was able to pick my manufacturers. I mentioned it almost casually to them, they immediately snapped it up and within two weeks the device was on the market selling like smoke.

I don't claim either that it is a "marvellous invention," or that it was the result of inspiration. But it has cost me a proportion of the hundreds of pounds I've spent on patents before learning what constitutes a "commercial" invention.

Its catalogue price is under ten shillings, and I have no bitterness in my heart against the public for not more readily lapping up my last-but-thirty (I think it is about that) idea—the first and still, I believe, the most ingenious, spectacular and best home talkie! The public has a right to know what it wants!

An Actual Example.

I, too, have experienced the peculiar honour of being the centre of scientific discussion the world over in respect of a "new principle," but I look back at that as one looks back at one's first circus or pantomime. Anyway, what I say is, if anyone has the temerity to suggest he has invented something which "smashes existing practice," then he must expect responsible scientists to tear the so-called "new principle" to pieces in search of snags. That's their job, for they are the public's guardians against irresponsible claims which by their mere existence are liable further to ruffle the already troubled waters of economic progress.

Here is an example of what has actually happened. When television was widely announced as "here at last" in the United States, the sales of radio receivers fell off alarmingly, for the public decided to buy no new ordinary sets, but to wait for "television" models. If they had continued to wait the radio industry in the U.S. would have been at a standstill during the past five years.

Fortunately, still, small voices of responsible scientists were to be heard through the roar of "ballyhoo," scientists who asked awkward questions. But, even if he speaks only quietly, the scientist can command cool reasoning and commonsense which are being appreciated more and more by the man-in-the-street—and the man-in-the-street is not a bovine illiterate—he's you and I.

Well, this has been a long P.S. and it has wandered far from the issues raised by Victor King in his article, but I think I have made my points clear!

STATIONS WORTH HEARING

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

THEY are still coming in! By "they," of course I mean foreign wireless stations. If you want to make an interesting little test just now, you can do so during the early afternoon of any but a thundery day. Set your tuning dial or dials down near the zero mark. Put your wave-change switch over to "medium" and turn on the "juice."

Then make a slow search over the "broadcast" band and I think that you will be surprised at your bag. The exact stations receivable will naturally depend a good deal upon your locality. If you live in the North you will hear the Scandinavian stations better than the Italians, whilst should you abide near the East Coast you will obtain better reception from central European stations than will be the case if your home is in Wales or Cornwall.

The New Paris P T T.

There are some big fellows, though, which seem to be receivable in most parts of the country by daylight. Amongst these are Stockholm, Rome, Langenberg, Hilversum and Heilsberg. And there is another, who has just come on the scenes; this is the new Paris P T T, a station that I can recommend to your attention for either daylight or after-dark reception.

Until quite recently Paris P T T was only a 1·2 kilowatter, and he shared a wavelength with another P T T station, Grenoble. The result was that neither was very powerfully received and you couldn't obtain good reception unless one or the other was silent.

Now we have a 50-kilowatt Paris P T T, who has the wavelength to himself, for Grenoble has moved to about 570 metres. The wavelength of Paris P T T is 328·2 metres, and that part of the band should provide in a few months a particularly good test for selectivity. On the two next-door channels are Breslau and Milan, each of whom will soon become a super-power station. The set which will pick out any one from the other two won't be bad!

Some weeks ago the Scandinavian stations were not too good. There has been lately a distinct alteration and I have had good reception from a number of them. Those that you should try for if you have not recorded them for a while are Horby, Gothenburg, Stockholm, Oslo, Kalundborg and Motala. Also look out for Falun on 307 metres—I have heard him very well on several recent evenings.

Taking them all round, there is a very distinct improvement in long-distance conditions, instead of the falling-off that might be expected with the approach of high summer. Here, for example, is a list of stations from which I have recorded much better reception during the past few days than for some little time: Berlin Witzleben, Belgrade, Brussels No. 1, Budapest, Bordeaux and Toulouse P T T.

There are a few, too, which are not quite so good as they were. Beromunster is one of these—his troubles are mainly due to heterodyne interference. Lwow has been showing rather more weak nights than he did, and I haven't during the last week or so had really good loudspeaker reception from Vienna.

Vienna on Long Waves.

The Vienna experimental station on 1,237 metres does not seem to be working quite so frequently as he was; perhaps he has to close down at intervals for circuit alterations during the tests. When, though, he is good he is often very good indeed, and I would recommend you not to neglect this wavelength when on the long-waves.

Amongst the very best of the medium-wave stations at the time of writing are Florence, Prague, Brussels No. 1, and Langenberg with Rome, Stockholm, Katowice, Frankfurt and many others.

R. W. H.

SHORT-WAVE NOTES

News and views regarding an exciting and fascinating wave-band.

By W. L. S.

MY incurable optimism has led me astray! In spite of repeated prophecies that "conditions will be good by the time you read this," they are still as bad as ever. Of course, by the time you read *this*—— But no—I'll leave it unsaid!

For those who like to enter a little competition I am asked to give details of a private contest that is taking place next week-end (May 22nd). On that day, from 00.00 till 24.00 B.S.T., our two friends, F. N. B. (Cheshire) and M. S. (Harlow), are trying to do each other down. Stations logged are to be amateurs on telephony only; wavelengths between 0 and 200 metres. The two logs are coming in to me for judging, so that if any others care to send theirs for the same period to me, via the Editor, I shall be able to tell them if they have beaten the champions.

Kootwijk Calling.

F. J. F. (Raynes Park) administers a mild castigation to me about my one-valver. He says there is nothing "hotted-up" or original about it—and, in short, that he is surprised at me for having the audacity to describe such a contraption!

The trouble is, F. J. F., that you expected a "contraption" and are disappointed to find a receiver that is conventional in appearance. The "One," as described, is what I would call a "mild" version of my own rather "hotted-up" single-valver.

Designers of racing-cars find out useful things with them, which are passed on to the public as improvements in their standard touring models; give the public the racing cars and they might not be able to do anything with them. Do you follow the analogy?

M. S. gives me the first details that have yet reached me of a new transmission just below G 5 S W-P D V (Kootwijk. Holland). He is tremendously strong—I have found him myself since—but is apparently only in the testing stage as yet.

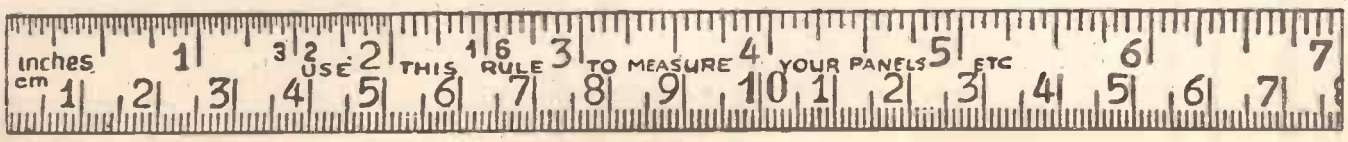
I see from the latest issue of "QST" that the Americans have pushed ahead with 5-metre work to very good purpose. Tests between a 'plane and a number of ground stations have resulted in communication on this wavelength over a distance of 115 *miles!* This, of course, somewhat upsets the apple-cart, as far as our previous theories are concerned. True, no such range seems to be possible between two ground stations, although they were situated on the tops of mountains and on tall towers.

It has always been said that 5 metres—and, to a lesser extent, 7 metres—is almost a "visible" wave. If you can see the other fellow (although you may need a telescope to do it), you stand a chance of hearing him. But if there are any blind corners, hills, buildings or obstructions of any kind in the way, it is a different matter altogether.

Super-Regeneratives Again!

Incidentally, the only good receiver for 5 metres appears to be a super-regenerative. In case this should conjure up visions of the fearsome Armstrong circuit to any old-timers who read this, let me add that "super-regens." have been much improved and much tamed since the old days. I am on the point of trying one out for 5-metre work myself, and will pass on anything interesting that arises from the experiments.

Quite as an aside, I find that J. W. B. (Bretton) has written me about the super-regenerative receiver for general short-wave work. He finds it excellent, and remarks on a point that struck me when listening to one—that even ultra-short-wave tuning seems quite *broad*. No, J. W. B., I can't think of a method of using my S.G. receiver as an Armstrong at the moment.



FROM THE TECHNICAL EDITOR'S NOTE BOOK.

Tested and Found-?

INEXPENSIVE H.T.

IT is curious how the modern H.T. battery has developed into a kind of self-advertisement. I regard this as an expression of trade confidence. Some of you may remember that the earlier H.T.'s were merely plain black and blue boxes, with plug-holes disposed in tarry black masses at the tops.

But, nowadays, the H.T. battery is blatantly, almost joyously, labelled all over as though it were permanently entrenched in its own carton.

A GOOD BATTERY

This new Pertrix H.T. battery is passing its "P.W." tests in an admirable manner.

Look at the above photo of an H.T. battery recently introduced by one of our most prominent advertisers. One glance at that photo and you know all about this particular accessory—its make, type and price.

It is, indeed, obvious that Pertrix are not following the "sell and forget" policy, and that, on the contrary, they are determined that their customers shall have a constant reminder of the origin of the accessory.

Not that this is anything but good salesmanship, for Pertrix batterics are first-class and do not need to hide their lights under a bushel of black tar!

That new Junior model shouts "I am a Pertrix and not ashamed of it."

As I have said before, we have used many "Pertrix" batteries in the Research Dept., and so far no one has ever let us down. We have one of the new "Junior" types on test at the moment of writing, and we are finding it to be well up to "Pertrix" standard.

And inasmuch as it gives you 120 volts for 11s., it is very good value for money. Finally, it is "Junior" in the Pertrix range, but that must not lead readers to think that it has less capacity than the average "standard" type, for it has not. Its name gives, I venture to suggest, something of a wrong impression of its qualities.

PREVENTING DIAL SLIP.

In referring to a recent article on the above subject, which appeared in "P.W." a few weeks ago, Messrs. H. Clarke & Co., Ltd., draw our attention to a knob of theirs which entirely overcomes the trouble.

There is no grub screw; you file a flat "face" on the spindle, push the knob on and it "stays put" with no possibility of slip. It is a sound scheme.

NEW "MOTOR" LOUDSPEAKER UNIT.

I have received details of the new British-made "Motor" loudspeaker unit. It is of the balanced armature type, and appears to incorporate some excellent features.

VARLEY SUPER-HET COILS.

Messrs. Varley are now in production with "Square Peak" Super-Het Coils. There are three models, viz: Single Control Aerial, Single Control Oscillator, and a Three-ganged Unit on base, in which the two preceding coils are incorporated, together with an H.F. transformer. The price of this complete unit is 30s.

THE VARIO CHOKE.

Sovereign are on sure ground with their new Vario Choke. It is a device which fits into modern set-designing requirements, as it combines in the one article the functions of two separate items which are in frequent use, viz., an H.F. choke and a variable feed control enabling amplification adjustment easily to be made.

Alternatively, the Vario Choke can be employed as a *Vario* H.F. choke to give the same effect in certain circumstances in the strictly literal sense of the words.

It has further uses, such as H.F. "stopping," so altogether it is a gadget which constructors should enthusiastically welcome, and especially as it costs only 3s. 6d., which is not a high price for nothing more than an H.F. choke of ordinary qualities, let alone a versatile, combination article.

There are three terminals on the component and one of these is shared by the H.F. choke and the adjustable condenser. One each of the other two terminals serves the respective "free" ends of the condenser and choke.

So you see, either of the two sections can be employed separately by the experimenter if he so wishes.

We have used Vario Chokes in several different manners, and find it fulfils its functions with high efficiency, either as simply an H.F. choke or in its special applications. It is particularly useful in an H.F. inter-stage position, when its control of amplification enables a high performance to be obtained with complete stability.

WORTH SENDING FOR.

Tunewell Radio have published a folder which they entitle The Tunewell "Guide To Super Radio."

It is a very well designed and printed publication and it should strongly appeal to constructors in that it embodies eight useful circuits, including a Band-Pass All-Mains Three, in addition to full details of a very interesting and useful range of radio components. This Tunewell folder is available, post free, to all who care to write for it.

PLEASE NOTE

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

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

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

AN INDOOR AERIAL.

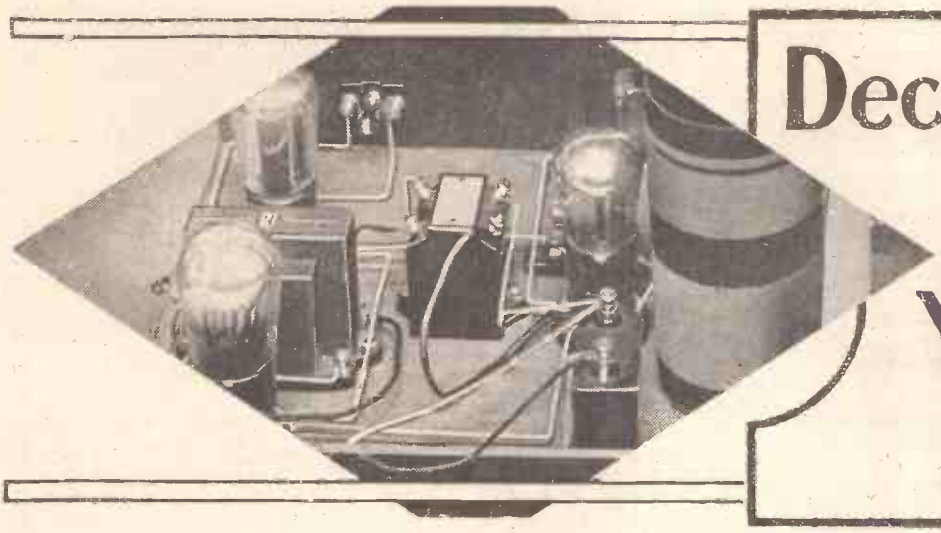
Those readers who are unable or unwilling to erect outdoor aerials will be interested in the Braided Indoor Aerial made by Melbourne Radio. This costs only 1/6, and comprises a thick, very softly pliable braided material, with insulating hooks at each end and a terminal for connecting purposes.

It is about seven feet in length. I like the colouring—it is a kind of "old gold," and I also consider it has a good pick-up for its length.

Of course, much of its efficiency depends upon its location, and the higher in the house it is fixed the better the results. Personally, I think it could be a little longer with advantage.

A VERSATILE COMPONENT

The Sovereign Vario Choke has several very useful applications, and is an inexpensive device.



Decoupling for Your Set

A snappy article that tells you how motor-boating, L.F. howling or instability can be mitigated by the use of decoupling.

By H. A. RAMPTON.

DECOUPLING often improves the performance of sets employing L.F. stages, as it prevents any tendency to L.F. oscillation. Actual oscillation is indicated by motor-boating or by a squeal, the pitch of which does not alter with the tuning.

Oscillation can, however, and often does, occur with no other indication than a distorted or rough tone from the speaker. Sets operated from a mains unit are more prone to this trouble than battery ones, though a battery which has been in use for some time is a frequent offender. Decoupling may, therefore, make your H.T. batteries useful for a longer period.

Output Stage First.

In general it is best to "decouple" the last valve first. How is this done? It simply means that you should use an output filter consisting of either a transformer, or of a choke and condenser, the choke being a 20- or 30-henry one for power valves and about 50 henries for a pentode. With the latter a tapped winding is best, as you can then choose the most suitable tapping for the speaker, but a centre-tapped component will be satisfactory.

With a pentode the lead from the condenser should go, not to the valve anode, but to the centre-tap on the choke. The alternative method of using an output transformer is equally satisfactory, but you should obtain one to suit the valve and speaker used, or else a multi-ratio transformer.

JUST TWO COMPONENTS

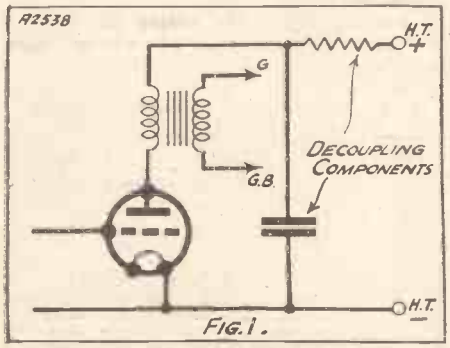


FIG. 1.

A simple spaghetti resistance and a fixed condenser are all that is necessary to decouple the detector valve's H.T. circuit.

Of course, decoupling the output valve circuit by means of a choke or transformer is more expensive than using a resistance to decouple an earlier valve, but it is well worth the extra money.

Among the advantages in addition to those mentioned are the prevention of direct current from passing through the L.S. windings. the ability to connect the speaker leads either way round, a slightly greater H.T. voltage available at the anode of the output valve, and the simplification of extension leads for the loudspeaker. This last is because these leads no longer have to carry the H.T. current.

If your set is still unsatisfactory with this addition, the detector valve should be the next to receive attention. In this case the decoupling components are used solely for this purpose, though in a receiver operating from a mains unit they may assist in reducing hum and in dropping the voltage to that suitable for the valve.

Resistance Values.

If you have no surplus voltage you should try a value of 20,000 ohms with a condenser of 1 or 2 mfd. (See Fig. 1.) This should effect a considerable improvement. You may have to put up the voltage for the detector, but no more current will be drawn from your batteries than formerly.

Using a decoupling resistance of 10,000 ohms may in some cases be satisfactory, and then not so much voltage is dropped. On the other hand, with this value of resistance it may be necessary to increase the value of the condenser to 3 or even 4 mfd. to obtain appreciable benefit from the scheme.

The same values will be satisfactory for an intermediate L.F. stage. For an H.F. stage it used to be thought that a resistance of only 600 ohms would be sufficient, as it would effectively prevent the H.F. currents from feeding back.

The value given was, however, quite wrong, as we have since realised. Not only is it necessary to keep out the H.F., but the L.F. as well. Thus the same values as used for the detector and L.F. valves may be used. In addition the value of the condenser needed may be found to be somewhat less, 1 mfd. often being adequate.

Not only are anode circuits decoupled in modern sets, but if you use "free G.B." or obtain your grid bias from a mains unit, it may be found advisable to decouple the *grid* circuits as well. Here we are up against an easy proposition. We can use any value of resistance we like because there is no direct current flowing through it! For the same reason we need not use resistances of the wire-wound type if we do not wish, as the grid-leak pattern will be perfectly satisfactory.

Improving Quality.

Again, since the larger the value of the resistance the smaller need that of the condenser be, we can use a small condenser, with a consequent saving in cost. In Fig. 2 there will be seen the connections for a valve using "free G.B." with decoupling added to the grid circuit. With an output valve, the best values have been found in practice to be 100,000 ohms and 1 mfd. condenser. However, a ¼-meg. grid leak can be used for the resistance without upsetting the performance.

A final point: for decoupling the screened grid of an H.F. valve, *always* use a *non-inductive* condenser. A capacity of 1 or 2 mfd. will be needed for the purpose.

IN THE G.B. CIRCUIT

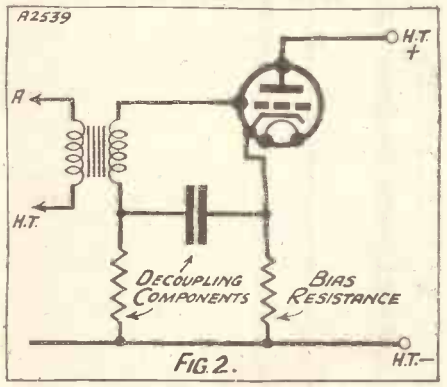
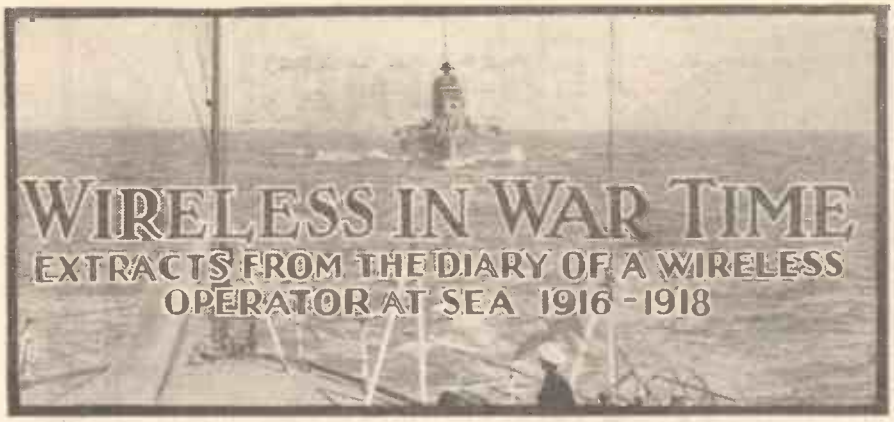


FIG. 2.

In mains receivers employing automatic grid bias it very often improves quality to decouple the grid from the anode current fluctuations.



FEBRUARY 1ST.—Yesterday evening we had another war warning which made us all jump, as our destination lies just about where the submarine was reported to be. Here's the message: "To all British Merchant Vessels. de G. C. K. (Crookhaven). Submarine sighted 16 miles west of Smalls 5 p.m. 30th. Also 30 miles S.S.W. of Start 9 a.m. 30th. Submarine active 2 p.m. 31st. Latitude 51° 16′ N., 8° 55′ W. Also active in vicinity of Longships. Ships for the Clyde are not to pass eastward of Ailsa Craig. Ships for Weymouth Bay to ask for instructions from local patrol vessels." Message ends.

Quite a little surprise packet for the captain. He has already lost one ship in the Pacific, so naturally he's nervy.

Off the Irish Coast.

FEBRUARY 2ND.—Sighted the Irish coast early this morning. Two or three fresh war warnings received in the cabin—one, a submarine seen 2 miles off Fastnet yesterday evening. We passed Fastnet and Crookhaven an hour ago, so we are O.K. However, a little while ago somebody thought he must be funny, and shouted: "Suspicious craft starboard."

I ran out on to the bridge and there, sure enough, was a long, silver kind of streak some distance away, but looking rather like a submarine. The captain yelled out "Hard a' starboard," but all for nothing, as it was only one of our own cruisers which had caused a reflection by the sun.

Submarine Activities.

FEBRUARY 4TH.—Sighted the shores of Pembroke this morning. The Excise officers were aboard yesterday, and told us that over 600 merchant vessels had been sunk by submarines during 1916. It is reckoned the Germans bag 12 a week on the average. Later: We have just passed quite close to Lundy Island.

Have sighted Hartland Point, Devon, but I could not make out Ilfracombe or Woolacombe.

Later: Just received a message *re* a submarine reported to be chasing a transport off Land's End. Also, a report of another submarine seen off Galley Head. This morning I picked up a message from the land station G L D answering an S O S sent out by some ship which had been fired at by a submarine in the Channel. 7 p.m. Just picked up another S O S.

The submarine reported off Galley Head earlier this morinng has torpedoed a boat, and the ship is now sending out a call for assistance. The message I picked up began: "S O S," gave the name of the ship, and then ran: "Torpedoed off Galley Head." The S O S was repeated until an answer was received from G L D. A battleship also answered her call.

Sheerness at Last.

FEBRUARY 7TH (8 p.m.).—We have anchored off Sheerness. As I write there is an insistent boom of big guns from the other side of the river. I wonder whether it's naval target practice, or what? About a dozen searchlights keep playing across the water. The scene in many ways is a unique one, especially when a searchlight turns an inquisitive eye upon some large ship. We have an armed guard of marines aboard now under the command of Captain "——" R.N.R. He's the biggest swanker I've ever met. He somewhat resembles Ferdinand of Bulgaria in appearance. The pilot has warned us to expect ructions when this particular chap came on board. He is a blustering, go-ahead sort of fellow, and comes into the saloon like a whirlwind. "Good-morning, good-morning, gentlemen Good-morning, gentlemen all," is his usual opening.

FEBRUARY 9TH.—We were paid off from the ship to-day, and I am going up to London to report for duty again. This has been a queer, yet interesting trip, and I am wondering now what sort of ship I shall be sent to next.

On a Prize Ship.

[EDITOR'S NOTE.—The writer of this diary was eventually transferred as operator-in-charge to a captured German vessel operating under the orders of the India Office and the Admiralty. For obvious reasons, it is again necessary to suppress the name of this ship. and also the names of the various individuals our diarist met while serving abroad the ship. The diary continues as follows].

On board H.M. Prize Ship "——" March 23rd, 1917.

In the first five minutes after going on watch to-day I picked up two S O S calls from torpedoed ships off Prawle Point. We have one or two Government official passengers on board, and one or two military men. Our final destination is Basra, Mesopotamia, but we are now making for Alexandria.

MARCH 24TH (7 a.m.).—I am jotting this down in the lull of the excitement, for we are "doing a bunk" from what the Chief Officer calls "a ruddy tin fish." I have informed the wireless station at Lands, End of our position, just in case we "got the bird."

It all started about half an hour ago, with the firing of the 4·7 gun on the poop, and the shouts of the lascars as they swung the boats clear of the davits. In a flash I was out on the boat deck and, staring carefully astern, I could see the submarine quite clearly, cutting the water in a long wave.

The gunners managed to get in about two rounds before she submerged, and for some minutes we were left wondering what was going to happen next. And then, away to starboard, we saw the periscope again. The gunners must have wasted quite a lot of shot, but they certainly didn't score a bull.

(*To be continued.*)

A PRESENT-DAY RADIO CABIN

As a contrast to the comparatively primitive radio apparatus that was installed in ships in the period covered by our contributor's diary, here is a corner of a modern liner's wireless cabin.

THE TYMPANIST HAS TWO NOTES ONLY—

but he puts them in because the rhythm needs them

—and you need the current of an Improved Lissen Battery in your receiver if you want to hear these same two notes properly.

For the current of an Improved Lissen Battery enables you to recognise the individual instruments of a band. Like many others, when you use an Improved Lissen Battery for the first time you may realise that your favourite radio band has more instruments in it than you thought.

THE SECRET OF THE TEST TUBES

The noticeable improvement in your reproduction is due to the extraordinary power output of your Lissen Battery. There is a process used in this battery which produces power of remarkable purity; power so sustained that over prolonged periods of time it remains steady, noiseless and abundant always. So long does the battery last that a PRINTED LIFE GUARANTEE is given with every Improved Lissen H.T. Battery sold.

60 VOLT
WAS ~~7/11~~ NOW 5/6
100 VOLT
WAS ~~12/11~~ NOW 9/3
120 VOLT
WAS ~~15/9~~ NOW 11/-

Ask by name for an Improved Lissen H.T. Battery. Obtainable from all radio dealers.

THE MIRROR OF THE B.B.C. By O.H.M.

THE SCOTTISH REGIONAL

LISTENERS' ASSOCIATIONS—THE ANONYMITY CRISIS—"A NATIONAL BROADCASTER"—EMPIRE DAY.

CLOSE on the heels of the opening of Broadcasting House has come the opening of Westerglen, the new Scottish Regional Station. This occasion has been something of a personal triumph for Mr. David Cleghorn Thompson, the B.B.C. Director in Scotland, and his enterprising assistant, Mr. Moray Maclaren.

There was the usual press view at Falkirk, and then in the evening the magnificent main studio in Edinburgh was the scene of a 19th Century Costume Ball on behalf of charity, patronised by fashionable Scottish Society. So far, so good. The twin-wave transmitters at Westerglen undoubtedly will give a much improved service to the densely populated areas of the Lowlands.

But there is no prospective solution of the problem of serving the Highlands. Provost Murray of Dingwall, supported by many representatives of other local authorities in the outlying areas, continues his campaign. It is difficult to see what the B.B.C. can do about it unless the Regional Scheme is upset, in other words unless some of the facilities now enjoyed by the more populous districts are withdrawn.

I understand that the whole problem is being seriously reviewed at Portland Place, but that it is unlikely that any constructive proposals will be announced before the Madrid Conference.

Listeners' Associations.

Nothing has been heard of the Wireless Organisations Advisory Committee for some time. This Body was created at the beginning of the Corporation five years ago. It was meant to carry out the intention expressed in a recommendation of Lord Crawford's Committee of 1925, which went out of its way to stress the importance of Advisory Committees in general.

It was the nearest approach which could be designed to represent the views of the man-in-the-street. The Wireless League, the Radio Society of Great Britain, the Radio Association, and one or two other similar volunteer bodies were represented on the committee which was presided over by Captain Ian Fraser, M.P.

It seems as though this committee has either abdicated of its own accord or has been politely pushed aside by the B.B.C. Anyway there is no recent account of its proceedings, if any.

And now, three of the listening groups in Warrington, under the Adult Education Scheme of the B.B.C., have formed themselves into a Listeners' Association. Other groups are manifesting active interest and it looks as though a new kind of National Representation of listeners may emerge.

The Anonymity Crisis.

I have been trying without much success to discover the principle and basis of the application of the anonymity rule, which is supposed to be applied to the B.B.C. staff. On the one hand, programmes produced by members of the staff are acknowledged personally and not inconspicuously.

On the other hand, equally excellent work carried out by the very able engineers of the B.B.C. is not acknowledged to those concerned. Then again, there is a curious embargo on the names of announcers.

The irregular situation resulting naturally creates jealousy and a sense of unfairness. The wise and right thing for the B.B.C. to do is to rescind the anonymity rule, which at present is not really applied, and which in no circumstances could be satisfactorily applied.

"A National Broadcaster."

It sounded strange to those who recognised his voice that Mr. Percy Edgar, the Midland Regional Director, should be taking a part in the light musical show "Little Miss Make Believe," which Charles Brewer, his second in command at Birmingham, produced recently in the new studios at Broadcasting House for National and Regional listeners.

But Mr. Edgar has a fine microphone personality and in some things he really excels. I doubt if anyone could have done a better running commentary on the opening of the Stratford-on-Avon Shakespeare Memorial Theatre than that in which Mr. Edgar told the world what was happening for half an hour before the arrival of the Prince of Wales.

A well-known Midland divine wrote afterwards that "one could visualise every moment, and the little touches by which you portrayed the crowd, the costumes worn and the thronged river and banks made the occasion live almost as though we were present."

Many other tributes to Mr. Edgar's fine descriptive powers were also sent in by listeners all over the country, and one correspondent was so enthusiastic that he described the Midland Regional Director as a "National Broadcaster." His own listeners will have another opportunity of hearing Mr. Edgar again on Wednesday, June 1st, when he gives his monthly talk on "Coming Events."

Mrs. Edgar Wallace.

Had he lived, poor Edgar Wallace would have made many appearances before the microphone, and I personally have no doubt that he would have become as attached to broadcasting as he had to the stage and the cinema. It was his wish to broadcast an appeal on behalf of Queen Charlotte's Maternity Hospital, in which he took a great interest, but the date was never arranged.

Now the appeal is to be made by Mrs. Edgar Wallace on Sunday, May 22nd. On the following Sunday, Mr. Seymour Hicks is to speak on behalf of the Padcroft Boys' Home of the London Police Court Mission.

257 STATIONS ON THE "COSMIC"!

LONDON READER RECORDS REMARKABLE RESULTS ON "P.W.'s" FAMOUS 3-VALVER.

Hampstead Garden Suburb, N.W.11.

Dear Sir,—Many thanks for that marvellous set, the "Cosmic" Star, which I have recently built up. I have received 257 stations, all of which have been identified.

The majority of these stations were received when an old 100-volt H.T. was in use, but now I have an H.T. eliminator. I live within ten miles of the powerful twin-wave station, Brookmans Park, and am using a low 75-ft. aerial, but I can cut out the "twins" within 7 degrees, thanks to the moderator.

Thanking you again, and wishing "P.W." every success,

I am yours faithfully,

22/4/32. A. P. MORGAN.

P.S.—I forgot to mention that I enjoyed the "P.W." programme from Lisbon very much.

EDITORIAL NOTE.—The full list of stations identified is far too long to be repeated in "P.W." but it clearly shows that the dials must be "alive" with programmes! Among the catches on long waves are Leningrad—always a difficult station to receive—and Lahti, the little-known Finnish station, on 1,796 metres. On medium waves the set roped in such out-of-the-way places as Riga, Helsinki and Tallin, while on the short waves the broadcast and amateur stations heard are dotted all over the world!

THE LISTENER'S NOTEBOOK

A rapid review of some of the recent radio programmes.

THE opening of Broadcasting House begins a new phase in the history of broadcasting. We take broadcasting so much as a matter of course that we are apt to overlook the fact that a decade is not time enough for it to have established any deep-rooted traditions; but, meanwhile, we can inflate our chests with pride at the contemplation of a very healthy youngster, second to none.

* * *

With the passing (?) of winter, Saturday evening programmes lose an attractive feature. I refer to the football results. These were always a popular feature, provoking no criticism and claiming both high- and low-brow adherents.

If there *was* any grousing, it was against the B.B.C. rather than the results themselves. I believe that many listeners found the suspense of waiting for these results while items of news (insignificant in comparison) were read out very irritating.

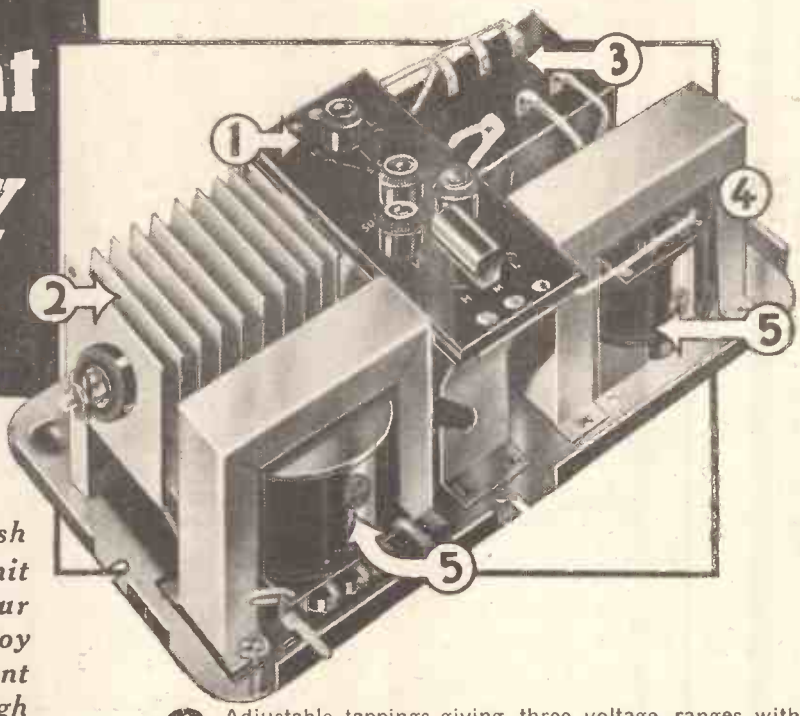
* * *

Monday's programmes suffer correspondingly with the completion of Mr. S. P. B. Mais' series of talks. To say that these have been popular is to put it mildly. Mr. Mais had fulfilled a task which confers on him ambassadorial rank.

