POPULAR WIRELESS AND WIRELESS REVIEW, January 2nd, 1926. REGISTERED AT THE G.P.O AS A NEWSPAPER.

A MAIN STATIONS AND 5 X X ULTRA CRYSTAL SET.

Popular Wireless

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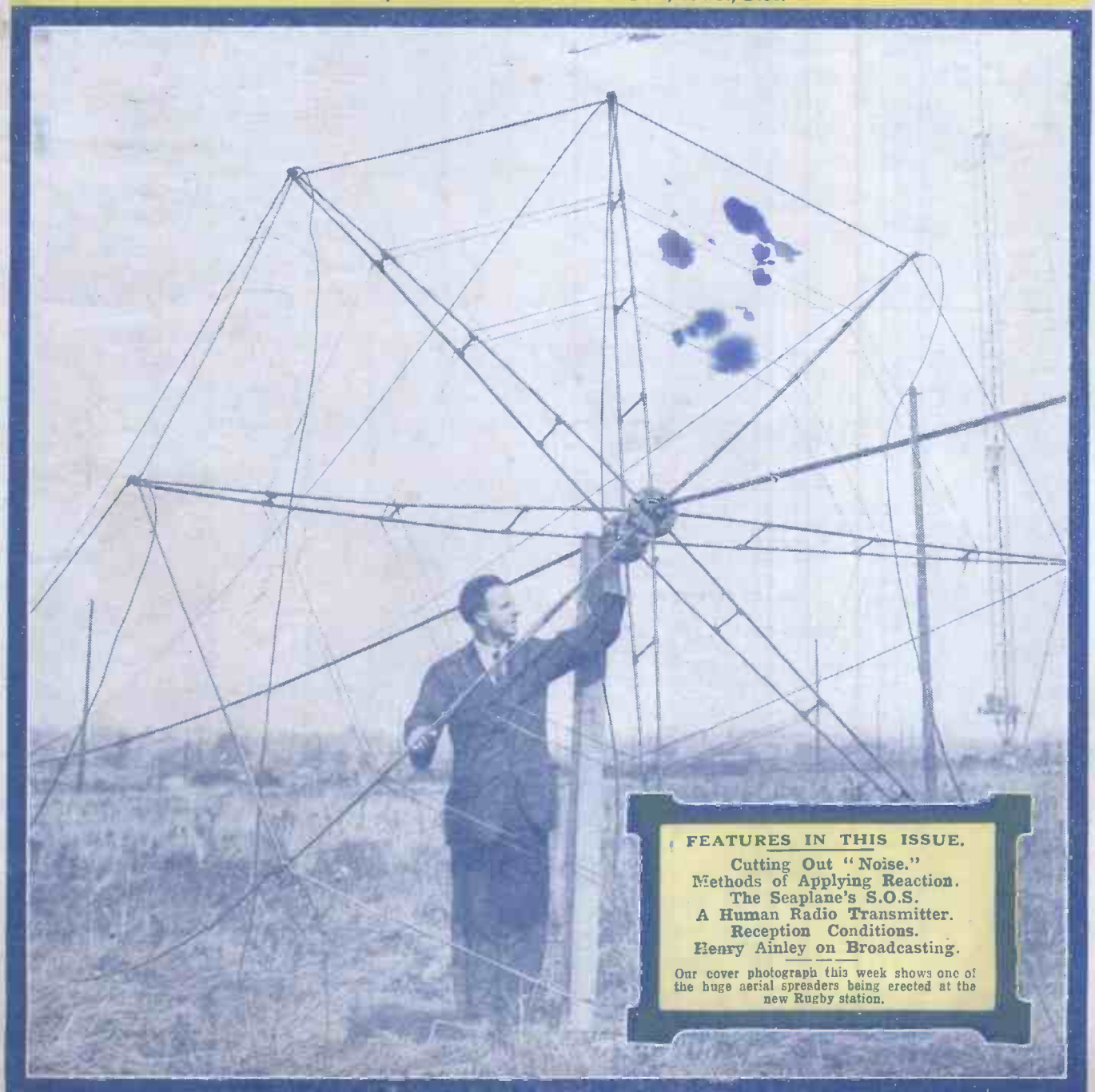
January 2nd, 1926

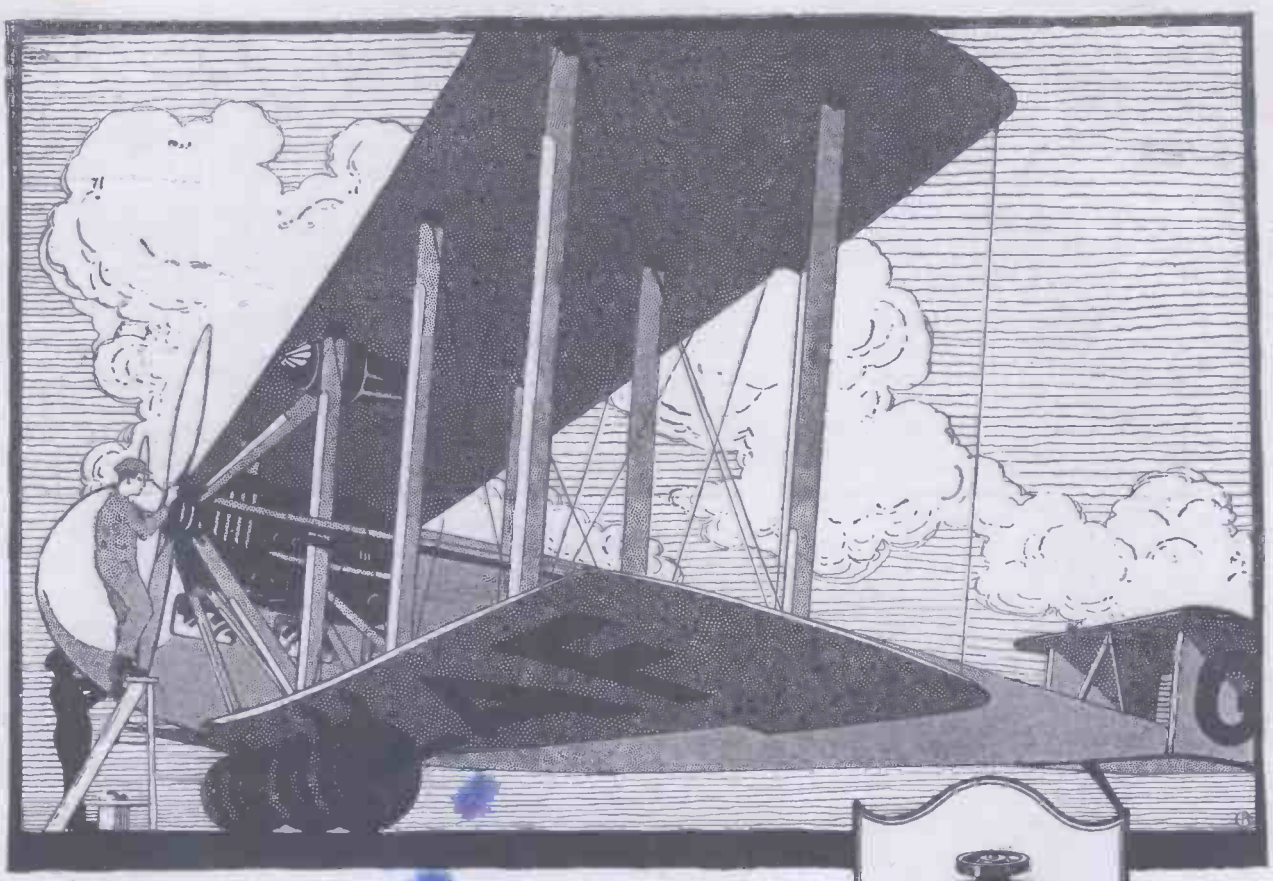
Scientific Adviser : SIR OLIVER LODGE, F.R.S., D.Sc.

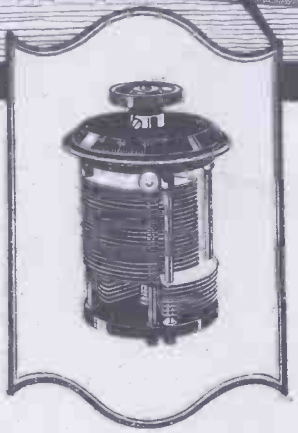


FEATURES IN THIS ISSUE.

Cutting Out "Noise."
Methods of Applying Reaction.
The Seaplane's S.O.S.
A Human Radio Transmitter.
Reception Conditions.
Henry Ainley on Broadcasting.

Our cover photograph this week shows one of the huge aerial spreaders being erected at the new Rugby station.





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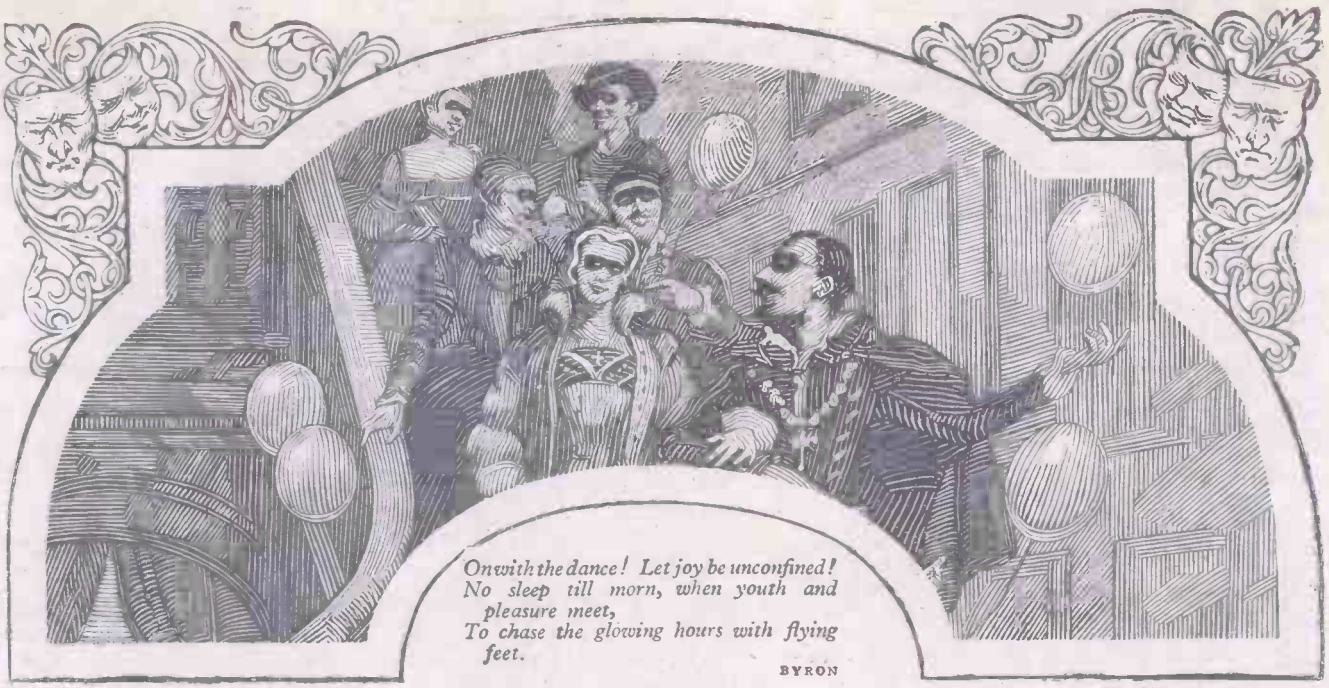

On with the dance! Let joy be unconfined!
No sleep till morn, when youth and pleasure meet,
To chase the glowing hours with flying feet.

BYRON

For the Radio Dance—the W3

AS Channing once said, "The animation of youth overflows spontaneously in harmonious movements." Coming down to earth, he would probably have said to-day, "After a hard day at the office there's nothing like a jig round the room to loosen our limbs and to drive away the cobwebs from our brain." For our radio dance let us be sure of three things: suitable valves—a good loud speaker and a first-class L.F. transformer. With this trio correct and well balanced the Savoy Orpheans will step right into your home.

Don't stint money on an L.F. transformer. Pay a fair price and you'll get a good article. After all, generous amplification and pure tone can only be ensured by the use of ample turns of wire—and wire costs money.

Then consider the loud speaker. For dancing you need volume—don't anticipate being able to obtain a true impression of a good orchestra on a small loud speaker. Choose one with an ample horn and a large diaphragm.

And finally the valves. For true volume and a richness of tone quite unique you'll need the Cossor W.3—a dull emitter valve capable of exceptionally fine loud speaker results.

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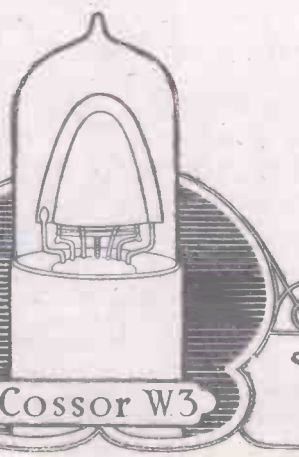

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RADIO NOTES AND NEWS.

Britain's Super-Station—The Unidyne Abroad—Amateurs and the Navy—Patchy Programmes—Hilversum Coming Down?—New Norwegian Station.

A Happy New Year.

WHAT will 1926 bring forth for listeners? Candidly the problems seem more fascinating this year than ever before—but even if we don't get Television, indestructible valves, everlasting batteries,

Installing the aerial upon the roof of Mr. Ramsay MacDonald's house at Hampstead.

and all the rest of it, it's going to be an exciting year for listeners.

On behalf of the Editor and staff of "P.W." I wish each and every reader a very happy and prosperous New Year.

Britain's Super-Station.

LATER news of the exploits of the new British P.O. wireless station at Rugby, shows that it amply fulfils all expectations. It now transpires that the original tests were on ¼-power, and were picked up in Java and Hong-Kong. Later, this was increased to ½-power, and Sydney, Australia, was easily reached. A further increase gave good signals in New Zealand and "amazing clarity" in Australia, so there is no doubt of Rugby's ultimate success.

One-Valve Results.

WRITING from his ship, the s.s. "Alice Marie," Capt. M. Ford tells me of some excellent long-distance results upon the 1926 One-Valve Unidyne. He says, "Whilst in Copenhagen I was able to receive several of the B.B.C. stations at good 'phone strength, though reception was hindered by a steel-girdered overhead transport railway, about thirty feet from my aerial."

The Unidyne Abroad.

ANOTHER interesting experience with the same receiver was the tuning-in of German, Spanish, and French stations whilst lying in Nantes, where Glasgow and Belfast were easily picked up. Bournemouth and 2 L O were "particularly strong." This is all the more remarkable considering that at the time the "Alice Marie" was moored alongside the Nantes Electricity Supply Station, and the powerful generators were not more than eighty yards away.

Heard in Hyde Park.

The Orator: "I am calling, calling, calling YOU."

The Indignant Passer-By: "Well, I ain't tuned in. Who do you think you are—2 L O?"

Better and Better?

IS the ether getting better and better, à la Coue? I am tempted to think so, because of the extraordinarily good results in "reaching out," which readers have been getting of late. All sorts of stations have been received, by all sorts of people, upon all sorts of sets. Crystal sets have been getting those coveted "other stations," whilst 1-valve, 2-valve and three-valve sets have simply scoured Europe and America. Since broadcasting began I do not remember so many enthusiastic letters from the "DX hounds" (Long-distance listeners).

U.S. on the Loud Speaker.

I CANNOT quote them *in extenso*, but even confirmed ether-combers have been quite excited by the number of new stations logged of late. For instance, Mr. E. Tarplee, of Gloucester—whose exploits have often been recorded in "P.W."—writes me: "Re W L W, Cincinnati. While sorting out the many U.S. stations early Tuesday morning, I came across this fellow at 2.55 a.m. on a wave-length of 422 metres, and he made the 'phones fairly vibrate! I changed over to the loud speaker, and it came through well; frankly, it took me quite a long time to convince myself I was not making an error."

Sorting Them Out.

THAT phrase, "While sorting out the many U.S. stations" speaks volumes, doesn't it? They say that the long-distance craze will soon die, but I am not so sure, especially when I read (at the end of a letter full of foreign call-signs) statements such as the following: "It is extraordinary how good reception was on Sunday. It took me from 2 a.m. till 6.15 a.m. before I was satisfied there were no more to be logged."

Amateurs and the Navy.

LAST week, when announcing the co-operation of British wireless amateurs with the Admiralty, I referred to the great success of such experiments in America. Everybody in the know was aware that the friendly assistance of the amateurs was greatly appreciated by the U.S. naval men. Here is the proof.

A Handsome Tribute.

THE following letter has been received by Mr. Schnell, who—it will be remembered—was chosen from amongst the amateurs to sail with the U.S. Fleet on their Pacific cruise, and was for that purpose granted the rank of lieutenant.

"My dear Lieut. Schnell,—On the occasion of your release from active duty

This is not Father Christmas, but another view taken upon the ex-Premier's roof. Readers will notice that he chose Winsulators!

in the Navy, I wish to extend to you the thanks of the Navy Department for your *extremely valuable* services in connection with high-frequency radio communication with the Fleet." (The italics are mine.)

(*Continued on page* 1050.)

NOTES AND NEWS.

(Continued from page 1049.)

Promotion After One Cruise.

THE letter concludes:

"As an indication of the Department's keen appreciation of your services, I take pleasure in informing you that you have been recommended this day for promotion to the rank of Lieutenant-Commander in the Naval Reserve.

"Very sincerely,

"(signed) E. W. EBERLE,

"Admiral, U.S. Navy.

"Chief of Naval Operations."

How's that for a handsome slap on the back for amateur radio?

A Swiss Record.

THE wave-length of the new Berne station has been fixed at 302 metres. It is interesting to learn that this newcomer to European broadcasting has already been picked up as far away as Argentine!

Hilversum Coming Down?

IS Hilversum toppling down the wave-length scale? The popular Dutch station has always had a penchant for 1,000 metres or more, but is now occasionally testing upon a much lower wave-length. A Westcliff-on-Sea reader recently picked up a Hilversum dance upon 500 metres, or thereabouts, and several other readers have reported out-of-hours testing upon the lower waves. I have often thought that H D O seemed rather lonely up there all alone upon 1,050 metres.

Patchy Programmes.

SINCE I expressed the opinion that listeners hadn't much to grumble about as regards the B.B.C. programmes, the latter have been very patchy. That anniversary business is being overdone, I think, and if two or three doleful celebrities happen to be born close in the calendar, why should listeners have to suffer ever after?

The Piccadilly Tone.

HOW pleasantly a good "all-round" programme, such as De Groot provides, falls upon the ear after this specialised stuff. By the way, those Piccadilly broadcasts are surely amongst the best acoustic accomplishments of the B.B.C. Lately there has been a rich fullness about them—a timbre, and a tone—that studio sounds nearly always lack. Isn't it possible to reproduce these acoustic conditions in the studio? A fine New Year engineering problem for the Silent Staff would be to "Make a noise like a Piccadilly."

2 L O's New Microphone.

I HEAR that a new type of microphone has been installed at the London station recently. It is called the Reiss microphone, and although very sensitive, it is claimed to be impervious to outside vibrations which would spoil transmission from the ordinary "mike." Instead of the usual carbon, it contains a patent crystal powder welded into a mass by hydraulic pressure.

2 J C.

THE call sign 2 J C has now been allotted to G. Sykes, Esq., 13, Longford Street, Gorton, Manchester, for an authorised power of 10 watts. The wave-length is 440 metres, and the band between 150 and 200 metres. Reports on modulation and Q S L cards will be welcomed.

University Radio.

THE establishment of a broadcasting studio at Oxford has given a fillip to wireless there. I am glad to announce that the vice-chancellor of the University has given his permission for a University Radio Society, which was duly formed on December 1st. Within the first week the membership numbered over forty, and the society is seeking affiliation with the R.S.G.B.

Communications should be addressed to the hon. secretary, E. Cuddon, Esq., Merton College, Oxford.

SHORT WAVES.

"The wireless set gives every home a new window from which to look upon the world."—"Leeds Mercury."

* * *

"The broadcasting service . . . has anchored sober individuals by the hour with flexible cords to small mahogany cabinets placed upon tables, and made them look and feel like sad mastiffs chained to kennels.

Like the motor-car and cycle, it has brought up to the surface the mechanic who slumbers secretly in most male bosoms, and many a citizen who was formerly uncertain in which direction to turn a gas tap now handles his drill and soldering iron, and can criticise the workmanship of the local plumber."—"The New Statesman."

* * *

"How curious that there are carrier waves just as there are carrier pigeons! Yet—and this is very remarkable, I think—while the former can carry a message much quicker than the latter, it, nevertheless, is unable to lay an egg and so can never become a mother. The laws of Nature are very inscrutable, really."—MAURICE LANE-NORTHCOTT, in "The Radio Times."

Vanguard Calling.

LISTENERS in south-east England who can tune up to 900 metres may now hear the "Vanguard" on the air. This giant plane, which provides accommodation for twenty saloon passengers, has recently completed its Air Ministry trials and has been handed over to the Imperial Airways Co. for service.

Germany Relays 5 X X.

THE Daventry programme was recently picked up, and relayed all over Germany, by the Königswusterhausen station.

I think that Königs-and-the-rest-of-it was very lucky, for lately every time I listen for 5 X X it is experiencing one of those "technical difficulties."

Those Technical Difficulties.

WHEN the poor old Chelmsford station used to fall off the air, we were always told that, after all, "it is only an experimental station"; and listeners gathered the impression that if the new 5 X X at Daventry ever *did* go wrong, it would be righted almost instantaneously. Now, however, the B.B.C. announces that when 5 X X breaks down the London station will deputise, if possible. Good old Chelmsford would have scorned the idea of a deputy-speaker, and its breakdowns were always referred to as downright "breakdowns"—and no hokey-pokey about technique!

New Norwegian Station.

I AM indebted to a Bergen reader for news of the new broadcasting station which has just been erected in that city. He tells me that a 500-watt Western Electric transmitter is installed, and will be working upon 360 metres by the time these lines are in print. Has any reader picked up the Norwegian station?

Capt. Eckersley Burnt Out.

A HIGH-POWER wireless station belonging to Captain Eckersley, the chief engineer of the British Broadcasting Company, was recently completely destroyed by fire at Derby House, Hendon.

The station had three 130-ft. masts, and the experimental apparatus was contained in a specially constructed wood-and-asbestos building, about 30 ft. by 15 ft.

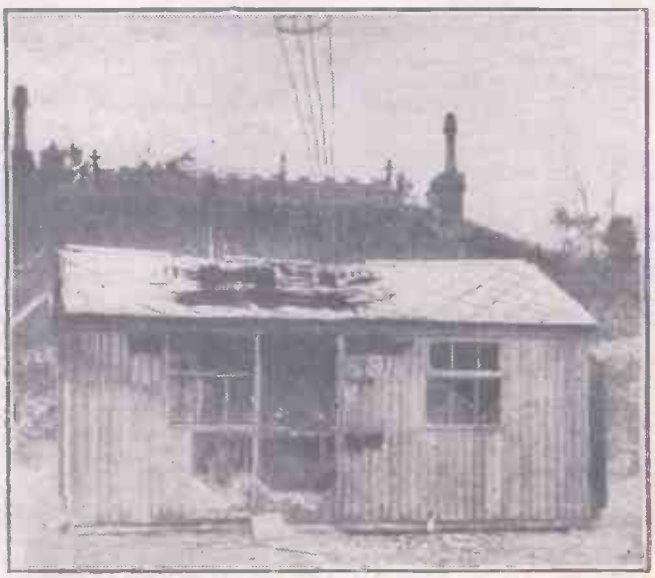
Every listener who has burnt out one valve will sympathise with Captain Eckersley, who probably lost 50 or more, some of them of the big transmitting type!

B.B.C. and Short Waves.

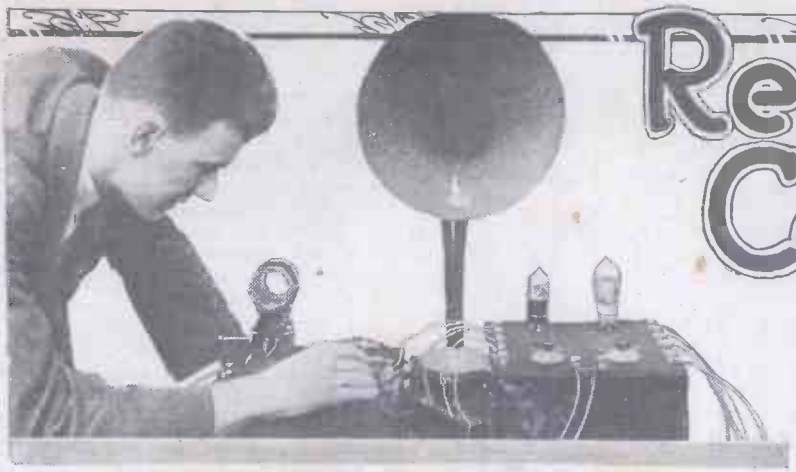
ACCORDING to an "Evening News" report, "probably the most valuable part of the whole collection was a new short-wave transmitter working at about 30 metres." It had just emerged from the experimental stage. It also appears that there were data on certain aspects of broadcasting which were completely destroyed.

Capt. Eckersley admitted that the fire was a "blow" to him, and it looks as though he had been exploring the short-wave possibilities pretty thoroughly. Will 1926 produce a B.B.C. short-wave station?

ARIEL.



A view of Captain Eckersley's experimental station after it had been partially destroyed by fire.



Reception Conditions

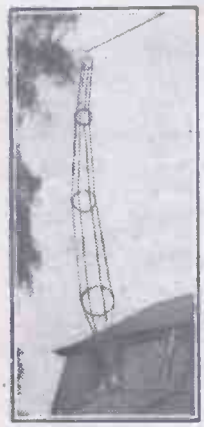
The first of a short series of articles for the general amateur.

By K. D. ROGERS
(Assistant Technical Editor).

I. The Aerial System.

IN a recent article I discussed the possibilities of the reception of DX broadcasting, pointing out that although it was possible to pick up many transmissions, yet the results could hardly be said to be enjoyable from a musical point of view.

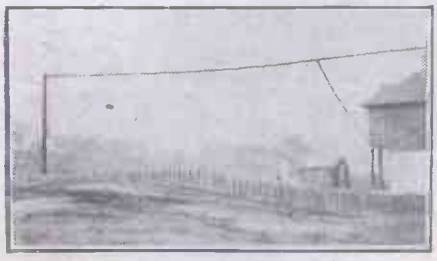
The trouble was, we discovered, due to interference from various causes, but there were occasions on which quite enjoyable telephony could be received—even on the loud speaker—provided suitable receiving arrangements were available.



The nearly vertical cage aerial used for local reception.

It is with this latter side of the question that I want to deal in this brief chat, for even though the picking up of stations other than the local may not always be easy or even profitable from a result point of view, yet there is a certain fascination about DX work that will appeal to all those who try it.

Let us take the most important section of the receiving gear first—the aerial-earth system, for this is the most difficult to adjust for maximum efficiency, and it is impossible to lay down any definite laws about it. the ultimate success or failure of DX work or even local reception must lie

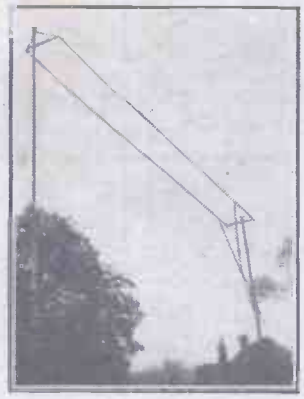


An example of a badly designed "L" aerial. Lead in should be at the end and the aerial is too long.

within the physical properties of that thin wire and its companion the "earth."

It is, as has been mentioned, impossible to lay down any definite laws, and all I can do in this article is to generalise, giving the results of experiments carried out from time to time on my own aerial system.

When broadcasting commenced in this country I, among many others, was of the opinion that a good large aerial was a *sine quâ non* if loud signals were to be obtained, and so a large single-wire aerial, about 30 feet high and 70 feet long, was erected. The height, I admit, was not a particularly striking feature of the aerial, but I was quite pleased that I was able to erect the full P. M. G. length (100 feet) without difficulties due to cramped space, and I looked forward to great results from that aerial. Some weeks passed and, following the first London station, one or two of the provincial stations were erected, and I came to the conclusion that, though the results from "the local" were not at all bad, I was not getting all I should out of the more distant transmissions.



A well made "[illegible]" which was erected for general purposes.

Several "Earths."

For some time I experimented with the receiver, adding H.F. stages, altering tuning coils, etc., but though I succeeded in improving the results I could not but help feeling that still something was missing. So I decided to turn my attention to the earth—a water-pipe connection.

To cut a long story short, several "earths" were tried—water-pipes, gas-pipes, buried plates, and later, earth pins, until I eventually decided to keep to the buried plate and earth pin combined. Increased stability in the tuning of the set was a direct result of my energies, but the actual signal strength was not noticeably increased.

I then tackled the problem that I should have turned my attention to before. I took down the aerial and put up another, ten feet higher and therefore ten feet shorter. Reception was decidedly better, but now that I was on the trail of the trouble, so to speak, I decided to leave the receiver alone for the time being, and to devote my attention solely to the aerial.

Now, though this article so far has been devoted to the DX side of reception. I do not want readers to imagine that I am going to neglect the more general side and leave the local station out of the question. I merely wish to show how important a link in the chain is the aerial, and we shall consider reception from the local station in the same way as that from more distant centres.

Improving DX Results.

So far I had been satisfied with the strength of signals from 2 L O—my local station—and I began to devote my attention to improving my conditions for the reception of the other B.B.C. transmissions.

I took down the aerial from the pole at the end of the garden, and stretched a wire from the pole (40 feet high) to the top of a tree (about 55 feet high), and from this wire I took the aerial to the house. This gave an aerial of about 60 feet in length and about 45 feet high at the top end, with no horizontal portion, the whole being at an angle of about 50° with the earth.

DX results improved considerably, but I noticed a slight decrease in the signals from the local station. This was a little unexpected, and so I tried a different type of aerial altogether. I obtained four wooden

Two aerials on one mast are to be avoided if DX results are desired.

hoops, enamelled them to prevent the weather from causing them to warp, and made a 50-foot "sausage," or cage, aerial. This was slung between the tree and the house, and certainly had the effect of increasing signals from the local station to a degree not experienced before, but the aerial proved itself a little too unselective for DX reception unless a lively circuit was used.

(*Continued on page* 1052.)

RECEPTION CONDITIONS.

(*Continued from page* 1031.)

For short-wave work the cage aerial has given and is giving excellent results, while I still use it for loud-speaker reception of the local station; but for long-range telephony it has proved inferior to other types that have been tried.

A double aerial gave no better results, and the writer decided that for the best results a special DX aerial should be erected, and this brings the state of affairs up to date. The special DX aerial has, as yet, not been erected, though the form it will take has been decided upon, based on the results of previous experiments. It will consist of a "T" aerial as high as possible—probably between forty and fifty feet—with small horizontal portions and a long lead-in vertically down to the wireless "den." A single wire will be used, and the horizontal portions will not exceed twenty feet either side of the down lead, which, of course, will be taken from the centre.

Making the best of cramped quarters. The aerial cannot come direct to the set and is kept away from the building by insulated supports.

It is not always possible, however, for listeners to erect special aerials for each separate section of their activities, though this would be the ideal state of affairs; and if one aerial is to compromise and do all the work, then the design must be modified to incorporate as many of the good features and as few of the bad qualities of the various types of aerials available. In this respect I would advise those who wish for their local station *only* to erect an aerial on the large size, such as the cage aerial referred to above, or a twin-wire L aerial, keeping the lead-in end toward the station required.

Insulation and Earth Efficiency.

If DX work only is to be indulged in, then a high aerial with short horizontal portion will probably be found to be the best, a T aerial being preferable.

Most amateurs, however, will wish to combine the two, and so a compromise will have to be made. In this case the aerial should be as high as possible, and should have a horizontal portion about one and a half times as long as the down lead. For instance, if the down lead is 30-35 feet, the horizontal portion can be 45-50 feet long. A longer horizontal will render the aerial too directional (if of the L type) for DX work, and in the event of stormy weather a swaying aerial with fairly long flat section makes tuning-in distant stations extremely difficult.

If one cannot get height, the extra "length" of wire must not be made up by placing it in the horizontal portion. An aerial 20 feet high, and having a 20-feet lead-in, therefore, should not have a flat part of more than 30-35 feet if DX work is to be undertaken. When compromising with aerials one has to compromise on results, and as the local station is the easiest to increase in strength the compromise should be in favour of the DX side of the question.

In any case, all the aerials should be accompanied by the best earth obtainable in the circumstances, should be as unshielded as possible, and should be well insulated. Personally, I use several (four or five) insulators at each end if I use the china type, or two "Winsulators" at each end if the self-cleaning and more preferable kind are employed. In the vertical cage aerial shown on the previous page, two "Winsulators" are used to keep the aerial insulated from the wire support at the top, a very useful method, as it is extremely undesirable that the aerial be lowered every now and then for the insulators to be cleaned.

In a further article I hope to discuss the various types of sets best suited for both DX, local, or "mixed" (DX and local) reception.

An American design of loud speaker which acts as an electric lamp as well.

FOREIGN RADIO NEWS.

FROM OUR OWN CORRESPONDENT.

Changes in Northern Stations.

VARIOUS alterations are intimated in Norwegian and Esthonian stations. At Notodden and Skien (Norway) relay stations, working with 50 and 100 watts respectively, have got going. The Bergen station is nearing completion.

Riga has decided to alter its wave-length to 488 metres. The new Reval station, Esthonia's ewe lamb, has been getting into difficulties, although (or perhaps because) it only attempted to broadcast twice a week. The station has now been taken over by a new concern, the Raadio-Ringhaaling, which is going to open up next week a regular daily broadcasting on a 350-metres wave-length.

The Northernmost Station.

Canada protests against the statement that Longyear-City, on the island of Spitzbergen, is the northernmost radio station in the world, and claims that honour for a Canadian owned station at Aklavik, which is only some seventy miles from the Polar pack-ice ring. This station, it is stated, has been repeatedly heard with great distinctness as much as 2,000 miles away.

Spanish Station alters Wave-length.

The recently inaugurated station Castillo-Radio, has, it is announced, altered its wave-length to 304 metres. Radio-Cadiz has adopted 360 metres, and Bilbao station 383 metres; this last extends its daily programme till midnight.

The Wave-length Muddle.

On the Continent broadcasting stations are springing up like mushrooms in the night. The wave-length bands are being overcrowded so that two or three stations sometimes operate on wave-lengths separated from each other by only a few metres, with the direct result that very bad interference between the stations is prevalent.

To combat this growing evil, the International Radiophone Bureau was started some time ago with headquarters at Geneva, with results with which most readers are now more or less familiar.

New Broadcasting Conference.

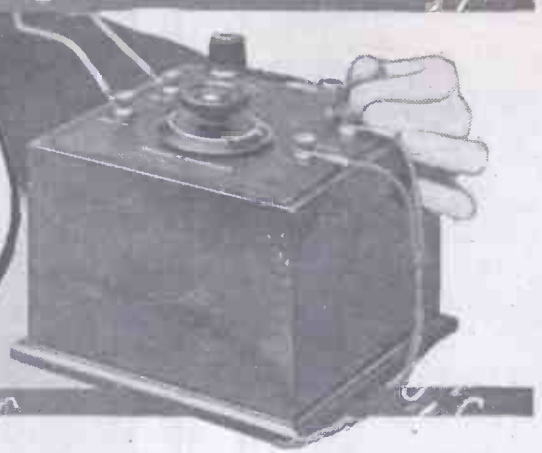
A new international Broadcasting Conference opened at Brussels to consider once again this question of overcrowded broadcast wave-bands. It is interesting and hopeful to note that another question under consideration is the limitation of broadcasting stations in Europe. The conference has already decided to carry out further systematic experiments in order to determine how to reduce interference.

Czecho-Slovakian Developments.

The Bruenn station has reduced its wave-length to 311 metres, and Prague, which has received a new installation, has been given 530 metres.

The previous Prague station has been moved to Bratislav, and will work on a 409 length. The two new Czecho-Slovak stations now building are going to work on 246 and 237 metres. These new lengths are all consequent on the deliberations of the Geneva conference.

A MAIN STATIONS AND 5XX ULTRA



The Set Designed and Described by
K. D. ROGERS and P. R. BIRD
(Assistant Technical Editors).
Constructional Work by
G. V. COLLE and C. A. MEADOWS
(Technical Staff, "P.W.").

THIS crystal set has been designed on the well-known Ultra principle, which was first described to readers of "P.W." in 1924. Since then the system has attained an enormous popularity, and thousands of readers have testified to the efficiency of the method.

For the benefit of new readers it may be advisable to say that the keynote of the success of the Ultra circuits is due to a balanced action between the aerial and secondary circuits. In most coupling systems energy from the aerial is transferred into the secondary circuit at any convenient point of the latter. In the Ultra receiver the energy is introduced at the exact centre of the secondary coil, and the effect is to increase signal strength and also the selectivity of the circuit.

The Lay-out.

As will be seen from the photographs on this page, this instrument is very compact, and it is easily handled. In addition to the variable condenser, which controls the tuning, and the crystal adjustment, there is a switch which enables the receiver to be used for long or short waves. In one position a loading coil for Daventry is automatically cut out of circuit, whilst in the other position it is introduced into the aerial and secondary circuits. Tuning, of course, is carried out by means of the variable condenser in both instances.

LIST OF COMPONENTS.

	s.	d.
1 Panel, 6 in. x 6 in. x ¼ in., with box 5 in. deep	5	0
1 Polar cam-vernier ·0005 variable condenser	11	6
1 Polar crystal detector	3	6
1 Bretwood series-parallel switch	5	0
4 Spider-web formers	1	4
½ lb. 26 S.W.G. D.C.C. wire	1	2
4 W.O. terminals	0	6
Wire, transfers, etc.	1	0

Looking now at the photograph showing the underside of the panel it will be seen that coils of the ordinary spider-web type are employed. The large coil which is supported by the variable condenser is really two separate coils joined in series and placed side by side to give the requisite number of turns. Each of these larger coils is wound with 75 turns, thus giving a total of 150 turns for the loading coil, which is thrown into circuit when receiving 5 X X.

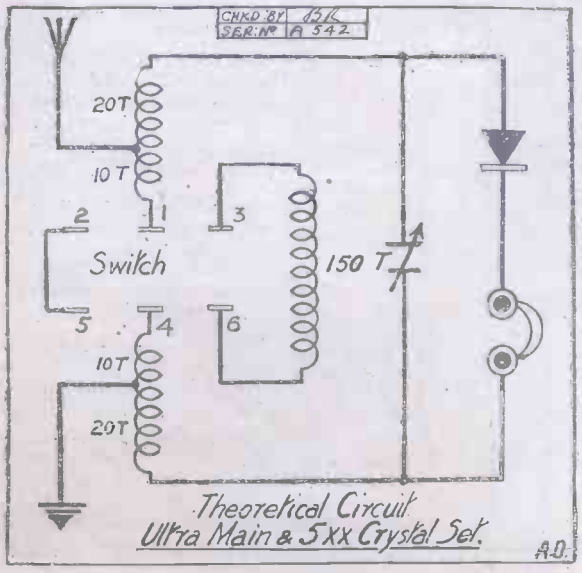
On either side of the large coil, and situated at the sides of the panel, are the two small coils which constitute the inductance for the shorter waves. These coils consist of 30 turns each and when the switch is in the "Local Station" position they are connected in series, thus forming a 60-turn coil. The arrangement will be the more easily understood if reference is made to the theoretical diagram which appears at the foot of the page.

Insertion of the Loading Coil.

It will be seen that when receiving the local station the aerial and earth are joined to the middle 20 turns of the 60-turn coil, and when receiving 5 X X this portion of the coil is divided at the centre and the 150-turn loading coil is inserted there.

For the shorter waves the tuning condenser (with the 'phones and crystal connected in series across it) is connected across the whole of the 60-turn coil, and for the longer waves it is connected across both the small and large coils, the latter being placed in circuit at the 30/31st turn of the smaller coil. (For the purpose of this

(Continued on page 1054.)



The theoretical diagram on the left shows how the switch is connected. It should be compared with the photograph on the following page, which illustrates the actual connecting wires.

On the right is shown the complete set ready for connecting up. The compact nature of the receiver is readily seen from this illustration.

A MAIN STATIONS AND 5 X X ULTRA

(*Continued from page* 1053.)

explanation the two 30-turn coils are referred to as the "smaller coil," as in effect they are only the two halves of one complete coil.)

Construction is commenced by winding the spider-web coils, four of which will be needed. Two of these are simply untapped 75-turn coils, the diameter of which must not measure more than about 4¼ in. if a case of the dimensions shown is used. If the centre diameter of the coil measures 1 in. across it is an easy matter to wind on 75 turns in this space.

The Tuning Coils.

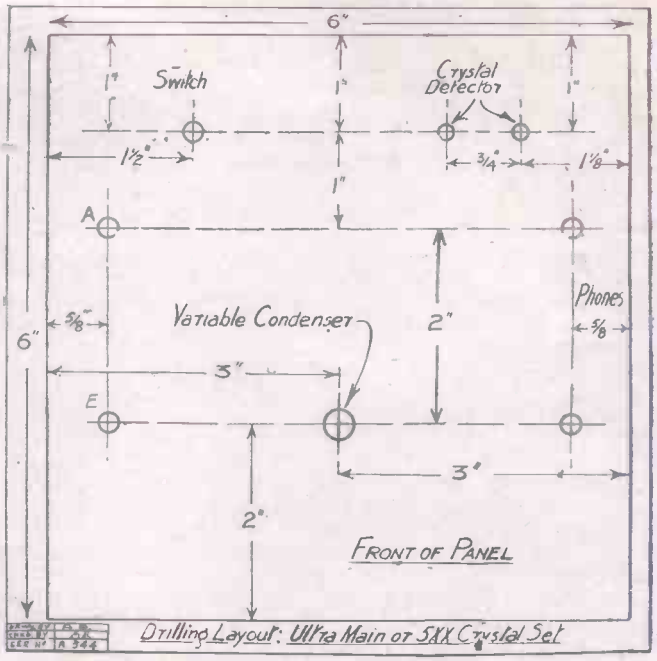
No. 26 D.C.C. wire was used for these coils, and there would have been room in the case for coils made with 24-gauge wire. It is very doubtful if the improvement effected by the use of 24 instead of No. 26 gauge would be noticeable, and no doubt most readers will prefer to use No. 26 wire throughout, in view of the fact that a ¼ lb. of this wire is sufficient to wind all the coils.

The drilling of the panel is then carried out in accordance with the panel drilling diagram which is given on this page. The switch, crystal detector, variable condenser, and terminals are then mounted. The method of fixing the coils in place can be seen from the photographs, the two large coils being joined in series and placed side by side. They are secured to the ebonite end plate of the condenser by a 4 B.A. screw which is tapped into it, or by any other method which suggests itself as being more convenient.

The two 30-turn coils are supported by one segment of the spider-web former. This is bent at right angles to the face of the coil and one of these segments is fixed on to the aerial terminal and the other one on to the upper telephone terminal at the opposite side of the panel. The remaining segments are cut off close to the coil winding, as shown.

In order to facilitate wiring it is important that the Bretwood switch should be mounted as shown in the diagram, with contacts Nos. 1 and 6 nearest to the edge of the panel. The arrangement is clearly shown by the photograph on this page. The connections should of course preferably be soldered but if not great care must be taken to ensure that the contact made is as near perfection as possible.

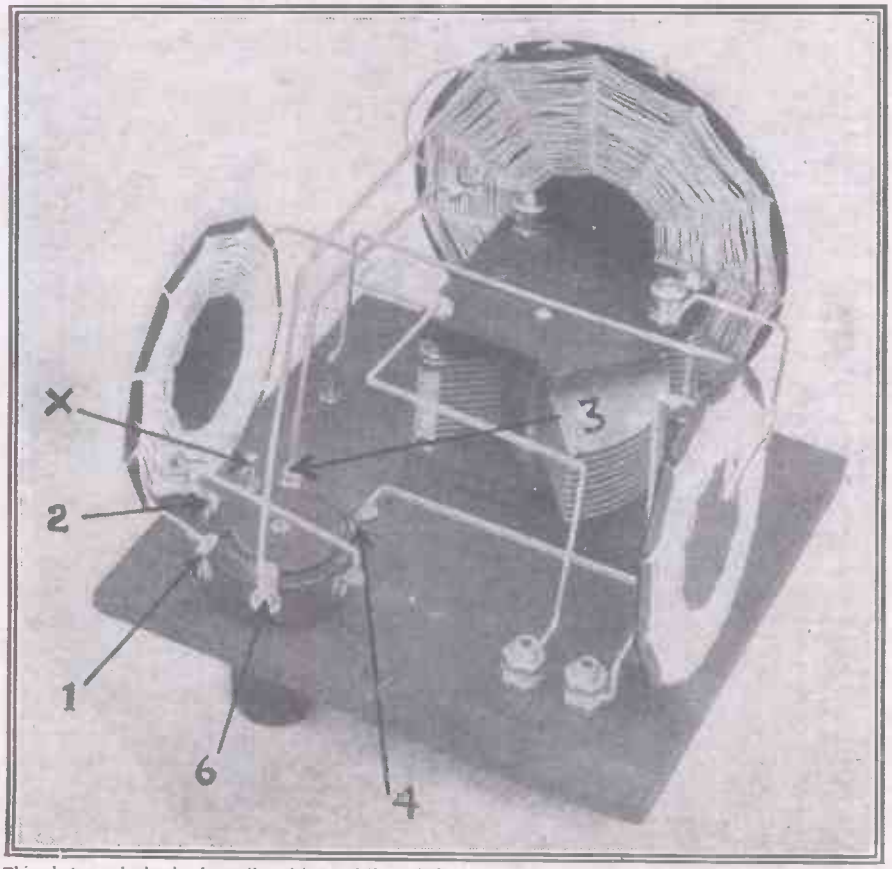
Wiring is carried out as shown in the wiring diagram which is given on page 1053. It is very important that the two 75-turn coils should be wound in the same direction.



The coils should be placed flat against one another, with the winding. Otherwise, the two coils will tend to oppose one another instead of combining together to form in effect one 150-turn coil.

Alternative Components.

It is very important in all crystal sets that the panel should be kept perfectly clean and free from flux, dust, etc. When the wiring has been completed as shown in the photographs and wiring diagram it should be checked over by the point-to-point connection referred to below. The receiver is then complete and its operation is so simple and effective that nothing may need be said upon this head. The crystal detector used (Polar) gave very good results on test, but any other well-made crystal detector could be used instead if desired. The more experienced constructor will note that the Bretwood switch performs the same functions as an ordinary D.P.D.T switch, so this type could be used instead; its connections being as shown in the theoretical diagram.



This photograph clearly shows the wiring and the switch connections. 1, 2, 3, etc. correspond with the numbers on the soldering tags of the switch. X shows how the coil is connected to the aerial terminal.

POINT-TO-POINT CONNECTIONS OF THE "P.W." ULTRA MAIN STATIONS AND 5 X X CRYSTAL SET

Aerial terminal to tap on left-hand 30-turn coil. (See accompanying photograph.)

Earth terminal to tap on right-hand 30-turn coil.

Inside connection of left-hand coil to fixed plates of condenser and one side of crystal detector. Inside connection of right-hand coil to further 'phone terminal and moving plates of condenser. Other side of crystal detector to remaining 'phone terminal.

Outside connection of left-hand coil to No. 1 contact of switch.

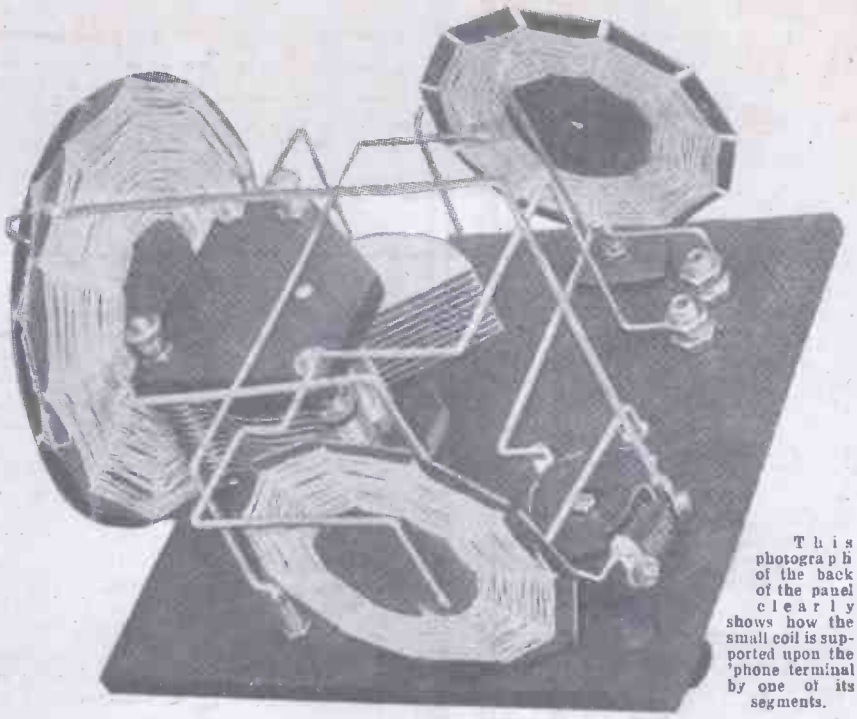
Outside connection of right-hand coil to No. 4 switch contact. Contacts 2 and 5 connected together. Contact No. 3 to inside of nearer 75-turn coil. No. 6 to outer connection of further 75-turn coil. The two remaining connections of the 75-turn coils should be joined together.

(*Continued on page* 1055.)

A MAIN STATIONS AND 5 X X ULTRA.

(*Continued from page* 1054.)

In all sets in which part of the tuning inductance is switched out of circuit upon certain wave-lengths, the spacing between the wiring and between the various coils is very important. Unless attention is paid to this detail it will invariably be found that, although the switch breaks the connection between, say, points 1 and 4 (see theoretical diagram on page 1053), and completes the circuit instead via point 3, the loading coil, and point 6, there is a tendency for the circuit to behave as though the loading coil were not included. Consequently, although the set would be tuned to 5 X X, it would, if the spacing were not adequate, be simultaneously tuned more or less to the short wave-lengths also.



This photograph of the back of the panel clearly shows how the small coil is supported upon the 'phone terminal by one of its segments.

Providing Selectivity.

In order to obviate this and to make the receiver as selective as it is possible for a crystal set to be, there must be adequate spacing between the coils or the wiring. The operation of the receiver in such a case is best understood by referring to the theoretical diagram shown on page 1053. Assuming that a small current is flowing in the aerial, and the switch is in the left-hand position, it will be seen that this current will flow down the aerial, through ten turns of the upper coil, across the switch contacts 2 and 5, through ten turns of the lower coil, and so to earth.

When Switching is Ineffective.

Such a current would set up a similar current in the secondary circuit, especially if this circuit were sharply tuned to the incoming signals. In this case, the oscillations in the secondary would be flowing in the circuit from, say, the top plate of the variable condenser, through the 30-turn coil across switch contacts 1, 2, and 5, 4, through the other 30-turn coil, and so back to the other side of the condenser.

This secondary circuit behaves exactly like a separated circuit, but it will be seen that actually the middle portions (ten turns each of the two basket coils) are common to both aerial and secondary circuits.

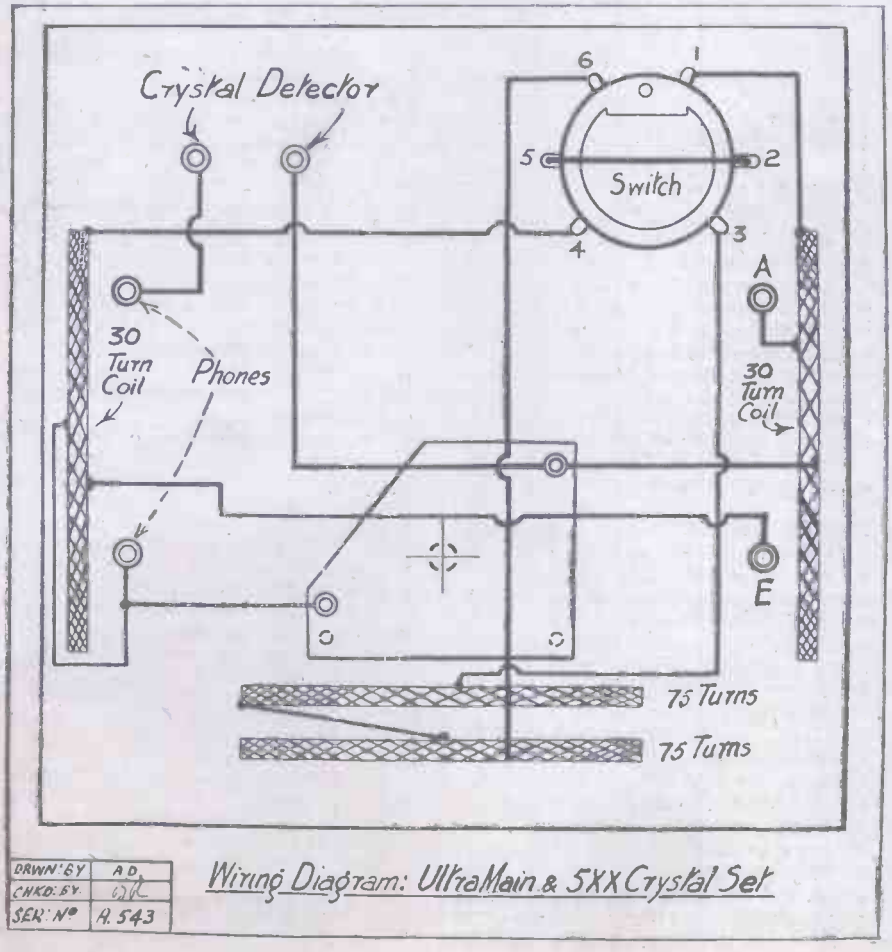
Similarly, if the circuit is effectively broken at points 1 and 4, and the switch is thrown over to the right, the 150-turn coil is included in the aerial circuit, and also in the secondary circuit. If, however, the spacing between points 1 and 4 is inadequate, there will still be a tendency for the circuit to oscillate at the lower wave-length.

Good Spacing Essential.

This is the more readily understood if it is realised that a small airspace is no obstacle to an oscillating current.

So, if there were only a small space between two long parallel wires leading to the points marked 1 and 4, it would in effect be another small condenser there, and the current would flow round through these two condensers quite readily.

Even if the switch were thrown to the right, and the loading coil joined mechanically via points 1, 3, and 6, 4, any badly spaced wiring at the points 1 and 4 would still provide a small condenser effect there, and therefore the short-wave tuning would still be present. It can easily be realised that if the local station's transmissions were flowing strongly in the aerial, they would tend to flow also in the secondary circuit; and if the small-condenser-effect existed between the points marked 1 and 4 the local stations' transmission would undoubtedly be heard in the 'phones, even though the set was really adjusted to receive 5 X X.



HENRY AINLEY ON BROADCASTING.

THE FUTURE FOR RADIO PLAYS.

AN INTERVIEW WITH A FAMOUS ACTOR-MANAGER.

By "ARIEL."

"I AM not a wireless fan!" were almost the first words that greeted me, when, after the second act of "Quinneys," I entered one of the cheerful dressing-rooms of the New Theatre and shook hands with Joe Quinney, dealer in antique furniture—better known, perhaps, as Henry Ainley.

"I like wireless as a science, but not as a hobby," said Mr. Ainley, refusing a cigarette, for his energetic career demands that he neither drinks nor smokes. "I was one of the first to welcome the advent of broadcasting from a theatrical point of view,"

Mr. Henry Ainley, the well-known actor.

he continued. "In my opinion the broadcasting of radio plays is beneficial to the theatre in some ways.

"But, frankly, I do not see how the broadcasting of *original* radio plays or playlets, specially written for broadcasting, helps the theatre. It certainly keeps the millions who listen-in aware of the existence of the theatre, but it does not help artistically or financially, as far as I can see."

Aid to the Theatre.

Mr. Ainley went on to say, however, that the broadcasting of excerpts of plays is a distinct aid to the theatre. He said he thought it was particularly helpful from the box-office angle, for he really believed that it was one of the most valuable advertising mediums a play or other entertainment could have.

"We are having a very cold winter," went on Mr. Ainley, "and I suppose ninety out of every hundred people prefer a comfortable armchair beside a fire to an expedition to a theatre.

"Most of the evening is spent listening-in, and an excerpt from a well-known play with a well-known cast is looked forward to by the public. And where it brings profit to the theatre is at the matinée performances.

"Those who believe in the fireside, a book, a pipe, and the gifts of the ether, will need a lot of cajoling away from their restful evenings. But they will willingly go to the matinée performances and enjoy the play or the 'show' in its entirety."

In Mr. Ainley's opinion the legitimate play does not offer the same advantages for broadcasting as do musical plays, operas, and revues.

"But I do not think that the play loses anything by it," he said. "Humorous plays, however, are more suitable for broadcasting than dramas, for the people who will enjoy the humour of the lines and the amusing situations, comfortably ensconced in the stalls, will appreciate it just as much a hundred miles away.

"Musical plays, however, have that distinct advantage of charming their huge, unseen audience, not only by word but by musical accompaniment."

"What is the drawback then, in broadcasting plays?" I asked Mr. Ainley.

"Well, plays have to rely solely on their good lines and the dramatic power of those acting in the piece. If there is a lack of plot and if good lines occur only now and again, it is hopeless. Whereas, in a musical play the music alone 'gets over' and is always a delight to listen to."

As is well known to POPULAR WIRELESS readers, Mr. Ainley has broadcast several times. Consequently he realises how difficult it can be to "put over" a play on the wireless. There are so many actors and actresses whose voices do not broadcast well.

Belief in Broadcasting.

Mr. Ainley also believes that broadcasting aids the popularity of the actor. For the artiste who can be heard from the fireside is far more popular than the one whom the average man or woman has to travel from Suburbia, sometimes as much as fifteen miles, to see, and then discovers after the long train journey that he is playing with a nasty cold in the head. When he has a cold he doesn't broadcast, which is somewhat of a relief!

"I would like to see more plays broadcast," said Mr. Ainley in conclusion. "While the individual result to a theatre, although extremely beneficial, is not overwhelming, the collective result is extremely good.

"I am all in favour of the broadcasting of radio plays. There is a great future here, and one that should be thoroughly exploited."

CHOICE AND CARE OF ACCUMULATORS.

ACCUMULATORS form a fairly expensive item in the cost of a valve receiver, but it is false economy to purchase cheap makes, which usually have very coarse plate grids, allowing all the paste to drop out after a short life. The best makes of accumulators, with the reputation of an established firm of battery experts behind them, are undoubtedly cheapest in the end. Choose cells with thick plates, and make sure that ample sludge space is allowed below the plates.

Important Considerations.

Preferably choose a battery in which each 2-volt cell is enclosed in a separate case. Accumulator plates are liable to swell slightly in the course of their life, and, if the cells are only separated by septa cemented into the main case, this swelling may break the joint and cause an internal short circuit which will shorten the life of the accumulator considerably. Glass or celluloid cases are preferable to ebonite, since it is easier to keep an eye on the condition of the plates. If you are wise you will purchase one of the excellent rubber accumulator trays now made, and stand your accumulator in it; the cost is slight, and this precaution will prevent any risk of damage to carpets, tablecloths, etc.

When you have purchased your cell, take care of it, and see that it is regularly charged, even when not in use. It is wise to have your cell re-charged at least once a month, whether used or not, to keep the plate surfaces active. Watch carefully for any signs of white deposit (sulphating) on the plates, and if this should appear, have the cell charged immediately with a long charge to work off the deposit.

Cells should be cleaned out at intervals to remove the sludge below the plates, as if this is allowed to remain it will eventually short-circuit the cell.

If the acid level falls below the top edges of the plates, it should be restored by the addition of distilled water. Never use ordinary tap water.

The "Safety Limit."

Never allow your accumulator to discharge below 1·8 volts per cell, this voltage being tested with the load on (i.e. with valves alight).

Certain types of valves are made for use with dry batteries, but it is far more satisfactory to use accumulators for L.T. supply if possible. In fact, it can be said that dry batteries are not suitable for running any valves except the ·06 amp. class, and even with these should not be used if more than two or three valves are being run.

THE SEAPLANE'S S.O.S.

Great Difficulties to be Overcome.

By G. H. DALY.

WHEN reading an account of the recent accident to the American seaplane PN9 No. 1—on her flight from San Francisco to Hawaii—many people will doubtless have been puzzled by the statement that the crew of the seaplane, which was forced to descend on to the Pacific owing to the failure of the petrol supply, had the tantalising experience of hearing wireless messages about themselves on their wireless receiver without being able to answer them because their transmitting aerial was submerged. It will be remembered that the crew of the seaplane were finally picked up by a submarine after being adrift for nine days and starving for four.

This inability to use the wireless transmitter is, of course, due to the fact that the transmitting aerial used in all air services consists of a wire or wires hanging or trailing downwards from the aircraft for some hundreds of feet.

Using a Kite Aerial.

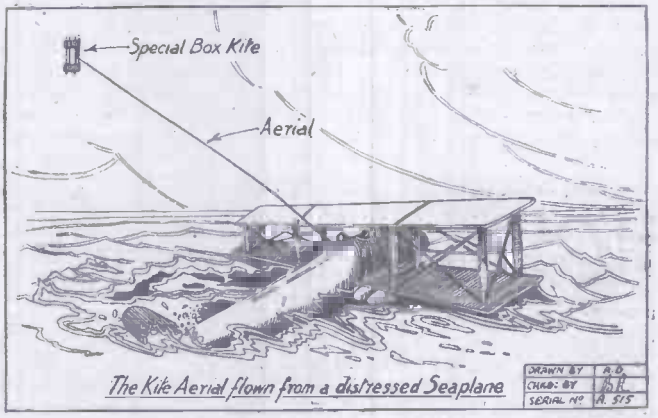
Consequently when the seaplane alights on the water the aerial is useless. Reception can still be carried on however by means of a small frame or temporary aerial provided the plane is fitted with a powerful valve receiver, which is invariably the case; but small frame aerials are useless for transmitting purposes.

A forced descent on to the waters of the North Sea was a very common experience in the Royal Naval Air Service during the Great War, and the drawback of the trailing aerial after a forced landing was very quickly discovered. After a series of experiments in 1915–16, in which the writer took part, this drawback was eventually overcome by two alternative methods.

The first method was to equip the seaplane with a special kite, and when forced to descend a spare aerial was hitched to the kite, and the kite was flown to the required height. This sounds delightfully easy, but endeavouring to fly a large kite from a seaplane in a choppy sea on a cold day—to say nothing of a slight seasick feeling which was often present—is anything but an easy matter. However, it could be managed, and a little patience and skill often meant the difference between a watery grave and a comfortable bunk that night.

The second method was to fit the seaplane with a telescopic mast. This mast consisted of a number of steel sections each about 5 feet in length, which, when not in use, slipped into each other like the sections of a telescope. When fully elongated the mast was about twenty feet in length, and the aerial was stretched from the top of the mast to the tail strut of the seaplane.

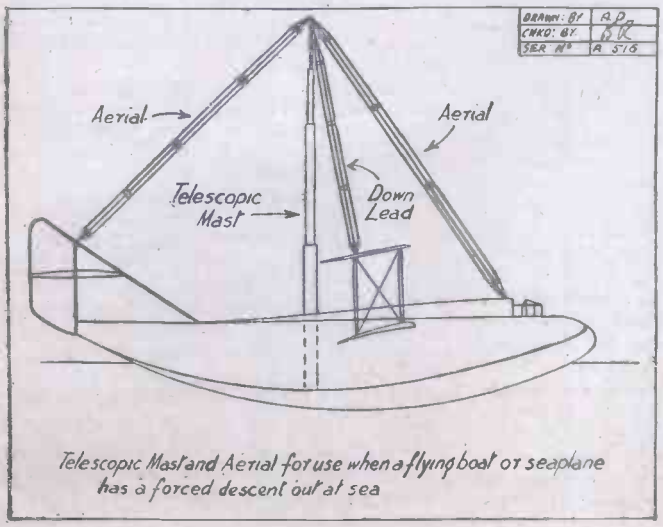
Although not so efficient as the kite aerial the telescopic mast was more reliable, and transmission from a seaplane on the water was effected over a considerable distance by this means. The most efficient arrangement was to equip the seaplane with both mast and kite, and it is difficult to understand why the American seaplane PN9 No. 1 was not equipped in this way.



The Kite Aerial flown from a distressed Seaplane

Many Difficulties.

Another difficulty in the wireless system on a seaplane when the latter has a forced descent is the fact that the power for the wireless transmitter is derived from a windmill generator, the armature of which is driven by a small wind propeller. When, for instance, the seaplane is in flight, the passage of the plane through the air rotates the small propeller at high speed; but, should the seaplane be stationary, this type of generator is obviously useless. Thus in a forced descent there is no power for the set, apart from aerial troubles.



Telescopic Mast and Aerial for use when a flying boat or seaplane has a forced descent out at sea

Every seaplane, like every ship, should be compelled by law to carry an emergency set which may obtain power either from batteries, hand-driven generator, or a small petrol motor generator. However, it is necessary to experience a forced "landing" far out at sea to realise the great difficulties to be overcome.

The kite won't rise, or, having risen a few feet, is smashed down on the water by a sudden gust of wind. The sections of the telescopic mast have a habit of jamming when urgently wanted, or perhaps a big wave carries the whole lot overboard, while all the time the frail seaplane is being mercilessly broken up by the wind and sea.

But most heartbreaking of all is to watch the masts and funnels of ships passing on the horizon, and, although you can see them they cannot see you—a small white spot on the watery waste, and so they pass on unheeding, and your heart sinks again—and so on.

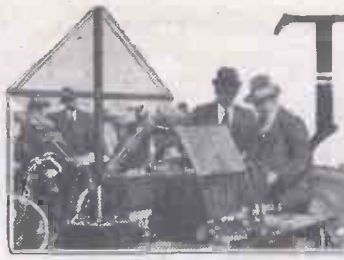
Maybe you are lucky and the kite goes up one, two, perhaps three hundred feet, and you crouch in the little wireless cockpit endeavouring to send out the S.O.S. and your position (in code) with steady fingers. Is there anyone near enough to hear you—a few minutes delay—perhaps half an hour, or an hour, and then comes the answer. And presently a ship heaves in sight—a plucky little trawler it usually was in those days, and your troubles were over—until the next time.

TO IMPROVE AN OUTSIDE EARTH.

WHEN the earth of a wireless set consists of a tube or a series of rods driven into the ground, the efficiency of the arrangement depends upon the conducting powers of the soil surrounding the tube. An improvement in conductivity can usually be obtained if a strong solution of common salt, about 1 lb. to a gallon of water, be prepared and the soil in the vicinity of the tube saturated with this.

It is interesting to note the reason. Dry earth is a very poor conductor of electricity, but moist soil is tolerably good because the water present dissolves out some of the mineral salts to form a conducting solution known as an electrolyte. Whereas absolutely pure water is an insulator, and weak solutions are fairly good conductors, when dissolved salts are present in larger quantities the conductivity of the electrolyte increases to a marked degree.

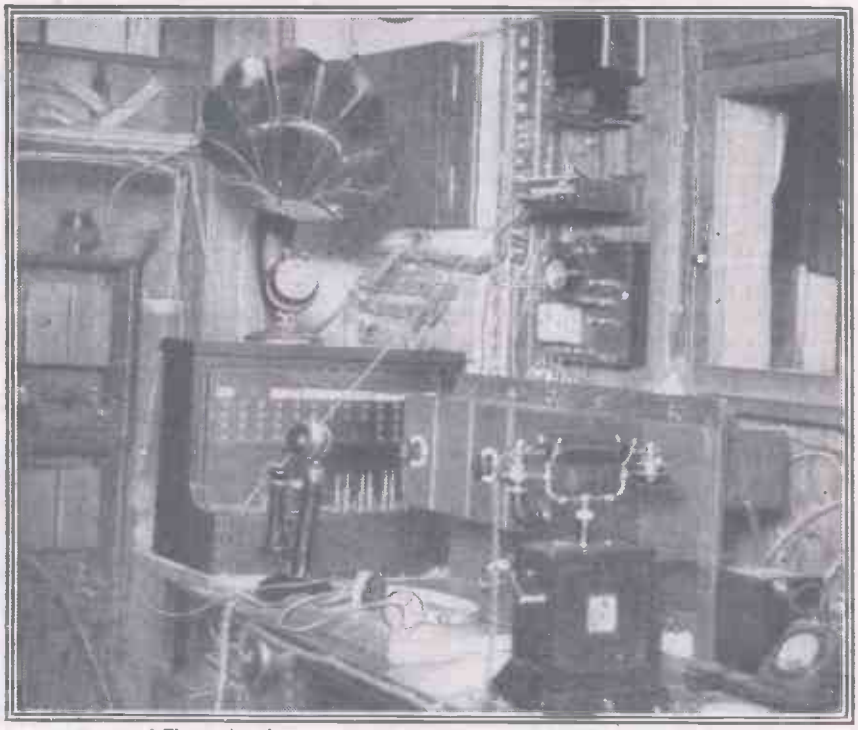
Hence if the soil is given the treatment recommended and, in dry weather, an occasional bucket of water given to keep the soil moist, then the earth can be relied upon to remain efficient.



Technical Notes

Conducted by our Staff Consultant, J. H. T. ROBERTS, D.Sc., F.Inst.P.

A CONSIDERABLE variety of devices have from time to time been brought forward for the purpose of eliminating the microphonic noises produced by the jarring of a valve in a receiving set. Most of those devices, or at any rate, most of those which have found their way on to the market, consist of the so-called "anti-microphonic" holders, in which the valve is mounted in a holder which is itself, in turn, supported upon springs or resilient members. I noticed lately in one of the American papers, however, a description of a somewhat novel type of anti-microphonic holder which did not depend upon the principal usually adopted. Instead of the springs below the valve, three side springs were provided, these consisting of strips of springy steel, the lower end being secured to the valve holder, and the upper end being free. At the upper end of each strip was attached a rubber pad, which pressed against the glass bulb of the valve. At first sight, assuming the valve was mounted in an ordinarily rigid holder, it would seem surprising that these side springs should overcome the microphonic effects, but according to the description referred to, the device worked very satisfactorily.



The engineer's control room at the Newcastle broadcasting station.

Easily Tried Out.

It should be a simple matter for the experimenter to try this out. The three springs may be made from a strip of watch or clock spring, and the small rubber pads may be inserted between the upper end of the spring and the glass; they need not, for the purposes of a first trial, be permanently attached to the spring. The lower end of each strip will need to be secured to the valve-holder, or alternatively, to the baseboard or experimental panel. As conditions vary so much, no suggestions can be offered here which will suit all cases, but it should be easy enough to try the idea out.

A Variable Condenser Hint.

When mounting a variable condenser, of the one-hole-mounting variety, you will often find that unless the lock-nuts are pulled up very tightly, there is a tendency for the condenser, as a whole, to shift in use, whilst if the lock-nuts are too tight, the rotor becomes stiff to turn. A correspondent sends me a suggestion, of a very simple nature, by which this trouble may be overcome. He recommends that a small piece of rubber sheet (it need not be circular—it may be of any shape), be inserted between the top plate of the condenser and the panel. This sheet should preferably extend close to the shaft of the condenser, as otherwise there may be a tendency, when tightening up, to bend the top insulating plate. The rubber sheet has the effect of increasing the friction between the condenser top-plate and the panel to such an extent that the tendency to rotation is overcome. In lieu of rubber, a piece of thick paper or thin cardboard may be used, preferably coated over with shellac. The same simple device may be adopted in the case of other one-hole components—rheostats, for instance.

Colloid Rectifiers.

Since I mentioned the colloid rectifier in these Notes recently, I have had a large number of inquiries from readers, anxious for fuller particulars with regard to this type of rectifier. For their information, I would say that a full account is given in the French radio journal "Radio Revue," for October, 1925. The original account, of course, was read to the French Academie des Sciences, by Ferrie and Andre. A number of metals were tried, including copper, nickel, copper-nickel alloy, soft iron, silicon iron, etc. However, if a sufficient number of readers are anxious for particulars, I will give a fuller account in a future issue of this journal.

An Interesting System.

A demonstration was recently given before the U.S. Navy Department officials, of a system, invented by J. H. Hammond, by which as many as eight messages may be sent simultaneously on a ten-metre wave-length from one valve, these messages being also received on a single instrument. A short-wave carrier of 30,000,000 vibrations per second (10 metres wave-length) is sent out and a number of "modulatory waves" are impressed upon this, the frequencies of the latter being from about 27,000 per second upwards, the modulatory waves producing periodic changes of intensity in the carrier-wave. The special receiver has one circuit which is sensitive to the carrier-wave, and separate circuits for the modulatory frequencies; the receiver is, in this way, able to separate out the different modulatory frequencies.

The system has the further advantage that the modulatory frequencies, being comparatively low and considerably separated, are difficult to tune in by anyone not already acquainted with their wave-length, and so a considerable degree of secrecy is assured with this system.

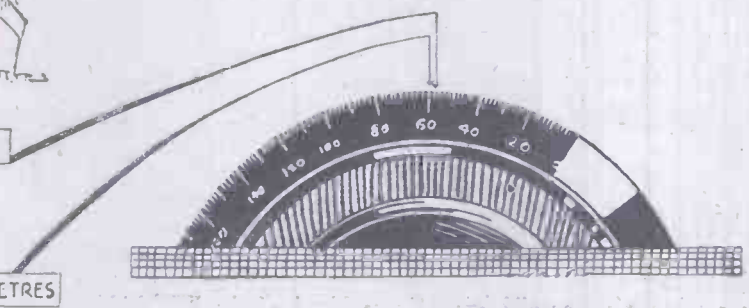
The Three Electrode Valve.

The basic patent for the three-electrode valve, which has been the subject of probably more litigation than any other patent in the history of the United States Patent Office, has just now been finally granted to the General Electric Co. of America and Dr. Langmuir. The main characteristic which distinguishes Dr. Langmuir's invention is that he was the first to realise that a "hard" valve, from which all gases had been carefully removed, was much simpler to operate and altogether more reliable and generally useful than one in which even a trace of residual gas remained. Previously, the vacuum tube, or "valve," was erratic in its behaviour, and although in many cases extremely sensitive as a detector, it could not conveniently be used with high plate voltages, owing to the liability to ionisation discharges and many consequent complications. Langmuir realised that all these troubles and peculiarities were due to the residual gas, and that if he could produce a valve practically free from gas, relying for

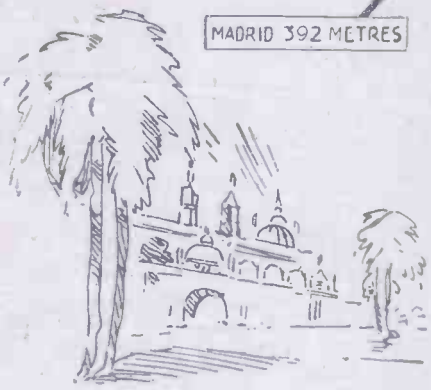
(Continued on page 1088.)

Easy Tuning of Elusive Stations

HAMBURG 395 METRES



MADRID 392 METRES



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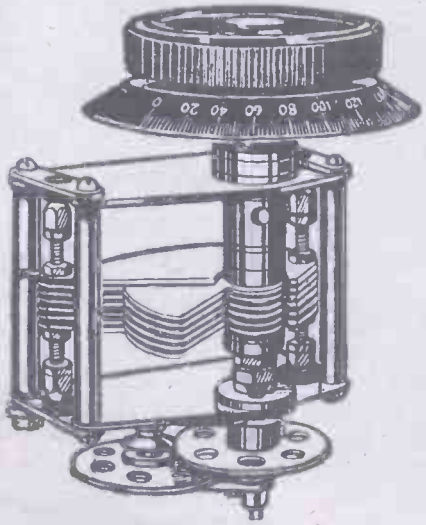

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THE UNIT COIL.

A NEW SYSTEM OF CONSTRUCTION.

BY A CORRESPONDENT.

SHORT-WAVE transmission and reception have had the effect of directing the attention to superlative quality in components, both those purchased and home constructed. Certain radio components are impossible to construct without suitable plant, tools and skilled labour; but coils as nearly approaching the ideal as any can be constructed with moderate skill and few tools. Usually for short-wave reception one coil is designed for one particular wave-band and is useless for any other. This, in order to cover the whole wave-band, involves the construction of many coils. An alternative method of construction in order to extend the wave-range of a coil is to tap it at suitable intervals. This, however, is open to serious criticism, for a tapped coil is accompanied by unduly large losses, due to eddy currents introduced into the "dead end." Although adaptations have been designed to lower these losses, they all suffer from eddy current losses more or less seriously. The most efficient modification is the one where several separate coils are linked together to form a coil of the required inductance, the unused coils being electrically disconnected but in close juxtaposition to the coils in use, thus causing a certain amount of loss.

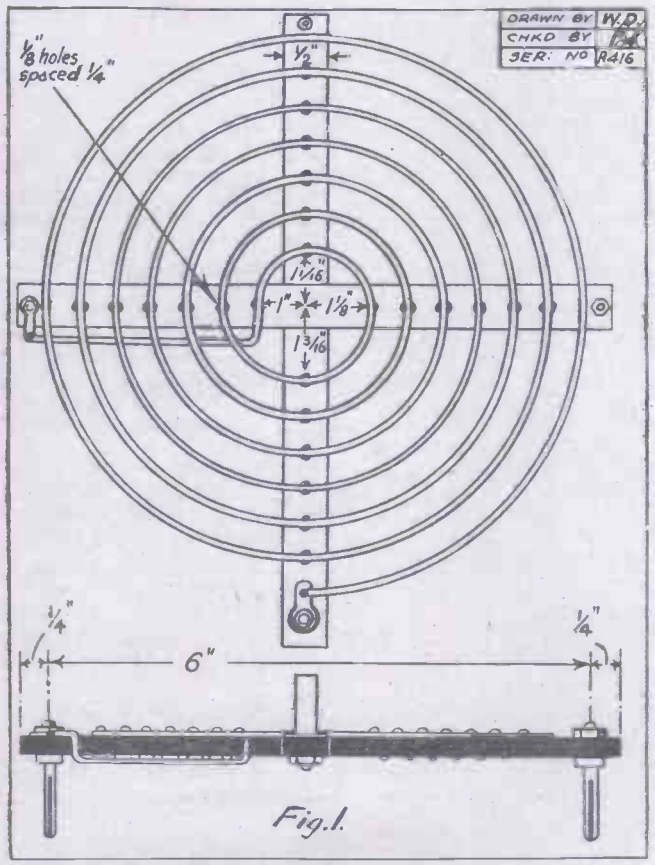

Fig. 1.

The writer has carried this idea a step farther, and designed a coil system which, although it can be used at varying inductance, has the advantage that the unused coils can be removed from the immediate vicinity of those in use. In short, the system consists of a number of small or "unit" coils any number of which can be fitted together to form a coil of the required inductance.

High Efficiency.

The only reason why the coil should not be equivalent in efficiency to its counterpart constructed with one unbroken length of conductor, is the presence of any added H.F. skin resistance which might be caused by the pins and sockets used for connecting the "unit" coils. However, the writer has found no loss in efficiency when the pins and sockets have been well cleaned and fit tightly.

The coil former is very simple, and consists of two pieces of $\frac{1}{4}$ in. thick ebonite $6\frac{1}{2}$ in. long and $\frac{1}{2}$ in. wide. These are joined together in the form of a cross by means of a halving joint made across the $\frac{1}{2}$ in. width; the joint must fit tight enough to obviate the use of a fastening screw, since a metal object in this position would cause serious losses. Four $\frac{1}{8}$ in. holes are drilled $\frac{1}{4}$ in. from each extremity to take the pins and sockets; a further row of seven $\frac{1}{8}$ in. holes are required in each arm. As will be noticed from Fig. 1, the distance of the first hole in each row from the centre of the former increases by steps of $\frac{1}{16}$ in. in the direction of rotation; this allows the coil to take the form of a true spiral. Two valve pins are mounted in one strip, and two sockets are mounted in the other, but on the opposite side.