One only hopes that his attempt to open the eyes of men that they may see Great Britain in winter will not be in vain. If

(*Continued on page* 322.)

High voltage, Ample current – for a penny a month



Change to an EKCO Unit and finish with batteries for ever! An EKCO Unit connected to your set in place of your usual battery means that you will enjoy all the advantages of an ample, silent and unvarying current supply at high voltage at a cost of only a penny a month.

There is an EKCO Unit waiting to give you better radio at the lowest possible cost. Choose the Unit suitable for your set from the Table or post coupon now for full details.

All EKCO Units are obtainable on Easy Payments.

1. Adjustable tappings giving three voltage ranges with perfect, noiseless contact. Patented plugs and socket for quick and easy connection of wires.
2. Westinghouse Metal Rectification.
3. Condensers tested to 500 volts.
4. All metal parts cadmium plated to prevent rust.
5. Choke and transformer coils wound on moulded bakelite bobbins.

EKCO H.T. UNITS

Model	Current Output	Voltage Tappings	Price	EASY PAYMENTS Initial Payment	EASY PAYMENTS 11 Monthly Payments of
A.C. 12	12 m/A	S.G.; 80; 120/150	£2.15.0	6/6	5/-
A.C. 18	18 m/A	S.G.*; 50/80*; 120/150	£3. 7.6	7/9	6/2
A.C. 25	25 m/A	S.G.*; 50/80*; 120/150	£3.17.6	8/9	7/1
D.C.15/25	15 or 25 m/A	S.G.*; 50/80*; 120/150	£1.19.6	6/-	3/8

Combined H.T. & L.T. Charger Units (for A.C. Mains)

Model	Current & Voltage	L.T. Output (*for charging accumulators*)	Price	EASY PAYMENTS Initial Payment	EASY PAYMENTS 11 Monthly Payments of
K.12	Current Output and Voltage Tappings same as Models A.C.12, A.C.18 and A.C.25.	½ amp. at 2, 4 or 6 volts	£3.19.6	9/-	7/3
K.18		¼ amp. at 2, 4 or 6 volts	£4.12.6	10/3	8/5
K.25		½ amp. at 2, 4 or 6 volts	£5. 7.6	11/9	9/10

Tappings marked * are adjustable.

Housed in solid drawn steel case, oxidised copper finish. Connecting plugs recessed below surface of case.

Size, 9 × 5 × 3¼ (K.25 and 25 cycle models 9¾ × 5⅝ × 3¾).

EKCO POWER SUPPLY UNITS

To E. K. Cole, Ltd., Dept. A.10,
Ekco Works, Southend-on-Sea.

Please send me particulars of EKCO Power Units.

Name.....

Address.....

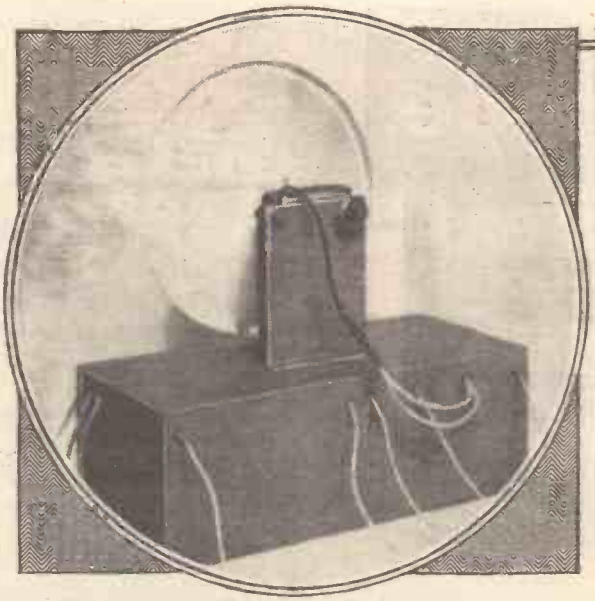
.....

LAST week I dealt with the construction of the main portion of the set, and before passing on to the frame aerial windings and the mounting of the loudspeaker unit, I would like to stress two points.

The first of these is—*wire up as you go along.* This is important because of the compactness of the design.

The second point is—*stick to the components specified.*

The set has been built up in its final form after weeks of experimental work by the Research Dept., and the result is a blending of the most suitable parts for the job. Certain alternatives can be used, and these are mentioned in the component list.



SCIENTIFICALLY CLEAN ASSEMBLY

The set is built into a metal screening chassis, on which there is a simple bracket for mounting the speaker unit and cone.

An Efficient Frame.

Do not forget to mark all the L.T., H.T., and G.B. leads so that you can recognise them after the metal work enclosing the whole layout has been slid into position.

And now for the frame aerial. This is a simple winding consisting of two sections — one for the medium waves and the other for the long wave-band.

You will be able to see from the photograph exactly how it is wound.

ONLY THREE VALVES.
PROGRAMMES AVAILABLE ANYWHERE AT ANY TIME.
VERY COMPACT.
UNUSUALLY LIGHT.

The cabinet specified has an inner framework and an outer shell. The aerial is wound round this main framework, which is, in fact, the body of the cabinet. The medium-wave winding comprises 14 turns of No. 24 D.C.C., each turn being spaced ¼ in. The end of the winding is then threaded through a hole in the woodwork and taken across the framework to the beginning of the long-wave section of the frame. This winding consists of 40 turns of No. 32 D.S.C., each turn touching, and is wound in the same direction as the medium-wave portion.

Connecting-up the Aerial.

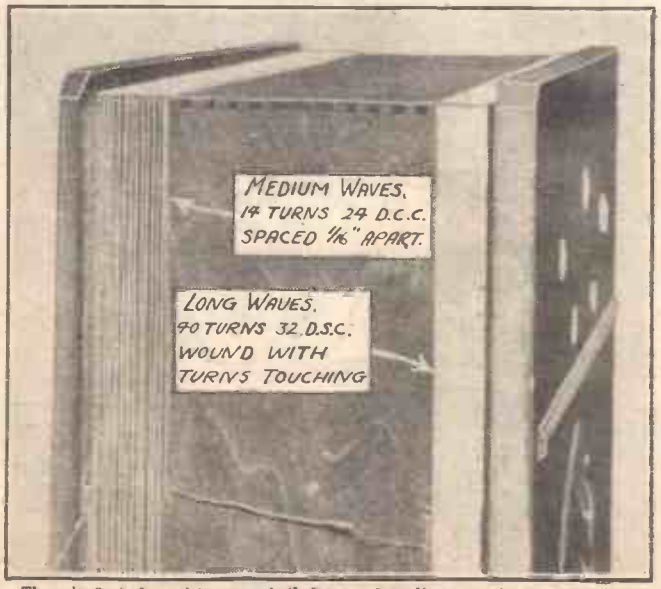
You will notice from the photographs that the two windings are arranged one at each end of the framework.

The *end* of the medium-wave portion is joined to the *beginning* of the long-wave section.

Thus there are two flexible leads that connect up with the wave-change switch. These are the junction of the medium and long-wave windings, and the *end* of the long-wave section.

The beginning of the medium-wave portion goes to the fixed vanes of the first tuning condenser, and, of course, to the grid of the S.G. valve.

FULL DUAL-WAVE POWER



There is first-class pick-up on both long and medium wavebands, and excellent daylight results are given.

The Speaker Unit.

The end of the long-wave winding is actually taken to the moving vanes of the first tuning condenser, and then goes on to L.T.— of V_1 to the screening and to the wave-change switch. You will find this quite clearly shown in the wiring diagram in last week's issue.

Remember to leave plenty of slack in the three flexible leads to the frame because these have to pass through holes in the metal box. They can easily be cut to size after the box has been placed in position on its runners as described previously.

Now for the mounting of the speaker unit. The unit in the original receiver is a Blue Spot, and this is secured to a piece of sheet

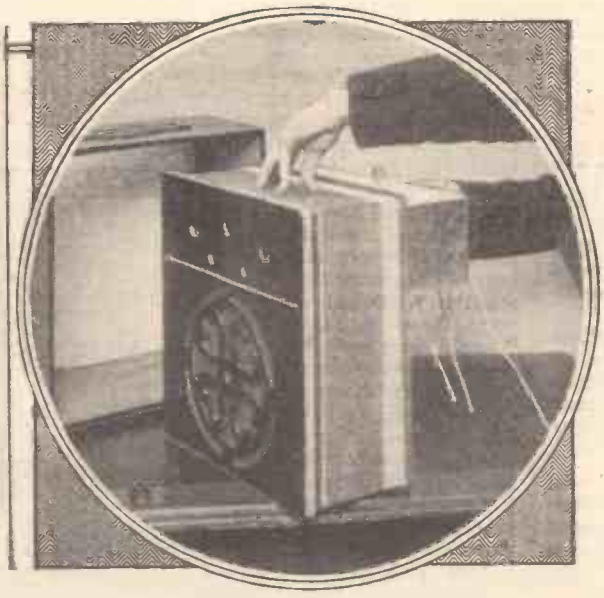
By A. JOHNSO
who gives further
ing the most satis
set for home co
has ever been in
publ

YOUR INEXPENSIVE "OUT

1 Aluminium box, screen and baseboard (Magnum).
1 Portable case (Camco Carrier).
2 ·0005-mfd. variable condensers (Formo midlog line).
1 ·0003-mfd. differential reaction solid-dielectric condenser (Polar, Ready Radio, Telsen).
1 On-off snap switch (Bulgin, B.A.T.).
1 2-gang on-off push-pull switch (Cordo).
1 H.F. choke (Sovereign Super, Ready Radio, Lissen, Wearite).
2 ·0003-mfd. fixed condensers (Formo Mikadensor, and Dubilier 670, or small T.C.C., Igranic).
2 Horizontal valve holders (Parex and W.B., Lissen).
1 Standard valve holder (Lissen, W.B., Graham Farish, Wearite, Bulgin, Telsen, Lotus).
1 2-meg. grid leak with terminals or tags (Graham Farish "Ohmite," Lissen, Igranic, Dubilier).
2 20,000-ohm resistances as above (Graham Farish "Ohmite," etc.).
1 15,000-ohm resistance as above (Graham Farish, etc.).
Note.—These resistances can be of spaghetti type if desired (Lissen, Bulgin, Varley, Lewcos, Tunewell, Telsen, Sovereign).
1 01-mfd. fixed condenser (Lissen, T.C.C., Dubilier, Ferranti).
1 ·001-mfd. fixed condenser (Dubilier 670, T.C.C., Lissen, Sovereign, Ready Radio, Telsen, Ferranti, Graham Farish, Formo).
1 L.F. transformer (Lissen Hypernik, R.I. Hypermite, Varley Niclet, Igranic Midget, Lotus).

A 1932 PORTABLE OF MOST

ild the ITDOOR THREE



NO SPACE WASTED

The chassis slides snugly into the cabinet, with the "works" completely screened from the aerial.

ON-RANDALL,
r details regard-
sfactory portable
nstructors which
ntroduced to the
lic.

aluminium bent at right angles and secured to the underside of the metal box by two wood screws which pass through into the wood baseboard.

Messrs. Burne-Jones will no doubt be able to supply a specially-made bracket to suit any desired speaker unit, provided they have the unit available for fitting purposes.

TDOOR" SHOPPING LIST

2 2-mfd. condensers (Dubilier type 9200).
1 Output choke (Varley Pentode Nichoke).
1 Cosmic dual-range coil (Goltone, Wearite, Telsen, Ready Radio, Sovereign, Peto-Scott).
2 2½-in. tuning dials (Ormond).
12 ft. 18-gauge tinned-copper wire, and sleeving (Wearite), or Glazite, Soldawyre, Quickwyre, Jiffilinx.
Flex, screws, etc.
1 Sheet Kraft paper.
2 ozs. 24 D.C.C. Wire.
2 ozs. 32 D.S.C. Wire.

ACCESSORIES.

LOUDSPEAKER UNIT.—Blue Spot, Lissen, Telsen, Ormond.

VALVES.—1 S.G.: Mullard P.M.12A, or P.M.12, Mazda S.215, Marconi S.22, Osram S.22, Tungsram S.210, Lissen S.G.215, Cossor 215S.G., Six-Sixty S.S. 215S.G.

Det.: Marconi H.2, Cossor H.L.210, Mullard P.M.1H.L., Six-Sixty S.S. 210H.L. (Note.—Many valves will not go into the set owing to their height.)

Pentode: Mazda Pen. 220. Lissen P.T. 225, Marconi and Osram P.T. 2.

BATTERIES.—H.T.: 2 of Drydex Blue Triangle 63 v., Ever Ready Popular P. Portable 63 v., Siemens H.1 60 v., Pertrix 237 60 v.

G.B.: 3 volts for 120 v. H.T.

ACCUMULATOR.—2 volts (Exide PC2, Oldham JLV4, or other small portable type).

MAINS UNIT.—(Should be small and give 120 to 150 volts 15 m.a. max.) (Heayberd D. Minor, Atlas, R.I., Tunewell, Regentone, Formo, Tannoy, Ekco).

It is, however, a job that can be carried out by the constructor himself with very little trouble.

The main point is that the driving rod of the speaker unit should come directly opposite the centre of the fret on the front of the cabinet.

You Can Use Wood.

The cone should be of the same diameter as the fret, and the edges of the cone should *just not* touch against the cabinet front.

The necessary adjustments can be readily made by sliding the cone along the driving rod of the unit and afterwards fixing it in position by means of the locking device provided.

There is no reason why the bracket holding the unit should be of aluminium; wood will do quite as well, and if this is used, two small angle brackets of metal can be employed for mounting it to the underside of the metal box.

Now for a few words about making the cone. You will need a sheet of Kraft or any good cartridge paper, and from this sheet cut a circle 10 in. in diameter.

Cone Dimensions.

The circle is best drawn on the paper with the aid of a compass and the paper can then be cut round the pencil line. A second circle should be drawn inside the first, this circle having a radius of 4⅛ in.

Before you actually cut the paper round the 10-in. diameter circle, mark off three lines in pencil. Two of these are radii 3¼ in. apart at the circumference. The other line is a parallel one ⅜ in. from one of the radii, and represents the overlapping portion.

The diagram shows this more clearly than I can describe it in words. Cut round the large diameter circle with a pair of scissors, and remove the segment between the two thick lines (between one radii and the line which is ⅜ in. from the second radii).

Incidentally, the scissor-cut is made right along the radius from the circumference to the centre of the circle. Now shape the cone, bending it until the two radii are touching. Then secure in position by secootining the overlap in place on the outside of the cone.

Some Battery Points.

When dry, gently bend back the edges of the cone along the inner circle so that you have a "turn-back" of ⅜ in. all round.

The photograph will make this clear. The cone is now complete and is attached to the driving rod on the unit by the locking device provided.

When you have completed the constructional work, and the set is assembled in the cabinet, you can then place the L.T., G.B. and H.T. batteries in position.

You will have to choose your batteries

(*Continued on next page.*)

EXTREMELY LOW CURRENT CONSUMPTION.
EASY TO BUILD AND OPERATE.
NO SOLDERING.

CAN BE USED ANYWHERE

The great charm of the Outdoor Three is that it can also be used indoors, as it is of handsome appearance.

ORIGINAL AND EFFECTIVE DESIGN

BUILD THE OUTDOOR THREE

(Continued from previous page.)

carefully, giving due consideration to the question of space.

The L.T. battery is an unspillable type 2-volt accumulator, the grid-bias battery a 4½- or 9-volt strip, and the H.T. two 60-volt units, joined in series.

Fit the batteries into the cabinet, if necessary inserting strips of cardboard or rolled-up paper to act as wedges to prevent movement when the set is carried from place to place.

High-Tension Voltages.

Then connect up the various leads. H.T.+1 will want approximately 72 volts; but, of course, this value can be adjusted slightly in order to achieve the maximum degree of efficiency. The figure is about right for normal purposes, using the type of valve specified.

H.T. + 2 will be 120 volts, and G.B— is 3 volts in the case of the Pen. 220.

With regard to the operation of the receiver, this is all plane sailing. There are two tuning controls, one for the frame and the other for the intermediate circuit.

The control on the left-hand end of the panel (looking at the front) is the frame-tuning condenser. Slightly below this, to the right, is the wave-change switch which changes over both tuned circuits simultaneously.

In the centre is the reaction-condenser, and to the left of the right-hand tuning control is the L.T. on-off switch.

Operation of the Receiver.

The preliminary tuning operation is best carried out on the local transmission, and the procedure is as follows:

Pull out the wave-change switch knob (this is the setting for the medium wave-band) and switch on the L.T.

With the reaction control at its minimum (knob fully rotated to left), turn the two tuning controls round until signals are heard.

Then rotate the reaction-control knob to increase the volume. I have, so far, said nothing about the directional properties of the frame.

All frame aerials are directional, and in order to obtain maximum volume from any given station, the frame should be orientated into the position of loudest signal strength. This effect will be found to be very marked and it has the further advantage of increasing the selectivity. So when you tune in the "local" just try the effect of rotating the set and you will immediately hear the difference in the volume when the frame comes into the position most favourable for reception from this particular transmitter. The idea is the same for any station.

On Long-waves.

To receive on the long wave-band push the wave-change switch knob towards the panel and tune in as before.

Daventry 5 X X will, of course, be the station to "go for" first, and then Radio-Paris. And remember the directional properties of the frame whenever you require a little more selectivity.

And now I will conclude by giving a few general hints. Many of the faults in portables are due to loose connections. A single slack terminal will often cause loud cracklings in the speaker, and when this happens it frequently entails a laborious search before the offending connection is located.

So I recommend you to pay particular attention to all joints under terminals, and to see that everything is well insulated and shipshape before you put the finishing touches to the chassis.

Another point is to make sure that the valves fit snugly into the valve holders. Here, again, a little play is liable to cause unwanted noises and, sometimes, fading.

I stress these points because a portable is bound to be subjected to slight jars in the course of its work, and these aggravate any troubles due to faulty connections. Let me say something about tone. There are a resistance and fixed condenser in series across the output choke. The values chosen are the normal ones; but opinions concerning quality vary.

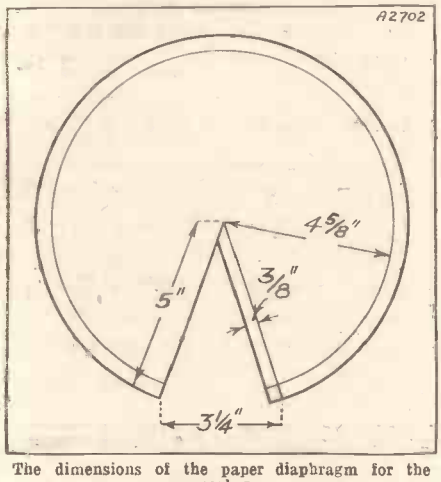
Varying the Tone.

Some prefer a fairly high-pitched tone, in which case the fixed condenser may with advantage be made smaller, or alternatively the resistance may have a higher value.

The effect of a large fixed condenser is to lower the tone by decreasing the amplification of the higher musical frequencies. A small condenser will have less effect upon the upper register and so the high notes will be more prominent.

Much depends upon the type of speaker unit employed, and also upon the stiffness of the cone.

CUTTING THE CONE

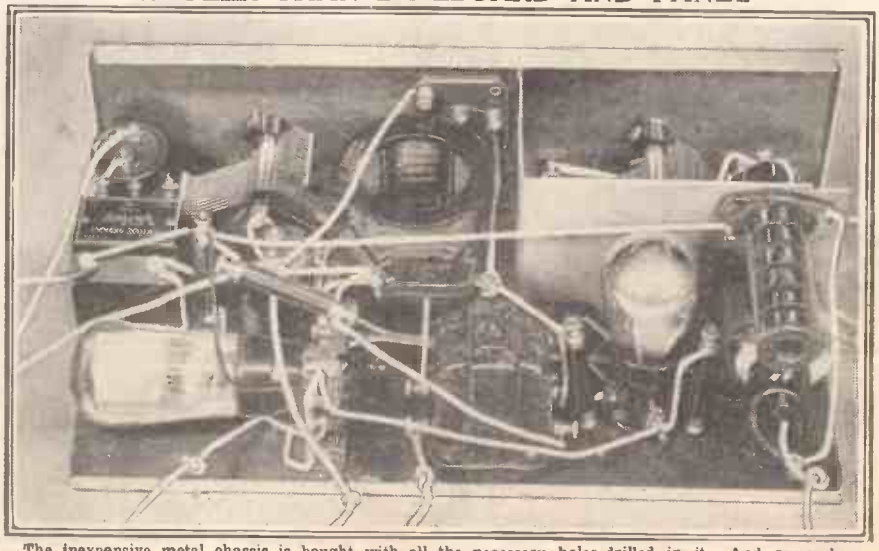


The dimensions of the paper diaphragm for the speaker.

THE COMPLETED CHASSIS

The chassis with speaker fitted all ready for sliding into the cabinet—a very simple operation this.

SIMPLER THAN BASEBOARD AND PANEL



The inexpensive metal chassis is bought with all the necessary holes drilled in it. And, remember, there is no soldering to do.

Build "The OUTDOOR Three" with a READY RADIO Kit for OUTSTANDING RESULTS!

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Complete Kit of Components less valves and cabinet.
OR BY EASY PAYMENTS
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with valves less cabinet.
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Complete kit of Components as Kit "B" with Cabinet and free blue print.
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		£	s.	d.
2	Formo ·0005 Log Mid-line Variable Condensers		2	0
1	ReadiRad ·0003 Differential Condenser		3	6
1	ReadiRad Snap Switch		2	9
1	ReadiRad 2-gang "On-off" Push-pull Switch		3	6
1	Sovereign Super H.F. Choke		3	6
2	W.B. Horizontal Valve Holders		2	0
1	Standard Valve Holder			6
1	2-megohm Leak, with Terminals		1	6
1	Lewcos 15,000-ohm Spaghetti Resistance		1	6
2	Lewcos 20,000-ohm Spaghetti Resistances		3	0
2	T.C.C. ·0003 Fixed Condensers, Type "M"		2	0
1	T.C.C. ·01-mfd. Fixed Condenser, Type "S"		1	9
1	T.C.C. ·001-mfd. Fixed Condenser, Type "S"		1	6
1	R.I. Hypermite L.F. Transformer		12	6
2	Dubilier 2-mfd. Fixed Condensers, Type "BB"		7	6
1	ReadiRad Cosmic Dual Range Coil		6	6
1	Varley Output Pentode Nichoke		12	6
1	Packet of Jiffilinx for wiring		2	6
2	Ormond 2½" Tuning Dials		2	0
2	ozs. 24 D.C. Wire			8
2	ozs. 32 D.S. Wire		1	10
3	Valves as specified (Cossor 210 DET., PM.12, Mazda PEN.220	2	1	0
	Flex, Screws, etc.		1	6
1	Polished Oak Cabinet	1	15	0
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Any component can be purchased separately.

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'Grams: Readirad, Blackvil.

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A miniature MARVEL

SIZE

2⅛" long × 1 5/16" wide × 11/16" high

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(Type M.C.)

Price 2/6

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The exceptionally low price of this component has already established it as a permanent favourite amongst both experts and amateurs.

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BRITISH MADE

Overall Diameter, 9⅜".
Overall Depth, 4¼".
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MOVING COIL *SPEAKER*

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Including Transformer and Baffle Board.

D.C. Resistance: 10 ohms.
Impedance of Speech-coil: 5 ohms.
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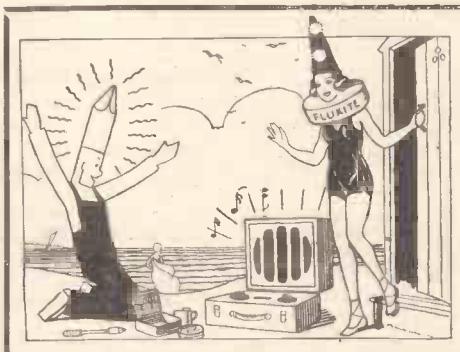

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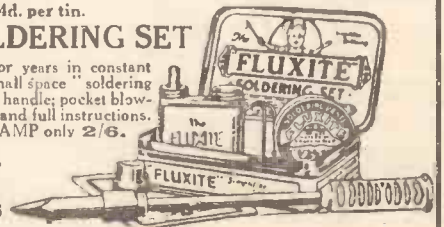

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ALL MECHANICS *WILL* HAVE

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CAPT. ECKERSLEY'S QUERY CORNER

Under the above title, week by week, our Chief Radio Consultant comments upon radio queries submitted by "P.W." readers.

Don't address your letters direct to Capt. Eckersley; a selection of those received by the Query Department in the ordinary way will be answered by him.

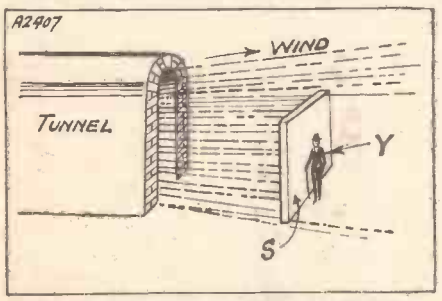
A Curious Shielding Effect.

S. B. (Seven Kings).—"My house is, I believe, roughly sixteen miles from the Brookmans Park transmitter, and I always imagined that, at this distance, one's reception was almost entirely due to the transmitter's 'direct ray.'

"Since, however, the evenings have become lighter, I find the National programme noticeably weaker, and with nightfall an increase of signal strength occurs. Is this an indication that my aerial is not completely in the 'service area' of the National transmitter at Brookmans Park?"

You should be in the direct ray of the shorter-wave Brookmans Park, *but* your direct ray service may be locally

WHY IS HE SCREENED?



Little Mr. Y is right opposite the mouth of the tunnel but does not feel the wind! Read on this page about the "P.W." reader whose set was situated similarly.

shielded and you may, therefore, be owing something to the indirect ray. A wind may blow from the mouth of a tunnel as shown in my drawing. You (Y) may be behind a shield (S) The direct wind is not very strong, even though further away from the source of the wind, and outside the effect of the shield it may be stronger, and much further away weaker.

Thus you are in an *area* of direct ray in your house at Seven Kings, but you may be locally shielded. Even at this distance, the indirect ray is quite strong, and is, in your shielded position comparable with the (shielded) direct ray.

Works with No Grid Leak!

B. J. (Muswell Hill).—"While altering one or two details in my receiver the other day, I removed the detector grid leak from its holder and omitted to replace it before switching the set on. I was surprised to find that without the grid leak results were practically the same as with this in position. I do not know whether this effect is normal, or if it indicates a defect."

I recently explained to an Essex reader how the grid leak works, and I could refer you, therefore, to my answer to explain the first principles of leaky grid detection.

The fact is, it works by a leaky resistance. If the valve holder or the mounting which holds the grid leak, or the wiring on the grid condenser, or all together, have an insulation resistance of only hundreds of thousands of ohms, there's no theoretical need for a real resistance in parallel with this fortuitously provided leak!

So your leak is in the wiring on the valve holder or the—but I won't go through that list again! But this fortuitous leak varies with the damp in the atmosphere, the temperature, and what-not, so it's better to use the proper resistance always.

Would It Help?

A. A. R. (Cheam).—"When I recently shortened my aerial in order to get greater selectivity, I noticed a marked loss of signa strength. Could I still retain this improved selectivity and at the same time bring back my lost volume by increasing the number of wires in the horizontal span?"

No! Very unlikely!

Aerials can be "calculated" pretty exactly when one is dealing with supporting masts of insulating material and/or far enough away from the downlead, when there are no buildings or metal structures nearby, when the earth is made by a fan of copper spreading far beyond the confines of the area "shadowed" by the aerial, and so on.

But when it comes to a bit of wire strung up in a garden, with cisterns and lead pipes, telephone wires, and tramway conductors all round an earth half on to a gas-pipe and half to a water-pipe (which is touching a gutter) aerial calculation becomes a *little* difficult. Nevertheless, I answer your question firmly by saying, No! Very unlikely!

Separated Side-bands.

J. C. (Sheffield).—"When a transmitter, working on 300 metres, sends out a note of 1,000 cycles, it is said that the station actually radiates three frequencies: one of 999,000 cycles, one of 1,000,000 cycles and one of 1,001,000 cycles. If three transmitters were installed, each radiating *unmodulated* waves of these frequencies, would a receiver tuned to the 1,000,000-cycle one reproduce a 1,000-cycle note in the loudspeaker?"

Surely it would. A side-band can be considered as a weaker station heterodyning with a stronger. It's the heterodyning of side-bands with the carrier and with one another which produces the complex sounds which are disentangled after rectification.

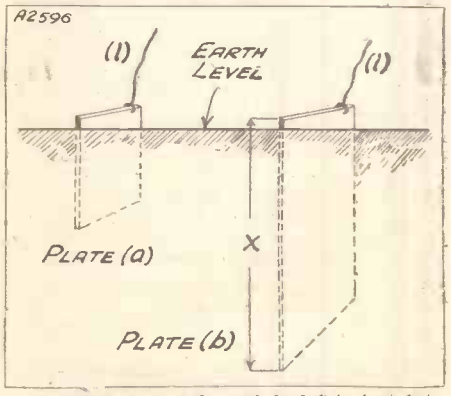
By the way, you will realise that to get a pure 1,000 note with the three transmitters there would have to be a very exact adjustment of frequency and phase, even, between the 1,000 transmitters to represent the side-bands.

In practice you would get, after rectification, 1,000 and 1,010, perhaps, because it's difficult to adjust frequencies to accuracies greater than one part in a hundred thousand.

About the Earth.

H. Q. (Colchester).—"I have been told to bury my earth plate as deeply as possible, and also to keep the earth lead as short as

BETTER BURIED



In both these cases the earth lead (l) is short, but obviously plate (b) is going to give better results than plate (a).

possible. I can't very well have a short lead to my earth plate if it is buried very deeply. Does this matter?"

In the vertical sections of earth I have shown the length (l) of the lead is in each case short, but plate (a) is shallowly buried; plate (b) is deeply buried. About 1 ft. 6 in. is enough, however, for dimension (x).

Leave the edge of the plate sticking above ground and make a good soldered joint to the wire. Do *not* bury this joint. The plate could be 16 gauge.

ONLY IN "P.W."
can you read Capt. Eckersley's replies to listeners' own problems.
AND REMEMBER—
Captain Eckersley's technical articles appear only in
"POPULAR WIRELESS"
and "MODERN WIRELESS."

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

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

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

QUESTIONS AND ANSWERS

CAPACITY SWITCH FOR THE "COSMIC" THREE.

J. W. S. (E.C.1).—"What are the wiring connections running from the Cyldon Extenser to the following points: Capacity switch, ·00075-mfd. moderator condenser; ·0003-mfd. fixed condenser and coil?"

The connections for putting a capacity switch into the original "Cosmic" Three are as follows. The moving vanes of the Extenser go to the filament of V_1 (and thus to all the points to which that terminal is joined). The fixed vanes of the Extenser do *not* go direct to the ·0003-mfd. fixed (grid) condenser and to "6" on the coil, as shown in the blue print of the "P.W." "Cosmic" Three.

Leaving these latter points joined together, you must connect them to one side of a new ·0005-mfd. fixed condenser, and to one side of a new on-off switch.

HOW ARE YOUR RESULTS NOW?

Perhaps your switching doesn't work properly? Or some mysterious noise has appeared and is spoiling your radio reception? Or one of the batteries seems to run down much faster than formerly?

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

Full details, including scales 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 post free immediately. This application will place you under no obligation whatever, but, having the form, you will know exactly what information we require to have before us in order to solve your problems.

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

Then the other sides of this new ·0005 and of the new switch are joined together, and to the F terminal on the Extenser.

In other words, the fixed vanes don't go *direct* to the same points as before, but they go through the extra ·0005 condenser, which has a new switch wired across it.

All the other connections remain as before, so the ·00075-mfd. moderator condenser has its fixed vanes connected to the top terminal on the moderator coil and to "3" on the short-wave coil.

The moving vanes of the moderator go to one self-changer contact and to "1" on the dual-range coil.

One side of the ·0003-mfd. condenser goes to grid and to grid leak. While the other side goes to the new ·0005 and new switch, as well as to "6" on the coil.

And, of course, the remaining terminals of the new condenser and switch go to the fixed Extenser vanes, as stated.

Incidentally, remember to be careful not to make the new leads any longer than necessary. In other words, mount the new switch close to the F terminal on the Extenser, and keep the ·0005 new condenser near the switch.

A QUESTION OF SCREENING.

The following interesting letter from a Tonbridge, Kent, reader is reproduced below on account of the information it contains on a subject of considerable interest. Many thanks for it, R. C.:

Dear Sir,—On reading the query put forward by B. M. R. (Barnet) in "P.W." I think the following incident might help him to understand how masses of metal near an aerial (outdoor or frame) tend to shield it from radio waves.

I recently constructed the short-wave one-valve set described by W. L. S., and used it on medium waves in conjunction with a two-valve amplifier.

The whole contraption I took with me in a canoe on the river, and on putting up a small aerial between two sticks at each end of the boat, I received good, strong signals. Proceeding down the river, I had to pass under a metal bridge, and I noticed that when within 4 ft. of this, the signals faded completely out, but reappeared again the other side, showing the screening effect of the bridge, although it was a high one.

Another bridge constructed of wood had no effect whatever.—Yours faithfully, R. C.

DUPLICATED DIAL POSITIONS.

E. L. (South Wales).—"I have built the "Cosmic" Three, which is going very well, but there is one point I should like to be clear on, as regards to the short waves. I find that I tune the same stations on each of the two dial readings. Please can you tell me if that is as it should be."

Yes, this is quite O.K. and is no disadvantage at all.

MODERATING THE "MAGIC" THREE AND SIMILAR SETS USING PLUG-IN COILS.

In the original "Magic" Three, plug-in coils were used to cover the various wave-bands, the two coils in use on the medium waves being a reaction coil of about 35 or 50 turns, coupled to an X-type coil of 60 turns or so.

The latter coil was tuned by a ·0005 condenser, connected across it, and the aerial lead was joined to this coil at one or other of the tapping points according to the selectivity required. Further adjustment of selectivity was obtainable by connecting the aerial to the A1 terminal, when a small condenser was placed in circuit, but usually this gave too great a reduction in strength for medium-wave stations, as it was intended primarily for work on the short waves only.

Many readers seem to have found a difficulty in applying the moderator to this class of circuit (which has been outlined rather fully above in order to assist all readers who have similar arrangements to apply the moderating principle to these).

The best way to look at any such set, with a view to improving its selectivity, is first to note the simple aerial-earth circuit originally used.

Follow the paths of currents flowing between the aerial and earth by tracing the conductive pathway provided between aerial and earth terminals. You will immediately see that an untuned circuit is employed.

Coming in from the aerial terminal the current flows through a flex lead fixed to this, and via a clip to the plug-in X-coil. One end of this coil is joined to the earth terminal, so the aerial currents simply flow through a certain number of turns of the X-coil, down to this end, and out via the earth terminal.

DO YOU KNOW—?

1. **Which was the first B.B.C. station, and where it was situated?**
2. **Which of the Greenwich "Six Pips" indicates the exact hour?**
3. **The three ways of stating Ohm's Law?**
4. **The longest wavelength used for regular broadcasting?**
5. **The number of ticks per minute given by the B.B.C. interval signal?**

THE ANSWERS ARE ON PAGE 320.

In doing so they introduce the aerial currents into the tuned circuit, because they traverse a portion of its coil. (The tapping points are merely a means to vary the proportion of aerial turns which can be included.)

To "moderate" such a set, first take the flex lead off the X-coil, leaving this latter to act simply and solely as a tuned-grid coil, which it will do without any further alteration of its connections. In future, instead of a direct tapped connection, it will receive its input from the aerial via the moderator coil, which will be placed close to it.

One end of the moderator coil, and one side of the moderator condenser must be connected permanently to earth. The other terminal of the moderator coil goes to the other side of the moderator condenser, and the aerial terminal is connected to one of the taps. And that is "all there is to it," so far as actual connections go.

To operate the arrangement you proceed as already described in "P.W.," and by tuning the moderator condenser you first get greatly increased results in your new aerial-earth circuit. Then, by moving the moderator coil in relation to the X-coil, you can get any degree of selectivity you require between zero and maximum.

TECHNICAL TWISTERS.

The missing words in last week's "Technical Twister," No. 113, were as follows: Interference. Nine. Common.

Find the position which gives a happy medium—it will only take a moment or two—and when the moderator coil is fixed there, you will find you get enormously increased power on the weak stations, and far better selectivity on the strong stations, by adjusting the moderator condenser as an adjunct to tuning

MODERATOR REPLIES IN BRIEF.

W. H. (Barrow-in-Furness).—The arrangements for moderating the "Titan" Four are

(*Continued on page 320.*)

DISTORTION!

TRACK ITS CAUSE WITH THIS WONDER INSTRUMENT

Don't WONDER what's the matter with your radio set. Get an "All-in-One" Radiometer and FIND OUT. Even the novice can trace any radio trouble in a few minutes with the "All-in-One" Radiometer. Tests everything. No other instrument like it.

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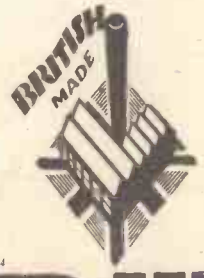


A 4

DUBILIER

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

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page 318.*)

the same as for the "Titan" Three, which have already been described.

H. B. (Birkenhead) uses a Colvern Dual-Range Coil in the Mullard "Master" Three, connected as follows:

No. 1.—To grid leak and condenser and fixed vanes of tuning condenser.
No. 2.—To moving vanes of tuning and reaction.
No. 3.—Left free.
No. 4.—To Aerial.
No. 5.—To H.F. choke.
No. 6.—To fixed vanes of reaction condenser.

In such a case disconnect the aerial from No. 4 terminal and "moderate" between aerial and earth. The connections will then remain as above except that No. 4 terminal will be left free. One end of moderator coil and one side of moderator condenser will be connected to "earth" (or to No. 2 terminal, which amounts to the same thing).

The other terminal of the moderator coil will be joined to the other side of the moderator condenser. And the aerial lead will also go to this point.

Then tune on moderator condenser as necessary, after the best position for moderator coil relative to the tuning coil has been found.

J. H. (Royton, Lancs.), M. W. A. (Brandon), and others.—See the reply to W. H. (Barrow-in-Furness). You will note that his connections are similar to yours.

C. H. C. (Rugby).—You might not find a great difference, but in the majority of cases there is an improvement found when the selector coil is removed and the moderator used instead.

MODERATING "EASY-CHANGE" 3.

A. A. (Blackpool), L. T. (Paisley), "Corkite," S. E. B. (Charlton), and others.—In the "Easy-Change" Three you can moderate between the No. 1 socket and the tapping on L3. Simply remove the present flex lead that joins these points, and connect a moderator coil and condenser there instead. i.e.: One side of coil and one side of condenser to No. 1 socket. And other side of moderator coil and of moderator condenser to earth terminal.

Then couple the coil to L3 and "moderate" as described in the articles.

U. R. (Gloucester).—"Moderating" is for improving *medium* waves, and as these are O.K. there would be no advantage in your case.

W. S. (Leytonstone).—With an S.G. valve you should not need it, and if properly connected, the coil units give good selectivity. Try a small (say ·0001) variable condenser in the aerial lead instead.

R. D. R. (Horfield).—Afraid it is not practicable in your case.

"MELODY MAKER" (Tottenham).—Join one terminal of moderator coil and moderator condenser to earth. Join second terminal of moderator coil and condenser together.

Disregard aerial terminal A, instead take aerial lead to second terminal on moderator coil. Then tune as necessary and shift the moderator coil closer to the medium-wave winding until best position for it is found.

G. W. (Burgess Hill).—You can moderate by disregarding aerial terminal, taking aerial lead to tapping terminal on moderator coil instead. Other connections for this are same as in reply above. When complete place the coil near the medium-wave plug-in coil, and proceed as described, by tuning and altering coil position if necessary.

C. B. (Acton Vale); S. T. (Walmer Road); W. B. (Newquay); T. G. D. (Edgbaston); H. W. A. (S.E.8); A. W. F. (Homerton); H. T. (Woodham); C. S. (Southampton); B. M. E. (Sevenoaks); R. L. (Bideford); H. C. T. (Port Vale); S. W. (Newport); E. G. D. T. (or E. G. T. F.) (Birkenhead); T. T. (near Watlington); "Astor" (Woodham Ferris); and R. B. C. (Leicester). Your set is unsuitable.

A. W. H. (S.E. 25).—The easiest way would be to take the aerial off A and ignore that terminal on the coil unit in future. Instead, connect one side of moderator coil and of moderator condenser to earth.

Then join the other side of moderator condenser to the lead from aerial and take this dual lead on to the other moderator coil terminal.

You will probably have to experiment rather carefully with the position of moderator coil in relation to the unit.

T. L. E. (Preston).—Yes, but try the different taps as well.

"CHARLIE" (Reading).—Use flex leads and experiment with different positions until the best is found, and then fix the coil there.

FOR THE SHORT WAVES.

G. D. M. (Bradley, near Bilston).—"Could you tell me if the 'Magic' Three set is suited for short-wave reception without the use of an adaptor? If so, what kind of wire should I use to make the required coils, the diameter of the coils, and the approximate number of turns per coil? Will the circuit require any alterations?"

The "Magic" Three—like the famous "Cosmic"—was designed with a view to effective work on the short as well as on the medium and long waves, so no adaptor or alteration in wiring is necessary. But whereas with a "Cosmic" the change to short waves is done merely by a switch, the "Magic" needs a set of short-wave plug-in coils.

Such coil sets are usually made of stiff, bare, self-supporting wire (gauge about No 14 or 16), and consist of three or four coils. A good selection is a 2, a 4, a 6, and an 8, the numbers denoting the number of turns, spaced about ⅛ in. apart. The diameter of the coils is about 3 in., and the 2-turn coil is nearly always used in the aerial holder, the others being interchanged, as desired.

TOO MANY VOLTS?

D. W. (Ilford).—"I am writing in fear and trembling, because I am very much afraid that you are going to tell me to alter my set—or, rather, my mains unit! This is the position.

"When I shifted into a house with direct current mains, I made up my mind that I would finish with buying H.T. batteries, and I went into session with a friend of mine in the electricity line to make me a first-class, hum-free, high-voltage, steady current, safe, mains unit.

"All the condensers were high-test voltage, all the resistances were worked out to a hair's breadth by him, and when we put the set on I nearly wept with joy at the really first-class results we had. The volume was simply grand, and there was not the slightest trace of hum, even when the programme was off, and even when the set was not tuned to any station at all. It was almost too good to be true.

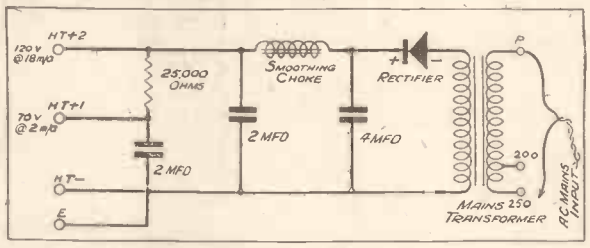
"I was so pleased with it that some time later I mentioned it to a neighbour, who asked if I would mind him measuring the voltages across it so that he could work out a similar scheme for his set. And his voltmeter, which he swears is a good one, shows that instead of 120 volts, which is the maker's maximum for the valve, I am getting 140 volts on the plate.

"Will it shorten the valve's life? Have I got to alter my beautiful eliminator, or do you think that 20 volts extra on 120 does not matter? I am very much afraid you will say it will."

It does seem a shame to have to alter it, and in your case we should be very much inclined to take a chance on it and leave things as they are, remembering that the modern valve is a very hardy and robust piece of mechanism, and it is quite possible that the extra 20 volts is not doing it an ounce of harm.

MISSING LINKS No. 34

AN A.C. H.T. UNIT.



This is the complete diagram of the arrangement shown last week. It will be seen that the "missing" items were the rectifier and the 4-mfd. smoothing condenser.

"P.W." PANEL, No. 72. PREFIXES.

Owing to the widely varying range of units of resistance, capacity, inductance, etc., used in radio work, it is customary to denote quantities by the aid of prefixes.

Thus the prefix "kilo" denotes "multiply by 1,000," and "milli" denotes "divide by 1,000."

Examples, 2 kilowatts = 2,000 watts, 5 milliamps = $\frac{5}{1000}$ amp.

Similarly the prefix "Mega" (or "meg.") denotes "multiply by 1,000,000," and "micro" denotes "divide by 1,000,000." Examples, 2 megohms = 2,000,000 ohms and 20 microvolts = $\frac{20}{1,000,000}$ volt.

THE ANSWERS

to the questions asked on page 318 under the heading "Do You Know—?" are as follows:

1. London, 2 L O. It was erected on the top of Marconi House, Strand, W.C.2. 2. The last. 3. $I = \frac{E}{R}$; $E = I \times R$; $R = \frac{E}{I}$ where I = current in amps. E = volts and R = ohms. 4. 1,935 metres, used by Kaunas (Lithuania). 5. Sixty per minute.

You must be careful, however, not to let the grid-bias battery deteriorate, for if this happens the extra voltage would certainly be detrimental. And, anyhow, it should be a simple matter to "drop the voltage" if necessary. Remember, that even if the resistances inside the "eliminator" are not of the plug-in kind, which are easy to alter, it would be quite possible to drop the voltage to the last valve by a resistance added externally.

You can work it out very easily by Ohms Law, $R = \frac{E}{I}$ where R is the resistance, E is the voltage, and I is the current.

The current in question will, of course, be the anode current taken by the valve at 120 volts, which will be the current flowing through the added resistance under the new conditions. And the voltage will be the voltage across the resistance, that is to say, the voltage which will be "dropped" between the mains unit and the set.

To make it clear we will take a typical case where it is desired to drop 20 volts, as in your own case, when the current to be passed under the new conditions is say 10 milliamps.

Ten-milliamps is ·01 ampere, but as that is rather an awkward figure to work with, you can put down the milliamps and get your answer in *thousands* of ohms, instead of ohms, so that stated in this way the problem becomes $R = \frac{E}{I} = \frac{20}{10} = 2$ thousands of ohms.

Thus, in the case we have taken, 2,000 ohms would be required to drop the 20 volts and reduce the voltage at the plate to 120.

WHEN YOU HAVE BUILT

Your Set, are you always satisfied that it is pulling in all it should.

You can make certain, if it is fitted with Six-Sixty Valves because your nearest Six-Sixty Valve Service Station will be pleased to help you to get the best results.

Six-Sixty Valve Service Stations also give straight advice without obligation on all valve problems.

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THIS COMPONENT SPECIFIED in 'OUTDOOR' 3

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Senior Type H.F. Choke all from dealers.

3/6

In other sets constructors are already finding the Sovereign Vario-Choke invaluable. The latest contribution by Sovereign to Radio Progress costs only 3/6. Make certain you know about it before building your next H.F. or S.G. Set.

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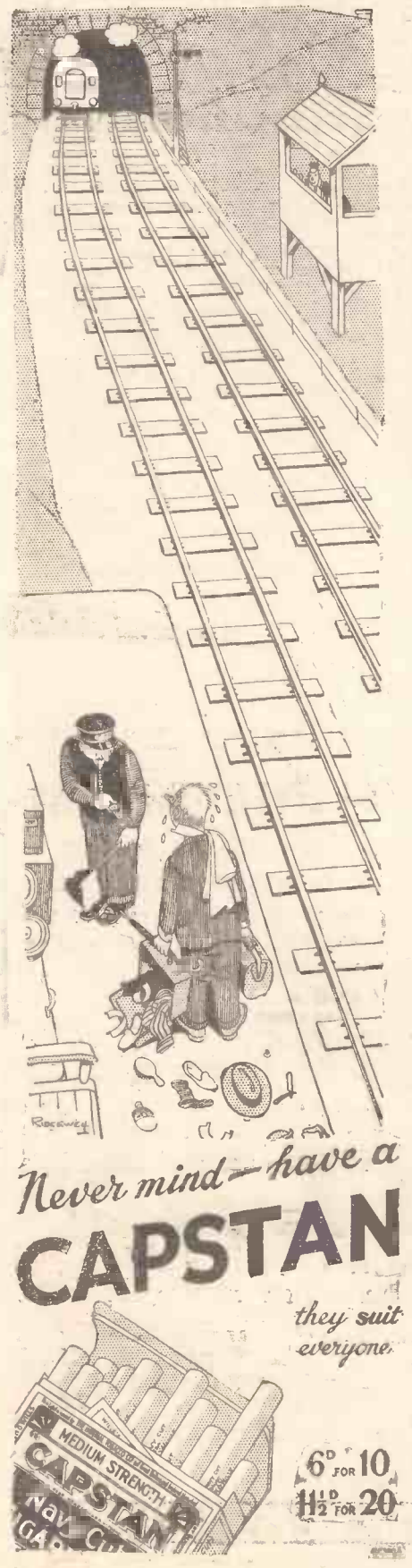

THE LISTENER'S NOTEBOOK

(*Continued from page* 310.)

his purpose is achieved, then he will have given the death-blow to the wintering-abroad habit.

I hope Mr. Mais will be given another series of the like to do next winter, and if I might suggest a subject, let it be "Our Known Island." In such a series I venture to predict as many revelations as the last provided, for is it not a fact that our acquaintance with many of our popular resorts doesn't extend beyond the band-stand or the pier?

* * *

I was impressed with the note of calm dignity that characterised the B.B.C.'s tribute to the assassinated President. Although our announcers don't always pass muster—they have actually been guilty of saying lor and awda (disgraceful!)—there's no doubt that when tributes have to be paid, they *do* rise to the occasion, especially he whom we have come to regard as our premier announcer.

* * *

One recent high-light was, in my estimation, "Dr. Abernethy" (pronounced Aberneethy, if I had my way). I didn't hear it when it was first produced some time ago, so cannot make comparisons. I am told, however, that Mr. Gordon McLeod, in the title rôle, wasn't as successful as his predecessor.

In view of Mr. McLeod's convincing performance, this is hard to believe. I liked, too, the delightful way the rest of the cast played up to the one central figure, to the obvious advantage of the latter.

* * *

I have at last heard the cuckoo! He was in a very persistent mood, which almost exhausted my patience. I stuck him out, however, and was rewarded with a medley of songs beginning with "Little Brown Jug" from some foreign station. He then faded right out.

Another powerful station to find an outlet through my loudspeaker is Poste Parisien. Needless to say, this pleases me, for a wider field of alternatives, particularly when they offer bright entertainment, *can* supply the toning corrective that weary listeners sometimes need.

* * *

In "Miscellany" there was an attempt at something different, which isn't to be despised. The item was a very meaty affair, calling for the full exercise of our digestive powers. In fact, I thought these powers were rather overtaxed. The reciter's whisper, by the way, was strangely reminiscent of that ghost-like voice which, with a piano, used to help some while ago, in a stop-gap capacity.

* * *

What a prolific output of really tuneful dance music there has been of late! Time was when only one such tune was sandwiched between long stretches of uninspired rhythmic noise. Happily, this fashion has gone, and all bands (with one exception, perhaps) seem to like the pretty-pretty nowadays. I wonder how far Henry Hall is responsible for this.

A band that is now well to the fore of first-class bands is Bertini's, of the Winter Gardens, Blackpool. For consistency and freshness he hasn't a rival in my opinion. I always make a note of his broadcasts, never fail to listen-in, and am never disappointed.

* * *

The Palladium relay was good, and above the usual standard of music-hall relays. It was interesting, too, as a revelation of the limitations of wireless.

To anyone who has never seen Miss Cicely Courtneidge a good deal of her comedy must be lost. To those who have, imagination would supply the deficiency. One could picture her, for instance, in "The Fairy Queen," in net and spangles, bidding her fairies to her aid—and it was a funny picture, too. She seemed to convulse the Palladium audience, and such laughter is always infectious.

Of course, she sang "The King's Horses," but this is the sort of song that takes some killing. "Laughing Gas"—also heard before—justified the repetition, judging from the way the audience received it. Altogether a riotous half-hour.

I didn't see the need for the added feature—the community singing—in a vaudeville programme with such artistes as George Gee, Ethel Levey, Stainless Stephen, and Elsie and Doris Waters. Surely such people are all-sufficient in themselves!

On the other hand, I can think of many other bills which would have appreciated Mr. Lewis' help. It would be invidious to single out for praise any particular turn from such a strong cast. They were *all* first-class. That was the best Saturday night we have had for some long time.

Special Whitsun Holiday Issue . . .

This week's issue of ANSWERS is a Special Whitsun Holiday number, packed with a record programme of holiday features, including

"SECRETS OF MY LETTER-BAG," BY GRACIE FIELDS

and an article by Commander the Hon. J. M. Kenworthy. There is, too, a wonderful "three prizes in one" holiday competition offer of

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which must be won for a phrase. Or the winner may take £350 cash down. And there's £1,000 must be won in a "quick result" picture contest as well! Make sure of *your* copy of

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9th February, 1932.

Messrs. Milnes Radio Co.,
Cottingley Bridge, Bingley.

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I think it is about time I sent you a line to let you know how the H.T. Unit is going on. Just fancy, I shall have had it four years next June.

I have had a set since 1924. The first four years was one long trouble and expense with wet and dry batteries. Since buying the Milnes Unit, it has been splendid to have nearly four years of comfort, and, after the first cost, no expense to speak of. Five shillings has been the cost during the whole time I have used your Unit. For the last twelve months the cost of upkeep has been 3½d. per week.

I've never found running your H.T. uses any more from the accumulator than when I used dry or wet batteries. All I know is—it's a splendid addition to any set, and would not like to use any other.

Well, I cannot write enough in its praise. If this note is of any use to you, use it by all means, *every word is true.*

I am, Yours faithfully,
C. N. BATT.

Write To-day for Full Particulars :—

MILNES RADIO CO., Aire Works, Cottingley Bridge, BINGLEY—YORKS. *Phone: Eingley 500*

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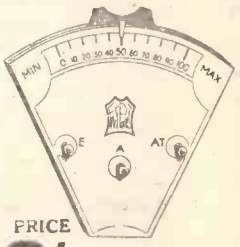

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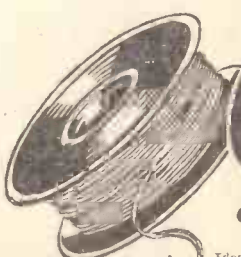

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P.1.

MORE NOTES FROM THE NORTH

By Our Northern Correspondent

NEARLY all the plans for summer broadcasting in the North Region which were dealt with by the North Regional Director, Mr. Edward Liveing, in his broadcast talk recently, have already received publicity in POPULAR WIRELESS. Mr. Liveing mentioned, however, that in addition to the resorts named in my recent "Notes from the North," arrangements have been made to relay during the summer the Llandudno Orchestra playing at the Pier Pavilion, Llandudno. This is the first time that arrangements have been made to broadcast this orchestra.

An interesting broadcast referred to by Mr. Liveing will be on June 25th, when the new motor liner "Georgic" will sail on her maiden voyage from Liverpool. Some years ago the North Regional stations gave a very interesting broadcast of the departure of the "Britannic" on her maiden voyage, but this time plans of an even more unusual character are being made.

A New Wave for Newcastle.

Mr. Liveing mentioned that it had been definitely decided to give to the Newcastle transmitter a wave-length of 211 metres. POPULAR WIRELESS readers will perhaps recall that when the Newcastle transmission trouble first arose on the opening of the North Regional station over a year ago, I suggested that the B.B.C. should give the Newcastle transmitter the 200 metres wave-length, which was free owing to the closure of the Leeds transmitter.

The idea was turned down by the B.B.C. on the grounds that the wave-length was too short and would restrict the area covered by the transmitter as well as causing listeners some difficulty in getting low enough in wave-length on their receiving apparatus.

Instead, Newcastle was placed on the National common wave-length and forced to relay the National programme, producing the ludicrous result that programmes produced in the local studio could not be transmitted from the local transmitter but had to be radiated from the North Regional transmitter at Moorside Edge.

OFFICIAL "P.W." EXHIBITORS.

Readers are reminded that further information regarding the components for the "Outdoor" Three can be obtained from official "P.W." exhibitors who also display P.W. "Cosmics" etc. The latest additions to the list of Exhibitors are given below.

LONDON.
C. H. Appleton, 74, Upper Clapton Road, CLAPTON.
S. T. Corry & Co., 52a, Southampton Row, W.C.1.

BIRMINGHAM.
Messrs. Wallace & Co., 856, Bristol Road, Selly Oak.

COTTERIDGE.
Messrs. Wallace & Co., 1839, Pershore Road.

NOTTINGHAM.
Mr. Pickbourne, 93, Sneinton Boulevard.
Reliance Engineering Co., Theatre Quadrant.
Reliance Engineering Co., 101, Alfreton Road,
Reliance Engineering Co., 144, Derby Road.

READING.
G. Wilson, 45, Castle Street.

TORQUAY.
S. J. Searle, 33, St. Marychurch Road.

SAFETY FIRST

The Eelex testing Prods, improved type. The points can be fixed in the "out" position, if required, by a sharp turn. For testing sets with intricate wiring, they prevent short circuits and save you money in replacements.

PRICE Per pair **3/6**
Red and Black.

BYLDURONE CABINETS

A Byldurone Cabinet! So easy to construct—only a screwdriver required. Supplied complete, ready to put together. Handsome yet sturdily built—Byldurone Cabinets will give an added charm to your customers' radio.

Specify BYLDURONE Cabinets

Their distinctive coverings can be supplied in an extensive range to suit individual taste, and to harmonise with furniture style and colour schemes.

Write for List A21.

J. J. EASTICK & SONS
Eelex House, 118 Bunhill Row, London, E.C.1
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FREE A Luxury Wireless Set
or components of equivalent value
Wonderful offer to introduce the Radialaddin Club. Write for particulars
Dept. P.W., 47/48 Berners Street, London, W.1
Museum: 1821

Photo Cells

are now well known for their use in commercial as well as scientific work. For sound films, television, invisible ray, colour comparison and photometry. Counting and timing of passing objects such as cartons travelling on endless belt to packing room, motor cars through a tunnel. Timing the velocity of a projectile or speed of races; transmission over a beam of light, illumination control, burglar alarm. measuring photographic plates, pyrometry, smoke detection, storm and sunshine detectors.

The usual price of these cinema photo cells is £5: and they are guaranteed in their sound to light responses. Most fascinating experiments may be made with one of these and your radio set.
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15/- *as illustrated.*
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THE PICTURE PAPER WITH THE MOST NEWS
SUNDAY GRAPHIC
and Sunday News

TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio reception.

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

"Straight" Curves.

ALTHOUGH we speak of the "straight" part of the characteristic curve of a valve it is very doubtful whether any part of the curve is really absolutely straight. I think it simply amounts to a question of the scale on which you draw out the curve.

Some little time back, when I was intimately connected with valve manufacture. I must have plotted the curves of hundreds of valves of all kinds and makes and I believe that the "straight" part of the curve is always a slight bend, in some cases slighter than others, but nevertheless a bend and not absolutely straight.

Incidentally, this accounts for some of the shortcomings of certain types of valves, especially if the departure from the straight is at all appreciable. I daresay you know that the screen-grid valve, notwithstanding its extraordinary amplification and the wonderful advances it has made possible in portable receivers and in high-frequency amplification generally, is still far from being perfect.

Sometimes you get an effect known as cross-modulation, whereby two stations having wave-lengths very close together become difficult if not impossible to separate: this effect is due to the absence of straightness in the "straight" part of the characteristic curve of the valve.

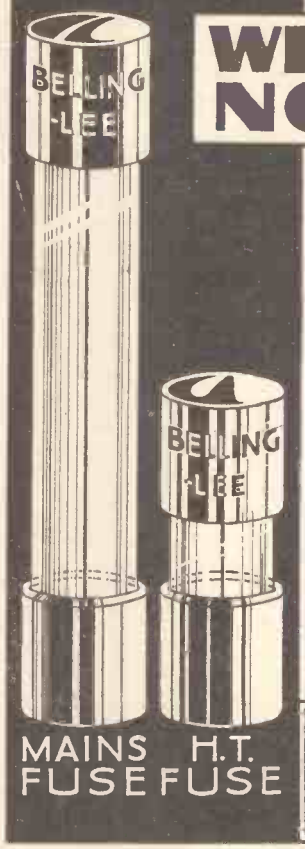
A great deal of work on the part of valve designers has been naturally devoted to this question and set designers have endeavoured to cope with the slight imperfections of the valve by making corresponding allowances in the arrangements of the circuit. But there is still room for a good deal of improvement.

S.G. Improvements.

Nevertheless screen-grid valves to-day are very much better than those even of a year ago. Not only are the characteristics better but the screening has also been much improved. This means that bigger amplification can be obtained without instability setting in.

It also has an effect upon the tuning, which is rendered easier. The actual amount of screening varies considerably in different valves and you can easily verify that the capacity between grid and anode, even of different specimens of the same make of valve, will vary considerably. The value of this capacity is very small, and its effect

(*Continued on next page*)



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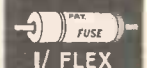

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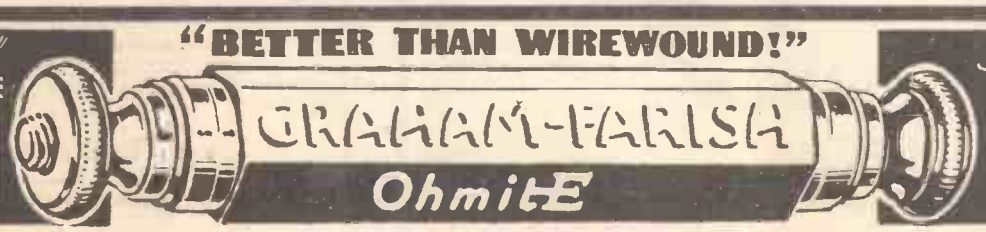

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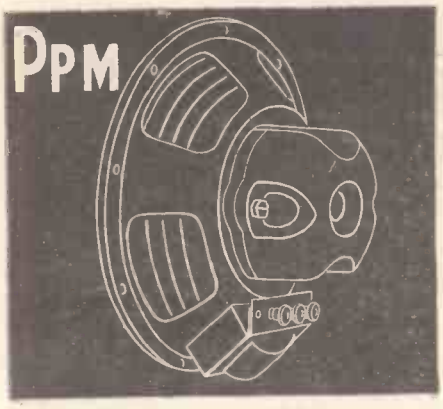

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TECHNICAL NOTES

(*Continued from previous page.*)

depends very much upon the type of circuit with which the valve is used, but in some cases it makes quite a difference.

Power-Grid Detection.

I said something in an article in " P.W." a little time back about power-grid detection, and as this seems to be of interest to a good many readers I think it may perhaps be useful to give you a word of warning with regard to the actual current consumption on this system.

If you use high-tension dry batteries you want to take care that these are not heavily overloaded. Another point you want to watch is the coupling transformer, as this also may be badly overloaded if the current is excessive.

If we are using a medium impedance valve as the detector and a fairly high voltage, say 120 or 130, you will have perhaps as much as 8 or 10 milliamps passing through the valve. Apart, as I say, from the drain upon the high-tension battery, this heavy current may mean that the coupling transformer is working under very adverse conditions.

When it is passing a current of, say, 2 or 3 milliamps, it may be perfectly satisfactory, but if the current becomes too high the inductive value of the transformer may be so altered that the whole receiver puts up a very poor show. Excessive anode current here, may, in fact, completely alter the frequency-amplification curve.

There is also the question of burning out the transformer to be considered, but I do not think that it is very likely to happen. It is not so much a question of any danger of actual breakdown of the transformer, so much as working it under adverse conditions. So you want to remember to have mercy on your transformer and high-tension supply when you are going in for power-grid detection.

Push-Pull and Grid Bias.

When using a pair of valves in a push-pull amplifier arrangement you may either use a single grid bias for the two or you may have separate grid bias for each valve. With old types of valve this separate arrangement of the bias was not so important, but with the modern and more efficient valve having a relatively high slope it becomes quite a matter of importance to have precisely the right bias and, inasmuch as the two valves will certainly differ, however slightly, from one another, it is really a great advantage to have separate bias for the separate valves. The bias should be properly adjusted so that the anode currents through the two valves are the same.

Using Tapped Transformer.

This can be arranged by using a tapped input transformer of which the secondary is tapped into two parts, one part to each of the two push-pull valves. The two parts of the transformer secondary are tapped separately on to a grid-bias battery so that the amount of grid bias applied to each of the grids of the push-pull combination is separately adjustable. In adjusting the grid bias a milliammeter should be used in the anode circuit so as to indicate the current flowing, and the bias should be

(*Continued on next page.*)

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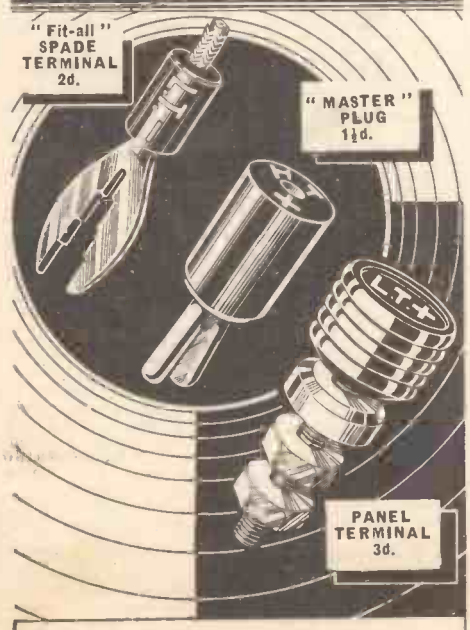

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TECHNICAL NOTES

(Continued from previous page.)

arranged so that the anode currents flowing through the two valves are equal.

Of course, all this is on the assumption that the valves are *reasonably* alike as regards their anode impedances and amplification factors; if they are seriously different they should not be operated together as a push-pull amplifier at all.

Mains Sets.

Although battery voltages vary quite a lot, we are accustomed to think when we go over to mains operation that the voltages are quite constant, but this is not so, and in some cases or in some districts the mains voltage will vary to a surprising extent.

Now this will have an instant effect upon the efficiency of the valves, and therefore upon the operation of the whole of the receiver; but in addition to this, increases in the voltage applied to the valves, above the normal voltage, especially if frequent or long-continued, will have quite a serious effect upon the lives of the valves themselves.

I dare say you know that modern electric lamps of the ordinary filament type are run up to very high temperature for efficiency, but a very small increase in the voltage that is, in the temperature of the filament, will produce a relatively serious shortening of the life of the filament.

Voltage Regulation.