The wire to be used for the coil is 14 gauge bare copper. This is wound on a shaper, after removing the kinks by drawing round a hammer handle. The shaper consists of a metal disc $1\frac{1}{2}$ in. in diameter by $\frac{1}{8}$ in. thick, with two larger discs about 3 in. in diameter screwed one each side of the small disc by means of a centre bolt. A $\frac{1}{4}$ in. hole is drilled $\frac{3}{4}$ in. from the centre, through which one end of the coil is bent to hold it in position. Nine turns are wound on the shaper, and on dissembling the coil will spring to an open spiral, which, if it is not of the required size—i.e. $\frac{1}{2}$ in. between the turns—must be gently unwound until the inside diameter is 2 in. and the outside about 5 in.

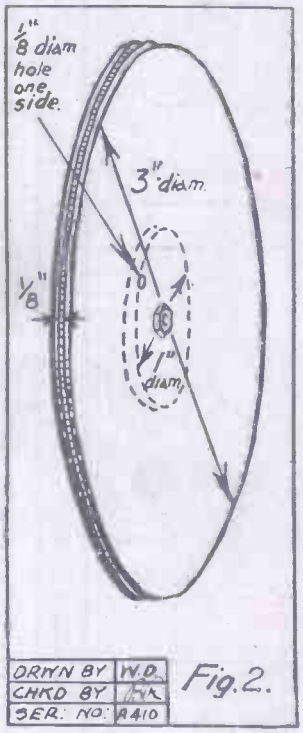

Fig. 2.

The spiral is laid on the socket side of the former and bound on with doubled thread or thin string, by passing it through the $\frac{1}{8}$ in. holes and over the wire. The doubled end is first attached to the inside wire with a hitch. The method of binding is clearly shown in Fig. 3. The remaining

(*Continued on page* 1062.)

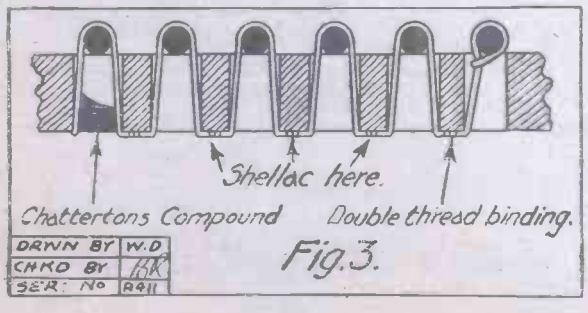

Fig. 3.

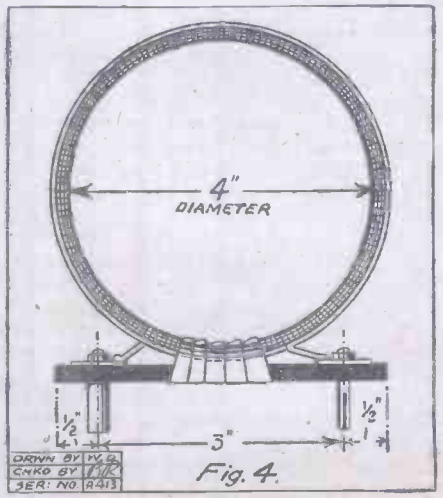

Fig. 4.

THE UNIT COIL.

A New System of Construction.

(*Continued from page* 1061).

ends are pulled tight, and fixed in position by some Chatterton's compound plugged in the last hole. After this operation a dab of thick shellac on the underside portions of the binding will hold the thread in position and also prevent any leakage due to moisture which may be absorbed by it.

This method of attaching the coil to the former has the advantage of reducing the self-capacity which is present when the coil is threaded on the former, a method necessitating small portions of the solid dielectric being between the turns. The method is not confined to this type of coil, and it can

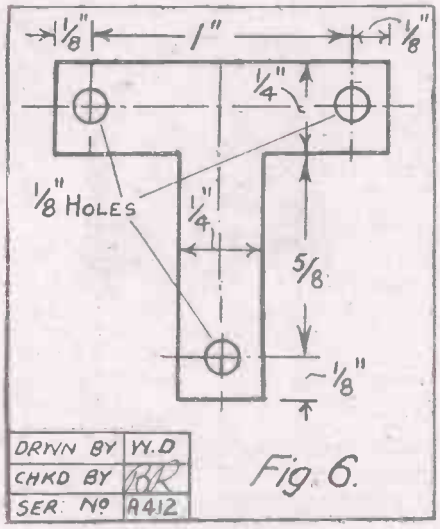

Fig. 6.

be used with advantage when constructing a cylindrical coil.

It will be noticed that there is provision on the former for seven turns of wire, but for ultra high frequencies this number is better reduced by removing the two inside turns.

The particular pin and socket to which the coil is connected by means of soldering tags is unimportant, but the same procedure is necessary with subsequent "units." However, it would be best in order to prevent confusion to follow the assembly shown in Fig. 1.

Broadcast Coils.

When necessary the coil can be mounted on the receiver panel by plugging into two sockets 6 in. apart, the connections being one socket and a pin attached to a short length of flex plugged into the connected socket of the last "unit." Intermediate connections for autoplex tuners or earth tapping for a Reinartz coil can be made by clipping on to the connecting sockets.

A coil of this type suitable for the broadcast wave-band would necessitate about six to eight "units," thus making a large and clumsy coil. Also it is quite possible that the number of pin and socket connections would have a bad effect, consequently a different type of "unit" has been devised, without, however, straying from the principle of the system.

In this case the "unit" shown in Fig. 4 is in the form of short cylindrical coils, mounted on a special pin and socket plug. The coil is formed by winding 15 turns of 20 gauge D.C.C. copper wire on a $\frac{7}{8}$ in. length of 4 in. diameter cardboard tube, which has been previously dried and treated with thin shellac. For the reception of 5 X X a loading coil of 100 turns must be provided in series with the above "units," or alternatively another set of units can be constructed with 26 gauge wire, in which case 25 turns will easily be accommodated on the cardboard tubing.

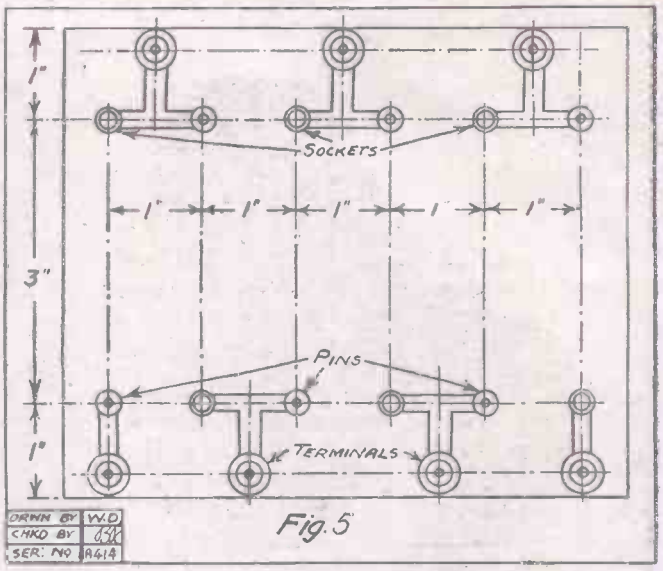

Fig. 5

The plug is made from a strip of ebonite 4 in. long by $\frac{7}{8}$ in. wide, a pin and socket being mounted 3 in. apart. The coil is bound centrally to the plug with insulating or empire tape, and the coil ends attached with soldering tags to the pin and socket. Five "units" are constructed identical with the above description. It is important to see that the coils are wound in the same "sense," and the connections to the pins and sockets are all similar.

Obtaining Reaction.

The system of connecting the "units" for the broadcast wave-bands deviates somewhat from the original, inasmuch as the coils, instead of connecting direct, are plugged on a special stand, in order that the coil may be incorporated in the ordinary receiver, where appearance is sometimes a desirable asset.

A panel of ebonite 5 in. by 6 in. by $\frac{1}{4}$ in. has two rows of pins and sockets alternately mounted at 1 in. pitch with the rows 3 in. apart to conform with the "unit" plug (Fig. 5). The connections are made by means of "T" pieces of sheet brass about 20 gauge, cut and drilled to the dimensions given in Fig. 6. The two arms connect the pins and sockets in pairs, and a terminal is bolted to the leg through the ebonite. The hole for the terminal is better drilled with the "T" in position, then a slight discrepancy will not cause any inconvenience. All the bolts of the pins, sockets and terminals must be cut off flush with the securing nut on the underside of the panel, which is then supported by four 1 in. square blocks of $\frac{1}{4}$ in. thick ebonite, fixed with Chatterton's compound in each corner.

When reaction on to the coil is desired, this can be provided by the well-known American "tickler" coil; an arrangement of this type is illustrated in Fig. 7.

The "Tickler" Unit.

The width of the ebonite base is extended $\frac{7}{8}$ in., making the overall width $1\frac{3}{4}$ in. Midway between the pin and socket a 6 in. length of 2 B.A. brass rod is mounted vertically by lock nuts and a spring washer. This rod supports the reaction coil, which is wound with a split winding on a $1\frac{1}{2}$ in. length of cardboard tube 3 in. in diameter. A winding of 20 turns of 26 gauge D.C.C. will be found to be a suitable size for efficient reaction on the wave-band covered by the set of coils.

A similar coil to that constructed for the other "units" is mounted on the ebonite, and a slot $\frac{1}{4}$ in. wide by 1 in. long is cut centrally in the ebonite to facilitate the binding of the coil. This "unit" is mounted on the stand so that the "tickler"

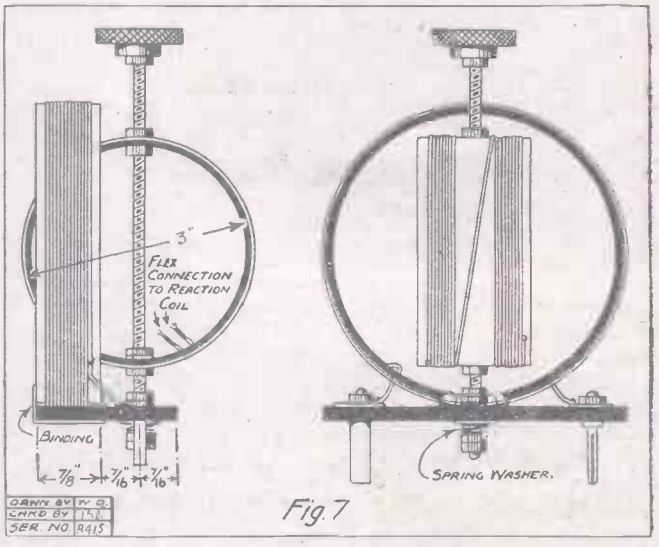

Fig. 7

coil rotates half in the coil mounted with it and half in the adjacent "unit." This ensures that maximum coupling will be obtained.

Connection to the reaction coil is best made with flex, as terminal connections only complicate the construction and add in no way to the efficiency.

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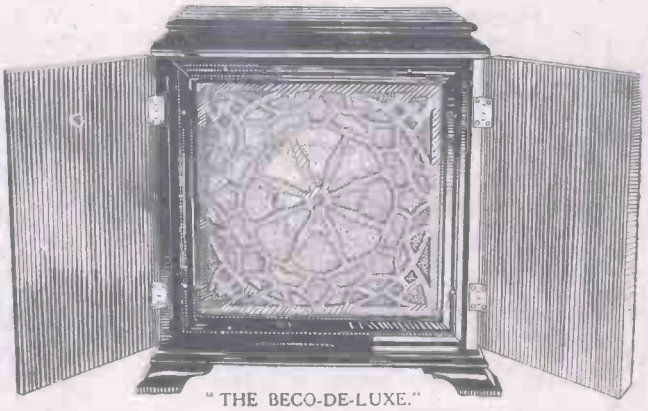

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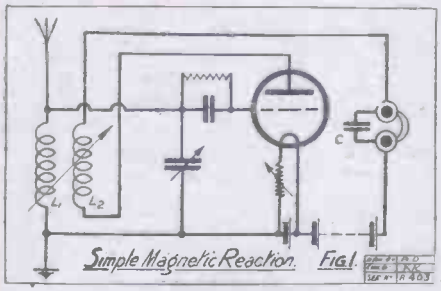
Methods of Applying Reaction

A Practical Article for Every Amateur by Lieut.-Commander H. W. SHOVE, D.S.O., R.N.

IF two circuits carrying oscillating current are "coupled," either by the intersection of the constantly varying "lines of force" of their surrounding magnetic fields ("inductive" or "magnetic" coupling), or through a condenser, across which oscillating, but not direct, current can pass ("capacity coupling"), energy



Simple Magnetic Reaction. FIG.1.

will be transferred between them and the flow of current will be helped or hindered thereby, according as the two are in or out of step, or "phase."

Negative Resistance.

To make use of such coupling between the anode circuit of an H.F. or detector valve and some preceding circuit in the set, often its own grid circuit, in order that the amplified H.F. impulses may help on the weaker ones in that circuit, is the underlying principle of reaction in a wireless valve set. The "helping on" process being commonly referred to as introducing "negative resistance."

When the negative resistance is sufficient entirely to overcome the normal resistance a very small applied voltage will give rise to a (theoretically) infinite response, the valve generating oscillations which, being fed back to the aerial, will radiate energy instead of absorbing it. This condition of "self-oscillation" is that aimed at in transmitting sets, and which the decent broadcast listener seeks to avoid.

Two Possible Methods.

As noted above, there are two methods of coupling circuits to obtain reaction. Inductive coupling is by far the more popular amongst British amateurs at present. The standard "straight single-valver," embodying the method, is shown in Fig. 1. It has both merits and defects. Foremost among the former may be placed simplicity, both in construction and operation. All that need be added to the elementary non-reacting single valve circuit is the reaction coil, L2, with some means of coupling it variably to L1 (A.T.I.), and a 'phone condenser, *c*, if not already fitted.

This latter is necessary because the 'phones, having a high inductance value, would choke back the H.F. impulses. The condenser, on the other hand, allows the H.F. to pass freely, while practically stopping the L.F. Thus, across the 'phone terminals, we provide two paths, one for the L.F. (the 'phones), the other for the H.F. (the condenser). The rest of the anode circuit being common.

Magnetic Interaction.

The degree of reaction is controlled by the size of the reaction coil (determining the strength of its magnetic field) and the distance (or angle) between the two coils (determining the amount of interaction of the fields).

It is evident that the magnetic interaction between L2 and L1 will be reversed by reversing the connections of L2. Thus, there is a right and a wrong way round for this coil. If connected the wrong way the effect of bringing the coils together should be to weaken the signals. But it will sometimes be found that reaction (even to the oscillating point) can be obtained whichever way the connections are made.

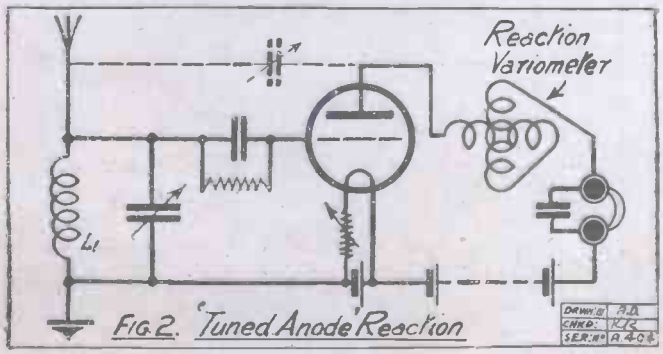


FIG.2. Tuned Anode Reaction

This is because there is always a coupling by capacity, the coils and other parts of the circuit acting as the plates of a condenser, and this coupling is of opposite "phase" to the magnetic. This state of things should be avoided by the use of a reaction coil of sufficient size to give the required magnetic effect while still well

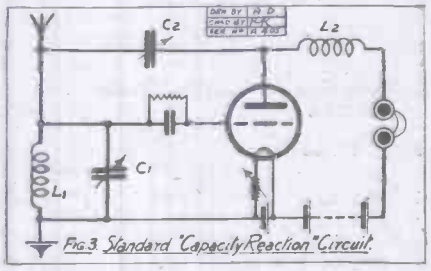
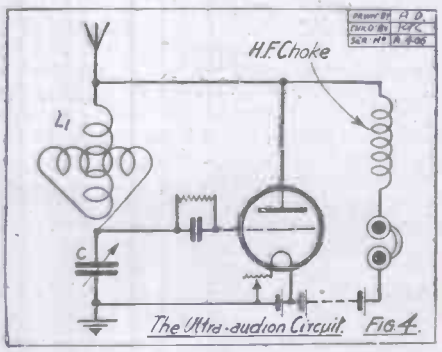


Fig.3 Standard "Capacity Reaction" Circuit.

separated from the A.T.I. and by keeping the leads in the set well spaced.

Capacity Reaction.

It is, however, impossible to avoid a measure of capacity coupling through the valve itself, where the glass between the lead-in wires is (in the ordinary 4-pin type) comparatively thin, and forms a very effective "dielectric." In the system which



The Ultra-audion Circuit. FIG.4.

we have next to consider this is made use of. Here (Fig. 2) we have the simplest form of "capacity reaction" popular in the U.S.A., and which deserves more attention in this country than it receives.

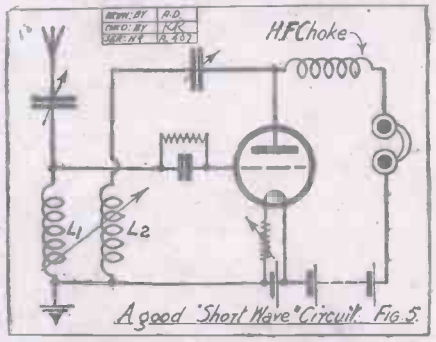
The condenser formed by the valve capacity is, of course, of low value, and the coupling therefore comparatively weak. But if the anode as well as the grid circuit be *tuned*, it is often quite sufficient to give all the reaction required and, with many

(*Continued on page* 1066.)

METHODS OF APPLYING REACTION.

(*Continued from page 1065.*)

valves, to produce self-oscillation. The system then consists simply of tuning the anode circuit, generally by a variometer, though a coil and condenser may be used. If self-oscillation is set up, it is suppressed by slightly de-tuning the anode circuit. If sufficient reaction cannot be obtained with the two circuits accurately tuned, a small



A good 'Short Wave' Circuit. Fig. 5.

(vernier) condenser, in the position shown by the dotted lines, may be added to increase the coupling. This will not require adjustment after initial setting and a fixed condenser of the correct value could be substituted.

Easy Control.

Developing the idea of adding capacity in parallel with the valve brings us to the standard capacity reaction method of Fig. 3. Here, instead of actually tuning the anode circuit, we interpose only an untuned "choke coil," L2, and increase the value of the (variable) coupling condenser (C2) to provide stronger coupling. The correct size of condenser will depend on that of the choke, a small choke necessitating a large condenser and vice versa. Suitable values for the "broadcast band" will be 100 turns on the choke and .0003 mfd. for the condenser. As we do not now wish to "by-pass" the H.F., the 'phone condenser is omitted.

Those who have never before tried it will be surprised at the ease of handling of a capacity reaction circuit, compared with the standard magnetic method. So far as efficiency is concerned there is little to choose between them. Practically all that can be said against the capacity system is that it is slightly more costly (owing to the extra condenser), and that a small amount of experimental work may be needed to arrive at the correct proportion of choke and condenser for the valve and other constants of the set.

"Direct" Coupling.

The difference between condenser coupling and that by a direct connection is really only one of degree, an uninterrupted conductor being electrically similar to a condenser of infinite capacity. Thus it should be possible "in the limit" to arrange a system of "direct feed-back" from anode to grid. And this can be done in practice, if we take measures to overcome the difficulty that the direct connection, unlike the finite condenser, offers no greater obstacle to the passage of L.F. or direct current than to that of H.F. If we simply "shorted" the reaction condenser of Fig. 3, we should render the circuit useless, because there would be no difference of potential between the grid and anode and also because the low resistance path through A.T.I. would be opened to the L.F. and D.C. (from H.T. battery) as well as the H.F.

The "Ultra-Audion."

These faults are obviated and a direct feed-back circuit obtained in the famous "Ultra-audion" of the great American inventor, Dr. Lee de Forest. Fig. 4 shows the most popular form of this. The difficulty of preserving the grid/anode D.P. is overcome by taking the grid/filament voltage fluctuations across the series A.T.C. instead of, as usual, across the A.T.I. The feed back then being taken to the top of the A.T.I. the latter forms a "choke" between grid and anode. The H.T. and 'phones are now connected "in shunt," forming a distinct L.F. circuit between anode and filament, the leakage of H.F. by this path being prevented (as in the ordinary capacity reaction circuit of Fig. 3) by the omission of the 'phone condenser, and (if necessary) the addition of an H.F. choke. The A.T.C. (*c*) being included both in the grid/filament and the H.F. branch of the anode/filament circuits, performs the double function of tuning and of controlling reaction.

If the latter is too strong when the grid circuit is tuned, it can be reduced by altering the proportions of A.T.I. to A.T.C.

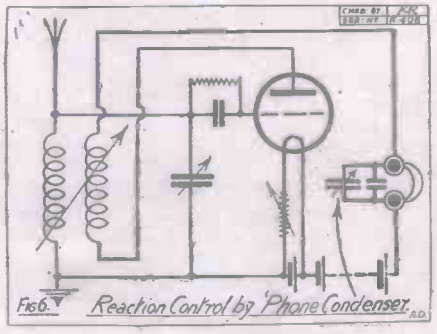


Fig. 6. Reaction Control by 'Phone Condenser.

Thus the A.T.I. is generally, as shown, a variometer or a tapped coil, though fairly good results can often be obtained with a fixed coil, the filament temperature or H.T. voltage being varied to control reaction. Other methods of control have been dealt with by the present writer in a former article ("Controlling the Ultra-audion," "P.W.," No. 140).

The "Ultra-audion" is a splendid all-round circuit, and its popularity seems to be deservedly on the increase. But, in common with all the circuits hitherto discussed, it has the defect that variation of reaction setting alters the tuning of the grid circuit. There are various devices for reducing this effect in the ordinary magnetic or capacity reaction circuits, as also for obtaining very fine adjustments. There is not space to deal with these here, but mention may be made of one particularly suitable for short-wave work.

This (Fig. 5) consists in the use of "shunt H.T." (as in the Ultra-audion) and a reaction coil whose coupling to A.T.I. may be either fixed or variable. In either case fine control of reaction is obtained by the insertion of a variable condenser in series with the reaction coil, thus enabling the H.F. feed-back to be regulated by increasing or decreasing the capacity, and hence the impedance, of the reaction circuit. The disadvantage of the method on moderate or long waves is the large size of reaction condenser required.

Popular Short-Wave Circuits.

An alternative is the use, in the ordinary type of magnetic reaction circuit, of a variable 'phone condenser. This need not be unduly large, if it be used to supply only a part of the by-passing capacity, the rest being given by a small fixed condenser of rather lower value than the normal (see Fig. 6). Fine control of reaction by this means has very little effect on grid circuit tuning.

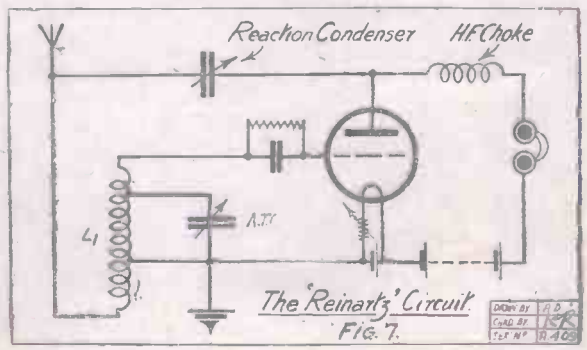
Finally, mention must be made of the excellent "Reinartz" circuit (Fig. 7). This is a capacity reaction circuit with shunt H.T. supply, but, by the addition of the coil 1, closely coupled and continuous with the A.T.I., some magnetic reaction is also introduced. These two (magnetic and capacity) reactions have opposite effects on the tuning and, when the circuit is properly designed, the reaction setting can be left fixed while tuning over a considerable wave-band. Hence a Reinartz set is exceedingly convenient to work with and very popular, especially for short-wave amateur telegraphy work.

Many of the short-wave receivers now in use at the stations of well-known amateurs are based upon the Reinartz circuit though they may have been modified to make them more suitable for operation at the higher frequencies. Such is the receiver used by Mr. E. J. Simmonds at Gerrard's Cross and described a few weeks ago in POPULAR WIRELESS (No. 182).

This receiver uses the same method of reaction as was employed by Mr. Reinartz in his original circuit except that the reaction coil is wound separately and can be variably coupled to the grid coil. The reaction condenser is also altered in position so that no hard capacity effects are present.

Instead of controlling reaction by a variable condenser placed between the plate of the valve and the reaction coil, the condenser is placed between the reaction coil and the filament end of the grid coil. This enables exactly the same effects to be obtained as with the earlier design, but makes for much easier handling, especially if low-loss variable condensers are used, and variation of reaction appears to effect the grid tuning very little.

The position and size of the H.F. choke also has an important bearing on the results, and readers interested in the Reinartz circuit will do well to look up the article in question.



The 'Reinartz' Circuit. Fig. 7.

Cutting Out Noise

By B. HONRI.

PART I.

"Let it be Music—not Noise," is the theme of our contributor, who is on the engineering staff of the B.B.C. and may be credited with a good deal of experience in "cutting out mush."

"WHY, it's just like a gramophone!" said an admiring friend, listening to our loud speaker three years ago. We blushed with gratification then, but now the same remark would—or should—be the greatest insult to our loud

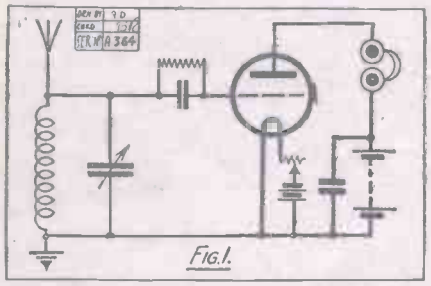


FIG. 1.

speaker. The science of radio has developed rapidly, in spite of the adherence by most of us to obsolete methods. Some readers will perhaps remember the unintelligible babble of the demonstration loud speaker at the first radio exhibition two or three years ago, and its perfection at the Albert Hall last year. This was due not so much to the improvement in the loud speaker itself, but to the perfection of amplifier design at both transmitting and receiving ends, together with the introduction of better microphones in the broadcasting studio.

Main Cause of Distortion.

The greatest cause of loud-speaker distortion is not the loud speaker itself, but the use of bad low-frequency amplifiers; and the next greatest cause of distortion is the popular grid leak and condenser method of rectification. Let us, therefore, begin at the beginning and consider the rectifying part of our valve receiver. Fig. 1 shows an ordinary single-valve receiver employing grid leak and condenser rectification. The alternate positive and negative half-cycles of the incoming high frequency are impressed on the grid of the valve through a grid condenser. Electrons are attracted to the grid from the filament every time the grid becomes momentarily positive during a positive half-cycle. If the grid leak is omitted the electrons will gradually accumulate on the grid, and make it more and more negative with respect to the filament, until the incoming high frequency has very little effect on the grid. If, however, the grid leak is put into the circuit, it allows the excess of electrons on the grid to return to the filament. The variation at audio-frequency of the accumulated grid charge produces a varying anode current which, in turn, operates our 'phones.

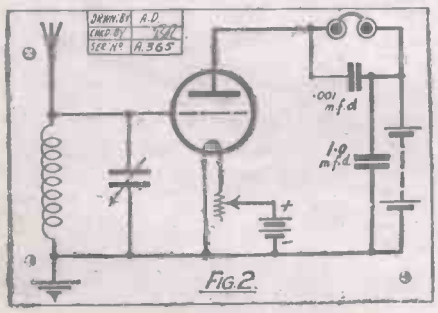


FIG. 2.

Action of the Grid Leak.

The following rather clumsy simile may help newer readers more fully to understand the action of the grid leak. Let us imagine the grid of the valve to be a water-tank, the grid leak a hole in the tank, and the incoming high-frequency pulsations to be water pumped into the tank. The upward (and useful) strokes of the pump, which result in a flush of water, are equivalent to the incoming positive half-cycles. The hole in the tank will only permit a certain steady "leak," and so the height of the water in the tank will rise and fall according to the variation of the amounts pumped into the tank (i.e. the variation in amplitude of the incoming wireless waves). This, I think, is quite obvious. The amplitude of the waves varies as they are modulated at audio-frequency at the transmitter, and if our "leak" is of the right "size," our grid potential (height of water) will also vary at the same audio-frequency. It will be seen that the actual value of the leak will depend on the strength of the signals. The grid potential of a valve always governs the anode current, and so the anode current in this case will vary as the now far-off transmitter modulations. The variation in anode current actuates our 'phones.

An explanation of why the grid leak distorts would require an article to itself. It is sufficient here to say that close to a broadcasting station it gives a "blasting" effect, that it does not faithfully copy on all audible frequencies the transmitted modulation. It is a recognised fact that the clarity of the crystal is not approached by valve detection. Most amateurs, in a frenzied effort to obtain louder signals, use soft valves, strong reaction, and freak circuits. The circuits are usually very interesting,

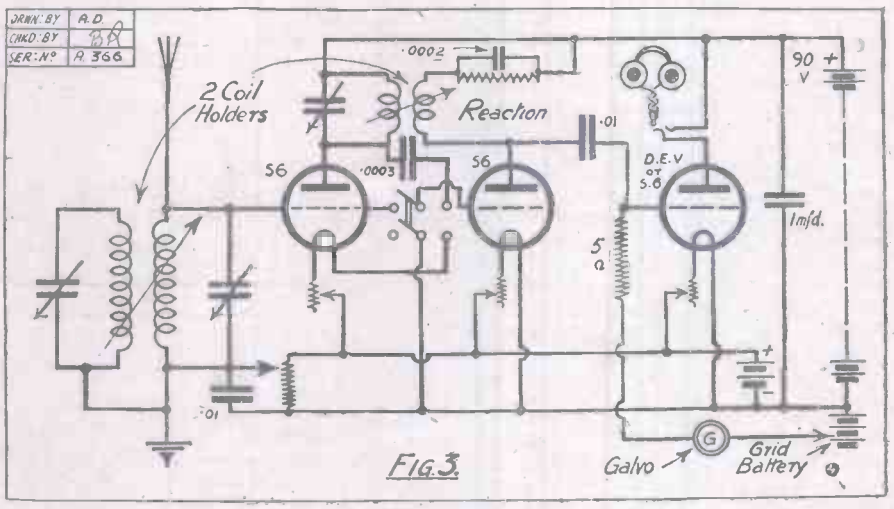


FIG. 3.

but their use is to be deprecated for "quality" reception.

It is not necessary to use a crystal in order to obtain perfect quality from the rectifier part of a set. The detector valve may be operated on the lower bend of its curve to give crystal clarity. Using general purpose valves, this may be done by putting two or three volts negative bias on the grid. There will, however, be a great diminution in signal strength, and it is advisable to use the special valves described for the purpose to obtain loud, as well as clear, signals. The DE5 B, DE3 B, DFA 4, S 6, or DEQ types of valves are suitable for anode rectification, the last two being perhaps the best. Fig. 2 represents a single valve anode rectification circuit for any of these

(*Continued on page* 1068.)

CUTTING OUT NOISE.

(Continued from page 1067.)

valves. In order to operate the valves on the lower bend of their curve, a low anode voltage should be used, unless there is a resistance in series with the anode, as with resistance-capacity amplification.

It should be pointed out that it is of little use using anode (or lower bend) rectification on a set with a bad low-frequency amplifier. The amount of distortion due to leaky condenser rectification, though appreciable, is small compared with the distortion of bad transformers. When using a good resistance-coupled amplifier the excellence of anode rectification is most obvious. Used in connection with one high-frequency valve, great sensitivity may be obtained. Fig. 3 shows a suitable circuit with switching for cutting out the high-frequency valve. Perhaps the best arrangement for all-round 'phone reception is a one high-frequency, one detector, and one low-frequency set utilising tuned anode high-frequency coupling, anode rectification, and resistance low-frequency amplification. This circuit is shown in Fig. 3. A wave-trap is embodied in this circuit, it being the coil L1 tuned by the condenser C1. To cut out the local station this coil is brought close to the A.T.I., and is tuned until the local station disappears. Distant stations are then tuned in in the usual manner, and it will be found that little interference is experienced from the local station unless one is practically underneath the aerial. Bournemouth is constantly received on this circuit three miles from 2 L O with absolutely no interference or background from the latter.

Tracing L.F. Distortion.

It may be advisable to use a DEV valve in the low-frequency stage within a mile or two of the local station when receiving signals from that station. The DEV valve has a more open mesh grid than the S6 or DEQ, requires more grid bias, and is capable of handling very much stronger signals without distortion. The only distortion likely to be met with in this receiver is the distortion due to grid current and rectification in the low-frequency valve when very strong signals are being received, and the distortion due to strong reaction when distant stations are tuned in. Grid current may be detected by breaking the grid leak at the point X and inserting a galvanometer. The galvo. will give a visual check on grid current distortion, and is an interesting and valuable refinement which should be on every experimental set.

The writer is not in favour of transformer coupling for low-frequency amplification, owing to the uneven amplification of various audible frequencies. With resistance-capacity coupling this uneven frequency amplification is only present on the extreme lower limit of audible frequencies. There are on the market a few really good transformers—all of these of British make, by the way—and it is possible to obtain quite good quality with them if care is taken in the design of the amplifier.

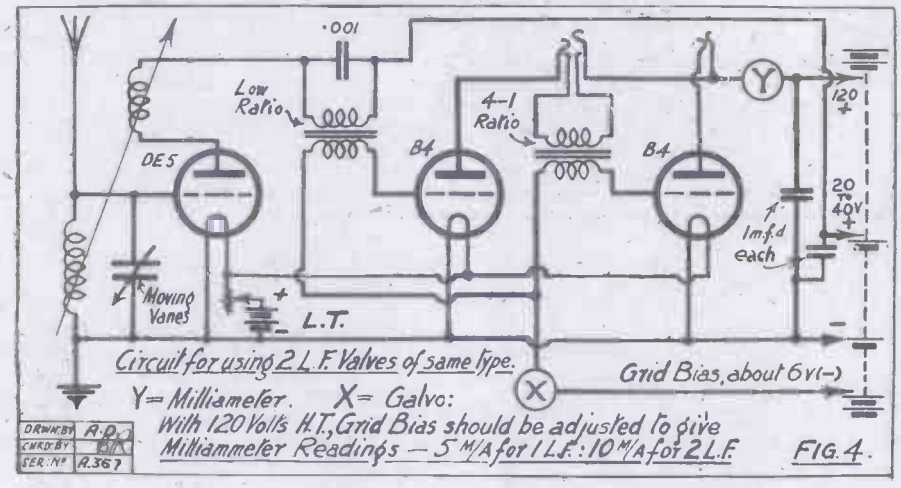


FIG. 4.

Low Ratio Transformers.

Distortion in transformer L.F. amplification is due to a variety of causes. Apart from the really bad transformers (which are hopeless) a common fault is the small number of turns on the transformer primary. It will usually be found that low-ratio transformers have a much larger winding on their primaries than those having a high ratio. The primary impedance of the transformer should match the output impedance of the preceding valve. The detector valve has almost always a high impedance, and so the following transformer should have on its primary as many turns as possible. A good low-ratio transformer should, therefore, be used in the first L.F. stage, a suitable ratio being 2·7–1. The first L.F. valve should be a power valve (of the B4, DE5, etc., type) unless signals are exceptionally weak, when a valve of higher magnification may be used.

Importance of Correct Impedances.

For the second L.F. stage advantage may be taken of the fact that the preceding valve has a low impedance and a higher ratio transformer (say 4–1) may be used, giving a greater voltage magnification. The second L.F. valve should be of the same type as the preceding valve unless very strong signals are expected. If it so happens that the signals from the local station are exceedingly strong a valve with a very open mesh, such as the LS5A and DE5A, should be used in the last stage. In this case, when a stage of amplification is cut out, it is good practice to arrange the switching so that the last valve is always the last valve—that is to say, that when one L.F. stage only is used the first L.F. valve should be omitted.

Remembering the importance of matching the primaries of our transformers with the impedance of the preceding valves, the first stage transformer (with its low ratio) should be used in conjunction with the last valve, when the last valve is switched to follow the detector. Suitable circuits are shown in Figs. 4 and 5. The milliammeter and galvanometer needles should be steady even when the set is going "full out."

If the galvo. needle moves at all it shows that the last valve is running into grid current and, therefore, causing distortion. The milliammeter is an additional check on grid current distortion, and so is useful in determining the right amount of grid bias to be used on the various valves.

When grid current is present, more grid bias is necessary; when rectification is taking place, there is too much grid bias. A high anode voltage should preferably be used on the amplifier section of any receiver (with suitable grid bias adjustment), as this lengthens the straight part of the valve's characteristic curves.

If L.F. valves are allowed to run into grid current by the use of wrong valves, low

(Continued on page 1071.)

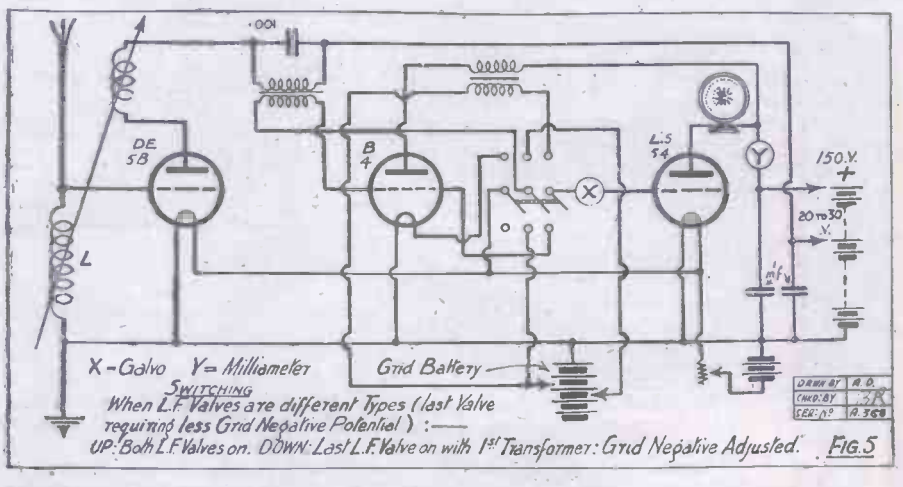


FIG. 5

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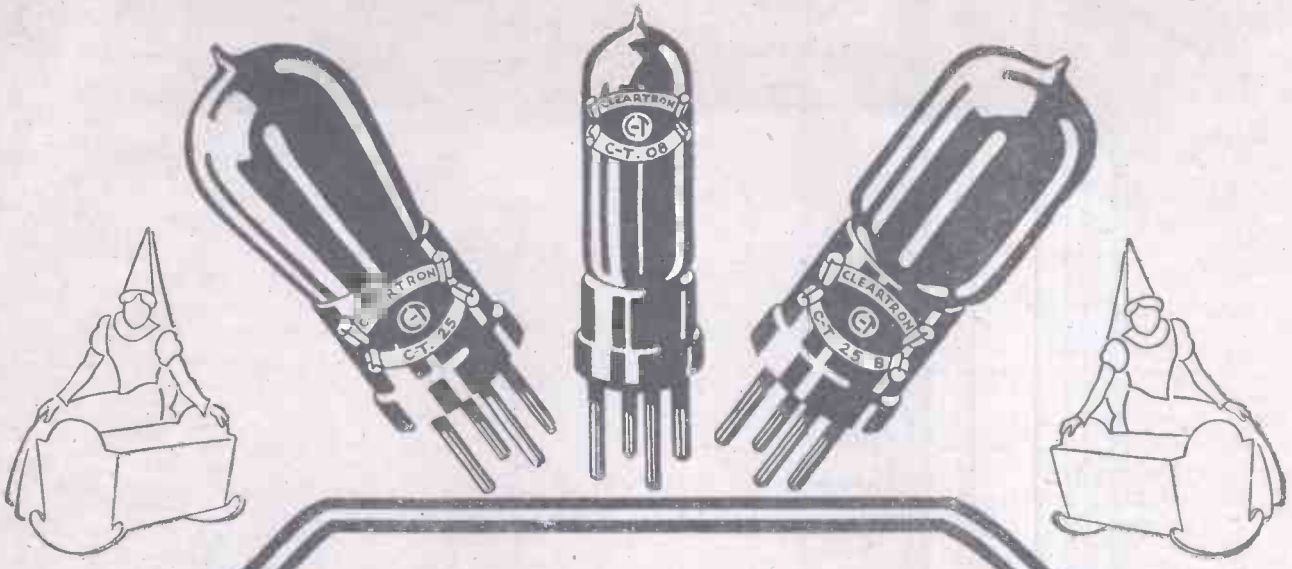

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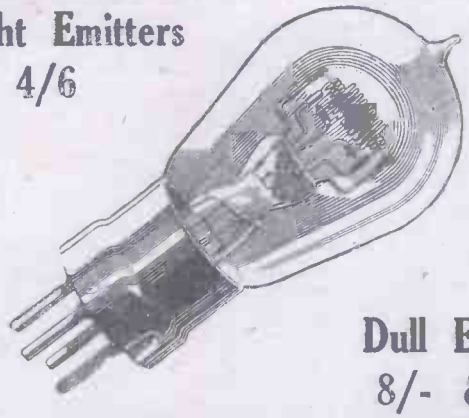

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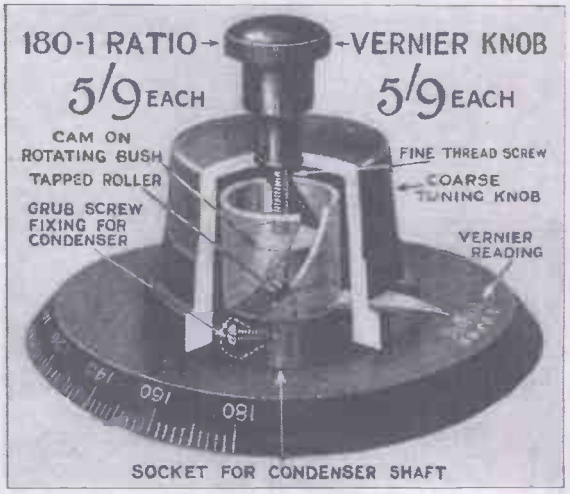

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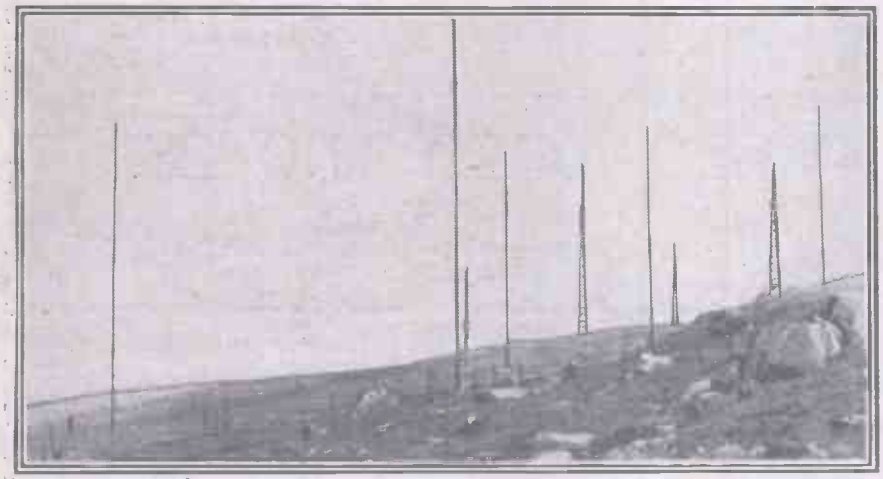
AN ITALIAN'S EXTRAORDINARY EXPERIMENTS.

By DR. ALFRED GRADENWITZ.

(Our Correspondent in Berlin).

THE obvious analogy of wireless and reception has occasionally been referred to in accounting for certain psychic phenomena, such as transmission, telepathy and clairvoyance, and the possibility of invisible vibrations constituting a link between two persons has been suggested.

Without necessarily seeing in this analogy the actual mechanism of these phenomena, some of the pioneers in the field of psychic research have recently been endeavouring to ascertain the presence of electro-magnetic waves similar to those used in radio in connection with certain more or less unusual



A recent photograph of the aerial system of the giant valve transmitting station at Carnarvon.

phenomena. An Italian scientist, Professor Ferdinando Cazzamalli, of the University of Milan, has, however, been the first actually to prove the existence of such waves emanating from human beings, and has published an account of his results in the "Revue Métapsychique," organ of the Paris International Metapsychic Institute.

Cazzamalli has, to begin with, been content with investigating psychically abnormal, more or less hysterical, sensitive and "clairvoyant" persons—in fact, actual mediums from a psychic point of view, in connection with whom particularly striking effects could be expected.

Interesting Tests.

In order to be independent of "statics," those atmospheric disturbances familiar to every wireless amateur, he installed his subjects in a hermetically closed chamber inwardly lined with conductive metal foil—in fact, in a so-called Faraday cage. The usual wireless arrangements, both valve and crystal apparatus with various ranges of wave-lengths, were used as receivers.

A first series of tests was made with an ordinary 4-valve receiver designed for a wave range of 300 to 4,000 metres. Signorina Maggi, the most interesting among his subjects, would act upon this receiver even during the natural emotion connected with the recital of poetry, as well as in a state of light hypnosis, characteristic noises being perceived in the headphones.

During the automatic writing of a message, a well-known psychic phenomenon, there would in the headphones be heard certain noises which, as eventually ascertained by inconspicuous notes, always occurred at the most intensely emotional places. In this, as well as in all other cases, the person experimented on would be absolutely ignorant of what the test was intended to bring out.

Cazzamalli afterwards experimented with a simple detector set, the range of which was comprised in the region of very short waves reaching from 100 to 20 metres. As soon as the subjects had fallen into self-hypnosis (auto-hypnosis) there would in the headphones be heard noises resembling a sequence of radio-telegraphic signals, ceasing immediately as the person awoke and invariably recommencing as hypnosis was again induced.

These noises would become especially intense when the experimenter suggested to the hypnotised medium hallucinatory visions; in fact, they would then become so characteristic as to be readily distinguished from normal noises perceived in the telephone. As soon as the medium awoke, these noises would likewise cease immediately and would not occur again until hypnosis was once more induced.

As the sensory activity of the subject became even more intense a rattling noise, and modulated sounds like those of a violin with the mute on, would be heard in the headphones provided that the person was, as it were, tuned to the receiver.

Future Experiments.

Further tests were made with a two-valve heterodyne receiver and two amplifier valves for a range of 50 to 100 metres. Those telepsychic phenomena which in Miss Maggi's case occurred with particular intensity (detailed visions of remote places, descriptions of inaccessible objects, etc.) would set up in the telephone a rattling and sometimes a repeated whistling noise, always in accordance with visions actually suggested in a state of hypnosis.

Sounds coming, it seemed, from a distant flute, would sometimes be heard at the acme of these visions. As soon, however, as the visions disappeared, the acoustic phenomena in the radio receiver would likewise cease.

In continuing his tests Professor Cazzamalli expects to work not only with abnormally sensitive but with normal subjects in order thus to ascertain a possible connection between wave emission and mental as well as psychic activity under the normal conditions of everyday life.

CUTTING OUT NOISE.

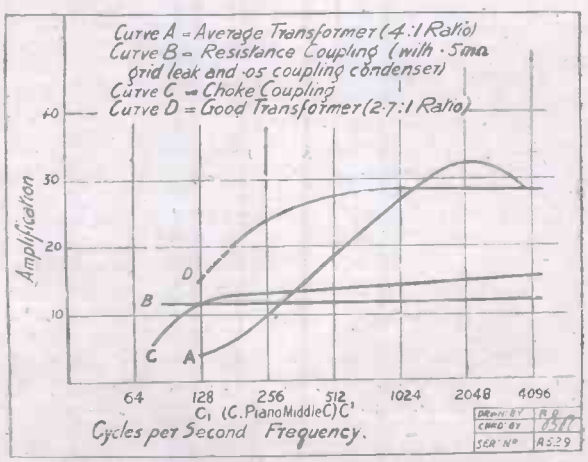
(Continued from page 1068).

anode voltage, or incorrect grid bias, a load is put on the secondary of the transformers preceding the offending valves, and that tinny, gramophone type of distortion, so often heard in wireless shop demonstrations, is the result.

Quality First Consideration.

Too often is the loud speaker blamed for the terrible noises one hears in these shops, whereas in almost every case the distortion is due to the causes mentioned above. It certainly is not fair to either the loud-speaker manufacturers or the broadcasting stations for anybody to subject transmissions to the violent distortion which is so often heard. With the British stations, at any rate, quality is the first consideration, and it is surely up to us all to emulate in our receivers the care which is taken at the transmitting end to avoid distortion.

(To be continued).



Representative amplification curves which may be expected in the cases of first stage amplifiers.

CURRENT TOPICS.

By THE EDITOR.

An "Overcrowded" Ether—The One Bright Spot—The Brussels Conference—Lord Gainford's Astounding Remarks.

WHAT with the Government Wireless Committee, the criticisms of the B.B.C.'s programmes, the new wave-length conference at Brussels, and the destruction of Captain Eckersley's private station by fire, this "Radio Christmas" has been a lively one. Regarding the last disaster, we extend our sincere sympathies to Captain Eckersley.

We understand that although his property was fully insured, much valuable data and apparatus which cannot possibly be replaced was completely destroyed. We feel sure our readers will join with us in sympathising with the popular chief engineer of the B.B.C.

Mention of the second wave-length conference at Brussels reminds us of the ever-increasing menace of interference between broadcasting stations. It would seem that Mr. Reith's tentative suggestion—made before the Government Committee—that a limited number of super broadcasting stations might prove more efficacious than the present number of medium-powered stations, offers the only reliable solution.

Although the conference at Brussels is arranging new wave-length experiments with a view of reducing interference between Continental and British stations, we are not very optimistic as to results.

The broadcasting wave-bands are all too narrow for the number of stations. The one bright spot in the conference is that plans for limiting the number of continental stations will be discussed. We hope something practical will come of the discussion, for it is certain that if continental stations are going to increase *ad lib.*, chaos will shortly be supreme in the ether, and we shall all have to agree with Captain Eckersley that DX work, as regards continental reception, is a "wash-out."

* * *

One of the results of the Brussels conference has been the birth of a plan for "dividing up the ether," and during the next three months a technical committee will make experiments to find out whether the plan will work in practice as well as it would appear to work in theory.

Captain Eckersley has explained that high-power stations such as F L and 5 X X are not affected by the plan, as it is realised that such stations are international and use a wave of such length that congestion on that wave-band is not to be feared.

The plan deals chiefly with wave-lengths up to 600 metres, and covers the whole of Europe, Asia, and North Africa.

As there are not enough wave-lengths to go round, some stations are to share a wave-length with others; and as some wave-lengths must be given to more than one station, the stations thus affected must be sufficiently far apart so that they will not clash. It is reported that stations sharing the same wave-length will be of minor importance.

It will be interesting to see how this new scheme works out in practice. It may prove satisfactory; but for how long? If new stations are to be built, the same problem will inevitably crop up again, and another plan will have to be devised.

But if, in conjunction with the new wave-length scheme, arrangements are made to restrict the birth of new continental stations, there is a good chance of the scheme proving worthy of its originators.

* * *

Lord Gainford made some rather astounding remarks the other day. "You may be surprised to hear," he said, "that among every hundred people who appear to be qualified to broadcast, we find only five who can be paid for their services as broadcasters; of those 5 per cent only about half are ever employed a second time.

"It does seem that we are very quickly getting to the limit of those who we think are sufficiently expert to entertain listeners."

If this be true then the B.B.C. make a mistake with fifty in every hundred of their selections—as the "Evening News" has already pointed out.

And surely, out of the 95 per cent negations there must be many artistes who would please listeners probably even more than the efforts of the artistes chosen by the B.B.C.'s programme staff!

It is more than likely that the B.B.C. set far too high a standard for artistes; that the gentlemen who select artistes are biased (probably unconsciously) in favour of artistes who have first-class broadcasting voices, etc. We suggest that a sacrifice in this respect would not matter very much so long as it was within the power of an artiste to *entertain*.

If he can hold the attention of listeners, if he can make people laugh, surely he need not have the "perfect microphone voice"?

If Lord Gainford's figures are correct the prospect of more varied and pleasing programmes is a poor one.

BROADCAST NOTES.

By O. H. M.

A "Committee of Dilemmas"—The Marconi House "Flare-up"—The B.B.C. and the Press.

THE Broadcasting Committee is earning the title of the Committee of Dilemmas. At nearly every session several amusing dilemmas emerge from cross-examination. The first outstanding occasion was in connection with Sir Arthur Stanley's evidence. Sir Arthur had paid a great tribute to the B.B.C. and had declared that it had conducted broadcasting as well as any other organisation could have done "during the pioneering period." He then went on to suggest the importance of changing the organisation next year. The other horn of this particular dilemma was the subsequent admission that the pioneering period would not be over for some years yet.

At another session Mr. Walter Payne, speaking for the theatres, attributed the present difficult plight of his industry to the increasingly effective competition of broadcasting. A little later on Mr. Payne was understood to declare that the entertainment side of the B.B.C. programmes was ridiculously feeble and inadequate.

The evidence so far has been remarkably good-tempered. But apparently there need be no optimism at the Treasury if the other interests succeed in their promised raids on radio funds. Lord Riddell, for the newspapers, was content to leave matters as they are. But the theatres, music-halls, music publishers and the concert industry are all looking for portions. Considered separately, these 10 per cent of licence money demands might appear not exorbitant, but taken together they would leave little or nothing for broadcasting. It would be then simply a case of the Post Office collecting the licence money and handing it direct to the entertainment industry.

I am inclined to think the theatres are making a mistake in ridiculing broadcast programmes. Mr. Payne's slashing attack on the "deadheads" who preferred the "entertainment dole" was not calculated to increase the popularity of his cause among the ten million people who listen to radio. It is much better to continue the policy of constructive co-operation exemplified by the existing agreement between the theatre managers and the B.B.C., a great part of the credit for which is due to Mr. Payne.

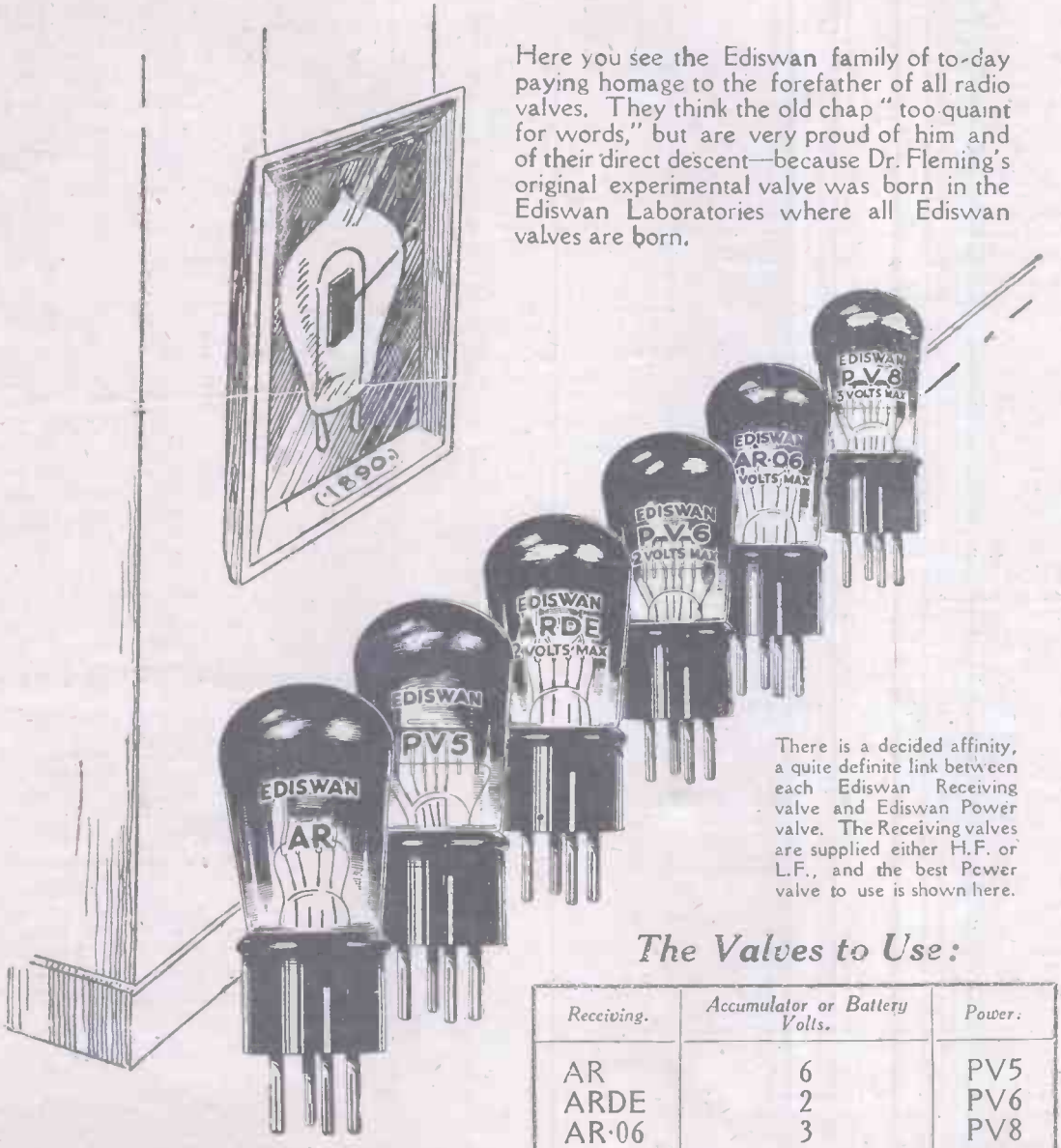
The Marconi House "Flare-up."

From all I hear the little flare-up about Marconi House and Christmas alternative programmes is symptomatic of "nerves" at the Post Office. But what I don't like about the episode is the fact that it should be left to the ingenuity of the "Daily Mail" to ferret out for itself a story of such general interest as this was. There is, of course, the usual stream of official denials and disclaimers, with which I regret to note the B.B.C. associates itself. But denials when official and categorical invariably try to obscure facts. There is no doubt in my mind that the Wireless Telegraphy Board must have considered a suggestion to allow the old 2 L O aerial to operate during Christmas and New Year for alternative seasonable programmes. I feel that such a consideration would have been eminently reasonable. It is common knowledge, moreover, that the Air Ministry has dismantled the screening apparatus of its

(*Continued on page* 1085.)

THE HAPPY FAMILY

"Ancestors"



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162/03

THE "POPULAR WIRELESS" CONTINENTAL BROADCASTING TIME-TABLE. Specially compiled by ROBERT R. PECORINI, M.Inst.R.E. ("2RI").

Transmiss'n Starts G.M.T.	Ends G.M.T.	Station and Call Sign	Wave-length metres	Frequency kilo-cycles	Days of the Week	Nature of Transmission
05.40	19.15	Koenigswusterhausen (L P)	2525	119	Daily (throughout day)	Wolff's Press Service.
05.55	06.05	Hamburg*	395	759	Weekdays	Time.
05.55	06.05	Bremen	279	1075	"	Usually relay Hamburg.
05.55	06.05	Hanover	296	1013	"	"
06.00	20.00	Koenigswusterhausen (L P)	4000	75	Daily (throughout day)	News.
06.25	06.30	Hamburg*	395	759	Sunday	Time.
06.35	06.42	Lausanne (H B 2)	850	352.7	Weekdays	Weather (local).
06.40	06.46	Eiffel Tower (F L)	2650	113.1	"	"
07.12	16.10	Amsterdam	1955	153	Daily (except M., Sat.)	News, Bourse.
07.30	08.30	Frankfurt-on-Main*	470	638	Sunday	Concert.
07.30	08.30	Cassel	273.5	1096	"	Relaying Frankfurt.
07.30	18.50	Koenigswusterhausen (L P)	2900	103.4	Daily (throughout day)	T.U. News Service.
07.30	10.30	Leipzig*	452	663.7	Sunday	Sacred music & Service.
07.30	10.30	Dresden	294	1020	"	Relaying Leipzig.
07.30	08.05	Eberfeidt	240	1249	"	Sacred Service.
07.30	08.05	Munster*	410 (287)	731 (1045)	"	"
07.30	08.05	Dortmund	283	1060	"	Relaying Munster.
07.30	08.05	Helsingfors	370	810	"	Sacred Service.
07.30	08.45	Koenigsberg	463	648	"	"
07.30	11.00	Voxhaus (Berlin)	505&576	594 ; 521	"	"
07.50	08.07	Vienna	530	566	Weekdays	Markets.
08.00	08.10	Koenigsberg	463	744	"	"
08.15	08.30	Marignane	1525	196	Daily	Weather.
08.45	10.15	Copenhagen*	308	973	Sunday	Sacred Service.
08.45	10.15	Odense	950	316		Relaying Copenhagen.
08.45	10.15	Hjörring	1250	240		
09.00	09.20	Voxhaus (Berlin)	505&576	594 ; 521	Weekdays	Markets and Weather.
09.00	09.10	Oslo*	382	785	Friday	Markets.
09.00	09.10	Aalesund	515	582 5	"	Relaying Oslo.
09.00	10.00	Komarov (O K B)	311	965	Sunday	News, Concert.
09.00	09.15	Leipzig	452	663.7	Sunday, Thursday	News.
09.05	09.30	Leipzig*	452	663.7	Weekdays	"
09.30	10.00	Rome (1 R O)	425	706	Sunday, Thursday	Sacred Concert.
					Alternate days	Organ music.
09.30	10.15	Radio-Berne	301.5	995	Sunday	Religious Service.
09.40	10.30	Bloemendaal	345	869	Sunday	"
09.42	09.50	Toulouse (M R D)	1525	196	Daily	Weather. "
10.00	11.00	Stockholm* (S A S A)	427	702.5	Sunday	Sacred Service.
10.00	11.00	Gefle (S M X F)	325	923	"	" "
10.00	11.00	Karlstadt (S M X C)	221	1357.4		
10.00	11.00	Eskelstuma (S M V X) (Radio Club).	243	1234.5		
10.00	11.00	Norrkoeping (S M V V)	260	1154		
10.00	11.00	Joenkoeping (S M Z D)	265	1131		
10.00	11.00	Trollattan (S M X Q)	345	869		Mostly relay S A S A irregularly.
10.00	11.00	Fœlon (S M Z K)	370	810		
10.00	11.00	Malmœ (S A S C)	470	638		
10.00	11.00	Gothenburg (S A S B)	286	1049		
10.00	11.00	Sundsvall (S A S D)	545	550		
10.00	11.00	Liukoeping	467	642		
10.00	11.00	Boden (S A S E)	1350	222.1		
10.00	11.30	Barcelona (E A J 13)	460	652	Sunday	Sacred Concert.
10.00	11.00	Zurich	515	582	"	Concert.
10.00	11.00	Vienna (O T W)	400	750	Daily	Tests.
10.00	11.45	Sokolnicchi (Moscow)	1010	297	Tu., Thur., Fri., Sat.	Political Lecture.
10.00	11.50	Voxhaus (Berlin)	505&576	594 ; 521	Daily	Concert.
10.00	11.00	Leipzig*	452	663.7	Sunday	Educational Talk.
10.00	11.00	Oslo	382	785	"	Sacred Service.
10.00	10.10	"	382	785	Weekdays	Bourse.
10.00	10.15	Toulouse	441	680	"	Market prices.
10.00	10.15	Munich*	485	618	Wednesday	Chimes.
10.00	10.15	Nuremburg	340	882	"	Relaying Munich.
10.00	11.50	Breslau*	418	717	Sunday	Sacred Service & Music.
10.00	11.50	Gleiwitz	251	1195	"	Relaying Breslau.
10.00	11.50	Voxhaus (Berlin)	505&576	594 ; 521	Weekdays	Workers' Concert.
10.00	11.30	Vienna	530	566	"	Concert.
10.00	10.10	Koenigsberg	463	648	"	Weather.
10.05	11.40	Hilversum (H D O)	1050	285.7	Sunday	Divine Service.
10.30	11.30	Munster*	410	732	Sunday	Concert.
10.30	11.50	Eberfeldt	240	1249	"	"
10.30	11.50	Koenigswusterhausen (L P)	1300	231	"	Orchestra, Esperanto.
10.30	11.30	Radio-Berne	301.5	995	Sunday	Concert.
10.30	11.30	Stuttgart	443	677	"	Sacred Service.
10.30	12.30	Koenigsberg	463	648	"	Concert.
10.30	11.30	"	463	648	Weekdays	"
10.45	11.00	Leipzig	452	660	"	Weather.
11.00	11.10	Zurich	515	582	"	"
11.00	11.30	Voxhaus (Berlin)	505&576	594 ; 521	Sunday	Orchestra.
11.00	11.10	Graz	399	—	Weekdays	Bourse.
11.00	12.00	Frankfurt-on-Main*	470	638	Sunday	Concert.
11.00	11.50	Leipzig	452	663.7	Weekdays	Music.
11.00	11.10	Helsingfors	370	810	"	Weather.
11.30	12.25	Breslau*	418	717	Weekdays	Concert (stat. orch.).
11.30	12.10	Munster	410	731	"	Bourse, Markets.
11.30	11.40	Stockholm (S A S A)*	427	702.5	Daily	Weather.
11.37	11.43	Dutch Meteo (K N M L)	1100	272.6	Weekdays (except Thur.)	Weather.
11.40	12.00	Hilversum (H D O)	1050	285.7	Weekdays	Police News.
11.55	12.00	Leipzig	452	663.7	"	Time.
11.55	12.00	Frankfurt-on-Main	470	638	"	"
11.55	12.00	Radio-Berne	301.5	995	Daily	T.S., Weather, Bourse.
11.55	12.15	Voxhaus (Berlin)	505&576	594 ; 521	"	" "
11.55	12.15	Breslau	418	717	Sunday	" "
11.55	12.15	Zurich	515	582	Weekdays	" " Bourse.
11.55	12.05	Eiffel Tower (F L)	2650	113	Daily (except Monday)	Market.
11.55	12.00	Hamburg*	395	759	Sunday	Time.
11.55	12.30	Frankfurt-on-Main	470	638	Weekdays	Talk.
11.55	13.00	Rome (1 R O)	425	706	Sunday	Government comm'n
12.00	12.10	Munich	485	618	"	Time, Weather.
12.00	13.00	Ryvang*	1150	—	"	Divine Service.
12.00	13.00	Odense	950	316	"	Relaying Ryvang.
12.00	13.00	Hjörring	1250	240	"	"
12.10	12.20	Vienna	530	566	"	Time, Weather.
12.14	12.20	Eiffel Tower (F L)	2650	113	Daily	" "
12.15	13.30	Munster*	410	731	Weekdays	Lecture, Concert.
12.15	13.30	Eberfeldt	240	1249	Monday, Friday	Concert. Relays Munster occasionally.
12.15	12.40	Oslo	382	785	Weekdays	Markets : Exchange.
12.30	12.40	Lausanne (H B 2)	850	353	"	Weather (Zurich), Time
12.30	13.40	Radio-Paris	1750	171.3	"	Concert.
12.30	13.40	Toulouse	441	680	Daily	Music.
12.30	13.40	Zurich	515	582	Weekdays	Piano.
12.30	13.40	Moscow (R D W)	1450	207	"	News, Concert.
12.45	13.45	Radio-Paris	1750	171.3	Sunday	Concert.
12.45	13.45	Hanover*	296	1013	"	Orchestra. Relays Hanover.
12.45	13.45	Hamburg	395	759	"	"
13.00	14.30	Stockholm (S A S A)*	427	702.5	"	Weather.
13.00	14.00	Eberfeldt	240	1249	"	Concert.
13.00	14.30	"	240	1249	Weekdays	Orchestra.
13.00	13.15	Toulouse	441	680	Daily	Time, News, Weather.
13.00	14.30	Munster	410	731	Sunday	Concert.
13.00	13.10	Brussels (B A V)	1100	272	Weekdays	Children.
13.00	15.30	Leningrad	940	319	Weekdays	News, Concert; Talk.
13.05	14.30	Munster	410	732	Saturday	Children.
13.05	15.00	Hamburg	395	759	Weekdays	Concert; relaying Bremen. Concert.
13.05	15.00	Bremen*	279	1075	"	"
13.15	13.40	Toulouse	441	680	Daily	Orchestra.
13.20	13.30	Voxhaus (Berlin)	505&576	594 ; 521	"	Bourse.
13.30	14.00	"	505&576	594 ; 521	"	Lecture.
13.45	13.52	Radio-Paris (S F R)	1750	171.3	Sunday	News, etc.
13.45	14.00	" "	1750	171.3	Weekdays	News, Prices, Exchange
14.00	14.30	Voxhaus (Berlin)	505&576	594 ; 521	Sunday	Chess.
14.00	15.00	P.T.T.* (Ecole Supérieure)	458	655	"	Concert relay.
14.00	15.00	Lyons la Doua	479	626.3	"	
14.00	15.00	Pic-au-Midi	350	855	"	Relaying P.T.T.
14.00	15.00	Toulouse	315	952	"	
14.00	15.00	Grenoble	875	343	"	
14.00	14.30	Frankfurt-on-Main	470	638	Weekdays	Talk.
14.00	16.00	Breslau	418	717	"	"
14.00	17.00	Munich	485	856.6	Sunday	Concert.
14.00	15.00	"	485	618	Saturday	Women's talk.
14.00	14.30	Voxhaus (Berlin)	505&576	594 ; 521	Sunday	Chess.
14.10	14.30	" "	505&576	594 ; 521	Weekdays	Talk, News.
14.15	14.45	Hamburg*	395	759	Sunday	Esperanto.
14.30	15.30	Madrid (E A J 7)	373	804	Daily	Concert or Orchestra.
14.30	15.25	Voxhaus (Berlin)	505&576	594 ; 521	Sunday	Concert or Children.
14.30	15.30	Frankfurt-on-Main	470	638	Weekdays	Children.
14.45	15.30	Munich	485	618	"	Concert.
14.45	14.50	Eiffel Tower	2650	113.1	" (except Sat.)	Exchange.
14.45	16.15	Reval	350	856.6	"	Testing regularly.
15.00	17.00	Frankfurt-on-Main	470	638	"	Concert.
15.00	16.00	"	470	638	Sunday	Children.
15.00	17.30	Radio-Berne	301.5	995	Daily	Conc., Chat, Chil. (Wed.)
15.00	16.30	P.T.T.* (Ecole Supérieure)	458	655	Saturday	Concert
15.00	16.30	Grenoble	875	343	"	
15.00	16.30	Lyons la Dona	479	626.3	"	Relaying F.P.T.T.
15.00	16.30	Marseilles	350	856.6	"	
15.00	16.30	Toulouse	310	967	"	
15.00	16.30	P.T.T.*	458	655	Sunday	Lecture.
15.00	17.30	Stuttgart	443	677	Daily	Concert.

(Continued on page 1076.)

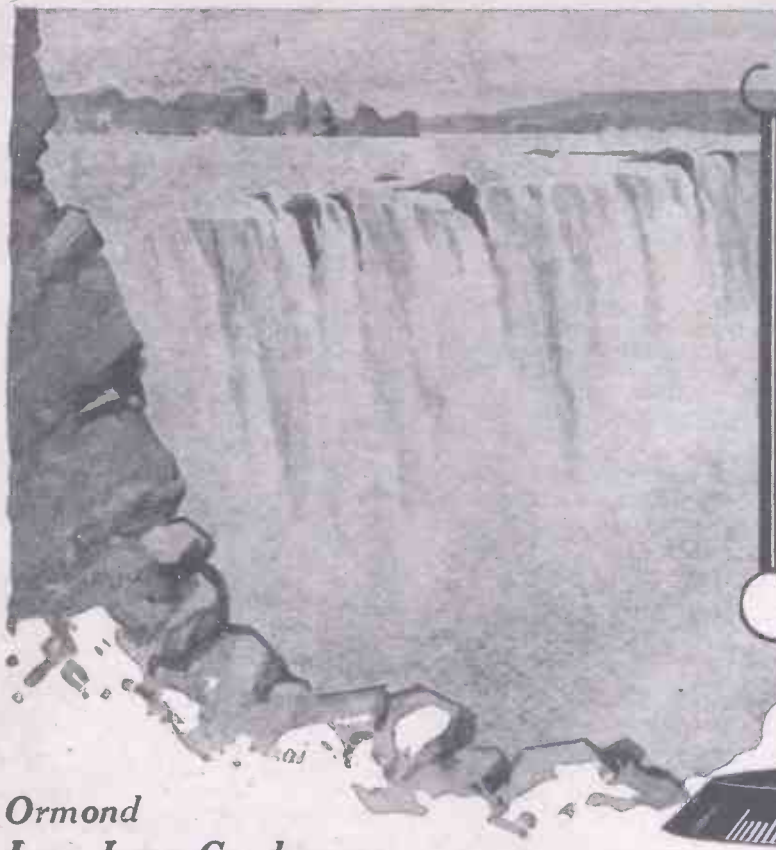
THE "POPULAR WIRELESS" CONTINENTAL BROADCASTING TIME-TABLE.

(*Continued from page* 1075.)

Transmiss'n Starts G.M.T.	Ends G.M.T.	Station and Call Sign	Wave-length in metres	Frequency kilo-cycles	Days of the Week	Nature of Transmission
15.00	15.30	Berlin	505&576	594 : 521	Saturday	Children's Hour.
15.00	17.00	Koenigsberg	463	648	Sunday	Concert.
15.00	15.15	Lyngby (O X E)	2400	125	"	News.
15.10	16.30	Vienna	530	566	Weekdays	Concert
15.15	16.00	Hamburg*	395	759	Sunday	Operatic Music.
15.15	16.00	Bremen	279	1075	"	Relaying.
15.30	17.15	Munster*	410	732	Saturday	Concert.
15.30	19.30	Madrid (E A J 4)	304	986.5	Tues., Wed., Fri., Sat.	News, Lect, or Concert.
15.30	17.15	Dortmund	283	1060	"	Relay.
15.30	16.30	Berlin	505&576	594 ; 521	Daily	Concert.
15.30	17.00	"	505 &576	594 ; 521	Sunday	"
15.30	16.35	Leipzig	452	663.7	Wednesday	Concert.
15.30	16.00	Eberfeldt	240	1249	Saturday	Children's Hour.
16.00		Radio-Lyon	280	1071	Sunday	Concert.
16.00	17.15	Zurich	515	582	Daily	Orchestra.
16.00	17.30	Dresden	294	1020	Thursday	Concert.
16.00	18.00	Breslau	418	717	Saturday	Light music.
16.00	17.30	"	418	717	Wednesday	Dance.
16.00	17.00	Eberfeldt	240	1249	Saturday	Thé Dansant.
16.00	18.00	Madrid (E A J 6)	392	765	Sun., Wed., Sat.	Concert.
16.00	17.45	Hamburg	395	759	Sunday	Talk and Concert.
16.30	16.45	Radio-Paris	1750	171.3	Daily	Bourse, etc.
16.45	17.45	"	1750	171.3	Wednesday	Concert.
16.45	odd	Taupsa (R A W)	1800	166.6	Daily	Testing
17.00	18.30	Radio-Belgique	265	1132	Sat., Tues., Thurs.	Concert.
17.00	18.30	Liége (Radio-Wallonie)	285	1052.6	Mon., Wed., Fri.	Concert.
17.00	19.30	Frankfurt-on-Main	470	638	Weekdays	Lecture Talk.
17.00	17.20	Rome (1 R O)	425	706	"	Children.
17.05	17.40	Berlin	505&576	594 : 521	Sunday	Opera.
17.15	17.30	Zurich	515	368	"	News.
17.15	18.00	"	515	368	Weekdays	Children.
17.30	18.30	P.T.T.*	458	655	Saturday	Lecture.
17.30	18.00	Stuttgart	443	677	Sunday	Radio Talk.
17.30	18.00	"	443	677	Weekdays	Lecture.
17.30	18.00	Rome (1 R O)	425	706	Sunday	Dance.
17.30	18.00	"	425	706	Weekdays	Orchestra.
17.30	20.00	San Sebastian (E A J 8)	346	867	Daily	Concert.
17.30	17.45	Radio-Toulouse	441	680	"	Bourse.
17.30	18.30	Graz	399	—	Tues., Wed., Fri.	Lecture.
17.45	18.00	Radio-Paris	1750	171.3	Weekdays	Bourse, News.
17.45	19.15	Berlin	505&576	594 : 521	Sunday	Talk.
17.45	19.15	Moscow (R D W)	1450	207	Weekdays	Concert, News.
18.00	22.00	Strasnice (A D)	570	526	Daily	Concerts (with breaks).
18.00	18.10	Radio-Berne	301.5	995	Daily	News.
18.00	20.00	Madrid (E A J 7)	373	804	Tues., Thurs., Sat.	Concert.
18.00	19.00	Hamburg*	395	759	Sunday	English.
18.00	19.00	Stuttgart	443	677	"	Lecture : Talk.
18.00	19.00	Zurich	515	582	Weekdays	Concert.[Concert, Talk.
18.00	18.30	Stuttgart	443	677	Monday	Esperanto.
18.00	20.00	Kief	1000	300	Tues., Wed., Fri.	Concert.
18.00	22.30	Bilbao (E A J 9)	415	729	Daily	"
18.00	20.00	Komarov (O K B)	311	968	"	Concert or Dance.
18.00	20.00	Madrid (E A J 6)	392	765	Mon., Thurs.	Concert.
18.05	18.50	Barcelona (E A J 1)	324	926	Weekdays	Concert.
18.10	18.30	"	324	926	Sunday	Agricultural Talk.
18.10	19.10	Vienna (O T W)	400	750	Weekdays (see Notes)	Testing.
18.15	19.10	Koenigsberg	463	648	Sunday	Talk, Lecture, Weather.
18.15	18.40	Oslo	382	785	Daily	Talk, Time, Concert,
18.15	19.10	Eiffel Tower (F L)	2650	113.1	"	Concert, News [News.
18.30	19.00	Barcelona (E A J 1)	324	926	Sunday	Recital.
18.30	19.25	Munster*	410	732	Saturday	Lecture, Concert.
18.30	19.15	Rome (1 R O)	425	706	Daily	Govm't Communica'ns
18.50	19.00	Barcelona (E A J 1	324	926	Weekdays	Press.
18.55	19.00	Eiffel Tower (F L)	2650	113.1	Sunday	News. [Dance.
19.00	21.00	Oslo	382	785	Daily	Orchestra, Concert,
19.00	21.45	Stuttgart	443	677	"	Concert, News, Talk.
19.00	21.00	Barcelona (E A J 1)	324	926	Sunday	Concert.
19.00	19.30	Lausanne	850	352.7	Weekdays	Lecture, Carillon Time
19.00	21.00	Berlin	505&576	594 : 521	"	Music.
19.00	22.00	Hamburg*	395	759	Sunday	Theatre.
19.00	21.00	Cadiz (E A J 3)	360	832.8	"	Organ, Concert, Talk.
19.00	22.15	"	360	832.8	Weekdays	Music, Dance.
19.10	20.40	Koenigsberg	463	648	Sunday	Theatre.
19.10	irreg.	Hilversum (H D O)	1050	285.7	Weekdays	Police News, etc., Conc.
19.15	20.30	Zurich	515	582	Sunday	Concert.
19.15	Irreg	Malaga (E J A 25)	325	923	Weekdays	Concert.
19.15	20.15	Radio-Geneva	1100†	273	Sunday	Religious Lecture.
19.15	20.15	" "	1100†	273	Weekdays	Orch., Lecture, News, Esperanto (Tues.).
19.20	20.30	Dortmund	283	1060	Saturday	Orchestra.
19.30	20.00	Leipzig*	452	663.7	Almost daily	Lecture (Thursday). Opera (21.45), News.
19.30	22.00	Vienna	530	566	Weekdays	Concert
19.30	21.30	Eberfeldt	240	1249	Saturday	Lecture, Music.
19.30	22.00	Frankfurt-on-Main*	470	638	Daily	Concert.
19.30	20.00	Lausanne	850	353	Weekdays	"
19.30	19.45	Radio-Agen	318	943	Daily	News, B'urse Con. (Tu.)
19.30	21.00	Breslau	418	717	Saturday	"
19.30	21.30	Berlin*	505&576	594 : 521	Daily	Concert, News.
19.30	20.30	Frankfurt-on-Main*	470	638	Weekdays	Concert.
19.30	19.40	Rome (1 R O)	425	706	"	Bourse, News, Weather.
19.30	21.30	Koenigswusterhausen	1300	231	"	Relaying Berlin.
19.30	19.40	Oslo	382	785	Daily	Esperanto Course.
19.30	21.40	Radio-Berne	301.5	995	Daily	Conc., Orches., News.
19.40	21.00	Eiffel Tower (F L)	2740	109.4	"	Concert or Opera.
19.40	21.40	Hilversum	1150	285.5	Sunday	W'kd'ys. : News, Conc.
19.55	22.30	Graz	399	—	Tues., Wed., Fri.	" " "
20.00	20.15	Radio-Belgique	265	1131	Weekdays	Lecture.
20.00	21.30	Liège (Central)	205	1919.6	Mon., Wed., Sat.	Concert.
20.00	20.20	Lyngby (O X E)	2400	125	Daily	News, Time, Weather.
20.00	22.30	Copenhagen*	308	973	"	News, Esperanto, Lecture, Concert
20.00	21.00	Seville (E A J 5)	350	855	Sunday	Children.
20.15	20.30	Radio-Lyon	280	1071	Daily	News.
20.15	20.45	P.T.T.*	458	655	Saturday	Talk.
20.15	21.10	Radio-Belgique	265	1131	Weekdays	Music, Lecture, News, Opera, (M.W.)
20.15	22.10	" "	265	1131	Saturday	"
20.15	20.40	Radio-Paris	1750	171.3	Sunday	Radio Talk."
20.15	20.40	"	1750	171.3	Weekdays	Talk and Bourse.
20.15	21.15	Radio-Geneva	1100	273	Weekdays	Conc., Dance. News (A.T.S.).
20.15	21.00	Dresden	294	1020	Wed. (almost daily)	Talk and News.
20.30	21.00	P.T.T.*	458	655	"	Talk.
20.30	22.00	Dortmund*	283	1060	Saturday	Opera.
20.30	22.00	Munster	410	731	"	Relaying Dortmund.
20.30	22.00	Eberfeldt	240	1249	"	"
20.30	21.00	Frankfurt-on-Main	470	638	Weekdays	News, Talk, Sport.
20.30	21.00	Radio-Paris	1750	171.3	Saturday	Concert.
20.30	21.00	Eiffel-Tower (F L)	2740	109.4	Sunday	"
20.30	20.45	Radio-Toulouse	441	680	"	Sports, News.
20.30	21.30	Radio-Lyon	280	1071	Daily	Orchestra.
20.30	21.30	Radio-Belgique	265	1131	Sunday	Concert.
20.30	22.00	Seraing-Radio	195	1538	Mon., Thurs., Sat.	Concert.
20.30	20.40	Rome (1 R O)	425	706	Weekdays	Weather, News.
20.30	20.45	Radio Toulouse	441	680	"	Press.
20.30	24.00	Madrid (E A J 4)	304	986.5	Sun., Mon., Thurs.	Concert.
20.40	22.30	Rome (1 R O)	425	706	Daily	Opera or Concert.
20.45	22.00	P.T.T.*	458	655	"	Talk.
20.45	22.30	Radio-Paris	1750	171.3	"	Dance or Concert.
20.45	22.30	Radio-Toulouse	441	680	"	Concert, Talk.
20.50	22.00	Koenigsberg	463	648	Sunday	News, Concert.
21.00	24.00	Madrid (E A J 6)	392	765	"	Concert.
21.00	22.00	Radio-Berne	301.5	995	Saturday	Dance.
21.00	22.30	P.T.T*	458	655	Daily	Concert and Tests.
21.00	21.05	Rome (1 R O)	425	706	"	Time Signals.
21.00	21.05	Lausanne	850	353	Sunday	" "
21.00	22.45	Oslo	382	785	"	Time, Dance.
21.00	22.00	Frankfurt-on-Main*	470	638	Daily	Theatre or Concert.
21.00	23.00	Sokolnicchi (Moscow)	1010	297	Tues., Thurs., Fri.	News, Lect. or Concert.
21.00	23.10	Barcelona (E A J 1)	325	923	Weekdays	Concert.
21.00	21.10	Radio Catalana (E A J 13)	460	652	"	"
21.00	21.30	Breslau*	418	717	"	News, Sport.
21.00	21.15	Seville (E A J 5)	350	856	"	News.
21.00	24.00	" "	350	856	"	News, Talk, Concert.
21.15	22.30	Petit-Parisien* (see below)	358	865.9	Daily	Concert.
21.30	22.15	Eberfeldt	240	1249	Weekdays	"
21.30	22.30	Rome (1 R O)	425	706	Daily	Dance.