In the case of a wireless valve, especially now that filament temperatures have been brought so low, you might think that there was ample margin for temperature variations, and that considerable increases could be borne without endangering or shortening the life of the valves. Messrs. Ferranti, Ltd., however, tell me that voltage regulation is most important for radio purposes where mains valves are used and that mains valves will have their lives appreciably shortened by long-continued overload of even as little as *five per cent.*

When they say that their lives are shortened they do not mean, of course, that the filament will be in danger of burning out, but, as you know, a dull-emitter filament may become practically useless as an *emitter*, or at any rate very inefficient, although it is far from being actually physically destroyed.

A Ferranti Regulator.

In this connection you will probably be interested to know, although it really belongs to the realm of heavy electrical engineering, that Ferranti's make a number of special voltage regulators for keeping the voltage of the electric supply as constant as possible.

These are enormous pieces of engineering plant and do not directly concern the radio user, as naturally they are installed at the electric power generating stations. But, inasmuch as their purpose is to prevent variations of the line voltage they play a very important part in connection with the satisfactory operation of radio receivers, and more so as more people change over to mains operation.

Valve Construction.

Talking about valves, the manufacture of valves is nowadays a very much more

(Continued on next page.)

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TECHNICAL NOTES

(*Continued from previous page.*)

scientific and accurate business than it was a few years back.

In the old days, seven or eight years ago, the electrodes of the ordinary receiving valve were fairly widely spaced, and slight errors did not make any material difference to the characteristics. But in these days of valves with steep-slope curves, when clearances between electrodes are very small, accuracy is all-important in the construction of the valve, that is, if its characteristics are to bear any reasonable approximation to those set out on the makers' specification chart.

All this means a good deal of expensive machinery and refinements, not only in the manufacture, but also in the testing. Notwithstanding the fact that the modern radio set demands a much higher standard of valve efficiency than was the case a few years ago, I think it is safe to say that the demands are met to-day even better than ever, and British valve makers undoubtedly hold the leading place in the world in this important field.

The Importance of Fuses.

Commercially-made sets almost invariably incorporate the necessary fuses in the high-tension and low-tension circuits, but in home-made sets this important precaution is, I am afraid, often overlooked or omitted as being unnecessary. To leave out fuses is simply to be penny-wise and pound-foolish, because where a fuse consisting, perhaps, of a flashlamp bulb costs but two or three pence, it may well save you as many pounds worth of valves.

You may go over the circuit as carefully as you like and decide that there is no possibility of a short circuit causing any damage to the valves, but you never know what form the accident is going to take. A breakdown in a valve, for example, may result in other valves receiving the high-tension voltage into the filament circuit. A fuse in the negative high-tension lead would prevent this.

Transformer Variations.

One circumstance which has often saved a valve in case of a breakdown is the fact that the small transformers used have poor "regulation"; that is to say, when a heavy load is thrown upon the output winding, the voltage simply falls correspondingly so that the transformer cannot stand up to any very heavy overload.

This, of course, is all to the good in the case of an accident.

Sometimes resistances are used which, whilst small compared to the rest of the resistances normally in the circuit, so that they have very little effect upon the normal intended current, are large compared to the other resistance in the event of a short-circuit. In such a case the safety resistance prevents any large flow of current in the circuit.

But even this is not really sufficient to rely upon, and it is much better to use fuses, either regular fuses made for the purpose or flashlamps at the necessary points in the circuit. So next time you build an all-mains receiver be on the safe side and fix a pair of suitable capacity fuses in series with the mains lead to your set.

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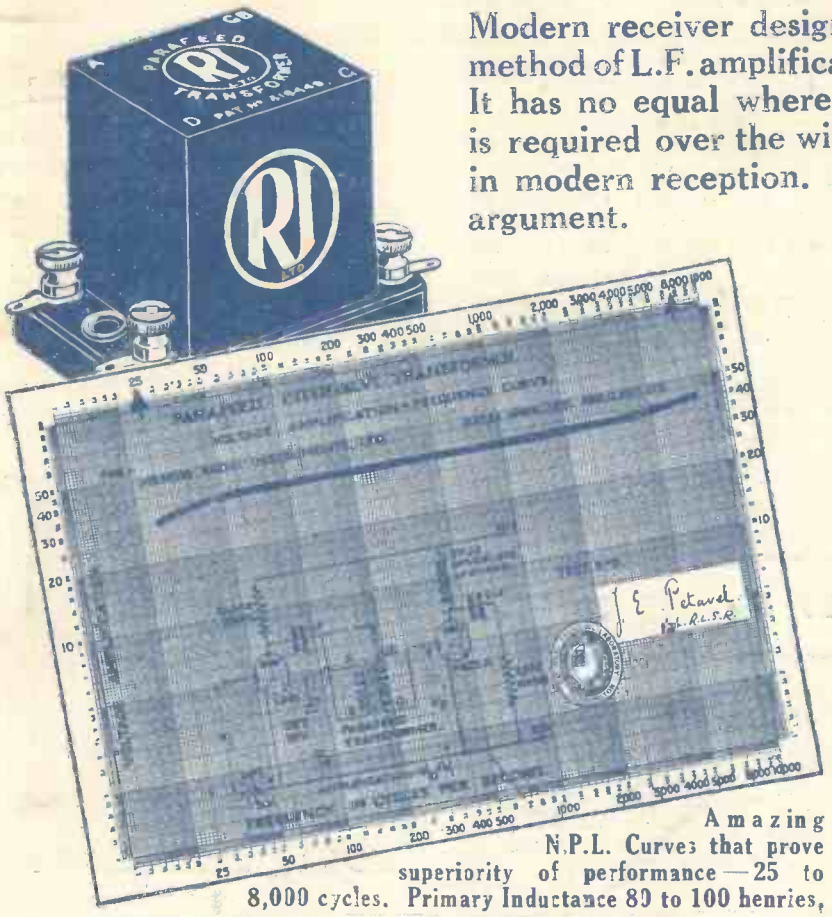

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8/9

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POPULAR WIRELESS. May 28th, 1932.

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

MORE POWER FROM PENTODES (See Page 335)

Popular Wireless

Every Thursday PRICE 3d.

No. 521. Vol. XXI. INCORPORATING "WIRELESS" May 28th, 1932.

A SELECTION FROM THIS WEEK'S CONTENTS:

A TOUR ROUND BROADCASTING HOUSE

LOCATION AND SHORT WAVES

ALL ABOUT ELECTRIC SHOCKS!

CAPT. ECKERSLEY ON "ELIMINATORS"

"MOSE" TELLS YOU HOW HE THINKS RADIO COMEDY CAN BE IMPROVED

HOW TO BUILD THE "COSMIC" ONE

(A whole-world-on-one-dial set for headphone reception.)

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'Grams: Readirad, Blackvil.

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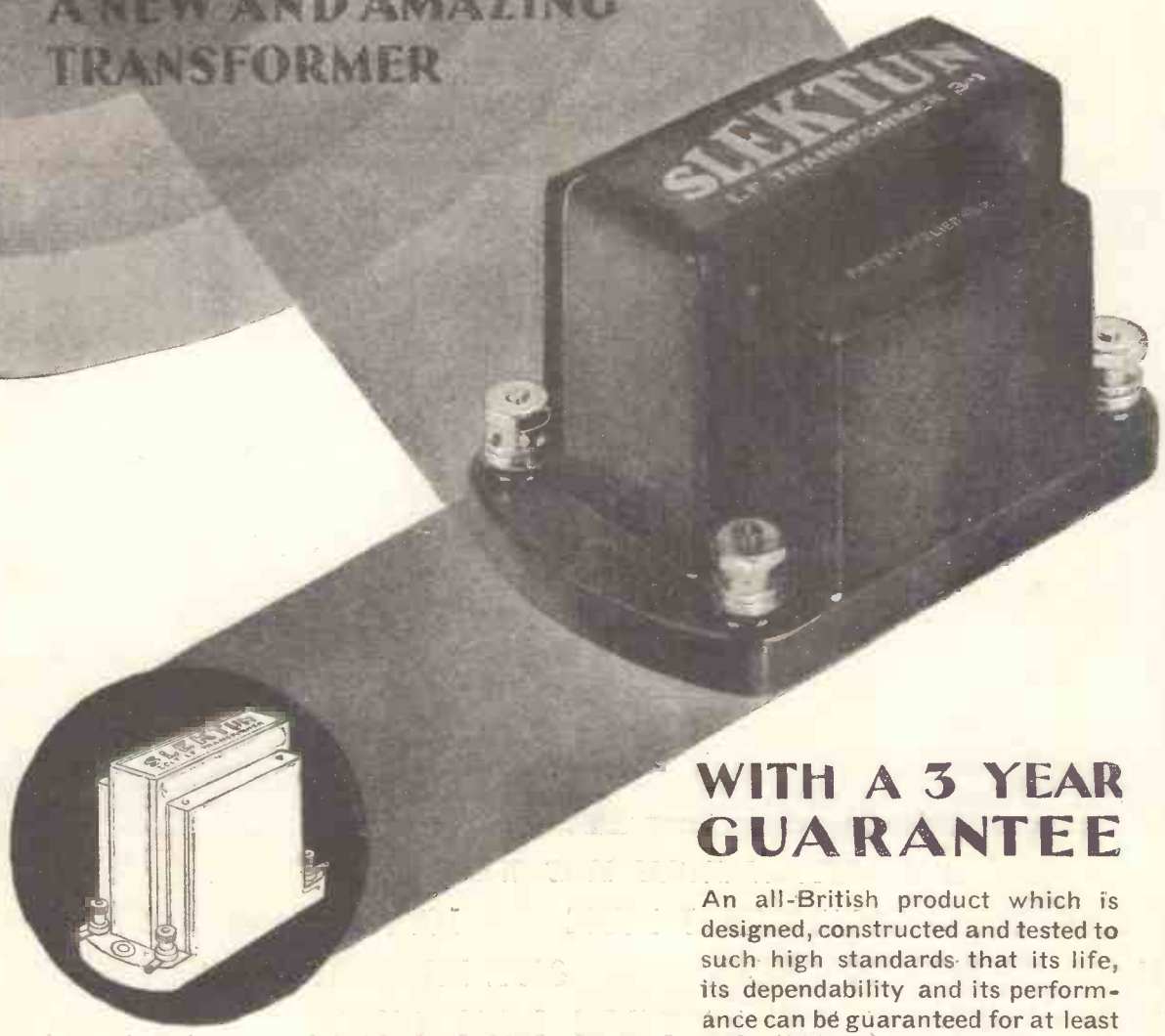
8/6



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Assistant Technical Editors:
K. D. ROGERS, P. R. BIRD,
A. JOHNSON RANDALL.

RADIO NOTES & NEWS

Strange Thought.

SOMETIMES I let a certain old man into my garden to play. He is supposed to be a gardener. A few days ago he was pottering about, adjusting a leaf here and a blade of grass there; presently he straightened up, placed the palm of his hand on the lumbar region, quite in the approved style of "Every picture tells a story," and appeared to be lost in a reverie as he gazed at my aerial.

"What's on your mind?" I asked. "Well, zur, I just thought how if this here *wire* hadn't a been invented, we shouldn't have none o' this yere wire-*less*. Why must we have summat so's we can have none on't, eh? Seems all wrong to me!"

A Perennial Springs Up.

A DABBLER in the study of what is called "telepathy" asks me whether I think that the phenomena which are bunched under that name are connected with wireless. I get it every year about this time, this manifestation of the desire to attribute mysterious things to the agency of radio.

The answer is that I don't think about them at all. I have never come across an instance of so-called "thought transference" which was accepted by scientific psychologists as genuine. Anyhow, the subject is so far removed from the sphere of practical radio that it doesn't concern me.

"Most Amusing."

THE sight of a specification which included the phrase "Multimu S.G. valves" reminds me of the American lady's cat, which had "a predilection for Greek." The poem ends:

Doubt not my strict veracity,
For I can prove my words are true:
She often comes and talks to me
And says: "Mu, mu."

A Spot of Optimism.

ALL this swaraj bunk, boycott balderdash and non-co-operation nonsense which the followers of Ghandi have been talking about does not appear to have hurt the radio trade. For during the last nine months of last year India's radio imports increased from £33,750 for the corresponding period of 1930 to £46,875, and our share of this increase increased from £18,750 to £30,000.

Broadcasting for Schools.

THE Central Council for School Broadcasting, with an arrogance worthy of the B.B.C., has now decided to advise education authorities and schools to install only such apparatus as has been approved by the Council.

I should like to see some "education authority" sit up and tell the blessed "Central Council for Whatsitsname" just precisely where that Council gets off the 'bus! But none will have the nerve to do it.

Well, manufacturers who humbly wish their gear to be approved, had better write (humbly) to the Secretary of the aforementioned C.C.F.S.B., at Broadcasting House, London, W.1.

OFF TO AUSTRALIA

At the invitation of the Government of Australia, Capt. P. P. Eckersley—"P.W.'s" Radio Consultant-in-Chief—has gone to that continent to advise upon the broadcasting service there. Fortunately for our readers, that onerous task will not interfere with his contributions to "P.W.," which will continue to appear as usual. He is here shown with Mrs. Eckersley on the boat train at St. Pancras, and we are sure all our readers will join with us in wishing them Bon Voyage.

Soft Answers.

K. R. N. (Norwich). No, the Post Office can't be expected to accept responsibility for your canaries copying oscillators. D. R. (Epsom). Wrong shop! Who *is* Greta Garbo? Chuck the films and turn radio. Then you will know who P. P. E. is, and, possibly, his favourite flower. S. F. (Rye). Sorry! you've lost your wager, because a straight wire *has* inductance, though not as much as a corkscrew! D. L. S. (Minehead). Thanks for verses—though our tame poet says that when you say "metre" you don't mean what *he* does. Who told you that "ampere" rhymes with "hamper?" J. N. (Woolwich). Oh, no! I write these Notes while I shave. No trouble at all. Try it, old boy!

"Ariel's" Historical Researches.

HEARTY claps having rewarded my previous excursions into ancient radio history, here is a little more fruit of my researches. A booklet about wireless in 1922 furnishes me with the information that, "in favourable conditions speech and music can be received in Liverpool from a London broadcasting station on one valve, provided the outside aerial contains about a hundred feet of wire." 'Smarvellous! The same booklet reveals the stupendous fact that at the beginning of 1922 some seven or eight thousand licences were in force, mostly for reception.

Queer Quandary.

AN evening newspaper has been publishing quandaries, propounded by its readers, with the replies of well-known people stating what decisions they would make. No radio quandary has appeared to date, so I must remedy the deficiency. Here is my contribution. You are a "Cosmic" convert with a step-uncle in Loughborough who has a performing seal and a floating kidney. One night you are listening-in and you hear an S O S from Lwow about a Lithuanian glass-cutter who went sane and bit an Ogpu sergeant in the back veranda of a Nijni-Novgorod banker's flat in Varsowa, at twenty zlotys per

(Continued on next page.)

"ARIEL'S" RUNNING COMMENTARY ON RADIO *(Continued)*

bite, no rebate for a quantity. *Now*—and this is important—your H.T. battery is borrowed from next-door and your last stage L.F. valve from next-door-but-three. Would you, or must they? Can I? If so, who?

The "Voice" of Love.

A REMARKABLE broadcast over the Columbia radio system in the U.S.A. was carried out last month, when the light from the planet Venus was passed through a telescope, picked up by a photo-electric cell and its "sound" amplified and handed on to the broadcasting microphone. The "sound" of Venus came to listeners as a high violin note. A cigar, induced to perform in the same manner, produced a hoarse growl.

I do hope that this will not make American listeners believe that Venus makes a noise, though I am not so sure about the cigar. The American flag, the report says, made a noise like an orchestra without a conductor. How very American!

"See Britain First."

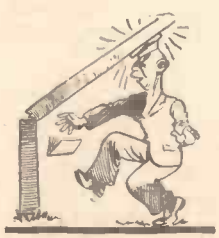
ALAS! for those wonderful talks by S. P. B. Mais, that they are over. I hope he or the B.B.C. will republish them in book form.

Mr. Mais is the man to go hiking with. I consider that a series of talks such as he has just given is exceedingly valuable to Britain and I earnestly trust that they will have the effect of keeping many people at home in this wonderful island, this year and many a year.

As one who has visited foreign parts widely, and lived abroad, I say that there is nothing which I have seen overseas which would woo me from my native shores again. See-Britain with the eye of Mr. Mais and you will agree that "east, west, home's best."

A Wireless Van Miracle.

THE most notable exploit of the Post Office wireless detector van is its alleged detection of a set which was not working and whose aerial was at the time actually being dismantled. A fair cop—as the burglars are supposed to remark—but how did this marvellous van detect a silent set?



The incident occurred in Walsall in April, and there was much "(Laughter)" in court when it was stated that the aerial pole broke just as the "investigation officer" from the van arrived. But I think that the court missed the point, for the laugh was really on the van.

The Rebel.

I ENTERTAIN great respect for that lady employée of the B.B.C., who, having sued a man for damaging her car, told the Registrar that the car had received a "binge." The charming litigant was, of course, using quite the wrong word—"as every mother's son doth know"—and she corrected it to "biff," on being promptly and properly advised by the Registrar, who added that he was surprised that any B.B.C. person should use such expressions.

I raise my hat to her for having preserved the well of English undefiled in despite of the nasty purifying agents which the B.B.C. have striven to cast therein.

"Lady, be Good."

EARLY this month the staff of the B.B.C. were welcomed to Broadcasting House by the Director-General in the Concert Hall—a perfectly unnecessary proceeding, I may say, *en passant*. But the fact which stands up and screams is that the sitting formation of the assembled disciples provided for the sexes to be separated, the men being in the centre, flanked by the women!

They do the same in prison chapels! However, it was no doubt a proper precaution, for how dreadful it would have been if an Acting-Deputy Stock Market Report Reader had been permitted to whisper, "Do you like *Canpacs*?" to a Female (Probationary) Flute Drier (1st Grade)!

"SHORT WAVES"

THAT'S FORTUNATE!

Enough cotton is raised in the South of America to stuff the ears of everybody who ever had to listen-in to songs about that part of the country.—"Judge."

* * *

It is stated that the B.B.C. has discovered a man who can play three pianos at once.

We can only appeal to the B.B.C.'s better nature.

* * *

Touching scene at the B.B.C.—"Uncle Cyril" announces his own twins!—"Punch."

* * *

A writer in one of the daily newspapers, dealing with the principles of the cone loudspeaker, playfully conjures up the idea of turning the door or a table into a loudspeaker—i.e. "music from a bedroom door."

It is a belated headline, because every day in thousands of homes there is music from the bathroom door.

* * *

A local wireless dealer was charged with assault and battery, and brought before the judge.

Judge (to prisoner): What is your name, occupation, and what are you charged with?

Prisoner: My name is Sparks. I am an electrician, and I am charged with battery.

Judge (after recovering his equilibrium): Officer, put this guy in a dry cell.—"The Cherry Circle."

"Yo, Ho, Ho, and a Bottle of——"

SHADES of Jim Hawkin's, Long John Silver, Cap'n Smollett and all the rest of the company of the "Hispaniola"—for Hayti, the negro republic, better known as Hispaniola, has given a concession to some American firm for the erection of a radio station at Port-au-Prince and, later on, of nine receiving and transmitting stations, so I read.

I don't know whether these stations are for broadcasting or for commercial telegraphy, but I do know that Hayti is only about 400 miles long and 160 miles broad, and that it doesn't need nine.

A Great Little Broadcaster.

ACCORDING to what I hear, a wire-haired terrier, named "Short," has had the time of his life and set up a canine record, too. This young fellow was induced to bark at a microphone located in Schenectady, U.S.A. Mankind then arranged for Short's remark to travel to Holland, thence to Java, thence to Australia and so back to America, where Short's own bark came back to him from a loudspeaker.

This insolent reply called for an immediate response from Short, and so the conversation continued until the test ended and Short was dragged growling and yelping and swearing from the ring. I reckon he won, don't you?

Advertising By Radio.

I STILL have a shot in the locker for my friend Mr. Werner (of Cal.) who thinks that radio advertising in general is a proposition. I take up the *Christian Science Monitor* of Boston, Mass.—quite a well-informed little periodical, as W. W. will admit—and I read that recently, U.S.A. radio has become clotted with all sorts of "free" offers, "startling announcements" and the like.

Then, says the "C.S.M.": "If radio has the pulling power which advertisers claim for it, are these offers on the air attempts to acquire a mailing list—or desperate measures to bolster up a system which will not produce results under its normal procedure?"

I didn't say it, W. W.!

The First Hiker's Set.

IN the course of my delving amongst early records, I found that Holland had the honour of having produced the first "hiker's" receiver. A radio club at Noordwijksche, it seems, had developed a one-valver with a wave-range of 400–2,000 metres.

This they transferred to a tray something like what the Holborn gutter-traders affect; it was slung by bands round the neck and held by one hand, close to the lowest waistcoat button of the hiker. It had a frame aerial, 80 centimetres square, and a 200 miles range.

It's true—I have seen its photograph!

ARIEL.

THESE RADIO COMPONENTS

A COMPLETE AND CRITICAL REVIEW

YOU could take a kilowatt from many mains and it would cost you only one penny per hour. If your wireless cost you a penny per hour and you listened four hours *every* day (might you be forgiven !) you would pay about £6 per annum in power. People ought to take about one-tenth of a kilowatt, and so it would cost them if they listened 2 hours every day about 6s. a year.

The Watts Required.

There is a great gap between the 100 watts and the 1,000 watts, between £6 per annum and 6s. per annum. One day we shall need a kilowatt—to-day 100 watts is ample. To-day few people take their 100 watts. Let us work out what power we ought to have. I think a four-valve set is a good sort of mains set these days. Each filament takes the order of an amp at 4 volts, making 16 watts. The transformer has a two-thirds efficiency, so we take about 24 watts for L.T. As to H.T., the H.F. valves take say a couple of watts all told, the detector another four—in fact, everything except the last valve can be easily lumped as 10 watts.

Now the last valve ! The loudspeaker playing quite moderately wants an R.M.S. ½ watt. for peak demands. Now I should like to have such a factor of safety as to give me say a peak *two watts* R.M.S. The last valve has an efficiency of say 20 per cent at most, meaning we want 10 watts in the last stage.

So, in all, we require apparently about 20 watts of H.T. supply. The rectifier and so on is only about 50 per cent efficient, and so say 40 watts from the mains for H.T. Thus the total mains consumption should be, for a four-valve set, about 70 watts—costing only a few shillings a year to the consumer.

For Variable Loads.

This means that the output H.T. part of an eliminator should certainly be capable of giving 20 watts at 200 volts, or a current of 100 milliamperes at 200 volts. How many do ? Isn't it nearer 20 milliamps and if you increase the loading, don't the volts drop and drop ?

Of course, all eliminators suffer from poor regulation. It seems almost inevitable that they should. For a fixed design of set it does not matter much, there's a fixed load, and once you have adjusted the H.T., well, it should stay like that for ever. In experimental work I strongly advise an eliminator with a real factor of safety and an adjustable voltage output. The connections Fig. 1, show how I could do this.

Thus the primary is tapped and either a stud switch or a simple plug or even a "tie clip" selects various ratios of transformation of the transformer. Obviously the volts rise per given load as the selector arm moves towards (a) in my diagram. This is the only really nice way to regulate volts for experimental work.

"ELIMINATORS"

Continuing his trenchant remarks concerning the power supplies of radio receivers, our noted contributor—who is "P.W.'s" Chief Radio Consultant—this week deals with mains units, and gives some very useful advice concerning their use.

The Limits of Batteries.

Of course, if I really wanted to have a proper experimental laboratory I should have a large D.C. machine with an output of two kilowatts and a voltage going up to 3,000, and I would have variable excitation and a potential divider, and I should be terribly happy about that very vexed question of H.T. volts !

The A.C. mains rectifier is all very well, and is indeed ideal, for a fixed load (provided it is capable of supplying it), but when it comes to questions of variable load, I think it's a terrible snare and delusion. Regulation is fatally bad—it must be as far as I can see—and that is a real curse.

A lot of people use wet batteries for H.T. A lot of people are sensible if they can afford such luxuries and can afford to keep the batteries charged and in good condition.

You don't want wet batteries though if you are designing against a *fixed* load.

B.B.C. Practice.

I was party to the use of batteries in the B.B.C. control room. There we used 300 volts of about 20-ampere-hour cells. By this means we could use a great number of amplifiers using the same H.T. supply, but amplifying different programmes without risk of "cross talk." Naturally batteries are only good for the *lower* voltages—300–400 is a maximum for valve amplifier sort of work, and for big voltages we are driven to rectified A.C. or machines.

All this is a bit beside the point as far as my average reader is concerned—the average reader wants to look at cost carefully. So I reiterate, when designing a set remember you do want the proper volts—200 is the minimum in my opinion—and you want these volts at full load, which should be of the order of 100 milliamps.

It may cost money—it may cost a lot more than you want to pay. But, if you get a metal rectifier it will last you for ever, and you will always know that your set is not starved of power.

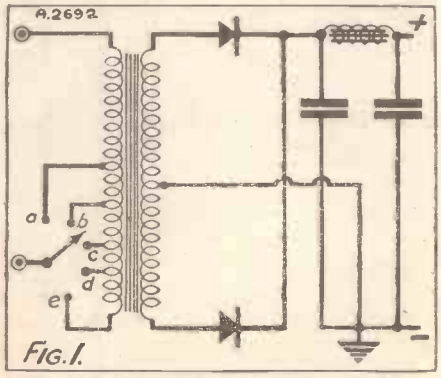
Real Power.

All the circuit design in the world, all the care with exact grid bias, exact impedance matching, exact this and that, fails, and fails completely if you haven't got a proper power supply. That edgy throttled quality one is so tired of hearing comes quite often because the eliminator won't give the power.

It's just those fortissimi which fail and go into blasting shudders, it's just that top

(*Continued on page* 356.)

VOLTAGE REGULATION



Capt. Eckersley considers the voltage output of an A.C. mains unit should be made adjustable for experimental work by using a tapped primary.

"P.W.'s" famous short-wave expert discusses reception freaks, and gives some suggestions concerning an interesting experiment amateurs can try.

ANYONE with the slightest practical experience of short-wave work has come across some of the amazing freaks of reception that appear to be the rule, rather than the exception. Nothing is more confusing than to receive, as I do sometimes, two letters from the same town, helpfully informing me about the "conditions up Sheffield way," or "up Aberdeen way," and to find that the two writers completely contradict each other.

It is not the writers' fault—luckily I have had enough experience to know that at once. It is just that two receiving aerials, not more than a quarter of a mile apart, appear to bring in completely different sets of stations.

I do not think this can be put down to directional reception, since it often occurs even when the aerials are similar in size and parallel to each other.

Look to the Receiver.

Do not think I am going back on my own words and saying that there are lots of very *bad* locations about. A man that excuses his poor results on short waves by talking about his "bad location" is generally the owner of an extraordinarily poor receiver! But, undoubtedly, there is a weak spot in the armour wherever we set up a short-waver, for we almost invariably find that there is some part of the globe that we cannot receive as well as "the man next door."

My own situation, for instance, is undeniably bad for Australia, but phenomenally good for South America and South Africa. A transmitter-friend of mine, less than two miles away, annoys me intensely by working with one Australian after another when I can't even *hear* them! But, on the other hand, I find that I frequently cause him a bad half-hour by chatting merrily on with South Africa and South America when *he* can't hear anything at all.

My friend and regular correspondent, "G.C.A." assures me that he can never hear the Australians well in the evenings—when others receive them well—although in the mornings they are better at his station than anywhere else!

Of course, all this is rather hard luck on the man whose "good spot" happens to be some part of the world that is not infested with short-wave transmitters. I know two people whose short-wavers would be pronounced thoroughly bad—both by me and the owners—were it not for the wonderful way in which they receive Java, Saigon, Chi-Hoa and sometimes Manila, P.I.

An Interesting Test.

All of this is leading up to some experiments that I am hoping to carry out very shortly. Regular readers will remember that in "Short-Wave Notes" not long ago I described some tests with a portable receiver on Wimbledon Common. My plan is to make a much longer tour with the same receiver, and really to get down to this "location" business.

I have been spending many long evenings tabulating the reports I have received from most of the big towns in England, and I am just going to find out for myself whether they are correct! If everything turns out as I hope it will, I shall spend a day with my little set, seated on the cairn at the top of Snowdon! If there is a "dead spot" up there it certainly won't be due to screening—unless the clouds have anything to do with it.

Coming nearer home, I shall also "test out" the tower on Leigh Hill, and some of the lesser lights like Box Hill, Ranmore Common and Newlands Corner. A two-valver will be used, with an open aerial consisting of about twenty feet of flex that can be swung round in any direction, and it should be possible to ascertain definitely whether the direction of the receiving aerial has a great deal to do with local conditions.

The main reason for this short article is to appeal for a few more reports from some of my regular readers and correspondents, on these lines: First, the direction in which your receiving aerial runs; and secondly, the part of the world that you do not seem to receive well.

Armed with a sheaf of information of this kind, I may really be able to find something out.

Try This Experiment.

Finally, I have a suggestion to make for the benefit of those who have sufficient space and are keen enough to try it out. As a start, listen for three or four days and log all that you hear—this should show you where your "weak spots" appear to be. Having done this, put up an aerial at right-angles to your usual direction and try for another three or four days.

As a sequel to this, try, if possible, a short aerial broken in the centre with the receiver attached at the break. That is to say, dispense with your earth, connect half of the aerial to your aerial terminal and the other half to your earth terminal.

It does not matter about making the two halves exactly equal in length; one may be outside and the other running across your room away from it. But *do* see that the receiver is equipped with two lengths of wire, one running in each direction from it.

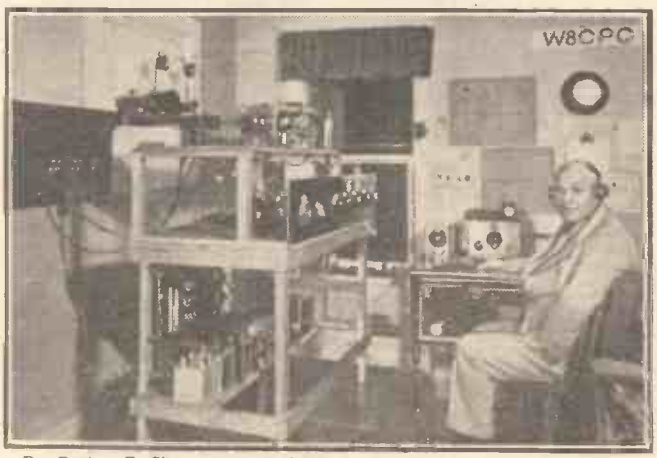
I venture to prophesy some interesting results to this experiment; I have certainly had some myself.

An Old Dodge

But I do not claim originality for it, as it was described by Dr. Pickard in "Q.S.T." if I remember rightly, in 1925, under the title of "Horizontal Reception."

But please, do help me and "P.W." to collect some real information about short-wave freaks, send in the particulars asked for above, addressed to W. L. S., c/o the Editor, "P.W."

A U.S. "FAN" AT HOME



Dr. Barton T. Simpson, an enthusiastic American amateur transmitter, operating his station, W 8 C P C.

SHORT-WAVE RECEPTION

Our Popular Contributor, W.L.S., writes regularly each week in this paper. Make sure of your copy in advance by placing a standing order.

THREEPENCE. EVERY THURSDAY

Billy Bennett Says—

RADIO COMEDY can be IMPROVED

The well-known radio comedy star "Mose," of "Alexander and Mose," has a few words to say about the popularity of radio comedy in this country, and gives some hints on how it could be improved.

WHEN I think how popular broadcasting has grown from nothingness, in ten years or so, to be as universally important as it has become to-day, and how thoroughly generally satisfied the public has been with the programmes, I feel that it is unfair of me to make the mildest complaint!

I have a very great admiration for the B.B.C. ways, but the Broadcasting Corporation itself is always looking for possible improvements, and so I do not think that a word on one form of improvement which most radio artistes agree might be made, would be out of place or over-critical.

People Appreciate Humour.

I am sure all listeners will agree that we might well include a bit more comedy in the programmes. At the present rate we get a variety concert from one station or another about once a week, but even that one concert might well include more humour.

That the majority of people appreciate humour is illustrated by the fact that far more theatres run comedy than tragedy in London. Broadcast variety needs more pep and punch. It needs to be more varied, more forceful, more British and more frequent. A laugh a day keeps the doctor away!

I've no criticism about the turns with which we are provided at present. Nearly all the humorous ones are good, and they're certainly clean, which is a blessing these days. But it might be a good thing to ring the changes rather more often.

More New Talent Wanted.

There have not been many new names on the radio comedy list for the last two years; I believe no great new reputations have been made in that time, and that means there might well be instituted a search for new talent. I'm sure any regular listener will agree with me.

Most radio sets get British stations better than foreign ones, and numbers of sets only get British stations, and therefore the B.B.C. alone is called upon to provide the major portion of our national wireless enjoyment.

Thousands of listeners can and do tune in to Continental operas and concerts, and so on, but very many thousands more cannot understand any other language than English, and cannot get the full enjoyment from the Continental stations because of that. Besides all that we are terribly insular still, and do love to hear our own country-people entertaining us over the ether.

I sympathise with the difficulty before the B.B.C. directors in choosing turns, because it so often happens that a famous actor has no "microphone voice," and though popular on the stage, would be disappointingly inaudible on the radio. This makes such a difference to the number of stars available for broadcast work, and is probably one reason why our comedy turns are not more varied than they are.

But there *is* plenty of talent available—music-halls manage to find it—and I believe if I took pencil and paper I could jot down a good many attractive comedy turns (even without looking outside this country) that listeners would like to hear.

It is invidious to mention names when there would be space enough only to select a few, but I should think, with real care in choosing, listeners of to-day could be given a representative selection of comedy makers to equal, say, a company composed of such indisputable former stars as Dan Leno, Marie Lloyd, Joe Elvin, Gene Stratton, Vesta Victoria, J. L. Toole, and J. C. Macdonald.

AN EXPERIENCED HAND

Billy Bennett, who is very well versed in stage comedy, as well as microphone humour.