NOTES—For the convenience of experimenters, and in anticipation of eventual general use, wave-lengths have been paralleled with corresponding frequency expressed in kilocycles.
Relay stations are mentioned under initial entry of main station. An asterisk (*) marks main station with relays working. The following stations may be occasionally heard testing: Kiel, 233.5 m. (1284 kc.); Reval, 350 m. (855 kc.); Milan (Sch. Teleg.); Riga, 488 m. (614 kc.); Aalesund, 515 m. (582 kc.); Salamanca (E A J 22), 290 m. (1034 kc.); Vienna (O T W), 400 m., (750 kc.) 07.45,—10:00, 17.00—19.00; Budapest, 588 m. (510 kc.); Stettin, 241 m. (1244.8 kc.); Amsterdam 700 m. (428.3 kc.); Asturias (E A J 12), 346 m. (872 kc.); Skieen, 201 m. (1498 kc.); Notoden; Barcelona (E A J 18), 300 m. (1000 kc.).
PROJECTED STATIONS: Bratislava, 409 m. (733 kc.); Innsbrück (Feb., 1926); Bergen; Trondjheim; Tromsö; Stavanger; Christiansand; Rosenbrugel; Salzburg; Klagenfurt; Munchenbuchsee, 238 m. (1260 kc.); Prague, 530 m. (566 kc.); Ceuta (Spanish Morocco); Varsovie; Karlsborg 1350 m. (222.1 kc.); Cracow; Hammeren 1900 m. (157.8 kc); Seville E A J 21.
† Radio-Geneva testing occasionally on 800 m. (375 kc.). †† Petit-Parisien's wave occasionally swings over 7 per cent. Have taken P.P. on 370 m. (810 kc.).

(*Continued on page* 1086)

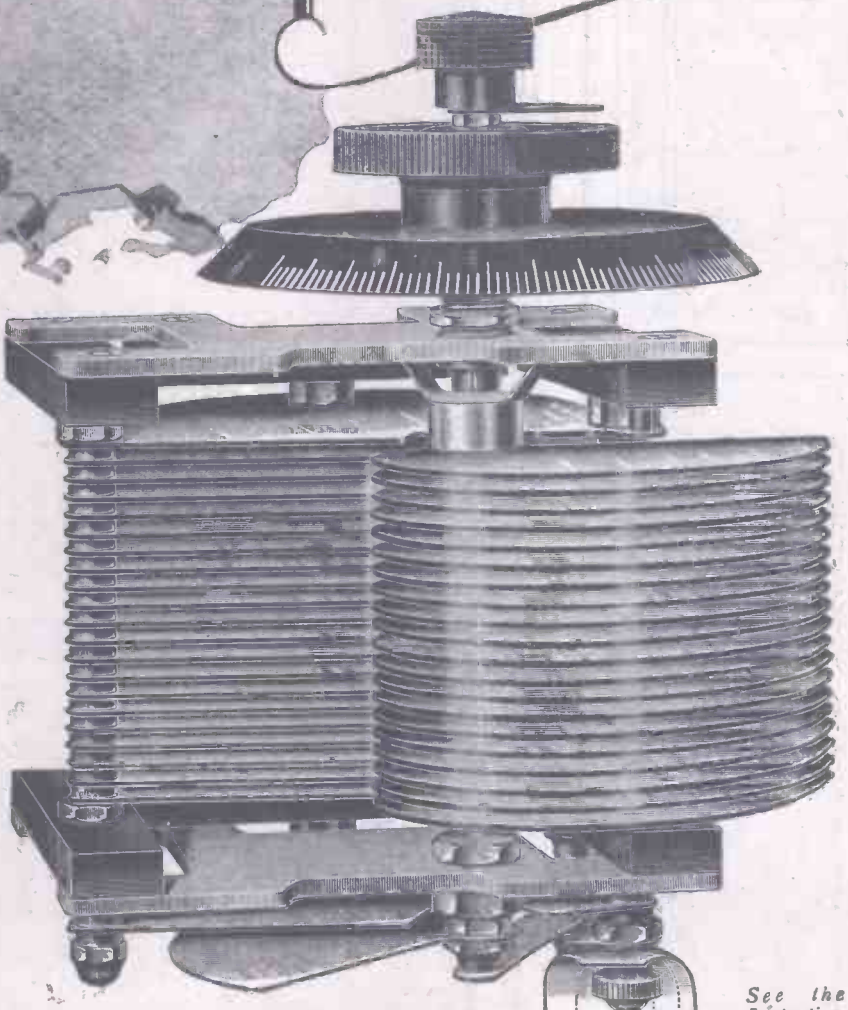


FOUR MILLION
horse power under control

***NIAGARA FALLS** supply the energy for huge electric power stations—power that is used to drive electric trains in cities 250 miles away.*

A button pressed, a lever moved, the turn of a knob; that is how things are done to-day—the result of inventive genius and modern engineering skill.

***ORMOND PRODUCTS** are typical examples, and the outcome of 25 years' British Manufacturing experience.*



Ormond Low Loss Condensers

(SQUARE LAW)

(Patent applied for.)

A new departure in British Condenser design, giving the following advantages:—

1. Practically negligible losses. 2. One-hole fixing—one ⅜ in. diam. hole is needed to fix this condenser to panel. 3. Rigid construction—cannot warp; end plates of stout aluminium, perfectly flat. 4. Fixed vanes supported by ¼ in. ebonite strips. 5. Smooth action, spindle tension is maintained by a specially designed friction washer. 6. Moving vanes and end plates are at earth potential. 7. One-piece knob and dial—supplied loose. Secured by 4BA Set Screw.

This condenser is fitted with optional soldering Tags, or Terminals, and can be supplied with or without Vernier as desired.

Supplied in the following sizes:

Size.	Price with Vernier.	Price without Vernier.
·00025	8/-	6/6
·0003	9/-	7/6
·0005	9/6	8/-
·001	10/6	9/-

Complete with Knob and Dial.

We specialise in turning Brass and Steel Screws and Machined Parts and Accessories of all descriptions.

Ask your dealer to show you these Ormond Condensers—the best dealers stock all Ormond Products.

ENGINEERING ORMOND COMPANY Reg. App. for

Dealers are requested to send for 1926 Calendar, Catalogue and trade terms.

199-205, Pentonville Road, King's Cross, London, N.1.

Telephone—Clerkenwell 9344, 5, and 6.
Telegrams—"Ormendengi, Kincross."

Factory — Whiskin Street, Clerkenwell, E.C.1.

See the Inspection Label on every Condenser.

25 YEARS' BRITISH MANUFACTURING EXPERIENCE.

Traders and manufacturers are invited to submit wireless sets and component parts to the "P.W." Technical Dept. for test. All tests are carried out with strict impartiality in the "P.W." Test Room under the supervision of the Technical Editor, and the general reader is asked to note that this weekly article is also intended to provide a reliable and unbiased guide as to what to buy and what to avoid.—EDITOR.

FROM Messrs. J. Nicklin & Co., Ltd., of Great Charles Street, Birmingham, we have received a Rushton plug-in lead-in tube. It is a straightforward device consisting of a 6 in. ebonite-covered rod with sockets at each end. Stout spring plugs with screw binders are supplied which ensure rigid, efficient connections. If the earth lead is fitted with the patent plug terminal supplied the aerial can be earthed in a moment.

* * *

A fixed condenser that will probably appeal to the amateur is to be placed on the market by C. A. Vokes & Co., of 38, Conduit Street, Regent Street, W.1. Known as the "Build Up," it is so designed that plates can be removed or added with but little trouble, and a full range of capacities between ·00025 and ·006 mfd. is made available. It is a stoutly-made little component, quite capable of standing up to many hundreds of "changes" without damage. It also loses no electrical efficiency in favour of versatility, for on test a "Build Up" representing various capacities held its charges well and gave every satisfaction.

Messrs. Vokes also sent us several of their new "Micamold" fixed condensers. These are "permanent" in nature, in more senses than one. They are about the toughest things in wireless we have yet examined. They are square in shape, and are formed of moulded Bakelite with hard brass tabs projecting through. Thus their plates are set in a solid, hard substance, have but an electrical contact with the outside, and are independent of atmospheric variations. These, too, on test proved to be thoroughly efficient, and their capacities were found to be very close to those stated in each individual case.

* * *

The 1926 catalogue issued by Messrs. Will Day, Ltd., 18 and 19, Lisle Street, London, W.C.2, is a production that will interest all amateurs. It contains beside details of numerous English products, a large range of American components. Not that we are in sympathy with the sweeping statement contained in the introduction, "American radio apparatus is far in advance of that of any other country in the world," for it is our opinion, and that of our resident American correspondent, that in many respects British manufacturers have not only caught up with America but have even overtaken. Nevertheless, Messrs. Day are to be congratulated on bringing the pick of America's radio gear within reach of the English amateur.

The new "Statuette" model Claritone loud speaker.

* * *

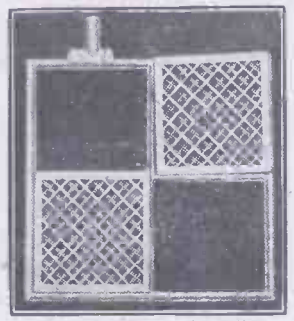
We have always viewed those crystal detectors for which absolute permanency is claimed with considerable suspicion; but, nevertheless, there is always the possibility that some day someone

(*Continued on page* 1080.)

APPARATUS TESTED.

(*Continued from page* 1078.)

will invent something really good in this direction. And that reminds us, we recently tested a "Lyn Din," a permanent detector manufactured by John Walker & Co., 1, Lancashire Court, New Bond Street, W.1. Now that Lyn Din has been in use for some time at odd periods, and is still giving good service. If it keeps this up for a few months, then it will easily have justified its retail price, which is but 1s.—not a high price for even a week or two's escape from the bondage of crystal scratching!



A Tungstoue accumulator plate partially assembled.

* * *

Messrs. J. & W. Barton, 22a, Virginia Street, Southport, have sent us a sample of their "Can'teross" connector. Sold at 5s., it should appeal to listeners who desire to incorporate in their receiving outfits a battery connector with which mistakes cannot be made once the initial connections have been completed.

An accumulator that will be new to the majority of our readers is the "Tungstone." An all-British production, remarkable claims are made for it by its manufacturers, the Tungstone Accumulator Co., Ltd., 5, St. Bride's House, Salisbury Square, London, E.C.4. These include, for instance, the claim that it will stand dead shorts without damage. We had have the opportunity of examining a Tungstone accumulator very thoroughly, and our opinion is that it does indeed include distinctly original if not entirely revolutionary points of design. In fact, the particular model we have in mind almost bristled with such, not the least intriguing being its removable plates. In about 15 seconds, with the assistance of a couple of spanners, the plates can be completely removed, *en bloc*. The plates from one cell can be lifted out and dropped into one of the other cells, if desired. No wood separators are employed, patent grooved supports which do not encroach to any considerable extent between the plates being a feature of the Tungstone. We have in our possession a 6-volt Tungstone which will be given some severe work to do this winter for car starting and lighting, so that we will be in a position to judge how it stands up to real hard work at the conclusion of a few months. In the meantime, we advise interested readers to obtain one of the Tungstone circulars—it will be found to contain a mass of information about that product, including details of special H.T. and grid bias units.

* * *

A very novel crystal detector was recently brought to our notice. It is known as the "Permec," and is made by Permec, Ltd., of Junction Place, Praed Street, W.2, and is retailed at 6s. By means of a most ingenious series of calibrated mechanical movements, every spot on the crystal and every degree of pressure of the cat's-whisker can be recorded with precision. Only two moving knobs are employed, but one of these performs most original double duties. The Permec is very well made and has a "guinea" finish. Messrs. Permec are to be congratulated on being able to produce a completely British article of this nature at such a reasonable price. Readers are advised to ask their dealers to let them examine this new detector; they will find it nothing if not interesting.

The "Revo" loud speaker—one of this season's new models.

RADIOTORIAL

All Editorial Communications to be addressed to The Editor, POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

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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 and 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 contributions to be addressed to The Editor, The Fleetway House, Farringdon Street, London, E.C.4. 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 Editor desires to direct the attention of his readers to the fact that, as much of the information given to the columns of this paper is of a technical nature and concerns the most recent developments in the Radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and trader would be well advised to obtain permission of the patentees to use the patents before doing so.

PATENT ADVICE FOR READERS.

The Editor will be very pleased to recommend readers of POPULAR WIRELESS *who have any wireless inventions to patent, or who desire advice on patent questions, to our patent agent. Letters dealing with patent questions, if sent to the Editor, will be forwarded to our own patent advisers, where every facility and help will be afforded to readers.*

TECHNICAL QUERIES.

Letters should be addressed to:
Technical Query Dept.,
"Popular Wireless,"
The Fleetway House,
Farringdon Street,
London, E.C.4.

They should be written on one side of the paper only, and MUST be accompanied by a stamped addressed envelope.

Queries should be asked in the form of the numbered questions: (1), (2), (3), etc., but may be accompanied by a short letter giving any necessary additional particulars as briefly as possible.

For every question asked a fee of 6d. should be enclosed. A copy of the numbered questions should be kept, so that the replies may be given under the numbers. (It is not possible to reproduce the question in the answer.)

IMPORTANT.—If a wiring diagram, panel lay-out or list of point-to-point wiring is required, an additional fee of 1/- must be enclosed.

Wiring diagrams of commercial apparatus, such as sets of any particular manufacture, etc., cannot be supplied. (Such particulars can only be obtained from the makers.)

Readers may submit their own diagrams, etc., for correction or for criticism. The fee is 1/- per diagram, and these should be large, and as clear as possible.

No questions can be answered by 'phone.

Remittances should be in the form of Postal Orders.

Questions and Answers

FRAME AERIALS.

E. S. A. (Acton, London, W.).—Has a frame aerial any advantage over an outdoor aerial?

It is far less efficient than a good outdoor aerial, and is useless for crystal set or single-valve working except under very special conditions.

Its disadvantages can be overcome with the aid of several stages of H.F. amplification, and then the strong directional properties of the frame aerial are sometimes of great value.

DRILLING EBONITE.

"CONSTRUCTOR" (Maidenhead, Berks).—When drilling ebonite, I find it difficult to start the drill at the exact point necessary for the spacing of valve legs, etc. What is the best method of ensuring that the drill works exactly from the centre marked?

(*Continued on page* 1084.)

RADIOTORIAL QUESTIONS & ANSWERS.

(*Continued from page* 1082.)

When the position has been marked off, a small hole should be punched for the drill to start in. All that is necessary is a light tap on the punch from a small hammer.

TYPES OF COILS.

R. N. (Rickmansworth).—In circuits where large duolateral coils are required, can basket coils be used instead ?

Yes, several basket coils with a total number of turns approximating that of the required duolateral coil can be connected up in series and clamped together, with quite good results.

SIGNALS IN NEAR-BY AERIALS.

F. S. E. (Weston-super-Mare).—How can I prevent a scratching noise in my 'phone every time my neighbour adjusts his crystal ? We are both using crystal sets.

If your aerial is close to that of your neighbour—which it probably is—try and separate it by as great a distance as possible, erecting it at right-angles to the other one, if possible. Failing this, suggest to your neighbour that he tries one of the crystal detectors now on the market which remain set and require no adjustment.

CARE OF ACCUMULATORS.

E. F. A. (Caterham, Surrey).—I am buying my first accumulator shortly, and as I have never had any experience of electrical work, I should be very glad of some hints upon the care of same. How should I treat the accumulator so as to ensure it is properly charged, at the correct rate, etc ?

We cannot do better than refer you to the following hints, which are supplied free by A. J. Stevens & Co., Ltd., to purchasers of their well-known accumulators :

"A new accumulator requires just a little care and understanding if it is to give good service in its later life. After it has delivered about three-quarters of its charge, send it to be re-charged, even if it is apparently good for many more hours. After its first or initial charge, please do not use it till you cannot get any more out of it.

"Tell the man who is charging it that it is a new battery, and to follow the makers' instructions. It will pay you in the long run to have the original acid removed and replaced by fresh. Never run the battery to exhaustion at any time, but special care must be taken until after the third or fourth charge. It is only after this period has elapsed that any accumulator is in its normal condition, and we cannot too strongly urge you to have just a little patience if you wish to obtain the best possible results from your battery.

"**These remarks apply equally to every make. The better the battery, the more care it deserves.**

"Replace spilt acid with fresh acid having a specific gravity of 1·225 at 60° F.

"Replace loss owing to evaporation with distilled water. The use of tap water will seriously affect the life of the battery."

CRYSTAL SET ALTERATION.

R. L. (Heston) submits a crystal circuit for criticism, and asks why he cannot receive the Paris time signals although he receives London very clearly.

Your circuit is quite correct, and for wave-lengths up to about 900 metres it should be very selective. Probably your loading coil is not of a correct value. A suitable one is as follows. About 130 turns of 26 S.W.G. should be wound on a cardboard former with 1½ in. centre diameter in basket fashion. Nine slots are required, and the wire may be taken through alternate slots to save room, if desired.

CUTTING OUT AN H.F. VALVE.

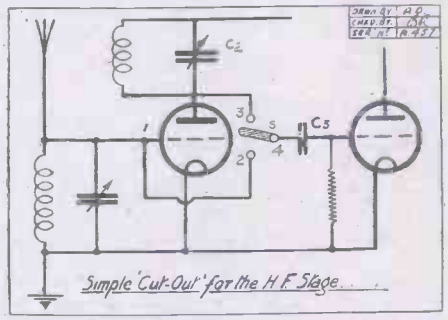
E. F. S. (Birkenhead).—I have a three-valve set (H.F., Det. and L.F.), the first two valves of which are very much upon the lines of the "P.W." Continental Set. The aerial coil (35 or 50) is tuned by a ·0005 variable condenser, and the 75-turn tuned anode coil is tuned by a similar condenser, but having a capacity of only ·0003 mfd. I find that when listening to Liverpool and the nearby stations the H.F. valve makes very little difference to the signal strength. For the sake of economy I should like to be able to switch out this valve, if it can be done without much trouble.

What is the best method to accomplish this, which involves but little alteration to the wiring of the existing set ?

The accompanying diagram shows a simple cut-out for the H.F. stage, employing a single-pole double-throw switch, or one of the switch-arm-and-two studs type.

To install the switch, first break the lead which connects the anode coil and condenser (C_2) to the grid condenser (C_3).

The grid condenser side of this lead is then joined



Simple Cut-Out for the H.F. Stage.

to the centre of the S.P.D.T. terminals (or to the switch-arm, as the case may be). The other end of the anode-coil-and-condenser-lead is taken to an end of the switch (marked 3 in the accompanying diagram).

It will be seen that when the switch is thrown into the "up" position it re-makes the connection which was broken.

To switch in the first valve, all that is necessary is to connect the remaining side or stud of the switch to the grid lead of the first valve. When the switch is in the "down" position the grid condenser is disconnected from the anode circuit and connected instead to the top of the A.T.I., and to the aerial.

It is, of course, necessary to turn off the filament rheostat of the first valve when this is not in use. And it should not be forgotten that when an H.F. valve is switched out of circuit it is necessary to reverse the leads to the reaction coil.

BROADCAST NOTES.

(Continued from page 1072.)

big receiver at Adastral House. Thus, there would have been nothing extraordinary in the announcement that the request to reopen Marconi House aerial temporarily had been turned down for perfectly sound reasons. But no, our pundits did another of their famous impersonations of the clam, and in the end have suffered a great deal in prestige.

Why should the Wireless Telegraphy Board work in secrecy as secluded as a grand chapter of Klu Klux Klan? It is a very necessary and important body which takes decisions affecting millions of people.

There should be publicity for all the decisions in which the interests of broadcast listeners are at stake. As for the B.B.C., while one readily admits the difficulty of their position, I find it a little hard to justify their attitude in the recent incident. Why all this deference to officialdom? Why all the agitated denials of what any intelligent and informed person knew to be the truth?

* * *

The B.B.C. and the Press.

During his evidence at the Broadcasting Committee, Lord Riddell, on behalf of the Press, mentioned that if the broadcasting authority were allowed to put out news before 7 p.m. then the Press would have to reconsider whether they would continue to allow the agencies to provide any news for broadcasting. The same would apply if the broadcasting authority were allowed to try to collect news on its own. Now, there was much more in this statement than meets the eye, and I am able to give the first published account of the basic facts and tendencies recognised by what is virtually a threat in reply to a threat.

Now the threat which started this exchange originated at a time last spring when an ineffectual endeavour was made to take advantage of the clause of the B.B.C. licence which enables the P.M.G. to grant another licence if he is convinced that the B.B.C. is carrying out its work inadequately. Certain foreign press organisations intervened on the ground that the B.B.C. news service was wholly inadequate and a way behind that given in other countries by radio. Their real reason, however, was to undermine the big groups now in control of the British Press.

Thousands were spent. Secret agents were about in all directions. There were certain minor repercussions in the Courts but no tangible result accrued. The great conspiracy failed in its immediate purpose, but the echoes have not yet died down. The P.M.G. became alarmed at the apparently inferior news facilities of the B.B.C. The B.B.C. became restive for an extension. The public were a little harassed. The Press saw a challenge but did not recognise the challenger. With all his wonderful acuteness Lord Riddell was unaware of the full effect of his threat. In the battle that is to come between what our American friends call "The real honest-to-God big man groups," broadcasting will be the determining factor. Lord Riddell's challenge should be to a foreign group; otherwise it is not aimed in the right direction. Watch the House of Commons in May!

Correspondence

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

'PHONE EXTENSION LEADS.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have a 1-valve set and it may interest your readers to know that by running cotton-covered wire (fine) from the ·002 fixed condenser across the 'phones, to 'phone terminals placed underneath the ends of the mantelpieces, it is possible to hear the broadcasted programmes with greater comfort and convenience in all the rooms of the house. The cotton-covered wire can be run along the edge of the ceiling, or along the wainscotting, or any part of the room which affords protection and where it will not be conspicuous, and tappings can be taken off to the adjoining rooms from the main circuit. The wire can be run between the door and the posts, and the former shut on to the wire, which must be slackened to allow it to be pressed into position, where it will remain if fixed and not pulled. Provided the wire is fixed it will not hurt, and if the door presses too hard upon it, this can easily be remedied. Of course, the insulation and connections must be good, and one has to tune in before taking the 'phones to another room. I have had this arrangement for a considerable time and it is most satisfactory using three pairs of 'phones.

Yours faithfully,
H. NORMAN.

The Cot,
Datchet, Windsor.

THE "P.W." CONTINENTAL SET.

The Editor, POPULAR WIRELESS.

Dear Sir,—Some few months ago I built the "P.W." Continental set and am pleased to report that its performance is well up to the usual high standard of "P.W." sets. Living, as I do, only two miles or so from 2 L O's aerial, I experienced difficulty in cutting him out when listening to other stations; so I have added a series wave-trap consisting of a ·0005 variable condenser shunted across a 30-turn basket coil, and as a further refinement one stage of L.F. amplification. This is a great improvement and I can now separate Stuttgart (446 m.) from Toulouse (441 m. ?), and the latter station from Belfast (440 m.). Also Oslo (382 m.) from Bournemouth (386 m.) and Brussels (202 m.) from Elberfeld (259 m.). The last two I can get on the loud speaker; but I find that fading is more in evidence on the lower wave-lengths.

Having calibrated my set, I can, in addition to the above, receive the following stations while London is transmitting: Berlin, Munich, Birmingham, Frankfurt, Ecole Supérieure, Rome, Glasgow, Breslau, Münster, Newcastle, Hamburg, Madrid, Petit Parisien, San Sebastian, and most of the German relay stations. All the above come in at good 'phone strength with the exception of Rome, whose output, I understand, has recently been reduced.

The coils used for the above are as follows: Aerial 60, anode 75, reaction 40. A.T.C. in series except for Berlin. I find it possible to get within about 20 metres of 2 L O's wave-length before this station is heard in the background. Recently at about 2.30 a.m. I tuned in four Americans. They were rather faint and I did not get their call signs, although some musical items came over well. No wave-trap was necessary or desirable for the above. I will now close with my best thanks to the designer of such an efficient set, and prosperity to POPULAR WIRELESS.

Yours sincerely,
WALTER N. NOTCUTT.

99, Hungerford Road,
Holloway, N.7.

THE TRINADYNE.

The Editor, POPULAR WIRELESS.

Dear Sir,—Mr. S. E. Cryer's letter in a recent issue, *re* the Trinadyne, induces me to write about that circuit endorsing all he says.

After experimenting with several circuits, I have made up the Trinadyne permanently, as I find it is the clearest and sweetest set I have ever heard.

The circuit is in "P.W." for May 2nd (Fig. 3). There is an error in that diagram—the A.T.C. should be ·001.

I put in switch to cut out last valve, used "Energo" and "Ferranti" for transformers 1 and 2 respectively, and the secondary of a little transformer for choke. All the variable condensers need verniers. I use Philips' valves.

Here, about six miles from 2 L O, that station comes in splendidly on L.S. with two valves, and 5 X X comes in equally well. With three valves these are too loud, though still clear and crisp. Radio-Paris is audible on L.S. with two and loud with three valves.

I have devoted only one evening to DX and then got 5 I T practically clear of 2 L O, Radio-Paris practically clear of 5 X X, and Hilversum quite clear. After 2 L O shut down, and the following came in: Madrid, Petit-Parisien (?), an Italian speaking station, a German station, and other stations were apparent, but owing to lack of experience I could not get them.

The set is stable and apparently does not "oscillate" easily, does not howl with 30-ft. 'phone leads, and is easy to handle though very delicate in tuning.

I too should appreciate a "P.W." investigation into this set, which I feel certain is ideal for local loud speaker work, as it is as clear as a bell and so easy to handle. Thanking you for the help I have had from your excellent paper.

Yours faithfully,
WM. R. C. MATTHEWS.

43, Deanhill Road,
East Sheen, S.W. 14.

P.S.—I find a cat's-whisker detector *essential* for DX, but a perikon excellent for local station.

THE ONE-VALVE REFLEX.

The Editor, POPULAR WIRELESS.

Dear Sir,—I should just like to add a word of congratulation to your already long list of compliments, this time regarding the "One-Valve Reflex," described in "P.W." No. 175, October 3rd, 1925.

I have made this set up twice, the first time on an old panel, using old components, a foreign D.E. valve and home-made coils. The only decent thing in the components was a new R.I. detector. Well, considering my components, I think you will agree results were very good. I am only about 2½ miles from 2 L O, and of course that station is uncomfortably loud at full strength on 'phones, and I could manage to work a "Baby" Stirling loud speaker distinguishably on London. Bournemouth was easily obtained, as also were Birmingham, Newcastle, and Manchester.

I can never manage to get Daventry. However, I put that down to my nearness to 2 L O.

But Sunday is what I class as "my day out." I can have a rare old shuffle over a good many miles, starting off with amateurs in the morning, B.B.C. stations in the afternoon, and I can get Continental stations quite easily on Sunday evening before 2 L O comes on. That is one peculiarity regarding this set; if I get a distant station before London comes in I can hold it, but if London is already on I have a rare job to "reach out"—though I can eventually get somewhere else, although London is in the background all the time. This must, of course, be due to my nearness to 2 L O. There is no denying that it is a wonderful small set and will honestly be worth anyone's while making up. For volume and range it is a marvel and you really are to be congratulated by

ANOTHER REGULAR READER.

129 Flat, 2, High St.,
Shadwell, E.1.

THE "POPULAR WIRELESS" CONTINENTAL BROADCASTING TIME-TABLE (*continued from page* 1076.)

Transmiss'n Starts G.M.T.	Transmiss'n Ends G.M.T.	Station and Call Sign	Wave-length in metres	Frequency kilo-cycles	Days of the Week	Nature of Transmission
21.30	22.10	Dortmund	283	1060	Sunday	Dance.
21.30	24.00	Radio-Toulouse	441	680	Weekdays	Concert or Play.
21.30	22.45	Berlin	505&576	594; 521	Saturday	Dance.
21.30	22.45	"	505&576	594; 521	Weekdays and Sundays (except Saturday).	Chess and Sport.
21.40	21.50	Lyngby (O X E)	2400	125	Weekdays	Weather.
22.00	23.30	Cassel*	275	1091	"	Concert.
22.00	23.30	Frankfurt-on-Main	470	638	"	Relaying Cassel
22.00	24.10	Bilbao (Viscaya) (E.A.J.11)	383	784	Daily	News, Concert.
22.00	23.10	Radio-Cima (E A J 19)	402	745.8	Weekdays	Speech, Music.
22.00	23.00	Hamburg*	395	759	Sunday	Dance.
22.00	24.00	Madrid (E A J 7)	373	804	Mon., Wed. Fri.	Concert.
22.00	21.00	Madrid (E A J 6)	392	764	Tuesdays and Fridays	Concert etc.
23.00	23.25	Norddeich (K A V)	1800	166.6	Weekdays	Weather, News.
23.00	24.00	Radio-Geneva	1100	272	"	Dance.
23.00	01.00	Milan	405	606	Daily	Testing.
23.00	24.00	Vienna (O T W)	400	750	"	Tests (see Notes).
24.00	01.00	Seville (E A J 5)	350	855	Sunday	Concert.

HOW TO ADJUST A CRYSTAL SET.

HOW many people can adjust a crystal set properly? Not one in a hundred! It is amazing that such a simple and common adjustment should be done "blindly" when there is a logical and proper way to do it, which every crystal-set owner ought to learn. Here is the secret.

Every ordinary crystal set has two different adjustments, which must both be perfectly made before the set will receive perfectly. First of all, the tuning. You ought to mark the dial of your set so that it is always adjusted to the point where it will slightly weaken signals if shifted even half a degree. Most sets will receive the local station over quite a large portion of the dial-markings, and the first thing to do is to find out to within half a degree which is the very best point for maximum signals.

Wave-length Tuning.

Suppose you are dealing with a set which will tune in, say, 2 L O, anywhere between 20 and about 50 degrees. You can only adjust the tuning properly upon *weak* signals, so the first thing to do is to find a bad spot on the crystal which will hardly let any sound at all come through. Now the condenser-dial readings will be narrowed down from a large reading (20 to 50) to a small reading, say between 32 and 36. Beyond these points nothing will be heard, and the exact adjustment lies half way between the extremes. A little more juggling with the bad spot on the crystal will reduce signals still further, and eventually you will be able to fix with certainty the exact tuning adjustment as lying between, say, 34 and 35, as only between these figures can 2 L O be heard. Then mark the dial at 34·5, and remember that no juggling with this will in future be necessary; your set will be correctly tuned.

Then Enjoy the Concert.

The best possible position for the cat's-whisker can be found in a very similar way. Throw the tuning temporarily out until signals are weak. Tickle the crystal until the spot most sensitive to these weak signals has been found, and then tune back again to the 34·5, or wherever it may be, and listen-in, with the knowledge that if you tried for hours you would never get louder signals than your well-tuned, well-adjusted set is giving you.

PHOTOGRAPHS.

Readers are invited to submit photographs of wireless interest for publication in "Popular Wireless." Every photograph accepted and published will be paid for at the rate of 10/6 per photo.

TECHNICAL NOTES.

(Continued from page 1058.)

its action entirely on the pure electron stream from the heated filament, most if not all of the troubles would disappear. That his theory was well grounded there is now no need to point out. Many of the very great developments of wireless during the past few years have been made possible by the introduction of the "hard" valve.

The patent has experienced a multitude of vicissitudes and during its comparatively short life has not only been frequently contested, but has actually been once revoked.

Stabilising H.F. Stages.

Everyone who uses tuned H.F. amplification knows the tendency there is to self-oscillation in such an amplifier, particularly on short wave-lengths. There are many ways of checking this tendency, but one particularly simple method is to use a circuit which extracts a portion of the energy from the tuned circuit and dissipates the same without reacting on the receiving circuit. The extra circuit may consist of a few turns of wire, closely coupled to the H.F. transformer and shorted by means of a non-inductive resistance. For the latter purpose an ordinary rheostat, of fairly large maximum resistance value, will be found to be quite suitable. The principle is perfectly simple: the coupled coil merely absorbs a proportion of the energy and dissipates it in the resistance. The number of turns on the coil will generally be few, and the value of the rheostat must be found by trial. The number of turns may be increased (with consequent increase of incoming signal strength) until the self-oscillation trouble disappears.

Use Good Ebonite.

A reader sends me an account of his experiments with different types of circuit, the sets being in all cases mounted upon a three-ply-wood panel. He remarks that, contrary to popular belief, such a wood panel works perfectly well, and that there would seem to be a good deal of "nonsense" talked about surface leakage, bad ebonite, etc.

Whilst agreeing that perfectly good results can often be obtained by the use of really dry three-ply wood, especially if the surfaces are carefully shellac-coated, I am afraid I cannot agree that the results will, in general, be equal to those which would be obtained, in similar circumstances, with an ebonite panel of good quality. For one thing, a good deal depends upon the nature of the circuit and upon the disposition of the parts on the panel, the conditions in which the set is used, and so on.

Personally, although it may be admitted that there is a certain amount of—perhaps pardonable—elaboration in the advertisements of many wireless components, I have always found that it pays to use really good quality ebonite for the mounting of the parts of a set, not only from the point of view of the appearance of the finished article, but from that of its functioning, too. There are quite enough sources of distortion, loss, and trouble in a wireless receiver, without asking for more, and the preference of a good ebonite panel to a doubtful or inferior one is a simple precaution that is, in my opinion, well worth while.

R/R

The finest Loudspeaker Valve ever produced.

THE P.M.4 VALVE is the real valve for many happy radio nights. It gives pure and powerful volume free from microphonic noises.

In addition, the wonderful "N" FILAMENT of the P.M.4 requires only ONE-TENTH AMPERE from a 4-volt accumulator, or 3 dry cells, which means a reduction to ONE-SEVENTH in the cost for re-charging and only two journeys *instead of fourteen.*

The P.M.4--price 22/6.

GET ONE FROM YOUR DEALER

Mullard

THE · MASTER · VALVE

Printed and published every Thursday by the Proprietors, The Amalgamated Press (1922), Ltd., The Fleetway House, Farringdon St., London, E.C.4. Advertisement Offices, Messrs. J. H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4. Registered as a newspaper, and for transmission by Canadian Magazine Post. Subscription rates: Inland and Abroad, 19/6 per annum; 9/9 for six months. Sole agents for South Africa: Central News Agency, Ltd., Sole Agents for Australia and New Zealand: Messrs. Gordon & Gotch, Ltd.; and for Canada: The Imperial News Co. (Canada), Ltd. Saturday, January 2nd, 1926. R/R

POPULAR WIRELESS AND WIRELESS REVIEW, January 9th, 1926 REGISTERED AT THE G.P.O. AS A NEWSPAPER.

THE TRUTH ABOUT THE GREAT FIRE AT 2 0 0.

Popular Wireless

Every Thursday PRICE 3d.

No. 169. Vol. VIII.

and Wireless Review

January 9th, 1926

Scientific Adviser : SIR OLIVER LODGE, F.R.S., D.Sc.

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How to Make

THE "P.W." A.1 CRYSTAL SET,

and

A "P.W." NEUTRODYNE THREE-VALVER.

Aerial-Earth Efficiency.

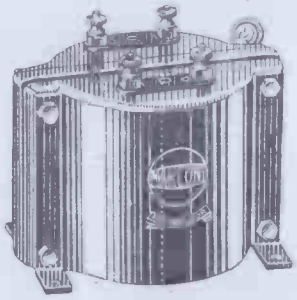
Broadcasting Playwrights.

Etc., etc., etc.

One of the large inductance coils in course of assembly at the great Rugby station is shown in the above photograph.

Marconiphone and STERLING RADIO

Marconiphone and Sterling Receiving Sets, Loud Speakers and Components are supreme. Correct in design, made of the finest materials and perfect in performance, they give unfailing satisfaction to users and get the best out of radio under all conditions. *Descriptive literature on request.*

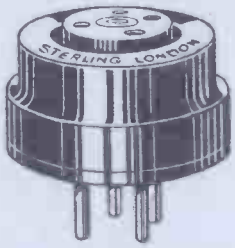


The MARCONIPHONE "IDEAL" RANGE OF TRANSFORMERS.

A type for every specific purpose. With their use very extensive amplification is possible without distortion. "Ideal" Transformers undergo a special impregnating process using *Marconite*, the most perfect insulating material obtainable and non-corrosive. Each Transformer is within 5% of the guarantee curve.

"IDEAL" TRANSFORMERS are supplied as follows:—Type "A," ratio 2·7 to 1; Type "B," ratio 4 to 1; Type "C," ratio 6 to 1. Type "E," ratio 8 to 1. Each complete in metal case (as illustrated) **30/-**

"IDEAL JUNIOR" TRANSFORMER. This type has been produced in a ratio of 3 to 1, for it was found possible at this ratio only to successfully retain in a simplified form the standard "Ideal" principles of construction. Supplied at the popular price of **25/-**



STERLING "NON-PONG" VALVE HOLDERS.

Obviate microphonic noises and lengthen the life of the valves. Valve holder **4/3**

Adapted (as illustrated) .. **5/-**

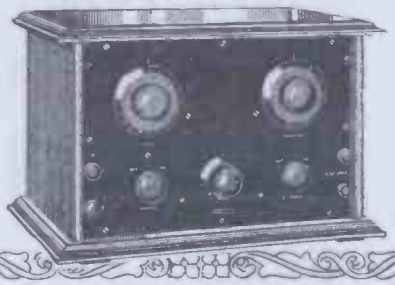
STERLING "MELLOVOX" LOUD SPEAKER.

The Popular Hornless Type. **48/-**

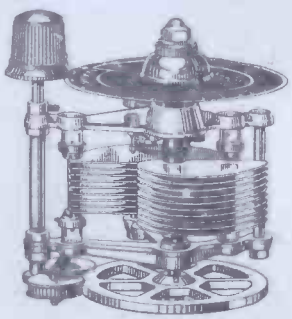
Faithful in reproduction, mellow in tone and ample in volume for all home requirements. In brown, blue, mauve or black, with gold floral designs on the diaphragm.

MARCONIPHONE TYPE 31 RECEIVER (Three Valves). Guaranteed one hundred miles loud speaker range, generally exceeded under normal conditions. Set, inclusive of valves, accessories and royalty, for broadcasting wave-lengths **£21-17-0**

Fitted with coils for Daventry reception instead of broadcasting coils **£22-2-0**



At all Radio Dealers.



The New STERLING "MINILOSS" VARIABLE AIR CONDENSERS.

These condensers have a high maximum to minimum capacity ratio. The novel slow motion movement has a ratio of 7 to 1, it is very smooth in operation and allows no back-lash or grating.

"Pyrex" glass plugs are used for insulating the fixed plates; these plugs are outside the electrostatic field, consequently High Frequency losses are reduced to the minimum.

The moving vanes are so mounted that there can be no side-play; they are attached permanently to the framework with a flexible connection. This obviates the possibility of grating due to bad or high resistance contact, an essential feature when working on very short wave-lengths or Super Receivers.

One hole is needed for fixing and another small one for the control spindle, allowance is made for mounting on any thickness of panel up to $\frac{3}{8}$-inch.

Made in Three Capacities:

.00025 mfd.	Price 21/-
.0005 mfd.	,, 24/-
.001 mfd.	,, 30/-

STERLING "LILLIPUT" HEADPHONES.

A veritable masterpiece of headphone efficiency. Clear in tone, light in weight, and extremely comfortable. Easily adjustable to any head. The most efficient, inexpensive 'phone obtainable. Price **20/-**

THE MARCONIPHONE COMPANY, LIMITED

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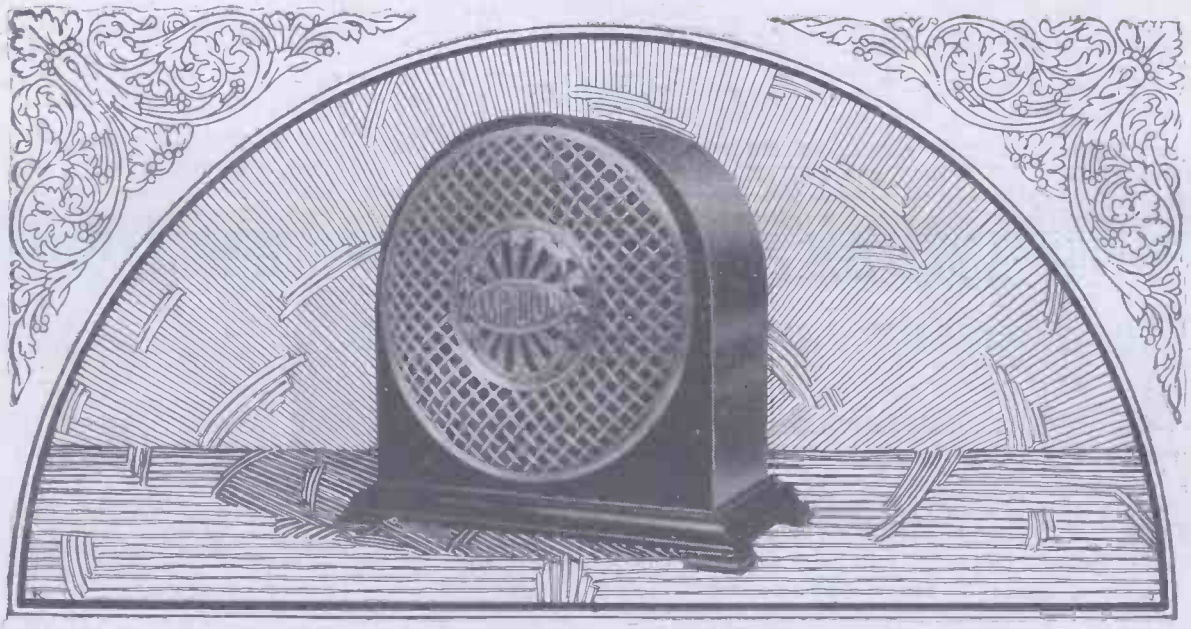

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The Natural Tone Loud Speaker

Pure, smooth, natural tone and realistic reproduction, combined with artistic appearance and compact form, are qualities which render this unique amongst contemporary instruments. Totally different in design, in appearance, and in results, Radiolux is a revelation in loud speaker quality.

THE WORLD'S STANDARD **AMPLION** WIRELESS LOUD SPEAKER

Available in two sizes and in various distinctive finishes from all AMPLION STOCKISTS, Radio Dealers or Stores.

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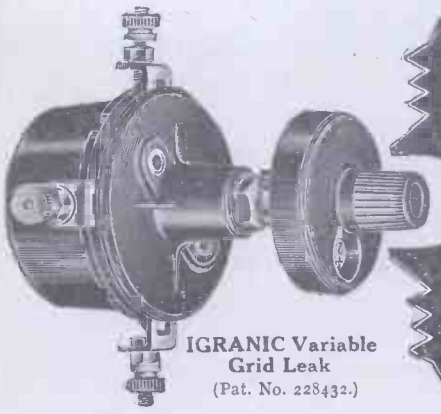
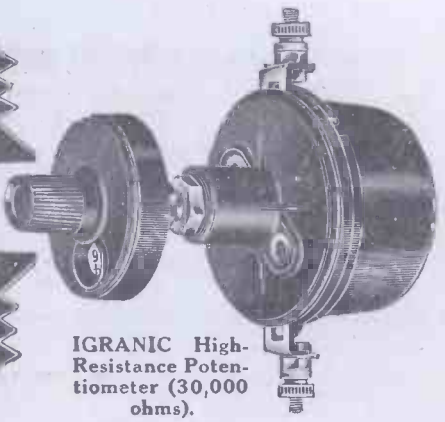
FOR THE FIRST TIME IN LOUD SPEAKER HISTORY SCIENCE AND ART GO HAND IN HAND

IGRANIC
Fixed Grid Leak
(Regd. Design No. 716072.)

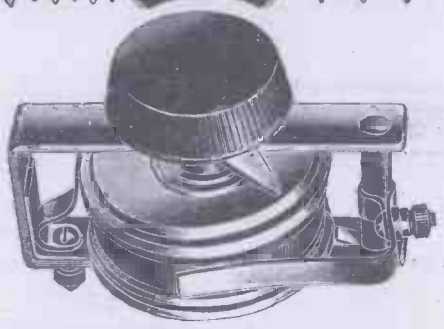
4 aids to efficiency



IGRANIC Variable Grid Leak
(Pat. No. 228432.)



IGRANIC High-Resistance Potentiometer (30,000 ohms).
(Pat. No. 228432.)



IGRANIC Low Resistance Potentiometer (300 ohms).
(Pat. No. 218604)

HERE are four IGRANIC RADIO DEVICES which will add to the efficiency of your receiver—because they ensure that the valves operate under the most favourable conditions.

To secure maximum sensitivity, with a high degree of stability and distortionless reproduction of speech and music, it is *essential* that your valves should function under the *correct* conditions. These four IGRANIC RADIO DEVICES enable them to do so.

Upon your choice of circuit will depend the particular components which you require—but whatever your requirements may be, always specify

RADIO IGRANIC DEVICES

Write for List 2930.

IGRANIC ELECTRIC CO., LTD.,
149, Queen Victoria St., London. Works: Bedford.
Branches: Birmingham, Bristol, Cardiff, Glasgow, Leeds, Manchester, Newcastle.

IGRANIC Variable Grid Leak
(*Patent No.* 228432)

constitutes a distinct advance in grid leak design and provides for a smooth and continuous variation of resistance from 0 to 5 megohms, thus enabling the highest efficiency to be obtained under all conditions of reception. The special method of manufacture and the composition of the resistance element and construction of the moving contact combine to make this variable grid leak exceptionally reliable and constant in operation.

The conducting parts of the Igranic Variable Grid Leak are well separated from the control knob, thus eliminating hand capacity effects.

Single hole fixing.

Fitted with Indigraph Knob and Dial, as illustrated .. Price **6/3**
Fitted with Control Knob only .. .. „ **5/6**
Without Knob or Dial, plain spindle only .. „ **5/-**

IGRANIC Fixed Grid Leak.
(*Regd. Design No.* 716072)

links accuracy with reliability in operation and great adaptability.

The resistance element is composed of a special compound which, in conjunction with the novel method of assembly, ensures absolute silence and constancy in operation.

A distinctive feature is that it is adaptable to various forms of mounting, and as easily interchangeable, enabling other values to be rapidly substituted. Conical ends allow of Igranic Fixed Grid Leaks being mounted in standard types of clips, or, if preferred, the round portions of the terminal ends may be slipped into the clips which are provided on certain makes of grid condensers.

Supplied in the following resistances: ·05 megohm, ·1 megohm, ·2 megohm, ·5 megohm, 1·0 megohm, 2·0 megohms, 5·0 megohms.

Price complete with clips and fixing screws, and with two special spade terminals, **2/3** each.

IGRANIC High-Resistance Potentiometer (30,000 ohms)
(*Patent No.* 228432)

This component is suitable for all the purposes to which an ordinary low resistance potentiometer is applicable. If used in H.F. circuits, the use of a fixed condenser of about ·006 mfd. in shunt across the variable contact and the negative end of the resistance is recommended strongly in order to bypass the H.F. currents. It is particularly recommended for use with grid cells for the control of potential applied to the grids of low-frequency amplifying valves. Owing to the high resistance value current consumption is very low.

Very smooth and even adjustment enables critical variations of grid potential to be made and ensures silence in operation.

Single hole fixing.

Fitted with "Indigraph" Knob and Dial .. .. Price **6/3**
Fitted with Control Knob only .. .. „ **5/6**
Without Knob or Dial (plain spindle only) .. .. .. „ **5/-**

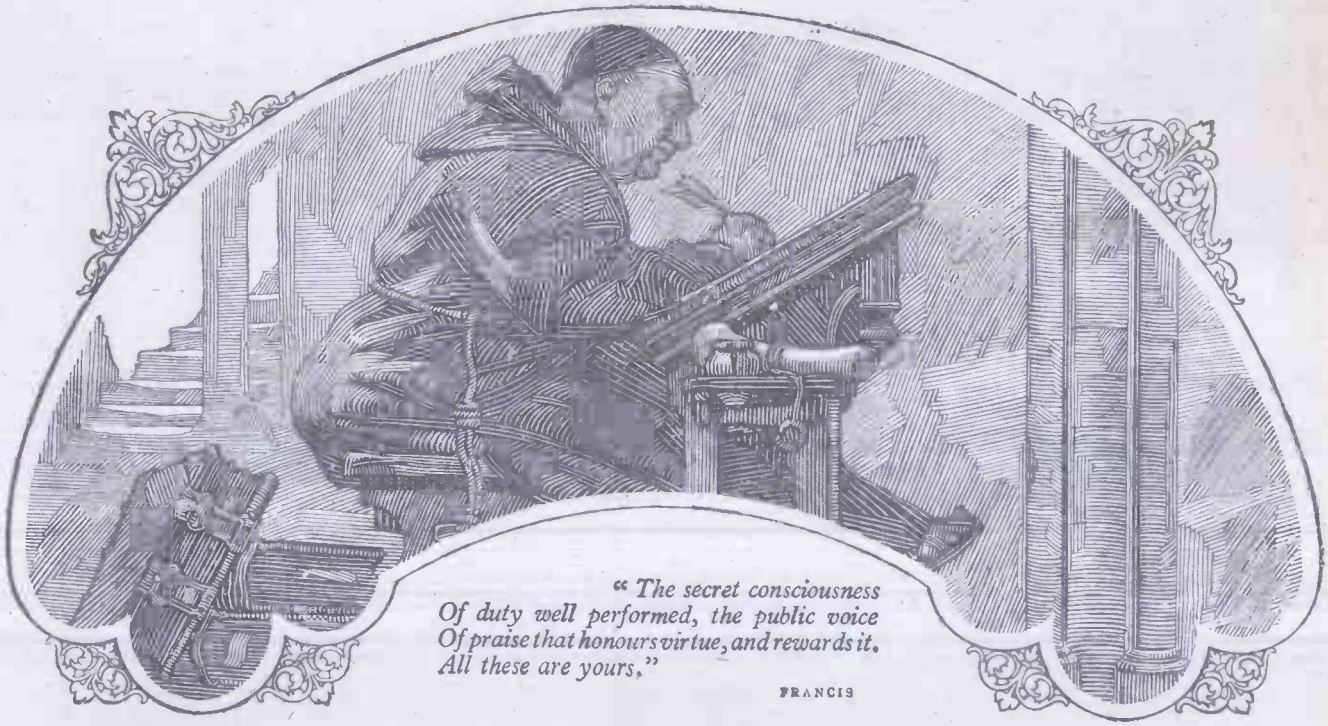
IGRANIC
Low-Resistance Potentiometer (300 ohms)
(*Patent No.* 218604)

Certain types of crystals give better results when an initial potential is applied across them. For this purpose the Igranic Potentiometer gives the fine adjustment for perfect reception.

For valve circuits its use permits the grid potential of H.F. valves to be adjusted to the most favourable value for the particular type of valve used, and any tendency to oscillate will generally be corrected by this means.

Supplied with full instructions and drilling template.

Fitted with Knob and Pointer (as illustrated) **5/6**
Fitted with Igranic 2" combined Knob and Dial .. **5/10**



"The secret consciousness
Of duty well performed, the public voice
Of praise that honours virtue, and rewards it.
All these are yours."

FRANCIS

Of Duty well performed . . .

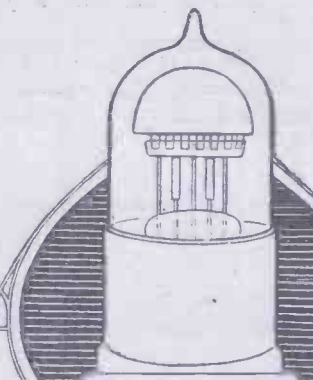
THE monk in his cell—the worker at the bench. Between these two a great gulf, yet by one common bond they are united. The bond of Duty. No monk ever possessed more enthusiasm for his tasks in life than those loyal workers—men and women alike—engaged in the business of making Cossor Valves. Without their co-operation—so cheerfully and willingly given—the nation-wide reputation for long service and dependability enjoyed by Cossor Valves must inevitably suffer.

Whether you buy your Wuncell Dull Emitter in Eastbourne or Edinburgh, in Canterbury or Carlisle, its unique standard of performance will be worthily and creditably maintained.

Long life—exquisite purity of tone—unequalled sensitiveness—supreme economy of operation—all these features are ensured in the Wuncell by reason of its patented design and construction. Only the arched filament in combination with a hood-shaped Grid and Anode—by utilising almost the whole of the electron stream—can achieve such magnificent and unparalleled results.

For 2-volt Accumulators.

W.1. For Detector and L.F. use Consumption : .3 amp.	14/-
W.2. (With red top) For H.F. use Consumption : .3 amp.	14/-
W 3. The Loud Speaker Valve Consumption : .5 amp.	18/6



For 2, 4 or 6 Volts.

W.R.1. Similar to W.1 but with special resistance which can be short-circuited when not required	16/-
W.R.2. Similar to W.2 but with resistance as above	16/-

A. C. Cossor, Ltd. Highbury Grove, N.5

Cossor Wuncell W.1. Valves

Gilbert Ad. 4299.

Popular Wireless

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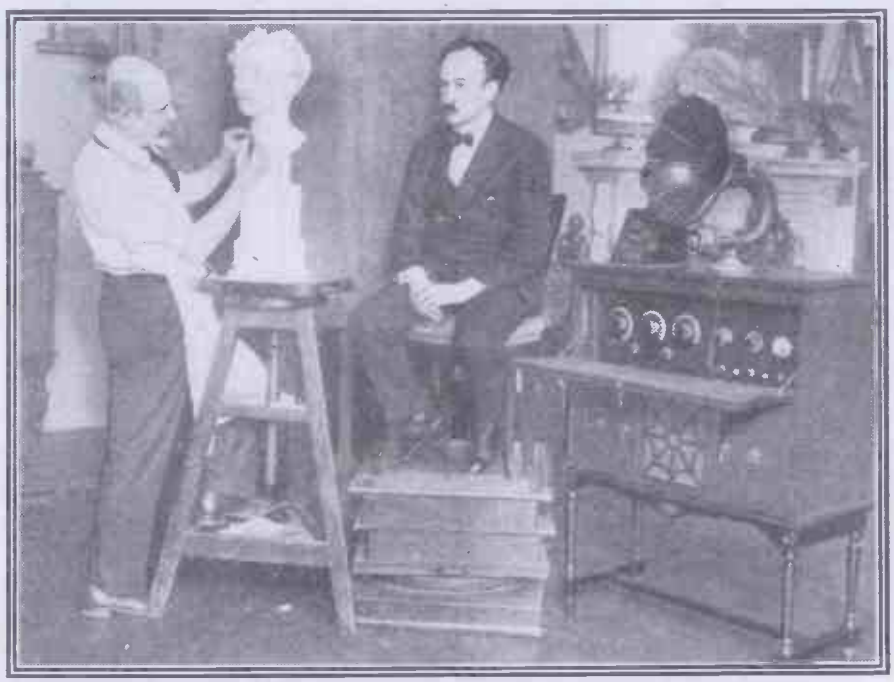
RADIO NOTES AND NEWS.

Ex-Premier and "P. W" Premier Set—Sir Harry Lauder—The Wireless Compass—The Overcrowded Ether—Moscow Missionaries—A Radio Round-up.

Ex-Premier and the "P.W." Premier Set.

BEFORE he set sail for Ceylon in search of a well-earned rest, Mr. Ramsay MacDonald 'phoned up Fleetway House to report upon the behaviour of the "Premier Set," which had been installed at his Hampstead residence. He had been listening in, he said, and enjoyed it greatly. In fact, he was quite sorry to leave his new-found friend, and looked forward to enjoying many pleasant hours with the set upon his return from the East. (The set was designed for loud-speaker results from Daventry and London, and full constructional details of it were published in "P.W." 185.)



The latest use for radio. Both model and artist find wireless music an aid during the long sittings.

Wireless for Trains.

GERMANY is arranging a public service of wireless telephone communication from trains travelling at full speed. Starting in a few days, the express trains between Hamburg and Berlin will inaugurate the service. Passengers will be able to put a call through to friends and business acquaintances as easily as if they were at home. As soon as possible the service will be extended to other lines.

Can't the British trains use wireless, too?

Sir Harry Lauder.

WHAT a splendid broadcaster is Sir Harry Lauder. It is good to know that in a few months he will be on the air again, for he is one of the few famous entertainers who succeeds in putting personality "over the ether" as effectively as over the footlights. Listening to him was like listening to Wendall Hall, the great American radio star—they both have the "wireless presence," which makes one forget the loud speaker for the moment, and creates in its stead the illusion that they are in the room.

What Causes "Fading."

SOME extraordinary figures have been published recently by the U.S. Bureau of Standards, in connection with radio research. According to the report in the "Scientific American," the most "startling conclusions are in reference to fading. At all distances greater than 50 miles from a station actual tests showed that the received wave intensity is continuously fluctuating, the variations being as great as 100 to 1." No wonder these stations are difficult to "hang on to" sometimes.

The Postmaster-General and Mr. Ford.

I HAVE received a long and impassioned letter from Mr. R. M. Ford, of Albert Gate, S.W.1. with regard to the recent wireless prosecution which he suffered at the hands of the Postmaster-General. Mr. Ford is not one whit discouraged by his experiences at Marlborough Street Police Court—in fact, he seems to be contemplating the next round with positive zest. And he doesn't mean to give in until he has used the last shot in his locker—or, should I say, the last pint of petrol in his tank?

The Wireless Compass.

ON January 15th, an experimental night aeroplane service will be inaugurated between Croydon and Paris. The pilot, instead of watching the needle of an ordinary compass, will listen in to a wireless compass. At regular intervals during the flight distinctive wireless signals will be transmitted, which can easily be picked up by the pilot *if he keeps on his course.*

Experimental Night-Flying.

BY means of a powerful wireless set and wing-coils in the aeroplane, the latter can be made to act like a frame aerial. So long as it is pointing towards the desired station the signals will come through all right, but a deflection from its course will weaken the wireless received by its aerial.

The air-plane chosen for this experimental night flying (which at first will be limited to a cargo service), is the Vickers-commercial machine, fitted with two Rolls Royce engines.

The Swing of the Pendulum.

HAVE you noticed that the horse-collar coil, of spiral-staircase dimensions, is at last going out of fashion?

(*Continued on page* 1094.)

NOTES AND NEWS.

(*Continued from page* 1093.)

Fortunately, "P.W." never lost its head about these monumental crosses between a birdcage and a rat-trap—as some of our contemporaries did—and now the thin-wire coil is being solemnly re-discovered!

I think I've tried every kind of coil known, from a transmitting inductance to No. 46 gauge S.S.C., and in my opinion they are all much of a muchness, except the one that you can't lay your hands on when you want it—invariably that would be just the coil for the job in hand, if only you could find it!

Dignity in the Children's Hour.

YOU know how the critics grumbled at one time because the Uncles (and Aunties, too, for that matter) were too "kiddish" during the Children's Hour? Well, the other afternoon I heard one of the London Uncles trying to enjoy himself and remain quite dignified at the same time—with disastrous results. Generally he is a young and rather-jolly uncle, but his dignity aged him audibly, and made him sound like old Uncle Tom Cobley and all.

Another Unlicensed Listener Fined.

YOU know the keen and critical eye which a policeman turns upon an unlicensed dog at this time of the year? Well, that is how they are beginning to look at aerials! A Kentish Town listener noticed this recently, when he had to pay ten shillings fine under the Wireless Telegraphy Act! The prosecution stated that there was no excuse for anyone pleading ignorance, and in the interest of the people who paid for their licences the P.M.G. felt it was necessary to prosecute all those who failed to take out a licence. Verb. sap.

Curing "Baby's" Cold.

IF your loud speaker has developed a "cold," it is a good plan to examine the diaphragm. A New Cross reader, in a cheery letter of good wishes, tells me that happening to remove the horn from his "Baby," he was astonished to find a large moth wedged between the horn and the diaphragm! How it managed to get down the small neck was rather surprising, but having arrived it evidently opened its wings and cut off its own retreat. The poor little thing probably died in the middle of one of those talks!

The Overcrowded Ether.

"BROADCASTING in general is now face to face with what might be called the 'ether traffic problem,'" says Mr. Norman Edwards, Editor of POPULAR WIRELESS, in an important article in the "Observer."

The writer frankly summarises the great changes which Continental broadcasting has undergone during the past year in the following words:

Radical Alteration Needed.

"AT first it seemed as though the work of the International Radiophone Bureau was going to assist in a solution of the problem, but after some weeks' observation of the work of the bureau, the impartial critic of broadcasting is forced to the conclusion that nothing but a radical alteration in the whole system of British broadcasting, and, possibly, in Continental broadcasting, will improve conditions."

The Broadcasting Committee.

THE deliberations of the Government's Broadcasting Committee were, of course, interrupted by the Christmas Holidays, but I hear that there is to be a steady New Year push, and the report will be made as soon as possible. It is a great pity that the illness of Mr. Kipling has prevented the famous author from attending, for his appointment to the Committee was one which listeners everywhere approved.

Moscow Missionaries.

ACCORDING to a writer in the "Observer," special anti-religious lectures were to be broadcast from the Moscow wireless station upon Christmas Day.

Did any of my readers pick up this charming effort to promote good will on earth and peace in the air?

SHORT WAVES.

"It is still too soon to estimate the cultural effects of wireless. But already it is clear that broadcasting will not go the way of the cinema; will not sacrifice its artistic possibilities for the sake of a cheap and easy popularity."—"The Outlook."

* * *

"Listeners-in are potential dead-heads."—The Chairman of the Entertainment Organisations Joint Committee (in evidence before the Broadcasting Committee).

* * *

"The B.B.C. experts probably exaggerate the value of some of their more serious endeavours. Their potted science, history and economics may conceivably light eternal fires in a bosom here and there, and embark some eager mind on a course of genuine study, but we fancy that most of their auditors switch off the valves when an educational item is announced."—"The New Statesman."

Revelry by Radio.

THERE seems a pretty general agreement that radio acquitted itself well during the holidays. After all, what could be more companionable than a crystal-set, or hug you tighter than some 'phones do? Think how a lonely soul is encouraged and enheartened when a cheery voice hails him as "Hello, Everybody"—specially if he happens to be practically nobody!

So when the experts tell you what a wonderful new thing radio is, don't forget its still more wonderful *old*-world jollity, coming down from the chimneys and cheering everybody up just like Father Christmas himself!

The "P.W." Two-Valver.

WRITING from South Farnborough, Hants, a reader says: "I have just made the "P.W. 2-Valver" (described in your issue of October 24th, 1925), and I think the results are really wonderful. London (35 miles) comes in loud on the loud speaker, Bournemouth (72 miles) is fair, and Daventry is almost too loud." A Dutch valve was used as detector, and a Cosmos Shortpath as amplifier.

A Radio Round Up.

IT is reported that there has been a gigantic radio-round-up at Aberdeen. The "Daily Express" says that *six hundred* summonses have been taken out against Aberdonians suspected of possessing unlicensed wireless sets. News of the issue of the summonses caused a rush for wireless licences, but most of the applicants said they were for new sets!

100 Miles of Earth Wire.

SOME idea of the great power used by the gigantic new P.O. wireless station at Rugby, can be gained from the fact that this station is about 30 times as powerful as 5 X X. The earth system consists of approximately *one hundred miles* of copper wire!

The frequency of the wave transmitted is unusually constant, as it is derived in the first instance from a tuning-fork, the ninth harmonic of which is used to govern the transmission-frequency.

Relaying America.

I SEE that Captain West, of the B.B.C., has been writing in a somewhat pessimistic strain about relaying American programmes. He says: "It is a curious thing that, whereas this time last year and also the previous year, American stations could be heard easily on their normal broadcasting wave-lengths on any night from midnight to 3 a.m., this year the reception of American stations on these wave-lengths has been extraordinarily unsatisfactory."

Tuning-in Transatlantic Stations.

THIS experience of Captain West's seems at variance with results obtained all over the country by "P.W." readers. I have before me, for instance, a letter from Bideford (a notoriously difficult district for long-distance results), which says: "Using H.F., Det., and L.F., on Monday morning, seven Americans were tuned in, including W L W (Cincinnati, Ohio) and W C B D (Zion City, Illinois)." This letter continues:

3,000-Miles on One Valve.

"USING the same number of valves on Tuesday morning from 12.30 till 4.30 a.m, *ten* U.S. stations were heard, which were as follows:—W G Y, W B Z, W P G, K D K A, W F T, W A A J, W H A K, W I L W, W T A M and W H A B. Four others were heard but not identified."

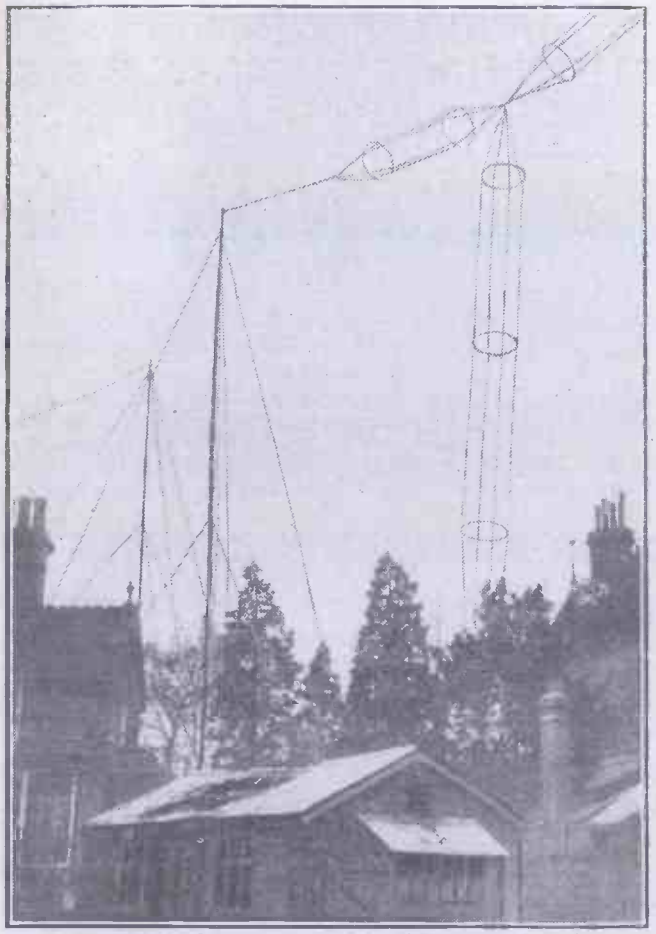
And just to show that even in the English Channel American stations can be received upon *one-valve* sets, here is an extract from a letter posted at Cowes. "At 12.15 a.m. G.M.T. I picked up W G Y at good 'phone strength, and also another station whose call-sign I could not hear. It was undoubtedly an American station, as a 10.00 o'clock time-signal was transmitted at about 3.00 a.m. G.M.T. The set is a straight one-valver (D.E.)."

Hamburg on the Loud Speaker.

HASN'T Hamburg been handing out the aerial-amps. lately? Several readers have remarked upon the steadiness of this station, and one, writing from Plumstead, says: "I can tune in Hamburg any night (cutting out 2 L O) at fair loud-speaker strength. I use the one-valve Chitos, with one stage of L.F. added, which works loud speaker well—you can hear 2 L O all over the house!"

On favourable nights this reader also "pulls in" Rome on the loud speaker.

ARIEL.



A photograph of 2 O O taken after the fire which destroyed the station.

THE TRUTH ABOUT THE GREAT FIRE.

"Much ado has been made about nothing."—

By "ARIEL." Capt. Eckersley.

In this article we publish the true facts regarding the fire at 2 O O, as given to "Ariel" in an interview with the Chief Engineer of the B.B.C.

TWO days after the disastrous fire at the experimental station belonging to the B.B.C.'s chief engineer, I discovered Captain Eckersley in his handsomely furnished office with the big windows overlooking the Thames. In the distance I could see, through mist and rain, the electric signs twinkling their glad announcements, urging me to use G.P.O. sauce, etc. Farther still, I could see Watney's brewery. However——

"A cigarette?" said Captain Eckersley.

"Thanks, I will," I murmured gratefully.

"Mind where you throw the lighted match," said Captain Eckersley, somewhat mournfully.

Then he told me the whole story of the burning down of 2 O O, the facts of which had been somewhat misunderstood.

Valuable Apparatus Lost.

"Much ado has been made about nothing," he said. "I am bewildered by the interest taken in the accident. It was purely a private station owned by my cousin, Mr. Drysdale Kilburn, and myself. It was a source of interest to me, and it amused Mr. Kilburn. It also interested Mr. Kilburn as much as it amused me."

2 O O came into existence in October, that is, roughly two months ago. It was situated in the grounds of Derby House, Hendon, the residence of Mr. Drysdale Kilburn.

"We erected it together as a purely private arrangement," the chief engineer of the B.B.C. told me. "It was mainly to enable me to keep my hand in. Here at the B.B.C. I never get a chance of switching a switch or tinkering about with a valve. I was able to go to Derby House once a week and make experiments, and that was the real reason of 2 O O's existence. The report that 2 O O was the official experimental station of the British Broadcasting Company is quite incorrect.

"Naturally, if we had made some revolutionary discovery at Derby House the B.B.C. would have had the benefit of such a discovery."

The station cost over one thousand pounds to erect. It was a building of wood and asbestos. There were three masts 130 feet high. The apparatus inside was of considerable value. The fire which broke out in the early hours of the morning was discovered by a maid. It was then too late to do anything for the building was well ablaze. How the fire started is a mystery. It happened as suddenly as it ended. The building was razed to the ground. There now remains nothing of 2 O O.

I asked Captain Eckersley what kind of experiments had been going on there.

"We were experimenting mainly with short-waves," he replied. "We were very successful. What we anticipated did work. We were very pleased at the result of our experiments.

"The burning-down of 2 O O came as a great shock to Mr. Drysdale Kilburn and myself. We had put our heart and soul into the erection of this station, and it means starting all over again."

Future Experiments.

Programmes were frequently broadcast from 2 O O. A 100-metre wave-length was used. From all parts of England came reports that the "picking up" of these programmes were successful.

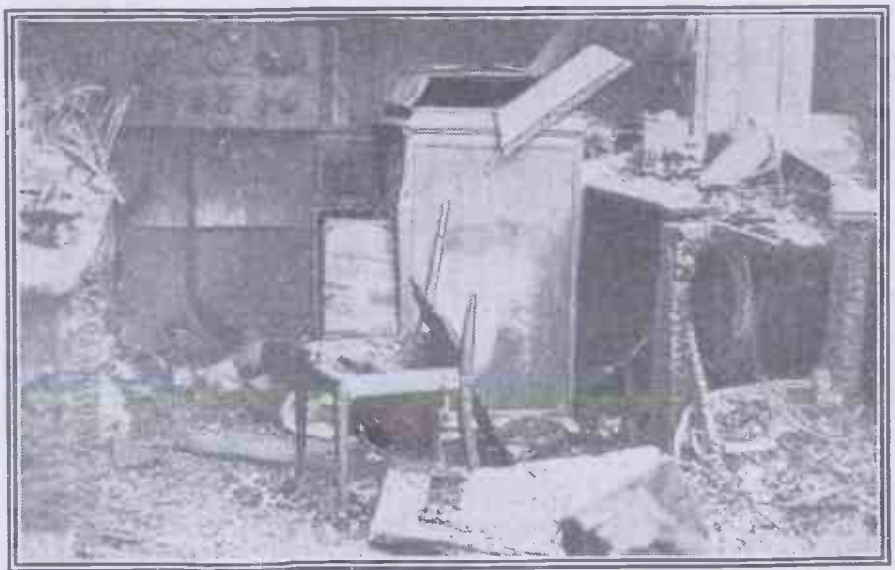
2 O O programmes were heard in Edinburgh at full loud-speaker strength on two valves. The broadcasting usually took place at one or two o'clock in the morning, and generally consisted of the call-sign followed by some conversations.

"A lot of people seemed to get us," said Captain Eckersley, "and on every hand we heard that our experimental broadcasting was looked forward to.

"Our experiments were forging ahead," he said, "and in the course of the next few months we had hoped to continue these experiments on shorter waves. The fire, of course, has halted everything.

"I cannot yet say whether we shall build another station. The experiments undoubtedly will be continued elsewhere. They may be continued at the British Broadcasting Company to which all my energy is devoted."

(*Continued on page* 1096.)



Part of the interior of Capt. Eckersley's experimental station showing the remains of a gramophone and other gear.

FOREIGN RADIO NEWS.

FROM OUR OWN CORRESPONDENTS.

The Approach of Television

M. EDOUARD BELIN, the well-known French physicist, who has been working at the problem of television for some time past, submitted to a meeting of experts at the Sorbonne an adaptation of his former discovery of a method of sending written messages and photographs by telegraph and radio which closely approaches full television.

The apparatus consists of twenty highly polished mirrors on a vertical steel disc, which revolves at the rate of 4,000 revolutions per minute. These mirrors pick up the image to be transmitted and simultaneously merge the details into a strong beam of light for projection over considerable distances.

By combining this apparatus with his former established system of transmitting photographs and documents, M. Belin believes that inter-continental television is merely a question of further slight improvements.

Radio in the Vatican.

A very fine receiving set and a fairly powerful transmitter have been bought, and were recently installed in the Vatican. For the time being they will only be used privately, but the idea is being considered, it is said in Rome, of eventually using the Vatican station for broadcasting the Pope's announcements to the Roman Catholics throughout the world.

The Pope to Broadcast.

German radio engineers have been fixing up a temporary radio installation by means of which the Pope will broadcast his speech proclaiming the end of Holy Year. It is understood that the entire cost of this is being defrayed by the firm of Siemens Brothers, Berlin, who are also lending the transmitters and loud speakers.

These latter will be placed at intervals along the front of Saint Peter's and also at the extreme end of the colonnade of Saint Peter's Square.

Radio for Lighthouses.

As the result of an article in the Paris daily "Le Matin," a sum of money has been raised by public subscription for presenting lonely lighthouses along the wild coast of Brittany with radio receiving sets.

The lighthouses of Ar-Men, La Jument, and Kereon will be the first three on the French coast to be equipped.

Destroying an Illusion.

The little Baltic republic of Latvia has one broadcasting station of which it is very proud, at Riga. One of the assets of the Riga programmes is a certain tenor whose popularity with female listeners-in is peculiarly great.

A local paper thought to take advantage of this by announcing that in an early number it would publish the photograph of the man with the fascinating voice.

The editor, however, received the following letter in his next mail-bag: "Will you please, Mr. Editor, not publish Mr. X's photo? I am so fond of his voice; it puts me in a regular dream every time I hear it. And, if I were to see his photo as he really is, I am afraid it would destroy the illusion——"

Village Church Starts Broadcasting.

The pastor and congregation of the little township of Bloemendaal, near Amsterdam, have got a bad attack of "Radioitis." They have now launched out as broadcasters on their own.

It all started by the pastor's son and the old bell-ringer erecting an aerial on the spire of the church. Ambition grew with results. By and by a small transmitter was installed, to the end that the farmers in the countryside around might be regaled with the pastor's sermons.

The idea grew still larger, and now a regular station is being installed in the church, which will broadcast the sermons of Bloemendaal's Reformed Church pastor throughout the length and breadth of Holland.

Germans' Radio Enterprise.

Probably in no European country is radio put to so many different uses as in Germany. Among big concerns broadcasting special information by radio to subscribers of their own are the following:

The *Europa Radio Dienst*, which sends out financial, banking, industrial, and commercial news, subscribers paying 150 marks per quarter for the service.

The *Wirtschaft und Industrie Rundspruch*, which broadcasts not only to German subscribers, but also to clients over all Central and Southern Europe another service of financial and commercial information.

THE TRUTH ABOUT THE GREAT FIRE.

(*Continued from page* 1095.)

When the news of the fire at Captain Eckersley's station was made known the offices of the B.B.C. and the homes of Captain Eckersley and Mr. Drysdale Kilburn were inundated with messages of condolence.

"We were very touched by all this," he went on, "and would like to thank all most heartily who were kind enough to write to us. Frankly, we were surprised at the view taken in the Press that the burning down of 2 O O was a great loss to British broadcasting. Everything can, and will, in some form or other, be replaced. There were no secrets of a revolutionary character, as it was suggested in some quarters, the key to which has been lost.

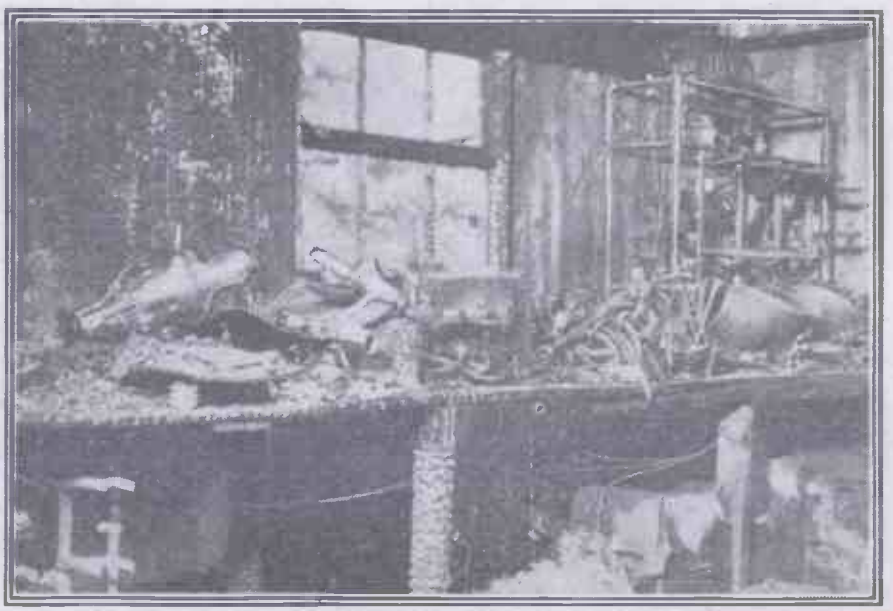
"A great many persons were aware of the experiments going on at Derby House, and there was no secrecy about the work being carried out."

Before leaving, Captain Eckersley told me about his visit to Brussels.

The chief engineer of the British Broadcasting Company went to Belgium to put forward a new scheme for the allocation of European broadcast wave-lengths; the scheme being placed before the Council of the International Broadcasting Union.

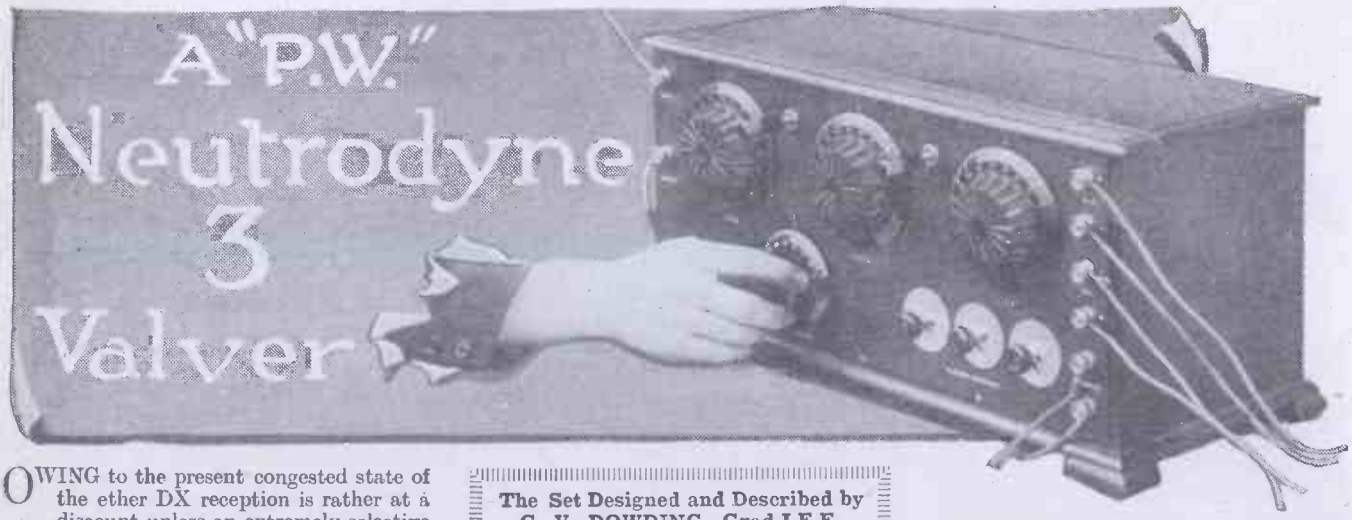
"My scheme," Captain Eckersley told me, "would allow more important stations to retain their exclusive wave-lengths, but each of a number of common wave-lengths would be used by less important stations. The order of the accuracy needed would be very high; the error must not exceed a small fraction of one per cent.

"This new scheme," concluded Captain Eckersley, "provides for a series of wireless zones. Interference by stations in the same zones would be eliminated by arrangement. And whether or not stations in one of these zones were operating on the same wave-lengths as stations in another zone at an enormous distance, it would not matter."



The remains of one of the transmitters at 2 O O, where all the apparatus was destroyed by the recent fire.

A "P.W." Neutrodyne 3 Valver



The Set Designed and Described by G. V. DOWDING, Grad.I.E.E. (*Technical Editor.*)

Constructional Work by G. V. COLLE and C. A. MEADOWS ("*P.W.*" *Technical Staff.*)

OWING to the present congested state of the ether DX reception is rather at a discount unless an extremely selective receiver is available. The average one H.F., detector and L.F. so much beloved by listeners is hardly sufficient if uninterrupted reception is to be carried out from stations more than 100 miles or so away. It is not the fault of the receiver, which is quite capable of exceeding that range, but it is rather the fault of the method of tuning employed in the set.

The use of the large tuning dials greatly enhances the appearance of the set besides simplifying tuning the receiver.

There are two ways of increasing the selectivity of a wireless receiver. One is by increasing the selectivity of the aerial circuit by means of wave-traps and similar devices, and the other is by means of tuned H.F. stages. Unfortunately, the former usually results in serious loss of signal strength, besides being rather difficult to handle, so that if successful DX reception is to be carried out, we have to resort to a set employing the second method.

This also has its disadvantages in that it is fairly difficult to handle and is more costly to build and to run. The usual DX receiver makes use of two stages of H.F. amplification, both being tuned, which provides all the selectivity required, together with ample amplification. Unfortunately, however, when dealing with broadcast wave-lengths the two H.F. stages are apt to burst into oscillation when all the circuits are in tune, and, as the desired signals cannot be heard unless the circuits are in tune, some means have to be adopted to stabilise the receiver so that oscillation does not take place.

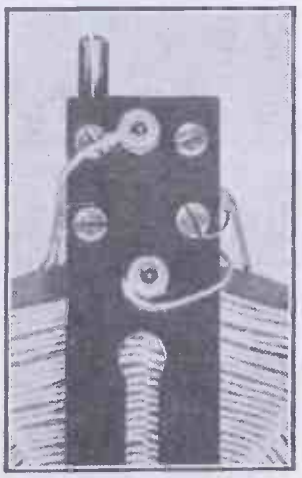
There are many ways of doing this, each having its own particular advantages and disadvantages, but perhaps the most popular and efficient method is that introduced some time ago in America by Professor Hazeltine and known as the Neutrodyne circuit.

With regard to this method readers may be interested in the article by Mr. C. E. Field, B.Sc., one of our staff consultants, which appeared in our issue of December 12th under the heading of "Hard Circuits Made Easy." In this article Mr. Field discussed at length the principal points of the Neutrodyne circuits, and his explanation should be read by all those who intend to construct the "P.W." Neutrodyne Three-Valver.

For the benefit of those readers who are unable to read the article in question, a brief explanation of the action of the Neutrodyne may be of interest.

Action of the Neutrodyne.

Those who have experimented with receivers containing more than one stage of amplification will know that such circuits can be very unstable and difficult to operate and that, if reaction is employed to increase the range and selectivity, it often becomes impossible to keep the circuit from howling. As Mr. Field explains in his article, "... when reaction is introduced the cause of this oscillation is easy to see if we understand the nature of the signals being received. Telephony signals are rather complex, but may be regarded as consisting of groups of waves, the frequency with which the groups follow one another being dependent upon the note being transmitted.



This photograph shows the small terminals fixed in the coil holder for the centre tappings of the "Ultra" coil.

"The strength of the signals depends very largely upon the number of waves in each group, and, if we want to obtain strong signals from a valve, much will depend upon the extent to which we can prevent the individual groups of waves from dying away ... and so, we use reaction, which actually lengthens the groups of waves."

Most readers will be aware that there are two forms of reaction—magnetic and capacity, and it is with the latter that we

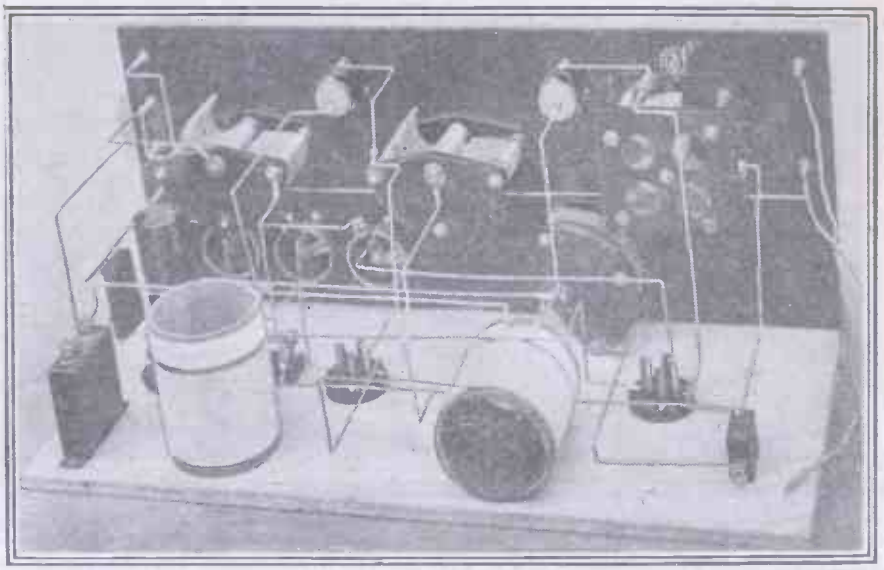
(*Continued on page* 1098.)

LIST OF COMPONENTS.

1 Panel 18" x 8" x ¼", with Cabinet and Baseboard	39	0
1 Peto-Scott ·0005 Variable Condenser	11	0
2 Wates "K" Type ·0005 Variable Condensers	16	6
1 Wates "K" Type ·0002 Variable Condenser	7	9
2 Neutralising Condensers (Lissen)	9	0
1 H.F. Choke (Lissen)	10	0
1 ·0002 Grid Condenser, with 2 meg. Leak (Lissen)	3	8
1 ·002 Fixed Condenser (Lissen)	2	6
1 2 mfd. Fixed Condenser (T.C.C.)	3	10
1 Baseboard-mounting Coil Holder (Peto Scott)	1	6
3 Baseboard-mounting Valve Holders (Burwood)	5	3
3 "Precision" Rheostats	9	0
1 Basket Coil Holder (with 2 extra terminals) or	1	3
1 "Ultrynic" Coil (Igranic)	9	0
¼ lb. 26 S.W.G., D.C.C. Wire	1	7
lb. 24 S.W.G., D.C.C. Wire	1	3
1 Cardboard Former (2½ in. dia., 8 in. long)		2
1 4½-in. Spider Web Former		4
8 W.O.-Type Terminals	1	0
1 piece of Ebonite, 1" x 3" x ¼"		3
Wire, Screws, Transfers, etc.	2	0

NEUTRODYNE 3-VALVER.

(Continued from page 1097.)



A clear idea of the arrangement of the components can be obtained from this view of the completed set.

have to deal when considering multi-stage H.F. receivers. It must be realised that every valve has a certain capacity value existent between its grid and plate circuit, owing to the proximity of the two electrodes mentioned within the valve itself.

It is this capacity between the plate and grid of the valve that causes the trouble in H.F. circuits, because when we have, as in the case of the receiver under discussion, several tuned circuits merely separated by the H.F. valves, the capacity in these valves is often sufficient to couple the circuit together, so that plate circuits react upon the grid circuits, causing oscillation, whenever the circuits come into resonance.

Thus, some method must be devised to nullify this capacity-reaction effect of the valves, and this has been very ingeniously accomplished in the Neutrodyne. The circuit employed and generally admitted to be the best is shown below, and it will be seen that H.F. transformer coupling is used, the secondaries being tuned. A peculiar feature, however, is the fact that the H.T. lead to each transformer is taken to the centre of it instead of to the end remote from the plates of the valves. This is done for a definite reason.

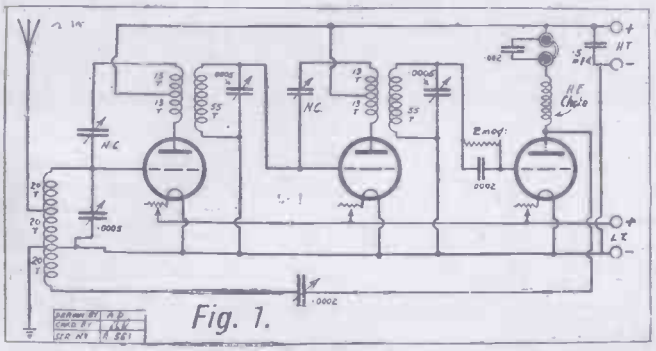


Fig. 1.

It will be obvious that, if the oscillations set up in the circuits by the valve capacities are due to the transference of energy from the plates to the grids, the most direct way of counteracting this effect would be to transfer just as much energy at the same time, but from grid to plate. In other words, the two transfers of energy would wipe each other out. This is the reason for the centre tap in the primaries of the transformers, for it will be seen that, if we connect one end of the transformer to the plate of the valve, and its centre to the H.T. battery, we have a small but complete circuit in that one half of the transformer primary. We have, however, the other half of the primary still at our disposal, and it will be seen that, if the remaining end is connected by means of a capacity to the grid of the valve, impulses will be transferred from the grid to the primary by two distinct paths, one through the valve and the other through the external capacity. These impulses will, therefore, meet in the primary and, as they oppose each other, will cancel one another out. Thus there can be no transference of energy between the plate and grid of the valve through the valve that will not be immediately cancelled by an equal transfer of energy by the external path.

Construction of the Set.

Such is a brief explanation of the action of the Neutrodyne, but, once more, readers are advised to read Mr. Field's article in order to grasp more fully the principles underlying this receiver.

The construction of the Neutrodyne three-valver is not at all difficult, all the components necessary being standard except the two transformers (or neutroformers)

(Continued on page 1099.)

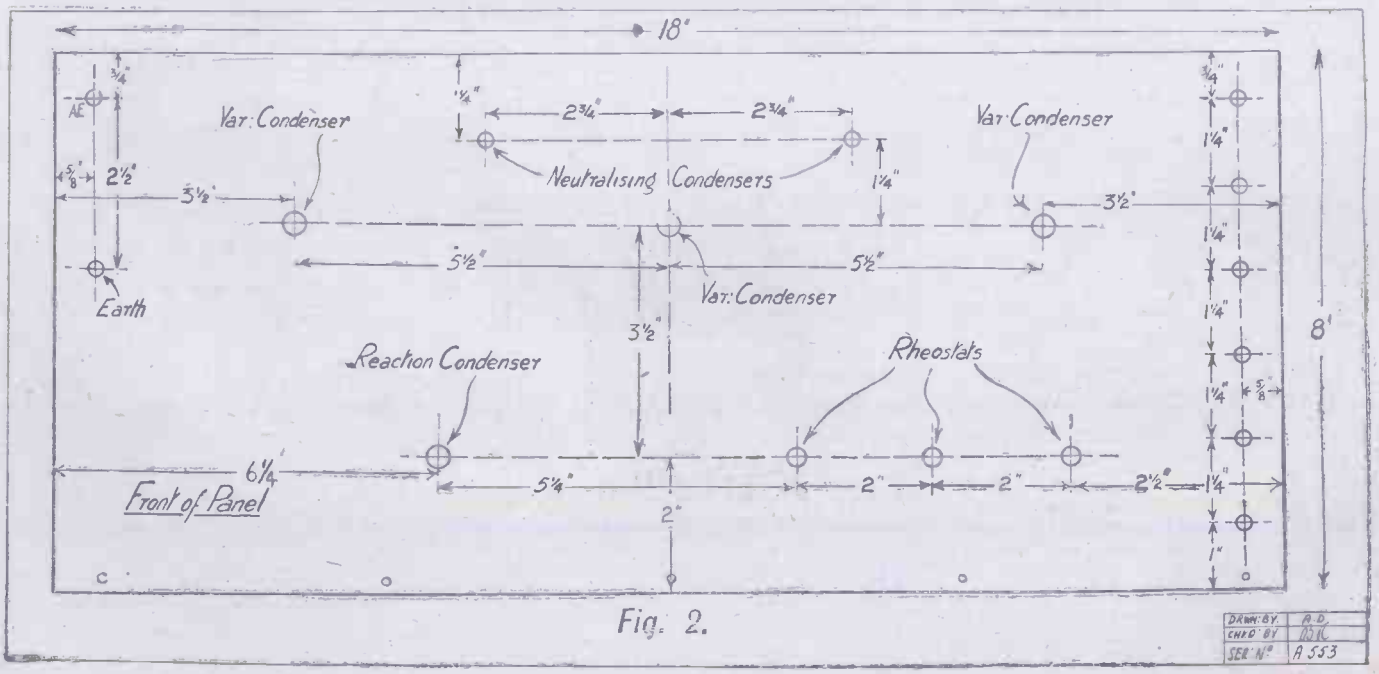


Fig. 2.

NEUTRODYNE 3-VALVER.

(*Continued from page* 1098.)

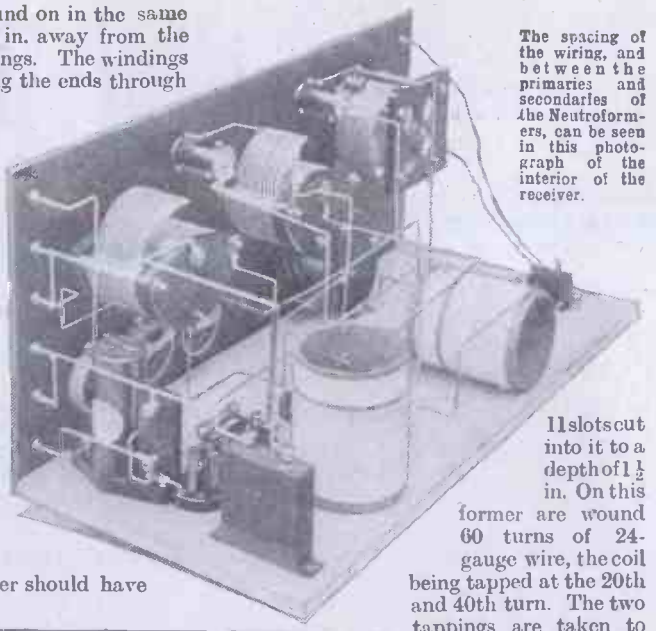
and the aerial coil. Fig. 1 will show a modified Reinartz form of reaction as being introduced, and it has been found that exceptionally smooth control of the receiver has been the result. The list of components on page 1100 will give the constructor an idea of what is needed.

The Neutroformers.

Two neutroformers can be purchased, if desired, but, as it is a simple matter to make them at home, the details given below will be found useful. Two cardboard formers, 3¾ in. long and 2½ in. external diameter, will be required, together with ¼ lb. of 30 D.C.C. and ¼ lb. of 24 D.C.C. wire. The two neutroformers consist of 26 turns of the 24-gauge wire wound on at one end and tapped at the 13th turn, and 55 turns of the 30-gauge wire wound on in the same direction, commencing ¼ in. away from the end of the primary windings. The windings should be fixed by passing the ends through holes in the former. The horizontal neutroformer is fixed to the baseboard by means of two brass screws, while the vertical one is kept in position by means of a strip of ebonite jammed into the former and screwed to the baseboard.

The aerial coil is of the well-known Ultra type, and may be purchased from the Igranic Company under the name of the Ultrynic, if desired, or may be made at home by the following method:

A cardboard or fibre former of 4½ in. diameter should have 11 slots cut into it to a depth of 1½ in. On this former are wound 60 turns of 24-gauge wire, the coil being tapped at the 20th and 40th turn. The two tappings are taken to two small terminals fixed in the coil holder, the ends of the coil being taken to the plug and socket of the holder.



The spacing of the wiring, and between the primaries and secondaries of the Neutroformers, can be seen in this photograph of the interior of the receiver.

In Fig. 1, it will be noticed that the first 20 turns are used, coupled in series with the plate of the last valve, as a Reinartz reaction coil, the remaining 40 turns being used as a tuned secondary in the grid circuit of the first valve, the aerial being auto-coupled by connection to the 40th turn.

Wiring Up.

The panel drilling diagram given in Fig. 2, shows the lay-out of the components, while extra large dials have been employed for the three tuning condensers, in order to assist the constructor in the handling of the receiver.

Care should be taken in the wiring of the set to keep all wires as far apart as possible, otherwise the subsequent neutrodyning of the valves will be impossible. Fig. 3 shows the actual connections of the receiver, and these should be carefully checked by reference to the point-to-point list given on the next page. Flexible leads should be taken to the aerial and earth terminals, as these have to be connected to the two terminals provided on the Ultra coil.

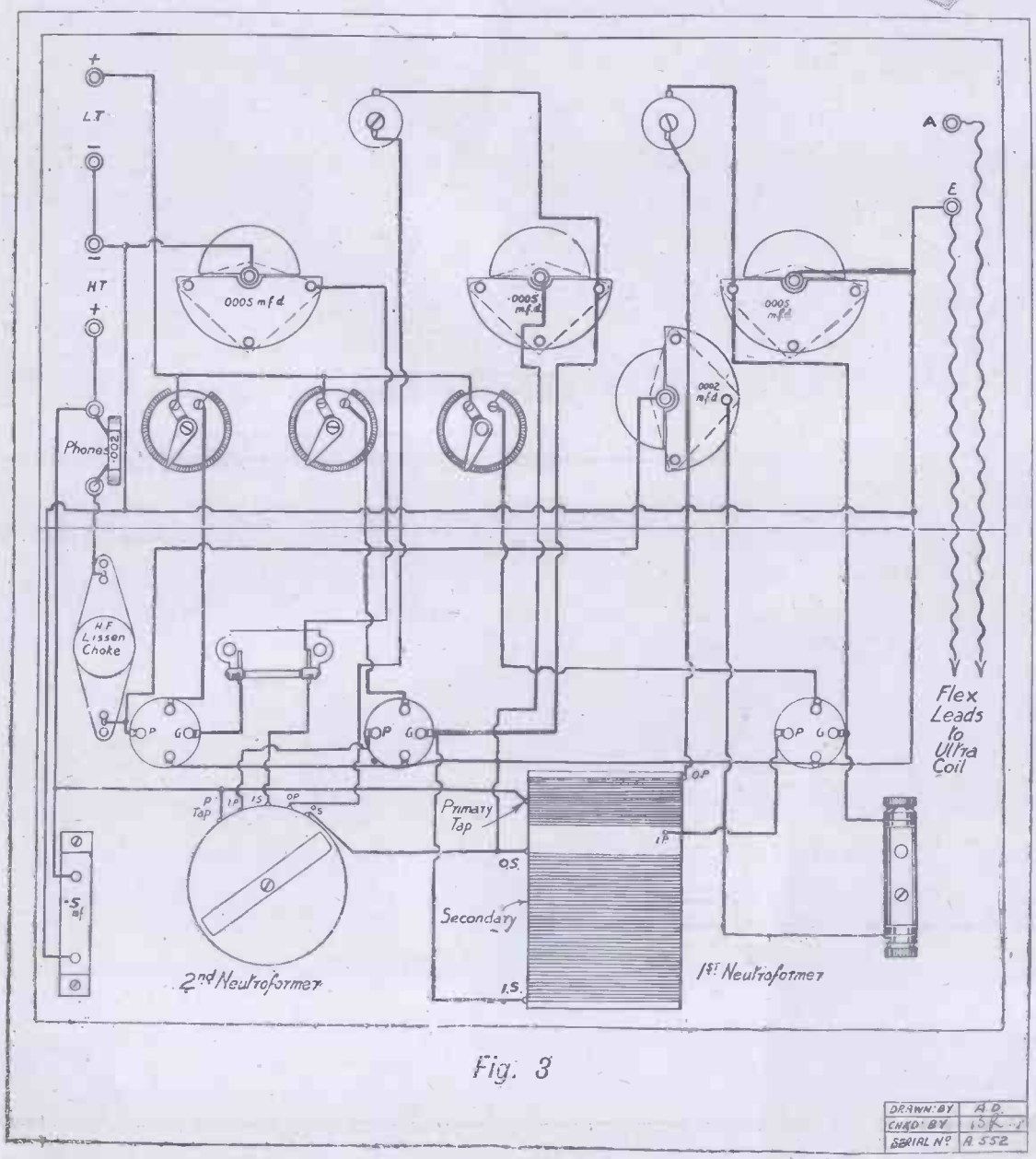


Fig. 3

(*Continued on page* 1100).

NEUTRODYNE 3-VALVER.

(*Continued from page* 1099.)

The components denoted by numbers in this photograph are as follow: (1 and 3) H.F. Condensers; (2 and 4) Neutrodyne Condensers; (5) A.T.C.; (6) Aerial Coil; (7 and 9) Neutroformers; (8) Reaction Condenser; (10) H.T. Condenser; (11) H.F. Choke.

When the construction of the receiver has been completed, and the wiring carefully checked, the task of neutrodyning the set must be undertaken. In order to render this as easy as possible, valves suitable for H.F. amplification must be used in the first two stages of the set. Those used in the receiver, the photographs of which appear with this article, were bright emitters (Cossors), with a Cosmos A45 valve as detector. This does not mean that dull emitters cannot be used; in fact, any type of valve can be employed, provided it is suitable for the task which it has to perform.

Adjusting the Neutrodyne Condensers.

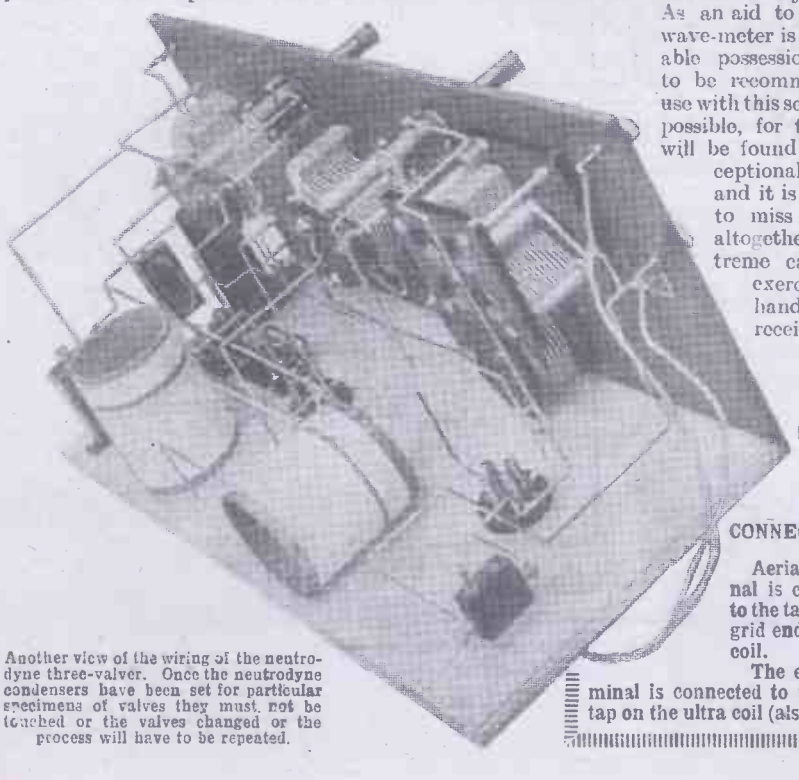
The aerial coil is placed in position with the aerial flex connected to that terminal whose tapping goes nearest the grid end of the coil. About 45 to 50 volts H.T. should be available, and the three valves placed in position, and the set tuned to the nearest station. If well constructed, it should not oscillate until the reaction condenser (bottom left on panel) is increased slightly from the zero position, and tuning should be found to be very sharp. When the nearest station has been tuned in, endeavours should be made roughly to neutrodyne the set. To do this, the first valve filament is switched off and the set is retuned so that signals can be heard at maximum strength. The first neutrodyne condenser is then slowly varied, retuning every now and then until the signals are decreased as far as possible.

The second valve must then be considered. The first valve is switched on, the neutrodyne condenser being left "set," and then the second valve is switched off. The same process is now repeated with the second neutrodyne condenser, after which all valves should be switched on and endeavours made to tune in a more distant station. When this has been done, the process should be repeated, extreme care being taken that the set is kept absolutely in tune throughout the operation.

Exceptionally Sharp Tuning.

The receiver should now be properly neutrodyned, and is ready for use. Reaction is, of course, obtained by varying the reaction condenser, and will be found to be exceptionally easy to use. No self-oscillation will be apparent, and though at first it may be difficult for the constructor to tune in any but a fairly near station, he will rapidly get into the way of handling the set, when DX results will become easily possible.

As an aid to tuning, a wave-meter is an invaluable possession, and is to be recommended for use with this set wherever possible, for the tuning will be found to be exceptionally sharp, and it is quite easy to miss a station altogether if extreme care is not exercised when handling the receiver.



Another view of the wiring of the neutrodyne three-valver. Once the neutrodyne condensers have been set for particular specimens of valves they must not be touched or the valves changed or the process will have to be repeated.

POINT-TO-POINT CONNECTIONS.

Aerial terminal is connected to the tap nearest grid end of ultra coil.

The earth terminal is connected to the other tap on the ultra coil (also by flex) and with busbar to the L.T. negative and H.T. negative, also to the moving plates of the first ·0005 variable condenser. L.T negative is connected direct to one filament socket of each valve holder.

The other filament socket of each valve holder is connected to one side of its rheostat, the other sides of the three rheostats are joined together and to L.T. positive.

Fixed plates of the first ·0005 variable condenser are connected to one side of the first neutralising condenser, grid socket of the first valve holder, and to the socket of the fixed coil holder. Plug of the fixed coil holder is connected to the fixed plates of the ·0002 variable condenser.

Plate of first valve to one side of first neutroformer primary, other side of primary to the other side of the first neutralising condenser. The centre taps on the primary windings of both neutroformers are connected together and to H.T. positive.

One side of secondary of first neutroformer to grid of second valve, fixed plates of second ·0005 variable condenser, and to one side of second neutralising condenser. Other side of secondary to moving plates of second ·0005 and L.T. negative.

Plate of second valve to one side of second neutroformer primary, other side of which goes to the remaining connection of the second neutralising condenser. One side of secondary of the second neutroformer, to fixed plates of the third ·0005 variable condenser, and to one side of the grid leak and condenser, the other side of which is connected to grid of third valve.

Moving plates of the third ·0005 variable condenser are taken to the L.T. negative lead to which also is taken the remaining end of the second neutroformer secondary.

Plate of third valve to one side of H.F. choke, and to moving plates of ·0002 variable condenser. Other side of H.F. choke to one 'phone terminal, other 'phone terminal to H.T. positive.

A ·001 fixed condenser is connected across the 'phone terminals, and a ·5 across the H.T.

BROADCASTING PLAYWRIGHTS.

Useful Advice for Budding Authors.

By WILLIAM MACREADY.

The author of this article is not only one of the B.B.C.'s dramatic experts but a professional actor of many years' experience and considerable fame. The suggestions he makes in this article should prove of great value to our readers who wish to write Radio Plays.

AS the oldest professional actor in the service of the B.B.C., and producer of the greatest number of plays at any of the provincial stations, I may fairly claim to understand the needs of the dramatic side of broadcasting. It has been said that the average stage play is totally unsuitable for radio performance, and that our modern school of dramatists cannot write for the microphone.

My own experience flatly contradicts such a theory. I know of over two hundred plays (of four and five acts), as well as some hundreds of one-act pieces, all the work of our best modern authors, which only need a producer with experience and imagination to adapt them for radio purposes without damaging the plays or the reputation and feelings of their authors.

A great number of plays have "been specially written for broadcasting." After listening to all of these, I can honestly assert that I have only heard *two* which, by any stretch of imagination, could interest and hold the average listener.

The suggestion to darken one's room and try to create an "atmosphere" is of little avail if one is to hear no more than a series of mechanical effects, "full of sound and fury, signifying nothing."

The listener needs something more stimulating. He requires a tonic after the cares and worries of the day. He is not averse to a little instruction as contained in the various talks. The influence of music acts as a solace. His drama is a different matter. He is out for amusement or thrills, and must have one or the other —both, if possible—so that his allegiance to radio may be unswerving. The most exhaustive tests are essential to the successful broadcasting of "sound" effects.

Stage Effects.

The clash of swords will not convey the idea of a duel ; the shriek of a syren will not suffice for that of the curlew ; the rattle of a pair of hoofs will not suggest the gallop of a horse ; nor will the banging of a door in the studio sound like the real thing. This is where the ingenuity of the producer is of the greatest assistance to the author as well as to the listener.

From the storehouse of his imagination, and, of course, after the necessary tests, the producer is enabled to supply the all-important connecting link between the dialogue and the "business." One of our most successful effects at Birmingham was in "Under Two Flags," where Cigarette's ride through the desert was one of the features of the performance. The crunch of the horse's hoofs in the sand was perfectly natural, and evoked the most favourable comment.

I have read over a thousand plays by would-be radio dramatists during the last two years, and have found only *three* at all suitable for broadcasting. The greater number contained too many characters. Others lacked cohesion in plot, others were too "talky," whilst the greater number were full of the most improbable and grossly unnatural situations.

Helpful Advice.

What, then, is the remedy ? A word or two of helpful advice to the embryo radio-dramatist may (or may not) be acceptable. I give it for what it is worth

Mr. William Macready.

and, in palliation of my apparent presumption, would modestly state that not only have I adapted the works of many famous authors for broadcasting, but have written several plays for the same purpose.

Here, then, is a fairly comprehensive set of rules for the successful writing of radio plays. Let the subject chosen be as original as possible. Do not crowd your play with too many characters. It is bad policy to introduce a dozen speaking parts where four or five should be sufficient for the purpose. Make a distinct character of each, i.e. the young squire, the wife, the father, the evil genius of the story, etc. Avoid the duplication of characters; avoid the introduction of the "eternal triangle" ; politics, religion, mother-in-law, inebrity, the Hebrew race, or anything else likely to give offence to listeners.

It is most important that the story be coherent and free from any suspicion of a secondary plot, as nothing is more irritating to a listener than the exercise of a triple form of concentration. By this I mean the necessity of following the main and secondary plots in addition to visualising the whole. Let the dialogue be crisp, natural, and free from "talkiness" or unnecessary speeches. Many an otherwise good play is ruined by padding with irrelevant matter. A good story is better told in one short act than in dragging it out to three or four.

In the case of comedy or farce the imagination of the author may take liberties which would be impossible in drama. When a play is frankly labelled farce, many otherwise improbable situations are overlooked in the laughter they provoke. The writer of this type of play should, above all else, aim at laughter making. It is therefore his duty to make his dialogue as light and witty as possible. The use of epigram may be freely resorted to and even punning is permissible and often advantageous. The introduction of musical items is to be deprecated, as these interrupt the action, and may prove a distraction endangering the success of an otherwise capital piece of work.

Suitable Plays.

If the story demands the inclusion of a large number of characters, it is advisable that each address the other by name as often as possible during the performance. Sufficient time must be allowed to elapse during the dialogue to make the situations feasible. For instance, it is asking too much of the listener to believe that a servant ordered by his mistress at Hampstead to go to the City and return with his master, can fulfil his errand whilst half a dozen lines of dialogue are spoken between his departure and return. This is one of the greatest mistakes made by amateur dramatists.

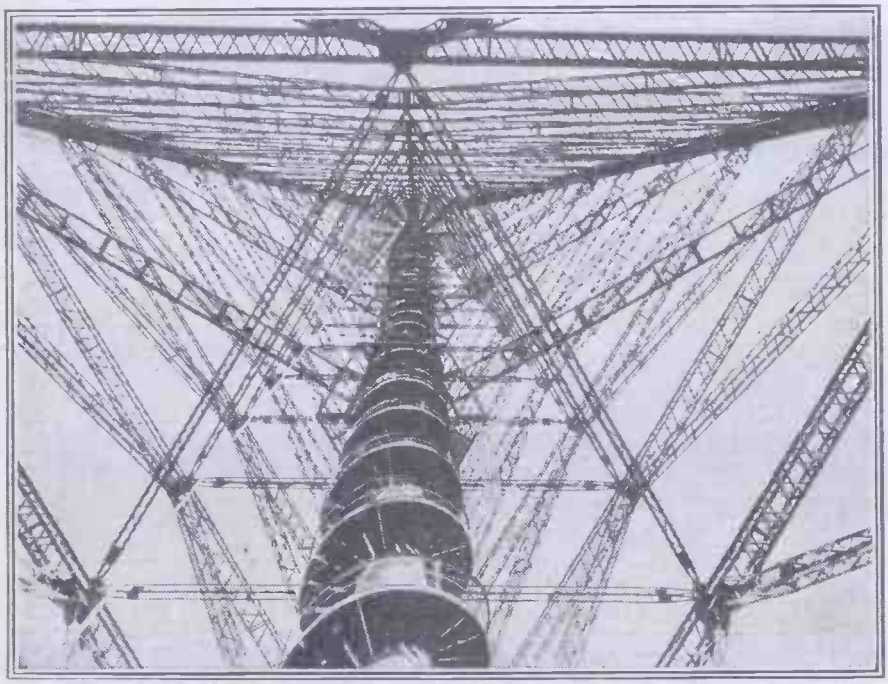
Finally, let your dialogue be of the clean and wholesome order. There is no room in broadcasting for the double *entendre*. There is a wide and ever-increasing demand for radio playwrights. The observance of the few hints here given should make the path of the 'prentice hand a little smoother, and encourage his efforts to provide new material for that most popular of all items, the radio play.

Some instances of suitable plays may be given as a help to beginners. Of one act comedies (just to name a few) are "Mrs. Hilary Regrets," "Dream Faces," "Case For Eviction," "His Lordship," "The Lunatics," "Kitty Clive," and numerous others. Of the longer plays those of Oscar Wilde and Sydney Grundy are admirably suitable for broadcasting.

Technical Notes

Conducted by our Staff Consultant, J. H. T. ROBERTS, D.Sc., F.Inst.P.

REFERRING to the recent experiments of Dr. Alexanderson, the famous radio engineer of America, a large number of reports have now been received and analysed as a result of the comparative tests of the horizontal and vertical waves sent out from the super-power station of the General Electric Co., at Schenectady. It has been found from these experiments that the horizontal radiation gave better service in the zone from 60 to 250 miles from Schenectady, whilst at greater distances, the vertical antenna radiation was more satisfactory. Reports also verified, in part, the theory of Dr. Alexanderson that horizontally polarised waves may twist in their progress until they are polarised in a vertical plane, and so on.



An unusual view of the giant mast at the new Berlin broadcasting station. The mast is over 850 feet high and is said to be the largest in the world.

"Stereoscopic" Broadcasting.

One of the latest American stations to "take the air" is WHAP, New York City, and this station employs a special type of double microphone. The two individual microphones are mounted by rubber suspensions each in a large metal supporting ring or hoop. The two rings are then placed a distance apart about equal to the distance between the two ears of the average person. The two microphones face each other, and the announcer or broadcaster speaks into the space between them. It is claimed that the results obtained by this method are superior, other things being equal, to those obtained with the usual single microphone.

Still another type of loud speaker diaphragm is reported as a result of the Phonofilm experiments of the famous scientist, Dr. Lee de Forest. Dr. de Forest considered that none of the existing systems was suitable for his purpose, and he set to work to make out his own style of loud speaker. He has evolved a type in which the diaphragm is vibrated at the edges instead of at the centre.

"Since the beginning of the telephone art," says Dr. de Forest, "every telephone reproducer, whether an earpiece or a loud speaker, has been operated by moving a diaphragm or cone in a direction perpendicular to its surface. Telephone men seem unable to get away from the idea that the diaphragm must operate like a piston in order to agitate the surrounding air.

"In this new method, I discovered that when an electro-magnetic telephone unit is applied tangentially to the edge of a properly curved diaphragm, instead of at right angles to it, the entire surface takes up the vibrations and sends out sound waves of the correct amplitude in all directions. Although the application of impulses tangentially to the membrane is a radical departure, it seems self-evident that it is the more natural method.

"By enlarging the membrane sufficiently I dispense with the horn altogether. There is no horn tone, because there is no horn, and we have natural reproduction because we avoid the old piston impact. We now have a sound-wave action somewhat similar to that produced when a stone is thrown into water. This results in greater carrying power and uniform volume throughout the room, without objectionable intensity close by or in any one direction."

How the Crystal Works.

The explanation of the rectifying property of a wireless crystal has always been a matter for speculation since the discovery of this curious property was first made. A very large amount of experimental work has been carried out on this subject, but even to this day no complete theory has been forthcoming as to how the crystal works.

It seems to be fairly generally admitted that thermo-electricity plays an important part in the unilateral conductivity of a crystal contact, but even that much admitted does not help us on very far. For the next question is, of course, as to the explanation of thermo-electricity itself.

Thermo-couple Theory.

It is well known that most of the best thermo-couples require that at least one of the two members of the couple shall be a compound or impure substance, and the gradual decay of the thermo-electric power of a couple, after prolonged heating, appears to be due to a breakdown or annealing process, by which the strain in the original material is relieved.

Similarly, as I pointed out in the articles which I recently wrote in this journal on the subject of thermo-electricity, there appears to be a close relationship between substances which have a marked thermo-electric property and those which act as good crystal detectors for wireless purposes. This, of course, goes to support the theory that the crystal detection is a thermo-electric phenomenon.

As to why a substance should detect, some very interesting and important information has recently been published by Dr. E. T. Wherry, a distinguished American mineralogist, who has examined a large number of specimens of every conceivable composition.

His observations confirm the general view that a certain amount of impurity, resulting in increased crystal strain, makes for better detecting properties, but, curiously enough, in some cases, he finds the reverse. In galena and pyrite impurity is necessary, but in zincite, the rectifying properties are better the purer the specimen. Dr. Wherry gives a comprehensive list of the specimens he has examined, with the results obtained, and a theory of the crystal structure and the peculiarities to which he attributes the detecting power of the substance. A full account of these experiments will be found, by those interested, in "The American Mineralogist," Feb., 1925.

Radio Fortunes.

It is a matter of common observation that numerous fortunes have been made out of the comparatively new industry of radio broadcast manufacture. Every experimenter has some secret idea that may, perhaps, bring him, if not wealth, at any rate a good return for his ingenuity and trouble of getting upon the market.

(*Continued on page* 1134.)

HARD CIRCUITS MADE EASY.

By C. E. Field, B.Sc.

(*Staff Consultant, "Popular Wireless"*).

In this article, second of a series, Mr. Field deals with the difficult Super Heterodyne Circuit in a way which will make its intricacies clearly understood by new amateur experimenters.

No. II. THE ARMSTRONG SUPERSONIC HETERODYNE CIRCUIT.

THERE is, perhaps, no wireless circuit with a more terrible name than the Armstrong Supersonic Heterodyne; but with the name the terrors end, for although the circuit is somewhat complex it involves no new principles. Before proceeding further, it should be pointed out that this circuit has nothing whatever to do with the celebrated Armstrong Super-regenerative receiver, which is considered in another of these articles.

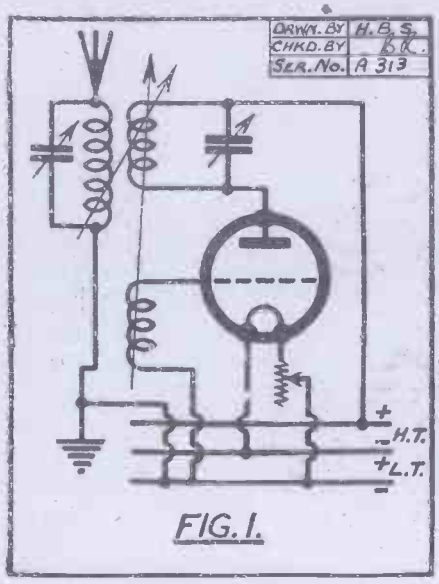


FIG. 1.

H.F. Amplification.

Amateurs who have experimented with high-frequency amplification will know how difficult it is to receive broadcasting on a set in which two or more high-frequency valves are employed, especially when the intervalve couplings are of the tuned-anode or tuned-transformer type.

This is what takes place. Voltage impulses are received on the grid of the first valve, and produce in the plate current magnified variation, which are passed on to the next valve grid by means of some form of coupling. Unfortunately, however, a portion of the energy from the valve plate finds its way back to the grid through the capacity which exists between the electrodes of the valve, the same transference taking place between each plate and grid circuit. The result is that the energy in the grid circuit of each valve is slightly augmented, exactly as if a reaction coil were employed. Just as a set will oscillate when too much reaction is introduced, so it will oscillate when too much energy passes between the plate and grid circuits of the valves by condenser action. Now, the amount of energy, or current, passing through a condenser depends upon two factors. The first of these is the capacity of the condenser, which determines the opposition offered to a particular current. The less the capacity the greater is the opposition, so that it is desirable to reduce valve capacity to a minimum. This is brought about in special anti-capacity valves by spacing the electrodes as widely as possible, but the capacity cannot be disposed of entirely.

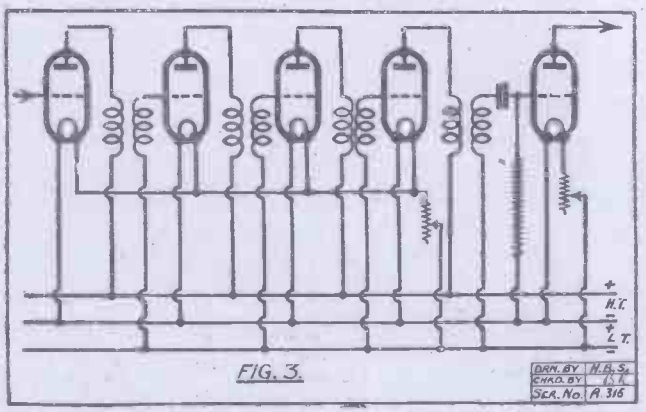
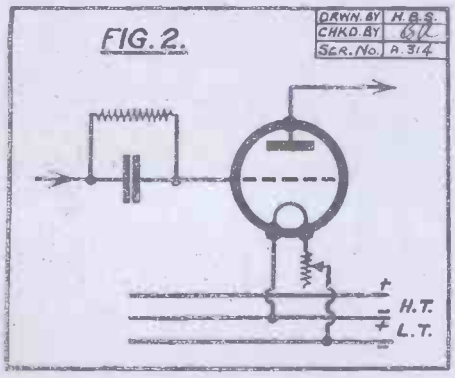


FIG. 3.



Self-Oscillation.

The second factor upon which depends the self-oscillation of a valve is the wave-length of the signals being received. Short-wave signals consist of currents alternating at very high frequencies, and as a condenser offers little resistance to high-frequency currents, a valve oscillates very readily upon short wave-lengths. On the other hand, a multi-valve set working on, say, 5,000 metres is quite stable, and several valves can be employed without self-oscillation being set up.

The "Beat" Principle.

One solution to the difficulties of short-wave reception, therefore, would be to increase the wave-length. This may sound a little Irish, but it is what is carried out by the supersonic heterodyne circuits.

In order to see how this is brought about, let us consider what causes the howling noise when a set oscillates. The howling is due to the fact that the set is not correctly tuned, and generates waves of a slightly different frequency from that of those being received. Now, when two sets of waves occurring at different frequencies are superimposed, it is evident that they will at one moment be in step with one another, which means that they will have their maximum values, in one direction, at the same instant.

They will then fall more and more out of step, until the maximum value of one set in one direction coincides with the maximum value of the other in the *opposite* direction. In the first case, the values of

(*Continued on page* 1108.)

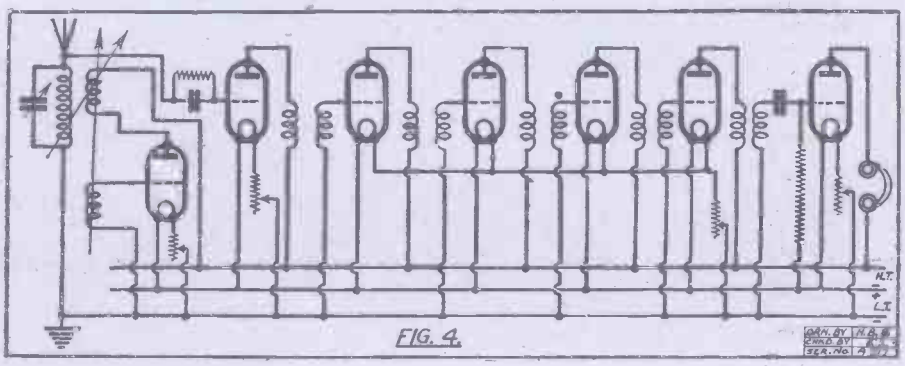


FIG. 4.

VARIABLE CONDENSERS.

FROM A CORRESPONDENT.

THERE are so many well-advertised makes of this component on the market, each of which claims to be the most efficient and to have the lowest losses, that the amateur is bewildered and usually ends by buying any type put before him. A few of the faults usually present in these components are mentioned below and should be carefully avoided.

Faults in Bearings.

Most makes have a top bearing consisting of a screwed stem running in a plain hole in the top bush. Now, it is obvious that the wearing surface in a bearing of this kind is extremely small, being practically a line contact along the top of the screw thread; and even if the spindle originally fits the hole in the bush, as it seldom does in practice, it will not be long before the bearing is quite sloppy. Now a very small amount of side shake will cause a large change in capacity, and this fault will consequently cause infinite trouble in the ideal set where tuning is dead sharp. This fault can be detected by turning the condenser to its all-in position and then rocking the knob sideways; if any motion can be seen at the outer edge of the moving vanes, reject the condenser.

Another fault common to the majority of advertised makes is the method of taking the strain of the spring washer. It will be found on examination that this strain is usually taken between the top and bottom end-plates, which are often made either of poor quality moulded composition or else of soft thin aluminium sheet. This very often means the resetting of the condenser after mounting on the panel, and in some cases the subsequent development of short circuits. In sound mechanical design this strain should be taken on the two faces of the top bearing bush.

End-plates.

Metal end-plates have recently made their appearance on variable condensers, mainly because they are cheap to manufacture, but it must be remembered that any metal introduced into a high-frequency field represents a loss of power. A condenser of this type cannot therefore be as efficient as a similar instrument built up with end-plates of good quality ebonite or bakelite.

A Serious Fault.

Another serious fault introduced by the use of metal end-plates is the reduction of the length of leakage surface between fixed and moving systems.

Cheap moulded end-plates should be avoided for similar reasons, since many of them are of poor insulating properties, whilst others have hygroscopic surfaces. As an illustration of the futility of cheap moulded compositions, the writer recalls testing a receiver recently in which the A.T.C. was fitted with a cheap moulded dial. The condenser was in series with the A.T.I. and in the aerial lead. Touching the edge of the dial with the fingers resulted in over 50 per cent loss of signal strength.

Fixing Arrangements.

The writer is against the application of the one-hole fixing method to variable condensers. This method leaves the greater part of the weight of the condenser hanging on the top bearing, and, should any settling or warping take place in the top plate (as it often does), short circuits will be caused by the change in the relative positions of the fixed and moving systems. The condenser should be fixed by at least two screws placed approximately midway between the centre spindle and the fixed vane pillars.

Vernier Control.

In many variable condensers vernier adjustment is provided by means of a small spindle moving concentrically with the main spindle. In these instruments it is of the utmost importance to see that turning the vernier knob does not move the main spindle, otherwise the vernier is worse than useless. Make sure, also, that the connection between the main and vernier moving plates is quite sound.

HARD CIRCUITS MADE EASY.

(*Continued from page* 1107.)

the two waves add together, and in the second the resultant is the difference between the two. The result is that the train of waves formed by the two sets superimposed rises and falls in value at a low frequency. In other words, a low-frequency wave motion is produced, the frequency actually being the difference between the frequencies of the component wave-trains, and corresponding to a very long wave-length.

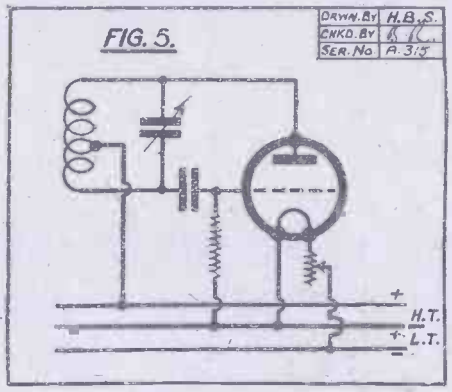
Thus, if we were receiving signals which came in at a frequency of 1,000,000 cycles per second, and our valve was oscillating at a frequency of 999,000 cycles, the result would be a howl at 1,000 cycles per second.

The Heterodyne Arrangement.

We can now see how to set about increasing the wave-length of the signals we are receiving, so that we can make use of several stages of high-frequency amplification.

First of all we require a valve oscillating at a frequency slightly different from that of the received signals. An arrangement which is familiar to all of us consists of two coils magnetically coupled, one in the grid, and one in the plate circuit of the valve. When the coils are sufficiently tightly coupled (i.e. close together), the valve will oscillate at a frequency which depends upon the size of the coils and the tuning condensers, on account of the transference of energy from the plate back to the grid circuit.

We then have, flowing in the coil in the plate circuit, currents at a frequency slightly different from that of the received signals, and in order to obtain our required long wave-length current, these oscillations must be superimposed upon those in the aerial coil. To do this, we simply bring the aerial and plate coils together so that they are magnetically coupled. This is shown carried out in Fig. 1. It must be



emphasised that the valve is neither detecting nor amplifying, but serving merely as a generator of oscillations.

Suitable "Beat" Frequency.

If the foregoing has been understood, it will be seen that between the terminals of the aerial coil are impulses at the frequency of the received signals, varying in value at a frequency corresponding to a long wave-length which, in turn, is determined by the frequency of the added oscillations. A suitable wave-length for these "beat" variations would be 5,000 metres.

Before the advantages of high-frequency amplification can be utilised, the short waves must be disposed of, so that the next step is to rectify the impulses from the aerial. This is carried out in the ordinary way by means of a detecting valve, employing a grid condenser and leak, the connections being as shown in Fig. 2. The output of this valve consists of a carrier wave of 5,000 metres, upon which are superimposed the ordinary low-frequency telephony oscillations. The plate of the detector, therefore, can be regarded as if it were a receiving aerial, picking up signals on a 5,000-metre wave-length, and the remainder of the circuit is quite straightforward and conventional.

The Second Detector.

Several valves can now be coupled together by any of the usual methods for long-wave amplification, to form what is called the intermediate-frequency amplifier.

Finally, a detector is required to get rid of the 5,000 metre carrier-wave, and hand on the telephony to the headphones or note-magnifier.

In Fig. 3 is shown a four-valve intermediate-frequency amplifier, followed by a detector. In order to obtain our complete supersonic heterodyne receiver, we now simply join the three portions, shown in Figs. 1, 2 and 3, together. The aerial is joined to the grid of the first detector, the plate current of which is sent through the primary winding of a 5,000-metre wave-length transformer, which couples it to the remainder of the circuit. The complete seven-valve set is shown in Fig. 4.

There are many other ways of connecting up the oscillator valve, a method commonly employed being to join one tuned coil between the plate and grid, with a centre tapping taken to either the filament or the positive high-tension lead. In the latter case, a diagram of which is given in Fig. 5, the grid must be insulated from the high-tension battery by a grid condenser, and a grid leak must be employed.

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THESE Coils are the most reasonably priced PROTECTED plug-in coils on the market. They are neat in appearance, and are exceptionally efficient in operation, the distributed capacity and high frequency resistance having been reduced to a minimum.

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20	3/0	75	3/0
25	3/0	100	4/3
35	3/0	150	4/6
40	3/0	200	5/0
45	3/0	250	5/6
50	3/0	300	6/0
60	3/0	400	6/6

The Set (20 to 400 inclusive) **£2 10s. 0d.**
(List value bought singly £2 18s. 9d.).

Prices of larger coils on application.

Coils and Condensers

Variable Condensers

IF selectivity and sensitivity are desired in a Receiver, low loss condensers must be used. This Condenser is really a low loss model of the straight line wave-length type, in which is incorporated a direct reading vernier movement. Compare the price with that of any other precision condenser.

Capacity.	Price.
·0002	8/6
·0003	9/6
·0005	10/6
·001	13/6

Publication No. 115 is a 16-page booklet containing much useful information, together with charts and diagrams, which make it a particularly interesting and useful reference book for all interested in the constructional side of Radio.

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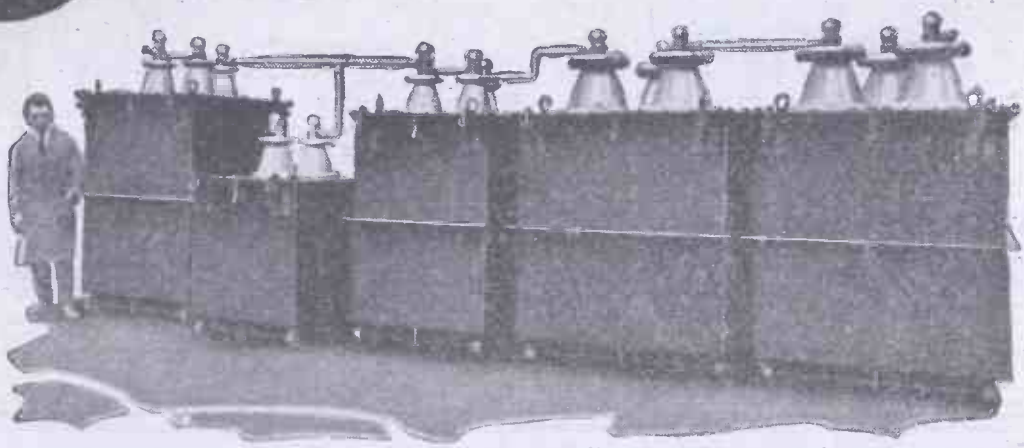
Dubilier



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THE bank of Dubilier Condensers illustrated above is composed of the largest Mica Condensers in the world. It was designed for installation in the British Government's new transmitting station at Rugby, and consists of four large Condenser units connected in series for the main C.W. circuit, together with an anode-feed condenser tapped on to the series. This condenser operates continuously at 12,000 Volts D.C., with an additional super-imposed radio frequency current of over 60 amps. The last condenser in the series is insulated from the earthed containing tank for a potential of over 90,000 Volts. The capacity of the C.W. condensers in series is 0·021 mfd.

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Aerial-Earth Efficiency

An Important Subject of Interest to Every Amateur.
By M. C. PICKARD.

Sinking an earth plate at one of the large Commercial Stations.

THE subject of the aerial and the earth connections is one which is neglected to a remarkable extent by the average wireless amateur. There seems to be an idea at large that a hundred feet of wire hung up anywhere and anyhow, and a piece of bell-wire tied on to the nearest water-pipe, is all that is necessary to obtain a good aerial-earth system; probably the accounts one reads of wonderful results with all sorts of inefficient aerial arrangements tends to increase this neglect of the most important part of any receiving station.

FIG. 1

It stands entirely to reason that the efficiency of any set depends directly upon the efficiency of the aerial to which it is coupled; if the aerial arrangement is so poor that it will not respond to incoming waves, it is not fair to expect the set to produce audible signals. Even a twenty-valve super-heterodyne could not amplify what is not there in the first place. Therefore the writer thinks that a few words on the design of aerials and earths will be of interest to amateurs.

Design of the Aerial.

Very often in the past an amateur has been advised to obtain a hundred feet of wire and erect it in such a way that as much as possible came into the down-lead and the rest came into the horizontal portion; i.e. in such a way that the height of the aerial was as great as possible. This advice with an aerial not under forty feet in height is excellent; but where the maximum is limited to twenty feet or so, the result can be better described as abominable.

The result will be a long, low aerial having about fifteen feet of down-lead and eighty-five feet of horizontal span; there are two very serious faults with such an aerial.

Firstly, as the horizontal portion is long and at only a small height above the ground, the capacity of the aerial to earth will be high; the effect of this will be that the sensitivity of the aerial tuner will be decreased because the value of inductance used will be low in proportion to the value of capacity used. Besides this, there is, of course, the well-known fact that a low aerial is a poor collector of energy as compared with a high aerial; but this is a fault which cannot be remedied by the design of the aerial.

The second serious fault which a long, low aerial possesses when used as a broadcast aerial, lies in its very marked directive properties. With an aerial of this type it will be found that signals are very much louder when the lead-in end of the aerial points in the direction whence the transmission is coming. This effect may, with a very long, low aerial, become so pronounced that the responsiveness of the system may become nil to signals from any direction other than that in which the lead-in end of the aerial points.

Effective Height Important.

Thus it will be seen, from these two illustrations, that a long, low aerial is of very little use for long-range reception except from one definite direction. If the maximum height for the aerial is restricted to twenty feet or so, the amateur cannot do better than use only forty feet of wire altogether. In almost every case the results will prove more satisfactory than those which would be obtained using the full regulation hundred feet.

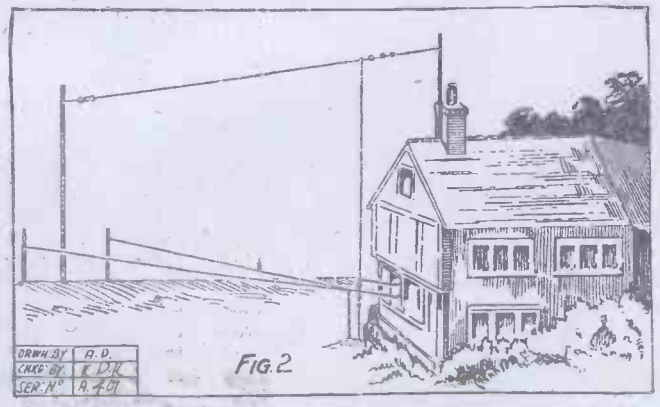


FIG. 2

These remarks apply to the inverted L aerial in particular, but also to a smaller degree to the T type aerial. The use of the T type aerial is not, however, recommended for amateur reception purposes. The ideal type of aerial is, of course, a plain vertical wire a hundred feet in height, the bottom end leading direct to the aerial terminal of the set.

As a general rule for designing an outdoor aerial, let the effective height of the aerial be as great as possible, and let the horizontal portion be about equal to or less in length than the vertical portion, and it should slope *up* from the lead-in and not down. We now come to a very important point in the design of an aerial—namely, the reduction of losses to a minimum.

Insulation.

Firstly, let us consider the type of wire most suitable for use. There is still no better wire than copper—except silver, which is out of the question if only on account of expense—for use in aerial construction. Stranded wire, or strip, should be used, and, if it is to last any length of time, it should be insulated. A hundred feet coil of 7/22 enamelled copper wire, as sold at practically every wireless shop specially for aerials, is ideal. With regard to the actual insulation of the aerial, three or four—preferably four—insulators should be inserted at each end of the horizontal span. Insulators made of highly glazed porcelain are good, and the best shape is that known as "small shell"; the large shell type are unnecessarily large for reception purposes.

At each end of the aerial allow at least four feet of halyard of some sort, so that the aerial wire does not come nearer than about three feet to any brickwork. The same precaution must be observed with regard to the down-lead; a very useful method of keeping it from touching the wall is to hold it out by a stay at the bottom end, as illustrated in Fig. 1. This stay must have three insulators inserted in it.

With regard to the down-lead itself, this should be a continuation of the horizontal portion of the aerial, and not a wire soldered on.

(*Continued on page* 1112).

AERIAL - EARTH EFFICIENCY.

(*Continued from page* 1111.)

We now come to a consideration of the actual lead-in to the set. By far the most efficient way of accomplishing this is to drill a hole through the window-frame half an inch or so in diameter, and push through this a piece of ebonite tube which fits it tightly. This tube should project about six inches on either side, and the outside end should be bent downwards slightly to prevent rain running into the room through the tube. This bending can be done by immersing the end of the tube in boiling water for some time, when it will become quite pliable and may be bent to the required shape and allowed to set.

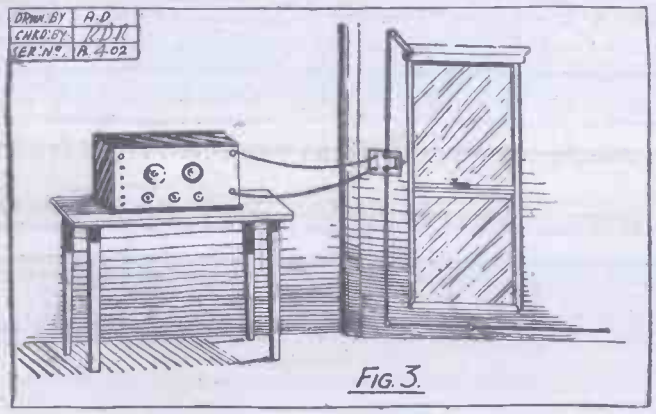


FIG. 3.

The horizontal portion of the aerial must be pulled taut, and also the down-lead by means of the stays (S. Fig. 1). Insert the free end of the down-lead (A. Fig. I) through the tube (T), and pull it through to the inside of the room so that it is reasonably tight. To hold it in position, a cork or rubber stopper, having a portion cut away from one side to allow the wire to pass, can be inserted in the inside end of the tube.

Obtaining a Good "Earth."

Before dealing with the arrangement of the aerial lead within the house, it will be advisable to consider the earth connection. This is in the writer's opinion an extremely important point, and is *the vital* point for long-range work. Probably the best all-round connection will be to a water-pipe, if one is within easy reach of the room in which the set is to be operated. This pipe should be the main water-pipe leading out of the house, and the shortest way of getting to it will usually be to make a hole straight through the floor into the cellar and take the earth wire through this. The best way of attaching the wire to the pipe, which, of course, must be sandpapered clean and bright, is to solder it on; but a copper earth clip may be used instead if desired. An insulated wire should be used to run between the set and the pipe, and should not be of smaller gauge than the wire used for the aerial. It should not be tacked down tightly against the wall, but should be run through brass hooks with porcelain interiors.

If there is no convenient water-pipe available, it will be necessary to employ an outside ground connection. The spot chosen for this connection is very important and must be of good soft soil, the damper the better. Ground which has an underlying bed of rock is of very little use, unless the bed lies at a good distance below the ground, say twenty feet or so.

The hole to receive the earth "plate" should be dug as deep as possible, not less than two feet at the inside limit. A suitable "plate" can be obtained by using a large bucket, a small roll of wire netting, or almost any metallic object having a large surface area. The earth lead should be soldered firmly on to whatever is chosen, and the joint coated with a coat of pitch or bitumen (only the joint). The plate should then be placed in the hole and about two gallons of strong copper sulphate solution poured on it. This will ensure excellent conductivity in the surrounding ground, but will, incidentally, in all probability prevent plants growing in the near vicinity of the earth connection.

If a bucketful or two of cinders are available, these can be put in the hole around the plate before the earth is replaced, and will materially help to improve the conductivity of the connection. Incidentally it is a good plan to bury a wide bore copper tube with the connection in such a way that in dry weather water can be poured down it to keep the connection damp.

If it is not possible to obtain a good earth connection to either a water-pipe or an outside buried earth, the amateur may use a counterpoise, or "capacity earth" as it is sometimes called, and, provided it is carefully erected, he will at any rate know that it will be reliable, which is more than can be said for any earth connection proper until it has been tested.

Essentially, a counterpoise consists of an arrangement of wires directly underneath the aerial and about six feet or so from the ground. These wires, with the aerial proper, form the two plates of a condenser, the counterpoise thus serving the same function as an earth connection save that it has no direct connection with the transmitter. There actually is a connection, however, through the capacity which the counterpoise has to earth. Hence it will readily be appreciated that a counterpoise is a very good substitute for an ordinary earth.

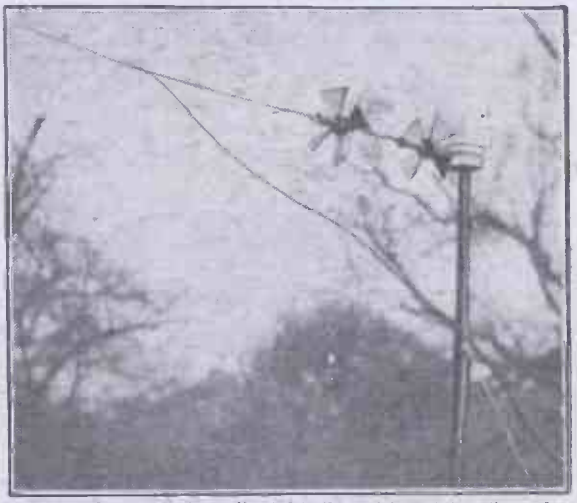
In practice a counterpoise for reception can be made by running two wires, each of the same length and horizontal span as the aerial, from a point at the lead-in in such a way that they radiate from this point, their free ends being about six or seven feet apart. The direction taken by the wires must be such that the line which bisects the angle they form is directly underneath the horizontal span of the aerial. The wire used should be the same as that used for the aerial, and the insulation throughout must be just as good. A lead-in wire is taken from the point where the two wires converge, through the window in precisely the same way as that in which the aerial down-lead was led in. The whole arrangement is shown in Fig. 2.

Connections to the Receiver.

We now come to the final consideration in the design of the system, the arrangement of the leads within the house. The first thing is to obtain the earthing switch, which is preferably of the D.P.D.T. type with two of the end contacts shorted. This should be screwed to some convenient place on the window frame, or on the wall, by the window, and the earth lead, run to it through hooks with porcelain interiors as previously explained, connected to one of the centre contacts.

The aerial lead must be connected to the other centre contact, but special precautions must be taken to support it at least six inches from the wall. There are several gadgets on the market which will do this effectively, but a simple arrangement can be made at home quite easily.

Obtain two pieces of round wooden rod a half-inch in diameter and about eight inches in length, and bind one end of each with No. 36 S.W.G. steel wire. Now with a brace and bit drill two holes having a diameter of one half-inch, and about one and a half to two inches deep, into the solid edges of the window frame, in such a position that one is situated near the aerial lead-in tube and the other near the switch. Into each of these holes knock the unbound end of one of the two rods, using a wooden mallet to accomplish this and not a steel hammer. Now with a red-hot knitting needle bore a hole down the top of each of the rods, and very carefully screw into these holes two brass hooks with insulating interiors of porcelain. The aerial lead is taken from the lead-in tube through these hooks to its terminal on the switch. The arrangement is illustrated in Fig. 3. The leads to the receiver are taken to the remaining terminals on the switch, so that when the blades are in one position the aerial is connected to earth direct, whilst in the other position the aerial and earth are connected to the set.


Two of the "Winsulators" fitted to the aerial erected on the roof of Mr. Ramsay MacDonald's house at Hampstead.

"P.W." A1 Crystal Set

The Set Designed and Described by
P. R. BIRD
(Assistant Technical Editor).

Constructional Work by
G. V. COLLE
(Technical Staff).

ALTHOUGH the old-fashioned method of tuning a crystal set by means of a tapped coil is not now so fashionable as formerly, the method has much to recommend it. This is especially the case where the constructor is expert at soldering connections (of which there are a great number), and providing that this part of the work is done thoroughly the efficiency of such a set is very high.

From the photograph on this page it will be seen that the receiver is totally enclosed in a compact case. Opposite to the aerial and earth terminals are two "output" or "amplifier" terminals, which are connected in parallel with the telephone terminals. This arrangement is simply a matter of convenience in case the set is eventually used in conjunction with a low-frequency amplifier.

"P.W." A1 CRYSTAL SET.
LIST OF COMPONENTS.

	s.	d.
1 Panel (8 x 6 x ¼ in.) with Cabinet	5	0
1 Burndept Crystal Detector	4	0
1 Panel-mounting Coil Holder (Peto-Scott)	1	2
2 Switch Arms	2	6
20 Contact Studs		8
4 Stops		2
¼ lb. 26 S.W.G., D.C.C. Wire ..	1	3
1 4-in. Spider-Web Former ..		4
6 Terminals (W.O. type)		9
2 Coils Glazite	2	4
Screws, Transfers, etc.	1	0

A "close-up" of the complete set, with the loading coil removed from its socket.

The "Amplifier" Terminals.

In such a case it is more convenient to connect the input of the amplifier to the crystal set at the two right-hand terminals marked "amplifier," than at the two terminals in front marked "'phones." Another advantage of these two pairs of terminals being connected in parallel is the fact that they can be used for two pairs of telephones, the second pair being merely joined to the terminals marked "amplifier" when desired, without in any way disturbing the other connections of the crystal set.

Looking at the complete set from the front of the box it will be seen that the tuning is carried out by means of twenty studs and two switch arms, each of which is free to make contact with ten of the studs. The left-hand switch arm travels over the studs which are connected to adjacent turns on the tuning coil, and consequently this switch arm is known as the "units" control.

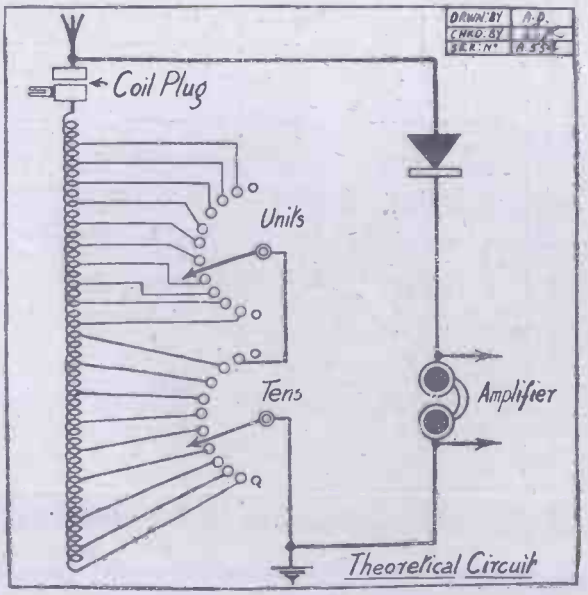
The studs of the right-hand switch are not tapped to adjacent turns, but instead they connect to the tuning coil at every tenth turn (twentieth, thirtieth, fortieth, etc.), so this switch is known as the "tens" switch.

Provision for Loading.

In order that the set will work efficiently over a wide band of wave-lengths, provision has been made for the insertion of a loading coil. This takes the form of a plug and socket into which can be placed an ordinary plug-in coil, and it is connected between the aerial terminal and the tuning coil. When not in use this coil plug must be shorted by means of a shorting plug, in order to complete the connections.

Between the loading coil socket and the "amplifier" terminals is placed the crystal detector. The particular model used is a "Burndept," which is fitted with an ingenious device by means of which the pressure of the catswhisker upon the

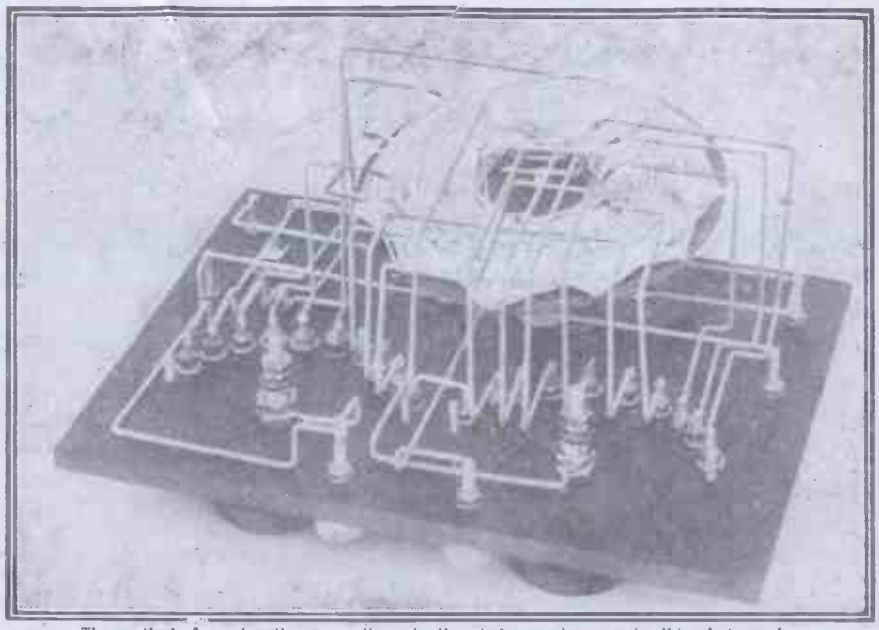
(Continued on page 1114.)



"P.W." A1 CRYSTAL SET.

(Continued from page 1113.)

surface of the crystal may be regulated very accurately. This is an important point with most crystals if it is desired to obtain the best possible results with them, and although a cheaper crystal detector would no doubt have given good results,



The method of spacing the connections to the studs can be seen in this photograph.

POINT-TO-POINT CONNECTIONS.

Aerial terminal to plug of loading coil holder and one side of crystal detector. Other side of crystal detector to one 'phone and one amplifier terminal. The remaining 'phone and amplifier terminals are connected together and to earth.

Socket of coil holder to the beginning of the tapped basket-coil winding. The ten "unit" taps of the coil should be connected to the ten contact studs, as shown in the diagram.

The "units" switch arm is connected to the first stud on the "tens" section, and the remaining taps are connected in order to their respective studs.

The "tens" switch arm is connected to earth.

the model shown is recommended as being excellent value where high efficiency is required.

The Case and Components.

The case shown in the photograph is quite a cheap one, and the fact that when the lid is closed the "works" of the set are completely covered, is a great advantage. Otherwise dust and similar small impurities would tend to accumulate between the studs, from whence they are very difficult to remove. In order to clear the components mounted upon the panel (excluding the shorting plug or coil, which can be removed when not in use), the lid of the case must be approximately 1½ in. deep.