Too Few and Far Between.

Another thing that could be made more extensive and more varied is the selection of actual radio comedy plays and playlets offered to us now.

The legitimate stage isn't exactly my province, but I do think most listeners will back me up when I say that our present radio plays are too few and far between, and that they are nearly always broadcast at an extremely awkward hour. Most of us are thinking of bed at ten o'clock, yet that is the time at which the plays are nearly always offered us.

This means that, with so few plays available even very late, a normally busy man with a few calls on his evening time is able to hear about two plays in a year, and no more. Again, it would be a good thing to offer more encouragement to unknown and to famous writers, to write plays for broadcasting.

Talks Might Be Reduced.

Probably there are many listeners who are capable of writing something good, and if prizes were offered periodically for short plays, I am confident there would be plenty of competitors. The works of Shakespeare, Sheridan, Sterne, and the rest of the great playwrights of the past might also be called upon much more frequently than at present, to help fill the programmes.

We do, I admit, get an occasional rendering of some classic play, but it is so seldom at present that people who go out much in the evenings must surely never get a chance of hearing them.

Yet radio listeners are like all other folk—they keenly appreciate being given something bright and amusing in the way of entertainment. There are a number of the present talks, fascinating in themselves, but each one calculated to appeal to only a tiny section of the community, which might well be reduced a little in number to make way for more and better radio comedy.

A TOUR ROUND BROADCASTING HOUSE

BY A SPECIAL CORRESPONDENT

Who records his impressions in a delightfully readable article.

CUM multis aliis, quae nunc præscribere—darn it! There's that wretched Latin breaking out again. You see my fountain pen has gone all *quodlibet* since my recent tour of Broadcasting House. And the cause of it is that huge Latin inscription which meets your eye the moment you pass through the main doorway of the B.B.C.'s new home.

It dominates the whole of the entrance hall—and is a stern warning to those who come a'-visiting with laughter in their hearts.

Of course, it is good Latin—at least it is precise; anyway, there are precisely fifty words, but I don't imagine for one moment that there are fifty people in Broadcasting House who could tell you what they mean!

"The Great Plan."

However, no doubt it is all a part of the Great Plan. And what, you may well ask, is the Great Plan? It is nothing less than an attempt to recreate the mystery of radio. It was all getting too homely and familiar at Savoy Hill. Hence Broadcasting House.

"What," I asked my guide, while we were standing in one of the Talks studios, "is that peculiar dial affair on the wall over there?"

"I'm afraid I don't know," he replied with a puzzled frown.

"Perhaps it is some kind of indicator to measure the length of the talks," I politely suggested, as I went closer to the brightly-coloured disc and examined the curious hieroglyphics which encircled it.

"That pointer is moving *now*," observed one of my five companions.

And it was, so we silently stood before the object respectfully waiting for something to happen. We waited. And we waited. Then someone hissed between his teeth.

"It's a clock! An ordinary clock for telling ordinary time." He muttered.

After further investigation we conceded him his "ordinary time" as a possibility but it is certainly no ordinary clock! Thus we encountered further evidence of the Great Plan.

Have You Seen Them?

And here I must mention that the sculpture, yes, sculpture, which graces (I said *graces*) the exterior of the good ship Broadcasting House, has nothing whatever to do with the G.P. At least I don't think it has. In fact, I believe the sculptor responsible for these works of art suffered from a dose of H.T. that leaked through the wall while he was plying his chisels. Anyway, let's be charitable.

But to return to the Entrance Hall, and carefully averting our eyes from the Sailor's Song from the Latin Opera Sardincania (Well, it might be that, mightn't it?) what are one's *general* impressions? Rather admiral, I think.

There are counters to the left on which literature is neatly displayed. This is the B.B.C. bookshop! On the right a harassed reception clerk is to be seen busily engaged in entering callers' names in a big book and asking programme pundits through a 'phone whether they won't see him, her and they. And no doubt, mostly they won't!

Dead ahead, shrinking beneath the—(no, I won't mention it again)—are the lifts.

Hundreds of Yards of Corridors.

We step into one of these lifts, the door quietly shuts, and we are whisked into the very jaws of broadcasting. We traverse hundreds of yards of not-too-wide corridors lined with flat cabin—no, *cell*—hang it, I'll get it right in a minute; lined with oven—no, *safe*, no—well, just doors, then.

There are also windows shining with pale light. It's supposed to be imitation daylight, but I don't see even imitation flowers being deceived by it. Now and then one stumbles over exotic alcoves where, amid modernism run riot, announcers and artistes may rest awhile to recuperate.

On our one side is the outer skin of administrative offices where stenographers and other "clericals" ply their crafts and pretend they are broadcasters, and on the other a fat wall which encircles the studios.

Complete Acoustic Isolation.

You see the idea? Complete acoustic isolation. Not one word of scandal from the outer world can penetrate into these cloistered studios. Loud-voiced taxi-men in the streets outside can curse their indigent musical fares with all the strength of their lungs without point-one-of-one-per-cent of a decibel of it reaching gentle-souled Mike.

We peeped into some of the studios where rehearsals were in progress. In one "Mrs. Feather" was extracting guffaws from Henry Hall and his boys; in another Mr. Victor Hely Hutchinson was giving Section something of the B.B.C. Orchestra some tips about the interpretation of Bach—or it may have Stravinsky.

In a larger studio Sir Landon Ronald could be seen gesticulating at an even bigger bunch of musicians. I wondered why a lady member of this Section of the B.B.C. orchestra should so interestedly be reading a newspaper in the middle of it all. Had it been a Latin dictionary there would be no need for speculation.

A respectful peer into a fourth studio rewarded us with a glimpse of Bertram Fryer giving the works to a throng of vaudevillists. Later we saw Miss Cecil Dixon at a piano and, best of all, a play in full blast.

The Studios.

Four or five studios were needed for that. In one an elderly man was inciting a group of people, including several small boys, to dance about and shout—which they did with great vim and vigour and with wide grins. In another a passionate tête à tête in front of the mike was in progress, though as the artistes were deriving their passion from pieces of paper, the scene lacked conviction to the eyes of us beholders!

And then the effects studio. What wondrous

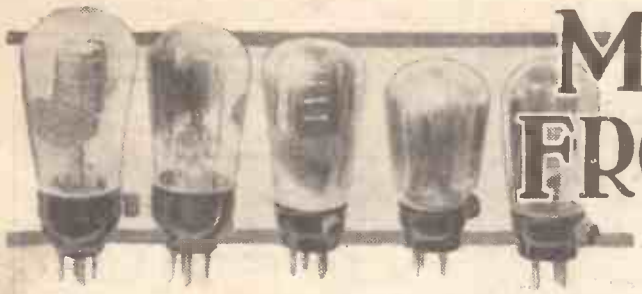
(*Continued on page* 354.)

THE INSCRIPTION IN THE ENTRANCE HALL OF BROADCASTING HOUSE

Deo Omnipotenti Templum Hoc Artium Et Musarum, Anno Domini MCMXXXI. Rectore Iohanni Reith, Equite. Primi Dedicant Gubernatores Precantes, Ut Messem Bonam Bona Proferat Sementis, Ut Immunda Omnia Et Inimica Paci Expellantur. Ut Quaecunque Pulchra Sunt Et Sincera Quaecunque Bonae Famae, Ad Haec Aurem Inclinans Populus Virtutis Et Sapientiae, Semitam Insistat.

A MAGNIFICENT ACHIEVEMENT

Broadcasting House is a magnificent architectural achievement, and its technical equipment is vastly superior to anything else of its kind anywhere in the world.



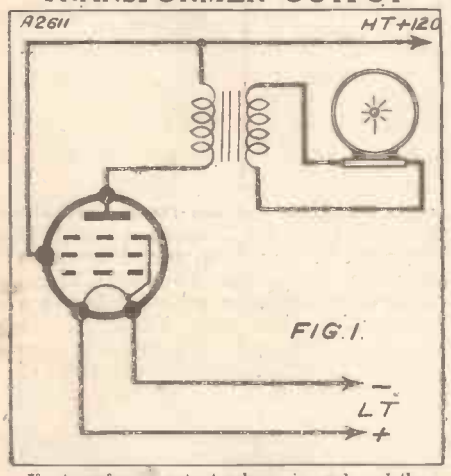
MORE POWER FROM PENTODES

BY R. W. HALLOWS M.A.

One of the first users of pentodes in this country tells readers of his practical experiences with this class of valve, and gives some useful tips on getting the best results with the latest types of pentodes now on the market.

THE pentode valve has had a rather curious history in this country, so far, at any rate, as the battery-operated types are concerned. If we could draw a "popularity curve" on the lines of loudspeaker response curves we should find that its shape was very queer. At the outset everybody wanted pentodes—the curve rose to a high peak. Then, for reasons into which we shall enter in a moment, the pentode went rather out of favour, and there was a corresponding trough. Since then there have been many ups and downs, and now there are signs that the pentode is really coming into its own.

TRANSFORMER OUTPUT



If a transformer output scheme is used, and the loudspeaker is of the low-resistance moving-coil type, a very high-ratio transformer is usually needed.

I can, I think, claim to be the first "outside" user of pentodes in this country, for I was employing them nearly a year before they made their appearance on our markets. I received one day a letter from a Dutch friend who told me that he was obtaining marvellous quality from his loudspeaker with an output valve of a new kind which had an impedance of about 100,000 ohms. At the time this statement appeared to be utterly incredible, but long experience had convinced me that the word "impossible" should be used with care about matters wireless.

Incredible at the time.

There was considerable difficulty about importing these valves from abroad, but I managed to have a couple brought over. Then came another difficulty—there were no loudspeakers specially wound for the pentode available in this country, nor were there such things as pentode output chokes or transformers. The only thing to do was to make one's own. Have *you* ever tried the task of winding on 10,000 or 15,000 turns of cobweb-like D.S.C. wire?

Well, eventually I succeeded in giving those prehistoric pentodes a proper test, and I can tell you that it was a revelation. I wrote guardedly about them, and vast numbers of readers promptly armed themselves with epistolary bricks which they hurled at my devoted head.

To talk about unheard-of amplification with good quality from a very high-impedance output valve was, they said, to display a complete ignorance of the fundamentals of wireless. At the following exhibition at Olympia the pentode valve appeared, and wireless enthusiasts fell over themselves and each other in their eagerness to buy it.

H.T. Consumption of Early Types.

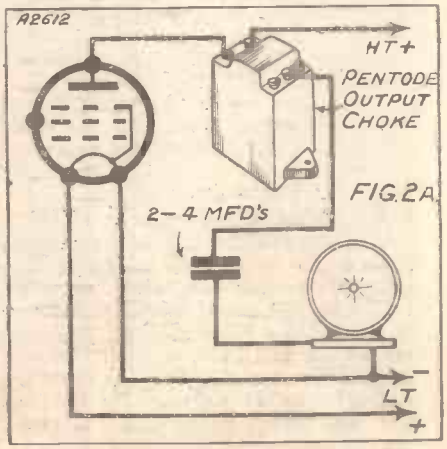
The pentode in its early days was very nearly stifled by its own popularity. Everybody wanted it; it was fitted into all kinds of sets quite unsuitable for it, and worked more often than not from standard capacity batteries. It even made its appearance in portable sets with devastating results to the pockets of purchasers, who found that they required a new high-tension battery rather better—or really I should say rather worse—than once a month.

Those early pentodes used an unconscionable amount of high-tension current. I measured the total H.T. drain in one portable set incorporating a pentode valve, and found that a small-capacity dry high-tension battery was expected to supply about 30 milliamperes!

This big drain on the high-tension battery was one of the reasons why the pentode fell into disfavour within a few months of making its bow to the public. Another was that the pentodes of those days were rather apt to suffer from internal short-circuits unless you treated them with considerably more care than is given to a valve in the ordinary course of events.

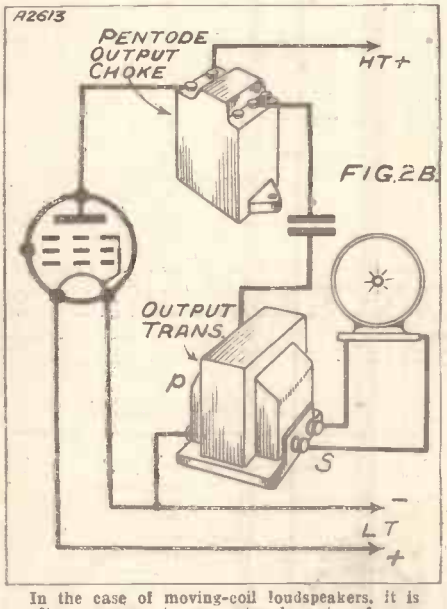
I well remember blowing up a large part of an expensive accumulator high-tension battery through a dead short-circuit caused by the mutual entanglement of two of the grids of one of my pentodes.

MATCHING THE SPEAKER



Owing to the very high impedance of a pentode valve, a special tapped output choke has to be employed for the filter circuit to match up with the loudspeaker impedance.

FOR "MOVING COILS"



In the case of moving-coil loudspeakers, it is often necessary to use a step-down transformer in addition to the tapped choke. This is because loudspeakers of this type frequently have a very low impedance. In fact, it is not uncommon for them to be as low as 12 ohms.

Getting the Full Volume.

Another reason why the pentode went under a cloud from which it has yet hardly emerged was that many users were bitterly disappointed with the magnification actually obtained. They did not then (and some do not now) realise that unless you match loudspeaker impedance with pentode impedance by means of a suitable output circuit the valve may be a very poor performer as regards volume.

The last, and perhaps the most important, reason for the pentode's failure to maintain its full measure of popularity was that large numbers of those who fitted it to their sets discovered that the quality

(*Continued on next page.*)

MORE POWER FROM PENTODES

(Continued from previous page.)

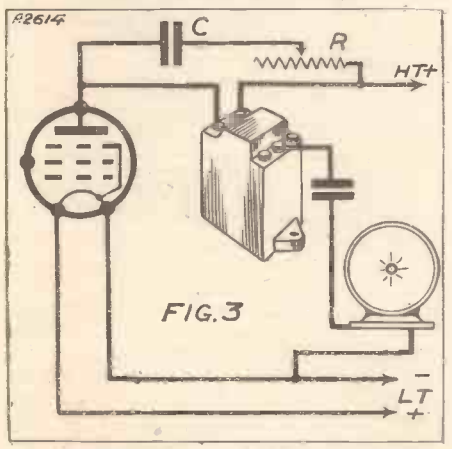
left much to be desired. By using correct output circuits they obtained plenty of volume, but they found that the reproduction was shrill and distinctly lacking in good rib-shaking bass notes.

In a word, the pentode earned, quite undeservedly, a reputation for being very extravagant as regards high-tension current, for being too delicate for ordinary use, for giving disappointing volume and for providing unpleasantly high-pitched reproduction. There are many to-day who still believe that the pentode is a cranky, uneconomical valve, incapable of giving good quality from the loudspeaker. I want to show not only these doubting Thomases, but also those who appreciate the good qualities of the pentode, how the valve can be given a real chance of doing itself justice.

Quite a Robust Valve.

First of all, let me say that the pentode is, so far as my experience goes, just about as robust a valve as the triode or the screened-grid. Its design has been so greatly improved that it now requires no kid-glove treatment. Dozens of them have come to me either through the post or as railway parcels, and I cannot remember in the last twelve months a single case of one arriving with an internal short-circuit.

TONE CORRECTION



A peculiarity of the pentode is that it is inclined to over-emphasise the higher notes. This can very easily be corrected by connecting a high-note filter as shown in the above and following diagrams. The fixed condenser C may have a value of ·02 mfd. or more and the variable resistance R may be of about 20,000 ohms.

Next the high-tension current consumption of the pentode has been cut down to something amazingly small. The bigger fellows, such as the Cossor 230 P.T., the Marconi P.T.240, or the Mullard P.M.22 draw not more than about 12 milliamperes with 120 volts and proper grid bias. This compares very favourably with triode output valves.

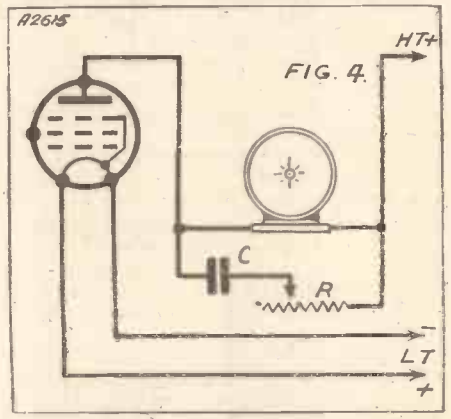
And we have a series of super-efficient pentodes such as the Marconi P.T.2 or the Mazda Pen.220. Apply 120 volts to the plates of these, about 108 volts to the priming grids, and 3 volts negative grid bias; the total H.T. current is then in the neighbourhood of 5 milliamperes—*five*, mark you, but the valve is capable of delivering an undistorted output of very nearly half a watt, or quite as much as is necessary in the ordinary way for home wireless reception.

Different Methods of Coupling.

Fig. 1 shows an output transformer used with a pentode; alternative methods of coupling are seen in Figs. 2A and 2B. Fig. 2A shows a pentode output choke used in a filter circuit; at 2B is seen a combination of choke filter and transformer coupling of the valve to the loudspeaker.

The impedance of the pentode is very high, whilst that of most moving-coil loudspeakers is of the order of only 12 ohms or so. Unless the impedance of valve and anode circuit are suitably matched,

ANOTHER ARRANGEMENT



This diagram shows how the high note filter is connected when the loudspeaker is joined right in the anode circuit—a procedure not always to be recommended, except in cases where the speaker has a special high impedance winding.

first-rate results are not to be expected. With a balanced-armature loudspeaker matching is not so difficult, for this kind of instrument has a much higher impedance than the moving-coil.

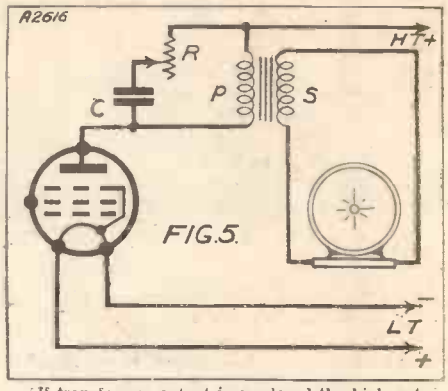
Good volume can, therefore, be obtained by the use of the plain choke filter circuit, provided that the step-down ratio of the choke is fairly big. Simple transformer coupling also works very well with most balanced-armature instruments. But unless the step-down ratio of the output transformer is very high, the pentode may not be at its best with a moving-coil loudspeaker. Much improved results may often be obtained from the arrangement seen in Fig. 2B, where there is a step-down both in the tapped choke and in the output transformer.

Balancing the Frequencies.

If one of the output circuits already mentioned is selected for the pentode, or if we decide to purchase a loudspeaker specially wound for the valve, we may find that, though the volume is excellent, there is something about the quality which leaves a good deal to be desired. Owing to its peculiar characteristics, the pentode is much better as an amplifier of the higher audio-frequencies than of the lower.

This quality is exceedingly useful if the valve is used in highly selective sets in

ACROSS THE PRIMARY



If transformer output is employed the high note filter must be connected across the primary winding.

which side-band cutting would lead normally to a suppression of treble notes and to a preponderance of the bass. In such sets the pentode supplies automatically a certain amount of tone-correction, owing to its better response to treble than to bass frequencies.

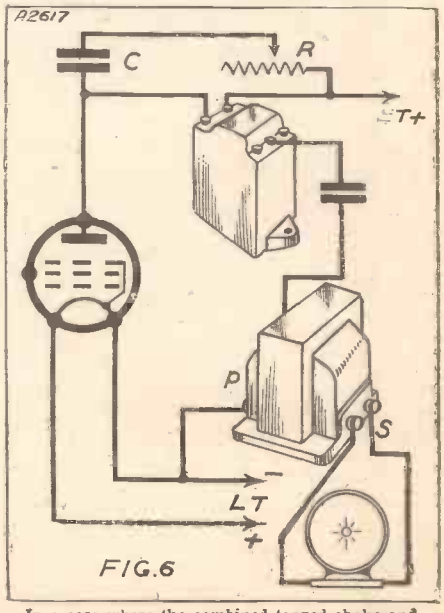
But in band-pass sets, and others which do not cut sidebands, the pentode, used as an output valve, may lead to a marked shrillness in reproduction.

Quite Simple

Fortunately, there is a very simple way of levelling up the response of the pentode to musical frequencies. This is illustrated in Figs. 3, 4, 5 and 6, which show its application to the different methods of coupling a pentode valve to a loudspeaker. The tone-corrector circuit consists of nothing more formidable than a fixed condenser with a capacity of ·02 mfd. to ·04 mfd., and a variable resistance with a maximum value of 50,000 ohms. If a variable resistance is not available, one with a fixed value of 20,000 or 30,000 ohms may be used.

(Continued on page 356.)

THE COMBINED SCHEME



In a case where the combined tapped choke and transformer arrangement is used, the filter is joined up in the same way as shown in Fig. 3. That is, across the whole of the output choke.

REACTION CONTROL and TONE COMPENSATION

by Carden Sheils

Some extremely interesting circuit developments which may have an important bearing on the future of reception technique are described in this authoritative contribution.

EVERY user of a wireless receiver knows that it is necessary to re-adjust the reaction control as he varies the tuning condenser, otherwise oscillation is likely to set in, or else signal strength will fall off. This is so because the transfer of energy due to reaction alters as the ratio of capacity to inductance in the tuned circuit is varied.

Quite apart from the effect which follows any change in the tuning, one finds that an increase in the strength of the signal is also liable to provoke self-oscillation. This originates in the detector valve, which is the usual source of reaction.

When a leaky-grid detector is used, an increase in signal strength makes the grid more negative, so that less current flows in the grid circuit. In other words, the damping effect of the detector on the preceding tuned circuit is reduced. This has the effect of sharpening the overall tuning, and the increased resonance throws the set into oscillation.

Anode Bend Detection.

If the detector works on anode bend, the same effect is again produced, though for a different reason. In this case an increase in signal strength actually makes the grid less negative, so that the valve works on a steeper portion of its characteristic curve. Consequently it becomes more efficient as an amplifier, and for a given input feeds back more energy, which in turn tends to produce self-oscillation.

An increase in signal strength therefore reacts on the detector valve in such a way as to cause oscillation unless some suitable adjustment is provided. In general, when reaction is pushed beyond a certain limit, as, for instance, in the attempt to secure very high selectivity, the problem of maintaining a smooth control of the circuits at all points on the tuning-dial takes on a new importance.

One of the latest developments in circuit design is to push reaction to such a degree as to involve the cutting of the side-bands on the H.F. side, the resulting loss in the high notes being restored by a "tone-compensator" inserted in the L.F. circuits. In circuits of this type the energy fed back by the reaction coil must be kept strictly proportional to the input energy, at all settings of tuning and for all strengths of signal, otherwise it becomes impossible to use a "fixed" tone-compensator in the L.F. circuits.

The compensator usually consists of an inductance in series with a resistance, put in as a shunt across the plate-filament circuit of the detector, or one of the L.F. valves. Such a circuit amplifies high notes more efficiently than it does low notes, and by accentuating the high notes restores them to their original value.

If reaction is kept constant the cutting of the side-bands will likewise remain constant, and the loss can be made good in the low-frequency amplifier by a relatively simple type of compensating circuit.

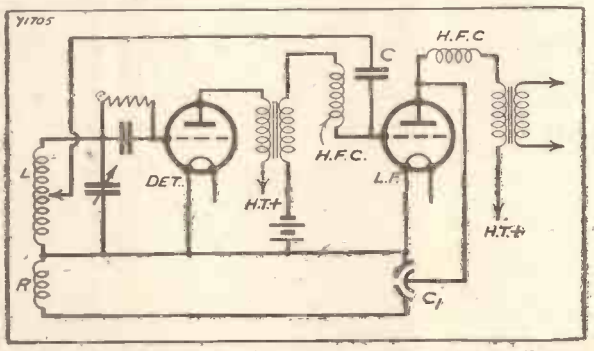
Keeping Feed-Back Constant.

One method of overcoming the tuning difficulty, i.e. of keeping the reaction constant at all settings of the tuning dial, is to insert a second condenser in parallel with the ordinary reaction condenser. The second condenser is ganged to the main tuning control, and is so arranged that, as the wave-length is increased, the normal reaction coupling is also increased, this compensating automatically for the falling off in reaction on the longer waves.

When tuning down to the shorter wave-lengths, the second condenser operates automatically to reduce or offset the "fiercer" reaction which normally comes into play. The result is to keep the circuits always near the threshold, but just below the point of self-oscillation.

The second difficulty, i.e. that of keeping reaction constant with variation of signal strength arises, as previously pointed out, from the effect of the signal on the grid bias of the detector valve.

UTILISING THE L.F. STAGE



H.F. energy is taken to the L.F. valve via the condenser "C," and after amplification, is passed back to the detector valve by means of a differential condenser.

So far as reaction is concerned this valve must be regarded as a high-frequency amplifier, and ought therefore to be worked under such conditions as to ensure strict proportionality between input and output, no matter how the signal strength may change.

Since the ordinary detector valve is not an ideal source of reaction, for the reasons given above, one possible alternative would be to make use of an auxillary valve for providing the reaction necessary to maintain the tuned circuits in a condition of razor-edged selectivity. A still better plan is to use one of the low-frequency amplifiers for this purpose.

An L.F. amplifier has a longer straight-line characteristic than a detector valve, and is therefore better adapted to keep the output or feed-back energy strictly proportional to the input or signal energy. It can be utilised to provide reaction, without interfering with its ordinary work as an L.F. amplifier, by "reflexing" it back to the H.F. side.

An Interesting Circuit.

Such an arrangement is illustrated in the accompanying figure. It will be seen that a condenser C of say ·0001 mfd. is branched from the input coil L to feed a part of the signal energy directly on to the grid of the first L.F. valve. A high-frequency choke is inserted, as shown, to ensure that the H.F. energy reaches the grid, and is not shunted away through the secondary coil of the inter-valve coupling transformer.

The L.F. valve amplifies this H.F. input, and feeds back through a differential condenser C_1 and coil R to the input of the first valve. A second H.F. choke is, of course, inserted in the plate circuit of the L.F. amplifier to keep the reaction energy in the desired path.

One advantage of this arrangement is that reaction, instead of being taken from the detector valve, as usual, is now derived from a valve having a long straight-line curve so that the ratio between input and output remains constant over a wider variation in signal strength.

A second advantage is that by tapping off across only a part of the input coil L, the amount of energy diverted to provide reaction can be adjusted, if necessary, to ensure that it never overloads the L.F. valve.

THE MIRROR OF THE B.B.C. By O.H.M.

PARLIAMENT TO "LOOK-SEE"

WAVE-LENGTH POSSIBILITIES—FUTURE OF THE UNION—B.B.C. FINANCE—THE SUNDAY EXTENSION.

I HEAR the B.B.C. is planning to enable all members of the House of Commons who so desire to visit Broadcasting House during June. This is a good idea if only because it will make a large proportion of the House aware of the importance of broadcasting. The fact that the present chairman of the B.B.C., Mr. Whitley, is an ex-Speaker of the Commons, makes the visit opportune.

Wave-length Possibilities.

As the Madrid Conference draws nearer the various wave-length interests get more feverishly at work. The "telegraphy" people are trying to hold their present ground against broadcasting; but I believe they will not succeed. Broadcasting is almost certain to get some useful concessions; but the trouble is not solved at that point.

The European zone will be allotted some extra channels, but who will get them? There is a multitude of claims to be considered. A dozen of the smaller countries believe themselves to be in a position of unfair disadvantage now and they are scrambling for the extras.

Then France, with the prospect of the early creation of a new centralised authority, wants more and better waves. Germany, too, considers she is aggrieved. Great Britain, of course, is seriously handicapped by the present limitation, the Regional Scheme itself being in danger. How the tangle is to be resolved remains to be seen.

Future of the Union.

The future of the International Union of Broadcasters is in the melting pot. There seems little more that this unofficial body can do to settle wave-length problems, which are now the concern of "administrations."

Times being as hard as they are it is not unnatural that there is some restlessness about meeting the expenses of an organisation which is said to have outlived its usefulness on major matters. But if the Union is demobilised, there will be continued a small nucleus technical unit at Brussels chiefly to check up on the waves.

B.B.C. Finance.

Parliament is much more interested this year than ever before in B.B.C. finance. Probably the publicity about Broadcasting House has focused this interest; but there it is, and there is a growing movement to get the affairs of the B.B.C. included in the material reviewed by the Public Accounts Committee.

I believe that this cannot be done without changing the Charter, an unlikely eventuality; but there is bound to be a determined attempt to bring about this change when the subject is reviewed in 1936. Personally, I think it would be a great pity to allow Members of Parliament to pass opinion on whether or not Sir Harry Lauder should have been paid £500 or £5.

The Sunday Extension.

Sunday, June 5th, begins a new page in the history of British broadcasting, of which it will be written that nine years had to pass before it was considered expedient that the Sunday programmes should start before 3 o'clock in the afternoon.

Now, from June 5th, broadcasting in Britain will begin at 12.30 p.m., and, although all B.B.C. transmitters will not be working at the outset, most listeners in all parts of the country will be able to hear either the Daventry National or the Regional stations.

The earlier start with the Sunday programmes is much more important than most listeners may realise. It is another step towards the provision of a complete service of broadcasting, and, like morning talks, which it will be remembered were instituted as an experiment some years ago, once begun, will stay.

English listeners have not hitherto known what it is to switch on their receiving-sets at lunch-time on Sundays, except those with apparatus sufficiently powerful to pick up foreign programmes, and that does not apply to the great majority who pay their ten shillings every year to the Post Office.

But once they can do so there will be no going back. We do not miss what we have never had, but very few Sundays will pass after June 5th before we shall expect a Sunday lunch-time concert to be available with the same regularity as on the other days of the week.

The items for June 5th are certainly attractive and indicative of the type it has been decided shall be given in the future, namely a half-hour's organ recital by Mr. G. D. Cunningham, relayed from Queen's Hall at 12.30, followed by a concert by Reginald King's Orchestra until 2.15 p.m., and then a recital of gramophone records of European orchestras until 3 p.m. To most listeners such items will be very acceptable, and well in keeping with the day.

Trooping the Colour.

An annual outside broadcast, more interesting, perhaps, to provincial listeners than to Londoners, is the ceremony of Trooping the Colour on the Horse Guards' Parade in celebration of the King's birthday on Saturday, June 4th. This is to be sent out from the National transmitters.

(*Continued on page* 356.)

THE LAST LINK WITH SAVOY HILL

Savoy Hill is now definitely a thing of the past, so far as the listener is concerned, and this photograph shows the final odds and ends being packed away in the last van to leave for Broadcasting House.

THE LISTENER'S NOTEBOOK

A rapid review of some of the recent radio programmes.

THERE were probably some who were a bit disappointed with the kick-off "Jimmy" Thomas gave to the "Rungs of the Ladder" series, for the simple reason that the story he told—like that of Dick Whittington and his cat—is pretty well known now. One was hoping he would divulge the secret of the why and the wherefore of his remarkable rise to fame. But isn't it possible that there isn't a secret? Just a case of "Some men are born great, etc." Who knows?

* * *

All the same, I enjoyed his talk; I listen to all celebrities, because I've an inquisitive longing to know *how* they speak. Though picture-papers make us familiar with faces, but for the talkies and wireless we would never know a thing about the voices these illustrious folk own.

We hazard a guess which remains unchallenged until wireless introduces them over the air. Then "who'd a thought it?"

* * *

Lord Lloyd is a case in point. Never have I been wider of the mark than in what I imagined to be his manner of speech. I expected to hear a strong, resonant voice, but the one which expounded the aims and ideals of the British Provident Association could hardly be called that. The speech did not lack conviction all the same.

* * *

A celebrity I am most anxious to hear is the Duchess of York. Her face is known

(*Continued on page* 357.)

STATIONS WORTH HEARING

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

WONDERING whether my own locality in the Home Counties might not be specially favoured in the matter of reception conditions I have recently been collecting the experiences of other long-distance wireless enthusiasts living in different parts of the country. I have also been able to obtain data at first hand in the course of a short trip to the West Country.

Conditions Excellent.

Everything confirms the views that I have expressed of late in these columns; long-distance reception continues everywhere to be excellent, and there can be no doubt that we are in for a wonderful summer—from the wireless point of view, at any rate.

Last year we were robbed of half the joys of summer-time listening, owing to the presence of atmospherics. The long-wave stations are always regarded as the great summer standby for long-distance work, since their transmissions are so little affected by conditions of daylight and darkness.

But the long waves are useful only when atmospherics are absent, or nearly so, and in 1931 we could make little use of stations such as Kalundborg or Radio-Paris or Huizen. This year atmospheric interference is so infrequent that the long-wave stations can be heard at their very best. And now that we have the new and far more powerful Radio-Paris, the giant Warsaw, and the really excellent Huizen (to name but three of the long-wavers) always there at our command we can enjoy DX reception with even quite small sets throughout the lighter months.

On the Medium Waves.

Medium-band conditions also continue to be good. There is, as I anticipated a week or two ago, some falling off in the volume obtainable from stations near the top of the band. Budapest, Vienna and Brussels No. 1 cannot now be classed as reliable. In fact, it is only on odd nights that first-rate reception is obtainable from them.

But towards the middle of the band, and at its lower end the receiving set is able to do itself full justice. We have lost a few of the smaller fry, it is true, but their absence is really all to the good, for it reduces interference and clears the ether for the bigger stations that are better worth our attention.

Here are some of the medium-wave stations that are worth trying for before dark. Prague, Langenberg, Rome, Stockholm, Stuttgart, Brussels No. 2, Brno, Poste Parisien, Hilversum and Heilsberg.

Reception After Dark.