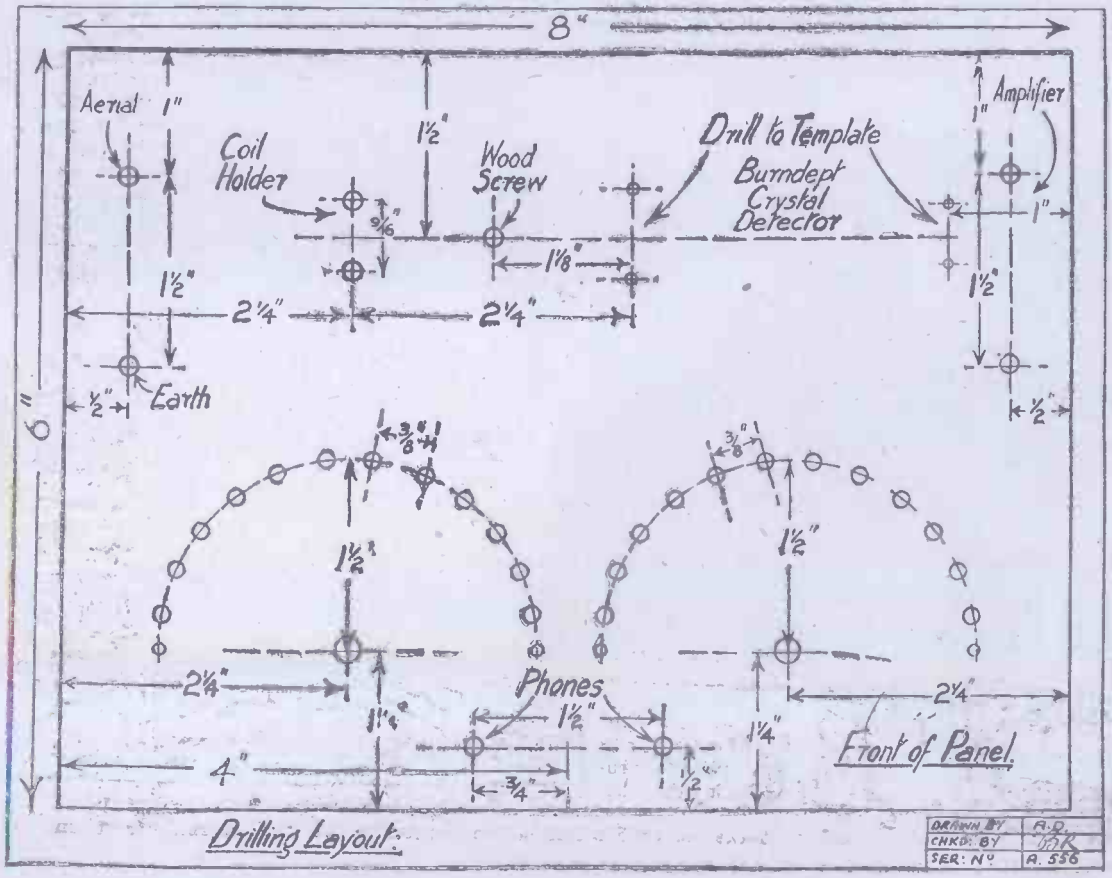
When the panel has been trimmed round to fit the case, it is drilled in accordance with the wiring diagram which appears on this page. The contact studs should be placed ⅜ in. apart, and the exact measurements for the Burndept crystal detector can be marked off from the template, which is included by the makers in the carton in which this component is supplied.

The Main Tuning Coil.

The tuning coil itself consists of an ordinary spider-web coil of the "double wound" variety. It contains 100 turns of No. 26 D.C.C. wire. The reason for double winding is to economise space, as otherwise a 100-turn coil is unduly bulky. For the benefit of those unacquainted with the term it may perhaps be necessary to explain that double winding is carried out on the ordinary spider-web former, and in the ordinary method; the only difference being that instead of the winding proceeding from slot to slot round the coil alternate slots are missed and the wire is carried down the first, third, and fifth slots, etc. When completed, the coil will be rather thicker than the ordinary spider-web coil of the same number of turns, but its diameter will be much smaller.

When winding the coil the wire should be looped and twisted to provide for the tappings at the following turns: 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, 9th, 10th, 20th, 30th, 40th, 50th, 60th, 70th, 80th and 90th. The usual method of twisting for this purpose is to double the wire back on itself for about 1 in., twisting the ends to hold them

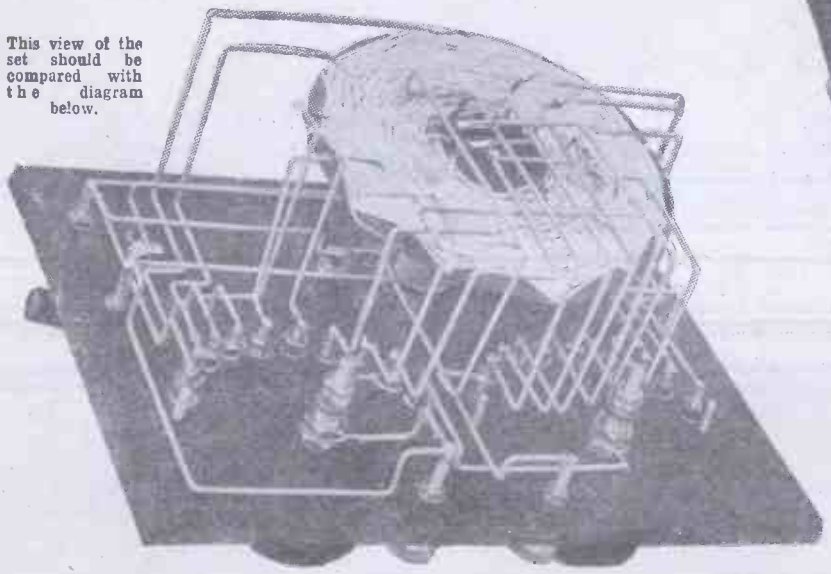
(Continued on page 1117.)



"P.W." A1 CRYSTAL SET.

(Continued from page 1114.)

securely. The wiring is then continued until the next tapping point is reached, when another loop is twisted in it. When completed the coil is supported upon a wooden pillar, about 2 in. long and ½ in. thick. As a matter of fact, the actual wooden pillar shown in the photographs was obtained from an old wire reel from which the ends had been cut off.



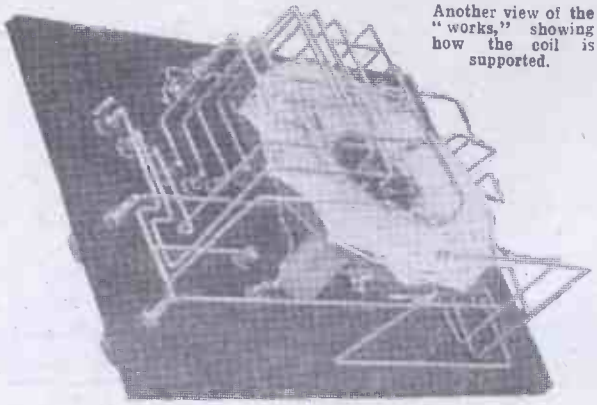
This view of the set should be compared with the diagram below.

The Switch Connections.

The wooden pillar is secured to the panel, and the spider-web former to the pillar, by means of small wood screws of suitable size. The coil is, of course, fixed with the tappings uppermost ready for connecting up the studs to the switches. The other connections to the crystal detector, loading plug, etc., should be done first, leaving the connections between the coil and the studs until the rest of the wiring is finished.

For the connections to the switch arms themselves, stiff wire may be used, connected to the bush between the two large nuts which hold the switch arms to the panel. Alternatively the connection may be taken to the moving part of the switch arm by means of flexible leads. The former method is preferable in most cases, so this plan was adopted in the receiver shown in the photographs.

The wiring of the coil is done in accordance with Fig. 1, and is best carried out by connecting the units tappings first, and then working out through the "tens" tappings to the outside of the coil. The completed wiring is clearly shown by the photographs.



Another view of the "works," showing how the coil is supported.

When completed the set should be carefully cleaned at the back of the panel, particular attention being paid to ensure that no dust or impurities are secreted between the studs. The wiring should be carefully checked from the list of point-to-point connections, and the set is then ready for use. It will prove a thoroughly reliable little instrument, capable of receiving good signals over a very wide range of wave-lengths.

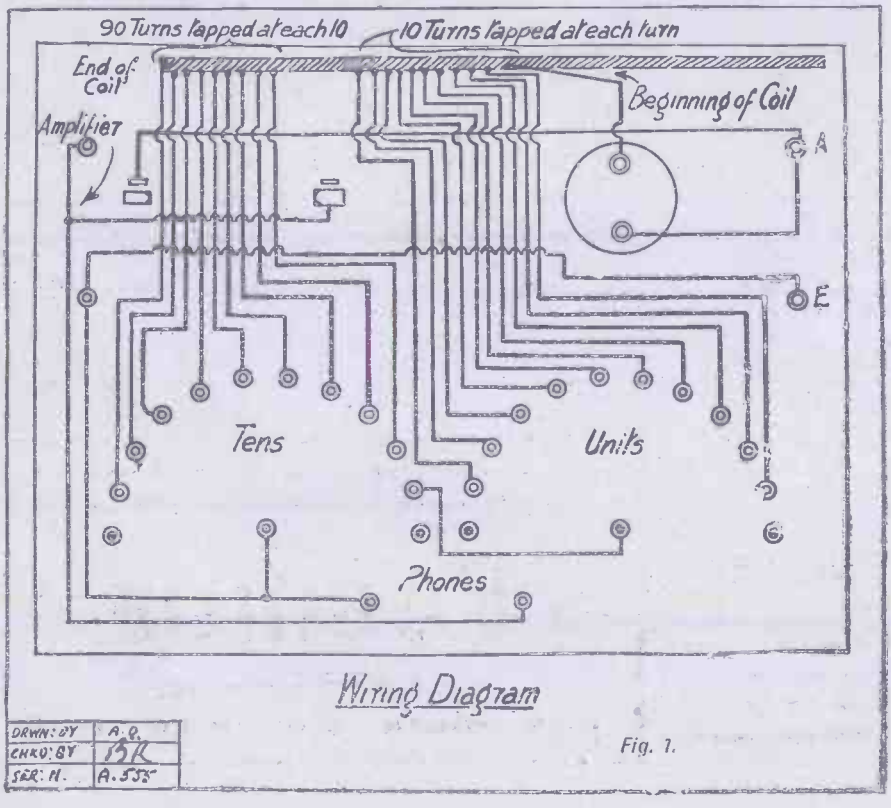


Fig. 1.

The Wave-lengths Covered.

Without a loading coil the tuning range extends between 295 and 900 metres when used with the average aerial and earth system.

If an exceptionally short aerial is to be used, or the earth-lead is unusually long, or if there is any other out-of-the-ordinary feature in the installation, these figures will vary slightly accordingly. But as slight variations are covered by a very small movement of one or both of the switch-arms, these little discrepancies are quite unimportant in practice.

When the set has been connected up and the shorting-plug has been inserted into the loading coil sockets, movement of the "Tens" and "Units" switch-arms will tune the set to the wave-length of any of the British main or relay broadcasting stations. Each of these stations work upon a wave-length between 300 and 500 metres, and once the tuning adjustment for any particular station is found it remains unaltered, unless, of course, the station subsequently changes its wave-length for some reason.

The Coil for 5 X X.

To receive signals from the B.B.C. high-power station at Daventry, it will be necessary to remove the shorting plug, and in its place insert into the sockets a loading coil. This coil may be of any type of tuning coil, such as basket, spider-web, or honeycomb, and should consist of 150 turns. The latter variety has the great advantage of being very compact, but both spider-web and basket coils will be found quite efficient, though undoubtedly cumbersome and rather fragile.

CURRENT TOPICS.

By THE EDITOR.

The B.B.C.'s "Crystal Policy"—Too Many Stations—The Congested Ether—Wanted, a Locarno Broadcasting Pact—The Remedy for Interference.

LORD GAINFORD, Chairman of the B.B.C., speaking at the opening of the new Newcastle station the other day, referred to what has been termed the B.B.C.'s "crystal policy"—that is, the policy of making programmes available for as many listeners as possible on the simplest and cheapest receiving apparatus.

By this policy, Lord Gainford said, just under 90 per cent. of the population could get one of the programmes on simple apparatus.

Lord Gainford stated further that the B.B.C. wanted to secure facilities to enable them to provide a minimum of two programmes for every potential listener, and the B.B.C.'s plans implied the provision of many more alternative programmes for those who had valve receiving sets.

Lord Gainford's reference to the B.B.C.'s "crystal policy" is especially interesting in view of the second conference of the International Radiophone Bureau, held at Brussels a few days ago, when plans were drafted in preparation for another attempt to solve the interference problem.

The Effects of a Policy.

The B.B.C.'s crystal-set policy has, in the opinion of many critics, been responsible for a good deal of the growth of the interference trouble.

The B.B.C.'s band of wave-lengths is limited; but into that narrow band they have crammed over 20 stations—including relays—and all because of the crystal-set policy, a policy of direct encouragement to listeners to buy crystal sets and to ignore the valve loud-speaker set.

We express no opinion on this policy as it affects the wireless trade, and if the trade does not mind crystal sets being boosted at the expense of valve sets, that is their look-out.

But what does concern the amateur is the effects of this policy. Three years ago we pointed out that too many B.B.C. stations of the 1½-K.W. and relay type should not be erected unless the Post Office gave the B.B.C. permission to operate over a wider wave-length band.

A Black Outlook.

The result to-day is that, what with the B.B.C. stations all operating on a band of 300 to 500 metres, and Continental stations springing up almost every day, the interference trouble is worse than ever, and is likely, despite the International Radiophone Bureau's efforts, to become worse unless the B.B.C. modify their crystal-set policy. And as the modifications necessary cannot very well be put into operation until the end of 1926, the outlook, as regards interference, is black.

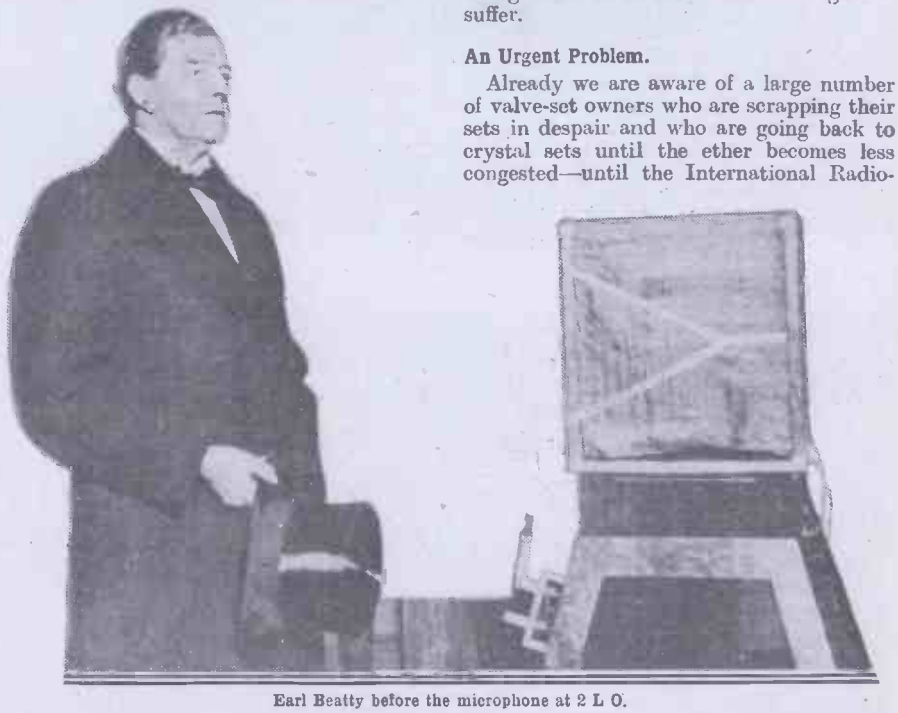
Mr. Reith has already made tentative mention of the remedy we have in mind—the scrapping of the majority of the B.B.C. stations and the erection of a limited number of high-power stations similar to Daventry.

This plan, if carried into effect, would greatly ease the congestion in the broadcast wave-bands; and if the Bureau can bring about an agreement whereby the Continental stations are similarly limited in number, peace in the ether may yet be obtained.

At present a Locarno Broadcasting Pact is very badly needed. Half-measures are not likely to succeed.

The truth of the matter is that far too much attention has been paid to the crystal user.

In order that a listener shall spend as little as possible on a set, the ether has been sacrificed to him. Irrespective of the thousands, the hundreds of thousands of valve-set users, stations have been erected to supply the crystal-set user with programmes despite the inevitable congestion on broadcast wave-bands and the consequent increase in interference.



Earl Beatty before the microphone at 2 L O.

Too Many Stations.

It is a policy we have never agreed with, and never can agree with. It is a policy which pleases crystal-set users at the expense of the vast majority of valve users.

We do not wish to suggest that the B.B.C. are solely to blame: the trouble is just as bad, if not worse, on the Continent; and the direct result is that Continental reception in this country is, for the average valve-set owner, a farce. Stations are treading on the toes of each other so closely that even a super-het. has its work cut out to separate them.

A New Scheme.

The crystal-set user doesn't worry. Naturally he is chiefly concerned with the reception of broadcast programmes from his local station or from 5 X X; it means little or nothing to him that Continental reception is chaotic, and that the valve-set owner finds it exceedingly difficult and often impossible to hear any other station without more or less constant interruption.

Naturally it is only fair that crystal-set owners should get a good service, but this service could have been given them without valve-set owners suffering so badly. A limited number of high-power stations, in this country and on the Continent, would give crystal-set owners an adequate service: the difference between the wave-lengths used by the limited number of stations could be greater, and consequently interference considerably reduced.

This method will, we feel sure, inevitably be adopted sooner or later; but the pity of it is that it was not adopted sooner, and that, for some time to come, it looks as though the valve-set owner has got to suffer.

An Urgent Problem.

Already we are aware of a large number of valve-set owners who are scrapping their sets in despair and who are going back to crystal sets until the ether becomes less congested—until the International Radiophone Bureau gets really powerful, and until it decides on drastic and really efficacious methods instead of the half-hearted methods recently agreed upon at Brussels.

Until the interference problem is dealt with and the wave-length band for broadcasting considerably eased, broadcasting reception for the valve-set owner who wants—and quite naturally—a little more variety than that offered, night after night, by 5 X X or his local station, will be hopeless.

And the direct result will be a waning interest. And that means a waning Radio Trade.

Silvertown

WIRELESS ACCESSORIES

Ensure Perfect Reception

B 500.

INTERVALVE TRANSFORMER.

Guaranteed for 12 months.

Price **21/-** each.

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(Patent 226245.) This switch is of the under panel mounting type, and is fitted to the panel by means of the two counter-sunk head screws supplied. It enables the experimenter to build up large capacities, and is an invaluable addition to any set.

Price **5/6** each.

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AN AID TO ENTHUSIASTS

We have prepared a logging chart for recording wavelengths, condenser settings, etc., of those stations which require careful calibration to tune in. A copy of this chart printed on stiff card, with hanger, can be obtained free of charge at any of our Branches or from any high-class dealer.

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FILAMENT RHEOSTAT.

One Hole Fixing.

Circular pattern, on ebonite former, complete with knob, pointer, black celluloid scale engraved in white and two terminals for connections. The resistance wire is wound on an insulating rod, thereby giving a perfectly smooth adjustment. B.599—Wound to approximately 5 ohms resistance.

Price **3/** each.

B.600—Wound to approximately 30 ohms resistance. Price **3/6** each.

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BROADCAST NOTES.

By O. H. M.

The Vicar of Mirth—Sir Harry Lauder at 2 LO—Continental Relays—The Broadcasting Committee—Alternative Programmes—The £5 Set.

THE Vicar of Mirth, Mr. Vivian Foster, will make a welcome reappearance before the microphone on Friday, February 5th, when he will be the central figure in a sketch entitled "A Village Concert," S.B. from London. The Vicar of Mirth is one of the most original and popular of the artistes that the B.B.C. attracts. True, he is occasionally criticised. But what artiste of distinction avoids criticism from some quarter? But apparently not all his listeners take his work as fun. I hear that the B.B.C. gets letters asking the name of the parish in which Mr. Foster officiates. One correspondent of this category expressed the ardent desire to attend divine service at the "Vicar's" church.

Sir Harry Lauder at 2 L O.

Sir Harry Lauder's microphone debut was undoubtedly the most successful and notable event of its kind in the history of broadcasting. It was characteristic of the man that he should have put himself out to study the technique of the new medium. The result was not only a performance of a great artiste, but what is at least of equal importance, the performance of a great microphone artiste. By the way, the rumour that he was getting £1,500 for three broadcasts was wide of the mark. The B.B.C. is to be congratulated for providing the great little Scot to listeners at a much lower figure.

Apparently the stream of congratulatory letters is unceasing. Both the B.B.C. and Sir Harry himself have had thousands of appreciations from all parts of the country, and from abroad as well. The question everyone is asking is "When is he coming on again?" Well, I understand that the next occasion will be in June. The delay will no doubt be unpopular, but, in the general interests of broadcasting, I am glad of it. There are very few "turns" of this quality, and they are better used sparingly. I hope that other "stars" booked for the microphone will follow Sir Harry's example and learn something about the medium and its limitations before being transmitted.

* * *

That able team, Donald Calthrop and R. E. Jeffrey, are evolving a new broadcast revue, entitled "Out of the Hat," which will be heard for the first time on February 1st. I am banking on this being really good. Donald Calthrop is now finding his feet in Savoy Hill.

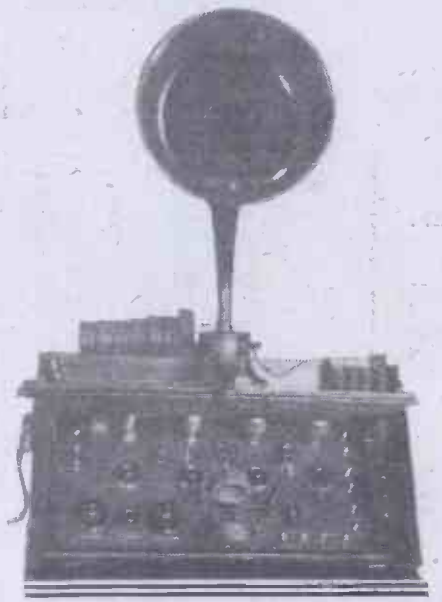
* * *

The Continental Relays are doing better, and I gather that the one arranged for February 5th should be first class. Captain West's indefatigable work is now yielding substantial fruit, and the chances of failure are much less than they were. Incidentally, the foreign broadcasters are co-operating more earnestly, realising the publicity value to them of these relays.

* * *

The Broadcasting Committee will not resume its sittings until the end of the first week of the New Year, but its members are not immune from advice and exhortation during the recess. I hear that hundreds of letters are being received, advancing as wide a variety of opinions. But the consensus apparently is that the B.B.C. should not be greatly changed. Listeners generally resent the imputation of the "entertainment dole," the phrase somewhat unhappily used by Mr. Walter Payne, giving evidence on behalf of the theatres and music-halls. The R.S.G.B., the Radio Association, the Narmat, will be heard early in January. I hear the trade unions interested in the publishing and printing business are to have an innings as well.

All the evidence will have been heard early in February. I hope that then the



A four-valve set constructed by G. Moorcroft, 14, Malvern Avenue, Smithills, Bolton, Lancs.

Committee will call Mr. Reith once more. It is difficult to see how they can come to a fair conclusion on such a mass of evidence without giving the managing director of the B.B.C. a chance to answer questions on at least the main points raised by special interests.

Alternative Programmes.

I advise music lovers to listen on January 29th, when there will be a special Sapellnikoff Recital from London. The music side of the B.B.C. is specialising more than it used to, on the principle that it is better to give rather fewer really good musical entertainments than a larger number of what the Critics' Circle might brand as mediocre.

* * *

I was glad to note that several B.B.C. spokesmen have come out into the open on the subject of facilities for alternative programmes. It is generally agreed that a reconstitution of the British system is overdue.

The fact is that, although we have the best single programme service in the world, we are behind other countries in facilities for alternatives capable of reception on simple cheap apparatus. There is no reason why London should not have four of these alternatives, and the other large centres of population at least as many. But I gather that the Post Office is chary of the new scheme. Moreover, there is no doubt that the Treasury has its eagle eye on licence money. The Post Office has limited the B.B.C. to £500,000 for the year ending March 31st next. This may be a correct interpretation of powers under the licence, but it is exceedingly bad policy from the point of view of those who pay their good money for the best possible broadcasting service.

Another Treasury Raid.

Already about £80,000 must be locked up, and now I hear that, in addition to holding back this money, the Post Office has decided not to release it without special Treasury sanction. The inference is obvious. It is a case of another raid, but this time on radio. One may have every sympathy with the desire of the Treasury to relieve the taxpayers' burden, and yet still doubt the constitutional validity and the fairness of what is in effect a new form of taxation. I hope that the matter will be fully ventilated in Parliament. The 10s. licence is paid specifically for broadcasting, and should be spent on broadcasting and on nothing else.

If the Treasury pundits think the British public will be satisfied to tolerate the permanence of the present arrangements for broadcasting, they are making a big mistake. Moreover, since Lord Gainford's speech at the opening of the new station at Newcastle, it is clear that the B.B.C. mean to take the public into their confidence more fully in the future than in the past. There is need of considerable vigilance, because I am not at all sure that the Broadcasting Committee itself does not look with a friendly eye on the Treasury raid on radio.

The £5 Set.

There would appear to be a considerable change-over from crystal users to valve users among listeners generally. I gather that the B.B.C.'s voluminous correspondence reveals this tendency. One hopes that the British wireless trade will take advantage of the opportunity and turn to the mass production of cheap but efficient one and two-valve sets.

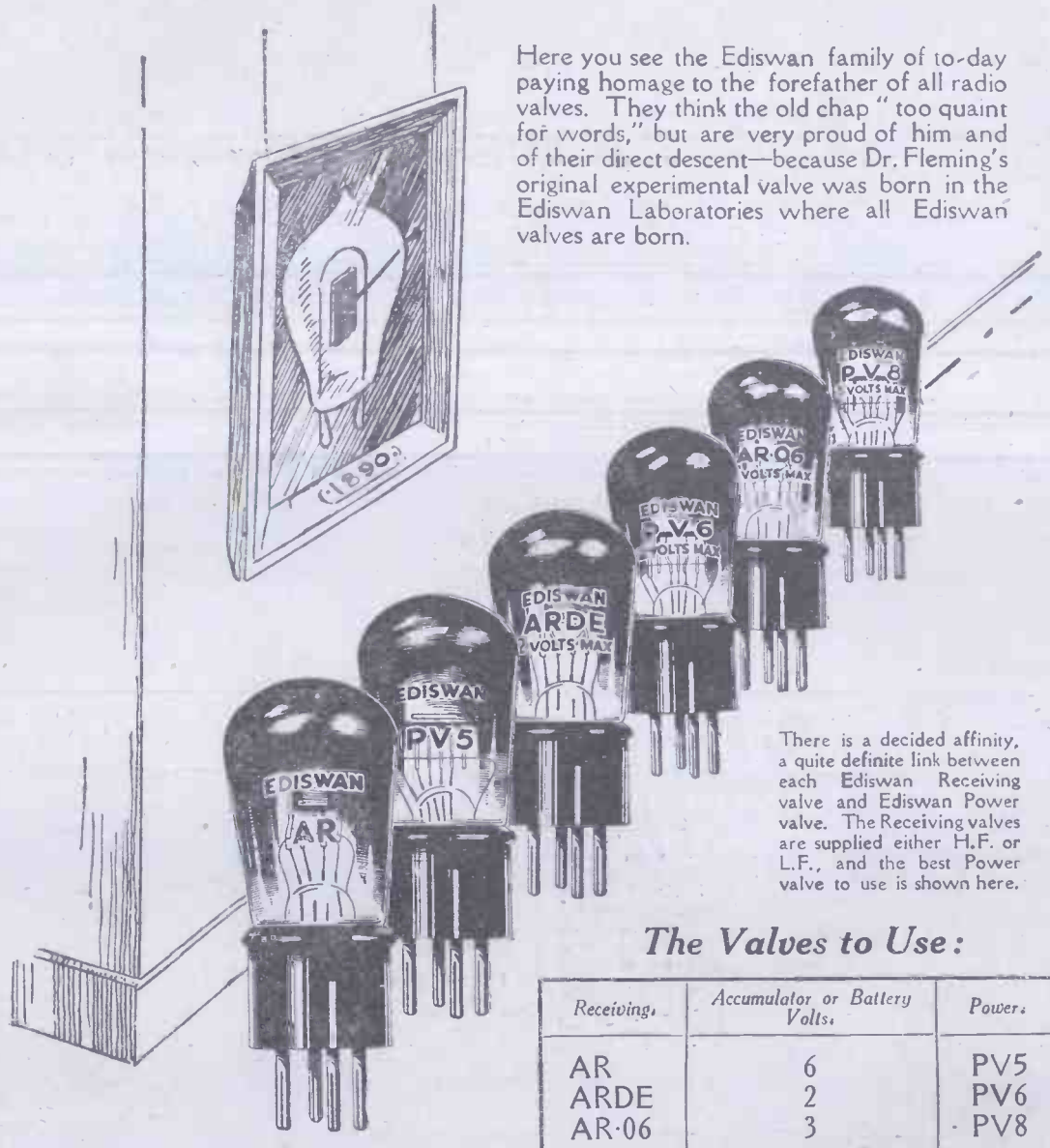
The British firm which is first to market a two-valve set complete with all components and accessories retailing at £5 will make a fortune. Hitherto it has been the custom to regard the period October to December as the pivot of the wireless selling year. But the introducer of the £5 two-valve, all-in set will sell all the year round as rapidly as the sets can be turned out. Incidentally, broadcasting will benefit, and unemployment will be reduced.

BROADCASTING NEWS.

Watch these weekly Notes. They are written by the best informed critic of broadcasting and often contain news which you will not find published elsewhere.

THE HAPPY FAMILY

"Ancestors"



Here you see the Ediswan family of to-day paying homage to the forefather of all radio valves. They think the old chap "too quaint for words," but are very proud of him and of their direct descent—because Dr. Fleming's original experimental valve was born in the Ediswan Laboratories where all Ediswan valves are born.

There is a decided affinity, a quite definite link between each Ediswan Receiving valve and Ediswan Power valve. The Receiving valves are supplied either H.F. or L.F., and the best Power valve to use is shown here.

Ediswan Valves are Entirely British Made.

The Valves to Use:

Receiving.	*Accumulator or Battery Volts.*	*Power.*
AR	6	PV5
ARDE	2	PV6
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With these groups and Ediswan H.T. and L.T. Accumulators the ideal is attained.

EDISWAN VALVES

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THE EDISON SWAN ELECTRIC CO., LTD., 123-5, QUEEN VICTORIA ST., LONDON, E.C.4.

162/93

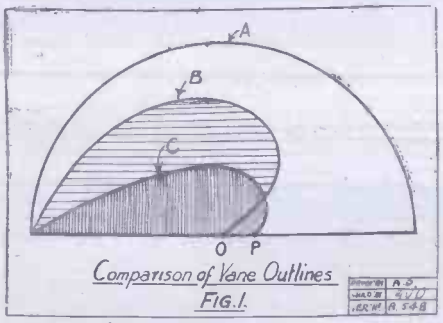
KILOCYCLE CONDENSERS.

By SEXTON O'CONNOR.

A few notes of general interest on the latest designs and improvements in condensers.

THE high standard of construction shown in the latest models of variable condensers can, perhaps, best be appreciated by comparing them with the type of instrument in common use a year or so ago. Apart from detail improvements for diminishing hand-capacity effects, facilitating panel mounting, providing ball-bearings for the moving parts, and securing greater robustness, the modern designer has succeeded in producing what is essentially a high-grade instrument of precision.

This advance has been brought about partly by the increasing interest taken in short-wave working, and partly by the general demand for greater selectivity. The first requirement involves the elimination of stray and dielectric losses, and also a low minimum or residual capacity at zero scale setting, whilst the provision of



Comparison of Vane Outlines
FIG. 1.

fine tuning or micrometer control is necessary in both cases.

Methods of Gearing.

As regards the latter feature the original method of using one or more separate vernier plates is now being replaced by various forms of spur, worm-wheel, or frictional slow-motion gearing, whereby a complete rotation of the control knob results in a comparatively small angular movement of the condenser vanes.

In some cases a clock-wheel train of gearing is used to give a step-down ratio of as much as 100 to 1, without appreciable backlash. In other cases the rotary vanes, instead of moving as one body, are made to overlap the stationary vanes in echelon—i.e. one after the other, thus giving a very comprehensive vernier-plate effect.

A notable feature of "precision" design is seen in the so-called straight-line or square-law tuning condenser. Here the moving vanes are specially shaped so that the degree of over-lap does not vary directly with the angular movement of the control knob, but as the square of that movement.

The effective capacity in a given circuit is known to vary as the square of the wave-length to which the circuit is tuned. Provided that the effective capacity can be designed to vary as the square of the movement of the control knob, it follows that any movement of the latter will then give rise to *directly* proportional changes in the wave-length of the tuned circuit. This, of course, is not the case with the ordinary or circular-plate type of condenser.

The New Geneva Arrangement.

In spite of criticisms that are sometimes levelled at the more extravagant claims made on its behalf, the square-law condenser (when used in a closed circuit with a good coil of low self-capacity) does give a substantially even distribution of wave-length readings round the condenser dial. That is to say, if the condenser in moving through 180° tunes the circuit over a band of 360 metres, then an advance of one degree in the condenser dial corresponds to an increase of two metres in the wave-length of the circuit, no matter at what part of the dial the condenser is being operated. On the other hand, in the case of a condenser fitted with semi-circular moving vanes, an advance of one degree has much less effect at the higher wave-lengths than at the lower.

Following on proposals under consideration at the recent Geneva conference it is expected that the present method of separating transmitting stations by so many metres in wave-lengths will shortly be replaced by a scheme of redistribution based upon the provision of a minimum gap of so many kilocycles between each station. On this basis, the condition for non-interference between any two stations is that a gap of at least 10 kilocycles should separate them.

DX Condenser Requirements.

The available broadcast range of wave-lengths between 200 and 600 metres, when expressed in kilocycles, becomes 1,500 to 500. This band of 1,000 kilocycles will accordingly permit 100 stations to operate, leaving a gap of 10 kilocycles between each station. A simple calculation will show that one quarter or twenty-five of these stations will then be working between wave-length limits of 200 and 240 metres, another quarter between 240 and 300 metres, whilst the remaining fifty stations will be spread out over the remaining band of 300 to 600 metres.

With such a distribution of transmitting frequencies, the ordinary square-law *wave-length* condenser will be found to have the same effect as the original circular-plate condenser—i.e. the shorter-wave stations will still be crowded together at the low-capacity end of the dial. Actually one-half of the total number of stations will fall within the first quarter of the condenser scale, whilst the other half are spread out over the remainder of the dial.

What a long-range listener really requires, when working under these conditions, is that the whole of the stations should be evenly spaced round the 180° of his condenser dial. In other words, the condenser dial should calibrate evenly in kilocycles.

The Three Types.

The theoretical design for a condenser satisfying this condition is based upon mathematical considerations which cannot be treated here, but the curve C shows the outline of a square-law *frequency* vane, as compared with the ordinary or semi-circular vane A, and with a standard square-law *wave length* vane B, of the same maximum radius, O being the common pivot for all the plates.

It will be noticed that the theoretical curve B for the square-law *wave-length* condenser strikes right into the pivot O, whereas the curve for the straight-line *frequency* condenser finishes at a point P on one side of the pivot. In fact, the theoretical curve C, if extended inwards, would encircle the pivot O an infinite number of times, and would never actually reach the central point.

Another interesting point is that the area of A is exactly twice that of B, and about eight times that of C, so that if three condensers are constructed having the same number of plates, the same maximum radius, and the same spacing, one with semi-circular plates A, another with square-law wave-length plates B, and a third with square-law frequency plates of shape C, then the maximum capacity of A would be twice that of B, and eight times that of C.

Minimum Capacity Difficulties.

The curve C, it should be mentioned, is not the only curve that will give the straight-line *frequency* effect. Other curves rising higher towards the curve B may be used so as to provide a larger area of plate, but in such cases the outline will finish at a point still farther from O than the point P. This is not desirable, because the position of the point P determines the minimum capacity of the condenser, and as previously mentioned this residue should be as small as possible, particularly for short-wave reception.

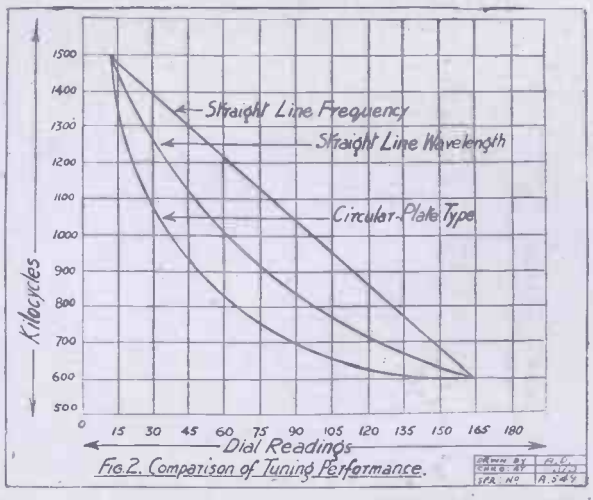


FIG. 2. Comparison of Tuning Performance.

It will thus be seen that the design of an efficient variable condenser is not an easy task, though rapid improvements are being made both in this country and America.

AMERICA CALLING.

By L. W. CORBETT
(Our Resident Correspondent in New York).

The Valve Patent — The New W J Z—Increased Power—The International Tests—Our Correspondent to Broadcast.

QUITE a considerable amount of surprise has been aroused in American radio circles by the granting of a basic patent relating to the modern vacuum tube to Dr. Irving Langmuir, who is the director of the General Electric research laboratories. This patent, it appears, was applied for as early as the year 1912, but, due to much litigation and legal affray, it has only just been allowed.

This example of "speedy" patent action seems to be pretty typical in the States; probably it's just as bad all over the world.

The Armstrong-De Forest suit has been hanging over for about ten years now; De Forest and Armstrong seem to be granted the patent relating to "reaction" in turn. At present De Forest is legally the discoverer of regeneration, but Major Armstrong told me the other day that he thought that he had a very good chance of getting the decision reversed on this matter in an appeal suit to take place within the next few weeks.

Another Valve Monopoly?

Reverting to the recently granted Langmuir patent, if we go very closely into the matter we will discover that the patent really relates to an improvement only, on the De Forest audions. In 1912, all the De Forest audions were of the soft variety; not at all efficient. Langmuir discovered a way of making a hard "tube," one with very little gas left in it, and he applied for a new patent on "a new kind of tube." So much importance was attached to the application that testimony was taken in England from a world-renowned British scientist.

No doubt a certain amount of the delay can be attributed to the intervening years of war when the commissioner of patents suspended proceedings temporarily, as the full time of the contestants for the patent was required for war work. In certain American circles it is feared that the granting of this patent will be the means of causing another valve monopoly; and that the many (probably more than a hundred) independent valve manufacturers will be ousted from the business. Until a year or so ago, all valve manufacturers, with the exception of the De Forest Company and the General Electric (and the latter's sub-licensed companies), were liable to be sued for infringement, for De Forest held the well-known grid patent, and no valves could be made without infringing this patent.

Effect on Prices.

While the patent was in force, there was naturally a valve monopoly, the General Electric turning out valves for the Radio Corporation of America (R.C.A.), they in turn selling them for what they liked. When the independently made valves began to appear, the R.C.A. had to drop their prices to a reasonable figure, either because it was necessary to, to compete with the independents, or because of the greater demand of valves; probably both. Whether it will be possible for the General Electric to put the various independents out of business on account of their latter patent, is a point of conjecture. It is doubtful whether they will attempt such a plan.

I was greatly interested in what Professor Morecroft had to say on the matter in his recent article in Radio Broadcast magazine, which, by the way, was subsequently quoted in the "New York Times" editorial page. He says:

The Power of a Trust.

"The government says that to improve the evacuation of De Forest's audion does constitute a patentable idea, and that the General Electric Company is entitled to this patent. This means, evidently, that every highly evacuated tube is subject to Langmuir's patent. But nowadays we use nothing but highly evacuated tubes, so we must conclude that every tube we have to-day is subject to this new Langmuir patent.

"This constitutes a most dangerous situation, one which the Radio Corporation of America (together with the General Electric.—ED.) can freely use to their advantage if they so desire. If we read the patent aright it appears that now, and for the next seventeen years, all of our valves are legally produced only by the R.C.A., so that the price is again at the mercy of this trust.

A two-valve set constructed by a lady reader of "P.W.," Miss Isa Hutton, 272, Buchanan St., Glasgow.

"Possibly the R.C.A. will not now push their advantage as they might have done had the patent been granted three years ago (in plenty of time before the independents were active). Seventeen years is a long time, and if the Radio Corporation lasts that time (a matter open to some doubt) it may still exert a stranglehold on America's radio before the expiration of the life of this patent.

"We believe that the Court was unfortunately advised in deciding that any man was entitled to a patent on the improvement in vacuum of a well-known device. It may be that some legal step yet remains by which this threatened stranglehold of the Radio Corporation on the valve situation may be broken, but just what means are to be employed are not quite evident."

The International Broadcasting Tests.

A couple of hours ago I was speaking to Carl Dreher, that famous American engineer who has all the "say" about the Radio Corporation's broadcasting stations in New York (W J Z and W J Y). I went up to the studio with the sole intention of tapping him about the new super-power W J Z at Boundbrook, N.J., for the benefit of "P.W." readers, who will want all the latest dope on this new development of the Radio Corporation before the International Broadcasting Tests this January. W J Z, Carl tells me, is using super-power every night of the week (including Sundays and all holidays) from seven o'clock until closing-time, Eastern Standard time.

During the morning, afternoon and early evening programmes a maximum of about one kilowatt is employed. For the super-power transmissions the power is from 40 to 50 kilowatts. The above times correspond to midnight onwards, Greenwich time. The Radio Corporation's station is usually on the air until 5 a.m., G.M.T., so British amateurs should be able to get the 50 kilowatter without much difficulty. The wave-length of W J Z is 455 metres. The quality of the transmissions has suffered quite a little since W J Z went over to high power, due to the difficulty of modulating so much power, but this will no doubt be overcome after a little time.

Higher Power American Stations.

En passant, I might mention the fact that W G Y uses 50 kilowatts on its 380 metre wave every Saturday and Sunday night. The Westinghouse station, K D K A (309 metres), uses 10 or more kilowatts every night. This latter station, by the way, the writer is able to tune in through the locals (this cancels my remarks in a previous article), in spite of the fact that one of the locals uses a wave only six metres different from that of K D K A, and Pittsburgh is more than 300 miles away.

Here is a list of some of the other American stations using five kilowatts or more, all of which should be heard during the Tests: W C B D, Zion, Illinois; W C C O, St. Paul, Minn.; W L W, Cincinnati, Ohio; W O C, Davenport, Iowa; W O R D, Batavia, Illinois; W S A I, Cincinnati, Ohio; W J R, Pontine, Mich.; and W G Y, Schenectady, N.Y., and several others which will be read by the time the Tests take place.

"On The Air."

The writer will be on the air during the International Tests from one or more of the New York stations, and would be very pleased to hear from any readers who manage to hear his dulcet tones (?). The English accent may be a little worn off from want of practice, and a slight nasal tinge may be noticeable, and maybe an odd "I guess—I calculate—I reckon," but the listener is *not* likely to hear the distinct plop which is usually occasioned by the lecturer or artist parking his Wrigley's on the microphone pedestal—not yet.

And now the IGRANIC-PACENT era dawns for all British Wireless Constructors

Thus another step in the elimination of guesswork is taken. Wireless Constructors seeking highest attainable efficiency in their sets may select from the Igranic-Pacent range of components secure in the knowledge that all of these represent the most recent developments of radio engineering research.

By the addition of the Pacent Radio Essentials Igranic have welded the experience of two great radio engineering organisations.

This is good news for those constructors and experimenters who have learned by experience that the brand Igranic signifies the super-component—for now new components augment the already comprehensive Igranic range.

The Pacent Radio Essentials have won such renown in America as to be made standard equipment in forty nationally-distributed radio receiving sets.

Write to-day for our new Igranic-Pacent booklet P13, which gives full details regarding these new devices.

Jack Switch and Jack Switch Attachment.

Double Circuit Jack.

THE IGRANIC-PACENT JACKS AND PLUGS.

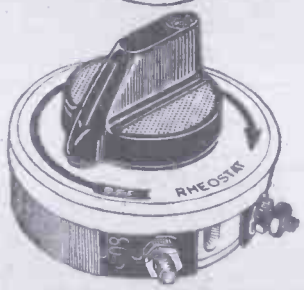
Igranic-Pacent Jacks and Plugs provide a simple, efficient, and very convenient means of carrying out many operations which are difficult with switches. In America practically all 'phones and loud-speaker leads are fitted with plugs, and jacks are arranged on the panel so that the mere fact of slipping the plug in the appropriate jack determines the number of valves used. The springs are of German silver, with silver contacts riveted in. Nickel-plated brass is used for the frames, so as to render them non-magnetic, and the special insulating material used is far superior to the fibre insulation in so many jacks. The lugs are fan-tailed and tinned to facilitate soldering, and the nipples can be adjusted to fit on any panel from ⅛ in. to ¾ in. in thickness. The range is so extensive we advise you to write for list.

THE IGRANIC-PACENT BALCON.

An efficient and inexpensive balancing or neutralising condenser, which can be fitted in a small space on panel or baseboard. Once adjusted there is very little risk of the setting being accidentally altered.

It consists of two nickel-plated electrodes enclosed in a glass tube, over which is fitted a nickel-plated brass sleeve. The glass tube forms the dielectric, and the balancing is obtained by sliding the brass sleeve along the glass tube. Price 2/-

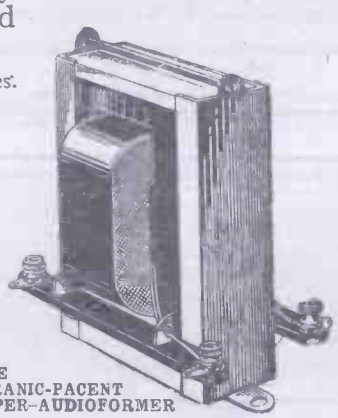
RADIO IGRANIC-Pacent ESSENTIALS



The IGRANIC-PACENT PORCELAIN RHEOSTATS and POTENTIOMETERS.

A porcelain base is used on these Igranic-Pacent Rheostats and Potentiometers. Fitted with moulded knob and gold—or silver-finished dial. Two unit construction; winding spaced to give maximum cooling effect. A 3/16 in. shaft with flat sides to facilitate mounting. Elongated holes to accommodate varying spaced mounting holes on panel.

Resistance.	Current carrying capacity.	Price.
RHEOSTATS:		
6 ohms ..	1·5 amps. ..	2/6
10 ,, ..	1·0 ,, ..	2/6
20 ,, ..	·6 ,, ..	2/6
30 ,, ..	·5 ,, ..	2/6
50 ,, ..	·3 ,, ..	2/6
POTENTIOMETERS:		
400 ohms ..	·25 amps. ..	2/6



THE IGRANIC-PACENT SUPER-AUDIOFORMER

A low-frequency transformer remarkable for its unique amplification curve. The special construction of the core and coils gives a uniform amplification of frequencies as low as 100 and as high as 8,000, resulting in perfect, distortionless amplification of speech and music. It is eminently suitable for use with general purpose valves, and particularly for power amplification up to plate voltages of 500 volts. Robust construction and careful manufacture eliminate breakdowns or other troubles.

Soldering tags and terminals are provided to the clearly marked primary and secondary. Price 27/-

LOUD SPEAKER

THE IGRANIC-PACENT JACK NAMEPLATE.

The Igranic-Pacent Jack Nameplate can be mounted behind the hexagon nut of a jack to indicate its purpose. Made of brass with silver or gold finish and black lettering, it is useful and attractive. Thirteen titles are available: Detector Jack, First Stage Jack, Second Stage Jack, Third Stage Jack, External Jack, Input Jack, Output Jack, Loud Speaker, 'Phones, Frame Aerial, Aerial-Earth, Volt-Meter, and "On and Off." Silver or Gold finish, price 3d.

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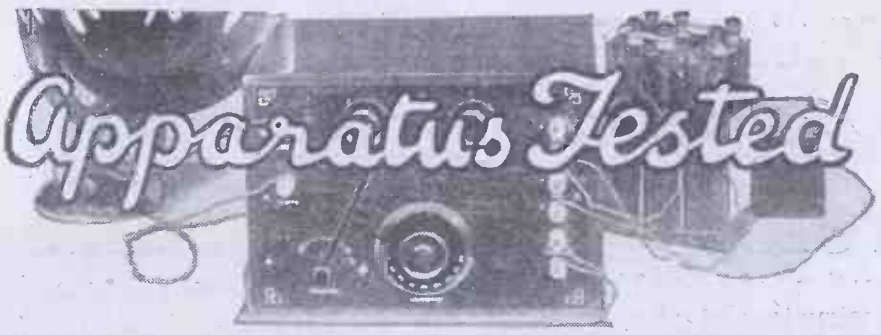


Traders and manufacturers are invited to submit wireless sets and component parts to the "P.W." Technical Dept. for test. All tests are carried out with strict impartiality in the "P.W." Test Room under the supervision of the Technical Editor, and the general reader is asked to note that this weekly article is also intended to provide a reliable and unbiased guide as to what to buy and what to avoid.—EDITOR.

FROM Messrs. Energo Products, Ltd., we recently received two Energo L.F. transformers for test. Both of these have ratios of 5-1, and are retailed at 21s. each. Completely shrouded with a metal casing, they are nice, solid components with well-spaced, substantial terminals. Judging from the results of a series of tests carried out with these transformers, their windings are of ample dimensions. Certainly they have comfortable primary impedances, and amplification is full on the higher frequencies, where so many L.F. transformers fall early by the wayside of frequency distortion. They have fairly low self-capacities, and in other essentials appear to be designed upon sensibly modern lines. Readers will doubtless, in due course, meet these Energo transformers in our constructional articles when further details concerning their capabilities will be given.

* * *

Messrs. Wates Bros., Ltd., of "Microstat" and "K" components fame, have recently opened a high-tension battery factory. This factory is equipped with the most up-to-date of machinery, and all the work is carried out on scientific industrial lines, in order that a battery can be produced at a really competitive price and yet be capable of high standards of performance. Messrs. Wates have sent us specimens of their new batteries in various stages of assembly, from the raw material up to the complete battery labelled ready for the market. We have carefully examined, and in several cases tested, the materials, and are pleased to be able to report that Wates "Pyramid" H.T. batteries *should* be good, if we can judge from the above. Anyway, the complete battery has been given some really gruelling work to do and, after two or three weeks of this, is just as lively as ever. We trust that Messrs. Wates' plucky efforts to compete seriously with cheap foreign batteries will succeed. They have very good chances, for there are not many British listeners or amateurs who would prefer a cheap foreign article to a cheap British article which they know something about.

* * *

Undoubtedly the smallest combined grid leak and condenser on the market is the "Watmel," which is retailed at 3s. This little component is perfectly efficient, and stands up well to the strictest of tests. It can be used in either series or parallel positions. Although its overall dimensions do not exceed those of the Watmel low-loss fixed condenser, it must not be thought that the "leak" is an ordinary condenser leak. It consists of a proper resistance element embodied in the general casing in a most ingenious manner. Altogether, this Watmel product represents a distinct advance in design which will commend itself to discriminating amateurs.

* * *

From Messrs. Radions, Ltd., we recently received a number of Radion dull-emitter valves. Of these the most interesting type is the D.E. ·34, a valve that consumes ·34 amps. at 1·6 to 2 volts. Used as a detector with 45 volts on the plate, it gave excellent results, while it operated well as both a first and second stage L.F. amplifier. H.T. voltages up to 100 and

(*Continued on page* 1128.)

APPARATUS TESTED.

(*Continued from page 1126.*)

grid biases up to 7½ volts were employed. Good volume and full, mellow tone was obtainable. The Radion D.E. ·06 was found to be no less efficient. This latter is an all-purpose valve (fil. volts, 3; fil. amps., ·06; H.T., 30-90). We consider it one of the best ·06's we have tested. No valve can be expected to excel in all three positions over specialised valves, yet this Radion certainly held its own very commendably. As an H.F. amplifier using 34½ volts H.T., as a detector using 45, and an L.F. using 75 with 3 volts bias, it would have pleased the most critical. The D.E. ·34 retails at 10s. 6d., and the D.E. ·06 at 10s. 6d.

A busy scene in Messrs. Wates new factory, where "Pyramid" H.T. batteries are made.

* * *

Owing to an error in Messrs. Gent & Co.'s advertisement for Tangent Coils in our issue of December 19th, "Self Capacity" was referred to instead of "minimum self capacity." It so happens that the self-capacity figure for Tangent Coils is extremely low, in fact, as low as it is possible to be; this result being achieved by the ample air spacing between the windings.

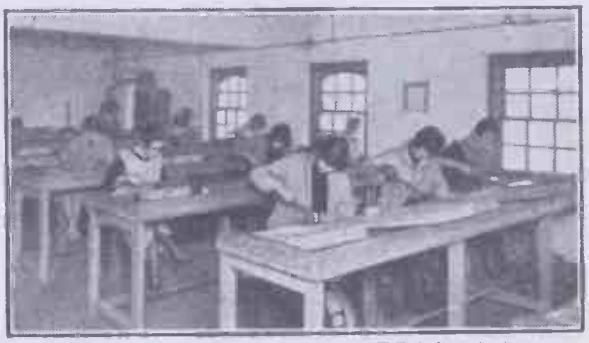
* * *

Messrs. The Goswell Engineering Co., Ltd., of 95/98, White Lion Street, London, N.1. have sent us a sample of the new pattern "Winsulator." For the benefit of those readers who are unacquainted with this novel device, a brief description of it will not be out of place. The "Winsulator," an invention of the technical editor of "P.W.," is a self-cleaning aerial insulator—the only article of this nature in existence. It consists of an ebonite rod which carries a small, loosely-fitting propeller. This little propeller has a fairly large hub. The slightest puff of wind will send this little rotor running up and down the ebonite rod, which is thus kept spotlessly clean. Leakage through soot and dust deposits, frost, and even rain, is thus rendered impossible and periodic aerial insulator overhauls become entirely unnecessary.

The new pattern "Winsulator" is so constructed that all its four vanes are fashioned from one piece of metal, the ebonite hub being split and riveted in position. The result is an almost unbreakable propeller—one that should last a lifetime. The screw-eyes at each end of the ebonite rod are, in this new model, provided with deep, close threads. The price remains the same for the improved "Winsulator"—i.e. 2s. 6d., direct from the Goswell Engineering Co., or through any wireless retailer.

* * *

Messrs. The American Hard Rubber Co. (Britain), Ltd., point out that "Mahoganite" is a trade name, and that it constitutes an infringement for any person to sell any insulating material bearing that name not manufactured by them. This information will, we trust, dispel any confusion that might have arisen subsequent to the publication of a recent "P.W." article.



Another view inside Messrs. Wates' new H.T. battery factory.

RADIOTORIAL

All Editorial Communications to be addressed to The Editor, POPULAR WIRELESS, The Fleetway House, Farringdon 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 and 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 contributions to be addressed to The Editor, The Fleetway House, Farringdon Street, London, E.C.4. 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 Editor desires to direct the attention of his readers to the fact that, as much of the information given to the columns of this paper is of a technical nature and concerns the most recent developments in the Radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and trader would be well advised to obtain permission of the patentees to use the patents before doing so.

PATENT ADVICE FOR READERS.

The Editor will be very pleased to recommend readers of POPULAR WIRELESS *who have any wireless inventions to patent, or who desire advice on patent questions, to our patent agent. Letters dealing with patent questions, if sent to the Editor, will be forwarded to our own patent advisers, where every facility and help will be afforded to readers.*

TECHNICAL QUERIES.

Letters should be addressed to:
Technical Query Dept.,
"Popular Wireless,"
The Fleetway House,
Farringdon Street,
London, E.C. 4.

They should be written on one side of the paper only, and MUST be accompanied by a stamped addressed envelope.

Queries should be asked in the form of the numbered questions: (1), (2), (3), etc., but may be accompanied by a short letter giving any necessary additional particulars as briefly as possible.

For every question asked a fee of 3d. should be enclosed. A copy of the numbered questions should be kept, so that the replies may be given under the numbers. (It is not possible to reproduce the question in the answer.)

IMPORTANT.—If a wiring diagram, panel lay-out or list of point-to-point wiring is required, an additional fee of 1/- must be enclosed.

Wiring diagrams of commercial apparatus, such as sets of any particular manufacture, etc., cannot be supplied. (Such particulars can only be obtained from the makers.)

Readers may submit their own diagrams, etc., for correction or for criticism. The fee is 1/- per diagram, and these should be large, and as clear as possible.

No questions can be answered by 'phone.

Remittances should be in the form of Postal Orders.

Questions and Answers

EARTHING ARRANGEMENTS.

"EARTH LEAD" (Colchester).—Would two or more leads give better results than only one, and should the earth wire be insulated up to the point where it enters the ground, or does it matter if it runs side by side with the lead-in?

Unless the wires were of exactly the same length, the two earth leads would be a disadvantage, and if the present "earth" is a good one there would be no improvement gained by adding another.

The wire need not be insulated if it is a short one, but to run the lead-in close to the earth wire is a very undesirable arrangement, which must be avoided whenever possible.

FITTING AN AERIAL.

R. M. I. (Tilehurst, near Reading).—What is the best form of aerial for receiving broadcasting, and how long may it be without violating the P.M.G. regulations?

(*Continued on page* 1132.)

RADIOTORIAL QUESTIONS AND ANSWERS.

(Continued from page 1130.)

The type adopted should depend upon the facilities available. The P.O. regulations permit 100 feet total length, including the lead-in, and irrespective of the number of parallel wires employed. For the purpose of receiving the broadcasting stations, a single wire aerial of some 60 feet as high as possible will be most suitable. If it is impossible to obtain this length, two parallel wires can be employed. No hard-and-fast rule can be laid down, but the following figures will form a rough guide: 40 to 60 ft., single wire; 35 to 40 ft., double wire; under 30 ft., four wires should be employed. In the case of a two-wire aerial, the wires should be at least 6 ft. apart, and if four wires are used, they should be spaced at 30 in. or so intervals.

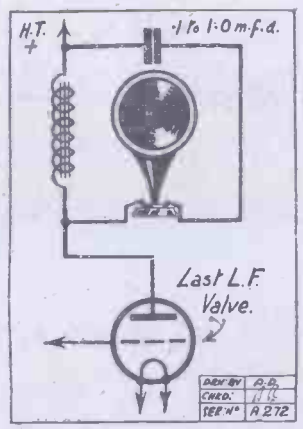
The article on "Reception Conditions" which appeared in our last issue should be of assistance to you as it discusses the very points you have raised.

PROTECTING LOUD-SPEAKER WINDINGS.

"Out-of-Pocket" (Mile End Road, London, E.1).—I have a powerful set, using a large power-valve for the last stage, and have just burnt out a 4,000-ohms resistance loud speaker. I do not wish to use lower plate-voltage on the power-valve because great volume and clarity is required (and the makers of the valve recommend up to 400 volts for the anode of the power-valve!) But I am anxious to protect the windings of the loud speaker if possible, and have been told that this can be done by means of an L.F. choke. In such a case, what are the connections to the last valve?

The method of shunting the loud speaker across an L.F. choke is shown by the enclosed diagram.

In addition to the choke itself (for which an L.F. transformer winding, or windings-in-series, can be employed) it will be necessary to use a large fixed condenser having a capacity of about ·5 mfd. This value is not critical and good results have been obtained with a capacity as low as ·1 mfd. and as high as 1 mfd. or more. The accompanying diagram



shows the connections. The L.F. choke is connected directly in the plate lead, in the position formerly occupied by the loud speaker. One side of the latter is connected to the plate of the last valve, the other side to the large fixed condenser, and the remaining side of this to H.T. +.

It will be seen that no direct current can flow through the loud speaker, but the variations of the steady current—due to speech, etc.—will be reproduced in the loud speaker.

CHOICE OF AN AERIAL.

"Aerial" (Barkingside, near Ilford).—Where should the lead-in join the aerial, at one end or near the centre? Does the height of the aerial matter much, or is this comparatively unimportant?

In the case of a T aerial, the down-lead should be taken from the exact centre. The inverted L type is also very efficient, and in this case the lead-in is taken from one of the ends of the horizontal portion of the aerial.

Height is perhaps the most important point of all. Length should always be sacrificed for height. Every possible inch of height should be obtained, and if it is possible to increase the height of the aerial one foot at the expense of two feet of length, that course should be taken. It is always worth while to spend an extra hour or so in fixing the lead-in end of the aerial to a chimney-stack instead of a window-frame or a point on the wall of the house. Remember that it isn't necessary that both ends of the aerial should be of similar height; in fact, if it is possible to gain very great height at the lead-in end, it is advantageous, even although the "free end" may be comparatively low.

TUNING A SHORT-WAVE SET.

"Short Wave" (King's Lynn).—Having built a set for short-wave reception, similar to the one described in "P.W." No. 141, I find that though it will oscillate quite O.K., the tuning is too sharp to allow me to tune a station in. Hand-capacity effects are fairly marked, and on varying the ·0003 condenser the stations sweep by so fast that it is impossible to tune them in. I nearly "got" K D K A one night, but had the same trouble in tuning.

There are four main points that will cause difficult tuning in such a set, and these should be guarded against.

Firstly, the wiring must be as short and direct as possible; do not go in for right-angle bends, but take wires direct, keeping grid and plate leads as short as you can.

Secondly, see that the two variable condensers are at least 3 in. apart—more, if possible—and use extension handles.

Thirdly, the set should not be oscillating violently. This will cause difficulty in handling—the reaction should be adjusted so that the set is only just "rushing," and not oscillating so violently that it is silent.

Fourthly, see that the aerial is not swaying. All aerial leads should be kept away from the house until the lead-in enters the room, as a swaying lead-in or badly swaying horizontal portion of the aerial will so alter the tuning that it is impossible to tune the station in properly. That is the reason a vertical or semi-vertical aerial is generally preferred. In this case the aerial can sway as much as it likes, for, if no leads come near the house, the variation in tuning is very little; and, indeed, K D K A has been received on 68 metres in a gale of wind *without fading*, though the aerial was not by any means "bar taut."

RANGE OF A ONE-VALVE SET.

"Schoolboy" (Streatham, London, S.W.).—What is the range of a single-valve set: (1) with reaction; (2) without reaction?

With reaction the set has a range of 100 or more miles for main stations. Without reaction, the range is not much greater than that of a simple crystal set, and 30 miles would be an average figure.

TECHNICAL NOTES.

(*Continued from page* 1102.)

In "Popular Radio," one of the leading U.S. radio journals, is given a list of "needed radio inventions," from which, it is alleged, fortunes are waiting to be made. Here is the list: A rechargeable "B" battery (high-tension battery, as we call it over here); a tube filament renewer (that is, some device or means for renewing the burnt-out filament of a valve); a self-tuning receiver; a filament current supply from the lighting circuit; a simple static eliminator; vacuum tubes (valves) without filaments for amplification; and a solution to super-regeneration.

I should point out (it will, indeed, be evident to my readers) that several of these problems have already been solved reasonably satisfactorily. The rechargeable high-tension battery, for example, the filament-current supply from the lighting mains, the static eliminator (which, by the way, is a matter of much greater importance in the States than in this country), and the filamentless valve for amplification—all these are accomplished facts. There is no doubt plenty of room for improvement.

Plenty of Scope.

The self-tuning receiver is further described thus: "A complete receiving set with an automatic dial device, similar to the automatic telephone, that will tune in electrically the different broadcasting stations by merely dialling the station call letters."

The "solution to super-regeneration" is amplified as follows: "A circuit modification of the Armstrong super-regenerator which will obtain full benefit of super-regeneration without critical operation and without distortion." The "Tube Filament Renewer" required is "A device that will enable the radio fan (experimenter or amateur) to renew, without great expense, burnt-out valve filaments."

There is no doubt plenty of scope here for the experimenter. The next step, however, after making an invention in wireless (or in any other branch of industry, for that matter) is to get the invention upon the market on terms which will be advantageous to the inventor and which will, at the same time, give reasonable likelihood of the invention being manufactured and marketed with commercial success.

Lack of space prevents me from enlarging on this subject at the moment, but I am always pleased to advise readers who have *good* ideas. Readers who desire an article on this subject should write to me, when, if there is a sufficient requirement, an article will be prepared for publication in this Journal.

A Novel Loud-speaker Diaphragm.

Referring to the notes I made recently on the subject of loud-speaker diaphragms, the Tower Co. has now adopted a novel type of diaphragm, the invention of Dr. Herman Fisher, the scientific consultant to that company, which is claimed to give more or less uniform reproduction for both high and low tones. This property is obtained by the use of what are virtually two diaphragms, one upon the other, the smaller one being of hard material, for the

(*Continued on page* 1135.)

TECHNICAL NOTES.

(*Continued from page* 1134.)

reproduction of the higher tones, and the larger one being of softer material, for the low tones.

The smaller diaphragm is pasted or similarly secured concentrically to the larger one, thus rendering the centre portion of the larger diaphragm more rigid than it otherwise would be, whilst at the same time four "arms" or "spokes" extend from the centre portion to the edge, and a rim is provided, also of the same material as that used at the centre.

The whole construction is as though you took a rim, and a centre portion (of about half the diameter of the rim), the two being joined by four spokes, and laid this upon a continuous circular backing of the softer material, and pasted the two together. This diaphragm, for which great claims are made, is now being adopted as standard by the Tower Co. in their loud speakers.

It is interesting to note that Dr. Fisher won fame in connection with the manufacture of violins, instruments made by him out-scoring genuine Stradivarius and well-known instruments in recent official tests in Paris.

Correspondence

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

A SHORT-WAVE UNIDYNE.

The Editor, POPULAR WIRELESS.

Dear Sir,—In view of the large number of letters which have appeared in "P.W." lately, referring to the range of Unidyne sets, I think you may be interested to know my experience.

I have applied the Unidyne principle to a simple low loss set of my own construction with rather gratifying results.

Australasian amateur C.W. code has been received from distances up to about one thousand miles at quite good strength and also local amateur telephony.

The commercial stations K E T, K I O, K E L, and N K F are readable with the aerial disconnected, and a few days ago good speech and music were received from K D K A, Pennsylvania, U.S.A.

The set employs only one valve—a Philips D.VI, and the condenser is not by any means "low loss."

Trusting that this will interest you and wishing your fine paper every success,

I remain,

Yours sincerely,

H. LLOYD-OWEN.

Amy Street, Campsie,
Sydney, Australia.

(*Continued on page* 1136.)

MARIE CORELLI IN SERIAL FORM.

A NOTABLE departure in journalism brings Marie Corelli's writings within the reach of the masses, who have hitherto only been able to secure her books on payment of several shillings. We refer to the serialisation of "BARABBAS: A DREAM OF THE WORLD'S TRAGEDY," the first long instalment of which appears in this week's issue of "Sunday Circle," the popular weekly religious home paper.

A beautiful art plate, entitled "Comin' Thro' the Rye," is presented with the same number. Plate and paper (containing the long first instalment of Marie Corelli's great story, "Barabbas"), can be obtained of all newsagents, price 2d.

CORRESPONDENCE.

(Continued from page 1135.)

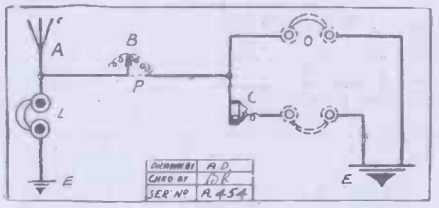
INTERESTING EXPERIMENTS.

The Editor, POPULAR WIRELESS.

Dear Sir,—Re your late article on crystal rectification. Having aroused considerable speculation on its theory of action, I am writing a few details of experiments which may prove of great interest or otherwise to readers of your valuable paper. The first experiment is as per figure :

A—Aerial.
B—Tuner (coil).
C—Crystal.
E—Earth.

With crystal directly earthed signals are clearly readable in position O. That is, using 'phones outside crystal circuit and clearly showing two distinct signal circuits—this little experiment may be taken a step further by taking a tapping anywhere along the aerial as at (L) with 'phones earthed and crystal directly earthed, and tuner at (P) audible signals obtained.



This shows that radio frequency is built up of two audio frequencies. Should this little experiment prove of interest, I will gladly forward particulars of characteristics of the two audio frequencies and further experiments I have carried out, which seems to put the crystal in a different light from the accepted theories of rectification.

Yours faithfully,
W. STUDLEY.

3/23, Robinson Road, Tooting, London, S.W.

THE SUNDAY PROGRAMMES.

The Editor, POPULAR WIRELESS.

Dear Sir,—In reading the correspondence column of your issue of December 12th, I was struck by what seemed to me to be a contradictory paragraph in the published letter of R. S. Rutland.

Whilst to a large extent corroborating his remarks with regard to the B.B.C.'s programmes, it is to paragraph 4 to which I wish to refer. Your correspondent says, "Why is De Groot so popular? The answer is not far to seek." After this, however, he goes on to say that one hour's Sunday dinner-time transmission from Radiola-Paris is worth all the programme of the B.B.C. for that day. I should therefore like to know how the first statement concerning De Groot's popularity can be reconciled with the remarks re Radiola.

Disregarding the religious service, which I assume I am correct in stating is an essential part of the Sunday programme, it seems to me an exaggeration to suggest that on the Sundays De Groot is broadcasting the afternoon programme combined with that of the evening is not equal to the standard of the mid-day transmission of Radiola. At the same time I am prepared to admit transmissions on other Sundays are extremely dull. It must, of course, be understood that I have written this letter on the assumption that R. S. Rutland agrees that De Groot is deservedly popular.

Yours faithfully,
J. H. HORSLEY.

Newton Road, Castleacre, King's Lynn, Norfolk.

ELECTRIC IRON AS AERIAL.

The Editor, POPULAR WIRELESS.

Dear Sir,—Whilst experimenting the other day I happened to "drop across" a "stunt" that may be of use to one of your readers who has, in his household, an electric iron with a holder adaptor. It will be found that it can be used as an aerial without running any risk whatever. All one has to do is fit the adaptor into the light holder, place a strip of copper sheeting (to which a piece of "lead in" wire has been securely fastened or soldered) between the bottom of the iron and some other piece of good insulating material the size of the iron. It is not necessary to "switch on," but even a "rough hook-up" fixed to the handle of the iron was found to function well with the iron in use.

Trusting the above will prove of use to some readers, where the question of aerials is a serious one.

Wishing your paper the further progress it deserves.

Yours faithfully,
GORDON K. WILLIAMS.

33, Lowndes Street, London, S.W.1.

If there is anything in these pages that you do not like, please let us know what it is when writing to us.

Put a CHECK *on your accumulator*

THE filaments of your valves are responsible for the life of your accumulator. The more economical these filaments are in the use of heat, the greater is the period between recharging, but the effective electron emission must not be impaired by too meagre a supply of energy. It is therefore obvious that the ideal filament for long accumulator life must have the lowest operating temperature possible, provided this is not achieved at the expense of length or thickness in construction.

The wonderful Mullard "N" filament has greater proportions and a lower operating temperature than any other filament on the market. It is prepared by a special electrical and chemical process *in vacuo* which results in abundant emission at a temperature so low that no sign of glow can be discerned.

This unique production of the Philips Mullard Research Organisation means one-seventh the cost and only two journeys instead of fourteen for accumulator recharging.

In addition you will obtain majestic volume and purity from your set hitherto unknown.

Ask for the P.M.4 ... ... 22/6

THE WONDERFUL "N" FILAMENT VALVE

Mullard

THE·MASTER·VALVE

ADVT. THE MULLARD WIRELESS SERVICE CO., LTD., BALHAM, LONDON, S.W.12

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POPULAR WIRELESS AND WIRELESS REVIEW, January 16th, 1926

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

IN THE "PADDED ROOM": BY SIR HARRY LAUDER.

Popular Wireless

Every Thursday PRICE 3d.

No. 190. Vol. VIII.

and Wireless Review

January 16th, 1926.

Scientific Adviser: SIR OLIVER LODGE, F.R.S., D.Sc.

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THE "P.W." UNIVERSAL AMPLIFIER,
AND
THE "P.W." "CRYSTOWAVE" SET.

Cutting Out Noise.

Adding a Valve to a Crystal Set.

The Polarised Radio Wave.

The International Broadcasting Tests.

Our cover photograph this week, showing the main approach to the great new Rugby station, gives an excellent view of two of the twelve 800 ft. masts. Electric lifts, each capable of carrying three men, run up the centres of these giant structures.

The Vanicon Square Law Condenser from 17/6.

Dubilier everywhere

— under the Seas

STANDARD Dubilier Condensers, of which one or two representative types are shown here, are used in the submarines of practically every navy on the seas. If our ordinary products are good enough for this exacting purpose, no amateur or experimenter need have any hesitation when purchasing condensers. All he has to do is to specify our products.

The Dubilier Condenser Company (1925) Ltd., manufacture Fixed Mica Condensers, Variable Air Condensers, Anode Resistances, Grid Leaks, The Ducon Aerial Adaptor, The Minicap Switch, the Dubrescon Valve Protector and the Mansbridge Varioneter. They are also the sole concessionaires for the products of the Mansbridge Condenser Co. Ltd.

Specify Dubilier

Type 610 Mica Condenser from 3/-.

REGISTERED DUBILIER TRADE MARK

DUBILIER
CONDENSER CO (1925) LTD

Left: Brown Cabinet Loud Speaker

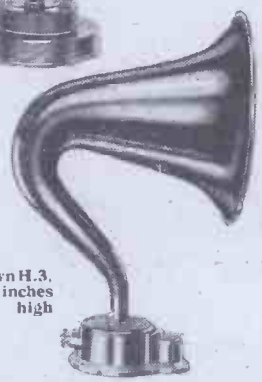
Right: Brown Gramophone Adapter

Incomparable Brown Wireless Instruments

OF all the Loud Speakers on the market to-day one is unique. One—by a brilliant application of an entirely original principle—achieves results which can be obtained in no other Loud Speaker. The Brown. Here is an instrument which steadily—month by month—has so grown in public favour that it is now recognised as the one great interpreter of true radio music.

Brown principles of design and construction can be found only in Brown Loud Speakers. The famous tuned-reed mechanism which permits the use of a supersensitive cone-shaped aluminium diaphragm as thin as paper is responsible for a tonal purity and mellowness which must be heard to be fully appreciated.

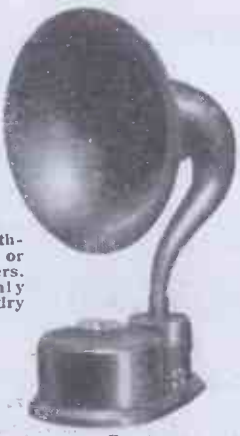
Brown H.1, 21 inches high



Brown H.3, 15 inches high

Brown New A-type 'Phones

Brown Q-type Loud Speaker



The Crystavox

The only Loud Speaker which can be worked direct from a Crystal Set without valves or other amplifiers. Requires only one 6-volt dry battery. £6 0 0

Crystavox Loud Speaker

Brown H.4, 10 inches high

Brown Featherweights

Brown H.Q. Loud Speaker 20 inches high

Brown Loud Speakers

The H.1.—The reputation enjoyed throughout the world by the Brown Loud Speaker was built up on the H.1—the original Brown.

120 ohms £5 5 0
2000 ohms £5 8 0
4000 ohms £5 10 0

The H.2—An excellent Loud Speaker for use where the volume of the H.1 is not required.

120 ohms £2 5 0
2000 ohms £2 8 0
4000 ohms £2 10 0

The H.3.—A new medium priced Loud Speaker of exceptional volume and purity of tone.

2000 ohms, £3

The H.4.—The smallest Brown Loud Speaker made. Fitted with standard tuned reed movement.

2000 ohms 30/-

The H.Q.—Fitted with identical movement to that used in Brown H.1, but incorporating a handsome curved horn.

2000 or 4000 ohms £6

The Cabinet.—A "hornless" Loud Speaker capable of excellent results. In a mahogany or oak cabinet.

2000 or 4000 ohms £6 6 0

The Brown Q.—The de luxe Loud Speaker of incomparable beauty. In all resistances £15 15 0

Brown Headphones

F. type.—The most popular Headphone for Broadcast use. Weight only 6 ounces.
4000 ohms 20/-

New A. type.—The new reed-type 'phones unequalled for sensitiveness. Wonderful value at 30/- (4000 ohms).

Standard A. type. The world's finest Headphones. As used by the Admiralty. 120, 2000 or 4000 ohms 50/-. 8000 ohms 60/-.

Gramophone Adapters

For converting your Gramophone into a Loud Speaker.

H.1 (2000 ohms) £4 10 0 H.2 (2000 ohms) £2 0 0

S. G. Brown, Ltd., Western Avenue N. Acton, W.3

Retail Showrooms: 19 Mortimer Street, W. 1.
15 Moorfields, Liverpool. 67 High Street, Southampton.
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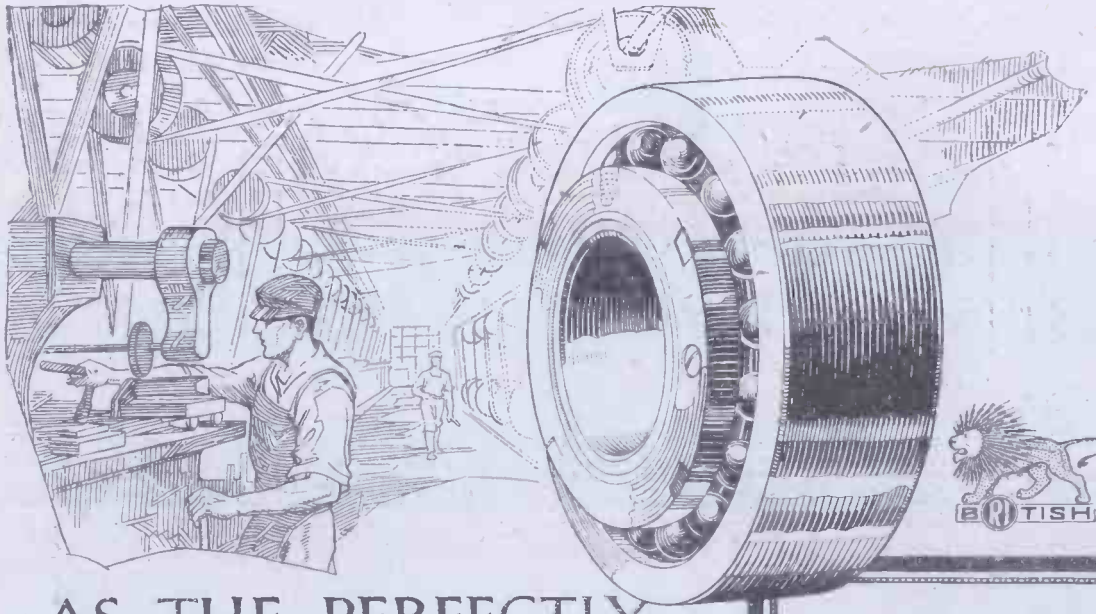
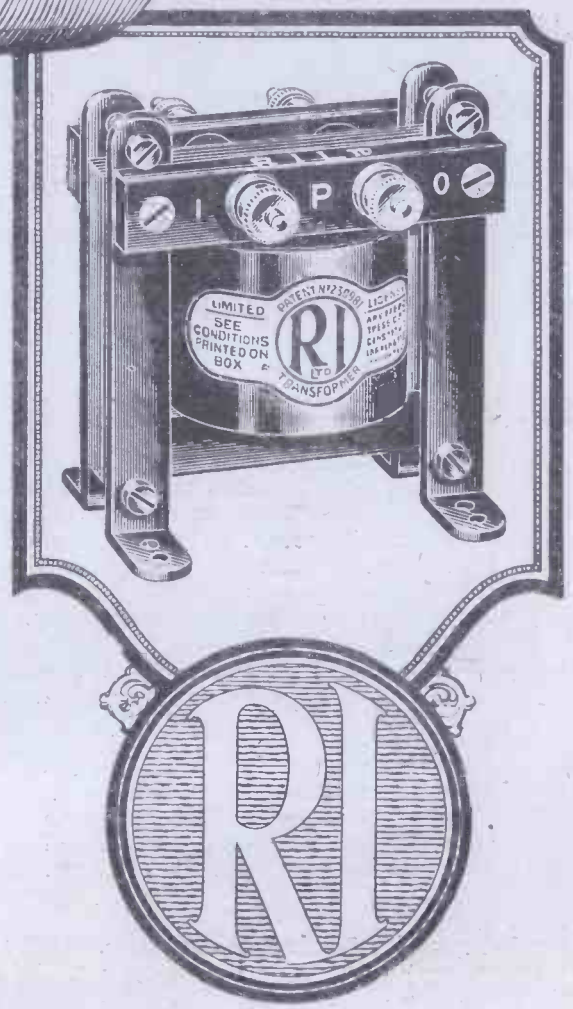
Cross House, Westgate Road, Newcastle.

LOUD SPEAKERS **Brown** AND HEADPHONES



BRITISH

AS THE PERFECTLY DESIGNED ❖ BALL BEARING ❖



As smooth in operation, and as free from energy loss as a ball bearing. In the one case, the big factor is the elimination of friction; in the other, the elimination of losses due to distributed capacity, leakage and incorrect impedance values.

The R.I. Transformer is the only one on the market to-day with the extremely low self-capacity of only 18 micro-microfarads. This has been secured by the sectionalising of the windings, and the disposal of the primary outside the secondary.

There are eight features in the "R.I." Transformer which will recommend it to every discriminating user:—

(1.) **Low losses at all audible frequencies.**
(2.) **Suitability for special or general purposes.**
(3.) **Equal efficiency for high and low input values.**
(4.) **Correctly designed windings, with minimum capacity losses.**
(5.) **Mechanically and electrically sound.**
(6.) **Specially recommended by eminent authorities for reflex circuits.**
(7.) **Generous area, both in iron and copper.**

AND

(8.) **Windings protected by hermetically sealed hard fibre tube.**

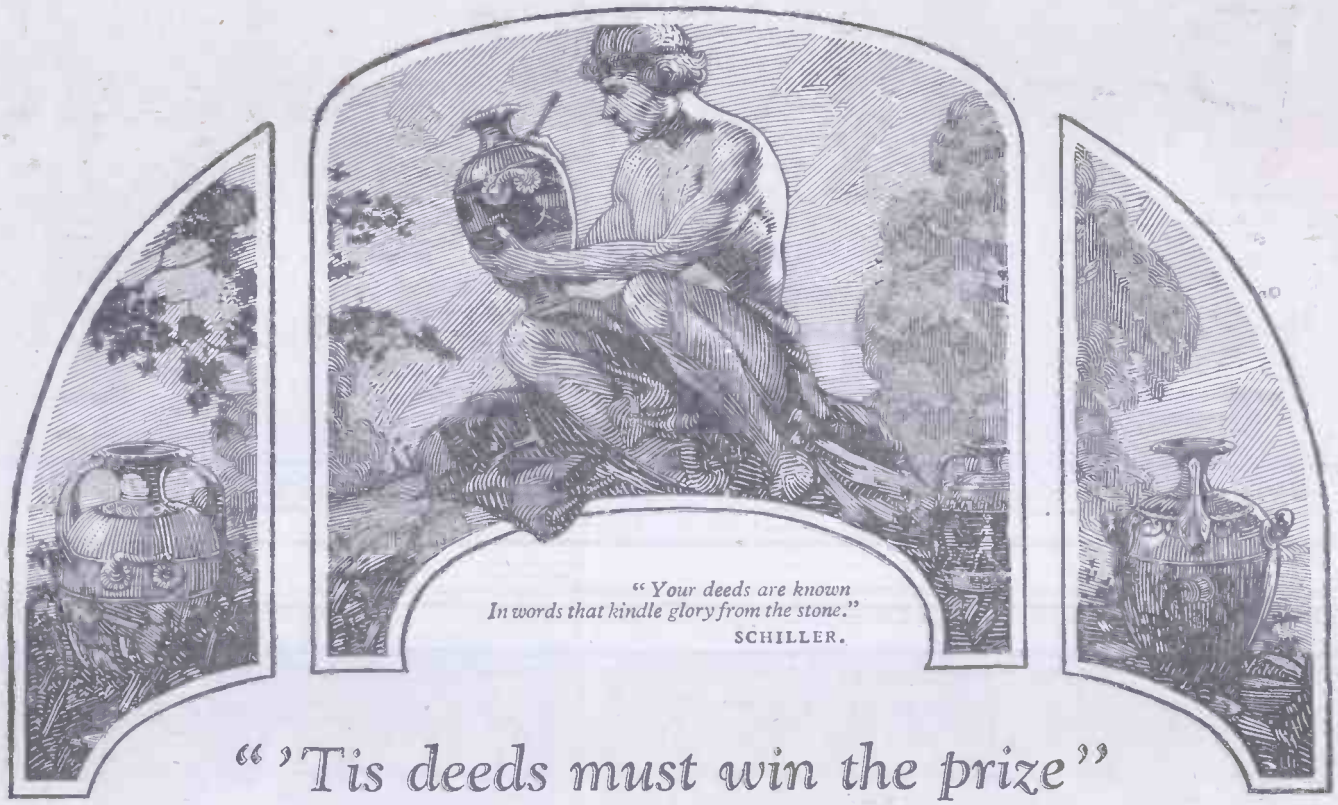
More R.I. Transformers are in use than any other make, and it has been so long recognised as the standard intervalve coupling for wireless use, that its name has become a by-word for efficiency in the radio industry.

Price 25/-

Write for the R.I. Blue and Gold Catalogue, free on application.

THE MARK OF BETTER RADIO

Advt. R.I., Ltd., 12, Hyde St., New Oxford St., London, W.C.1. P.C. 16



"Your deeds are known
In words that kindle glory from the stone."
SCHILLER.

"'Tis deeds must win the prize"

IN years to come, when the story of the Valve is written, certain developments will stand out like landmarks and win imperishable fame for their inventors.

First, the discovery of the electron theory. Later, Dr. Fleming's great contribution to the cause of Radio—the original two-electrode valve and the father of all valves. Afterwards, the addition by Dr. Lee de Forest of the grid, which resulted in the three-electrode valve. And then Valve development halted for several years. A long straight filament enclosed by a spiral grid—the whole being surrounded by a tubular anode.

This was the standard Valve until the year 1922. Obviously it had many disadvantages. A large proportion of its electron emission inevitably escaped from each end of the anode and served no useful purpose. This clearly caused a very serious loss in efficiency.

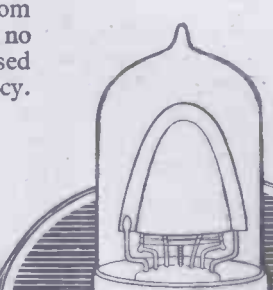
The spiral grid—owing to its lack of rigidity—was a fruitful cause of microphonic noises. The straight filament—tightly stretched to prevent sag—readily fractured and the Valve became useless. In 1922 there appeared a new Valve—one destined to win immediate recognition—the Cossor.

For the first time there was used in any Valve an arched self-supporting filament. A grid so rigid as to be utterly vibration-proof. And a hood-shaped anode which enclosed practically the whole of the electron stream. All of which were entirely original and exclusive features.

In three short years Cossor has triumphantly vindicated that its unique principles of design are correct. More than one of its features have been adopted by other makers. But Cossor users are not misled—for Cossor results are obtainable only by the combination of *all* these features.

For 2-volt Accumulators.

W.1.	For Detector and L.F. use - Consumption : .3 amp.	14/-
W.2.	(With red top) For H.F. use - Consumption : .3 amp.	14/-
W.3.	The Loud Speaker Valve Consumption : .5 amp.	18/6



For 2, 4 or 6 Volts.

W.R.1.	Similar to W.1 but with special resistance which can be short-circuited when not required - -	16/-
W.R.2.	Similar to W.2 but with resistance as above	16/-

Cossor Valves

A. C. Cossor, Ltd., Highbury Grove, N.5

Gilbert Ad. 4323

Popular Wireless

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P. R. BIRD.

RADIO NOTES AND NEWS.

The Services from St. Martin's—America on 8 Volts—Our Mental Equipment—International Tests—"P.W." Cheapest One-Valve Set—Broadcasting Pictures—The Rag-Chewer's Club.

The Services from St. Martin's.

IT has just been disclosed that some months ago the Rev. H. R. L. Sheppard, vicar of St. Martin's-in-the-Fields, placed his resignation in the hands of the Parochial Church Council on account of ill-health. Fortunately for listeners it has been arranged that Mr. Sheppard should be released for a long holiday—probably in Egypt—returning in about six months' time. All who have enjoyed his Sunday evening addresses will wish him a complete recovery.

Cutting Out H.F. and H.T.

I HAVE received a very interesting letter from a Dublin reader, who has been "stunting" with American reception upon two valves. Apparently my Dublin friend is of an incredulous nature, for not only does he disbelieve in H.F. amplification for long distance, but he "has no time" for H.T., either. So when he tried for America with a straight Det. and L.F. receiver—using 2 A.R.D.E. valves—his only H.T. battery consisted of two ordinary flash-lamp batteries.

Americans on 8 Volts.

THE first station, tuned in at 12.50 a.m., was W G Y (Schenectady, New York), which was very clear with 8 volts H.T., and could be heard with half the H.T. battery (one flash-lamp) cut out. About an hour later K D K A (Pittsburg) was heard on the 8 volts, and at 2.24 "very good" signals from W J B were received. Before closing down at 3.20 a.m. two other North Americans were bagged, one clearly disclosing itself as W B Z (Springfield, Mass).

Canada, Too!

THE other was a Canadian station, but unfortunately the first letter of the call sign was missed. It sounded like C N R G, but might have been C N R B or C N R E; anyway, it was undoubtedly a Canadian, and it came through C.W., Morse and mush, in response to the urge of two flash-lamps.

It was a remarkably good piece of work, but it won't surprise Unidyne users, for they can dispense with the H.T. altogether, and do amazing DX (long distance) work.

M. Edouard Belin who claims to have solved the problem of Television.

Our Mental Equipment.

ATTENTION! Professor G. W O. Howe, D.Sc., the eminent authority on radio, has been writing in the "Electrician" upon the wireless amateur's mental equipment.

This is what he says: "It is beginning to look as if a knowledge of Greek will soon be a necessary part of the wireless amateur's mental equipment. . . . We have heterodyne and neutrodyne, tropodyne and solodyne, unidyne and monodyne, and many more; it certainly looks as if those who interest themselves in wireless matters are expected to have a classical education."

As Good as Greek.

NOW, out of the six named above by the learned professor, "Unidyne" and "Solodyne" are the *names* of "P.W." *circuits*. So it would certainly appear that even if you haven't a "knowledge of Greek," etc., you won't go far wrong if you stick to "P.W."

Ubiquitous Unidyne.

IT is curious how the Unidyne is always cropping up, not only in the "Electrician"—which everyone has heard of—but in unknown places like Gourock and Inverkip. (I'd never heard of Inverkip until last week, but there's something about the name that fascinates me! When I've nothing to do for a moment I now say to myself "Inverkip"—"Inverkip"—and then more thoughtfully, "In-ver-*kip*." And somehow, I feel inexpressibly fortified; comforted by the mere knowledge that somewhere, though I may never see it, there is such a place as Inverkip!)

All B.B.C. and Several Foreign on 2-Valver.

AS I was saying, I didn't know there was such a place until last week, when someone kindly sent me a copy of the "Gourock Times." Here, sandwiched amongst the Greenock Jottings and the Inverkip Parish Council Report, was an account of the Gourock Radio Society's activities, saying:

"On Monday a lecture and demonstration was given by Mr. Marshall on the Unidyne, the high-tensionless circuit of Messrs. Dowding & Rogers, of POPULAR WIRELESS. A 2-valve (Detector and L.F.) set was used, and although no H.T. battery was used, satisfactory results were obtained on all B.B.C. stations, and several foreign

(*Continued on page* 1142.)

NOTES AND NEWS.

(*Continued from page* 1141.)

stations as well. . . . Mr. Marshall maintained that, although results from the circuit were at least equal to an ordinary Detector and L.F. circuit, the tone was clearer and purer, and there were no H.T. battery noises, which are sometimes ascribed to atmospherics, and which are inherent in the ordinary set."

International Tests.

THE International broadcasting tests which are being conducted this month will be carried out by stations afloat as well as ashore. One observer is embarking upon the French liner "De Grasse," so that the transatlantic signals may be studied half-way upon their journey, as well as at the ends. An official receiving station is also being installed upon the liner "Paris."

The Biggest Lie Broadcast.

BACK in September I referred in these columns to the "Biggest Lie Broadcast." I have just received a letter from the station concerned (4—Q G, of Australia), which explains how the message escaped the very rigid censorship which is imposed upon all news, and was broadcast. Immediately it had been transmitted an official explanation was made from the station, and was repeated several times in order to give listeners the full facts of the case.

It was thought here at the time that there was some perfectly feasible explanation for the "lie," and I am glad that this has proved to be the case, and that the Brisbane station doesn't allow a single disloyal electron to parade up or down its aerial under any circumstances whatever.

A Reader's Experience.

A WIMBLEDON reader, Mr. L. O. Simmons, of 22, Hubert Road, has sent me the following letter: "I am writing this in order to warn wireless constructors against the use of a cheap valve which is on the English market, by name "Triotron" T.S. This is an Austrian valve, rated 2·5.—3·0 volt, ·07 amp. I have tested out four, each bought from different parts of London. As a dull emitter they are absolutely a wash-out."

The Sympathetic Dealer.

THE letter continues: "However, as the filament volts approach 3 they function, but are very, *very* weak. The normal amplification of an English valve is never approached, and just as you are wondering whether you have really bought a bright valve in the wrong carton, the filament gracefully collapses—across the plate usually. The dealer to whom you complain is very sympathetic, but, as he says, how can he return them as they are all imported and non-returnable. If this will prevent one fool from making many, I shall be amply repaid."

Other readers who have tried the Triotron report similar results.

2 N H and 2 B M.

I AM informed that the call sign 2 N H has been transferred to Mr. E. A. Dedman, "Rossmoyne," 65, Kingston Road, New Malden, Surrey. Reports of reception upon 2, 5, 5, 8, or 23 metres, will be greatly appreciated.

By the way, Two Beer Emma (2 B M) now emanates from 166, Birchanger Road, South Norwood, S.E.25, and call books should be amended accordingly.

Foreign Correspondent Wanted.

ANY young German or Dutch reader who would like to correspond with an 18-year-old British radio enthusiast should write to W. Graham Browne, Esq., 37, Welbeck Street, Cavendish Square, London, W.1, who is looking for a kindred spirit to write from those countries. Some months ago Mr. Browne got into touch with an American radio friend through these columns, and it has been such a pleasant experience that he wants to extend it to Holland and Germany.

SHORT WAVES.

"There are a great many people who are trying to evade the broadcasting licence. They want something for nothing." . . . Fine 15/-. —The Magistrate (Mr. Cousins) at West London Police Court, recently.

* * *

"Entertainment of the kind offered by wireless is often even better than a personal friend—because you can close it down when you can't bear it any longer!"—Lady Cowdray, reported in the "Daily News."

* * *

"There is a moral obligation on whoever should control the wireless to see that items of beauty and nobility are broadcast at those times when the workers of this country have leisure to attend to them. If this time coincides with the rich man's after-dinner hour it cannot be helped. His demand that the whole country shall submit to jazz and nothing but jazz, because he wants to dance off the effects of his dinner, is a monstrous tyranny not to be tolerated in a free country."—Mr. James Agate, writing in the "Daily Chronicle."

Price of Panels Raised.

THE BRITISH EBONITE COMPANY, LTD., informs me that owing to the continued high price of rubber their prices are unavoidably increased as follows: highly polished and hand-matted panels, 50 per cent, other goods 33⅓ per cent. These advances were made upon January 1st, so I hope you have already bought the panel for that new set you were thinking of making.

"P.W." Cheapest One-Valve Set.

THAT cheapest one-valve set (described in "P.W." 174) seems to gain fresh adherents daily. A Twickenham reader says, "I am working a Dragonfly loud speaker on it. I can hear all words that are spoken (quite distinctly in any part of a large room), and when a band is playing I can hear the music if I go outside the room and shut the door."

Wireless Wizardry.

WRITING in "Answers" Grand Christmas Number, Major Raymond Phillips, the well-known authority upon wireless control, described some jolly radio tricks, under the title "Wireless Wizardry." And writing from the General Post Office, the Secretary of that august concern puts a damper upon any fun of this kind!

Major Phillips tells me that although it is really only a toy, with a range of 40 or 50 ft., he is informed that a licence must be taken out for the apparatus described; and, I believe, that in all the Major's experience he has never come across a more astonishing case of Wireless Control than this one—by the P.M.G.!

Broadcasting Pictures.

M. BELIN, the famous French inventor, has made the sensational announcement that he has solved the problems of television and of the transmission of photographs by wireless. In order to demonstrate the apparatus the inventor transmitted a photograph of the President of the French Society of Photographers. Commenting upon the claim, a "Daily Express" correspondent says: "Illustrations of the latest Paris fashions may shortly be broadcast from the Eiffel Tower."

The Rag-Chewers Club.

OUGHT there to be a British Rag-Chewers Club?

To consolidate radio-friendships, and to act as an organised group to foster the spirit of friendly talks in the air, such a club has been formed in Hartford, Conn. A body of amateur transmitters, who were in almost nightly communication with each other, formed the charter of membership, and have already enlisted 700 recruits! There are members in every state in the U.S.A., every province in Canada, and in Europe and Asia.

The rule is that you may become a member only when you have "chewed the rag" for half an hour or more with one of the members—on the air, of course!

Working Loud Speaker from Crystal Set.

SOME of the newspapers have just discovered—what most "P.W." readers knew years ago—that under certain conditions it is possible to work a loud speaker from a crystal set. But, unfortunately, they are supposing that the set used is responsible—which, as the late Mr. Euclid would have said, is absurd.

Although such crystal results are now being labelled "unparalleled" and revolutionary, I have always had a regular sprinkling of them in the reports I receive from "P.W." readers.

Here, for instance, is this week's:

More Freak Reception.

"I HAVE been a regular reader of 'P.W.' since No. 1, and I have seen so many accounts of other people's freak reception that I think it is time that I mentioned my own," says a King's Lynn reader. Moreover, I agree with him, for he certainly has something worth mentioning. Here it is:

A Radio Mystery.

"I AM eighty-five miles from 5 X X, and I only own a home-made crystal set, but I am regularly using a Sterling Dinkie loud speaker, and getting volume enough to be heard all over the room. I am also regularly getting Paris (F L) on the 'phones. I might add that I use no amplifying apparatus whatever."

I have received dozens of such letters, well authenticated, and all that they prove is that some people are luckier than others. Why this should be is just one of radio's little mysteries!

ARIEL.

SIR HARRY LAUDER.

In the "Padded Room"

by SIR HARRY LAUDER

The critics have acclaimed Sir Harry Lauder not only a famous and world renowned comedian, but the greatest broadcasting success since the B.B.C. was formed. We feel sure our readers will enjoy with added interest Sir Harry's reminiscences of his first, but we hope by no means his last, broadcast.—The Editor.

I AM all the more willing to give POPULAR WIRELESS some impressions of my first Broadcasting engagement for the simple reason that it was the first wireless paper I bought when I established my set at Laudervale, Dunoon, last summer. To tell you the truth, I don't know anything at all about the principles of this wonderful new science; the whole thing is too much of a mystery to me—in fact, there's black necromancy in it, and I always think that the less the plain man knows about this sort o' thing the better!

A Sensible Vow.

So I passed the first copy of POPULAR WIRELESS over to my man Henry, and told him to put himself in charge of the set. He has looked after it ever since. When I am at home I often turn it on, and let me say at once that it is an endless source of amusement and entertainment to my household.

Listening to various performers and performances, I long ago made up my mind that if ever I married again—no, no, I mean that if ever I appeared before the public as a wireless artiste, there were certain things which I would do and many other things which I would NOT do.

In the first place I vowed that I would try to make myself intelligible. By this I mean that everybody who heard me would be able to turn round and say, "Yes, that's Harry—down to the chuckle and the catch in his breath after a joke."

A Serious Proposition.

Among the things I decided NOT to do was to treat the microphone as a bone-headed member of an invisible audience. Mind you, I am not asserting in so many words that many broadcasting artistes have done this in the past; all I say is that some of the folks I have listened to "on the air" only made me the more determined, when the time came, to put over a show which would bear some reasonable resemblance to my ordinary work on the stage. If that could not be done I was doomed to failure. Not for me the standing up in a cold studio and telling some questionable jokes and stories, and hoping to get away with it! All my life I have taken my stage work seriously, and I never was more intent on this than I was on Wednesday night, the 23rd of December.

I had great assistance from Mr. Rex Palmer, and another old London friend. They explained to me the technique of the wireless operations, and answered all the questions I popped at them for fully half an hour. Of course, I must admit that I was benefited by having sung songs so often of late for His Master's Voice records; at Hayes they have a new system of recording, and so far as I am able to judge it is on the same lines as the wireless microphone.

In any case, the main thing that troubled me was the exact pitch for my voice, but one or two experiments soon put me right on this score.

Then came the question of accompaniment. At first I was not anxious to have the orchestra. I thought a piano would be better. But when I saw that the conductor was Dan Godfrey I knew there would be no trouble. Dan is one of those sensible conductors who realise that he and his men are only a delightful background—not the whole shoot! Incidentally, I always take a great interest in my music. It must be just right to the last degree.

The Lauder Touch.

Young Dan—Big Dan they should call him, for he looks like a tremendous jolly schoolboy—fell to my wishes in an instant, and he and his merry men can be dismissed with the remark that they were perfect all the way through, following every movement and nuance and twist—even every wink of my eye—as tho' they had toured with me for ten years! Thank you once more, Daniel the Dauntless!

Since returning from London I have had scores of letters from people in every corner of the land stating that I "came over" perfectly. But—and there's always a but to everything in the world—many of the writers ask why I didn't sing this song, or the next song, or tell this story, or the next story. Now what is a poor artiste to do in

(*Continued on page 1182*).

Left to right, a friend of Sir Harry's, Sir Harry Lauder, Sir Harry's manager, and Mr. Rex Palmer, in the studio at 2 L O.

THE INTERNATIONAL BROADCASTING TESTS.

Late News from America.

By L. W. CORBETT.

(Our Resident Correspondent in New York.)

THE year 1923, in November to be exact, saw the birth of one of the most interesting wireless experiments ever attempted, for it was at that time that the first of the International Tests took place. In November (and one day in December, I believe) of the following year, these tests were successfully repeated, and now we are on the eve of the third of these internationally important experiments. The year 1925 is conspicuous from the wireless man's point of view in that no International Tests were held during that twelvemonth period, due to the fact that the Tests have been advanced two months this time, which dates them for January, 1926.

The reason for this alteration in date is accounted for by the fact that conditions for long-distance reception are generally acknowledged to be better in January than in November, especially in America.

Previous to this year, the Tests have been wholly arranged by the staff of "Radio Broadcast Magazine," but so great was the enthusiasm in America last year, (and probably there will be far greater interest this year) that it has been decided that it would be almost impossible for one single organisation to cope with the matter.

Complete Co-operation.

In the United States this year, there are no less than eighteen distinct organisations all out to make the experiment an unqualified success. To make the Tests thoroughly successful there must be complete co-operation between all broadcasters.

Sadly, a few stations failed to enter into the spirit of the thing last year, and American fans were troubled by one or two southern stations who remained on the air during the American silent period. The amalgamation of the many organisations this year should do much to obviate such trouble, and complete co-operation is expected. Captain Eckersley writes that the International Bureau of Radiophonie in Europe is actively interesting itself in the International Tests this year, and under the excellent guidance of Mr. Arthur Burrows, complete and unqualified co-operation may be expected on the European side, in spite of the many outlets for pitfalls.

On the American side the arrangements have almost been completed, and it is possible to give a general schedule outline at this time. The exact date set for the commencement of the Tests is Monday, January 25th; the exact time, 4 a.m. to 5 a.m. In America the date is January 24th, late in the evening, as they are five hours behind us in New York. In American western cities they are nine hours behind G.M.T., so a time had to be arranged for the Tests when it was dark all the way from San Francisco to England, not an easy matter. Let us say, for example, that the British stations were to transmit at midnight on Sunday.

All very good. New Yorkers would have a fair chance of hearing us. It would be seven o'clock early evening there, and British stations have been heard at seven o'clock in New York before now. But on the Pacific, the time would only be three o'clock, which would not give radio fans in those parts much of a chance to hear Europeans. So the time finally chosen is generally admitted to be best although inconvenient for British broadcasters.

There is every indication that the Tests will be far more successful this year than they were in 1924. A very large percentage of U.S. stations have increased their power output since November, 1924.

Two Fifty-Watt Stations.

W G Y, for example, is going strong with fifty kilowatts, while the new W J Z has also settled down to steady work on fifty or so kilowatts. In spite of assertions to the contrary I have noticed in one or two British wireless magazines, I still think that W J Z is one of the best bets for the British amateur, and strongly advise all and sundry to listen-in around the 455 metre mark. His earlier transmissions were certainly not too good, but now the Boundbrook station is going with full steam.

An interesting experiment being carried out by the American stations on the last two days of International Test Week (Friday and Saturday in the States) is now being arranged over there. On these two days further International Tests will take place, but European stations are not included. By referring to the accompanying table it will be seen that the various sections of the country have been divided into their respective time-bands, and the stations will broadcast accordingly.

This table was compiled by the staff of "Radio Broadcast Magazine" of America. Programmes of exceptional merit are being arranged for the Tests so that listeners not interested in the International aspect of the affair will not be left in the cold. I don't think that it is necessary to mention any further particulars as the table gives all the necessary data.

SCHEDULE OF TRANSMISSIONS INTERNATIONAL RADIO BROADCAST TESTS, 1926.

All the Times in this Table are G.M.T.

Day	Time	Stations Participating
Monday, January 25th	3—4 a.m.	Canadian, American, Mexican, Porto Rican, Cuban
Monday, January 25th	4—5 a.m.	European and South American
Tuesday, January 26th.	3—4 a.m.	American Continent (see above)
Tuesday, January 26th	4—5 a.m.	European and South American
Wednesday, January 27th	3—4 a.m.	American Continent
Wednesday, January 27th	4—5 a.m.	European and South American
Thursday, January 28th	3—4 a.m.	American Continent
Thursday, January 28th	4—5 a.m.	European and South American
Friday, January 29th	3—4 a.m.	American Continent
Friday, January 29th	4—5 a.m.	European and South American

British and European stations are participating in the Tests only on the above five days. The American Continent Tests, which are mentioned below, take place early on Saturday and Sunday mornings British time.

EASTERN STANDARD TIME.

Day	Time	Stations Participating
Friday, January 29th	11—11.15 p.m.	American Eastern Standard Time Zone stations
	11.15—11.30 p.m.	American Central Standard Time Zone stations
	11.30—11.45 p.m.	American Mountain Time Zone stations
	11.45—12 p.m.	American Pacific Time Zone stations
Saturday, January 30th	11—11.15 p.m.	All Canadian stations
	11.15—11.30 p.m.	Northern half United States stations
	11.30—11.45 p.m.	Southern half United States stations
	11.45—12 p.m.	All stations south of the United States

It will be noted that this schedule will not only give American listeners a chance to hear stations in this country never heard before because of the station operating on a frequency used by some near-by station, but this arrangement will also give the overseas listeners a chance to pick up some American stations that are more distant from them than the stations almost on the edge of the Eastern seaboard. The arrangement of the American tests so that on the first night (Friday, American time) the stations will progressively transmit from east to west, and on the second night of those tests (Saturday, American time) transmit north and south, will give American listeners a chance to experiment with DX reception such as they have never before had.

The Continental and British stations, if they follow the same plan for their territory, on the last two nights of the test, will be on the air just one hour earlier than the American stations. This will keep the air clear for the American transmissions which follow. The British and Continental broadcasters will undoubtedly appreciate this arrangement, for it will give them a chance to get a bit more rest. Since the transmissions from abroad come at from four to five o'clock in the morning, London time, the physical strain on the various station staffs is bound to be quite heavy by the end of the test week.

The "P.W." Crystowave Set

The Set Designed & Described by K. D. ROGERS. (*Assistant Technical Editor.*)

Constructional Work by G. V. COLLE. (*Technical Staff.*)

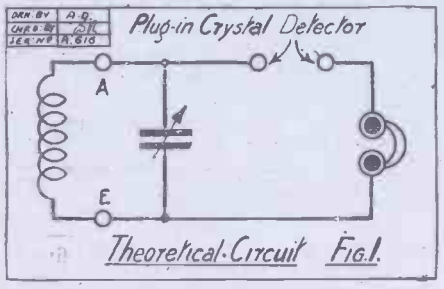
THE little receiver to be described in this article will be of exceptional interest to readers, whether they be crystal or valve set owners. Though simple in design and construction, it will form a useful instrument in the home of any wireless enthusiast.

Briefly it consists of a crystal set which can be used alternatively as a broadcast receiver, a wave-trap, or a wave-meter, so that it is universal in its uses. With regard to the first rôle, that of crystal receiver, there is very little that can be said, for the diagrams and photographs will show that it merely consists of the usual type of plug-in crystal set so well known to listeners.

Reliable Condenser Essential.

As regards the wave-trap and wave-meter, its use may be less apparent, and in the case of the latter it makes use of the absorption method, which has proved to be the most efficient and reliable system.

In the construction of this set only the best components can be used, and especially is this the case with regard to the variable



Theoretical Circuit Fig. 1.

condenser, which in the receiver photographed was of a geared type with a large dial divided into 360°. This large dial and the well-spaced divisions upon it are most needed when the set is being used as a wave-meter, for in that capacity the tuning is exceedingly sharp, and if accurate results are to be obtained, very careful readings of the condenser setting must be made.

The list of components given on this page show that very little is required for the construction of this instrument, and, while it is not essential that the constructor keep to the actual makes mentioned, he will be well advised to do so in the case of the crystal detector, because this is a small plug-in unit which plays a large part in the design of the receiver.

Few Components Needed.

In explanation of this statement it must be said that this crystal detector has to be removed from its sockets when the instrument is being used as a wave-meter or wave-trap, and the inclusion of any other type of detector (not of the plug-in variety) would necessitate either a dismantling of the detector every time the wave-trap or wave-meter was used, or else the inclusion of a series of terminals and shorting straps to be used when the crystal was to be put in or taken out of circuit. Any reliable make of variable condenser can be used, while the coil plug is, of course, of the usual type.

A small panel, only 6 in. square, is necessary, with a box to fit about 4½ in. deep. The panel is drilled according to the diagram given in Fig. 2, and the components are mounted in the positions shown by the photographs. There is nothing difficult about this part of the construction, and it will not take the constructor very long. Where greatest care is needed, however, is in the wiring of the set and the construction of the coils, if bought ones are not to be employed.

LIST OF COMPONENTS.

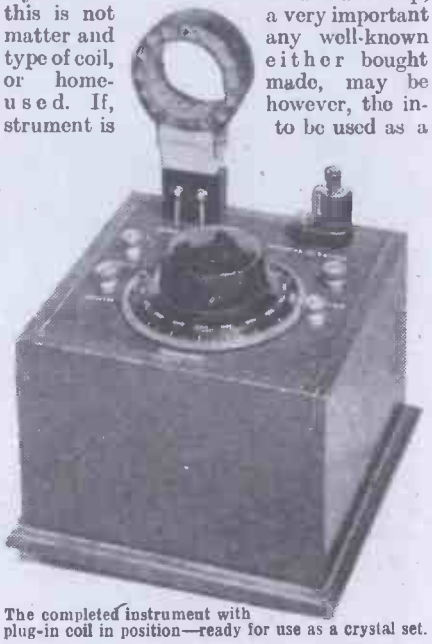
1 Panel, 6 in. x 6 in. x ¼ in...	1	6
1 Box to fit 4½ in. deep ..	3	6
1 Panel Mounting Coil Holder..	1	2
1 Crystal Detector (Wates' "K" Type)	5	0
4 Terminals W.O. Type		6
1 Variable Condenser ·0005 mfd. Geared with large dial (Peto-Scott)	23	6
Wire, Transfers, Screws, etc. ..	1	0

Stout Connections Should be Made.

The wiring must be carried out in stout, bare copper wire, and all connections must be made so that there is no possibility of their working loose or the wires bending and altering their position, for this would be fatal to the action of the set as a wave-meter. It is also exceedingly important that any traces of dirt or flux remaining after soldering has been carried out be removed, and once the set has been completed and placed in its cabinet it should be left severely alone as regards the interior. The wiring is very simple, and can be carried out from the diagram given in Fig. 3 or from the point-to-point list of connections on the next page.

With regard to the construction of the coils, if the set is to be used only as a crystal set or a wave-trap, this is not a very important matter and any well-known type of coil, either bought or home-made, may be used. If, however, the instrument is to be used as a wave-meter, the choice of the coil becomes more difficult. It is essential in this event that the coil be of robust construction, so that there is no danger of its value (either of inductance or capacity) varying with change

(*Continued on page 1146.*)



The completed instrument with plug-in coil in position—ready for use as a crystal set.

This photograph shows the instrument being used as a wave-meter. The crystal is removed and the coil is loosely coupled to the aerial coil of the valve receiver.

"P.W." "CRYSTOWAVE" SET.

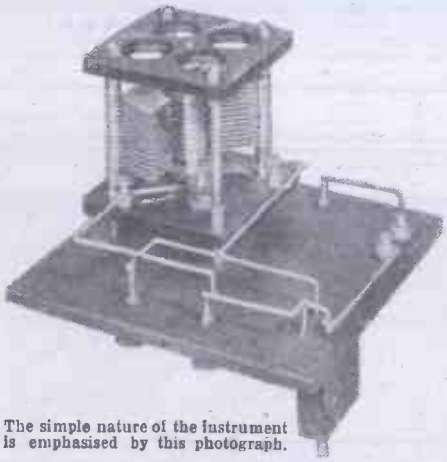
(*Continued from page* 1145.)

of temperature, atmosphere, or with use, for once the set has been calibrated the only variable section must be the condenser.

In actual use the receiver, the photographs of which appear here, was employed with Atlas plug-in coils, a special coil of that make being used for wave-meter work and kept solely for that purpose.

Using the Instrument.

This coil had 50 turns, and allowed wave-length readings to be taken between 150 and 500 metres.



The simple nature of the instrument is emphasised by this photograph.

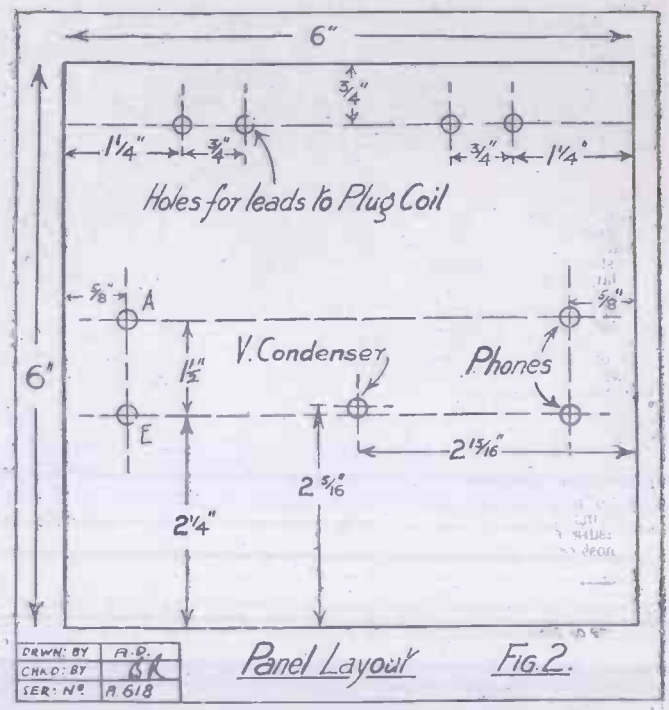
There is no reason why home-made coils or coils of other makes should not be used, providing they are of rigid construction and are carefully handled and, in this respect, it must be emphasised that the whole reliability of the set may be decided by the way in which the wave-meter coil is handled, so that it is advisable that this coil be used only when the set is to be used as a wave-meter, another one being substituted if it is to be used as a wave-trap or crystal set. When not in use, the wave-meter coil should be removed and carefully put away in a dry place where no harm is likely to come to it.

If it is decided to make the coil at home, the well-known basket type on a cardboard former can be employed, provided fairly stout wire, say about 22 gauge or 24 gauge is used, while it is a good plan to well shellac the coil after construction, taking care that the shellac is evenly distributed and does not set in blobs between the coil windings. This process will enable the coil to withstand atmospheric changes, but extreme care must be taken in the handling of it, so that the former does not become bent or damaged, or the turns shifted from their positions.

For use as a crystal set any coil covering the wave-length required can be plugged into the coil socket, the connections to the receiver being those marked on the panel.

Thus the aerial is taken to the aerial terminal, earth to earth terminal, and the 'phones to the remaining two terminals. The crystal detector is plugged into position and tuning is carried out by means of a condenser.

For use as a wave-trap any coil suitable (that is, capable of being tuned to the wave-length of interfering stations) can be used. It is plugged in the same coil holder and the connections to the instrument will vary with the type of wave-trap which is desired. If a series wave-trap is required, the aerial should be connected to the aerial terminal, the earth terminal being connected to the aerial terminal of the receiving set with which the wave-trap is to be used. The 'phone terminal is left unconnected and the crystal detector is removed from its socket. In the case of an absorption wave-trap no connections are made to the instrument, but the coil is coupled to the tuning coil of the receiving set inductively, the crystal being removed from its socket.



Panel Layout FIG. 2.

POINT-TO-POINT CONNECTIONS.

Aerial terminal to moving plates of condenser, one side of coil holder, and one side of crystal detector. Other side of crystal detector to one 'phone terminal.

Earth terminal to other side of coil holder, fixed plates of condenser and the remaining 'phone terminal.

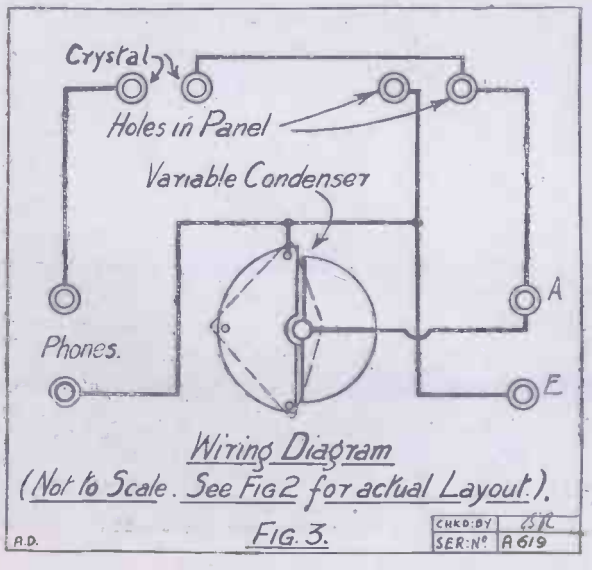
In either case the method of tuning is the same. First of all, the receiver is tuned to the interfering station, and then the wave-meter is brought into action and its tuning varied until signals from that station are eliminated or else decreased to their minimum. Finally, the receiver is tuned to the wave-length of the station it is desired to receive, the wave-trap being left as it was.

In use as a wave-meter, the instrument is left unconnected externally, the special wave-meter coil being inserted in the coil-holder and the crystal removed. As the wave-meter is to act upon the absorption principle, it must be so placed with regard to the receiver that its coil couples magnetically with that of the receiver, so a very loose coupling should be employed. As a rule, if the coupling is commenced at, say, 4 in. between the two coils and a rough adjustment made, it will be found that the wave-meter can be moved to a foot or more away from the set before it fails to operate, and it is at its farthest position that the accuracy will be greatest.

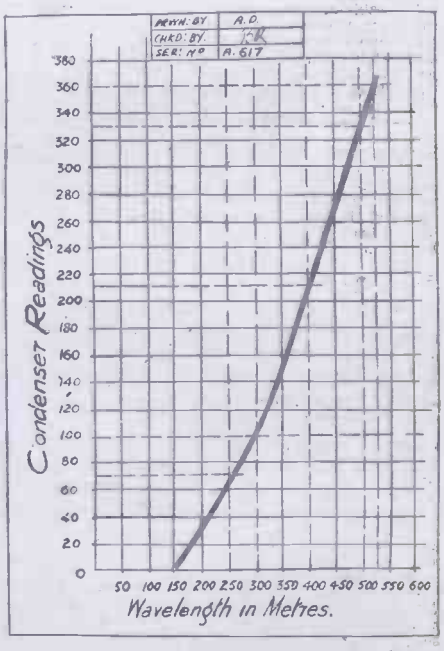
The operation is as follows: the wave-meter is coupled to the aerial or grid coil of the receiver (it is assumed a valve receiver is being used) and the receiver tuned to the station whose wave-length is required. It is now set so that it is just oscillating and the wave-meter condenser is slowly varied. No results will be noticed until the wave-meter comes exactly in tune with the receiver, when a sharp plop in the telephones will denote that the set has ceased to operate. The two instruments are now in resonance, and reference to the condenser dial on the wave-meter and the calibration chart will give the wave-length of the station. It is, of course, just as easy to carry out the reverse operation, namely, that of tuning your receiver to any desired wave-length by means of the wave-meter.

Before the wave-meter can be used it must be calibrated, and a chart similar to the one shown below constructed. To carry out the calibration, the constructor can either follow a reliable wave-meter and calibrate from that, or else he can tune with his own receiver to various stations whose wave-lengths are known, and work out his chart from the list of readings obtained thereby. At least six readings should be taken from different stations, for it will be obvious that the more readings that are obtained the more accurate will be the graph drawn on the calibration chart.

The chart mentioned before and appearing above must be taken as a rough guide only, for it will not be accurate for any but the one particular instrument from which it was constructed.



Wiring Diagram (Not to Scale. See Fig 2 for actual Layout.). FIG. 3.



THE POLARISED RADIO WAVE.

A Detailed Explanation of a New Wireless Development.

By Dr. E. F. W. ALEXANDERSON.

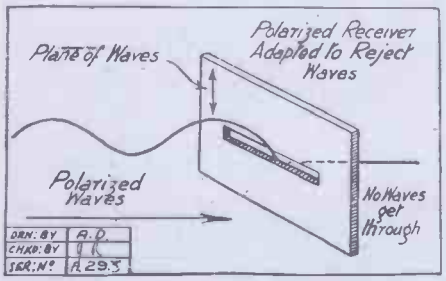
(*Radio Consulting Engineer, General Electric Co. America.*)

We are able to publish in this issue a long article from the pen of the discoverer of the Polarised Radio Wave—Dr. Alexanderson. Readers will remember that in a previous issue we published a brief article on the Polarised Radio Wave, but since then new developments have been announced, and Dr. Alexanderson's article may be regarded as the most authoritative and up-to-date on the subject yet published in this country—EDITOR.

ONE of the first results of a determined effort to explore the phenomena of wave propagation led to the discovery of horizontally polarised radiation. Since these discoveries were first announced the subject of polarisation has been brought into the limelight and is receiving much attention from radio investigators, amateurs as well as professionals. A wave of optimism has swept over the radio fraternity and brings forth new reports of success in the struggle against the old enemies of radio—static and fading.

The study of wave propagation over large distances requires a comprehensive organised effort. To this end the General Electric Company undertook to do the technical pioneer work in devising new forms of radiators and receivers, whereas, the Radio Corporation undertook to judge the practical value of this new development by making use of it in its communication system.

It has become a tradition among radio communication engineers to accept the judgment of traffic operators as final in valuation of the quality of a radio circuit. The reason for this is that the facts in regard to radio communication are not simple measurable phenomena such as we are accustomed to in most other engineering arts, but are statistical



A diagrammatic representation of polarised waves, showing how they would have no effect on a specially designed rejector.

averages. The traffic operator measures how many words per hour and per day he can transmit over a radio circuit with a required degree of reliability, and the statistical results so obtained are as definite and reliable as the mortality figures of an insurance company, whereas, the radio engineer when he is called upon to cure a bad case of static or fading is in about the same position as a doctor in relation to his patient. This makes his profession all the more fascinating, and the science dealing with the diseases of radio is making rapid strides.

One of the important steps in exploration of short waves was taken when the Radio Corporation of America installed in a temporary manner six short-wave transmitters in its commercial long-wave stations to be used as supplements to the regular service. These transmitters were, to begin with, operated in the neighbourhood of 100 metres. Similar transmitters were installed by the associated European companies.

Early Impressions.

The first impression from this new service was that the short-wave transmitters gave remarkably good communication at certain times during the hours of darkness, whereas, in day-time, the service was totally unreliable if any signals could be heard at all. Some of these transmitters were kept in regular service, whereas others were modified in order to explore possibilities of improved results.

Thus it was found that when the wave-length was below 50 metres the night signals became weaker, but on the other hand, service could be given during daylight hours. Tests with still greater reduction of wave-lengths of a range between 15 and 30 metres proved that it was often impossible to give good service across the Atlantic Ocean at mid-day in the summer. The stations which are giving the best all-round service at the present time operate at a wave-length of about 40 metres.

So favourable have these results been that the Radio Corporation is now installing a chain of short-wave stations to cover the Pacific Ocean, supplementing the two long-wave transmitters at the Hawaiian Islands. This new chain of stations will include the Philippine Islands. The conditions for wave propagation over the Pacific Ocean are notably different from those on the Atlantic Ocean, and, as a whole, easier.

It is therefore confidently expected that a good short-wave service will be established over the Pacific. The findings on the Atlantic circuit in regard to wave-length will not necessarily apply to the Pacific Ocean, and the stations will be built in such a way that the best operating conditions can be determined experimentally. It is, however, possible to make a reasonable forecast of expectations based upon the extensive experimental data which is already on hand and which is rapidly accumulating.

The experimental station built by the General Electric Company in Schenectady for the purpose of exploring these possibilities is now capable of operating with seven transmitters simultaneously with different wave-lengths and different types of radiators, and observations from these transmission tests are being made all over the world. The object of these tests is partly to explore the propagation characteristics of different wave-lengths and partly to make final tests of comparison between various types of radiators. Three types of radiators are used in these comparisons, but these are the result of a sifting process conducted on a smaller scale, in which a great many other antenna systems have been explored and at least temporarily discarded. The radiators which are now being compared are:

1. The straight vertical antenna oscillating at a harmonic frequency. 2. The horizontal antenna with an over-all dimension of one-half wave fed in the middle through a transmission line. 3. The series tuned horizontal loop.

The Three Types of Aerial.

All these three radiators have one feature in common, that the radiation is projected at a high angle upwards. They may therefore all be classified as high-angle radiators. It has been found that only the high-angle radiation is useful in reaching great distances. The high-angle radiator has therefore the double advantage of economy of energy and the absence of objectionable signal strength in the neighbourhood of the station.

The first type of antenna radiates a vertically polarised wave of the same general character as the waves that have been used heretofore in long and intermediate wave stations. It differs from old type of radiation only by being a pure high-angle radiator, whereas the old type of stations radiated a ground wave as well as a high-angle wave.

The second type of antenna, the half wave doublet, is an intermediate form. At right angles to its length direction, it radiates a horizontally polarised wave, and in its length direction it radiates a high-angle vertically polarised wave. Thus, in its length direction it has a radiation of the same character as that emitted from the vertical high-angle radiator, whereas, in the broadside directions, it emits a wave of different type.

The third antenna system, the horizontal series tuned loop, emits a horizontally polarised radiation in all directions.

For the analysis of the characteristics of high-angle radiation, we are particularly indebted to Commander A. Hoyt Taylor of the Navy Department, who has made extensive tests and furnished valuable data on the so-called "skip" distance of the wave. He has found that the distance skipped by the wave, which means the length of the trajectory required for the high-angle radiation to come down again to earth, depends upon the wave-length, day and night conditions, and summer and winter conditions, the general rule being that the shorter the wave, the greater is the skip distance.

The characteristic of the horizontally polarised waves has been explored in the neighbourhood of the station in Schenectady up to about ten miles, and also by measurements in the various stations of the Radio Corporation. For measurements of wave polarisation at long distance we are indebted to Mr. Greenleaf Whittier Pickard, who during last summer and fall has made systematic tests of the radiation sent out from Schenectady, as well as generally explored the conditions of wave polarisation.

His findings have been presented to the Institute of Radio Engineers; and it may be sufficient to mention that he has shown in the short-wave range the horizontal component of polarisation is usually twice as strong, and sometimes ten times as strong as the vertical wave. He has also shown that fading conditions are different in the horizontal and the vertical plane.

Mr. Pickard has also shown that the wave does not maintain its original plane of polarisation because the reception appears to be of the same nature, regardless of whether the wave is radiated with a horizontal or a vertical polarisation. These findings are in agreement with the original observation which led us to study horizontal polarisation, when it was found that a horizontally polarised wave from Schenectady was received with greater intensity on Long Island than the ordinary vertically polarised wave, although in both cases a vertical receiving antenna was used.

Explorations of wave polarisation in the neighbourhood of the station have brought out many peculiarities which have not yet been fully explained. So, for example, it is found at a distance of about ten miles from the horizontal loop radiator, that the wave comes down with an almost vertical direction of propagation. For those who believe in a reflecting Kenelly-Heaviside layer, this would appear to be good evidence, because it might be assumed that the wave has been radiated straight up from the station, and is reflected directly downwards.

Experiments with Loop Radiators.

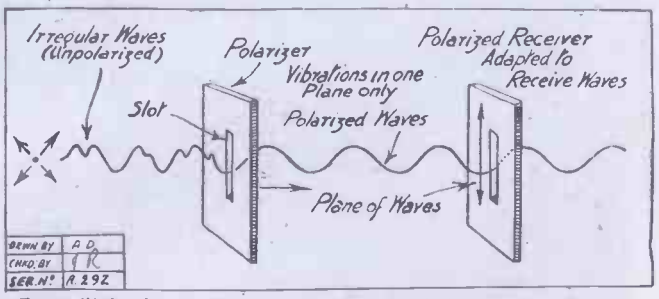
A loop receiver under those conditions gave no orientation of the station whatever, because the signals came in apparently equally strong from all directions when the loop was rotated around its vertical axis. This would indicate that the wave besides being vertically propagated was circularly polarised.

Similar observations at a point only a few wave-lengths distant from a horizontally radiating loop show that the wave comes down nearly vertically, but yet with a definite slant towards the station. Tests with a loop receiver gave in this case a distinct orientation, but the station appeared to be located at right angles from the direction where it really was.

One of the loop radiators used in these tests is round, another is about one-sixth wave-length wide and two wave-lengths long. These horizontal loop radiators also differ from the ordinary types of antenna by radiating on the magnetic compouent of the wave. An ordinary long-wave antenna creates an electrostatic field around the station, whereas the magnetic counterpart of the magnetic energy is confined to a tuning coil. In the series tuned loop radiator this process is reversed. A magnetic field is created around the antenna, whereas, the electrostatic counterpart of the oscillations is confined to artificial condensers inserted at regular intervals in series with the antenna conductor.

One advantage of confining the electrostatic field to artificial condensers has been found to be the fact that the antenna is much less subject to fluctuations in its natural period due to swaying of the wires in the wind. The radiation produced by these loops has a pure horizontal polarisation. The oblong loop projects its principal radiation 45 degrees upwards broadside to its own length direction. Reception tests have proven that it is superior to the vertical radiator.

From the elementary theory of directive radiation it would be possible to calculate a quite sharp directivity diagram for this antenna. Such a result was, however, not expected in reception tests at long distances, because experience with a variety of types of directive antenna systems had proven that whereas the theoretical directivity diagram can be easily confirmed in the neighbourhood of the station,



Transmitted polarised waves are accepted by polarised receiver, provided plane of polarisation is correct.

(*Continued on page* 1148.)

THE POLARISED RADIO WAVE.

(*Continued from page 1147.*)

the distant measurements do not bear out the elementary theory.

The reason for this seems to be that while the antenna sends out a radiation as calculated, there is an additional radiation which is projected almost vertically upwards, and then scattered in all directions by the upper layer of the atmosphere. Signals may, therefore, be received at distant points in directions where the elementary theory shows that it should be zero. A good deal more evidence must be collected before any definite conclusions can be drawn regarding these secondary phenomena, because each case of evidence is usually subject to several interpretations.

We have, however, good reason to hope that in a not distant future such a mass of evidence will be available that valuable conclusions may be drawn which will have important bearings not only on the development of radio but on fundamental questions in allied sciences.

From the point of view of the practical radio engineer, it is a satisfaction to be able to state that enough has been learned to create a new and promising field of radio communication as evidenced by the decision of the Radio Corporation to proceed with its chain of short-wave stations in the Pacific Ocean.

The stations which will thus be built will have antenna systems of the type classified as short-wave high-angle radiators. Which one of the three types discussed above will be adopted will depend upon further results from the comparative tests that are now in progress, and also upon final tests in the stations when installed. So far these tests have shown that the horizontally polarised radiation is superior to vertical radiation.

A Mechanical Analogy.

I have a mechanical model, made up for studying wave polarisation, in the General Electric laboratory. The model consists of weights suspended in such a way that they are free to move in all directions. Twenty-two of these weights are arranged in a row and connected together by rubber bands. Each weight is suspended from a yoke, and an equal weight hung on the other side of the yoke to serve as a counter weight.

A screen is set up so as to hide the counter weight and avoid confusion in observing the wave motion. This model was set up especially to study the twisting of the plane of polarisation, and the experiment has strikingly confirmed the theory which it was intended to illustrate. This theory is briefly the following:

We will assume that the medium through which the radio waves pass has such characteristics that the velocity of propagation for a vertically polarised wave differs slightly from the velocity of the propagation for a horizontally polarised wave. It is not necessary for the present purpose to try to explain the reason for this difference in velocity. We may assume that the reason for it is due to the electrostatic and magnetic effects, to the retarding effect of the velocity of the vertically polarised wave passing close to the earth, or, on the other hand, due to properties of free electrons in the upper atmosphere.

Whatever the cause may be, we may assume that such a difference of velocity exists, and the mechanical model has been constructed so as to reproduce such conditions. The weights on both sides are tied together with rubber bands. Wave motion in the horizontal or vertical planes can thus be studied independently, and these two wave motions may be adjusted for different velocities.

A wave started in the vertical plane maintains itself vertically, and a wave started horizontally maintains itself horizontally. If, however, a wave is started in a plane 45 degrees between the vertical and the horizontal, it is found that the wave motion proceeding therefrom assumes the shape of a corkscrew. The straight line oscillation of the first weight is passed along as an elliptical motion which gradually widens into a circle. Then this circle narrows down again to an ellipse, and finally a straight line at right angles to the original line of oscillation.

Conclusion.

This is exactly in accordance with the theory. The point where the wave has shifted its plane of polarisation 90 degrees is the point where the faster of the two waves is half a wave-length ahead of the slower wave. From this point on the wave proceeds repeating this peculiar corkscrew motion.

The fact that the twisting of the wave is due to different velocities in the two planes of polarisation can also be demonstrated by this model. For this purpose the rubber bands are added to the counter weights. The effect of this is to change the velocity of propagation in the vertical plane, whereas, the velocity in the horizontal plane has not been affected because only the vertical motion is transmitted to the counter weights by the suspension yokes.

The system can thus be adjusted so that the velocities in the horizontal and the vertical planes are exactly equal. After this has been done, it is found that the tendency to corkscrew motion disappears and the wave remains strictly in the plane

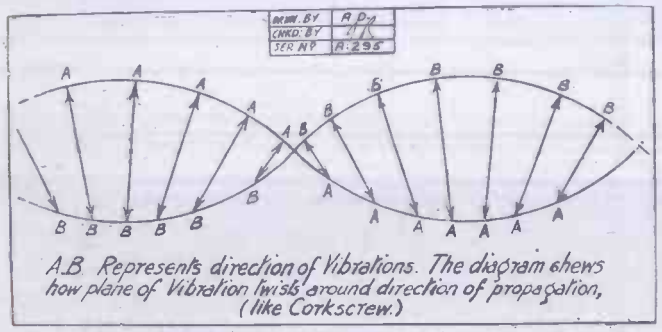


Diagram illustrating the rotation of the plane of polarisation, as discovered by Alexanderson.

Which it has been started. in while this mechanical experiment does not bring out any new facts that were not kuown from the classical theory of wave motion, it helps us to visualise the main phenomena in the radio-wave propagation which we are trying to explain. The phenomenon of a constantly shifting plane of polarisation which we discovered experimentally in tests between Schenectady and Long Island can thus easily be explained.

This conception of the wave motion is also a help in explaining the phenomena of fading. There is already much experimental evidence that fading is a phenomenon of interference. In other words, the fading is due to the fact that the radio waves arrive at a certain point through two paths. The waves will sometimes add to each other and sometimes neutralise each other. If we keep in mind the observations on the mechanical model that the waves in the two planes can be traced through separately and distinctly, we may conclude that the two paths of the radio wave which produce fading are not necessarily two separate physical paths, but may be the two paths in the horizontal and the vertical plane of polarisation.

For further illustration of this we can, in the mechanical model, introduce a detector. If we place this detector at a certain distance from the origin we find that the detector gives no response when the system is adjusted for different velocities of propagation, whereas it gives a maximum response when the system is adjusted for equal velocity in the horizontal and vertical plane. The phenomena of fading has thus been reproduced mechanically through polarisation in a single-wave path.

It is not hereby suggested that this mechanical equivalent is sufficient to explain the fading in actual radio transmission. It is, however, offered for what it may be worth as a help to interpret the many observations in actual radio transmission which are being accumulated.

POLARISED WAVES.

WHAT COMPARATIVE TESTS HAVE SHOWN.

Analysis of reports received from radio listeners on the comparative tests of horizontal and vertical radiation of radio waves from the super-power transmitter of the General Electric Company, at Schenectady, indicate that horizontal radiation gave better service in the zone from 60 to 250 miles from Schenectady, while at greater distances the vertical antenna radiation was more satisfactory. Reports also verified, in part, the theory of E. F. W. Alexanderson, that horizontally polarised waves may twist in their progress until they are polarised on a vertical plane.

Recent Reports.

A complete, non-technical report by Charles J. Young, under whose direction the comparative tests were made, follows.

A large number of letters, coming from all directions and from all distances up to 1,700 miles gave us the results of the horizontal and vertical radiation tests which were made by the General Electric Company with the help of a large number of co-operating listeners on the nights of November 2 and 3. We have been much impressed with the number of reports which did come in to us. A test from midnight to one o'clock is pretty late, and when so many letters are received, it is a most encouraging indication that the listeners are anxious to assist us in our honest endeavours to improve broadcasting.

Of the reports received some favoured the horizontal radiation which was given from midnight until 12.30 and others favoured the vertical radiation which was on the air from 12.45 till 1.15. On each transmission the same antenna power was used, which, due to difficulties in tuning up these new forms of antennas, did not amount to quite 50 kw. but was a little greater than 30 kw., a power still considerably in excess of that used in any ordinary broadcasting stations. One other fact which bears on the analysis of the data should be noted. That the night of Tuesday, November 3rd, when the tests were repeated, was characterised by much poorer reception generally than was Monday night.

On the first test, 64 per cent of the letters reported that the signal obtained from the horizontal antenna was the louder, and the majority of listeners stated that it was less disturbed by fading, and that the quality was somewhat better than on the vertical radiation. On the second night reports were about equally divided as to which was the louder, although the fading was still reported less on the horizontal radiation. Many noticed very bad quality on the horizontal test on the second evening, but this should not be taken too surely as a mark of bad transmission, as it may have been in some part due to the improper adjustment of the transmitter itself.

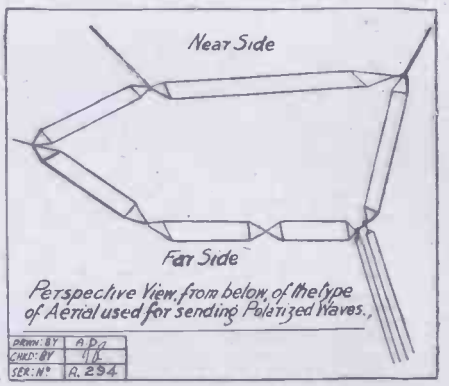
Interesting Results.

While most of the listeners reported a choice between the horizontal and vertical radiations, it was clear from the letters that there was no enormous difference in the loudness of the signals produced by the two types of transmission. This in itself is an interesting fact. It indicates that waves may leave an antenna vibrating in either a horizontal or a vertical plane, and will then be twisted around as they are transmitted until they give somewhere near the same effects.

When they reach the receiver they both come in on a vertical antenna, and the attempts which some of you made to determine the plane in which they arrived showed that there was little difference in direction between them. This information may be considered as verification in part of the theories of E. F. W. Alexanderson and others regarding the twist of waves during transmission.

In order to study the comparison between the two radiations for distance and direction, we have made a chart which shows the number of letters in each district which report the horizontal louder and the number which report the vertical louder. This graphical summary makes the results very plain. There is a clear indication that the horizontal transmission gave better service to the zone from about sixty to two hundred and fifty miles from Schenectady, while at greater distances the vertical seemed to improve and to become more satisfactory. It seems, therefore, that horizontal radiation may be of some assistance as a special means of broadcasting, although at the present stage of development the gain is not very marked.

There are some other points which this test has shown us, but which are either too involved or still too incomplete for discussion at this time. They will, however, be of assistance in planning future tests along these lines.



PHOTOGRAPHS.

Readers are invited to submit photographs of wireless interest for publication in "Popular Wireless." Every photograph accepted and published will be paid for at the rate of 10/6 per copy.

Technical Notes

Conducted by our Staff Consultant, J. H. T. ROBERTS, D.Sc., F.Inst.P.

Automatic Rheostats.

SEVERAL readers have asked me, from time to time, questions as to the theory and practice of the "amperite" or automatic rheostat, and as to its suitability for the purpose for which it is sold.

The word "amperite" is a trade name for a type of ballast resistance; ballast resisters are, however, well known and have been used for many years for certain special purposes.

First of all, let me explain the nature of the resistance and how it works.

The usual form of ballast consists of a fine wire of iron (or other metal, but iron is often used for reasons which will appear presently) enclosed in a glass vessel which has been exhausted and then filled with hydrogen at a pressure which depends upon the conditions under which the device is to be used. The construction is, in short, an iron wire in an atmosphere of hydrogen.

Gas Heat Conductor.

Suppose a certain steady current is flowing through the iron wire, and then, in series, through the filament of a valve. Then suppose the voltage in the circuit from any case is suddenly increased. If the resister were not there, the filament of the valve would be made considerably hotter, although the amount of current that would flow through the filament would not be proportional to the voltage applied; that is to say, the percentage increase in the current through the filament would not be equal to the percentage increase in the applied voltage. The reason for this is that the resistance of the filament is not constant, but increases with rise of temperature. The net result of a rise of voltage is that the current through the filament is increased, but not to so great an extent as it would have been if the resistance had not increased with the rise of temperature.

Suppose we have a metal whose resistance increases very rapidly indeed with rise of temperature (that is, in this case, with increase of the current passing through it). It will be evident that a rise in the applied voltage will only produce a comparatively small rise in the temperature of the wire.

If further, we help the wire by surrounding it with a gas—such as hydrogen—which conducts away the heat rapidly, then any increase in temperature is still more difficult to produce and maintain.

Popular in the States.

These considerations will indicate the reasons for choosing iron wire, and for putting it in an atmosphere of hydrogen.

The "filament," from the point of view of possible variations in the current passing through it, consists of the valve filament and the iron wire resister, the latter being specially adapted to resist changes in its steady current under the proper conditions.

It must not be supposed, however (as is sometimes wrongly stated) that the resister keeps the current and the temperature constant. All it does is to reduce the influence of changes in the externally-applied voltage.

In many cases, however, this is sufficient, and the use of the ballast resister then makes greatly for convenience.. In the United States there is a great tendency recently to adopt these ballast resisters as standard in commercial sets, thus doing away entirely with the variable resistances or rheostats.

Compact Rheostats.

In this connection, I notice that some of the American manufacturers who still use rheostats are adopting a special type of carbon resistance, in a small tube, which is adapted to be secured in a vertical position at one corner of the valve-holder, or rather, at one corner of the square base of the valve-holder. In this way the rheostat does not occupy any valuable space on the panel, and is very easily wired up into circuit. A milled-head screw permits adjustment of the rheostat and, once adjusted, it seldom requires any further attention. This little device makes greatly for neatness and convenience.

How the Crystal Works.

The ever-interesting subject of the mechanism of crystal rectification is treated in a very scientific and thorough manner in a paper in the "Philosophical Magazine," by Mr. A. C. James, of East London College. It is impossible here to give more than a very brief indication of the general nature of the theory proposed by Mr. James, but it may be said to be an "electrolytic" theory, that is to say, it resembles, in a general way, the usually accepted theory of the passage of electricity through liquid conductors. A large number of experimental results have been used as the basis for the formulation of this theory, and the interested reader will find a full account of these in the paper referred to.

Variable Transformers.

It will be remembered that a variable-core low-frequency transformer was described in this journal recently, the object of the transformer being to permit tuning and the adjustment of the impedance or turn ratio and such-like purposes. I hear that an American expert has lately used a variable transformer, on a somewhat similar principle, for high-frequency work. The iron core consists of a number of iron wires and these are mounted together upon the end of a screw support, which in turn passes through a side arm attached to the case of the transformer. In this way, by turning the screw, the iron core may be advanced further into the coils of the transformer or withdrawn, as may be desired.

A "low-loss" variometer—it is wound with copper tubing, but is used not for receiving, but in an American transmitting system.

The primary is aperiodic and the secondary is periodic or resonant for the desired frequency-range; in other words, varying the iron in the core varies the frequency of the secondary coil so that by this means the resonance of the circuit in which the secondary coil is placed may be adjusted at will. The relation between the iron core and the secondary is sensitive to changes in either, whilst relatively large changes in the primary are permissible without materially altering the operation of the transformer.

Interesting Results.

Some further interesting results are stated to have been obtained in connection with

(*Continued on page* 1783.)

BROADCAST NOTES

By O. H. M.

"My Day's Work"—The B.N.O.C. Season—Broadcast Appeals—Broadcasting "Pops"—Special Programmes for America—The Savoy Bands Incident—Donald Calthrop Resigns.

"MY Day's Work" is the title of a broadcast from London on January 30th, by the Chief Steward of the "Berengaria." This should prove interesting, and opens up a new vista of novel possibilities of the kind. I understand the B.B.C. will continue the feature. I hope they will include "My Day's Work," by a taxicab driver, a barmaid, an aeroplane pilot, a dustman, a university professor, a mental nurse, and a prison turnkey. There is ample room for variety of real human interest.

* * *

From nine to ten on February 2nd, Mr. Percy Pitt will conduct the London Station orchestra in an act from "Faust." Mr. Pitt is making a welcome reappearance before the microphone after a period of illness. His handling of the special Bach programme on Sunday, January 3rd, provided a great treat for music lovers. While on the subject of opera, I am reminded that the new B.N.O.C. season is being planned.

It is only right and proper that the B.B.C. should take some of their works, but I am glad to know that there are not to be such ample doses as last season. The average is to be one act once a week, instead of several acts three times a week. The B.N.O.C. appears to be going through another period of financial stringency. It has been suggested that the B.B.C. should pay a considerable sum annually towards the support and encouragement of British Opera. I am in sympathy with this idea, but I am sure the money should not be taken from the restricted allowance on which the B.B.C. is now working. Make it a charge on the licence money the Post Office is sitting on.

* * *

I am glad to hear that Relay Stations are being given a chance to show their metal on 5 X X. I hear that Liverpool has been chosen as the first of the relays to put through a big show, on or about the middle of February. Apparently the Savoy Hill people think that Liverpool and Edinburgh are the only relay stations that can stand the test of 5 X X. I would ask them to test all the relay stations, and would wager a fair sum that the results would justify the experiment.

* * *

"The Coming of the Northmen" is the title of Mrs. H. A. L. Fisher's talk on February 11th. Mrs. Fisher is one of the zealous band of occasional broadcast lecturers who are making determined endeavours to conquer all the mysteries and intricacies of the new medium. Her word pictures are coming across with striking quality and distinctness.

* * *

So the broadcast appeals are at last being cleared up. It was high time. My impression is that the B.B.C. have been too kind-hearted about appeals for excellent objects. If about a tenth of the number had been handled in the past, there would have been really big results, and no grumbles. The new scheme squeezes all appeals into the five minutes at 8.55 on Sunday nights, between the broadcast religious service and the main musical entertainment. Here's hoping that the kind ones at Savoy Hill will stick to their resolution.

* * *

The new Saturday afternoon broadcast "pops" are a first-class idea. The afternoon period on Saturdays has been badly in need of strengthening for the short days. Henceforth the Children's Hour on Saturday will begin at 4.15, and conclude by 5 p.m. Then from 5 to 7 p.m. there will be feature musical programmes containing light opera, orchestral works, symphony, and perhaps an admixture of chamber music.

* * *

The B.B.C. will broadcast special programmes to America on January 25th and 27th in connection with International Radio Week. These transmissions will take place between 4 and 5 a.m. Greenwich time. London, Daventry, and Bournemouth will participate on the 25th, Daventry, Aberdeen, Cardiff on the 27th.

An effort is to be made to put out programmes as characteristically British as possible. There is no intention to send jazz to America!

* * *

The incident of the Savoy Bands has provided a good deal of useful "copy" for the newspapers. What really happened was that the Savoy Hotel management made a business move by attempting to stampede the B.B.C. into the acceptance of terms a great deal more favourable than could be got otherwise.

The hotel management imagined that the bands had such a hold on the British public that the announcement of their intention to stop broadcasting would come as a staggering blow. This was the main idea. There was also a secondary point of general policy. The Savoy Bands have always resented the broadcasting of other dance bands which commenced in November. Moreover, they particularly disliked being classified with bands that play in smaller hotels and restaurants.

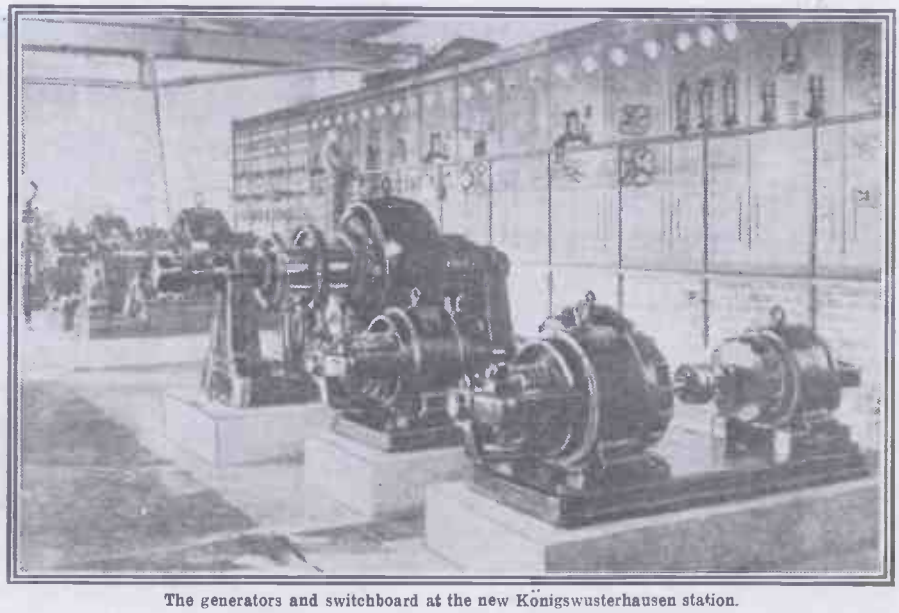
The size of the hotel or restaurant is naturally no concern of the B.B.C., who are interested only in the entertainment value of the bands. I believe the B.B.C. is right in using all the best bands available, but I hope they will make a really strenuous effort to retain Mr. de Mornys and his followers.

* * *

All this discussion about broadcast bands again raises the issue as to whether or not the B.B.C. should provide its own dance music. Suppose all the outside bands suddenly decided to stop being broadcast. This would leave 26 per cent of programme time to be filled in suddenly. It is hardly right that listeners should be at the mercy of the caprice of a few London hotels and restaurants. One solution is that Dan Godfrey be allowed to build up a B.B.C. Headquarters Dance Band, which would always be in readiness to fill gaps and which would also contribute a considerable portion of the broadcast dance music.

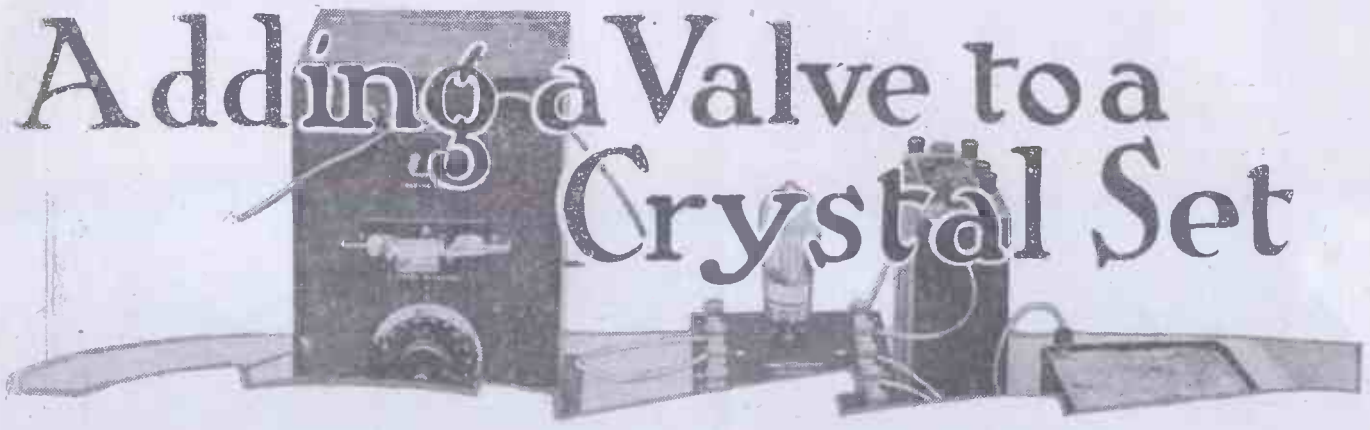
* * *

So Donald Calthrop has resigned from the B.B.C. I was very sorry to hear the news, but I am not altogether surprised. Reading between the lines of the published announcement I would say that it was not reasonably possible for a public utility service to retain the services of such a brilliant exponent of stage technique. I hope, however, that the B.B.C. will be wise enough to make Calthrop their ambassador to the entertainment industry. Let him take out "Radio Radiance," and devote the proceeds to charity; many battles will be won thereby.



The generators and switchboard at the new Königswusterhausen station.

Adding a Valve to a Crystal Set



A Special Article by
OSWALD J. RANKIN.

THIS article is intended as a practical guide to beginners who are anticipating making their first valve effort. The various arrangements to be described include the orthodox H.F. amplifier, the L.F. amplifier or note magnifier, and some excellent reflex amplifiers, all of which have been previously dealt with in these columns. Now, excepting perhaps the ordinary note magnifier, these arrangements usually necessitate making more or less drastic alterations to the crystal receiver. In the present examples, however, such an undesirable state of affairs has been completely eliminated, each amplifier being arranged as an independent unit which is simply connected up to the terminals of any existing crystal set, providing (in most cases) the aerial tuning condenser in the crystal receiver is in parallel and not in series with the aerial tuning coil.

An H.F. Amplifier.

The choice of an H.F. amplifier, an L.F. amplifier, or a combination of both, will, of course, depend upon individual requirements. Nowadays most beginners are (on account of the knowledge gained by common contact with the ever-increasing army of wireless friends) fully alive to the fact that H.F. amplification is employed to increase the *range* of a receiver, L.F. amplification for note volume, etc., and in view of this fact no attempt is made to wade through a lengthy explanation of the various arrangements. All details are of a purely practical nature, and the beginner should find no difficulty in following the diagrams, which are presented in both theoretical and practical form.

Fig. 1 shows how a single-valve H.F. amplifier, A, is arranged as an independent unit, and connected at the points marked X to the aerial and earth terminals of the crystal set, B.

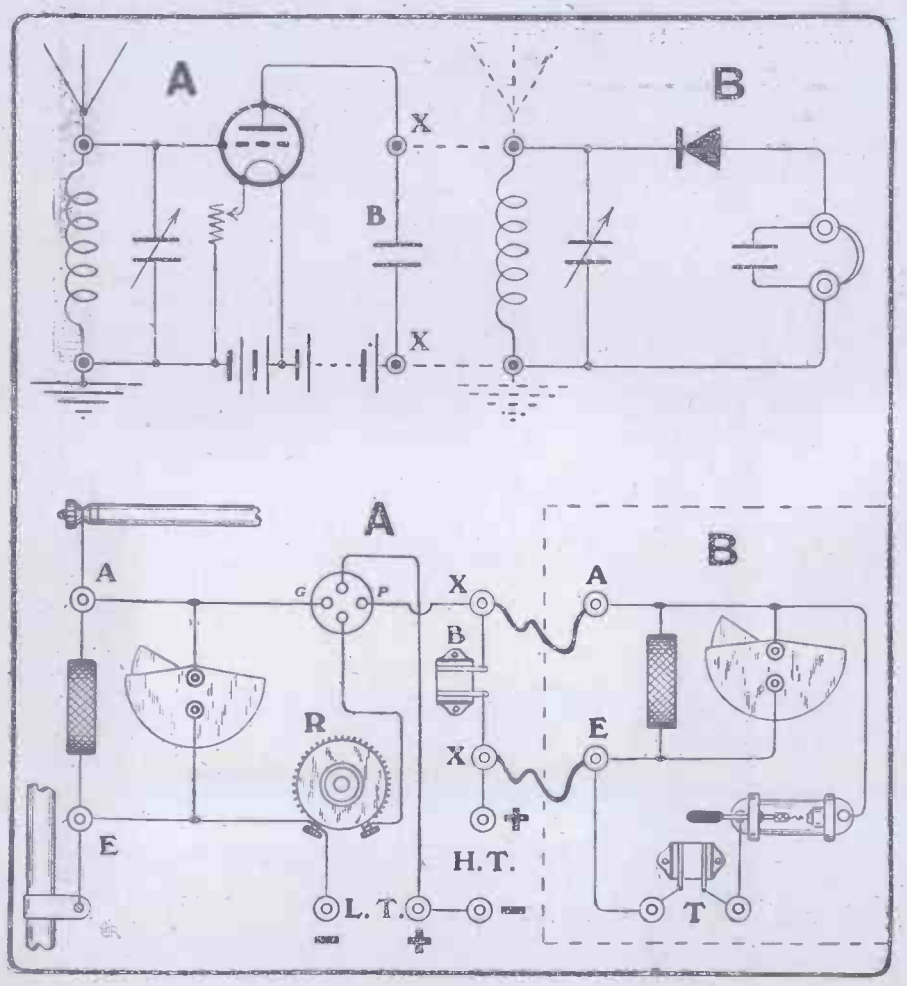


Fig. 1. A simple high-frequency amplifying unit.

Constructional Details.

We will assume that the latter employs the usual plug-in coil with parallel tuning condenser, and that similar tuning arrangements are used in the aerial circuit of the amplifier. The terminals X should be marked "Output," or "To Crystal Set," a ·0002 mfd. fixed condenser, B, being connected across them in order to balance out the capacity of the aerial, which, of course, is now connected to the amplifier.

It will be seen that the valve precedes the crystal receiver, and that the tuning arrangements of the latter now function as a "tuned anode" valve coupling to the detector and telephone circuit.

To construct the amplifier the following components and parts will be required: A standard coil socket, a ·0005 mfd. variable condenser, a valve holder, a filament rheostat, a ·0002 mfd. fixed condenser, eight terminals, a $\frac{3}{16}$ in. ebonite panel about 6 in. long by $4\frac{1}{2}$ in. wide, and some busbar wire for making the connections.

Low-Frequency Amplification.

Fig. 2 shows respectively the front and back views of the panel with all components fitted and wired up to the terminals. The point-to-point connections are clearly indicated, G representing the grid and P the plate socket of the valve holder, as in all other examples. The output terminal, which is connected to the plate of the valve, should be carefully marked, and when connecting the amplifier to the crystal set, see that this terminal is joined to the aerial terminal of the latter, exactly as shown in Fig. 1. A 002 mfd. fixed condenser should be connected across the telephone terminals of the crystal receiver.