After dusk the receiving set still has that pleasant lively feeling that makes long-distance work such a pleasure. Station after station is to be found, and every night has its surprises. Stations that should not be neglected on any favourable evening—this list is, of course, additional to that given above—are Fécamp (especially on Sunday evenings), Nurnberg, Gleiwitz, Leipzig, Turin, Bratislava, Bordeaux-Lafayette, Goteborg, Breslau, Strasbourg, Hamburg, Toulouse, Frankfurt, Beromunster and Florence. Try also a turn round the little stations at the very bottom of the medium wave-band. On some evenings quite amazing reception is to be obtained from them.—R.W.H.

SHORT-WAVE NOTES

News and views regarding an exciting and fascinating wave-band.

By W. L. S.

I AM more than a little surprised at the flood of letters that have reached me about my "Short-Wave One." Only one reader seems to have been disappointed with it: all the others express joy and surprise. I can't quite understand this, because (even with my natural modesty as a handicap), while I knew it was quite a good set, I couldn't claim anything epoch-making or startling about it.

A Tremendous Success.

Probably the extraordinary results that several readers report are due to the fact that they have never tried a single-valver of any kind before. The result is that they are finding out, for the first time, what it means to have quiet background on the short waves.

W. P. McG. (Knowle), who is an old correspondent of mine, confesses that he has always laughed at the very idea of "U.S.A. on one valve" until a week ago! His record, with a "One" made on my lines from odd parts that were lying about, is 30 broadcasting stations already, all on short waves, of course.

The same reader brings up an interesting point about the moon and its effect on short-wave work. He is right in saying that it is generally stated that conditions should be best at the time of the full moon, but has always found that the good patches come nearly a week *before* that. Looking up my voluminous logs, I find that they absolutely confirm this.

By the time these notes appear I shall have had an opportunity of testing out my own one-valve short-waver in several parts of the British Isles that I have been interested in, from the point of view of reception conditions. I am going to make a careful log of results throughout a tour with a total mileage of 1,000 or so, and shall check them up with a friend who is going to listen near my own home. By this means, if I don't find out anything else, I shall at least begin to know whether the changes in conditions take place over large or small areas.

The Whole Country Affected.

Personally, I think, from what I have found out so far, that when conditions in one part of the British Isles are bad, they are bad over the whole country—but not necessarily *equally* bad. I do think, though, that the broad categories of good, bad and medium hold for the whole of England, and probably Scotland and Wales as well.

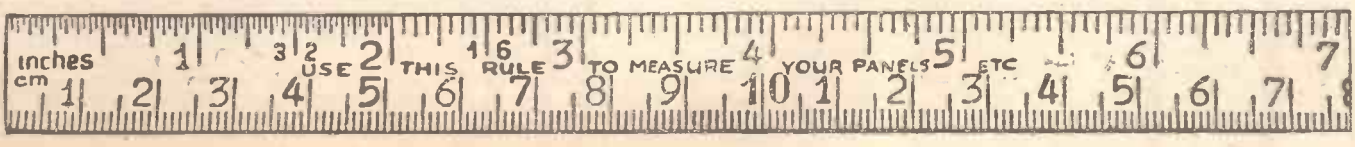
On top of these serious changes we have, of course, local variations in signals. But these take place almost from hour to hour, and are impossible to check up even by a series of logs.

I do seriously think that there *is* a connection between weather and radio during this part of the year. May and June are the two months of the year when we may hope to hear the West Coast Americans during the mornings; and I remember distinctly that for the past two years they have only come over on fine mornings. Every morning on which I have been out of bed at an early hour has either been "dull and bad" or "fine and good."

Good Times Coming!

For several mornings running during June last year, I remember working (both ways) with Californian stations, looking the while out of my window at a bright blue sky, with the sun illuminating the top of my mast from over the house.

While we are on this subject, it is queer to reflect that there *are* certain parts of the world from which signals are very rarely received except at some particular time of the year. California is perhaps the most striking; after that come Hawaii and Japan, which are seldom logged except during June and July. Japanese commercials, of course, come in at all times; but the low-powered "hams" came over for a month or more last year and have been very rare ever since.



THE "CLIMAX" ALL-ELECTRIC RADIO-GRAMOPHONE.

By a "P.W." TECHNICIAN.

A review and test report of a famous receiver designed for trouble-free operation from the A.C. electric-light mains.

WHEN it fell to the writer's lot to report on the "Climax" All-Electric Radio-Gramophone the test was undertaken with even more than usual interest because of the low cost of this particular instrument. It is priced at twenty-two guineas, which is a surprisingly low figure when one considers the class of apparatus supplied.

The appearance of the set proved to be everything that could be desired. Not only are the design, workmanship, and finish of the cabinet of a very high standard indeed, but even the details are pleasing.

Needs No Batteries At All.

Very often a good set "falls down" on a critical examination because of some trifle like control knobs of the wrong colour, or the absence of handles, or some such apparently trivial detail. But there was no such small criticism to make with this instrument. A close inspection confirmed the impression of clean design and good lines, and revealed an attention to detail that was very promising indeed.

Before mentioning any of the individual features let us make it perfectly clear what the set was designed to do.

It works from the electric light mains (alternating current) and needs no batteries whatever. And you can use it either as a radio set or as a gramophone.

For the latter purpose the lid is lifted, as illustrated in the photograph reproduced on this page, disclosing a turntable, beside which is mounted a "Climax" pick-up and tone-arm.

A very pleasing feature of this part of the set is the fact that an automatic stop is fitted, so that there is no need to jump up and switch off as soon as the record is played through. Better still, the provision of an electric motor means that there is none of that weary winding necessary; but for the moment we will not dwell on any of the details, however pleasing, but will continue our outline of the set in general terms.

An Instantaneous Change-over.

When a gramophone record is being played the music is reproduced via the moving-coil loudspeaker. This is mounted directly underneath the turntable, and is, of course, completely concealed by the ornamental front of the cabinet.

To control the volume a knob is provided on the pillar which supports the tone-arm. The instrument is thus fully equipped for first-class gramophone work.

Inconspicuously placed at the back of it there is a switch that transforms it into a radio set. And in this rôle it is capable of picking up both home and foreign stations, and of reproducing the programmes with great fidelity and a gratifying reserve of power.

All this for twenty-two guineas! No wonder that the testing of radio-grams is considered interesting work.

In order to try it out under really difficult conditions the set was first connected to a very badly screened and short aerial in the heart of London. Only a really sensitive receiver can put up a showing when such severe limitations are imposed upon it, and it says much for the set that it was able to come through such a test with flying colours.

Control of Volume.

First the London programmes were received at tremendous strength, which furnished an opportunity of testing the volume control. It proved to be smooth and efficient, and speech came through with great naturalness.

Although it was asking rather a lot of it,

Here is the set with the lid of the cabinet lifted to show the gramophone section in action. Note the knob on the tone-arm pillar, which constitutes an accessible volume control.

the set was then tried for daylight reception of foreigners, and even under the difficult conditions outlined the Radio-Paris programme was picked up without much difficulty

The M.C. Loudspeaker.

With an ordinary aerial in use many other stations would be receivable, and as it was evident that the sensitivity on the radio side was adequate, the simple change-over switch was operated and the instrument tried out on "gramophone."

It was here that its real quality became evident and the excellence of the reproduction had a chance to show itself. For the moving-coil loudspeaker is one which can carry a really large volume without a trace of distress.

The first record put on was a dance number, and it conclusively showed that there was nothing lacking in "cleanness," nor in the solid "body" of bass and lower notes. So well did these sound, in fact, and so singularly satisfying was the bass viol, that the next record was deliberately chosen as a test of "top."

The Circuit Employed.

It was of quite a different type, with a violin solo, and although this was an extremely stiff proposition to make a low-cost radio-gramophone stand up to the "Climax" All-Electric Radio-Gram answered to the test very well indeed.

To the man interested in the circuit side of radio a description of the arrangement used to obtain these results will be welcome. Here, then, are some of the finer points of this fine set.

The circuit is S.G., detector and pentode, with valve rectification. The operating controls are on the front, under the loudspeaker fret.

Tuning is rendered easy by a wide-scale dial, which is illuminated from behind. For both long and medium waves the dial reads in wavelengths. This and the illuminator, together with the slope of the scale, makes the set extremely easy to tune—a point of great importance to members of the household who have no skill in operating.

Mains Aerial, Too!

Placed centrally below the "window" is the tuning dial, with the wave-change switch to the left and the reaction condenser to the right. Below is the "selectivity and volume" knob; and, in effect, the tuning is a dual control, as its centre revolves separately and controls the trimmer for final accurate adjustment when very distant stations are being received.

At the back of the set, conveniently placed, are the mains sockets (from which the flexible connection goes) and the mains switch. Near these are the aerial and earth sockets and the gramophone change-over control.

Incidentally, an extra aerial is provided in the mains lead for use in flats, etc., where no ordinary aerial is practicable, and good results can be obtained from local stations on this.

For such a compact design the volume obtainable is really quite remarkable, and, as stated previously, the moving-coil loudspeaker seems to be able to handle even the very loudest passages with complete naturalness and freedom from overloading.

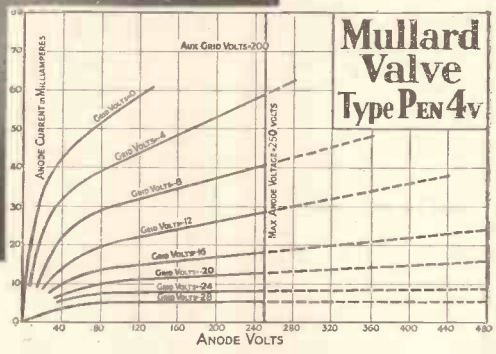
Adaptability of Design.

Another excellent point in the design is the provision of extra loudspeaker terminals for use if two loudspeakers are desired, perhaps in different rooms. And the roomy interior, accessible valves, and sturdy accessories are other good points in this pleasing assembly.

The selectivity control and general adaptability of the design enable the set to be used to advantage under widely varying conditions, and its high quality and low cost make it undoubtedly one of the outstanding successes of 1932 radio-gramophone design.

PEN 4V

RIGID UNIT CONSTRUCTION



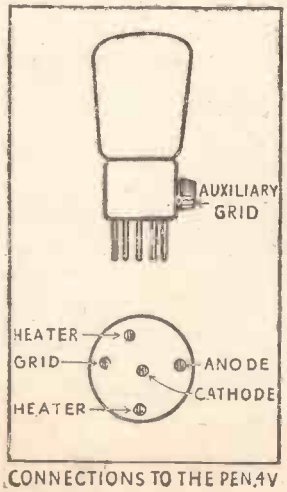
THE WONDERFUL NEW RIGID UNIT MULLARD PENTODE FOR A.C. ALL-MAINS SETS

The Pen. 4V is an Indirectly Heated Pentode for use in A.C. all-mains receivers—the valve that will give you three and a half times the output of an ordinary small output valve at only five sixths of the grid input—that will enable you to operate a moving-coil speaker.

Use the Pen. 4V. as output valve in 3-valve and 4-valve receivers having no other low-frequency stages or in 2-valve receivers following the Mullard 904V detector, and note the increased volume.

HOW TO CONNECT THE PEN.4V.

The heater is connected to the "filament" pins, the anode and grid to the normal "anode" and "grid" pins, and the cathode to the centre pin. The auxiliary grid connection is taken to the side terminal. If the total H.T. voltage is 250V, the 200 volts for the auxiliary grid connection can be obtained through a dropping resistance of 7,000 ohms, by-passed to Earth by a condenser of 2 mF capacity.



CONNECTIONS TO THE PEN.4V

OPERATING DATA

Heater voltage	4.0v.
Heater current	1.0a.
Max. Anode voltage	250v.
Max. Auxiliary grid voltage	200v.
Optimum load	8,000 ohms
Grid Bias (at auxiliary grid volts 200)	−10.0 volts

CHARACTERISTICS

(At auxiliary Grid Volts 200 control grid volts zero)

Mutual Conductance . 3.0mA/V

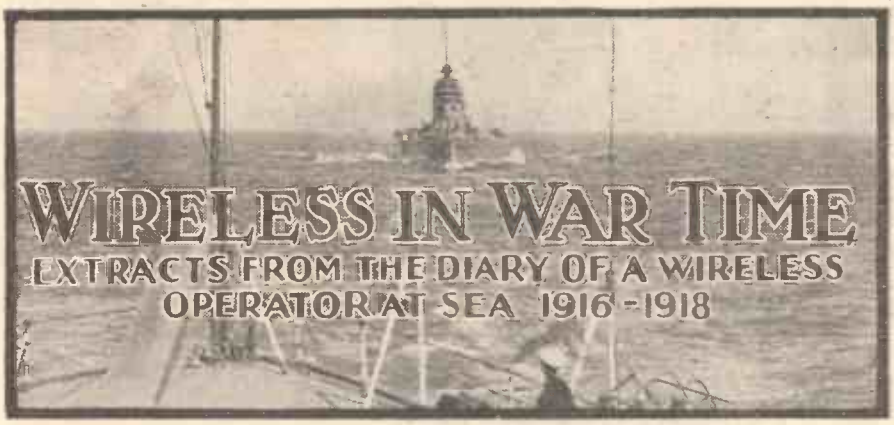
MADE IN ENGLAND

Mullard

THE · MASTER · VALVE

Advt. The Mullard Wireless Service Co., Ltd., Mullard House, Charing Cross Road, London, W.C.2

ARKS



APRIL 1ST, 1917.—About 2 o'clock this morning I had my first sight of Gibraltar. It was not much of a view, although there was a decent moon, and I suppose I shall have to wait until daylight to see what the famous Rock is really like. Our arrival caused something of a sensation, for, by some curious chance, we steamed past the patrol without being noticed.

Later, about half a dozen dazzling search-lights were focussed on us, and the Chief Officer of the patrol came dashing up in a spiteful-looking destroyer. The conversation he had with our captain, if written verbatim, would be definitely unprintable. The captain has rather a soft sort of voice, but the following may give some idea of how the conversation progressed.

C.O. of Destroyer: "What ship is that?"

Our Captain: "The ——."

C.O. of Destroyer: "What?"

Our Captain: "The ——."

C.O. of Destroyer: "For —— sake, speak up!"

Our Captain (a little louder): "This is the ——."

C.O. of Destroyer: "Oh, is it? Then what do you mean, sir, by passing my patrol, blister your eyes? Where are you from?"

Our Captain: "Barry."

C.O. of Destroyer: "Where?"

Our Captain: "Barry."

C.O. of Destroyer: "Oh, go—go into harbour, sir, and report to the Admiralty. Curse your —— voice," etc., etc.

The "Veronica's" Fate.

APRIL 2ND.—Well, Gibraltar's certainly interesting. We haven't been allowed ashore, but there is plenty to watch, for the harbour is full of ships and naval patrols. As the Gateway to the Mediterranean, Gibraltar, of course, is a very important key position. At 2 p.m. we left under the escort of H.M.S. Veronica.

APRIL 4TH.—Have received a message ordering us into Tunis, as a submarine has been noticed laying mines off Cape Bon. 9 p.m. Under way again. Long press message from Malta. Heard that America has declared war on Germany. By the way, we had news yesterday that H.M.S. Veronica, the ship that escorted us as we left Gibraltar, was sunk with all hands the day after she left us!

APRIL 11TH (Alexandria).—We have dropped anchor, and the lascars are pulling in the boats to the accompaniment of the serang's chant. The serang—who is the lascars' version of a bo'sun—is a sort of choir leader while they're doing a job. He sings some tuneless gibberish, and at the end of every verse the others join in with a monotonous "La da la" chorus. But they all seem very cheerful.

This place seems delightful—from the ship, at any rate. The graceful native boats, the Egyptians and Arabs on the quay, the brilliant sunshine, all combine to make an entrancing spectacle. We are moored close in, and the town lies right before us.

At Alexandria.

As we entered the bay—we came a long way round to avoid mines—I had an excellent view of a typical Egyptian coast-line—long, low, and of varying shades of yellow, and what appeared to be sand dunes rising to a moderate height and fading away into the background.

Fringing them, a cluster of palms and, away on the right, the outline of the Island of Pharos, site of the famous light-house of Alexandria and one of the seven wonders of the ancient world. We are now unloading some of the military stores, and a crowd of noisy Arabs are pretending to work hard.

Later: This evening I went ashore on a little trip of my own. By a series of short cuts I was taken to the heart of the town by a small Arab boy who, by sheer pertinacity, forced me to engage him for a couple of piastres. Although these short cuts led through the worst parts of the town, I found everything novel, and even exciting.

The houses appeared to be built anyhow. Dozens of natives were lying lazily in the gutters, their dusky faces grinning up at one, and showing enviable sets of flashing white teeth as they impudently asked for "backsheesh." Let these fellows sit tailor-fashion in the road, gutter or front of a shop, with a reed mat for protection from the sun, and they are as contented as only an Oriental can be. In fact, their very contentment is an expression of the fatalism of the East: "Let to-morrow take care of itself, for what must be, must."

A Wayside Shrine.

In one of these little, narrow streets I nearly caused trouble because of my curiosity. I came suddenly to what seemed to be a small wooden house, standing at the side of the road, half on the pavement and half in the gutter. For all the world it was like a cabman's shelter in London.

Peeping through a sort of lattice work, or grille, at one end of it I saw inside a carved box, in some ways resembling a coffin. I couldn't take a good look, for in two seconds I heard an indignant chatter of voices from a crowd of natives who had gathered round me, and who appeared to resent my curiosity. I sheered off and watched them, and noticed that they made several deep salaams in front of the lattice-work window before going on their way.

Later on, I heard that it was one of the wayside shrines, or the equivalent of such, which are fairly common in the East. But what the box contained, I don't know. Probably the remains of some holy man, or some holy relic.

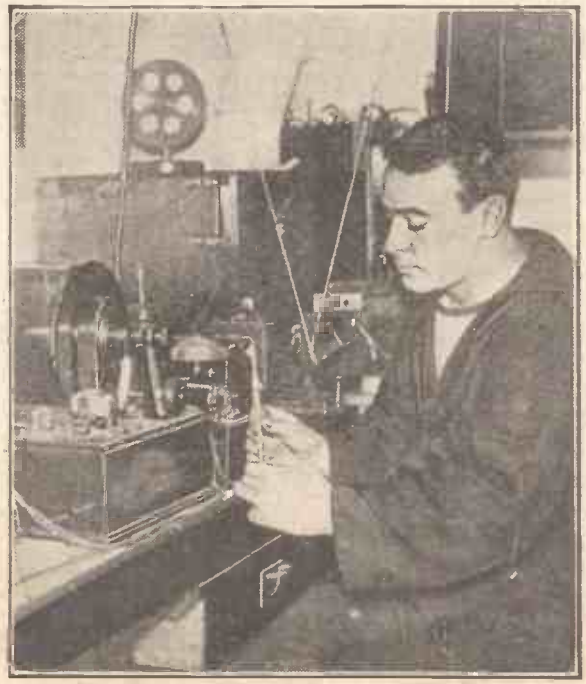
On every side there were a thousand and one curious sights to be seen. The chanting of a water bearer, or bread vendor, kept me for some time; and once, as I trudged along, I came to a mosque, and through the open doorway got a brief glimpse of a dim-lit interior, with a few tall, white-robed figures praying inside.

Abdulla Moses!

The air was heavy with the smell of incense, and brass-wrought lamps cast a ghostly light about the scene. Later on, I passed open-air cafés, where grave Egyptians in red tarboosh and loose flowing robes sat drinking coffee, puffing at pipes or hookas.

My Arab boy stuck close to me, but I was presently joined by an old Arab who did his best to get the position of guide. He must have followed me for miles, protesting that he was "Abdulla Moses, best guide in Alexandria, sar."

THE SETS OF SIXTEEN YEARS AGO



The radio cabin of a war vessel in 1916. Note the big induction coil on the left. This was employed to generate a high voltage for spark transmission.

These 3 Valves

GIVE RANGE LIVELINESS AND VOLUME

NEW LISSEN METALLISED SCREENED GRID VALVE

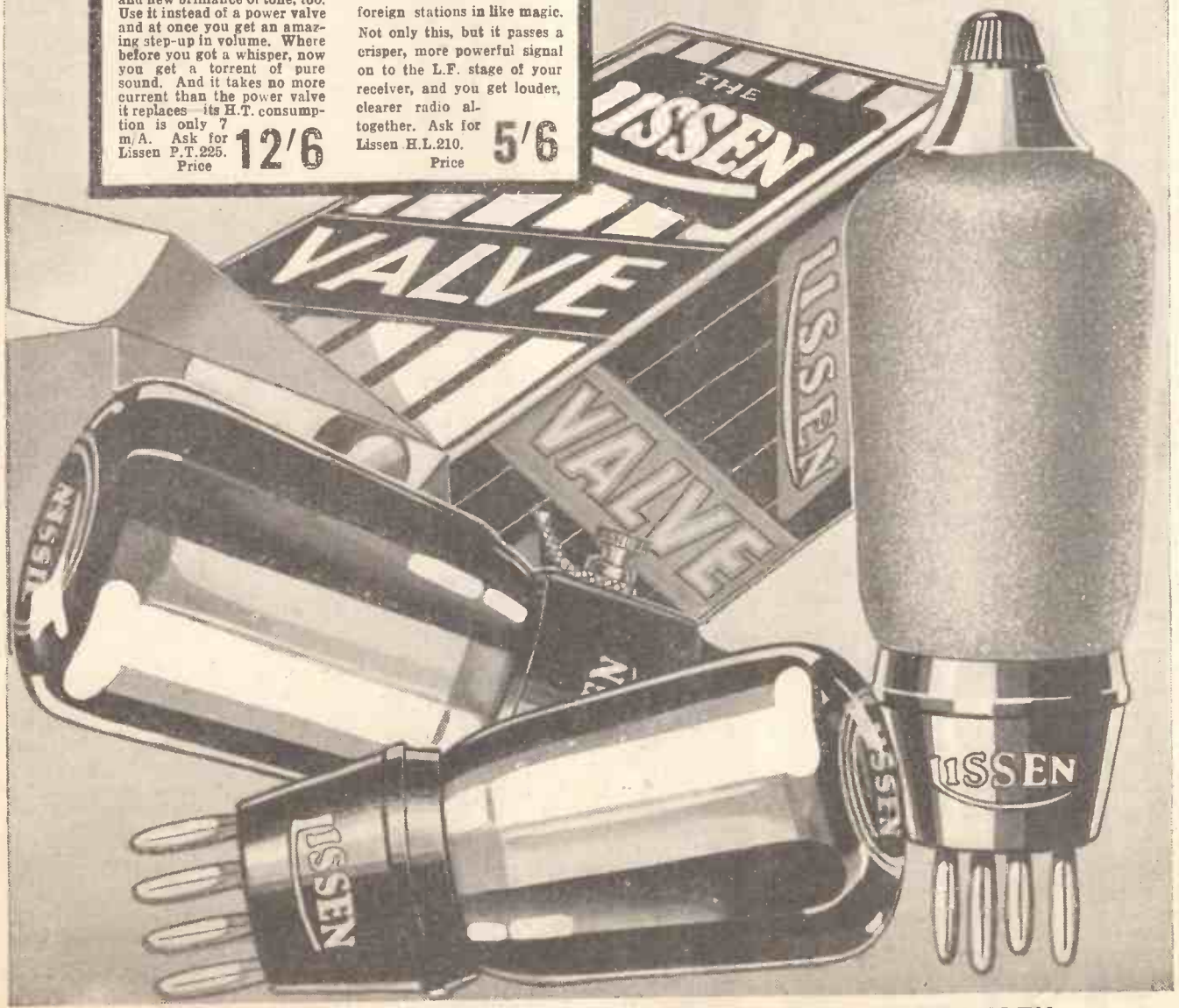
THE new Lissen Metallised Screened Grid Valve will give you much higher amplification without instability. During months of research Lissen have succeeded in getting the inter-electrode capacity of this Screened Grid Valve down to the minute figure of ·001 micro-microfarads. (Inter-electrode capacity causes instability and howling). Lissen have also been able to increase the magnification figure of this valve to 1,000. Get one of these new Lissen Metallised Screened Grid Valves in your receiver and get higher amplification than ever before. It will give you immensely increased range and bring in many stations you have never heard before. Ask for Lissen S.G.215. Price **12/6**

LISSEN ECONOMY POWER PENTODE

The Lissen Power Pentode Valve—P.T.225—converts any set with one stage of L.F. amplification into a fine, full-volume "Pentode-output" receiver. This valve puts new power into your loudspeaker, and new brilliance of tone, too. Use it instead of a power valve and at once you get an amazing step-up in volume. Where before you got a whisper, now you get a torrent of pure sound. And it takes no more current than the power valve it replaces—its H.T. consumption is only 7 m/A. Ask for Lissen P.T.225. Price **12/6**

LIVELY LISSEN DETECTOR VALVE

The Lissen Detector Valve—H.L.210—livens up your tuning, gives you extra range, greater sensitivity. It is so responsive that it brings the foreign stations in like magic. Not only this, but it passes a crisper, more powerful signal on to the L.F. stage of your receiver, and you get louder, clearer radio altogether. Ask for Lissen H.L.210. Price **5/6**



LISSEN LIMITED, WORPLE ROAD, ISLEWORTH, MIDDLESEX

All About ELECTRIC SHOCKS

From A SPECIAL CORRESPONDENT.

Facts about the death-dealing potentialities of electricity, which will no doubt interest all readers.

"GEE! That was a nasty one!"

Have you ever heard your technical friend shout out thus and simultaneously leap backwards with the amazing agility that only an electric shock can impart? Perhaps you have even been the principal performer in such an unpleasant incident.

Time For Merriment!

In this case you were thoroughly annoyed and possibly gave vent to your feelings in no uncertain manner. But if somebody else was the unlucky one, and you were the onlooker, the whole affair doubtless assumed a humorous aspect and was a fit occasion for laughter. Such is the way of mankind!

The question of shocks should really be treated seriously, for the effect of them, as everyone knows, may be dangerous, and in this "electrical age" are bound to become more frequent. The marvel indeed is that more people are not seriously hurt by them even now.

Let me say at once, however, that the risk of electrocution from a mains-driven wireless set is negligible. I believe there are not more than one or two recorded instances in which a wireless set resulted in a person's death, and then the fault was not directly due to the set.

Few wireless sets use more than 250-volts high-tension. Some may employ up to 400 volts, but I doubt if *any* of them could supply the necessary current at this pressure to kill a man. Thus, you see, the risk of a fatal shock from a radio set is too insignificant to worry about

One Side Always "Earthed."

This does not eliminate serious risk to the feeble—particularly to those with very weak hearts, for the ordinary domestic electric supply can give you a really "nasty one" and it does not do to take liberties when experimenting with all-electric wireless receivers.

The chief point to remember is that one side of the mains is always "earthed," so that a person who receives a shock while standing in a puddle, for instance, or while holding the earth wire of his wireless set, will get the full strength of the mains right through him.

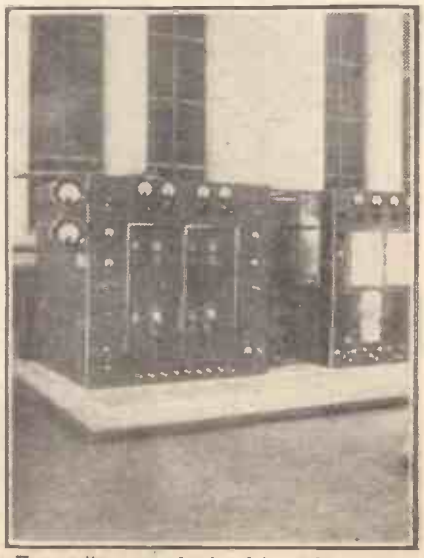
This is very unpleasant, but the risk only lies in the person fainting or collapsing with fright and falling on to the wire, so that the current passes continuously through him. The prolonged effect of such a shock might prove fatal.

People who have experienced a great many electric shocks will tell you that alternating current mains are more painful than direct current. A.C. mains, moreover, are apt to produce involuntary contractions in the muscles which throw the victim backwards.

Not Very Definite.

How a shock actually kills does not seem to be too definite. There are those who say that electricity kills by sheer destruction or burning of the tissues.

WELL PROTECTED



Huge voltages are developed in modern broadcasting stations, but the apparatus is always enclosed within protective railing or cages. Above is some of the gear at the League of Nations station, "Radio Nations."

It is American practice to conduct a post-mortem on murderers immediately after they have been electrocuted. This gives rise to the suggestion that the cause of death in such cases is not electrocution but the "post-mortem!"

It is interesting, perhaps, to refer to the American method of electrocution. Two thousand volts are applied for a few seconds to the criminal through contacts on the head and another on the calf. This causes instantaneous unconsciousness and the voltage is then reduced to 500 for a while, and put up again to 2,000 volts for a second or two every now and then.

Acts on the Nerves.

If the 2,000 volts were applied for more than five or six seconds continuously the body would be burnt. Death results through destruction of the nerves, electrolysis of the blood, and paralysis of the respiratory centres.

In many respects the effect, too, is akin to drowning, and just as in drowning artificial respiration may "bring a victim back to life." So it should be used to restore a person who has been electrocuted.

Medical opinion holds that in cases of electrocution artificial respiration should be continued for at least four hours after a person collapses. People have actually recovered more than four hours after apparent death.

Electrocution by lightning is, of course, another thing. Colossal forces are involved and the effect is more violent. There is usually a hole burned in the top of the head where the current enters and another at the heel. The nerves and blood vessels may be completely burnt up, and there is extensive scorching.

What voltage is necessary to kill a man? This question is always being asked, and the answer—strictly speaking—is that volts do not kill; it is the current, i.e. the amps. Actual experiments have shown that about ½ of an ampere passing through some vital part of the body will result in death.

Half an ampere certainly kills. Since the human body has a fairly high resistance, which varies according to the moistness of the skin and so on, it takes over 1,000 volts to pass half an ampere through a man. Given 1,500 volts you should be able to kill the driest-skinned person, while in some cases 600 volts might do the trick.

It's Amps. That Count.

"But I have had a shock of anything up to 100,000 volts off an induction coil," someone may say. Quite so; but the induction coil could only supply a few milliamps at the most.

The many thousands of turns of thin wire which go to form the secondary of the coil have a tremendous resistance, so that although the pressure—the volts—may be there, heavy current cannot be forced through.

When dealing with high-frequency currents, such as the radio-frequency current of a short-wave transmitter, the vital factor is skin effect. The current travels on the surface and does not penetrate the body to any appreciable depth.

Thus people can withstand amazing currents at high frequencies, which at ordinary low frequencies, or D.C., would bring instantaneous death

The "COSMIC" ONE

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

If this set were nothing but a one-valve version of the famous "Cosmic" then it would command a leading place among headphone receivers. But in addition to a full quota of Cosmic qualities it has valuable features of its own. It is indeed a uniquely important production.

GLANCE at the photograph which heads this page. It shows a neat little one-valve set, both the assembly and cost of which must surely be within the reach of practically every single reader of "P.W."

And yet it can probably command more radio programmes than many of those colossally expensive and lavishly-equipped seven, eight and nine-valve super-heterodyne receivers!

You don't believe it? But I assure you that that is a positive fact, though they will be headphone programmes in the one case and loudspeaker programmes in the other.

Remarkably Inexpensive.

Once this solitary difference is fully appreciated, I am certain tens of thousands of listeners will ask themselves whether, after all, it is worth while spending so much extra on a set and its installation and maintenance in order to obtain loudspeaker reception.

One of these days there is going to be a big "back to headphones" movement, and I am inclined to think that the "Cosmic" One may be instrumental in starting it!

Millions of listeners no doubt made their acquaintance with broadcasting via the loudspeaker, and haven't the faintest idea of the advantages of headphone listening.

What are the arguments against it? One: Headphones are uncomfortable. The old, heavy types may have been, but the light, adjustable instruments which are to be had nowadays are quite comfortable, and do not feel like vice clamps on the head.

Two: A whole roomful of people cannot listen-in together. Headphones can be purchased from 3s. 6d. upwards, and as many pairs as you like (up to half a dozen or so) can be driven from the "Cosmic" One.

On the credit side it can be argued that it often happens that all the people in the room in which the set is working may not want to listen to the radio all the time. With headphone reception they are not obliged to; moreover, those who are desirous of enjoying the programme can do so more or less uninterruptedly, for the headphones serve to shut out, to some extent, external noises that tend to interfere with listening.

And remember how troublefree and cheap a one-valver is to run. A tiny L.T. accumulator will last the full month, there is no grid bias and the H.T. battery need only be one of those small-capacity sixty-volters and it will give good service for months on end.

It Has No Rivals.

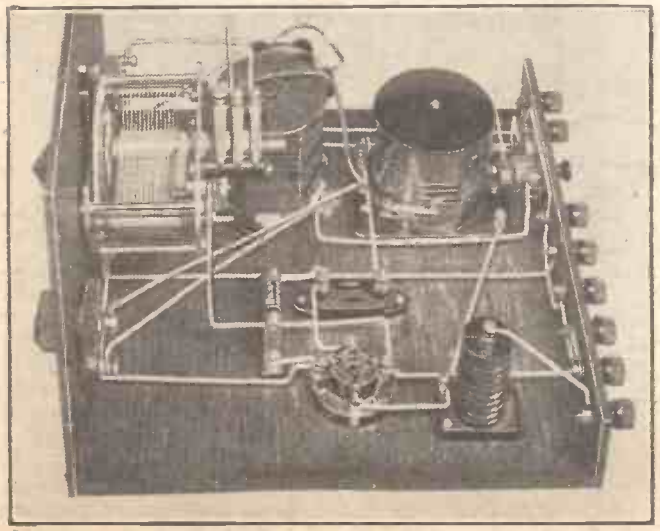
For those who are convinced of the merits of 'phone reception their choice of the "Cosmic" One as a suitable set to use must be automatic, for it has no rivals—it is unique. It is the famous "Cosmic" Three with only two straight-forward L.F. amplifying valves omitted. And it can accomplish with headphones everything which its three-valve predecessor is able to do on the loudspeaker. (The record stands at 140 stations at the moment!)