(*Continued on page* 1156.)

ADDING A VALVE TO A CRYSTAL SET.

(*Continued from page* 1155.)

Fig. 3 shows the ordinary transformer-coupled L.F. amplifier or note magnifier, D, which, of course, is connected to the opposite side of the crystal set, C, or, in other words, to the "output" or telephone terminals of the crystal detector circuit via the terminals, X (which should be marked "Input" on the amplifier), which are connected to the primary side of the L.F. intervalve transformer, B, and shunted with a ·001 mfd. fixed condenser, C.

A ·002 mfd. fixed condenser, D, should be connected across the 'phone terminals on the amplifier. If a similar condenser is included in the crystal set, C can be omitted. A 2 mfd. Mansbridge fixed condenser (shown dotted) might be connected across the H.T. battery or across the H.T. terminals, as shown; this is not absolutely necessary, but it is well to include it.

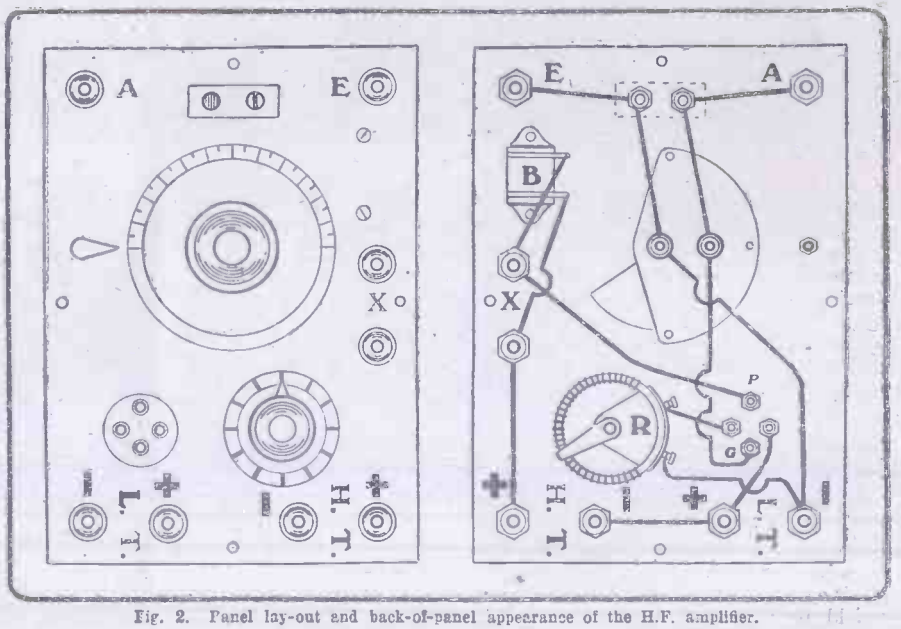


Fig. 2. Panel lay-out and back-of-panel appearance of the H.F. amplifier.

Very Adaptable.

Fig. 4 shows the point-to-point panel connections and also a front or top view of the panel, the dimensions of which may be identical to those in the previous example. The L.F. amplifier may be connected to any type of crystal receiver, no matter if the tuning condenser is in series or in parallel with the coil, or whether a loose-coupler, slide inductance, variometer, or tapped coil is employed. The H.F. amplifier may be used in conjunction with any of these arrangements with the exception of the coil which is tuned with a series condenser. It is, however, extremely unlikely to find a series aerial condenser in an ordinary crystal set, but should this be the case, then it is a very simple matter to connect it in parallel, as shown in the diagrams.

Now it is proposed to describe two excellent reflex or dual-amplification circuits which, being arranged as self-contained units, may be connected to the terminals of a crystal set in the same convenient manner as the more simple single-purpose amplifiers previously described, there being no necessity to alter the existing crystal circuit in any way, providing the tuning condenser (if used) is in parallel with the coil.

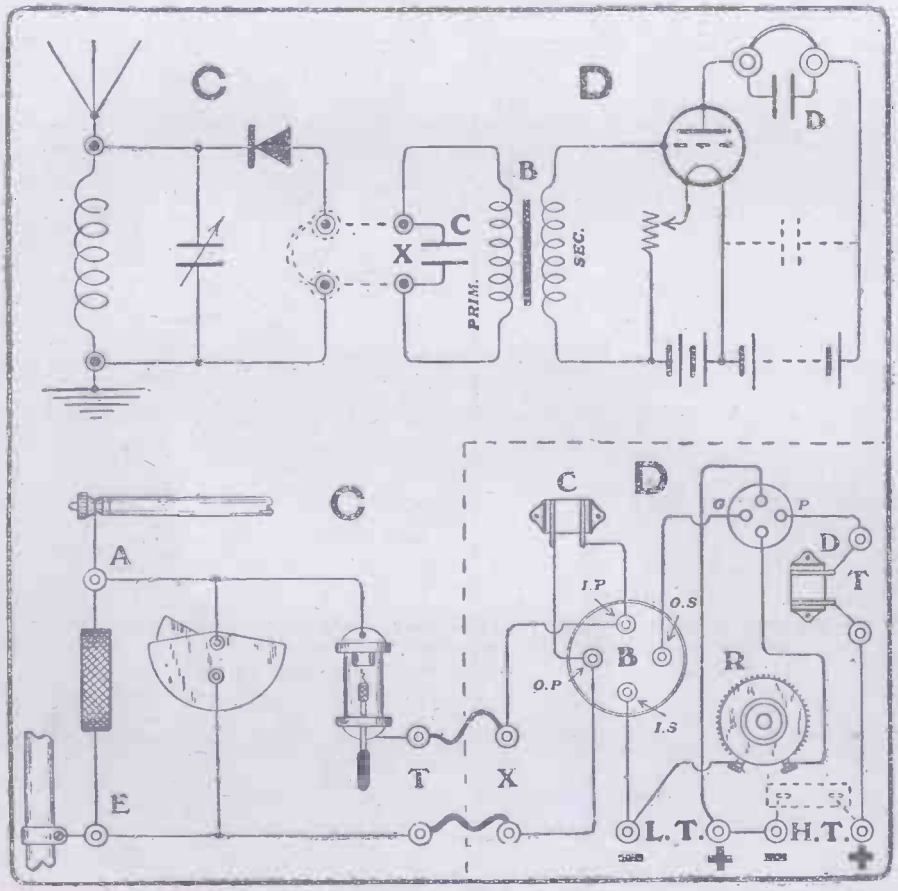


Fig. 3.—Theoretical and pictorial circuit diagram of the L.F. amplifier.

Dual Amplification.

By employing dual amplification one valve is made to do the work of two, or in other words both high and low-frequency amplification is obtained by using only one valve. The advantages gained by adopting such a method should be obvious; one effects a great saving in valves, apparatus, battery current, etc., and obtains results almost equal to those from an orthodox two-valver.

It is a mistaken idea to imagine that a reflex amplifier is a complicated and almost impossible affair, and that its construction and use calls for very special knowledge. A single valve unit can be made up and used successfully by any beginner, providing his ambitions are confined to the single valve and that he has gained a little experience with the more usual types of valve amplifiers. Of course, it is not advisable to make one's first valve instrument a reflex.

The arrangement shown in Fig. 5 is simple and very efficient, and it is probable that after trying this, and comparing the results with those obtained in any previous experiments, the reader will agree that it is undoubtedly the very best method of "hooking up" a valve to a crystal set. The circuit is not very selective, but it is easily handled, and gives good loud signals which are free from distortion of any kind.

Quite Straightforward.

Diagram E (Fig. 5) shows the amplifier, and Diagram F the ordinary crystal circuit. It will be seen that when the terminals, Y, are joined to the aerial and earth terminals of the crystal set, the tuner or same (coil

(*Continued on page* 1157.)

ADDING A VALVE TO A CRYSTAL SET.

(*Continued from page* 1156.)

B2 and ·0005 mfd. variable condenser, C2) acts as a tuned anode coupling, and that by joining the terminals Z to the telephone terminals of the crystal set the two circuits function as one—a single valve reflex receiver. The aerial tuning coil, B1, which is shunted with the usual ·0005 mfd. variable condenser, C1, should be a size smaller than the coil, B2, used in the crystal set, since the latter is now the tuned anode coil.

The Reflex Amplifier.

In other words, one should transfer the usual crystal set coil to the amplifier coil socket and replace it with a coil a size larger. For example, when tuning to 5 X X, try a No. 150 for B1, and a No. 200 for B2, and if with this arrangement the condensers should be "all in," or otherwise set at maximum capacity, then use a No. 200 coil for B1 and a No. 250 for B2. If a fixed coil or variometer is used in the crystal set a ·0003 mfd. fixed condenser should be shunted across the terminals Y, or across the A and E terminals of the crystal set.

The secondary side of the L.F. transformer D, is shunted with a ·001 mfd. fixed condenser, F; G is the usual 'phone condenser of ·002 mfd. capacity, and H represents a 1 or 2 mfd. Mansbridge condenser, which is connected across the H.T. battery terminals. If a "Success" transformer is used, and connected exactly as shown in the practical wiring diagram, there will be no need to change over the secondary leads if howling should occur; simply change over the leads to the crystal set 'phone terminals, and also try the effect of changing over the leads from the terminals Y to the A and E terminals. To construct the amplifier one will require a $\frac{3}{16}$ in. ebonite panel not less than 10 in. long by 8 in. wide. Full constructional details of this unit, with photographs and panel drilling chart, were given in the issue of POPULAR WIRELESS dated May 23rd.

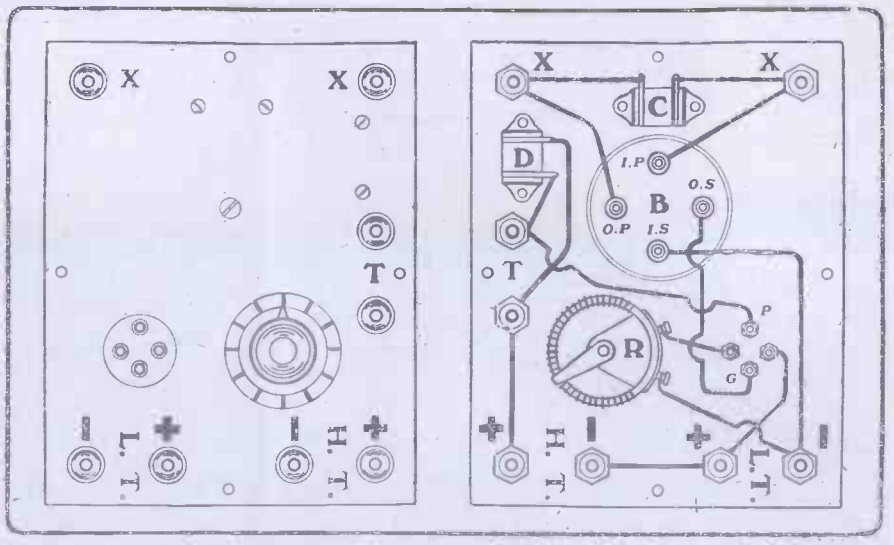


Fig. 4.—Back and front of panel lay-outs of the one-valve L.F. amplifier.

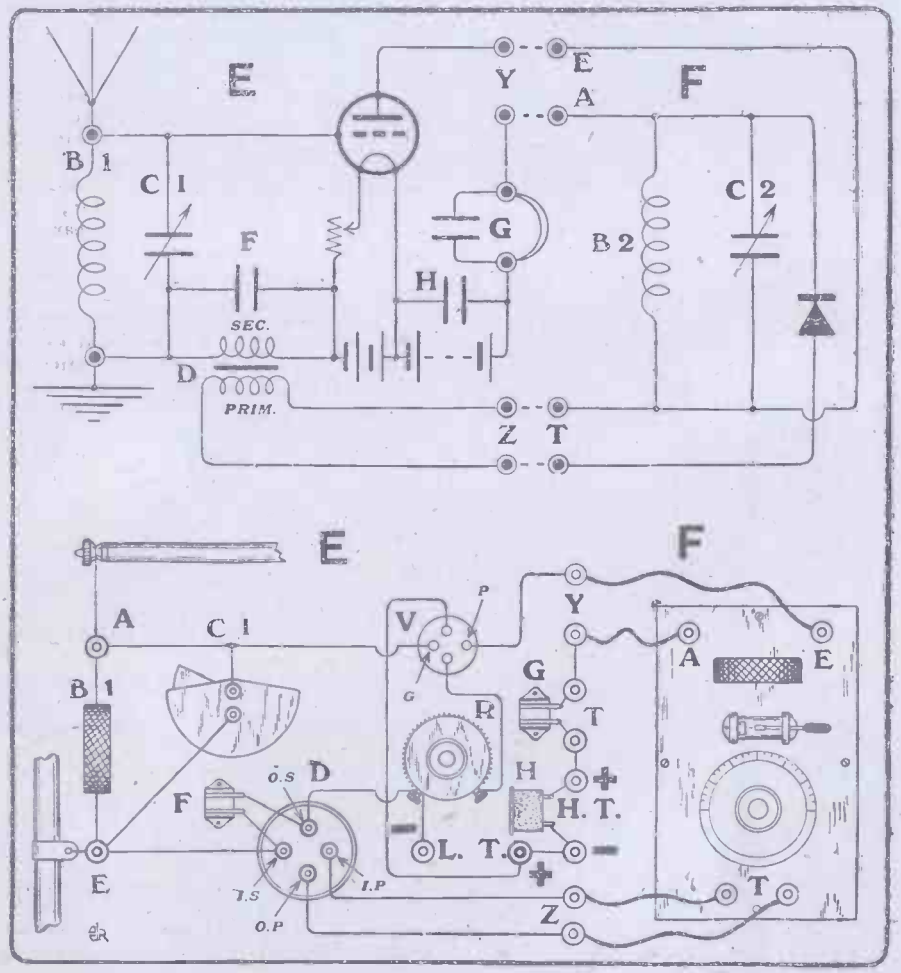


Fig. 5.—Circuit diagrams of a straightforward one-valve reflex amplifying unit.

More Difficult to Handle.

The arrangement shown in Fig. 6 is rather more complicated and a little more difficult to handle, but if the reader is looking for a single valve loud-speaker circuit, which will give reasonably strong and undistorted signals when tuned to the local station, then he is strongly advised to give it a trial. As in the previous example B1—C1 represents the aerial tuning circuit (amplifier G) and B2—C2 the tuned anode circuit (crystal set H) the same remarks concerning the sizes of the coils holding good. D is a ·0003 mfd. fixed condenser, and F is a 250-turn H.F. choke coil, which is connected as shown between the grid of the valve and the "Out Secondary" terminal of the L.F. transformer, G.

General Hints.

The choke may consist of 250 turns of No. 30 (or nearest) D.C.C. wire wound on a 1 in. diameter cardboard former, or alternatively one may use a standard No. 250 honeycomb coil. H is another ·0003 mfd. fixed condenser, I is the usual 'phone condenser, and J the 1 or 2 mfd. shunting condenser for the H.T. battery. The terminals Y and Z should be marked "Output A. E." and "Output T." respectively, these being connected as shown to the A and E and telephone terminals of the crystal set. Should howling occur, try the effect of changing over the leads from Y, and also the leads from Z. Almost any type of L.F. transformer can be used and no difficulty will be experienced in getting good results with any make of components in general, providing they are of good quality. Nothing has been said respecting valves, H.T. and L.T. suitable for these amplifiers, but these follow standard practice as advocated in other articles in "P.W."

SOME USEFUL HINTS.

FROM A CORRESPONDENT.

WIRE-WOUND rheostats should never have ebonite formers; ebonite when warmed by the passage of the filament current may soften and deform, and in any case the sulphur from the ebonite acts upon the surface of the wire, tarnishing it and causing unsteady contact. Vulcanised fibre is a better material for rheostat formers. There is at present on the market a type of rheostat wound upon a metal rod, insulation being provided by a thick coat of vitreous enamel. Rheostats of this type have been used in engineering practice for some years and prove very satisfactory.

Make sure that the resistance of your rheostat is guaranteed. Many so-called 7-ohm rheostats are much below this figure, some being little over 1-ohm, and this defect may result in a considerable shortening in the life of your valves. Another fault which can cause considerable annoyance in use is faulty attachment of the contact blade to the spindle. This attachment should be absolutely rigid. Connection posts should be provided and should be so spaced that there is no possibility of the connecting wires interfering with the motion of the contact blade.

If you are tempted to make use of a vernier rheostat on your detector valve, choose one in which this adjustment is achieved by shunting the main rheostat rather than by putting a small turn of wire in series. The latter method interposes two more rubbing contacts in the filament circuit, and it is no uncommon thing to find that the variation of the contact resistance at these points is greater than the whole vernier adjustment provided.

When Using Switches.

Avoid switches in H.F. circuits if possible; if you must use them, choose a type in which the contacts are spaced well apart, so as to avoid the evils of capacity and leakage.

Switches for L.F. circuits are not so critical, but even here the use of Dewar switches or of plugs and jacks is to be deprecated, since these components have very small leakage surfaces, and the slightest trace of soldering flux or moisture across these surfaces is sufficient to cause a large reduction in signal strength.

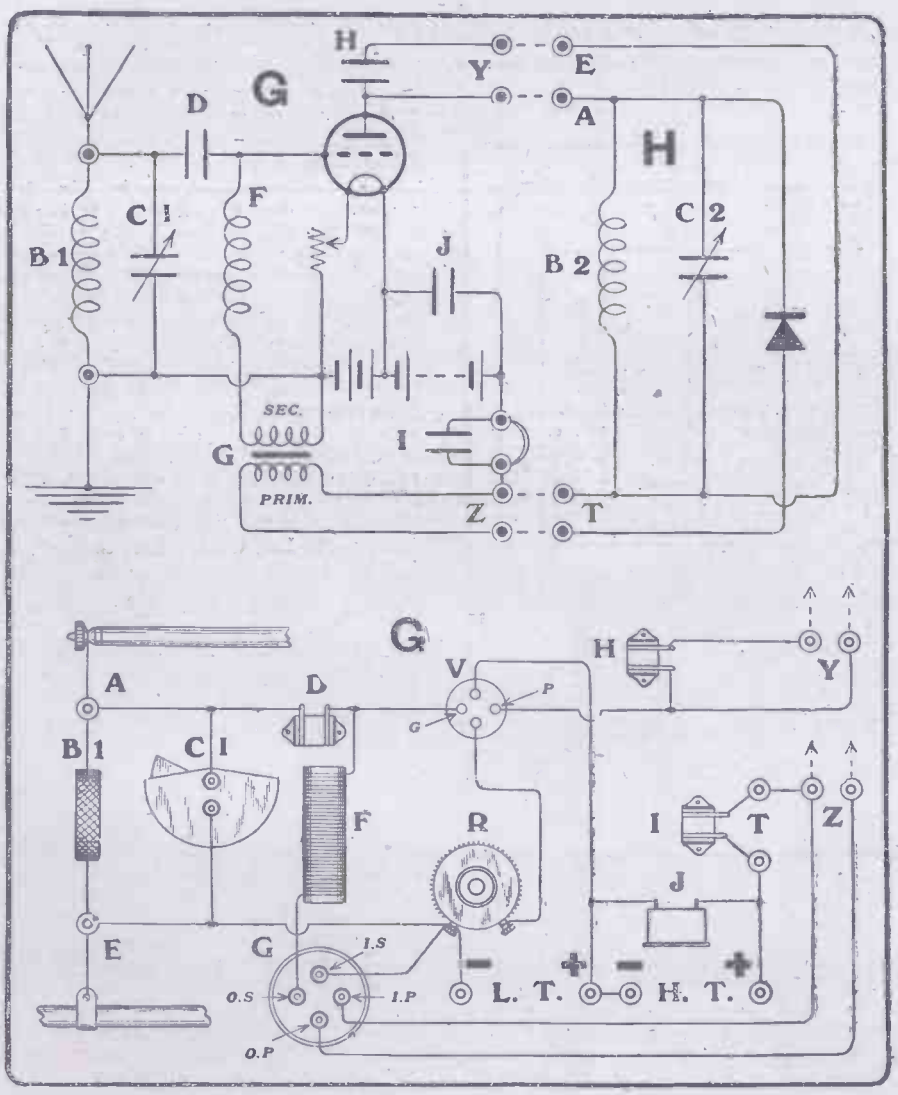


Fig. 6.—Diagrams of the reflex amplifier described in preceding pages.

'WARE BATTERY "REVIVERS!"

THE marvellous popularity of wireless as a pastime for the million has made the trade a happy hunting-ground for would-be swindlers. Quite apart from the sale of trashy components and cheap imitations of deservedly well-known "gadgets," come now mysterious solutions and chemicals and salts for use with storage batteries.

These chemicals are alleged to recharge the accumulator without subjecting it to the usual process of passing an electric current through it for the necessary time; but all the samples of such chemicals which have been examined by competent authorities have turned out to be more or less valueless. Moreover, it is extremely unlikely that any preparation of this nature could ever be developed, the whole idea being quite contrary to what we know of electro-chemistry.

It is true that these solutions do sometimes cause what seems to be a rejuvenation of a run-down battery, but that is a matter easily explainable. The active material in the usual type of lead-plate accumulator is a compound contained in the tiny grooves on the plate. When a battery is discharging this active compound is re-acting chemically with the acid solution in the battery, and thus producing the current.

A Transient Increase.

On the other hand, when a battery is being charged the active compound is being re-formed on the plate. A battery is run-down and in need of recharging as soon as the majority of the active compound has been used up by reaction with the solution.

Now any run-down battery usually has a little of the active compound left on the plate. If the old acid is poured away and replaced by new this residue of active compound will begin to re-act with the new acid and the battery will give a little more current—but only a little more, since the active compound is soon exhausted.

That is precisely the manner in which the transient increase of current is produced by most of the battery "renewer" liquids now being sold. They are frequently nothing more than new acid. A few contain sodium sulphate or "Glauber's salt," which exercises the same kind of effect—as has been well known to chemists for years.

None of these things do any good to the accumulator. Most of them are more likely to do it harm. Until the chemists discover something altogether new about these batteries the only way to effectively recharge an accumulator will be the good old-fashioned way of running an electric current through it.

ARE WE GETTING SHEEPLIKE?

A Plea for More Originality in Design.

By LIEUT.-COMMANDER H. W. SHOVE, D.S.O., R.N.

A YEAR or so ago practically every wireless receiver designed and built in this country consisted essentially of a single insulating panel on which all, or practically all, the components were mounted, the wiring, generally flexible and insulated by heavy sleeving, being run more or less anyhow between them. Dielectric losses were usually enormous, and the instability of H.F. stages something to make the angels weep. Nearly all H.F. sets, therefore, had damping devices (generally potentiometers), and the further losses thus introduced, together with those inherent in the inefficient wiring, were compensated by the brutal use of magnetic reaction. Even now, many amateurs seem to think that they cannot possibly be getting the best out of their sets unless provision is made for this, even in sets having two stages of H.F. where it may be confidently asserted that the need for it is a sure sign of inefficiency somewhere.

To the development of short-wave work may be attributed a good deal of the very gratifying improvement in all-round efficiency we have witnessed in the past. The general adoption of heavy-gauge bare wiring is, perhaps, the greatest single step forward. Not that either the square "bus-bar" or the practice of employing sharp right-angled bends is ideally efficient. But the employment of stiff connectors rigid enough to "stay put" does encourage a striving after neatness of arrangement which, though often sought primarily on æsthetic grounds, fosters a high standard of workmanship, and thus indirectly, perhaps, of efficiency.

The "American" Type.

Until recently British practice almost invariably mounted the valves on the front of the single panel, fully exposed to the risks of accidental damage, collection of dust between legs, etc. Accessibility was the natural plea for this and it had weight, so long as the further practice of screwing the panel permanently into a totally enclosed cabinet prevailed. (The latter practice probably arose from a desire to prevent accidental disturbance of the loosely flopping flexible wiring.) With the advent of stiff connectors, the "American" arrangement of inside valves, mounted on a baseboard, readily accessible by lifting the lid of the cabinet, and the "clean" front panel with only the control knobs visible externally, came into fashion, and to-day bids fair to become universal.

Now, this method has enormous advantages over the earlier one, not merely on the score of appearance, safety to valves, etc., but because it renders very much easier the working out of an efficient wiring plan, with short, well spaced leads. But it seems to the present writer that we are tending to standardise it too much. For can we say that we have yet reached the point in wireless development where the possibilities of arrangement have been exhausted and we can definitely pronounce one of them "the best"?

Too Much Standardisation.

There is always a danger of becoming "sheeplike" in these matters. Probably it was this that kept the popularity of the single panel alive so long. Commercial manufacturers under modern conditions are, of course, compelled to standardise, and their designs must be in accordance with popular fashion. And they are naturally slow to depart from an established practice, which they know will sell, in favour of something which their customers may regard as "freakish." So nearly all of them are now making "American" type sets. And nearly all the very excellent designs worked out by technical writers and published for the benefit of home constructors, follow the same plan. Again, these writers have to think of what components, cabinets, etc., will be most readily obtainable by their readers. As also what those readers think an up-to-date set *ought* to look like.

Advice to the Constructor.

Here, then, seems to be the chance of the amateur designer to produce something original and, maybe, superior to the prevailing type. In this, I think there is far less originality displayed to-day than there used to be. I am not referring to the working out of new circuits. For all-round efficiency, and save in exceptional circumstances, it seems almost impossible to beat the "straight" circuit, with not more than one stage of H.F. Two such stages may be used, if the constructor is a highly skilled operator, or cares to fit "Neutrodyne" control. But it seems very doubtful if—with a decent aerial system—it is worth while. And the design and adjustment (apart from subsequent handling) of a "Neutrodyne" is not easy. It is generally best to make up such a set from a published design, worked out by those who have better facilities for experiment than the average constructor. (I am not here referring to the amateur whose wireless interest is centred in experimental work, and who, therefore, has probably provided himself with a fairly equipped workshop). The same applies to the "Super-Het."

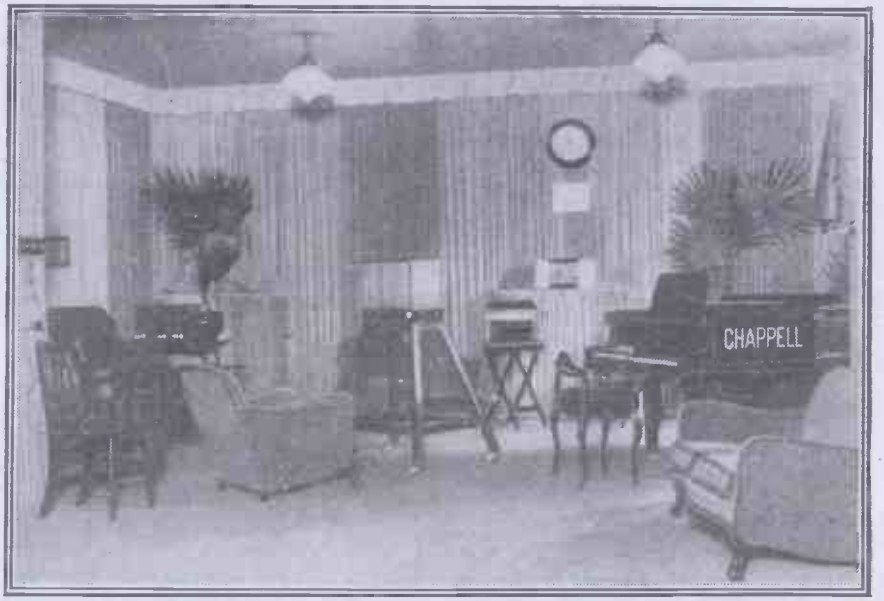
But with a straight circuit there is certainly a big field for the ordinary "handy-man" constructor who can produce at comparatively small expense something really novel, neat and super-efficient. Working out "housing schemes" for sets in various odd bits of furniture, old writing desks, occasional tables, etc., has its interest. But, for the maximum of efficiency, it is generally best to design a special cabinet for the set. Why not try:

(1) Building the set in two or more "stories," one valve on each, and so producing a receiver wherein the usual proportions of length to height are reversed?

(2) Getting away from the "panel" arrangement altogether; insulation, where necessary, being provided by bushing in the sides of the cabinet?

(3) Originality in the general shape of the cabinet. Why should a wireless set necessarily be a rectangular, box-like affair?

And so on, *ad infinitum*. But don't forget that you are designing a *wireless set*. The "freak" instrument, "camouflaged" as something else, is, in the present writer's humble opinion, at any rate, simply a silky "stunt." And it is rarely efficient.



The studio at the Sheffield Relay Station. It follows the well-known design employed in the other B.B.C. studios.

CURRENT TOPICS.

By THE EDITOR.

The Savoy Orpheans Band—Captain Eckersley and the Home Constructor—The Wireless Section of the I.E.E.—A Decision and What It Means.

IN this issue our broadcasting correspondent, "O. H. M.," throws interesting light on the decision of the Savoy bands not to continue broadcasting.

The Savoy Orpheans have made themselves universally popular with listeners throughout the country, and their attitude in not coming to another practical arrangement with the B.B.C. is somewhat unfortunate. There is no doubt that if it had not been for broadcasting the Savoy Orpheans band would never have attained its present degree of popularity, and in all probability their manager, Mr. de Mornys, would not have been able successfully to run the Orpheans' concerts at the Queen's Hall and at other concert halls in the provinces.

The B.B.C. and the Orpheans.

Broadcasting has made the Savoy Orpheans a world-wide reputation—a reputation which, in the ordinary course of events, would have been for some time pretty well limited to the Savoy Hotel and to a fairly limited number of people. No doubt the fame of the band would have spread to the outside world in due course, and concerts might have been arranged for the benefit of that section of the public which does not visit the Savoy Hotel. But nevertheless, that would have taken time, and broadcasting may safely be said to have been responsible for the rapidity with which the Savoy Orpheans have made themselves universally known and liked.

We understand that the terms of the proposed new agreement were somewhat severe, and the B.B.C. did not feel justified in allocating so much of their programme money to the engagement of the Savoy Orpheans when they could obtain the services of many other bands playing at London restaurants, cabarets, etc., which, if not better than the Savoy Orpheans, may be said in many cases to be quite as good.

There are Others.

When the Savoy Orpheans began broadcasting in the summer of 1923 they practically had the ether to themselves, and there was no other dance band being broadcast at that time which could in any way compare with them. But the situation has changed to-day, and listeners are well aware of the fact that there are many other bands in London which broadcast with quite as good results as the Savoy Orpheans.

Therefore, although it is regrettable that such a great favourite as the Savoy Orpheans Band should make this decision, it is not a matter for despair. We feel sure that listeners will find ample satisfaction and ample compensation for their disappointment in the many other bands which the B.B.C. intend to broadcast from time to time.

* * *

Our attention has been drawn to an article by Captain Eckersley in a recent issue of the "Radio Times." We do not propose to criticise this article at any length, because we do not feel that we should waste valuable space on such a criticism; but a few words in passing seem to be called for, in view of the fact that Captain Eckersley, as Chief Engineer of the B.B.C., speaks with some authority and undoubtedly has the ear of many thousands of listeners in this country.

A Humorist's Views.

Whether the bona-fide amateur and experimenter will take what Captain Eckersley says in his article seriously, we do not know, but, in short, he suggests in his article that it is much better to buy a ready-made set than to build one at home.

We confess we are astounded, although considerably amused, at these extraordinary views of Captain Eckersley.

That they will receive scant attention from amateurs in this country goes without saying, but we cannot help commenting on the fact that it seems a very great pity that Captain Eckersley should vent such peculiar views at this time in the history of broadcasting. But Captain Eckersley was always something of a humorist.

* * *

We learn that the committee of the wireless section of the Institution of Electrical Engineers has further carefully considered the proposal for a new institute of wireless engineers, and is definitely of the opinion that the interests of qualified professional wireless engineers are best served by the Institution of Electrical Engineers. The wireless section of the institution has already deprecated the formation of a new institute of wireless engineers, and feels confident that it is unnecessary and will not be supported by representative and qualified professional wireless engineers.

The Institution of Electrical Engineers has already explained that an engineer with adequate wireless qualifications can become a corporate member of the institution, and that other wireless engineers not reaching that standard are eligible as graduates, and, as such, can attend all meetings of the wireless section as well as those of the institution.

Wireless Engineers.

The committee have taken into consideration the suggestions arising out of the previous correspondence on this subject which appeared in the Press, and, with a view to improving and extending the activities of the wireless section and making it more definitely representative of professional wireless engineers, the committee submitted the following recommendations, which have been approved by the council of the institution:

1. While it is essential that the standard of qualifications for membership of the institution should be maintained, more opportunity is to be afforded to the physicist engaged in wireless work to become a member of the institution.

Applications for membership of the institution based upon the usual general scientific training and wireless professional qualifications to be referred by the secretary to a wireless section membership sub-committee, which will make reports and recommendations for the guidance of the membership committee of the council.

Wider Scope.

2. The qualifications for membership of the wireless section to remain as at present, viz.: "That he is a member of the institution and is actively engaged in the study, design, manufacture, or operation of wireless or high-frequency engineering apparatus," and the wireless section membership sub-committee to scrutinise all new applications for membership of the wireless section and decide who shall be admitted to it.

The sub-committee to be authorised to call for full particulars as to the nature of the study undertaken by an applicant or for particulars of his work in design, manufacture, or operation, in order to satisfy themselves that the applicant is properly qualified in wireless engineering.

3. The fact to be emphasised and more widely published that the meetings of the wireless section are open to all members of the institution.

4. The wireless section committee to get into direct touch with the local centre committees for the purpose of ascertaining the possibility of:

(*a*) Starting local wireless sections.
(*b*) Stimulating efforts to produce local wireless papers.
(*c*) Suggesting the reading of available suitable papers, or giving of lectures at local centres.

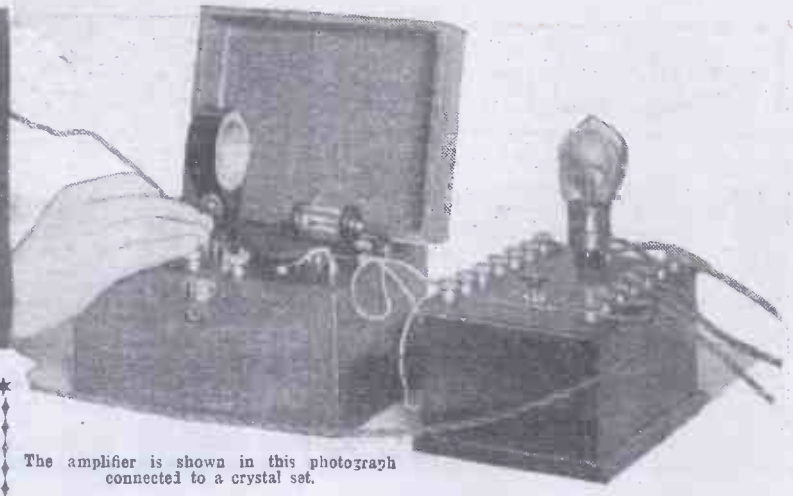
5. Each local wireless section, when properly constituted, to be entitled to elect or nominate one wireless member to the wireless section committee. For this purpose a local wireless section shall consist of at least fifteen members, who must already be members of the main wireless section.

A Wireless Section.

6. The papers and the discussions of the wireless section and other wireless papers, in addition to appearing in the journal of the institution, to be issued separately in the form of "Proceedings of the wireless section."

7. The chairman of the wireless committee to be an ex-officio member of council, in the same way as are the chairmen of local centres, as soon as the necessary alterations to the bylaws can be made, but in the meantime he will be invited to attend all meetings of the council.

The "P.W." UNIVERSAL AMPLIFIER



The amplifier is shown in this photograph connected to a crystal set.

The Amplifier Designed and Described by P. R. BIRD.
(Assistant Technical Editor.)
Constructional Work by C. A. MEADOWS.
(Technical Staff.)

ONE of the most useful and at the same time one of the simplest pieces of wireless apparatus to construct is a one-valve L.F. amplifier. It is also one of the easiest pieces of radio gear to handle. A one-valve amplifier of the nature of the one described in this article can be used in conjunction with both crystal and valve receivers of almost any description.

The purpose of an L.F. amplifier is to increase signal strength—not to increase range of reception. It does to some extent carry out the latter too, but that is merely incidental, as it were, to its real function. When signals are hardly strong enough to operate telephone receivers or a loud speaker comfortably, or when it is desired to convert fairly loud 'phone signals into comfortable medium-sized loud speaker signals, then a one-valve amplifier should

The complete instrument has a neat business-like appearance.

be used. Also, of course, it can be brought into service to bring medium-sized loud-speaker signals up to large-sized loud-speaker signals.

Note from the above the approximate degree of amplification that should be expected from a one-valve amplifier. It would not, for instance, be such that very faint crystal set signals would be brought up to loud-speaker strength. Two or three stages of L.F. valve amplification would be required for that. It has frequently been stated that every stage of efficient transformer-coupled, L.F. amplification should magnify signal strength by five times. This is distinctly misleading if not incorrect.

LIST OF COMPONENTS

1 Panel, 5 in. x 8 in. x $\frac{3}{16}$ in., With Cabinet 5 in. deep (Peto-Scott)	7	0
1 Ferranti L.F. Transformer (Type A.F. 2)	17	6
1 "Lissenstat Minor" Rheostat	3	6
1 Set "Security" Valve Sockets	1	0
15 W.O. Type Terminals	1	10½
Wire, Transfers, Screws, etc.	1	6

Most people will consider that two or three times is nearer the mark as judged by audible results. As a matter of fact, L.F. amplification will vary in accordance with the strength of the original signals; a greater degree of magnification frequently obtaining in the case of louder initial signals than in the case of weaker ones.

It is for this reason that L.F. amplification is employed for increasing volume and not reception distance. To increase range of reception efficiently, H.F. amplification must be resorted to.

Reliable Components Essential.

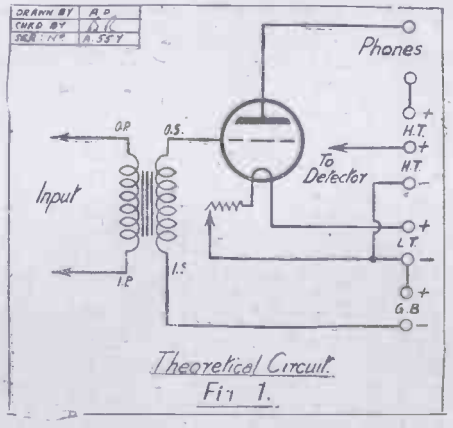
The one-valve L.F. amplifier consists of an L.F. transformer, a filament resistance, a valve-holder, terminals, panel and case. No tuning is required, the only possible adjustments being carried out with the filament resistance which controls the heat of the valve filament and which is by no means a critical adjustment, and the wander plugs of the H.T. and grid bias (if used). These last are quite secondary controls, and once good positions are discovered rarely require attention.

Fig. 1 is the theoretical diagram of the circuit. It will be seen that it is far from being complicated. The signals from a crystal set or a valve set are fed into the input terminals, across which is connected the primary winding of the L.F. transformer. From this the energy is transferred to the secondary winding, and then passed on to the valve, which performs the function of amplification, assisted by the high-tension battery and filament-lighting battery. In principle and in application nothing in radio could be simpler. In fact, constructors whose valve experience is limited can be assured that a one-valve amplifier is as simple to construct and even easier to handle than an ordinary crystal set.

The exact size of case and panel given need not be adhered to, nor need the particular transformer or filament resistance specified be used. Constructors are warned, however, against purchasing cheap transformers of obscure origin. Above all other wireless components, it pays to purchase a really good L.F. transformer.

Concerning Transformers.

If funds permit, we would go as far as to advise readers to give preference to the new 25/- Ferranti—it is well worth the extra 7/6. There are a whole horde of cheap transformers on the market which, if not hopelessly "dud," compare very badly with the higher-class makes, such as the



Theoretical Circuit.
Fig 1.

Ferranti, R.I., Eureka, C.A.V., B.T.H., Marconi "Ideal," Igranic, etc., etc. It must not be imagined that we consider the above applies to every L.F. transformer costing anything below 15/- or so—there are, of course, notable exceptions.

It must be remembered that all the following constructional details apply to the assembly of the parts quoted in the accompanying list, and that modifications may be necessary should any diversion from that list be made.

Three-sixteenth inch ebonite of good, branded quality should be used for the

(Continued on page 1162.)

THE "P.W." UNIVERSAL AMPLIFIER.

(Continued from page 1161.)

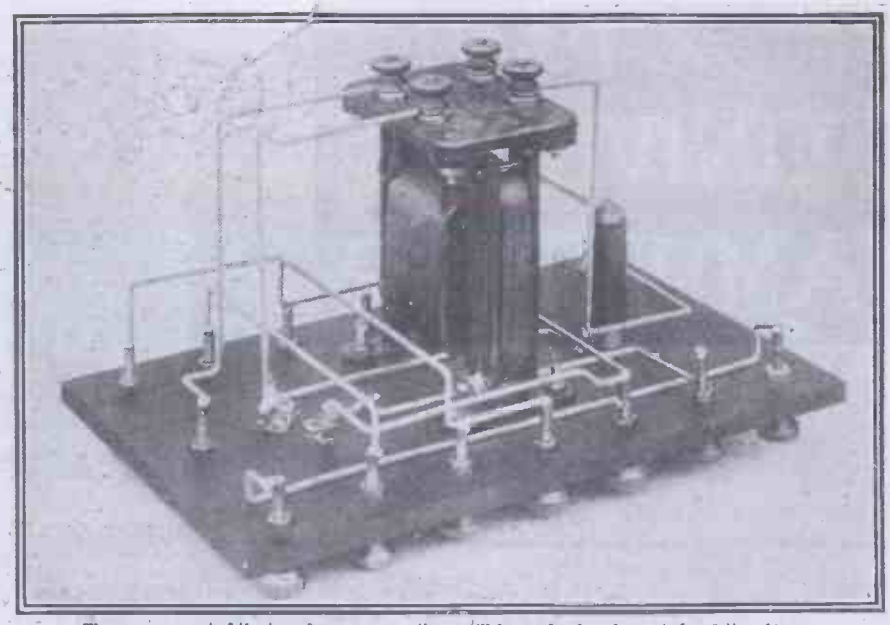
8 in. by 5 in. panel, which should be marked out and drilled in accordance with the panel drilling diagram, Fig. 2.

The holes for the 15 terminals should be tapped if possible. 4 B.A. will be the size for which a $\frac{5}{32}$-in. drill will be required. The Lissenstat Minor or other filament resistance used will require a larger hole than that, and if no large drills are available, the tang of a file will have to be brought into service for enlarging purposes.

For further details in respect of panel drilling in general and the mounting of the valve sockets in particular the constructor is advised to turn to the feature entitled, "For the Constructor," in the Radiotorial pages.

Wiring-up the Amplifier.

Having mounted the terminals, valve sockets and filament resistance, the transformer can be fixed in position. This is held by means of two countersinking brass screws (4 B.A.) and nuts—the positions are indicated in the panel drilling diagram. This completed, there remains but the wiring, which is by no means complicated. Square section tinned copper wire should be used, and soldering carried out wherever possible.



The arrangement of the transformer connections will be made clear by a study of the above.

It will be noticed that two of the terminals are connected together (one on each side marked H.T.+) but that no other internal connection is made to either. The purpose of these two terminals is to carry through the H.T. plus connection from the set or amplifier to which the instrument is coupled, a separate H.T. plus connection or "tapping" being provided for this amplifier. This will be made clearer when we discuss its use. The wiring diagram and the list of point-to-point connections will render the internal connections easy to follow and, of course, the under-panel photographs will materially assist. Given these, the constructor can hardly go wrong, although naturally it is advisable to proceed carefully and not with undue haste.

As each connection is complicated it is a good scheme to tick it off with a pencil on both the wiring diagram and the point-to-point check list.

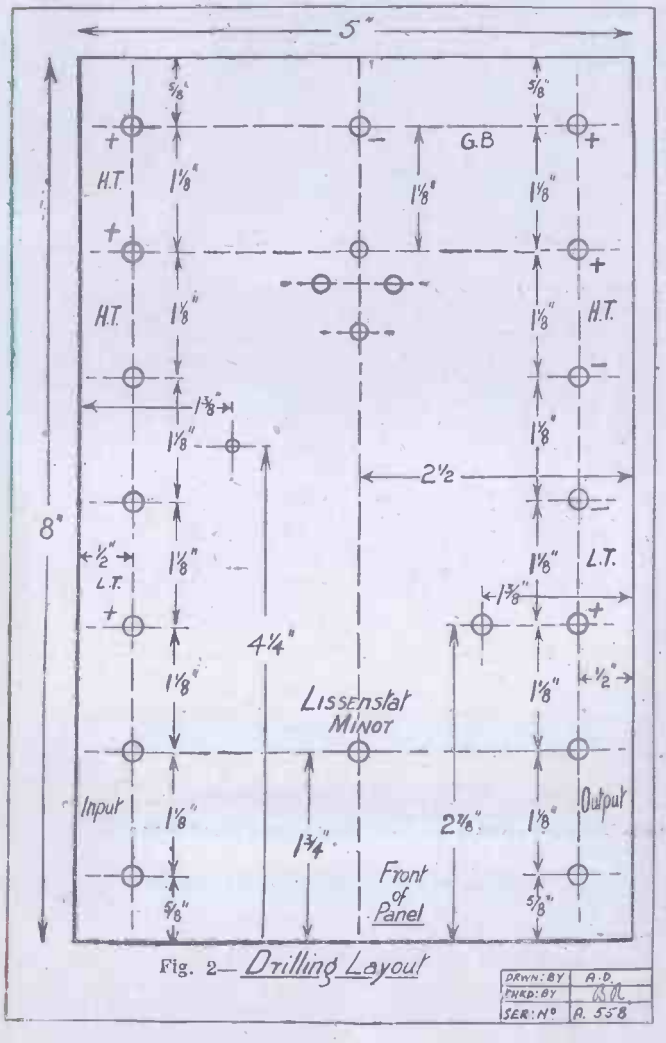


Fig. 2—Drilling Layout

The Cabinet.

The wiring completed, a soft rag should be taken and every scrap of Fluxite, dust, etc., removed. The transfers can then be affixed to the front of the panel.

The case should have either internal or external measurements corresponding with the size of the panel (8 in. by 5 in.), according to the method of fixing. With those measurements internally, two fillets of $\frac{1}{4}$-in. wood can be fixed in the case and the panel dropped in. This is a neat, simple method.

The case or cabinet, however, is quite an unimportant feature, and can be modified according to individual tastes. It can be either sloping or horizontal, plain or ornamental. Its only objects are to hold the panel up and to prevent dust accumulating. As long as it does these two things that is all that matters from a general point of view.

POINT-TO-POINT CONNECTIONS.

The two "input" terminals are connected direct to the terminals of the L.F. transformer marked "IP" and "OP." The "O.S." transformer terminal should be joined to the grid socket of the valve holder, and the "IS" terminal of the transformer to the grid bias negative terminal.

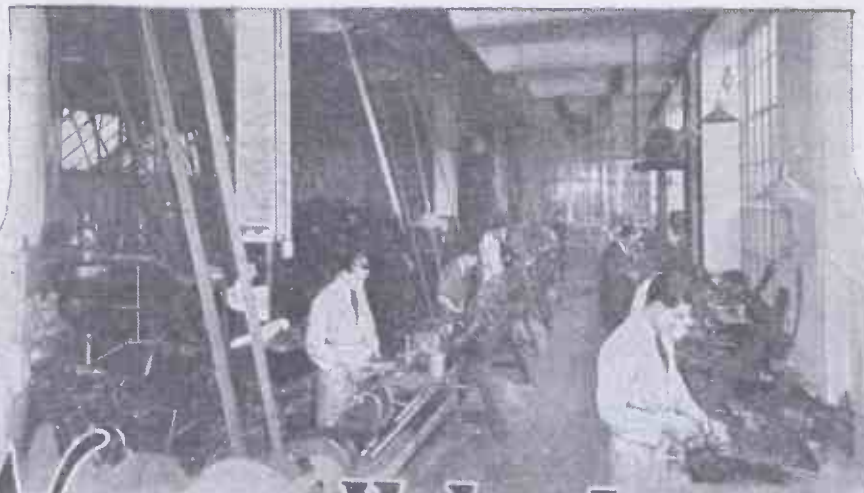
The positive grid bias is connected to L.T. negative, which is joined to the corresponding terminal on the other side of the panel, and to one side of the rheostat. Other side of the rheostat is taken to one filament socket of the valve-holder.

The other filament socket goes to L.T. positive, which joins the corresponding terminal on the other side of the panel, and opposite H.T. negative and H.T. positive terminals respectively should be connected together. The remaining H.T. positive terminal should be taken to one "output" terminal, the remaining "output" terminal to the plate socket of the valve holder. H.T. negative and L.T. negative are connected together.

The amplifier being ready for use, it will be as well briefly to detail *how* it is used.

When it is employed with a crystal set it will be operating as a first stage L.F. amplifier, and it is probable that no grid bias will be required. In this case the two grid bias terminals should be connected together by means of a short length of wire. The left-hand L.T. — should be left unconnected. The 'phone terminals of the crystal set should be connected to the amplifier "input" terminals, and the

(Continued on page 1164.)



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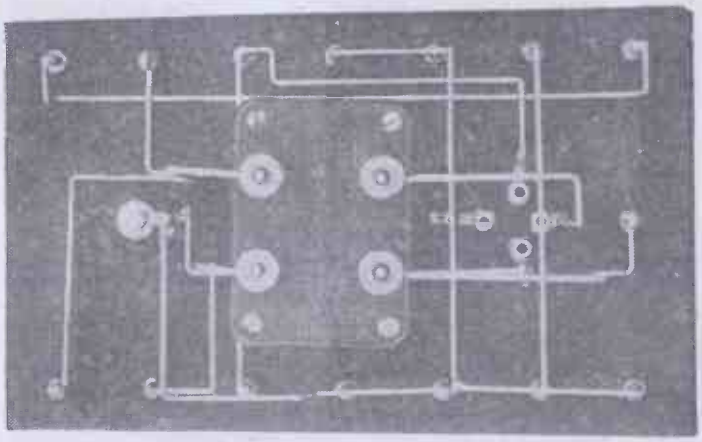
THE "P.W." UNIVERSAL AMPLIFIER.

(Continued from page 1162.)

'phones connected to the latter instrument's "output" terminals. A 60 or so volt H.T. battery should be connected to the top H.T. plus terminal and to the H.T. minus terminal and the L.T. battery to those two terminals marked L.T. All these connections are made to the right-hand terminals, the others being ignored.



A very clear idea of the wiring can be obtained from the above photograph.

Connections for Valve Receiver.

A two-volt accumulator will be required if a dull emitter valve of the Cossor Wuncell or Ediswan A.R.D.E. type is used. There are many other types, of course, which are equally suitable.

Using the amplifier with a valve set the battery connections are similar to the above, being removed from the receiver in the first place, and the receiver's battery terminals connected to the left-hand amplifier battery terminals (with exception of H.T.) with short lengths of wire. Telephone receivers or loud speakers are connected to the amplifier "output" and "input" joined to the receiver's 'phone terminals.

The two H.T.— terminals on the amplifier should not be used when it is being employed with a valve set, the H.T.— to set lead being taken direct from the battery to the H.T.— on the valve set.

Grid bias may be found to be useful and in this case connections are taken from the grid bias terminals to a small dry battery. Proper batteries of 9 volts, tapped at every 1½ volts are sold for the purpose. If the same amount of H.T. is to be employed for both the receiver and the amplifier—we do not recommend this—the two right hand H.T. plus terminals should be joined together.

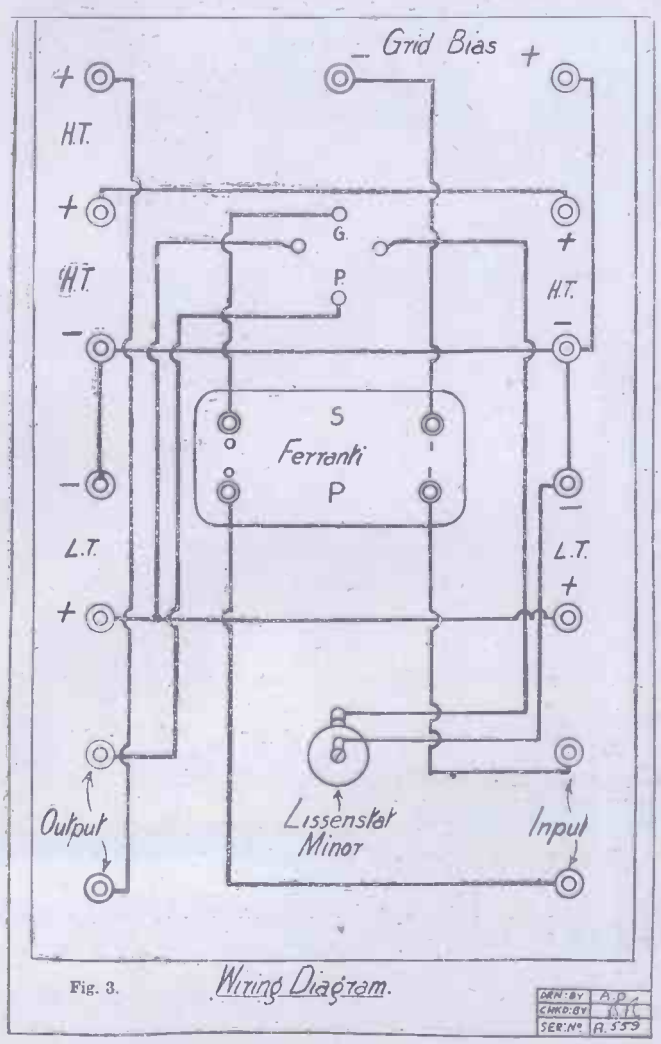


Fig. 3. Wiring Diagram.

Separate H.T.

If not, two H.T. plus wander plugs can be brought into service on the same battery, higher points being selected for the amplifying stage, as represented by the top H.T. plus terminal.

In conclusion, it is regretted that no really definite details in respect of the amount of grid bias on H.T., or even the value to use, can be given. The amplifier can be used in so many different ways, or, at least, with so many different sets, that very many different conditions would have to be taken into consideration, but a perusal of other articles on valves and amplifiers given from time to time in "P.W." will assist the reader in this respect.

TWO HINTS.

Fixed Condensers.

MORE manufacturing crimes have been committed in these components than in any other, and purchasers should on no account buy any fixed condenser which does not carry a reliable guarantee of capacity within a few per cent of its nominal value. Unfortunately, very few amateurs (or condenser manufacturers) possess apparatus to measure accurately the value of a condenser, but it can be checked approximately in many cases by connecting the condenser across a variometer and tuning the combination to the local broadcasting station or other signal. If the fixed condenser is now replaced by a good variable condenser and the system retuned by adjusting the latter, the capacity of the fixed condenser can be computed from the reading of the variable condenser, whilst the relative strength of the received signals will give a fair idea of the losses in the fixed condenser.

Connections.

The insulation resistance of these condensers is also of great importance and can be tested in the following way. Charge the condenser from an H.T. battery and discharge it through a pair of 'phones (after removing the battery connections), noting the loudness of the click obtained. Now repeat the operations, allowing a period of, say, five minutes to elapse between the removal of the battery connections and the discharge. If the click is very much weaker the insulation resistance is low, and the condenser should not be used.

A few words about connecting fixed condensers will not be out of place here. Many of these components are mounted in composition containers, and the greatest care is necessary in making soldered connections to these condensers to avoid softening the composition, which would damage the condenser by loosening the terminal screw.

Round or Square Bus-wire.

It is usual to prefer the square bus-wire, owing to the fact that it looks more "professional." This is, however, about its only advantage, and it is more difficult to work with, for two or three reasons. In the first place, all the bends have to be made in such a way that the wire is not twisted, or else the good looks of the wiring are spoiled. With round wire, however, it does not matter if the wire becomes twisted, as it cannot be noticed.

Secondly, the square wire, for some reason, always seems to be harder, and is more difficult to get into awkward corners than the nice soft round wire.

Thirdly, the square wire is often made unnecessarily thick, although thinner varieties can be obtained if you are particular to ask for them at the time of purchasing.

Round wire has just as much to recommend it, from the theoretical or technical standpoint, and if you find it more convenient, there is no technical reason why you should not use it.

FOREIGN RADIO NEWS.

FROM OUR OWN CORRESPONDENTS

Tax on French Amateurs.

THE financial crisis in France is threatening to affect radio amateurs, as it is understood that part of the Briand Government's financial proposals is a new tax on all private sending or receiving sets.

The proposals will certainly not go through without the most energetic protest by the ever-increasing number of French radio fans, and already in Marseilles, the local radio clubs have taken up the cudgels on behalf of their members, and are conducting an energetic campaign of protest.

The treasury's proposals really comprise two taxes, one on crystal sets, and one on valves. The latter is accepted by the radio organisations with the proviso that the yield of the tax be pooled into a fund for the encouragement of radio research and the better development of government radio stations. The former proposal is condemned as being undemocratic, since it penalises the humblest listener to the same extent as the possessor of an elaborate set.

Radio Religious Rivalry.

The ultra-Protestants in Holland are manifesting alarm at the increasing use being made of radio by Roman Catholics for diffusion of their religious views, and there is talk of the matter being raised in the Dutch Chamber.

A special association, the "Radio-Catholic Service," broadcasts not only Sunday catholic services, but also catholic religious instruction on Tuesdays, and the leading Dutch station, Hilversum, on a recent Sunday broadcast the choral mass and entire service at the Dominican Church in Amsterdam.

Broadcasting Propaganda Against Xmas.

Listeners who on Christmas Eve picked up the Moscow stations had an opportunity of hearing a specimen of the propaganda which the Soviet authorities are conducting against certain of the beliefs and observances of the Greek Orthodox Church to which they object.

The subject of the lecture was Christmas, and the Moscow lecturers were at great pains to point out that, while there was, from the Soviet point of view, no harm in observing the day as a holiday, December 25 has no real moral or historical significance, being merely the adaptation by the Church of an old Pagan festival, the observance of which was general throughout Europe before the Christian era.

French Radio Time Signals.

It is announced that, from January 1st, Lyons radio station has discontinued transmitting time signals. These will, so far as France is concerned, be broadcast only from the Eiffel Tower and the Croix d'Hins (L Y) stations. Some minor modifications in the way of announcing these signals are also intimated.

Dutch Short-Wave Experiments.

The Dutch Ministry for the Colonies announces that, in conjunction with the state postal authorities, it is conducting short-wave experiments with a view to establishing regular communication with the government stations in the Dutch East Indies. The trials are being made by the colonial office (P C U U) on 42 metres, and by the post office (P C M M) on 25 metres.

Radio on the Rhine.

Although the Allied military occupation authorities on December 16th removed all restrictions on the possession of radio receiving sets by private persons in the Rhineland, and shops are now allowed to sell sets freely, there are none but irate listeners as yet in this part of Germany.

Radio amateurs are complaining bitterly of this state of affairs, which they ascribe to the dilatoriness and ill-will of the German authorities, who, while professing to favour radio enthusiasm, have not yet set up any machinery for registering radio users in the Rhineland.

This is proving a great blow to firms selling radio sets, as in view of the removal of the Allied restrictions they had rushed big stocks into the district.

Two Exhibitions for France.

Two amateur radio exhibitions will shortly be held in France. Nice will lead the way with one from January 20th to February 13th. Metz will have the first radio exhibition in Alsace Lorraine, starting on January 28th and lasting four days. Both shows are meant primarily for amateurs, but a small section will be allocated to radio firms to exhibit novelties.

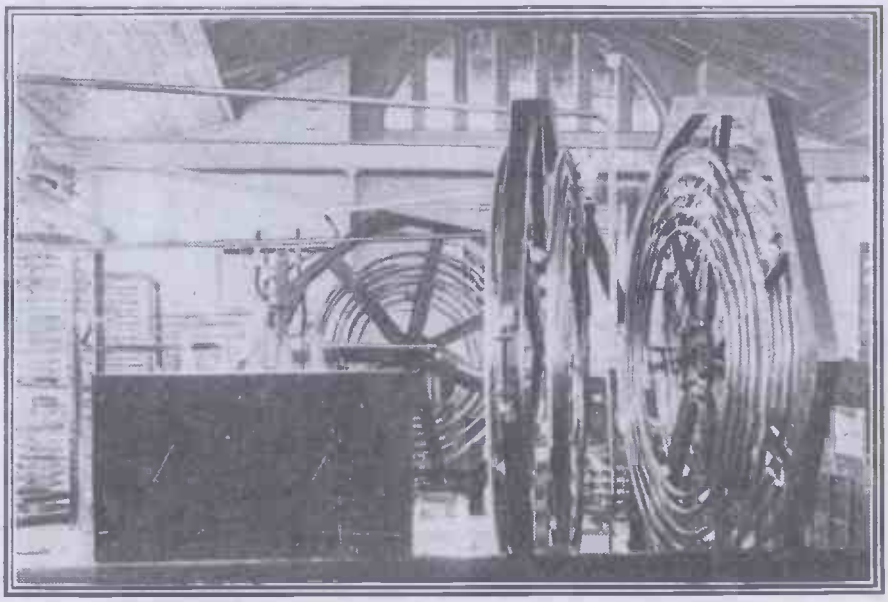
Radio-Toulouse University Lecture Broadcasts.

Arrangements have been made whereby the Radio-Toulouse station will broadcast lectures by the various professors at the University of Toulouse. A start is being made with the lectures of various professors of the faculties of arts and of medicine.

America and Austria Leading.

The radio review "Radio-Umschau" publishes comparative figures showing in various countries the number of radio licences granted per head of the population. From this list it appears that the United States take first place with one set for every 32 inhabitants. Next comes little Austria with one for every 40. Germany has only one per every 60, while Czecho-Slovakia is far in the rear with one set for every 800 of population.

The number of licences granted in Germany during November, 1925, the last month for which official statistics are available, shows an average daily increase of 1,768, a more rapid rate of growth than that of any other country. The number of American broadcasting stations, however, shows, according to the same authority, a great slump. On September 30th, 1921, at the height of the radio boom, there were 1,100 broadcasting stations in the United States, and this number had now been reduced to 550.



The giant transmitting coils used at the new wireless station at Berlin.

Japan Forging Ahead.

It is only a few months since receiving sets were allowed freely in Japan, but already, in Tokio alone, the number of licence-holders is over 75,000. It is thought likely that the next twelve months will see this figure at least doubled.

During the Storm.

During the terrific storm which swept France on December 23rd, radio proved of inestimable help in relieving the pressure on the telegraphic wires which, in many cases, had broken down as the result of the storm.

During that one day, the French station of Saint-Assise sent out 32,000 words to New York, 18,000 words to London, and over 10,000 words to other destinations overseas. Thanks to radio, every message was sent out on schedule time.

CUTTING OUT NOISE;

OR,

"LET IT BE MUSIC."

By B. HONRI.

(B.B.C. Engineering Staff.)

In his second article Mr. Honri continues his theme with regard to the elimination of "noise" from a set, and deals with the merits of the resistance-coupled amplifier.

MANY experimenters have avoided using resistance-capacity amplification on being advised that it is inefficient, that it needs a high anode voltage, and that it is expensive to make and maintain. Presumably because two stages of resistance coupling do not give the same amplification as two stages of transformer coupling (using the same anode voltage) the former method is considered inefficient. That there is a great improvement in quality does not seem to be taken into account.

I do not say that it is not possible to obtain "nice" loud-speaker reproduction using low-frequency transformers. A few of the best British-made transformers give quite excellent results, but the good ones are expensive and even they do not give as good quality as a cheaply made resistance-coupled amplifier. Even the very best transformers will not magnify equally all audio-frequencies, will not accurately reproduce both the roll of the drum and the top notes of the piccolo. Look at the advertised curves of transformers and notice whether middle C (256 cycles) of the piano is reproduced with the same strength as an octave above (512 cycles).

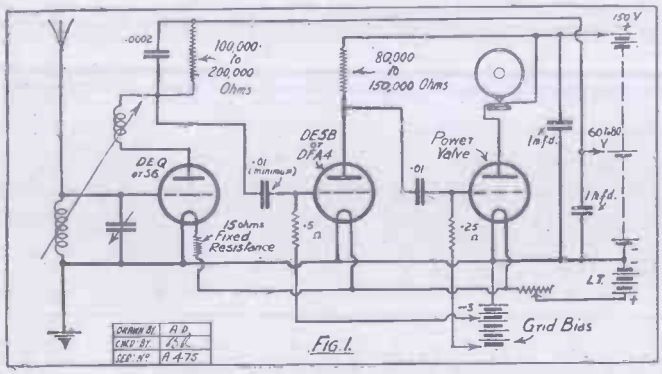


FIG. 1.

Unequal Amplification.

In the United States the striving for quantity and distance rather than quality is even more marked than in England. We find that most American low-frequency transformers have high ratio windings and give terrific magnification round about 1,000 cycles frequency. The designers, in an effort to give great voltage magnification in their transformers, in every case lessen the number of turns on the transformer primaries and consequently the primary impedance. They forget the close relation between the impedance of transformer primaries and the preceding valves, and do not seem to realise that a great magnification of the 1,000 cycle frequency is useless for good quality telephony if the same magnification is not given to all the other audible frequencies.

It seems a pity that manufacturers do not give experimenters more information regarding their low-frequency transformer products, particularly with regard to the impedance of the primary at various audio-frequencies. Roughly, however, it may be taken that a low ratio transformer has a much higher primary impedance than that of a high ratio transformer, and consequently for the least distortion a low ratio transformer should be used (following the high impedance detector valve) for the first low-frequency stage.

The resistances in a resistance-coupled amplifier offer equal impedance to all frequencies and, used in connection with correctly operated valves, should give "straight-line" amplification, that is to say, equal amplification is given to notes of all audible frequencies.

But why is this straight-line amplification necessary? Providing there is no distortion at the transmitting end, in the detector circuit, or the loud speaker, a "straight-line" amplifier will give an absolutely correct reproduction of the original music or speech. All the characteristics of the voice will be reproduced, and (with the loud speaker at the usual pianoforte strength) the piano will sound exactly as if it were played in the room. Admittedly, loud speakers do not yet give "straight-line" reproduction of all audible frequencies, but they are, nevertheless, the least distorting part of many broadcast receivers. It is probably only at the end of a good resistance amplifier that the perfect loud speaker would sound any better than the best types now on the market.

Fig. 1 shows a simple two-valve resistance-coupled amplifier used in connection with a detector valve arranged for anode rectification. As explained in a previous article, "lower bend" or anode rectification gives crystal clarity, and for this reason is a great improvement on the ordinary grid leak and condenser method. The rectifying valve in this circuit should be of the D.E.Q. or S.6. type for the best results but the D.E.3B., D.F.A.4 and other high-magnification valves may also be used. The anode resistance R1 should be 200,000 ohms when used in series with D.E.Q. or S.6 valves, that is for the first low-frequency stage. When the anode resistance is in series with lower impedance valves, as in later low-frequency stages, the resistance may be about 100,000 ohms.

The Coupling Condenser.

While it is certainly advisable to use wire-wound anode resistances, very good results may be obtained by using large paste cartridge-type resistances. These are very much cheaper than the wire-wound type, but they are said to gradually disintegrate as a result of the heating-up effect of the anode current. I have had a three-stage low-frequency amplifier using paste resistances working for nearly a year and it gives as good quality now, just as free from hiss, as it did when it was first made. But even the more satisfactory wire-wound anode resistances may now be obtained at less than half the price of the best low-frequency transformers, so that *really perfect* amplifiers may be constructed at a reasonable cost.

In view of the fact that the grid leak in the low-frequency stages may be ·5 megohms, and that there is a high potential difference across the coupling condenser, the condenser should have a high insulation resistance. It is, therefore, advisable to use a mica-dielectric condenser in this position and thus safeguard the valve grids from unwanted positive bias. There is a difference of opinion as to the correct value for coupling condensers in resistance amplifiers.

The usual American value for this component is ·006 mfd. and even though this value "cuts off" some of the lower

(Continued on page 1171.)

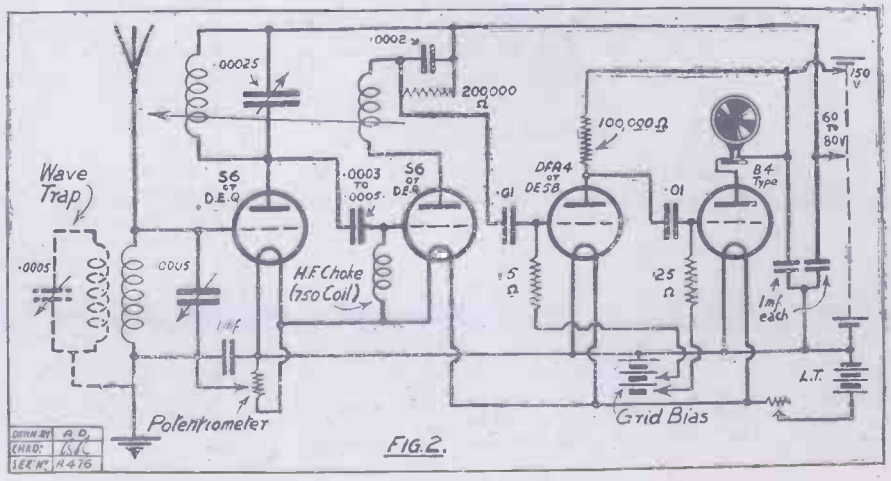


FIG. 2.

CUTTING OUT NOISE.

(*Continued from page 1169.*)

audio-frequencies, better reproduction will be obtained with this small condenser than with most transformers. Text-books give various values, from ·006 to 1 mfd., as being the correct capacity. But if the reader tries various condensers for himself, he will find that above ·05 mfd. there is no change in the tone of the amplifier, showing that there is no impedance to the lower audio-frequencies.

On most loud speakers, the difference in tone through using ·01 instead of ·05 mfd. coupling condensers on the amplifier is indistinguishable. This will, therefore, influence our decision as to the value of the coupling condenser we shall use on our amplifier. Reliable ·01 mfd. mica condensers may be bought for 4/- each, whereas a mica condenser having a value of ·05 mfd. costs about 17/6. For all practical purposes, a ·01 mica condenser will be found most satisfactory and, moreover, is quite cheap.

Tracing Distortion.

The circuit in Fig. 1 is suitable for clearly receiving on the loud speaker the local station at distances up to twenty-five miles on an outside aerial. Above this distance a high-frequency valve should be added (Fig. 2). The valves in the low-frequency amplifier section should be, for the first stage, of the high-magnification type (D.E.5 B., D.F.A.4, and D.E.3 B. are examples). Any good make of medium power valve may be used for the second stage. The same type of valve may be used for the third low-frequency stage if used on distant signals, but if the receiver is used with all three low-frequency stages on the local station for demonstrations or dances, a valve with a larger grid swing, such as the D.E.5 A. will be capable of dealing with much power without distortion. Good results for this stage may also be obtained by using two ordinary power valves in parallel. It is, however, quite impossible to obtain good quality with "demonstration" strength using one ordinary power valve in the last stage.

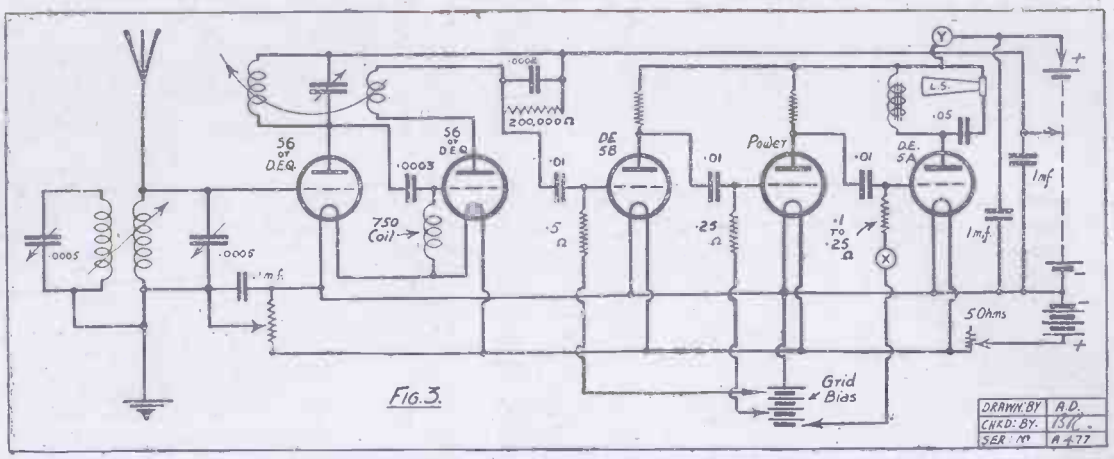


FIG. 3.

Put a galvanometer in the grid circuit of the last amplifier stage of such a receiver and watch the needle kick when the valve is overloaded and running into grid current. Those who give demonstrations should use such a circuit as given in Fig. 3, with a galvanometer at X and a milliammeter at Y. The needles of both instruments should be absolutely steady for undistorted amplification. A flick of the galvo needle indicates grid current, and fluctuations of the milliammeter may indicate rectification on the amplifying valves. Demonstrators should not be afraid of using a large number of valves in parallel in the low-frequency stages, and it is interesting to note that one Public Address System, famous for the quality of its loud-speaker demonstrations, uses no less than eight open-mesh low-frequency valves in the last stage.

A further development of this circuit, (Fig. 4) is suitable for home use. Switching is arranged for cutting out high frequency and low-frequency stages. Three stages of low-frequency amplification will only be necessary on weak signals, and if used on the local station will overload the last valve. When very loud signals are desired, a valve of the D.E.5 A. type may be used in the last stage, with suitable grid negative adjustments, as was done in the "demonstration" circuit.

It will be noticed that whatever low-frequency valves are switched on the last valve is always in use, giving a greater factor of safety in the prevention of overloading valves and also keeping the high tension to the anodes of the first two low-frequency valves constant. It will be seen that if the loud speaker is plugged on to the first low-frequency stage there will be a great increase in the plate voltage on the valve, necessitating an adjustment of grid bias.

Tone Adjustment.

The steady anode current feed to the last valve is prevented from going through the loud-speaker windings by the use of an iron-core choke and a condenser. Possible demagnetisation or "burning out" of the loud speaker is thus prevented. A further amplifier refinement is the provision of a tone adjustment. It will be remembered that the smaller the coupling condensers are below ·05 mfd. the more low notes are cut off and the higher is the tone. In the

(*Continued on page 1172.*)

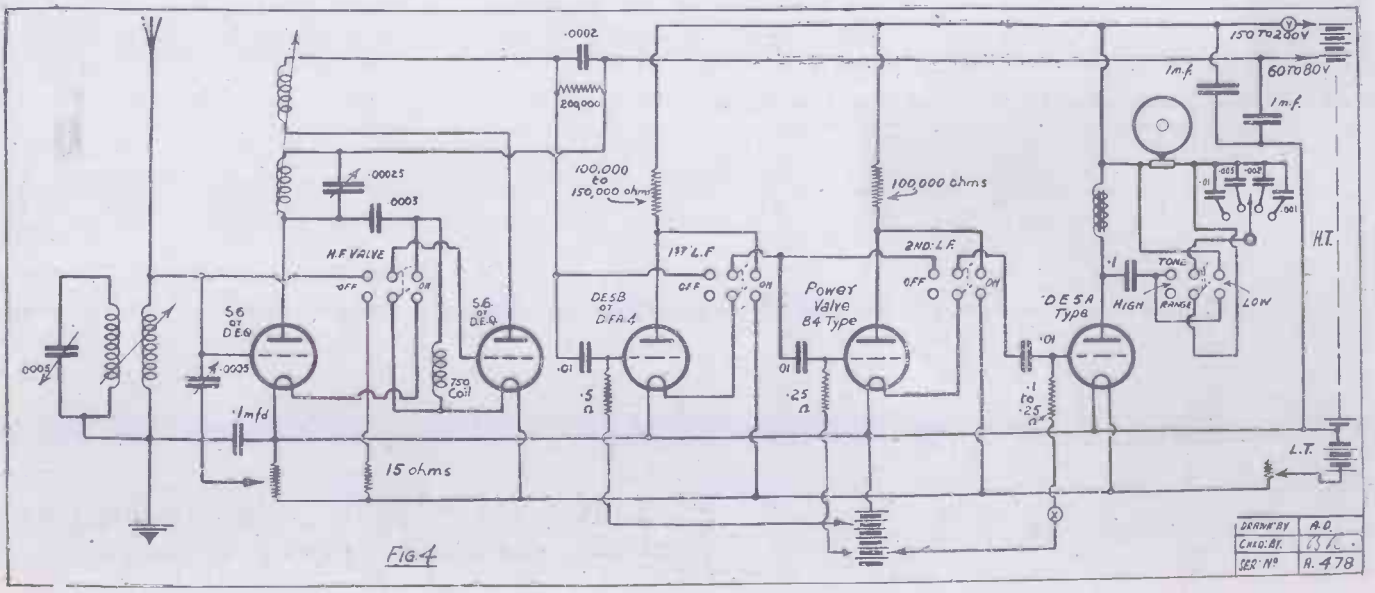


FIG 4

CUTTING OUT NOISE.

(*Continued from page* 1171)

same way, parallel condensers will by-pass the higher frequencies without affecting the lower frequencies, thus lowering the tone. With the use of a series-parallel condenser arrangement on the output choke (shown close up in Fig. 5) a large number of tone adjustments may be made. Paper dielectric condensers may be used in the tone filter.

You may ask what is the use of a tone adjustment? It certainly is true that the tone as well as the strength of the modulation of the transmission is varied at the studio control-room where there are some most elaborate correcting and differentiating circuits. It sometimes happens that the tone of the loud speaker itself is not quite to our liking, that the acoustics of the room make the tone lower than normal, or that reaction is used. All readers will have noticed the tone-lowering effect of reaction. This may be minimised by setting the tone adjuster too "high" and selecting a condenser value which gives the best correction.

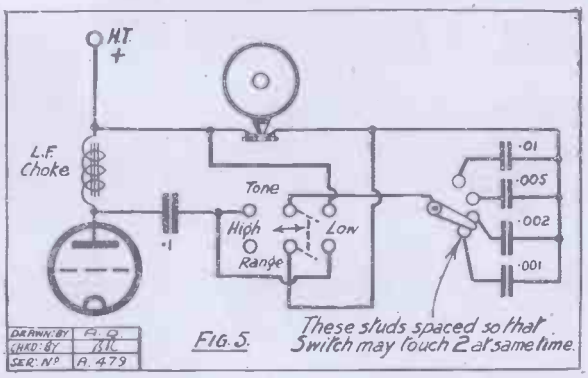


FIG. 5. These studs spaced so that Switch may touch 2 at same time.

In the circuit in Fig. 4 it has been considered that if a signal is weak enough to require reaction, the high-frequency valve should be added with the reaction on the tuned-anode coil; hence, there is no arrangement for putting reaction on the aerial when the high-frequency valve is not being used. Each valve is selected for its own particular function and does one job well instead of two or three indifferently.

High Tension Supply.

The problem of high tension supply is a knotty one whatever type of amplifier is used. High tension dry batteries are expensive and do not last very long. Accumulators are more satisfactory, but are expensive in the first cost, and have to be periodically charged. Even the smallest type of Leclanché cell is bulky and rather messy. A.C. mains sometimes take a lot of smoothing and D.C. mains are usually of too high a voltage. D.C. mains are perhaps the most satisfactory and 200 volts may be applied through a simple smoothing system direct to the low-frequency amplifier of a receiver. The detector and high-frequency valves may be fed in series with a Neon tube to bring down the plate voltage. As for the other methods of obtaining high tension, it is purely a matter of making the best of the job and choosing the arrangement which is the least inconvenient.

WHICH TYPE OF DETECTOR?