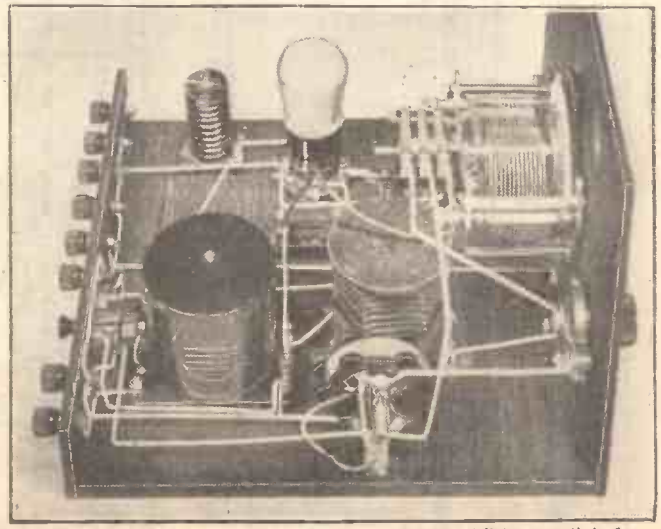
On the front panel is the single Extenser tuning control. Merely by twisting this you cover both medium and long wavelengths, the change from the one band to the other being perfectly automatic.

On the right is the reaction, and on the left the Moderator control, with which you can adjust the selectivity and power of the

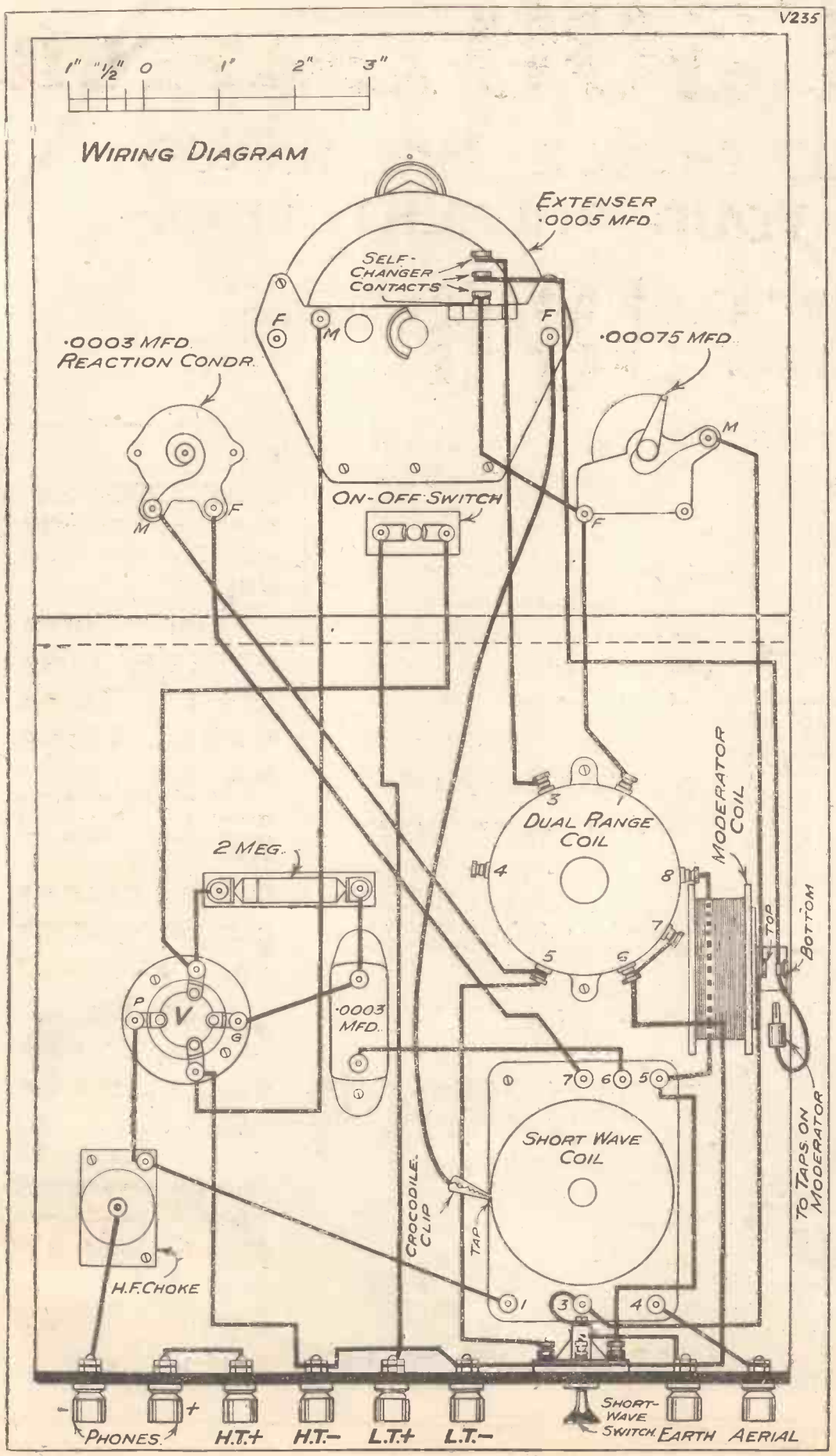
(*Continued on next page.*)

A MAGNIFICENT THREE-BAND SET FOR WHOLE-WORLD HEADPHONE RECEPTION





You can cover wavelengths from about 20 to 2,000 meters on this new set, and it is so easy to handle that it is as suitable for the most inexpert listener as it is for the D.X. enthusiast desirous of a "one hundred per center."



THE "COSMIC" ONE.

(*Continued from previous page.*)

THE PARTS YOU NEED.

1 Panel 10 in. x 7 in. (Peto-Scott, Permcol, Becol, Wearite, Ready Radio).

1 Cabinet to fit, with baseboard 10 in. x 10 in.

1 ·0005-mfd. Extenser, with slow-motion drive (Cyldon, Formo, Ready Radio, Duotune).

1 Dual Range Cosmic coil (Sovereign, Lewcos, Ready Radio, Peto-Scott, Tunewell, Wearite, R.I., Goltone).

1 Short-Wave Cosmic coil (Ready Radio, etc.).

1 Moderator coil (Ready Radio, Peto-Scott, Sovereign).

1 ·00075-mfd. solid dielectric variable condenser (Polar, Telsen, Ready Radio, Magnum).

1 ·0003-mfd. reaction condenser (Telsen, Ready Radio, Polar, J.B., Graham Farish).

1 Four-pin valve holder (Bulgin, Lissen, Graham Farish, W.B., Clix, Igranic, Wearite, Telsen).

1 ·0003-mfd. fixed condenser (Ferranti, T.C.C., Lissen, Dubilier, Ready Radio, Graham Farish, Goltone, Sovereign).

1 Push-pull on-off switch (Lissen, Ready Radio, Goltone, Peto-Scott, Wearite, Bulgin, Telsen).

1 Three-point on-off switch (Telsen).

1 H.F. choke (Lewcos type 11, Sovereign Senior, Ready Radio, Telsen Binocular, Wearite, Dubilier, R.I. Dual-Astatic, Tunewell).

1 2-meg. grid leak and holder (Lissen, Ready Radio, Graham Farish Ohmite, Ferranti, Telsen, Dubilier).

1 Crocodile clip (Goltone, Bulgin).

1 Terminal strip 10 in. x 2 in.

8 Indicating terminals (Belling-Lee type R, Bulgin, Igranic, Clix, Eclex).

18-gauge tinned copper wire and yellow sleeving (Wearite, or Glazite, Quickwyre, Soldawyre, Jiffilinx).

Flex, screws, etc.

'PHONES.—B.T-H., Ericsson.

VALVE.—Mullard P.M.1 H.L., Mazda H.L.2, Marconi and Osram H.L.2, Cossor 210 H.L., Eta B.Y. 2020, Tungsram H.210, Six-Sixty S.S.210D.

BATTERIES.—H.T. 60 volt (Pertrix, Drydex, Ediswan, Cossor, Magnet, Lissen).

ACCUMULATOR.—2 volt (Exide, Pertrix, Ediswan, Cossor, Oldham, Lissen, G.E.C.).

(*Continued on page 348.*)

S.T.300 ADAPTOR

WILL TREBLE THE RANGE OF YOUR PRESENT SET★

Kit "A"

Complete Kit of components less Valve & Cabinet

38/6

OR BY EASY PAYMENTS

7/- down and 5 monthly payments of **7/-**

The OUTDOOR 3

Kit "A" £4:11:0

Complete Kit of Components less valves and cabinet.

OR BY EASY PAYMENTS

8/6 down and 11 monthly payments of **8/6**

Kit "B" £6:12:0

with valves less cabinet.

OR BY EASY PAYMENTS

12/3 down and 11 monthly payments of **12/3**

Kit "C" - £8:7:0

with valves and cabinet.

OR BY EASY PAYMENTS

15/6 down and 11 monthly payments of **15/6**

To INLAND CUSTOMERS

—Your goods are despatched Post Free or Carriage Paid.

To OVERSEAS CUSTOMERS

—Everything Radio can be supplied against cash. In case of doubt regarding the value of your order, a deposit of one-third of the approximate value will be accepted and the balance collected by our Agent upon the delivery of the goods. All goods are very carefully packed for export and insured. All charges forward.

Head Offices:
EASTNOR HOUSE,
BLACKHEATH, S.E.3.
'Phone: Lee Green, 5678.
'Grams: Readirad, Blackvil.

Showrooms:
159, Borough High Street,
London Bridge, S.E.1.
'Phone: Hop 3000.

Kit "B" - £2:15:0

Complete Kit of components with valve less cabinet

OR BY EASY PAYMENTS

10/- down and 7 monthly payments of **7/6**

Readirad Binocular H.F. Choke SPECIFIED for the S.T.300 Adaptor

Absolutely efficient over all wave-lengths. Its extremely high impedance makes it specially suitable for use in screen-grid circuits. Its superiority is proved by the fact that it is specified by Mr. Scott-Taggart for the S.T. 300 Adaptor. Sturdily made, and beautifully finished. Price 7/6

A Wonderful Shillingsworth!

Here's the Greatest shillingsworth ever offered in radio—a full-size blueprint of the S.T.300, and a full-size blueprint of the Cosmic Star, and a copy of G. P. Kendall's famous book, "Ten Hows for Modern Radio Constructors." All for one shilling! Send now while stocks last!

READY RADIO

★

The S.T.300 Adaptor is particularly suitable for use with—

COSMIC Three
METEOR Three
COMET Three
MAGIC Three

It will treble the range of any Detector L.F. Set and greatly improve the performance of any set already employing H.F. amplification.

INSTRUCTIONS FOR CONNECTION TO YOUR SET FREE WITH EVERY READY RADIO S.T. 300 Adaptor KIT

CASH or C.O.D ORDER FORM

To: READY RADIO, LTD., Eastnor House, Blackheath, S.E.3.

Please dispatch to me at once the following goods.....

.....

for which { (a) I enclose / (b) I will pay on delivery } (cross out line not applicable) £.....

Name.....

Address.....

..... P.W. 28/5/32.

EASY PAYMENT ORDER FORM

To: READY RADIO, LTD., Eastnor House, Blackheath, S.E.3.

Please dispatch to me the following goods.....

.....

for which I enclose first deposit of £.....

Name.....

Address.....

P.W. 28/5/32.....

THE "COSMIC" ONE

(Continued from page 346.)

set exactly to suit your own particular conditions.

At the back, on the terminal strip, is the simple push-pull switch by which the set can be immediately transformed into a short-waver able to scour the very Antipodes for radio entertainment.

An aperture in the side of the cabinet provides access to the Moderator coil so that you can at any time vary the plug tapping position of this, though I am bound to add that this is quite a luxury, for once set you are not likely often to want to change the adjustment.

EVERYTHING, AND MORE, THAT HAS BEEN HAD ON THE "COSMIC" THREE IS POSSIBLE WITH THIS LITTLE SET. THE ONLY DIFFERENCE BEING THAT HEADPHONES REPLACE THE LOUDSPEAKER.

There is but one slight but important alteration in the circuit from that which figures in the earlier "Cosmics," and this is that the extenser is tapped down the short-wave coil in accordance with an invention due to W. L. S.

Although so utterly simple in conception, the practical result is truly great. It means that the .0005-mfd. extenser operates on short-waves just as if it were a special ·00025-mfd. short-wave condenser!

So in brief, ignoring the short-wave switch at the back, the "Cosmic" One is the best ordinary-wave one-valver—just the very instrument for DX. enthusiasts, or for the inexpert listener searching for the very latest development in simplified effectiveness. Operate that little switch at the back and you have a "hot-stuff" short-waver capable of receiving anything in the way of receivable short-wave material there exists in the ether.

It's a Winner!

It may be bad form to press the claims of this little set of mine, but I don't care one hoot about that; it is part of my job to design radio sets, and I'm so certain that the "Cosmic" One is a "winner" that I'd like nothing better than to see a million of them built!

You see it stands as so much more than what some people reckon a set "design" to be. Its circuit is entirely new, and it employs no less than four new components—the extenser, two "Cosmic" coils, and the Moderator. What a team of qualities for a simple little one-valver!

If you like, you can make the "Cosmic" short wave coil and the Moderator coil, for there will be brief but ample specifications of these inRadiotorial, probably in the next issue. Also, you can even build your own handsome-looking cabinet from ply-wood as was done in the case of the original model—if your powers extend to elementary carpentry. And I don't think it is necessary to give the dimensions for this wood-working, for those who want them ought easily to be able to work them out from the scale-diagram, or from the actual panel and base-board after these have been screwed together.

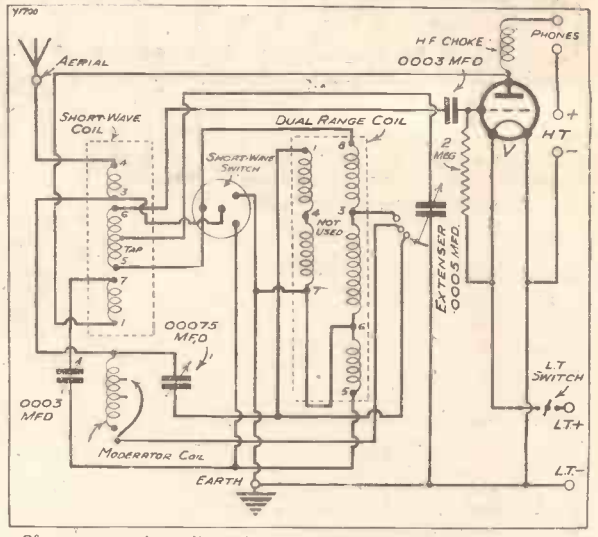
Short-wave Switch.

We have employed a Telsen three-point switch for the short-wave changing, and you will observe that a fourth connection is made to this switch by joining a short lead to the screw at the top of its plunger.

The tap to the short-wave coil is taken half-way down the grid winding. If there is a transparent covering to the coil a small square should be cut in this. The tapping lead can be soldered permanently, or a half-inch of stiff wire soldered to the coil-turn, and a crocrodile clip used to make connection to this.

Alternatively the coil wire can be scraped very clean and a thin lead tightly wound round it—a tricky little operation, but one calling for no special skill.

YOU HAVEN'T SEEN THIS BEFORE



Of course you haven't. It's a new "P.W." circuit . . . . . not a standard "hook-up."

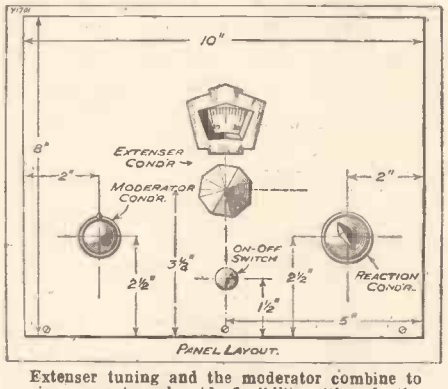
If this tapping business presents any difficulties to an individual constructor, it need not hold him up in the use of the set. *Pro tem.*, he can take the tapping lead (which runs from the fixed vanes of the extenser) to terminal number six on the short-wave coil. He will then get unimpaired medium and long-wave results, but it won't be quite as easy to tune in the short-wave stations—that is all.

And later he can set about giving the finishing touch by "tapping in," when he feels so inclined.

By the way, the numbers on some makes of coils may be different from those shown in the wiring diagram. In these cases, however, the makers supply supplementary instructions.

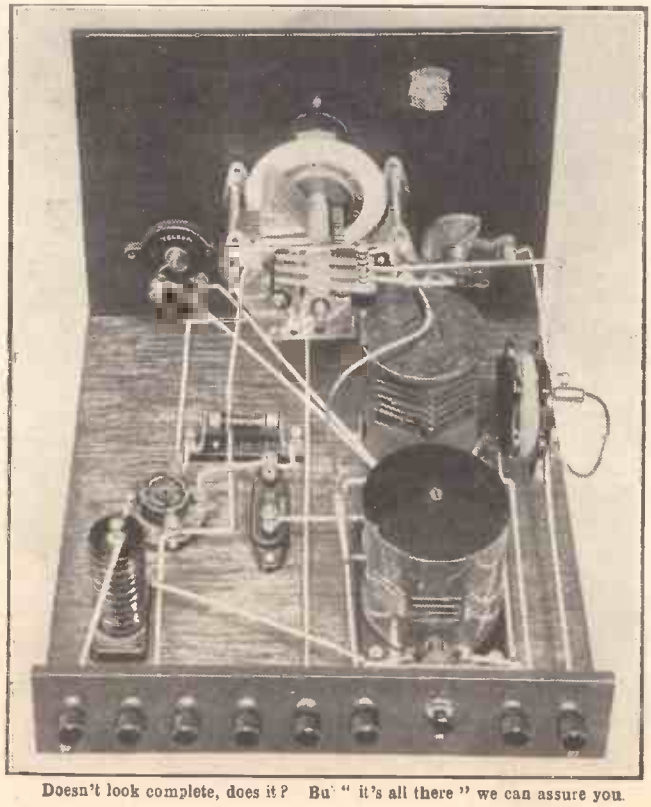
The "Cosmic" One is exactly the same in operation as the "Cosmic" Three, and all that has been written about this set in that respect applies now, anyway, I don't see how anyone can go wrong, so I'll close down and wait for new "Cosmic" records to be made—as most surely they will, with this ultra-modern, "hot-stuff" three-band one valver.

ASTONISHING FLEXIBILITY



Extenser tuning and the moderator combine to give you extremely wide flexibility with only the above few controls.

THE WORLD'S SIMPLEST "TRI-BANDER"



Doesn't look complete, does it? But "it's all there" we can assure you.

CAPT. ECKERSLEY'S QUERY CORNER

Under the above title, week by week, our Chief Radio Consultant comments upon radio queries submitted by "P.W." readers.

Don't address your letters direct to Capt. Eckersley; a selection of those received by the Query Department in the ordinary way will be answered by him.

Single Wire or Several Wires?

H. L. (Camden Town).—"I have an outdoor aerial consisting of a single straight wire 90 ft. long and 30 ft. above the ground. Will you please tell me whether I shall get louder music if I put up three or four wires of the same length?"

It is very unlikely that your aerial will be more appreciably sensitive by doing what you suggest. You have a fine aerial, anyway. A twist of a reaction knob or the polishing up of a circuit makes ten times the difference of adding wires to an aerial. It is only in transmission that one has to be very careful about super-efficient aerials.

H.F. Picked Up by the Mains.

L. T. (Croydon).—"I have frequently heard it stated that H.F. can be picked up by the mains and passed to the receiver, thus producing hum. Will you please say whether this is a fact, and, if so, why should high-frequency currents cause this trouble?"

H.F. AMPLIFICATION

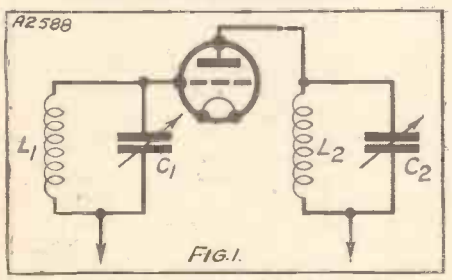


FIG. 1.

The first step to prevent feed-back is to screen the two circuits, as shown in Fig. 2.

I am as muddled as anyone about all this. I don't think anyone knows exactly what they mean.

But look at it this way. A set is plugged into the mains by a long cord (or the mains themselves are not enclosed in earth conduit), and the cord and/or mains can pick up H.F. from the broadcasting station just as an aerial does. This comes along and presumably struggles through the eliminator and arrives on the H.F. valves somehow and gets magnified, rectified, and pushed out of the loudspeaker.

It must presumably combine in some unforecastable way with the H.F. picked up by the aerial proper.

Hum? Well, people suggest that the H.F. picked up by the mains is modulated in intensity by the A.C. voltages. I cannot see why.

More likely the H.F. may make its way via the rectifier, which is only conductive

INTER-ELECTRODE CAPACITY

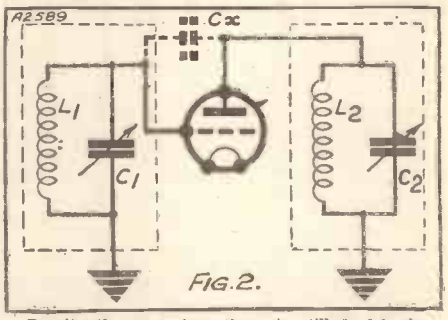


FIG. 2.

Despite the screening, there is still feed-back due to the capacity shown at Cx.

at certain moments, and is thus modulated. I do not think any very clear ideas exist in anyone's mind. I assure you my ideas are more suggestive than definite.

One thing I am sure of; it's a good idea to shield the set leads in an earthed conducting flexible sheath and also to insert an H.F. stopper in the mains incoming leads.

Then all doubt is eliminated, *n'est ce pas?*

Switching off the H.T.

P. F. (Glasgow).—"I never see in modern battery sets any provision for switching off the H.T. supply. Is it unnecessary to switch off the H.T. battery? What stops the battery from discharging if it is not switched off?"

Well, after all, what is the H.T. circuit? Starting at H.T.+, we go through a conductor of some kind to valve anode, to valve filament, to H.T. —, and so back to H.T. +.

Now, the *valve* is part of the H.T. circuit. If you cut off the filament current in the valve the filament stops emitting electrons, and the valve *is no longer a conductor.* So the H.T. current ceases because the H.T. circuit is broken by the cold valve.

Of course, if the valve *holder* is leaky, or if the baseboard has bad insulation, the H.T. battery may pass a bit of current through the wood or the "muckite," in which case it's advisable to put a switch in the H.T. circuit.

But in a decent set the insulation is sufficient.

ONLY IN "P.W."
can you read Capt. Eckersley's replies to listeners' own problems.
AND REMEMBER—
Captain Eckersley's technical articles appear only in
"POPULAR WIRELESS"
and "MODERN WIRELESS."

Why "Accumulator"?

S. McG. (Hampstead).—"Why is an accumulator so called? What does it accumulate?"

Well, acid, spray, and dust, and vaseline, and money for charging it, and curses when it runs down . . . No! Seriously, an accumulator is so called because it stores (or accumulates, I suppose) electricity.

When you charge an accumulator you appear to store that charge in the plates, and you can release the charge once more when you want to. An accumulator is a kind of tank into which you pour electricity.

You take the tank away, undo a tap and out trickles the electricity again through the circuit you want to energise.

Why Screen S.G. Circuits?

J. G. (Fulham).—"I understand that with an S.G. valve feed-back from the anode circuit to the grid circuit is prevented and if this is so, I fail to see why it should

THE EARTHED SCREEN

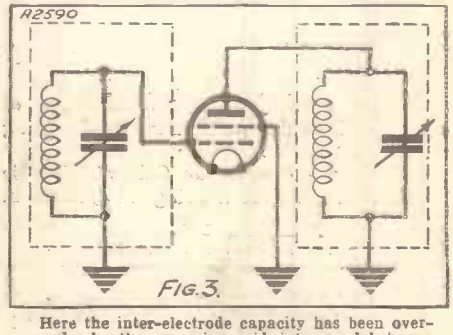


FIG. 3.

Here the inter-electrode capacity has been overcome by the screening grid interposed between grid and plate. In practice, of course, the various batteries are included.

be necessary to provide metallic screening between the various stages."

No! In a screened-grid valve the feed-back between anode and grid is prevented, but not the feed-back between anode circuit and grid circuit components, unless these are screened.

Take it this way. Fig. 1 is a three-electrode valve and has tuned circuits L_1 C_1 and L_2 C_2—*unscreened.* There will be feed-back—never mind how—so first let's screen L_1 C_1 and L_2 C_2. It will be found that there is still feed-back.

How? Between anode and grid of the valve by the little capacity C_x (Fig. 2), formed because grid and anode are close to one another.

We must stop *all* feed-back. How? By putting a screen between anode and grid, hence the screened-grid valve (see Fig. 3).

FROM THE TECHNICAL EDITOR'S NOTE BOOK.

Tested and Found—?

FOR RADIO-GRAM ENTHUSIASTS.

A WEEK or two ago a friend was examining my home radio-gram outfit. "I wonder you don't use an electric turntable motor," he said. My rejoinder was to the effect that I'd like to, but that I hadn't encountered a D.C. motor capable of running with the complete freedom from noise that I wanted.

And I also pointed out that I was in very good company in that the B.B.C. uses clockwork gramophone motors throughout. Which reminded me that during a recent tour of Broadcasting House I thought these B.B.C. motors looked rather familiar to me, though at the time I did not examine them closely.

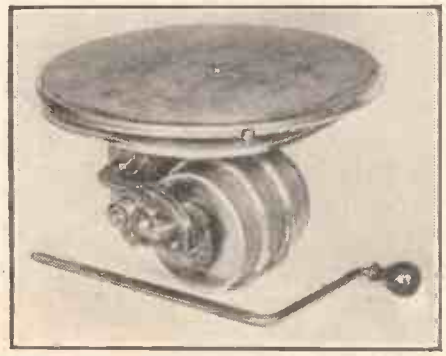
Afterwards I realised that in all probability they are identically similar to the actual model I am now employing! Anyway I cannot conceive of a superior demonstration of clockwork mechanics than my triple spring Garrard "Super."

It costs 35/- from the Cabaret Electric Co., of 170, Vauxhall Bridge Rd., London, S.W.1, and is a real bargain at that price for originally it listed at £4 1s. 3d. And in my opinion it was worth even that, for it is a magnificent proposition.

It runs with perfect sweetness and dead silence and will play three twelve-inch records. And you can re-wind while the motor is running without noticeable speed fluctuations and this is in my opinion an essential requirement.

For my part it will be an exceptionally good (and probably extremely expensive!) electric motor which will displace this bargain-price triple spring Garrard.

A FINE MOTOR

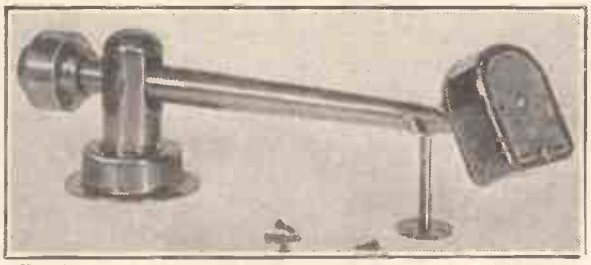


The Garrard Triple Spring Gramophone Motor. There is an automatic stop, and a 12-inch turntable is provided.

THE BULGIN PICK-UP.

The Bulgin Pick-up is designed on the well-known principle of bass compensation and treble peaking. This scheme is aimed at off-setting the failings of the average set and is, in my view, perfectly permissible and highly satisfactory in practice

A COUNTER-BALANCED ARM



Note the counter-balancing of the Bulgin pick-up arm. The pivot has a ball-bearing.

Messrs. Bulgin declare it is "perhaps open to criticism," but I don't think it is, for a "flat characteristic" pick-up (or an attempt at such) would give vastly less satisfaction to the ordinary radio-gram enthusiast, and after all it is he rather than the purist technician whose feelings in the matter should be considered.

Anyway, the vitally practical fact remains that the Bulgin Pick-up gives excellent results in combination either with a small set or with a more ambitious outfit.

There is good bass, crisp brightness and it is certainly easy on scratch; the top cut-off is a definite advantage in this respect.

The arm is nicely counter-balanced, giving a needle pressure of 4½ ounces for steady tracking at low frequencies.

The price of the whole accessory including arm, rest and mounting template is 30/-.

WELL-DESIGNED CONDENSERS.

Readers will have judged from Capt. P. P. Eckersley's recent article on condensers that the designing of efficient ganged assemblies is not, to say the least of it, a particularly simple business.

It is indeed one of the biggest problems in radio reception engineering to produce really satisfactory designs and keep the retail prices of the finished products within reasonable limits.

And all this makes the B.A.T. ·0005-mfd. two-gang at 15/- (3-gang 19s. 6d., 4-gang 28s. 6d.) one of the most attractive propositions of the day. Especially is this the case as the B.A.T. is a scientifically modelled component conforming with certain strict specifications for articles of this nature.

It is very robustly constructed and is altogether a fine production. There is unusually close matching between the individual units and accessible trimmers are fitted. B.A.T. gang condensers are handled by Claude Lyons, Ltd.

PLEASE NOTE.

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

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

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

CRYSTAL REPLACEMENTS.

No doubt you will be surprised when I say that there are still many users of wireless receivers employing crystals—thus starts a letter from our old friend, N. Heywood, of Staines Road, Twickenham, who has equipped a large number of listeners with crystals.

Now I am not surprised to hear that the crystal set is still enjoying considerable popularity, particularly in industrial areas, for this type of instrument is so obviously inexpensive to install and run and yet so completely satisfying in what it will do for those who have no DX ambitions.

But even crystal detectors are liable to need replacement, and so Mr. Heywood has designed a pair of cups which will fit all popular detectors. And these cups cost only 6d per pair, complete with crystals—good crystals, too, judging by the samples I have received for test purposes. They should command a ready sale.

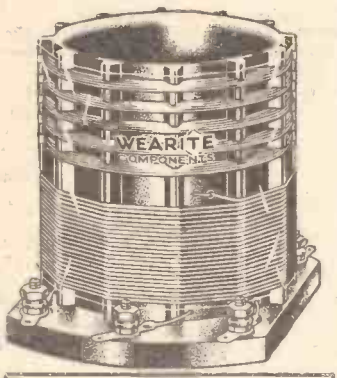
TWO OF THE B.A.T. GANGS

The B.A.T. ganged condensers are built in very rigid frames.

THE FIRST NAME IN RADIO COMPONENTS

WEARITE COMPONENTS

FOR THE "COSMIC"



Remember all Wearite Coils are subjected to an exclusive test on H.F. apparatus—no other coils made are so rigorously checked. Insist on Wearite. Per pair **9/-** or 5/6 for the Dual Range, and 3/6 for the Ultra Short-Wave range.

Here is illustrated the Dual Range "Cosmic" Coil (Price 5/6). For the "Cosmic" series of receivers a pair are available to cover long, medium and short-wave bands.

THE WEARITE *NEW* H.F. CHOKE

Here is something new—a *shrouded* choke covering 15—2500 metres without marked resonances—and at **3/6** List No. H.F.P.

IF YOU HAVE ANY DIFFICULTY IN OBTAINING WEARITE COMPONENTS WRITE US DIRECT GIVING NAME OF LOCAL DEALER. WE WILL POST YOUR REQUIREMENTS BY RETURN. C.O.D.

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

QUESTIONS AND ANSWERS

AN EFFECTIVE AND EASILY-MADE CRYSTAL SET.

F. W. L. (Donnington).—"I wish to make a crystal set for use on medium wavelengths, to act as a stand-by when valve set is not working. And, in order to make it as 'long-distance' as possible I should like to use a tapped aerial, and a variable connection for the crystal as well.

"I have some No. 22 D.C.C. wire on hand, and propose to use a 3-in. tubular former, with as many tappings as may be necessary. (As I enjoy making the tappings I don't mind one at every turn if this will help.) Please give the number of turns and full connections.

"(P.S.—The tuning condenser to be mounted on a piece of ebonite screwed to edge of small baseboard on which the coil is fixed. Crystal just above condenser, and all enclosed in box with lid. 'A,' 'E,' and two 'phone terminals at the back.)"

Your wire is quite satisfactory and you will need about sixty turns on the former mentioned. It will be waste of time to tap at every turn, even if you have plenty of time and inclination to do so; but we should tap at every five turns, all along the coil.

Arrange these tapping points to come well clear of each other, as the final connections will need three crocodile clips making contact at various points along the winding.

The connections will then be as follow:

Aerial terminal to a crocodile clip, by means of a flex lead. (This connection will, like the others, be tried on various tappings on the coil.)

Earth terminal to one *end* of the coil, to the moving vanes of the variable condenser, and to one 'phone terminal.

The remaining 'phone terminal goes to one side of the crystal detector. The other side of the detector goes to another crocodile clip by means of another flexible lead.

Finally, the fixed vanes of the ·0005 tuning condenser must be joined to a third crocodile clip by means of a third flexible lead.

Try the clips at various points until the best position is found.

(NOTE.—This reply also answers A. S. T. (Aberdeen, and others.)

THE MODERATOR AND PLUG-IN COILS.

The old plug-in coil is by no means as dead as it is supposed to be, and quite a number of enquirers have asked how the "Moderator" can be applied to various plug-in coil circuits. Here is a typical letter from F. H., of Woking, Surrey.

"I would like to thank you for the wonderful circuit, The 'Cosmic' Three. I have been longing for such a fine set, and now I intend to stick to this set, for I have had a couple which I made myself but neither one would beat the 'Cosmic' Three.

"I have had trouble with my moderator coil. It would not work on the medium wavelength, so I took it down and I found the plug was not making tight contact, after I put it back it worked wonderfully.

"Now, I have got one of your old circuits, from your 'P.W.,' 1930, and I made it up (The Globe Trotter). Not a bad set at all. I have got my plug-in coils, and a few spare parts and I would like to put your moderator coil in the circuit. Could this be done, please?"

The answer to this and to similar "plug-in coil" queries has already been given, but is repeated below for the benefit of those who failed to notice it.

If the set employs a separate plug-in aerial coil, placed up against the grid coil, you do not need the former, but only the latter and the moderator coil. Connect the moderator coil across the aerial coil holder's plug and socket, and wire the moderator condenser across these points also.

Choose the best tapping point for the plug when arranging the degree of selectivity, which is done by mounting the moderator coil near the grid coil in the exact position which is found by experiment to give the necessary sharpness of tuning.

The aerial tapping will affect this, so the coil position and tapping should be selected carefully.

If, instead of a separate aerial coil, the circuit employs an "X" coil, the Moderating is equally simple. In this case, connect one terminal of the Moderator coil and one side of the Moderator condenser to "earth." Join the other side of the moderator condenser to the other terminal of the moderator coil.

Then disconnect the aerial lead from the tapping on the "X" coil, and take it instead to the connection between Moderator coil and condenser which does not go to earth. And, of course, place the Moderator coil in various positions near to the "X" coil to see which gives the best results.

Remember when mounting the Moderator condenser and coil permanently that long leads are harmful and good spacing of leads is necessary.

FOR THE "OUTDOOR" THREE.

On page 281 of our May 14th issue it was stated that a table of equivalent connections for the "Cosmic" coils would be given in the following issue of "P.W." As there was insufficient room in the article, this table is now given below:

(Incidentally, the connections shown in the wiring diagram on page 282 are for one of the Class A coils, and coils with numbering different from the diagram are, therefore all of the "Class B" type.)

THE "P.W." "COSMIC COIL" GUIDE.
DUAL-RANGE COILS.

*CLASS A COILS.	*CLASS B COILS.
TERMINAL No. 2 is equivalent to	TERMINAL No. 3
TERMINAL No. 3 is equivalent to	TERMINAL No. 1
TERMINAL No. 4 is equivalent to	TERMINAL No. 8
TERMINAL No. 5 is equivalent to	TERMINAL No. 6
TERMINAL No. 6 is equivalent to	TERMINAL No. 5
(Terminal No. 1 is not used in this class of coil)	(Terminal No. 4 is not used in this class of coil)

*NOTE.—*Class A Coils* have their terminals numbered from 1 to 6.

Class B Coils have their terminals numbered from 1 to 8.

SOME INTERESTING QUERIES.

In connection with correspondence arising from the easy switch-over of the "Cosmic" to short waves, and the methods by which, if possible, a similar simple wave-band alteration might be made in other sets, a number of

(*Continued on page 354.*)

HOW ARE YOUR RESULTS NOW?

Perhaps your switching doesn't work properly? Or some mysterious noise has appeared and is spoiling your radio reception? Or one of the batteries seems to run down much faster than formerly?

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

Full details, including scales 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 post free immediately. This application will place you under no obligation whatever, but, having the form, you will know exactly what information we require to have before us in order to solve your problems.

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

DO YOU KNOW—

—the answers to the following questions?

There is no "catch" in them, they are just interesting points that crop up in discussions on radio topics. If you like to try and answer them you can compare your own solutions with those that appear on a following page of this number of "P.W."

(1) How to convert wavelength into frequency, i.e. into kilocycles per second?

(2) What is the wavelength of the new Falkirk Regional station?

(3) Which foreign station uses the blast of a steamer's siren as an interval signal?

(4) How to tell the negative main of a D.C. supply?

(5) Which way the electrons that form the anode current flow inside a valve?

The answers are given on page 354.

"P.W." PANEL. No. 73. HUM FROM MAINS UNITS.

The idea that a certain amount of hum must be expected when using the mains is fallacious. It can always be eliminated, and if hum is tolerated at all it should only be because it is so slight as to be almost unnoticeable.

* * *

One simple expedient which frequently lessens or abolishes hum is the reversal of the secondary leads of an L.F. transformer. Instead of "G" going to grid and "G.B." to grid bias, take "G" to grid bias and the "grid bias" terminal to grid.

* * *

Another easily-tried and often effective remedy is to put an L.F. transformer primary (or secondary) in the H.T. lead that supplies the detector, then join a large fixed condenser between the H.T.— and H.T. + (detector) terminals of the receiver.

VARIO-CHOKE

SEE PAGE 306
POPULAR WIRELESS LAST WEEK (21st May)

Without any flourishing or sensational claims, the Sovereign Vario-Choke (Prov. Pat. No. 111/32) was recently placed on the Radio Market . . . its great value was immediately recognised in all quarters as one of the most practical contributions to Radio Progress ever made. See what "Popular Wireless" says about it —and then watch out for its inclusion in the new sets! Every constructor will want to know more about it.

Complete with wiring instructions, from all dealers, or direct from the manufacturers. **3/6**

SOVEREIGN SCORE IN

"COSMIC ONE"

Sovereign has been specified in every COSMIC set published so far, and now, in the COSMIC ONE, both Sovereign Cosmic Dual-Range and Short-Wave Coils (5/- and 4/-) are specified by the designer. These coils have been officially tested and passed for accuracy and reliability. The pair of coils cost 9/-

The Sovereign Moderator Coil (also officially approved) costs 2/6 and is specially recommended.

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SPECIFICATION.—3′ 3″ high, 1′ 10″ wide, 1′ 6″ deep. To take panels up to 18″ × 7″. Panel opening to suit set. These cabinets allow ample room for the following :— Pick-up, Motor, Speaker, Batteries, etc., all for the reduced price of 39/6.

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This is what they said when the price was 2 Gns.:-

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G.H. (Kingston): *"The biggest bargain I have ever bought."*

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Works: Redditch (Worcs.)

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 352.)

readers have referred to the "tuning-condenser-in-series" method, or to some variation of it. And the following letter raises several points of interest which are dealt with below.

"Is it a feasible proposition in a set like the 'Cosmic' Three to use a ·00025 variable condenser for use on the short waves, then by means of a 2-point switch, add in parallel a ·0002 or ·0003 fixed condenser for medium wavelengths? Would the lowest fixed capacity be too great for normal tuning?

"Also, I have built a Kelsey S.W. Adaptor and plugged it into my, then, 'Comet' Three. The results were very good, I admit. A point I noticed that I am not clear about. In my 'Comet' I use an H.F. choke; in the Adaptor also an H.F. choke. When using the two sets I find the two chokes are in series. Is this good or bad and will it affect reception in any way?

"Another query. I have now built an exact copy of your 'Cosmic' Three (not with So-and-so's this and So-and-so's that 'instead of'). No; an exact copy, and it's the goods except, on long waves, I get a crescendo-diminuendo rattle whenever a certain Corporation 'bus and one certain heavy railway motor passes my home. Is it the sparking plugs or magneto that is causing the trouble, and can I remedy it?

"You will be getting fed up of my queries—not complaints—so I will switch off and listen now (12.30 p.m.) to Radio Napoli on 25·4 metres whilst having dinner.

"Yours, a regular since 'Combination' days.

"D. L. LEWIS.

"P.S.—I received your Lisbon broadcast very clear, except for occasional fading."

Regarding the wave-changing from medium to short, and vice versa, it should perhaps be emphasised that the "Cosmic" circuit differs from all that have preceded it in several important respects, so that for simplicity it is unequalled.

It is not possible by a simple alteration to an ordinary circuit to get equivalent results. The schemes of paralleling which you suggest would be quite satisfactory for the short waves. But it would not be O.K. on medium, and for the very reason which you feared might be the trouble. The minimum tuning condenser capacity would be approximately that of the fixed condenser, and so the bottom of the medium wave-band would not get covered.

Re the "Adaptor" connections, which result in two chokes in series—this was foreseen in the original designs, and is certainly no detriment. Rather, an advantage.

The interference from certain specified vehicles and not from others, certainly ties down the disturbance as one arising from these vehicles, and is probably due to their sparking plugs or magnetos.

WHAT'S WRONG?

IS IT YOUR LOUDSPEAKER?

The loudspeaker needs an occasional checking of its adjustment if the maximum results are to be obtained from it.

* * *

With most speakers the easiest way to make sure adjustment is correct is to turn the control slowly, increasing the sensitivity until the speaker "clicks over." Then slacken off the adjustment a little, and leave it set at that.

* * *

If it is adjusted too near the "full sensitivity" position you may get rattles on the loud passages of music from the local stations.

THE ANSWERS

—to the questions asked on page 352 are given below.

(1). Divide the number of metres into 300,000.
(2). 376·4 metres.
(3). Hamburg, and its relays: Bremen, Flensburg, Hanover and Kiel.
(4). There are several methods, the commonest being to immerse the two wires in a glass of water, and note which one bubbles more freely. This is the negative.
(5). From filament past the grid to plate.

DID YOU KNOW THEM ALL?

Any relief from interference of this kind will have to come from the authority controlling the vehicles, and the listener can do nothing except write to the B.B.C. giving the full details, when the matter of approaching the local authorities will be considered.

A TOUR ROUND BROADCASTING HOUSE

(*Continued from page* 334.)

machines therein are contained. Mike, majestically swinging round on a huge capstan suspended from the ceiling, a glass-fronted balcony with an imposing row of six gramophone turn-tables.

The latest synthetic aeroplane, the most up-to-date bath-tub for water noises. And the galloping horses! A solemn broadcasting official, dignified and tall, banging bunches of little discs on a hard table. Truly this radio is a wonderful thing.

But enough of the serious side. Let us turn to the lighter aspects of Broadcasting House. The engineering, for instance. Clapham and Dwyer and Abie and Sandy may all be firing off wisecracks in different studios, but there will be no Cross-Talk between any of the hundreds of microphone wires.

An Alternative Inscription!

Which gives me an idea. Why not wash out that old Latin inscription in the entrance hall and write up some honest English. I suggest "To the Memory of Cross-Talk—Killed by B.B.C. Technicians, 1932. R.I.P."

It's worth an inscription. Think of it. Mr. Agate can cough as loudly as he likes into the microphone of a Talks Studio without one splutter of it getting on to a Symphony Orchestra amplifier and posing as a bit of Bela Bartok.

Yes, some wonderful work has been accomplished at Broadcasting House, and the pity of it is that the majority of listeners won't even know much about it. The B.B.C., with its usual modesty, will say nothing, and just be coy, and the programmes—well, they *could*, but doubtless, won't.

As for casual visitors like myself, I fear they will be too busy swotting Latin dictionaries for the next few years. By the way, does "Musarum" mean museum? And has "Messem Bonam" anything to do with Alexander and Mose?

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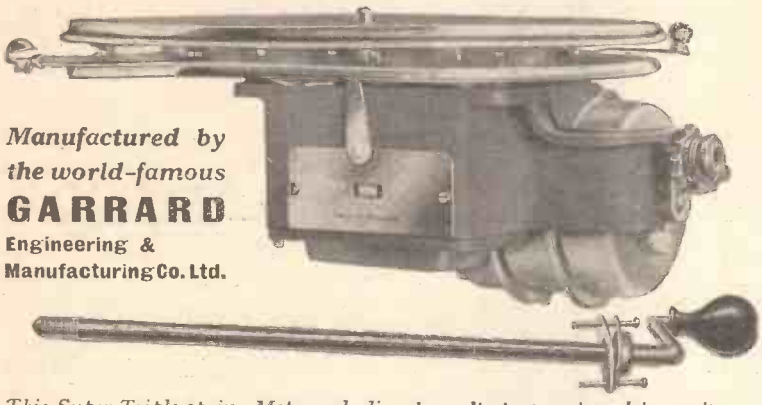
Super TRIPLE-SPRING GRAMOPHONE MOTORS

The finest Spring Gramophone Motor ever produced



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This Super Triple-spring Motor embodies three distinct spring drive units, and is thus three times as powerful and long running as ordinary single-spring motors. Fitted with motor plate, speed regulating lever, safety friction clutch, 12-inch turntable, winding handle, and automatic brake. All bright parts heavily nickel plated. All working parts totally enclosed. Silent running, silent wind.

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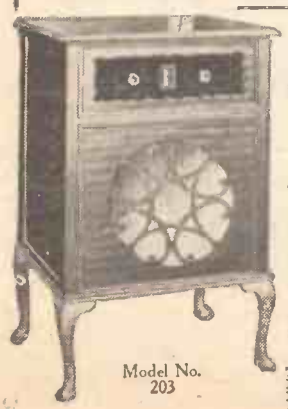

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P.W. 28/5/32

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MORE POWER FROM PENTODES

(*Continued from page* 336.)

In Fig. 3 the tone-corrector is seen applied to a choke-filter output circuit. The condenser C and the resistance R, in series, are placed across the plate and the H.T. + terminals of the choke. Fig. 4 shows the circuit used with a loudspeaker specially wound for pentodes.

Methods of Connecting.

Here the condenser and the resistance are connected in series across the loudspeaker windings. In Fig. 5 tone-correction is used with an output transformer, the combination of condenser and resistance being connected across the primary terminals of the transformer. Fig. 6 makes plain the way in which the corrector is used with the combination of output choke and output transformer. Here, as in Fig. 3, it is connected across plate and H.T. + terminals of the choke.

One last but very important point about using pentodes. It has often been stated in writing that no alteration in the plate circuit connections of a pentode should be made without first switching off the filament current. But there is a great deal of truth in the old saying that familiarity breeds contempt, and many a wireless man, having made such alterations without *apparent* damage to the valve, continues to do so when he is experimenting.

I have no hesitation in saying that any number of pentodes are ruined in this way. Their owners ill-treat them in this manner and, because the valve continues to function in some kind of way, they believe that it is still as good as ever. Careful tests would in most cases show that they had suffered severely.

It is not generally realised that to break the plate circuit of a pentode valve when the filament is still receiving its full heating current may result in the momentary development inside the valve of potentials eight or ten times as great as the original H.T. potential. The ensuing rush of current may well wreck the valve, but in any case it is certain to do some damage.

When Altering Grid Bias.

Again, *never* try altering the grid bias by moving the wander-plug with the filament still switched on. A glance at pentode curves will show you the terrific current that may pass through the valve when the grid is left "free" for a second or two.

In conclusion, the pentode may justly be described as a wonderful valve if it is given a fair chance. Its amplifying powers are little short of marvellous if it is correctly matched to the loudspeaker, and the quality that it furnishes leaves small room for criticism if its natural shrillness is curbed by the use of a tone-corrector circuit.

MIRROR OF THE B.B.C.

(*Continued from page* 338.)

The ceremony starts with the arrival of the Royal Procession and Royal Salute, after which the King will inspect the troops, and the massed bands and drums of the Brigade of Guards will play a slow march, counter-march and quick march. The historic ceremony continues with a drummer playing the Drummers' Call and the escort marches up to the Colour while the bands and drums play the "British Grenadiers." The Colour is then handed to the Ensigns for the Colour by the sergeant-major, and the escort salutes the Colour by presenting arms while the bands and drums play the National Anthem. Subsequently both Colour and escort march down the line of Guards, and the whole Parade marches past the King, first in slow time and then in quick time, finally forming up in line to give the Royal Salute.

The ceremony concludes when the Household Cavalry marches off and the King places himself at the head of the King's Guard and the Guards march off to Buckingham Palace headed by the massed bands, drums and pipes.

The Birmingham "Phil."

The Birmingham Philharmonic String Orchestra is to give its first broadcast concert in the Midland Regional programme on Tuesday, June 7th, under the conductorship of Johan Hock.

The performance is interesting because it will provide an opportunity for several young musicians to show what they can do in a well-chosen programme consisting of two works by Handel, the Concerto Grosso in B flat and the B minor Concerto for oboe and orchestra (oboeist, Lucy Vincent). "Recreations," by Alfred Wall, and Saint-Saëns' Prelude "The Deluge," and Grieg's "Holberg Suite."

THESE RADIO COMPONENTS

(*Continued from page* 331.)

note which cracks, it's just that drum which isn't rich and full, it's just that organ which fails to register the pedals which annoy me.

If you have battery power, well, you cannot have what I want, but if you have a mains unit, don't be afraid of it. Get a good one which will give 100 milliamps at 200 volts. Then you really can *do* something instead of messing about with half results.

I have mentioned metal rectifiers. It seems to me their use is highly desirable because they do not want replacing. I can assure my readers that these metal rectifiers are *really* reliable—it's an amazing thing but they are! It's curious that an oxidised metal should so well stay put—but it does.

I believe there again that metal rectifier costs are higher than valve (or more accurately thermionic) rectifiers, but the metal lads last "for ever," and the thermionic certainly do not. In years to come I should think everyone will use metal rectifiers.

FIXED CONDENSER TIPS

Two small points that you may find helpful.

Quite a good method of ascertaining the capacity of an unknown condenser of fairly small value is to connect it across one of your tuning condensers and note the reduction necessary to tune in some strong station, which will indicate quite well the capacity which the fixed condenser bears in relation to the tuning condenser in question.

* * *

When testing a disconnected mains set in which large smoothing condensers are used it is a good plan to short these before interfering with the wiring of the receiver

THE LISTENER'S NOTEBOOK

(*Continued from page* 338.)

the world over—for no one is more photographed than she. But I don't remember ever hearing her before the microphone. What a popular broadcast hers would be!

* * *

The International Vaudeville recently staged by Bertram Fryer wasn't a very illuminating affair. The best thing about *our* representative was his name—St. George. Was he entered on the strength of this, I wonder? It did not seem to have been on the strength of his performance.

* * *

Nor was he alone in this respect. Fortunately "The Swan Song" saved the hour from being a complete flop, although here the indifferent enunciation of the artiste concerned demanded much hard listening.

And this isn't always worth while. It seemed to me that on this occasion an air of depression had got into the studio, which even Haver and Lee couldn't lift.

* * *

I felt sorry for Mr. Gerald Barry that, as a result of a postcard, he had to begin his talk with an apology for committing a howler the week before. However, he made no excuses, but confessed his crime in a most courageous way. That's the spirit, Gerald!

* * *

It seems that Peter Dawson believes in keeping his best wine till last. I would have thought that, on such an auspicious occasion as a first broadcast, he would have chosen songs more remarkable for their melody than for their technical difficulties.

His last two or three songs were the only ones which really stirred me. The rest were depressing, though I've no doubt they were beautifully sung.

* * *

It is a new idea for a previous speaker to announce the next item on the programme, and one which announcers will view with alarm. Mr. Gerald Barry did this on the occasion of Lord Lloyd's talk, "Solving a Hospital Problem." Are unemployed figures to be increased by the addition of an announcer or two?

* * *

Was the choice of "The Triumph of Youth" as the play of the last week at Savoy Hill by accident or by design? If the former, then the coincidence was a very remarkable one.

Is there to be found anywhere a more perfect personification of the B.B.C., with its youthful ideals and aspirations than the young Baron Ernst? And who can typify its critics better than Pzter Gropp? It all seemed very pointed.

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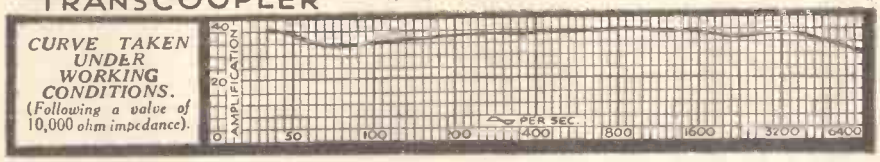

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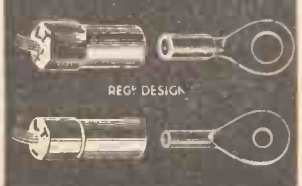

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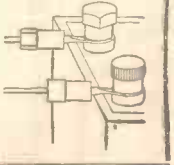

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TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio reception.

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

A Curious Set.

WITH a mains set or, in fact with power transformers generally, you will sometimes find that a fuse which is ample for carrying the normal current will "go" at the moment of switching-on or switching-off. I have one particular mains set in which this happened repeatedly, presumably due to some surge of current which momentarily overloaded the fuse. In order to overcome it, I had to use fuses much larger than calculations showed to be proper, and although I have used the set for a long time, I always have an uncomfortable feeling that one of these days something serious will happen to it!

Super-het. Developments.

The super-heterodyne set to-day is a very different thing from what we knew five or six years ago. In those days you had to be pretty skilled to use a super-het. set at all, and the owner of such a set regarded the smaller fry with justifiable scorn.

The earlier super-het. receivers were quite expensive to run and, moreover, there was not really so much requirement for a powerful receiver then as now, because there were not so many stations available. The tuning was not easy, as the various circuits had to be adjusted separately in order to get the set into operation at all.

Stability and Quality.

The screen-grid valve and the balancing or neutralising circuit have gone a long way to make the super-het. a more simple and manageable affair since stable high-frequency amplification can now so readily be obtained. The super-heterodyne is now actually gaining quite a large share of popularity.

The tuning nowadays is quite easy, stability, as I say, is not at all difficult to obtain, and the tone quality is often quite excellent. Perhaps I should not forget to add that the special coils which are used nowadays for super-het. circuits are also vastly superior to those we had several years ago, and these are in no small measure responsible for the great improvement in this type of receiver.

Screen-grid Coupling.

When coupling between a screen-grid valve and the detector a very popular arrangement is a tuned circuit connected to the leaky condenser of the detector and connected also through a fixed condenser to the anode of the screen-grid valve, the anode being supplied through a high-frequency choke.

One part of the above-mentioned tuned circuit is connected to the low-tension circuit, and so you will notice that the "stopping condenser," which I mentioned as being connected between the anode and the tuned circuit, has to stand the full high-tension voltage, or at any rate the full voltage between the anode and the low-tension side. It is important, therefore, that this condenser should be of sufficiently good quality and sufficiently high insulation resistance to stand up to this voltage.

H.F. Choke Losses.

Another important point to bear in mind is that if there are serious losses in the high-frequency choke these will upset the tuning and also the amount of magnification obtained. I mention the choke particularly because there are such wide variations in the quality of different chokes on the market, some being very effective and others being pretty well hopeless.

In some of the inferior chokes, not only is the amount of wire badly skimped but also the insulation is not by any means what it should be. If you are out for efficiency it is worth while to have a good choke and condenser, here, as well as in other parts of the circuit where these components occur.

Differential or Plain Condenser?

It is very important not only to have good detection but also to get smooth reaction, and many experimenters find themselves a little bit in doubt as to whether they should use a differential condenser or a plain reaction condenser. Sometimes you may think that the differential condenser does not give any advantage over the ordinary kind.

When a condenser is connected across the anode and filament of a detector, it usually seems to give a considerable improvement, but whether this should be one section of a differential condenser, or whether it should be a separate condenser altogether, is a matter which you can only find out by actual test. Generally speaking, however, I think that unless the possible economy of cost is the paramount consideration, it is better to go in for the differential.

A Strange Valve Effect.

A reader describes to me a curious experience he had with a valve, which I imagine is probably not uncommon although I have not actually experienced it myself. The set was an all-electric one, and the difficulty was that when the set was switched on it gradually became worse and worse during the course of a few minutes until finally it put up a very poor performance indeed.

If it was switched off and left for, say, five minutes and then switched on again it started well, but the same sort of thing happened again. To save you guessing, it turned out that one of the valves was badly constructed and the grid was actually being heated by the filament to such an extent that it acted as an emitter, the emission from the grid completely upsetting the normal working of the valve, of course.

You will see from this why the effect was progressive and took a minute or so to reach the steady state. On replacing the

(*Continued on next page.*)

TECHNICAL NOTES

(Continued from previous page.)

defective valve by another the trouble completely disappeared. If, therefore, you have anything of this kind—you may notice a similar effect but not to such a pronounced degree—it is as well to inspect the valves very carefully, and if you have any "spares," on hand, to try substituting a spare for each valve in turn.

Valves and Sockets.

I said something in these Notes the other day about solid valve pins and suitable holders for the same, inasmuch as the resiliency is lacking in the pin it has to be provided in the holder. I have received an interesting letter from Messrs. Lectro Linx, Ltd., makers of the well-known "Clix" products, in which they tell me that 90 per cent of the leading manufacturers in this country have adopted Clix resilient sockets in various forms for use with solid-pin valves.

As you probably know, the same manufacturers have recently extended their activities to the amateur and experimenter, and have produced a chassis type of holder of similar character but with terminal connections.

The H.F. Stage.

Experimenters and constructors often wonder whether it is worth while going in for a stage of high-frequency amplification or whether it is not sufficient to stick to the good old Det. and one or two L.F.'s. With reaction properly used and a good aerial and power valve there is something to be said for this latter arrangement; but, on the other hand, with a screen-grid valve quite a large amount of H.F. amplification can now so simply and easily be obtained that there is even more to be said in favour of the H.F. amplifier.

Drawbacks of the Det. L.F. Set.

One of the factors which, as a rule, limits the usefulness of the Det. and L.F. set is lack of selectivity. Reaction is not a true substitute for tuned circuits.

If too much reaction is used you generally get a cutting-off of the high notes which, of course, means distortion and loss of clearness or crispness. The drawbacks of such a set include difficulty of proper tuning, liability to distortion, lack of selectivity and liability to produce oscillations in the aerial circuit.

Now if a tuned high-frequency stage is added there are two tuned circuits, and consequently the tuning is sharper and the selectivity better.

"Pure" Magnification.

Since there is more magnification available—"pure" magnification—less reaction is needed and the likelihood of distortion is very much less. At first you might be worrying about the tuning being more difficult, but since the aerial and inter-valve circuits tune practically together, this is not really the case. Since the tuning is not so critical, different users of a set, or type of set, of this kind, will obtain more nearly the same results—an important point to manufacturers of commercial sets.

Stability is, of course, a very important feature, and for this, not only must the circuit be suitable, but also the different

(Continued on next page.)

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Supplied fitted to baffle ready for mounting into cabinet. Price included transformer - - -

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Designed by experts

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The P.P.M. Speaker incorporates an impregnated diaphragm, and a patented twin suspension permitting large cone movements without distress. The new patented cobalt content steel magnet produces a very high flux density.

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TECHNICAL NOTES

(Continued from previous page.)

parts of the circuit must be adequately shielded from each other so that they do not affect one another—except, of course, as required for amplification.

Electric Clocks.

Messrs. Ferranti, Limited, the well-known electrical and radio manufacturers, sent me some days ago an example of one of their latest synchronous clock movements, and I was very interested in making a number of experiments and tests with this.

The particular sample which I have is of the non-self-starting type, and comprises a simple and very effective type of phonic wheel, the rotor being no more than about 1-in. in diameter.

Attached to the rotor and on the same spindle is a flywheel; this flywheel, although mounted on the spindle, is only secured to the spindle through the medium of a small spiral spring, and the arrangement, which is very ingenious, has the effect of allowing the rotor to fall in step with the alternations very much more easily than would be the case if the flywheel were rigidly attached to the spindle. I tried deliberately a great many times to get the clock going at twice or half the normal speed, but without success; it insisted on going at the correct speed and no other.

Exact Time Always.

I was very much impressed with the simplicity and efficiency of the Ferranti movement, and any of you who are thinking of going in for a synchronous electric clock should make inquiries either locally or direct to Messrs. Ferranti, Limited, as to clocks suitable for your particular district. Until you have one of these clocks you will never realise what a boon it is to have absolutely accurate time "on tap" at all hours, and I think that ordinary spring-driven clocks will soon become things of the past.

I notice that some electric clocks are also made with an alarm device, and a further elaboration is a sort of multiple alarm which will work a buzzer at several different specified times which can be "set" on the clock. These clocks are particularly useful because you can set them for different times when special items are to come on.

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"P.W.'s"

TENTH ANNIVERSARY NUMBER

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Capt. Eckersley is writing a special article for it—and there will be full details of the "DECADE"—"P.W.'s" Anniversary Achievement.

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CONDENSERS, for smoothing L.T. Smooths out hum and crackles. Best British make. 500 volts T.C.C., 2 mfd., 1/6. Sterling, 1/6. 8 mfd., 5/-. 10 mfd., 7/-. '01 Dubilier 1,000 volt, 1/6.

SPECIAL BARGAINS.—9-lb. parcel of Radio Experimenter's Useful Sundries, 5/-, postage 1/-.

MORSE KEYS, 3/6. No. 1, R.A.F., 6/-. Brown, 7/6. Buzzers, 1/6. Complete Practice Set, Key and Buzzer on mahogany base, 7/6.

HEADPHONES.—Sullivan's Double Headphones, 2 receivers with metal headbands, 120 ohms, 3/- pair; ditto., 8,000 ohms, 4/- pair. Field Service Headphones, leather headbands, L.R., English make, 2/6 pair, clean and boxed in maker's cartons. Single Earpieces, L.R., 1/6. All as new. 7-in. double cord with Plug and Socket, 1/6.

VALVES.—The famous Western Electric Midget Peanut. Work on 1 volt at ¼ amp. bayonet or standard, 4-pin base, 3/9; power, 4/6, X-Ray Valves, 7 in. dia., 37/6. All good. 1-in. Coils, 6/6; 2 in., 17/6.

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is the title of a series of articles which GENE TUNNEY is contributing to CASSELL'S MAGAZINE. In the first of the series, appearing in the JUNE issue,

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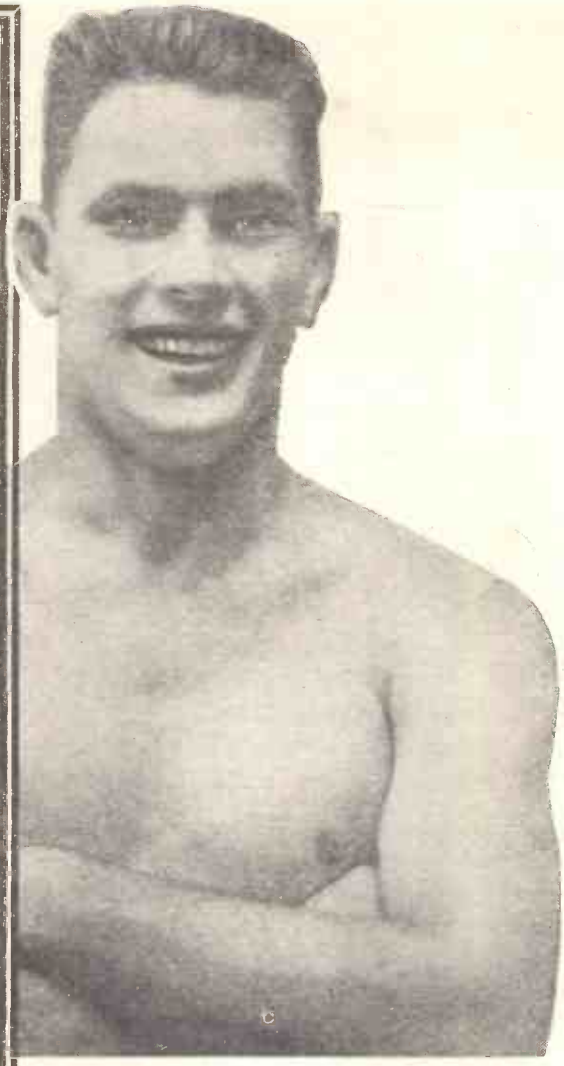
begins his own LIFE STORY

The man who was, until recently, the world's heavy-weight boxing champion tells the fascinating story of his rise to world-fame. Each article will carry that story nearer to the moment of his final triumphs in the Ring against the great Jack Dempsey at Philadelphia and Chicago.



You'll be thrilled by this stirring saga of the gay and grim realities of the struggle for championship honours. There will be, for instance, a breathless description of the famous "long count" at Soldier's Field, Chicago, in 1927. Here's an "inside" story of a champion's career told by the champion himself. Don't miss it!

Of course, there are many more splendid features in the JUNE CASSELL'S, including contributions from BEVERLEY NICHOLS, FRANK H. SHAW, E. C. BULEY and others.

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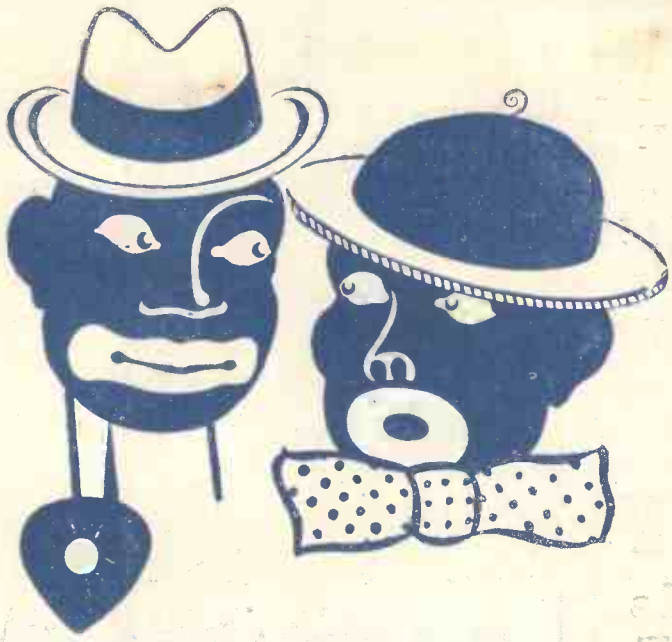
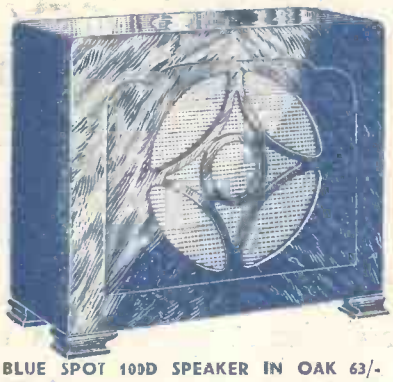


"Bo, you talk so much you's jes' like a loud speaker"
"Yeah—A Blue Spot Loud Speaker"
"An' why should you liken yo'self to a Blue Spot Speaker, Midnight?"
"Cause Ah'm always worth listenin' to, fellah."



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