ALL desirous of picking up broadcast programmes have at some time or another to answer the question printed above. It seems to be an easy one to answer, but if *quality* is to be the main consideration the question assumes a different aspect and is of extreme importance. Few listeners and constructors realise that a great deal of the distortion present in loud-speaker sets is due to faulty detection. They may have heard that "the crystal is the best," but apart from taking this statement for granted they have not given the matter a thought.

In many cases the crystal rectifier is capable of giving extremely pure results, but under some circumstances it will give far from good results. To obtain satisfactory reception the crystal should be provided with fairly strong impulses to rectify, and so it should not be used alone at distances above 12 miles from the average B.B.C. station.

The writer has tried many types of crystals and is still to be convinced that this much-vaunted rectifier is so very much superior to the valve. Often a badly adjusted crystal, or one with unsatisfactory physical properties, will give a noisy background—rushing sounds being present in all the reception.

H.F. Amplification.

Sometimes the crystal can be adjusted so that silence is obtained when no modulation is taking place, but too often this is not practicable, even though many types of crystals are tried. However, the crystal can be very good and it should certainly be tried in sets situated 12 miles and less from the transmitter. Above that distance either H.F. amplification must be used or else a valve detector must be employed.

The writer prefers the latter and strongly advises the anode bend rectification method. If a grid condenser and leak are used a noisy rushing background is almost bound to be present, due to the constant flow of grid current while the carrier wave of the transmitter is on.

In the anode bend method this background can, with careful adjustment, be made absolutely silent, and as this is being written a loud speaker of the hornless type is "pushing out" the local programme without a trace of distortion or background.

This is due to a carefully designed rectifier which comprises a P.M. 4 valve (a D.E.Q. might be even better), 4½ negative bias and about 80 volts H.T. A potentiometer across the L.T. gives fine adjustment and *no reaction* is used. This latter is an important point and should be considered carefully, for reaction inevitably invites distortion.

Furthermore, the set is *detuned* so that the grid of the detector is not swamped by the transmission which is taking place only 13 miles away.

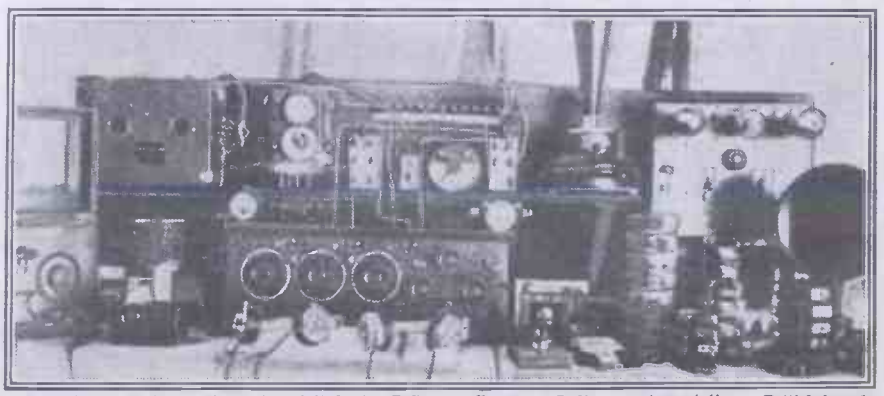
Suitable Valves.

If the anode bend method is tried it must not be assumed that the values of grid bias and H.T. mentioned above are necessary. The same PM. 4 can be made to give distortionless reception with only 25-30 volts H.T., and no applied grid bias, and it will be necessary to experiment a little before the best results are obtained.

Other suitable valves are the D.E.Q. and the D.E. 5 B., D.E. 3 B., or any high impedance valve that has a fairly sharp lower bend on its characteristic curve. The P.M.4 was used in the writer's case because it happened to be on hand, and gave very good results. It will depend upon local conditions as to which valve will be most suitable, but one of those mentioned should certainly be tried.

Should H.F. amplification and a crystal detector be used, then a really good piece of crystal should be employed in a detector capable of fine but firm adjustment. Tuned anode coupling will be quite O.K., though the writer rather favours the transformer method, owing to the fact that the plate current is completely removed from the detector circuit, and cannot cause a noisy background.

Whichever method the reader chooses, however, he should try various little refinements and each of the three methods before making his final decision. The grid condenser and leak method will give most volume and most distortion. The crystal will give (well handled) very clear results and least volume; while the best method (in the writer's opinion), the "anode bend" rectifier, using a good valve, will give very fair volume and exceedingly clear results if adjusted properly, and this adjustment is well worth the trouble in attaining.



Part of the receiving equipment installed at 2 B G, a well-known Indian amateur station. British broadcasting is picked up very well on the 5-valver shown in the centre of the photograph.

EFESCA

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8.	EFESCA DISC FIXED CONDENSER.
9.	EFESCA DUAL RHEOSTAT.
10.	EFESCA SPEECH AMPLIFYING TRANSFORMER TYPE "C."
11.	EFESCA TAPPED H.F. REACTANCE.
12.	EFESCA MICROMETER DETECTOR.
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14.	EFESCA SERIES PARALLEL CONDENSER.
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Catalogue No. 560 describing these Components, Post Free on application.

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Vote in space "A" for your own favourite component. Forecast in spaces 1 to 16 below what you think will be the result of the voting.

RULES AND CONDITIONS.

1. The decision of the Judges must be accepted as final and legally binding.
2. No member of the staff or works of Messrs. Falk, Stadelmann & Co., Ltd., will be allowed to enter this Competition.
3. The Competitor whose list most nearly agrees with the order of popularity as determined by the votes in space "A" will be awarded the first prize irrespective of what component he himself votes for in space "A." The next nearest will receive the second prize, and so on.
4. Write your full name and address clearly in the space provided and send the coupon with the box from any of the Efesca Components illustrated on this leaflet to: Competition Department, Messrs. Falk, Stadelmann & Co., Ltd., 83-93, Farringdon Road, London, E.C.1.
5. No correspondence will be entered into with regard to the Competition.

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Name.....

Address.....

I record my vote for No..... as the most popular component.

1st.	2nd.	3rd.	4th.	5th.	6th.	7th.	8th.

9th.	10th.	11th.	12th.	13th.	14th.	15th.	16th.

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AS the evening settles over the little homes of Japan and of the Nederlands, of Australia and of the Yorkshire Moors, there are to-day new interests there—a hundred delights made possible by Radio.

And in these thousands of little homes of many countries, most probably if you were to enquire, you would find the crystal to be NEUTRON.

Literally and in actual fact, Neutron Crystal is the heart of Radio enjoyment for crystal users in every corner of the World; it has wider sale in England, France, Holland, Germany, Spain, Austria, Japan, India, Australia, Canada, Denmark, Italy, Morocco, Scandinavia, Poland, Roumania,—than any other single Radio Crystal.

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Synthetic—consistent right through and in every place; tested and absolutely guaranteed; and British Made by Neutron Ltd.

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Wholesale enquiries to Neutron Distributors, Sentinel House, W.C.1.

Traders and manufacturers are invited to submit wireless sets and component parts to the "P.W." Technical Dept. for test. All tests are carried out with strict impartiality in the "P.W." Test Room under the supervision of the Technical Editor, and the general reader is asked to note that this weekly article is also intended to provide a reliable and unbiased guide as to what to buy and what to avoid.—EDITOR.

OSRAM valves need no introduction to readers here, for undoubtedly one of the most vigorous wireless advertising campaigns of last year was that carried out by the G.E.C. people in connection with those neat, efficient, pipless little tubes.

Osram valves have no excuse for being anything else but good, for the floor space given over to valve research work at the G.E.C. experimental laboratories at Wembley would house quite a reasonably sized factory. Here every process, from the refinement of the rawest of raw materials to the electronic bombardment of finished valves' anodes, is studied microscopically by a horde of people none of whom has not at least one scientific degree.

However, there was a structure upon which thousands of people were engaged in Biblical days and which was never completed so we thought it just as well to give the Osram D.E.2 H.F. and the Osram D.E.2 L.F. recently received by us for test, our usual critical examination. These two types operate at 2 volts max. fil., volts with the low fil., consumption of ·12 amps. The first-named, the H.F., has the high impedance of 45,000 ohms and is thus suitable for resistance coupled amplifying stages although it will operate very economically and efficiently in H.F. circuits. It is also recommended for detector stages when resistance or choke coupled amplifiers are in use. The D.E.2 L.F. is more suitable for detector stages when such precede L.F. stages coupled with higher ratio transformers than 3—1. As a first stage L.F. with about 80 volts H.T. and 3–4½ volts grid bias it gives full distortionless magnification.

Both of these Osrams can be fully recommended; they are invitingly economical and reach a high degree of efficiency in any of the various positions for which they are designed.

* * *

Quite a new type of variable condenser has recently been placed on the market by Messrs. Edison Swan Electric Co., Ltd. Known as the Ediswan "Double Value" it is "square law" and is divided into two sections. These two sections can be combined or divided by means of the action of a small knob situated in the centre of the dial similarly to a "vernier" knob. The effect is that either a variable of ·0003 or ·0008 mfd. is available. The scheme is good, for it enables a wider distribution of the lower wave-length adjustments to be obtained without sacrificing "breadth." Naturally it is not intended that the two capacity ranges should exactly overlap for the additional ·0005 mfd. should be used more for 1,600 metre and higher ranges and the ·0003 by itself on the lower, and of course, an accompanying change of inductance must be made. The instrument itself is a weighty, strongly-built component with tinned brass vanes and solid aluminium endplates. The moving vanes are in accordance with modern practice, earthed to the frame and a minimum of ebonite is employed. Very positive stops are fitted and the whole structure is definitely substantial. The price of the Ediswan "Double Value" is 18s.

A very pleasing component is the Ediswan dull emitter rheostat. Here we have a nice compact, efficient little article. Its design is straightforward and with its useful 30 ohms max., its one-hole fixing,

(*Continued on page* 1176.)

APPARATUS TESTED.

(*Continued from page* 1174

and smooth action and stout construction, it should prove quite popular at the price of 4s.

We recently received an Ediswan Super-het. coupling unit for test. Now this is a really excellent device and brings super-het. construction closer to the reach of the average constructor than anything previously introduced in the super-het. line. Our readers will shortly meet this last Ediswan product in other pages of "P.W.", so we will reserve our further comments until then.

* * *

Two interesting items were recently to hand from A. F. Bulgin & Co., of Cursitor Street, London, E.C.4. The first is the Decko dial indicator. This is a small bright spade-shaped little article with a screw nut and washer for panel mounting. When mounted it is raised from the panel and should be particularly useful for use with dials that do not fit closely. It is sold at 3d. The second item is a Decko neutralising condenser. This is a neat little component and on test it gave an extremely low minimum. An ebonite adjusting rod is supplied separately—a rather clever scheme. At the price of 3s., Neutrodyne enthusiasts will no doubt be interested in this Decko product.

* * *

A "Radio Tuning Record" for collecting details of coils and condenser settings has been produced by Messrs. Cartwright & Rattray, Ltd., 12 and 14, Brown Street, Manchester. It sells at 2d., and is an extremely useful little folder for both amateurs and listeners possessing receivers capable of DX work.

* * *

Single coil holders are in frequent demand, but there are not many really high-class items of this nature on the market. It would seem to us that it is one of those "lines" that has been somewhat overlooked; a point, no doubt, that causes one or two knowledgeable firms to congratulate themselves.

However, we have received a "Tiger" brand of this type of component from Messrs. The Athol Engineering Co., Comet Street, Higher Broughton, Manchester. A neat, well-finished little article it is, too, with its highly nickelled plug and socket and small, but stout, block porcelain base. It retails at 9d., and is a value-for-money proposition.

* * *

A set of "Erla" Balloon Circloid coils was recently to hand from Messrs. C. A. Vokes & Co. The set comprises two coils which operate as H.F. transformers and one which constitutes an aerial tuning coupler. "P.W." readers are, of course, well acquainted with these types of coils, but better known to them, perhaps, as Toroidal coils. The Erla set is very well made, and operates efficiently. Substantial mounting brackets are supplied. The coils are suitable only, of course, for the lower broadcasting band. The retail price is £3 10s. for the set.

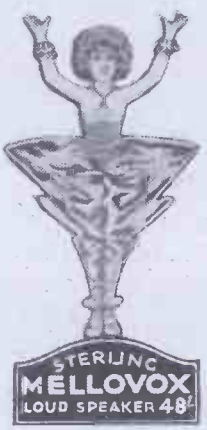
* * *

Messrs. Grahams, of "Amplion" fame, have sent us a sample of their new loud speaker smoothing device. It is known as the "Siftron," and consists of a choke and condenser enclosed within a case, which is provided with four terminals for connecting purposes. The object of the "Siftron" is, of course, to bypass the H.T. with the choke, and bring the loud speaker—or 'phones—into operation through a series condenser in a similar manner to the system included in the Household Three-Valver and many other "P.W." receivers.

The "Siftron" can be used with an existing set or be built into a new one. It is stoutly made, and operates with all the efficiency one would expect of a product of such a famous house as that of Graham.

* * *

A new B.S.A. Co. has been formed under the name of the B.S.A. Radio, Ltd., with head offices at Small Heath, Birmingham. An arrangement has been entered into with the Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.) whereby the developments of the latter concern in connection with radio broadcast receiving apparatus will operate for both companies.



RADIOTORIAL

All Editorial Communications to be addressed to The Editor, POPULAR WIRELESS, The Fleetway House, Farringdon 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 and 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 contributions to be addressed to The Editor, The Fleetway House, Farringdon Street, London, E.C.4. 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 Editor desires to direct the attention of his readers to the fact that, as much of the information given to the columns of this paper is of a technical nature and concerns the most recent developments in the Radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and trader would be well advised to obtain permission of the patentees to use the patents before doing so.

PATENT ADVICE FOR READERS.

The Editor will be very pleased to recommend readers of POPULAR WIRELESS *who have any wireless inventions to patent, or who desire advice on patent questions, to our patent agent. Letters dealing with patent questions, if sent to the Editor, will be forwarded to our own patent advisers, where every facility and help will be afforded to readers.*

TECHNICAL QUERIES.

Letters should be addressed to:
Technical Query Dept.,
"Popular Wireless."
The Fleetway House,
Farringdon Street,
London, E.C. 4

They should be written on one side of the paper only, and MUST be accompanied by a stamped addressed envelope.

Queries should be asked in the form of the numbered questions: (1), (2), (3), etc., but may be accompanied by a short letter giving any necessary additional particulars as briefly as possible.

For every question asked a fee of 6d. should be enclosed. A copy of the numbered questions should be kept, so that the replies may be given under the numbers. (It is not possible to reproduce the question in the answer.)

IMPORTANT.—If a wiring diagram, panel lay-out or list of point-to-point wiring is required, an additional fee of 1/- must be enclosed.

Wiring diagrams of commercial apparatus, such as sets of any particular manufacture, etc., cannot be supplied. (Such particulars can only be obtained from the makers.)

Readers may submit their own diagrams, etc., for correction or for criticism. The fee is 1/- per diagram, and these should be large, and as clear as possible.

No questions can be answered by 'phone.

Remittances should be in the form of Postal Orders.

Questions and Answers

RESTORING A DULL EMITTER.

R. S. A. (Goring-on-Thames).—Having allowed a dull-emitter valve to have too much voltage across the filament, is there any chance of restoring its properties, as they have been destroyed?

This depends upon the type of valve. The D.E. .06 amp., and similar types, are not always curable after this sort of mishap. In any case, the procedure is to burn the valve at the correct voltage for about half an hour or more without any H.T. on the plate. This will bring some of the special chemicals to the surface of the filament, and normal electron emission will result.

Another way is known as "flashing," but it is decidedly risky. It consists in connecting one filament leg of the valve to one side of the H.T. battery, and just brushing the other H.T. connection on the other filament leg. This should have the same effect as the above.

One method of ensuring that too much current does not pass when "flashing" a valve in this way, is to do the flashing from a fixed condenser.

(*Continued on page* 1180.)

RADIOTORIAL QUESTIONS & ANSWERS.

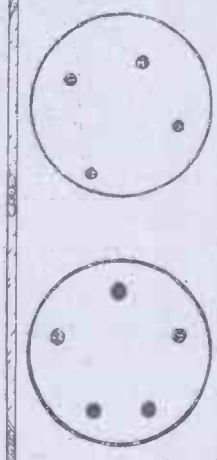
(*Continued from page* 1178.)

All that is necessary is to connect a very large fixed condenser—(say 1 mfd. or more)—across a high-tension battery of 100 volts or so. Disconnect the H.T. battery, and then connect the filament legs across the fixed condenser.

This latter will, of course, discharge itself via the filament, and as the current is limited by the capacity of the condenser there is no danger of applying the current for too long a period.

For the Constructor

VALVE TEMPLATES.



AT the top is shown an ordinary 3-electrode (4-pin) valve. The exact drilling positions can be determined by cutting out the paper template, and carefully pasting it to the panel in the required position. A better plan, which does not entail cutting the page, is to pin a piece of paper underneath the template, and then prick through the *centres* of the dots with a pin.

The lower template shows a Unidyne valve (4-electrode, 5-pin) of the U C 5 or K 4 type.

WIRELESS DIAGRAMS.

"NON-TECHNICAL" (Langport, Somerset).—Having had no wireless training I am very puzzled by the different diagrams used. Sometimes two or three quite different arrangements of the components are given, and in one of these diagrams a condenser may be shown as a box, whilst in others it is given as short parallel lines. Why are they drawn differently, and what is the purpose of several signs to mean the same component? When several arrangements for components are given, I suppose the wiring diagram is the one to follow?

There are three different forms of diagram in general use, called the "theoretical," "pictorial," and "wiring" diagrams.

The theoretical diagram uses the symbols to indicate the different components. Its purpose is to show at a glance the path of the current, and it is arranged without regard to practical lay-out and spacing, except that coils which are coupled are shown close together with an arrow through them to indicate the coupling. This class of diagram is read very easily with practice, and being clear, compact, and easily drawn is invaluable in the study of involved circuit connections.

The pictorial diagram is intended for the novice who is uncertain of the appearance of instruments or of their respective symbols. It is very useful for beginners, but is not so easy to follow as a theoretical diagram which, with practice, shows the path of the current at a glance.

The wiring diagram is simply a plan of the practical connections, showing how the components are arranged on the panel and the best method of taking the wires from point to point.

RANGE OF RECEPTION AND TUNING RANGE.

H. C. (Shepperton-on-Thames).—I have a crystal set consisting of a broadcast variometer, 'phones, with small condenser, and crystal detector, and with a 25-ft.-high aerial I get very good signals. I am told that a variable condenser would still further improve results and give better tuning. Is this so, and how should it be connected.

You would not improve results by adding a tuning condenser, as this is only useful for tuning a fixed coil or for "loading" a variometer.

(*Continued on page* 1181.)

RADIOTORIAL QUESTIONS AND ANSWERS.

(*Continued from page* 1180.)

The latter by itself is capable of very fine tuning, and the addition of a capacity across it would be detrimental, unless it is necessary to increase the *tuning* range of the instrument.

This tuning range is merely the band of wavelengths which the instrument will cover, and has nothing to do with the range of reception, which is what you wish to increase.

GAS-PIPE EARTH CONNECTION.

F. B. (Leyton).—Can the Gas Co. object to my using the gas-pipes as an earth ?

Yes, certainly; and in any case, a gaspipe does not make an efficient earth. The waterpipe or a direct ground connection is far better.

"STAND-BY" SWITCH.

J. R. Y. (Yeovil, Somerset).—Does the term "stand-by" (as used so often in wireless work) mean "wait," and, if so, how does it apply to a "stand-by tune" switch ? What is the purpose of the latter ?

The term first became general in wireless when one station (for instance, a coast station) was controlling all wireless communication over a certain area, and a number of ship stations were waiting to transmit. Certain of the ships would be instructed to wait for a definite period, and others would be instructed to "stand by," either to receive messages that were then on hand for them, or because it was nearly their turn to transmit to the coast station.

The term came to be applied to the switch because a different adjustment for tuning was necessary in the different circumstances.

The "stand by" side was used when the ship's receiving circuit was directly connected to the aerial, and all the stations in range were being listened to, in the expectation of a call or in order to seize the most favourable opportunity to transmit without undue interference with other stations.

On the "tune" side a single desired station was kept tuned in, and the coupling was loosened so that all other signals were weakened as much as possible; in other words, the circuit was made as selective as circumstances permitted.

CAN I WORK A LOUD SPEAKER ?

J. F. A. (Petersham).—I wish to work a loud speaker, and at present my signals are too loud to be comfortable with 'phones on. Would a one-valve L.F. amplifier be sufficient to work a small loud speaker of the "junior" or "baby" type ?

It is difficult to know what you mean by "too loud to be comfortable," as some people can enjoy signals which are deafening to other people. The usual rule as to whether a loud speaker will work when an L.F. stage is added is to place the 'phones upon a table in the centre of the room. If speech is then audible all over the room a loud speaker will nicely fill it, or if music only can be distinguished clearly a small loud speaker will give good results.

Where the signals are not loud enough to be heard in this way results with a loud speaker will be disappointing, as the input is not sufficient for satisfactory working.

AM I OSCILLATING ?

J. S. (London).—Being a beginner as regards valve sets, I should be pleased if you can give me any information with regard to reaction and oscillation. My set, I am informed, has a reaction coil fitted, and I do not wish to cause any interference to my neighbours' sets. How can I tell when I am oscillating ? And if so, how is it cured ?

We cannot do better than to quote the following paragraphs taken from a circular letter addressed to listeners in Canada by the radio branch of the Department of Marine and Fisheries of the Canadian Government, and published in "The Times" of recent date:

The principle of regeneration, as used in radio receiving sets, is that part of the output of the detector valve feeds back into his own input, and thus greatly increases the volume of the signal. The electric waves reaching the receiving set from the transmitting station travel down the aerial wire, through the primary coil in the set, and so to earth down the earth wire. The weak electric current resulting from this influences the valve in such a way as to set it functioning.

The resulting output from the plate circuit of this valve is fed back in such a manner as to set up a "field" or influence, in the part of the circuit connected to the input (the grid) of the valve. This field induces in the input circuit a current of electricity of the same frequency as that of the received electric waves. The energy, therefore, which comes

(*Continued on page* 1182.)

RADIOTORIAL QUESTIONS AND ANSWERS.

(Continued from page 1181.)

down the antenna wire is automatically strengthened by an impulse from the output of the detector valve. Unless controlled, this action will continue until the saturation point or climax is reached, the valve being then said to be in a state of oscillation. When a receiving set is in oscillation, it causes howling and squealing, both in itself and in neighbouring receiving sets. Regeneration should therefore never be allowed to proceed to this point, as it then constitutes a public nuisance.

(1) It causes whistles in radio receiving sets of all types which are tuned to the same station. This interference may be heard up to a distance of several miles.

(2) It distorts the quality of the music.

(3) It uses more H.T., and therefore the life of the H.T. battery is reduced.

(4) It tends to reduce the life of the detector valve.

When a radio receiving set in a state of oscillation is exactly tuned to a broadcast station, it is said to be in the state of "zero beat." This distorts the broadcast reception, and also interferes with neighbouring receiving sets which are tuned to the same station. In a word, regeneration carried to oscillation causes great annoyance to neighbours, poor reception and expense to the owner of the set, and has no advantages whatever.

The interfering whistle which is heard in a receiving set may originate in the set itself, or it may be interference caused by a neighbour. In order to determine this point, the following test may be made:

Leave the regeneration control (reaction handle) in a fixed position, slowly rotate the tuning dial, and note particularly the change in sound of the whistle. If the whistle rises and lowers in pitch sympathetically with the movement of your tuning dial, it indicates that your receiving set is in a state of oscillation, and probably causing interference to other sets. On the other hand, if the whistle does not change in pitch corresponding to each movement of your tuning dial, but simply varies in volume, the whistle is not caused by your receiving set, but is interference produced by some other oscillating receiving set in the neighbourhood.

IN THE "PADDED ROOM."

(Continued from page 1143.)

cases like this? I may tell you all quite frankly that I spent many hours in preparing my programme, and welding it all together. The songs I sang were only decided upon after long cogitation (good word that for a wee comedian, eh?) and because I thought they would make up into a harmonious and varied entertainment. When it is remembered that my present repertoire consists of something like sixty songs it will be seen how difficult it would be to please each and all of my admirers.

In connection with the song "There is Somebody Waitin' for Me," I hear that there has been a great run on it as a record since last week. In one great warehouse in London the song was played almost continuously (in answer to requests from shoppers) on the day following my appearance at 2 L O. At least, that is what the proprietor wrote and told me in a very charming letter.

If you ask me why I had the good fortune to be such a success over the wireless I will try to tell you. I "prepared" like any conscientious U.P. kirk minister. I threw my whole heart and soul into the business before me. I made up my mind to sing direct to everybody at the other end—if there is an "end" or even a "beginning" to this amazing medium! By tests and from experience I produced my voice to suit the vehicle. And I pronounced every word I sang, or spoke, so that there should be no doubt as to what I said or sang. That's all. And, my goodness, wasn't I all out at the finish of my show! I was as limp as a rag, and my "heid was bummin'."

Put it was worth it—in more ways than one! And with that real Lauder touch, I'll finish.

TECHNICAL NOTES.

(*Continued from page 1149.*)

the so-called "liquid valves" for radio purposes. It will be remembered that many experimenters have, at different times, claimed to have produced such valves with success, but exact details have always been difficult to obtain and other experimenters, repeating the tests, never seem to have been able to achieve much success. The German scientist Neinhold used colloidal suspensions, and found that any trace of electrolysis, in the ordinary sense, was fatal to the effects desired.

No important details are to hand as to the more recent experiments referred to above, but these will be duly reported when they become available.

Home-Made Transformers.

A correspondent sends me an account of his simple method of winding transformer bobbins in the absence of a lathe. Since these bobbins frequently carry many thousands of turns of wire, it is evidently a tedious job to wind them by hand. My correspondent, however, makes use of a gramophone turntable in lieu of a lathe. He mounts a wooden "holder" on the spindle of the gramophone, and then fits the transformer bobbin to this, the wire being paid off from the spool and guided by hand on to the transformer bobbin. The average gramophone will run at 80 revolutions per minute for perhaps 15 minutes, which means somewhere about 1,000 turns for one winding of the spring. Of course, although the labour of winding by hand is obviated, the time taken is rather long, for with, say, 12,000 turns to put on, it must take something like two hours' continuous work. Of course, although the normal speed of the gramophone may be about 80 revs. per minute, the machine may be speeded up to its highest speed for this purpose. However, it is no doubt better than the hand method.

Push-pull Amplification.

A reader asks for an explanation of the push-pull amplifier. This was fully explained in an article in this journal recently. Briefly, however, it employs two valves in opposition across a single transformer and its purpose, in connection with the loud-speaker end of the circuit, is to minimise distortion. When the input voltage becomes sufficiently high to swing the operating point of the valve off the straight-line part of the characteristic curve, the effect in the output or plate circuit is no longer faithful to the effect in the input or grid circuit, in other words, distortion results. In the push-pull amplifier, the input voltage is divided between the two valves and, in this way, neither of the valves is pushed off its straight-line working. The output from the two valves is combined to operate the loud speaker. Special transformers are made for push-pull work; these are convenient for the circuit, although they are not absolutely necessary, and the push-pull amplifier may be made up with ordinary transformers.

If there is anything in these pages that you do not like, please let us know what it is when writing to us.

Correspondence

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

A 1926 UNIDYNE ONE VALVER.

The Editor, POPULAR WIRELESS.

Dear Sir,—It may interest you to know that on my 1926 Unidyne one valver (my first valve set), I can get Radio-Berne every night almost as loudly as Hull. I can also get several German stations, especially Hamburg and Dortmund, and have even received W G Y quite audibly, one night at 11.45 p.m. Thanking you for your very excellent circuit.

Yours faithfully,
H. J. J. GRIFFITH.

Northgate Lodge, Lincoln.

A NOVEL DRY CELL.

The Editor, POPULAR WIRELESS.

Dear Sir,—The following description of a cell suitable for the lighting of dull emitter .06 valves may be of interest to your readers, as an old H.T. battery composed of flash-lamp cells was used in its construction.

An empty box of the kind containing one gross of school chalks is used, owing to the manner in which the sides are dovetailed and the bottom recessed to the sides. This kind of box is required as it is to be used for the container of the cell. The sides of the box are cut down until it stands about 2 in. high. It is then made watertight by soaking it thoroughly in melted paraffin wax, of which a layer ¼ in. thick is poured into the bottom to seal the joints. The box is then put aside till the wax hardens.

Eight flash-lamp batteries are then stripped of the insulation and zinc, etc., as only the small carbons with the surrounding depolarising bags are used.

Twenty-four ¼ in. holes are then drilled in the lid, which has also been previously soaked in melted wax. One carbon pole is then inserted in each hole with the carbon shanks jutting out on the top of the lid. Four lengths of tinned square section wire are then used to join up the carbons in each row, each pole cap being soldered on to its respective strip. The four lengths are then soldered together by another length of wire from which the positive connection is taken.

The negative plate is then cut out of sheet zinc, and measures 5½ in. by 3½ in., leaving a long strip about 3 in. long at one end for the negative connection. The plate is laid at the bottom of the prepared box and the strip is bent over the side.

The box is half-filled with a solution of sal ammoniac in water, as is used in ordinary Leclanche cells. The lid is then fixed on by one screw at each end, the poles dipping into the solution.

The current output is constant, owing to the large area of the depolarising poles, and two cells joined in series will give satisfactory service for a couple of months at least, before the zinc and the solution will have to be renewed.

Yours truly,
P. SALAMON

31, Annette Street,
Crosshill, Glasgow.

A HINT TO CORRESPONDENTS.

The Editor, POPULAR WIRELESS.

Sir,—I think more particulars would be gratefully read by your readers, from correspondents who from time to time send particulars of exceptional reception with such and such an article. I think the following particulars should always be included.

Height, length, and distance from local station, and direction of aerial.

The number and date of publication in which article appeared.

If indoor aerial, particulars of method adopted.

One of your correspondents, Mr. J. M. Bellairs, in a recent issue, page 1041, No. 187, gives a very good account of your Auto Wave-trap, but particulars of its whereabouts are not given. May I be excused for also drawing attention to Mr. Bellairs' aerial. Unless it is a misprint, or the P.M.G. standard has been rescinded, it exceeds the standard by 50 ft.

Again, the next letter on same page, entitled "A Super Crystal Set," is of no advantage only to a few of your readers who happen to live near Durham, and of no interest to them unless Mr. Gibbon is prepared to show them in what way it differs from the original "P.W." Ultra. I sincerely hope Mr. Gibbon will let us have the connections.

Wishing "P.W." and all its staff another prosperous New Year.

Yours,
A THANKFUL READER.
J. T. EDWARDS.

3 bk. 12, Bennett Street, Lozells.

[We trust correspondents will give these points their consideration: such-e details would, as Mr Edwards points out, prove of great value to interested readers.—ED.]

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POPULAR WIRELESS AND WIRELESS REVIEW, January 23rd, 1926. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

How To Make THE "P.W." TRINADYNE ONE-VALVER.

Popular Wireless

Every Thursday PRICE 3d.

No. 191. Vol. VIII. and Wireless Review January 23rd, 1926.

Scientific Adviser : SIR OLIVER LODGE, F.R.S., D.Sc.

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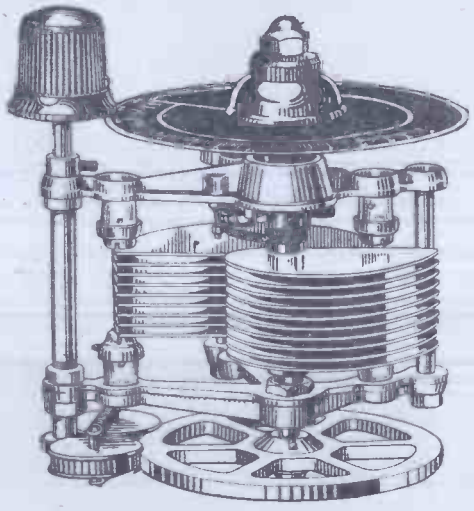
Reverberation and the Loud Speaker.
Ideas for Experimenters.
Notes on Capacity Reaction.
The Repair of Transformers.
An Interesting New Circuit.
Interplanetary Radio Communication.
The Human Body as a Radio Station.

One of the huge transformers employed at the new Hillmorton station is shown in our cover photograph. "Rugby, the World's Largest Station," is a special feature in this issue.

STERLING Radio

THE NEW STERLING "MINILOSS" VARIABLE CONDENSER



THESE condensers have a high maximum to minimum capacity ratio. The novel slow motion movement has a ratio of 7-1, it is very smooth in operation and allows of no back-lash or grating.

"Pyrex" glass plugs are used for insulating the fixed plates; these plugs are outside the electrostatic field, consequently High Frequency losses are reduced to the minimum. Sterling—first to introduce the vernier and square-law, are now the first in England to use "Pyrex" (a proved insulator of the highest quality) as a condenser insulator.

The moving vanes are so mounted that there can be no side-play, they are attached permanently to the framework with a flexible connection. This obviates the possibility of grating due to bad or high resistance contact, an essential feature when working on very short wavelengths or Super Receivers.

The conveniently shaped control knob is clear of the dial, this together with the fixed scale and movable pointer makes the operation of these condensers quicker and less trying than with the usual type.

One hole is needed for fixing and another small one for the control spindle, allowance is made for mounting on any thickness of panel up to ¾-inch.

Made in three capacities :

.00025 mfd.	... Price	21/-
.0005 mfd.	... „	24/-
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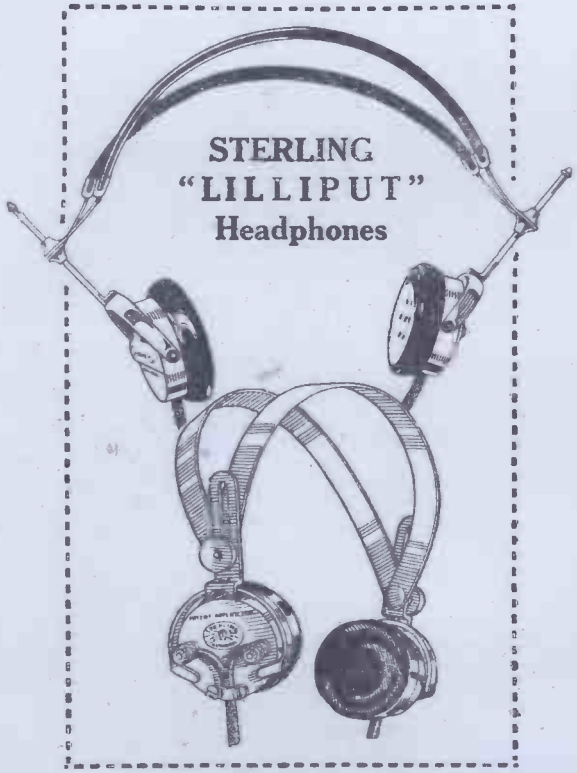

STERLING Headphones

"LILLIPUT" Headphones

A veritable masterpiece of headphone efficiency. Clear in tone, light in weight and extremely comfortable. Easily adjustable to any head. The most efficient, inexpensive 'phone obtainable.

PER PAIR

20/-

"LIGHTWEIGHT" Headphones

The World's Standard; first in design, quality, finish and performance. Supreme in tone and volume and as light as *good* headphones can be. Comfortable and easily adjustable.

PER PAIR

22/6

Write for a copy of Sterling Publication No. W364F, containing particulars of Marconiphone and Sterling Radio apparatus.

At all Radio Dealers

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America Acknowledges Amplion Supremacy

THE BEST features and latest developments of radio and phonograph are effectively combined in the beautiful Adler-Royal creation shown above. The price of Model 10 (a 5 tube Neutrodyne Radio-Phonograph with Amplion loud speaker unit) is, without accessories, $275.00.

"... with AMPLION Loud Speaker unit"

The manufacturers of the famous Adler-Royal are intent on providing the very best that money can buy. Thus it happens that Britain's Best Loud Speaker is incorporated in this famous American Radio Receiver.

The World's Standard

AMPLION

Wireless Loud Speaker

The Radiolux AMPLION, the most recent addition to the AMPLION range, by reason of its volume, clarity, sensitivity, and realistic tone, is a revelation in loud speaker quality.

The illustration shows a typical Radiolux Amplion, Model R.S.2.O. price £5/10/0.

Obtainable in two sizes. and in various distinctive finishes from AMPLION STOCKISTS, Radio Dealers, or Stores.

Demonstrations gladly given during business hours at the AMPLION Showrooms: 25, Savile Row, London, W.1; 79-82, High Street, Clapham, S.W.4; 10, Whitworth Street West, Deansgate End, Manchester; and 101, St. Vincent Street, Glasgow.

Patentees and Manufacturers:

ALFRED GRAHAM & CO. (E. A. GRAHAM), St. Andrew's Works, Crofton Park, S.E.4.

Doing one thing
- - - and doing it well

A BASIC essential of fine craftsmanship is the whole-hearted concentration upon one special task. Those fine old craftsmen of the Middle Ages devoted their whole lives to the betterment of their craft. They possessed the right spirit.

The same understanding can be observed among the ivory carvers of Japan, the metal workers of India, and the watchmakers of Switzerland. They all carry on the traditions of their fathers for generation after generation. Truly they realise that doing one thing and doing it well inevitably spells success. Among wireless enthusiasts throughout the country the name Cossor has also been associated with the basic idea of doing one job and doing it well.

Cossor Valves are the *only* contribution to the wireless industry by A. C. Cossor, Ltd. And here again specialisation has brought success. For many years Cossor has been making valves—always experimenting, always aiming to effect improvements. Each year has seen the standard of performance slowly—but surely—raised. Each year finds Cossor more determined to remain true to its self-imposed task.

Three years ago the research work on the Cossor hood-shaped Anode and Grid and the arched filament was completed. Its inventors were fully convinced that for increased sensitiveness, durability and tonal purity these principles possessed immense possibilities. And they resolved to concentrate upon their development.

What has happened has been wireless history. From a new valve with a sale of a few hundreds a week, the wireless industry has watched Cossor sales leap upward until today it enjoys the distinction of being by far the most popular British Valve.

Once again it has been proved that the public is always ready to recognise an honestly made article—and, once having recognised it, loyally continues its support.

The Wuncell Dull Emitter
Voltage 1·8 volts. Consumption ·3 amp.
W1 for Detector and L.F. **14/-**
W2 for H.F. amplification. **14/-**

The Cossor Loud Speaker Valve W3
Voltage 1·8 volts. Consumption ·5 amp.
Price **18/6**

Cossor

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Gilbert Ad. 4398

Popular Wireless

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RADIO NOTES AND NEWS.

"Cheapest One-Valve Set" Results—Winsulator Gets Going—A Gift Worth Having—New Antwerp Station—A Tribute to the Trinadyne—British Beam Stations.

Some Attractive Talks.

WHAT do you think of Mr. Filson Young's idea of replacing those gramophone records by the comparatively little-known gems of classical music? Personally, I don't think I should have appreciated the change before I heard that talk on "Mere Listening" by Sir H. Walford Davis; but he threw such a charm and glamour over the whole subject of the form and structure of music that I confess he has converted me from gramophones. By the way, you ought to send a stamped addressed envelope to the B.B.C. asking for the programme of Talks. Mr. Stobart has arranged a very attractive January-to-Easter session.

The Special Feature on Fridays.

AS from January 29th, the B.B.C.'s Friday special features are to be broadcast earlier in the evening. Consequently, arrangements are being made to broadcast dance music from London, as well as from 5 X X, from 10.30 to midnight on Fridays.

More One-Valve Results.

SOME good one-valve results have been reported this week. One Radford (Nottinghamshire) reader, using the "Cheapest One-Valve Set" described in P.W. No. 174, (September 26th), tuned-in tests from the new Prague station. It was operating upon 5 kilowatts, and reception at Radford was "good."

14-Year-Old Reader's Nineteen Stations.

ANOTHER good performance is that of a fourteen-year-old Cheltenham reader. The set and most of the coils are home-made, but the following stations have been received at "really loud 'phone strength": Daventry, London, Birmingham, Cardiff, Bournemouth, Hamburg, Toulouse, Oslo, Radio-Paris, Radio-Berne, Petit-Parisien, and Königswusterhausen.

In addition, the following have been tuned-in at moderate strength: Dublin, Manchester, Newcastle, Madrid, Lyons, Frankfurt, and Aberdeen.

More Mush.

I SEE that, as a result of an agreement recently signed by the P.M.G. on the one hand and the Marconi Co. on the other, there is to be a big extension of commercial wireless working. The latter company is now licensed to conduct services with Denmark, Sweden, Finland, Russia, Portugal, Jugo-Slavia, Bulgaria, Turkey, and Greece, and with all foreign countries outside Europe. Business men will welcome the shake-up which this will administer to some of the telegraphic services, but I am afraid it means a big increase in the mush line!

Miss EDNA MAY, the "Belle of New York," broadcasting from the London station.

A famous stage artiste at 2LO.

Cheaper to Buy the Licence!

FINES for being found in the possession of a wireless set without a licence are increasing in severity. There was a case recently at Stratford, London, E., where the defendant said he got his panel at a rag-shop for a tanner, and the apparatus was contained in a soap-box "cabinet." Evidence was given that the set produced quite good results, and the owner was thereupon fined 20s. and a guinea costs.

Winsulator Gets Going.

ONE of the most novel inventions of 1925 appears to have been the "Winsulator." As readers will know, this is the name given by the Technical Editor to his wind-driven, self-cleaning insulator which rotates like a windmill as soon as a breeze springs up. The useful little gadget never rests, but, day and night, polishes and furbishes the aerial insulator every time the wind blows.

The complete originality of the idea can be gauged from the fact that the full patent (No. 244,981) was granted in the remarkably short period of three weeks!

A Gigantic Radio Set.

THE London Hospital, in the Mile End Road, contains over 1,000 in-patients, and every one of them is now a *listening*-in patient. The hospital's receiving set is the biggest in the world and, quite apart from the loud-speaker connections, *many miles* of wire were used to connect up the 'phones!

It consists of an Igranic super-het., followed by a ten-valve power amplifier; sixteen valves in all! A little switch in the porter's lodge switches the whole caboodle on at once, and as soon as he switches off motor-generators start up and commence recharging the batteries.

A Gift Worth Having.

WHEN the batteries are fully charged, an Igranic automatic switch kindly turns off the generators. (If the receiver is started up again before the batteries are quite fully re-charged, this switch turns off the generators, just the same.)

Nowhere in the world could this super-set do more good, or be more appreciated, than where it is—right in the heart of London's East End. The complete installation has been designed and generously

(*Continued on page* 1190.)

NOTES AND NEWS.

(Continued from page 1189.)

presented to the hospital by the Igranic Electric Co., Ltd., in connection with the "Wireless for Hospitals Fund."

Transatlantic Tests.

DESPITE Captain West's rather gloomy prognostications to which I referred last week, the conditions for transatlantic relaying have never been so good as recently. The test via 5 X X at the beginning of the month was the most successful ever held.

A Radio Circle.

MUSIC played at Ciro's, London, was sent out from Daventry, picked up at Belfast-Maine, and sent on to New York (W J Z). From here it reached the Schenectady station (W G Y), and was picked up in England direct from that aerial. For all the long journey and many stages it came through perfectly, and was forwarded back to 2 L O on the landline at the same time as it was being relayed all over the United States. The engineers concerned exchanged telegraphic reports on the reception via Marconi wireless and the big station belonging to the Radio Corporation of America.

Mr. Donald Calthrop.

TO me it seems a great pity that Mr. Donald Calthrop has decided to leave the B.B.C. During the three months he has been broadcasting he has secured a hold upon listeners' affections, and certainly he introduced some delightfully light touches into the programmes and a little touch of informality that has been very pleasing.

Great as has been the success scored by Mr. Calthrop on the stage, I doubt if he ever gave more pleasure than when he read "Winnie-the-Pooh" to the microphone. And even if he doesn't come back to broadcasting, listeners will not forget Mr. Calthrop nor the standard he set.

New Antwerp Station.

ANTWERP is going to have a broadcasting station, and it is to be erected at the Zoo, of all places. It is expected that, in addition to programmes of its own, the new station will regularly relay from Brussels.

Colombo Station on the Air.

ONE of "P.W.'s" readers in Ceylon (who himself is a bit of a dab with H.F. amplification, and has on several occasions tuned in British stations) has kindly sent me details of the new broadcasting station at Colombo. The station is of normal "main" type, with a power of 1½ kw. and a wave-length of 800 metres. On the opening night it was picked up clearly in Calcutta.

This correspondent writes from a place called "The Sugar House." Isn't that a sweet name for an abode?

A Tribute to the Trinadyne.

WHEN Miss Mignon Nevada had finished singing those charming songs she gave us from the London station a Sunday or two ago, she happened to visit the home of a friend of mine who has a "P.W." Trinadyne and L.F. receiver. Having just come straight from the studio she listened critically and with great interest to the loud speaker. Then she turned to her host and exclaimed, "What a fine set you have! I often listen-in on my travels here and on the Continent, but this is the clearest and best reproduction I have heard."

Coming from Miss Mignon Nevada herself, I consider that constitutes one of the finest compliments that any receiver could receive!

An Old Friend.

A TUNBRIDGE WELLS reader has written to me inquiring who owns the call sign P C L L? He has picked up this station upon the short-waves, calling Z H C, and as this appears to be a Continental call, he wonders what is the range of his set.

I must confess I got something of a shock when he disclosed the nature of the set in question, for it was our old friend the "P.W." Super-Crystal set, that was finally resurrected and improved as far back as November 10th, 1923!

Our New York Correspondent's BROADCAST MESSAGES

Late Special News.

Mr. Corbett, our New York Correspondent, will broadcast special messages to "P.W." readers from W G B S (New York, 316 metres), 3 a.m., Jan. 29th; from W G Y (380 metres), 1 a.m., 30th; from Atlantic City (W H G, 300 metres), 3 a.m., 31st. It is possible that Mr. Corbett's talk from W G Y will be re-broadcast by the B.B.C.

"P.W." has made special arrangements for Mr. Corbett to broadcast messages at the above times, and our readers are cordially invited to listen for him and report their results to "P.W."

Diving Down to the Short Wave.

ON this occasion the secondary coil consisted of eight turns of wire (24 S.W.G.) and the reception was accomplished in broad daylight at between three and four in the afternoon.

It is very pleasing to find that "P.W.'s" old sets—the "Super-Crystal Set" was evolved long before the "Ultra" was thought of—are still going strong, and giving good results by diving down far below the wave-length levels for which they were designed.

An American Experience.

A FRIEND of mine who went over to Portland, Oregon, recently, has written me an interesting letter about radio in the States. In his own words: "I went out and bought a five-tube set, complete with loud speaker. It certainly does its duty by the last three amplifiers, but when I get it on distance—oh, boy, it just pulls them out of the ether. I've only had the set a week, and I've netted twenty-one stations upon the loud speaker."

Giving a Guarantee.

EXPLAINING that he has not yet examined the circuit arrangement, he says, "I bought the whole lot, absolutely new from a big store like Selfridge's, for about £14. This included the set, valves, a 6-volt 100-amp. battery, 90-volt H.T., aerial wire, insulators, ground wire, earth clip, and, last but not least, a definite guarantee. They delivered them, with the accumulator ready charged."

It certainly seems a bargain, and I like that guarantee idea, don't you?

British Beam Stations.

WORK on the new "beam" wireless stations is proceeding apace, and I understand that the Bodmin and Bridgwater stations are nearing completion. The masts have been erected, buildings completed, and a good deal of the apparatus installed.

Bodmin is to be the transmitting station for Canada and South Africa, whilst Bridgwater will do the receiving from Montreal and the South African station at Milnerton.

India and Australia, Too!

AT both of the British beam stations ten masts have been erected, five for each of the services. Each mast is nearly 300 ft. high, and has at the top a cross-arm 90 ft. in length. The aerials and reflectors will consist of *vertical* wires, suspended from triatics attached to the cross-arms.

In addition to those named, the Imperial chain will be strengthened by two other stations, at Grimsby and Skegness. These are for communication with stations at Poona, India, and Melbourne, Australia.

Television this Year?

ALTHOUGH we are in only the first month of this year, startling wireless claims are being made which, if substantiated, will put 1925 right in the shade. There is, for instance, the matter of television. How long will it be before we are looking-in, as well as listening-in? Then there are the successful experiments with telephony at the new Rugby station to be reckoned with. According to the last reports, the day is not far distant when any British 'phone subscriber, using the telephone already installed in office or home, will be able to chat with friends in America.

New Bergen Station.

MY recent inquiry about the new Bergen station brought me the interesting news that a Scottish reader has been receiving this station regularly since it started transmitting. He lives in Hawick, and tells me that the strength there is about equal to Oslo, but the quality is much inferior. The wave-length is exactly 362 metres.

This reader also receives Radio-Bern in daylight on three valves, but his best feat is the almost unbelievable one of picking up Oakland, California, on two valves. I hope that this is subsequently confirmed by the Oakland station, for signals from there would have to travel 3,000 miles over land, and then another 3,000 over the Atlantic. Six thousand miles on two valves must be something of a record, even for a "P.W." reader!

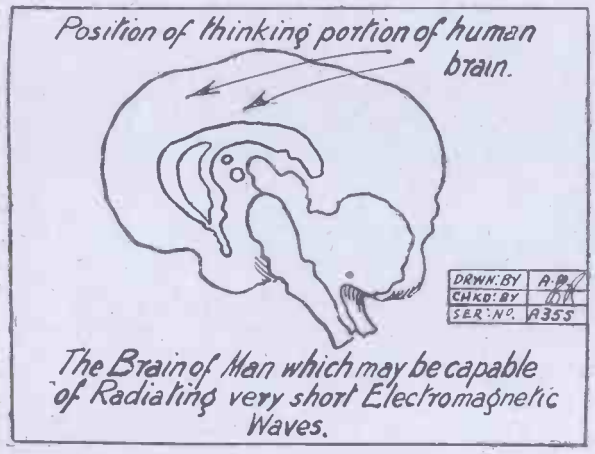
ARIEL.

The Human Body as a Radio Station

An article of general interest by G. H. DALY.

DOES the human brain radiate wireless waves similar to the waves radiated by a broadcasting station? Certain learned scientists have found that they can read other people's thoughts, and in return transmit their own thoughts; and the authenticity of their statements is beyond doubt even to the most sceptical mind.

The whole question hinges on that mysterious something which we allude to as our mind. Is this mind intimately connected with the equally mysterious ether of space? If so, do our thoughts create ether waves, and can these waves be detected like wireless waves? Many scientists are now inclined to think that the mind may be very closely connected with the ether.



The Brain of Man which may be capable of Radiating very short Electromagnetic Waves.

Conflicting Opinions.

It has long been known, for instance, that one mind can communicate with another in a very peculiar manner—this form of communication being known as telepathy or thought transference. Sir Oliver Lodge defines telepathy as the apparently direct action of one mind upon another by means unknown to science. That a thought or image, or impression, or emotion, he says, in the mind of one person can arouse a similar impression in the mind of another sufficiently sympathetic, is now proved.

If then we accept telepathy as proved, the point is—how is it done?

By a psychical process between mind and mind, says Sir Oliver Lodge; in other words spiritualism. There are no spirits, says Professor Richet, of the University of Paris, and telepathy is a case of subjective metaphysics, or, in plain language, it is caused by an unknown force which possesses an intelligent element. Hitherto, says this great physiologist and rationalist, scientists have devoted their attention to the observation of things that are without consciousness—without personality or will. The sun projects its rays without the slightest voluntary intention—without personality or choice. On the other hand, the forces which produce telepathy appear to possess an intelligent element.

It is rather terrifying to think, as Richet suggests, that there may exist a something which is capable of intelligent action, but so far this force, if it exists, has not attempted to govern mankind, as we, for instance, govern our domestic animals.

There is, however, another theory lately advanced, which states that telepathy is accomplished by ether waves set up by a physiological process in the brains of the individual holding telepathetic communication. In addition to this, and quite apart from telepathy, this theory states that every thought we think creates ether waves similar to light or wireless waves.

Four Theories Advanced.

The whole process of telepathy and psychic phenomena generally is due to the fact that man possesses what we call a mind, and of which we have very little absolute knowledge, despite the many famous works on pyschology, philosophy and kindred sciences.

The most inexplicable problem with regard to the mind is the latter's relation to the body. Are mind and body independent of each other, or vice-versa? Broadly speaking, there are four principal theories on this subject. (1). The soul theory or animism. (2). The separate existence theory. (3). The two aspect theory, and (4) the mechanistic theory.

To define them very briefly. Soul theorists believe that there is an independent mind in each body, but that mind and body work absolutely in conjunction with one another. Separate existence theorists also believe that mind and body are independent of each other but work separately along parallel lines, as it were; while the two aspect theorists assume the existence of a psycho-physical being which has two aspects—the psychic and the physical.

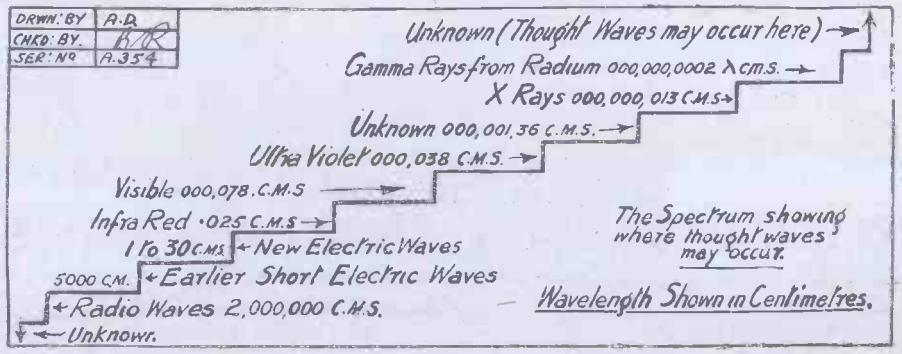
Electrical Action Probable.

The mechanistic is the fourth and last theory, and it is upon this theory that the ether theory of thoughts largely depends According to the mechanistic theory the mind has no separate existence, but as Professor A. Thomson expresses it, "is a direct product of the brain." Every thought we think, every feeling we experience, our memory, everything which we attribute to the mind, is merely the result of mechanical changes somewhere in the 9,200 million nerve cells which constitute the thinking part of our brain.

Our brain, like any other matter such as a brick, is composed of atoms arranged in certain combinations, and by this new theory, when a thought strikes us, these atoms are disturbed, and the new thoughts are merely re-arrangements of the said atoms. Inside the atoms are the electrons which take an active part in this re-arrangement, therefore the process is purely electrical, and sets up electro-magnetic waves in ether.

When, for instance, a current of electricity —which is really a flow of electrons from

(*Continued on page* 1192.)



THE HUMAN BODY AS A RADIO STATION.

(*Continued from page* 1191.)

atom to atom—lights the filament of a wireless valve, this flow of electrons *through* the filament creates ether waves, which we see as light or feel as heat waves. In the same way, when a thought strikes us and the atoms and electrons of our brain are disturbed—ether waves are also likely to be set up, states this theory.

It is well known, of course, that we cannot prove the existence of the ether; in fact, although broadcasting is very nearly perfect in many respects, no one knows exactly how the wireless waves travel through the ether to your receiver. And while the ether hypothesis is most probable, the Steinmetz theory, which dispenses with the ether of space, is by no means untenable. Nevertheless, we do know that wireless waves can be sent and received, and the same fact applies to telepathy.

The thoughts of one person can be transmitted to another whether separated by a yard or 10,000 miles, and there are many instances which point to the fact that telepathy is instantaneous, and therefore probably has the same speed as wireless or ether waves, namely 186,000 miles per second.

Ultra-high Frequencies.

Now if thoughts create ether waves, these waves must have a definite frequency, and it is possible that this frequency is so enormous that thought waves pass easily through the densest matter, and therefore we have been unable to detect them.

Whereabouts in the sprectrum are these waves likely to occur? At one end of the spectrum are radio waves having the longest wave-length and smallest frequency. Longer waves are unknown. Running into the radio waves are short electric waves, and still lower are those waves at present being investigated by Nichols, who claims to have isolated the hitherto unknown ether waves between the short electric and heat waves. The heat waves and infra-red rays come next with infinitely shorter wave-length, then visible light and ultra-violet light. After these there is an unexplored portion, and then comes X-rays and the gamma rays of radium, which are the shortest known.

The American, Dr. Millikan and the Frenchman Perrin have, however, advanced the theory that still smaller ether waves exist, having a wave-length of ·000000000001 of a metre. These waves have not as yet been isolated, and their existence must remain a mystery until some means of detecting them is found; but while it has been suggested that these may be the missing thought waves, it is more probable that thought waves, if they exist, come even lower down the spectrum.

Man's senses will only detect, directly, two kinds of ether waves, namely, light and heat waves; other ether waves can only be detected by artificial means. For instance, a mirror will stop light rays, but X-rays will pass through a mirror as if it did not exist, and require a thick lead screen to stop them. In the same way it is believed that thought waves will pass through a lead screen as the X-rays pass through a mirror.

But thought waves can already be detected, as happens in telepathy, and how are we to reconcile this fact with the possible existence of thought waves? Does there exist something in man's brain capable of detecting these ethereal thought waves in the same way as the eyes detect ethereal light waves?

While the phenomenon of telepathy can happen to anyone, mediums seem especially prone to this form of communication, and the question arises—is the brain of the medium different in any physical respect to that of a normal human being? Outwardly, at least, mediums do not appear to be on the same mental plane as the average human being, and Professor Richet has estimated that there is only one medium to every 20 millions of ordinary people. It is well known that there are certain parts of the brain the function of which is quite

Mr. Tom Clark, Asst. Editor of the "Melbourne Herald" broadcasting from 3 L O.

unknown, and which appear to be useless. In the case of the medium these idle portions may be further developed than in the ordinary person.

Sir Oliver Lodge has put forward the interesting suggestion that telepathy may be the germ of a new sense, something which the human race is, in the process of evolution, destined to receive in fuller measure. Perhaps the mind of the medium is more slightly advanced than the average mind, and so the former has the glimmering of the new sense.

On the other hand, Sir Oliver suggests that telepathy "may be the relic of a faculty possessed by our animal ancestors before speech was." In this case the average mind is more advanced than that of the medium.

Increased Mental Capacity.

Some years ago, Gernsback, one of America's more advanced thinkers, pointed out that when man lived in primitive state millions of years ago, it was necessary for his senses of sight, hearing, and smell to be very highly developed, for his life depended upon these senses. Nowadays the battle is more mental than physical, so it follows that man's mental capacity is being further developed while his senses are being retarded. Thus, man's mental machinery will grow infinitely greater than it is to-day. (H. G. Wells fully appreciated this fact when he gave the Martians enormous heads in his "War of the Worlds.") And it may happen that telepathy is the forerunner of super intelligence to come.

It has already been proved by Di Fruzzo and Charpentie that concentrated thinking will produce slig' t external fluorescence on a suitably excited X-ray screen—and this would tend to prove that thoughts are of an electrical nature, and should be capable of detection somehow, probably by means of the thermionic valve, which is the most sensitive detector of ether waves in existence.

Future Powers?

The proven fact of telepathy would appear in itself to indicate that we have within us a "force capable of exciting the mind of another person hundreds or even thousands of miles away." So what more likely than that this force is another instance of ether vibrations like X-rays, light, or wireless waves—and once we can isolate and control these waves, what new wonders will be revealed, what new powers harnessed to the needs of mankind?

POINTS WORTH REMEMBERING.

THE three properties most frequently encountered in radio work are undoubtedly inductance, capacity and resistance, and it is curious that these three bear a distinct resemblance to each other from a mathematical point of view.

For instance, in order to calculate the sum of several inductances in series the individual values are merely added together, while to discover the combined inductances of paralleled inductances the reciprocal of their individual values added together equal the reciprocal of the resultant value of inductance. The reciprocal of a value is that value divided into 1. The reciprocal of 4 is therefore $\frac{1}{4}$.

Rule Reversed for Capacity.

The foregoing rules apply exactly to resistance. If the resistance or inductance of three separate items is 2, 4, and 6 ohms or henries, as the case may be, in series the result will be 12 ohms or henries, and in parallel $1\frac{1}{11}$ ohms or henries.

With capacity the rule is reversed. Capacities in parallel add together in a straightforward manner, but capacities in series must be treated in the way that resistances and inductances in parallel are dealt with, and the reciprocal of individual capacities added together gives the reciprocal of the resulting combined capacity.

The resulting resistance of any number of resistances in parallel, or the resulting inductance of inductances in parallel, or the resulting capacity of any number of capacities in *series* will always be less than that of the smallest individual value.

An Interesting New Circuit

An article by
M. C. PICKARD
which will appeal to all amateurs interested in "one-valvers."

THE circuit which it is my purpose to describe in this article is one which should make a wide appeal to all wireless amateurs. There have, from time to time, been invented so many single-valve circuits using all manner of weird and wonderful arrangements of components, and for whose sensitivity and volume claims were made which were, to say the least of it, so remarkable that the experimenter is tempted to look upon anything

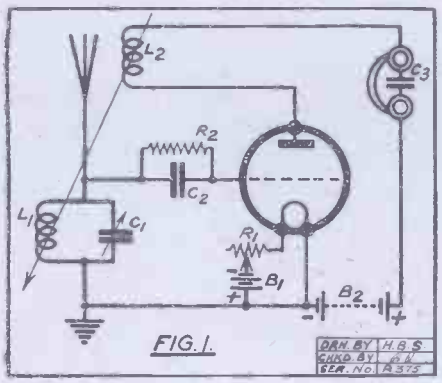


FIG. 1.

in the way of new single-valve circuits with distrust, and it is only with misgivings that one introduces anything fresh in this direction. The circuit which forms the subject of this article is, however, so extraordinarily efficient that the writer believes that it should become very popular.

Difficult Reaction Control.

Fig. 1 illustrates the ordinary single valve with reaction circuit, where L_1C_1 is the aerial tuner, R_2C_2 the grid leak and condenser, and L_2 the reaction coil. The action of this circuit is too well known to need any description here.

Its chief fault lies in the control—or lack of control—of reaction. The experimenter will have noticed that the change from non-oscillation to oscillation is sudden, even when a vernier adjustment is attached to the coil holder. The set bursts into oscillation with a plock which, of course, means that for distant stations a critical adjustment cannot be obtained, and the set cannot be worked in its most sensitive condition. This is really a more serious fault than many imagine, for if the set could be worked absolutely on the verge of oscillation the range would be enormously increased, and stations which were entirely missing before would come in at good strength in the telephones. Most of the super circuits which have been evolved owe their functioning to some refinement whereby they can work nearer the point of oscillation.

There are two other faults from which the Fig. 1 circuit suffers, though these are of a general rather than a technical nature. Firstly, "hand capacity" effects are very marked when adjusting the reaction coil; and, secondly, the variably-coupled coils are unwieldy things to mount in a cabinet, no matter what form they take.

Critical Adjustments Possible.

The circuit which this article purposes to describe suffers from none of these faults. Firstly, it is capable of a far more critical adjustment of reaction which gives it a really wonderful range and volume; and, secondly, it is neat and unobtrusive, and hand-capacity effects are, provided certain precautionary measures are taken, particularly conspicuous by their absence.

There is another rather important point in favour of this circuit, and that is that as the aerial coil is not coupled to any other coil, special arrangements of the tuner can be used to ensure selectivity and a minimum of losses. The circuit is illustrated in Fig. 2; its functioning is as follows. Oscillations from the aerial are impressed on the grid of V by the action of L_1C_1,

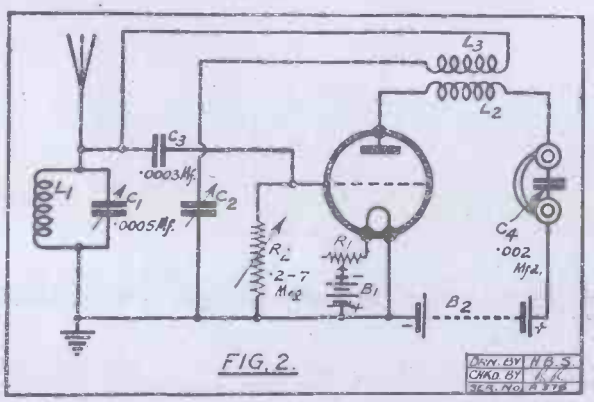


FIG. 2.

and, due to the action of the leak R_2 and the condenser C_3, the valve rectifies them in the ordinary way. High-frequency impulses are also amplified by the valve, and pass through L_2, the primary of the H.F. transformer L_2L_3.

The Regeneration Condenser.

This gives rise to induced currents in the secondary L_3, which are fed back to the grid circuit of the valve via the reaction condenser C_2. By varying the value of this condenser the amount of high-frequency energy fed back can be very delicately controlled.

The experienced experimenter will readily appreciate the resemblance which this circuit bears to the well-known Neutrodyne circuit, the difference being that the connections to the secondary of the transformer are reversed, so that the arrangement will give positive reaction, and not negative reaction, as in the case of the Neutrodyne. For this reason, if the set will not oscillate, it will be found necessary to reverse the connections to L_3.

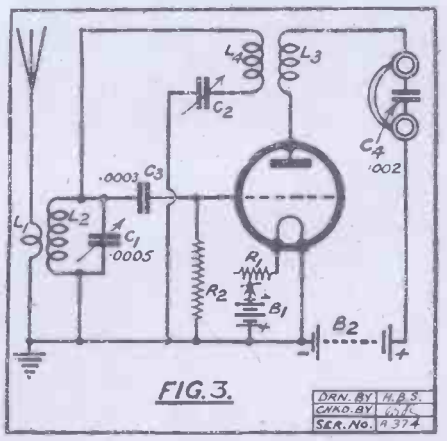


FIG. 3.

Smooth Action Necessary.

The condenser C_2 is a vernier, but one of the conventional type with flat vanes is not recommended. One of the tubular type, such as the "Polar," is ideal, as it is capable of very fine adjustment, and is so designed that the effect of hand-capacity is reduced to a minimum. It will be observed that this condenser is shown connected in the low potential lead; if the moving half-cylinder is connected to earth, it will be found that the effect of hand-capacity is entirely eliminated.

(*Continued on page* 1194.)

IMITATION EBONITE.

By T. P. MIDDLETON.

PROBABLY the greatest expense that is incurred by the wireless experimenter is entailed by the use of ebonite. Other articles such as low frequency transformers necessitate an outlay, originally greater; but these serve over and over again, whereas once a sheet of ebonite is drilled it is useless, except for scrap for making up small parts. The author has tried all sorts of materials and means for stopping up such holes, but has found that all are tedious and none is really satisfactory.

Wood, 3-ply and otherwise, is often suggested as a substitute for ebonite for use as panels, but when mounted in a cabinet, this has a crude and somewhat unfinished appearance. In fact, the eye has become so accustomed to the appearance of the ordinary ebonite panel that the average person often resents those made of mahoganite and similar coloured insulating materials.

Few Ingredients Required.

Fortunately, however, it is quite easy to treat the wood so that at a short distance it is indistinguishable from ebonite. The tools and materials required are few, viz: some plaster of Paris, some shellac varnish, a bottle of Radium jet black stain, a cabinet scraper, and some glasspaper (No. 00). The plaster of Paris should be fine and free from grit such as that sold for dental use by Messrs. T. C. Lindsey & Co. of Leather Lane, E.C., but ordinary plaster will do if it is carefully sifted through fine muslin.

Any good shellac varnish will do, but the author prefers to make his own by dissolving shellac in methylated spirit, as thus he is certain that it contains no resin, a common ingredient in ordinary shellac varnish. The shellac is well covered with the spirit, and is thoroughly shaken from time to time until dissolved.

The Radium jet black stain is sold in leather shops as a leather stain, and is apparently aniline black dissolved in some aniline derivative. The scraper can be bought for a few pence at any tool shop; as, of course, can be procured the 00 glasspaper. The scraper is sharpened by being held in the vice and the edge rubbed back and forth with a round steel rod such as the shank of a screw-driver.

Preparing the Wood.

Now for the panel; a piece of three, four, or other ply wood is procured of the desired size, and one side should be as free from knots and other blemishes as possible. This side is made smooth by using the glasspaper, and if necessary the scraper. Some plaster is then mixed with water to a thick paste, and is rubbed all over the surface back and forth, and especially across the grain. Use it liberally, and don't attempt to get it smooth; and allow to dry. When dry and hard, scrape off the superfluous plaster and rub down with the glasspaper, and it will be found that the pores of the wood have been so filled up that the surface is quite even. If the wood is very rough another application may be given, but this should not be necessary.

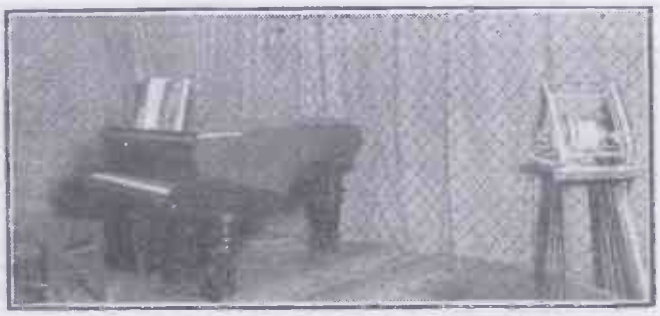
The Finishing Touches.

A rag is then taken and moistened with the black stain, and the whole surface well covered with the stain till it appears an even black. When dry, it is varnished with shellac varnish diluted with about an equal part of the black stain. It is then allowed to dry, and is rubbed down to remove the gloss and make it even, and is finally polished with a rag moistened with a drop or two of linseed oil mixed with a little black stain. The process is not long or tedious, and results in a very handsome finish.

And now for a few hints as to the best way to use such panels. (1.) To title the panel with transfers. Cut out the transfer, remove the stiff backing, and brush on to the face a thin layer of very dilute shellac varnish, leave till tacky, then apply to the panel, and press well down. After about ten minutes the title can be moistened with warm water, and the thin backing removed. (2.) Bush the panel with ebonite bushes for the terminals. For these it will be necessary to bore $\frac{3}{8}$ in. holes. One flanged bush and one flat disc are recommended.

To bore large holes in wood, say $\frac{3}{8}$ in. holes and upwards, no tool makes such a clean hole as a suitable sized centre-bit. A pilot hole is drilled with a small drill, e.g. a No. 34 Morse (tapping 4 B.A.) through the centre to take the spike of the bit. The hole is then bored half-way through from one side, and then the panel turned over, and the hole finished from the other. (3.) Mount condensers by first affixing to small pieces of ebonite by their one hole fixing nuts or otherwise, and then screw the ebonite on to the wood panel with small wood screws. It will be necessary to bore large clearing holes in some cases.

It is unnecessary to give further details as to mounting components, etc., on such ebonised panels, as experimenters will naturally use their own ingenuity, modifying the process to suit their own needs and conditions.



A corner of the studio at the Riga broadcasting station.

AN INTERESTING NEW CIRCUIT.

(*Continued from page* 1193.)

The coils L_2L_3 may conveniently take the form of an ordinary plug-in transformer, one whose coils each have seventy turns or so will be excellent. The variable grid leak shown is a very useful refinement, as a super-vernier reaction control can be obtained by its use. The reaction increases as the value of the leak is increased, and conversely as the leak is decreased in value the reaction will decrease. The plunger of the instrument should be connected to earth, so that the effect of hand-capacity will be again reduced.

The circuit is naturally selective by virtue of the high degree of reaction used, but a really super-selective arrangement is shown in Fig. 3.

This circuit differs from the preceding one in the tuning arrangement of the aerial. L_1 is an aperiodic coil of fifteen turns of No. 16 S.W.G., D.C.C. copper wire, wound directly on the top of the coil L_2, which consists of seventy turns of No. 18 gauge wire wound on a former three inches in diameter. A tapping is taken, as shown, from the fiftieth turn. This circuit is very selective, though not quite so sensitive as the one illustrated in Fig. 2. This is easily remedied at the expense of a little of its selectivity by winding L_1 to twenty-five or thirty turns.

It is, of course, quite possible to add L.F. amplifiers to either of these circuits; the Fig. 2 circuit, with one L.F. valve added, is illustrated in Fig. 4. This circuit will give excellent loud-speaker results up to twenty-five miles or so from a broadcasting station, whilst the range on telephones will be very much greater, its actual extent depending greatly upon the atmospheric conditions.

In conclusion, readers should be patient when using this circuit for the first time. Both reaction and aerial condensers must be varied at the same time, but the set is not difficult to handle.

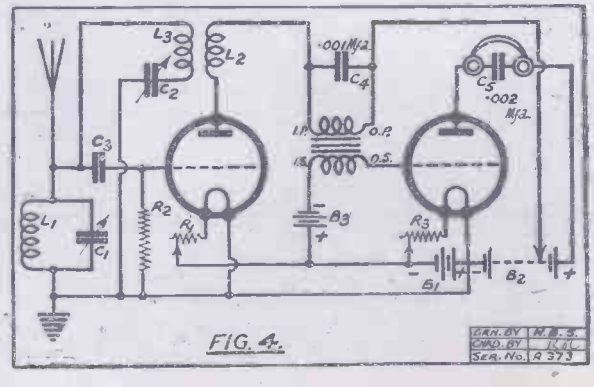


FIG. 4.

HARD CIRCUITS MADE EASY.

By C. E. FIELD, B.Sc.
(*Staff Consultant "Popular Wireless."*)

III.—The Unidyne Circuit.

THE articles that have been written from time to time dealing with noises in valve receiving sets can be counted in their hundreds.

Yet it is probably no exaggeration to say that in every one of these one of the most likely causes of trouble is stated to be the *high-tension battery.*

Many very compact portable sets have been designed employing one or two valves. In such receivers nearly half of the total space and weight may be taken up by the *high-tension battery.*

The man who constructs a single-valve receiver often does so because he is unable to afford one employing two valves. Yet he may spend ten shillings every six months or so on a *high-tension battery.*

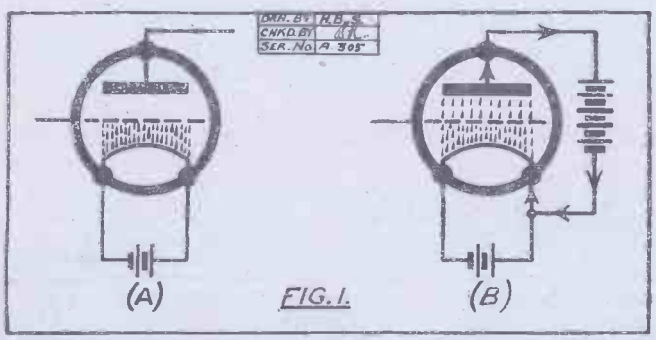


FIG. 1.

Valves very seldom die a natural death. If they are not dropped and the filaments shattered, they are wrongly inserted in their sockets, or otherwise inadvertently connected with their filaments subjected to the voltage of the *high-tension battery.*

No more need be said to emphasise the advantages of a circuit such as the Unidyne, which employs *no high-tension battery.*

How a Valve Works.

In order to understand how a circuit can operate without a high-tension battery, let us first consider in detail the working of a thermionic valve.

A valve contains three electrodes, the first of which is a piece of thin tungsten wire, known as the filament. The second, which is removed from it by about an eighth of an inch, is a sheet of metal, usually formed into a cylinder or a kind of cowl, surrounding the filament, and is known as the plate or anode. Between these two electrodes is a spiral or zig-zag of wire which is called the grid.

Let us look first at the action of the filament. When this is heated by means of the low-tension battery, the negative electrons of which it is composed vibrate violently backwards and forwards. The higher the temperature attained by the filament, the more rapidly do the electrons vibrate, until at length they rush about so violently that many of them are shot off the filament and fall on to any body in the immediate neighbourhood. Under these conditions the filament is very like a fountain, and the electrons can be imagined to be in the form of a fine spray. As some of them are shot off much faster than others, they travel farther, so that the spray is much more dense near to the filament than at a short distance away. In Fig. 1 (a) is shown a diagrammatic view of a valve with the filament lit, but no connection made to the other electrodes.

Now let us see what happens if we connect up another battery between the filament and the plate, the latter being joined to its positive terminal. Since the electrons from the filament are negatively charged, they will be attracted to the positively charged plate, just like iron filings to a magnet, and so, instead of spreading out in all directions, a large number of them will pass straight through the valve in an orderly stream. Having arrived at the plate, they will pass into the battery, and so a current will flow in the plate circuit of the valve.

The size of the current will depend largely upon the value of the positive voltage applied to the plate, or, in other words, upon the voltage of the high-tension battery. All of the electrons, however, do not reach the plate, so that the spray is still thickest near to the filament, and we can imagine the conditions inside the valve to be as represented in Fig. 1 (b).

If, now, we apply a positive voltage to the grid of the valve, it will help to draw away from the filament many of those electrons which were only shot off for a short distance, and will give them a help on towards the plate and so increase the plate current. A negative grid voltage, however, would drive many of the electrons back to the filament, and so reduce the plate current.

A Simple Explanation.

A varying grid potential such as is produced by incoming signals will therefore give rise to a varying plate current, and it is the magnitude of these current variations which determines the signal strength of the valve output.

It is obvious, however, that very large variations cannot be obtained in a very small current, so it is necessary to have a high initial plate current if we desire to obtain strong signals. This may be brought about by attracting the electrons strongly with a very high plate voltage. There is another method, however, of obtaining a large plate current which makes the use of a high plate voltage unnecessary. In order to understand how this can be brought about, let us follow the fortunes of a single electron when it is shot off from the valve filament. When it first starts on its journey, the electron will find itself confronted by a dense swarm of others in the same plight as itself. Now all these, like itself, are negatively charged, and so will act in opposition to the positively charged plate, and tend to force it back again to the filament. If our electron is shot off with sufficient velocity, it will overcome the repulsion of those around it and travel on to the plate; otherwise it will be driven back whence it started.

The Essential Factor.

It is evident, then, that if we could by some means counteract the negative charge of the electrons near the filament, we would provide such an easy path to the plate that very little positive plate voltage would be required. This is accomplished in high-tensionless circuits of the Unidyne type in this way.

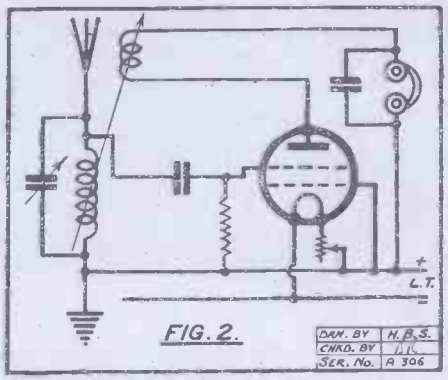


FIG. 2.

A valve is employed in which there is an extra electrode, in the form of a second grid, which is placed between the ordinary

(*Continued on page* 1196.)

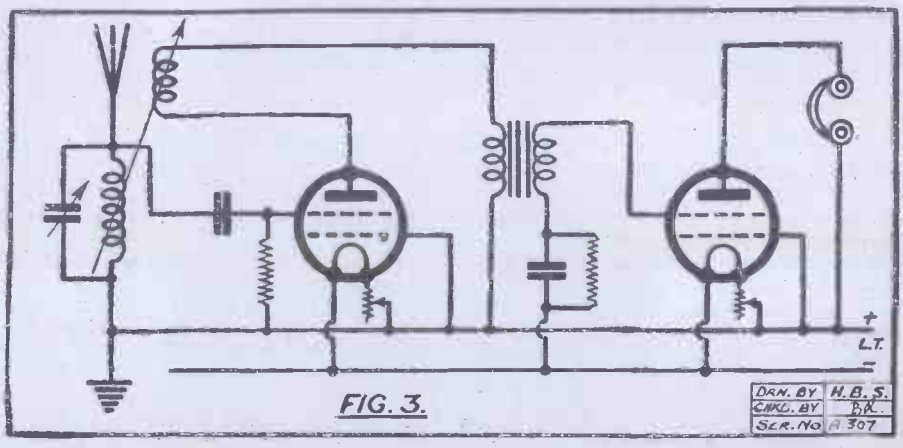


FIG. 3.

REVERBERATION AND THE LOUD SPEAKER.

By A. J. BOYINGTON.

Not only the efficiency of a receiver and the quality of a loud speaker must be studied if perfect reproduction is to be obtained, there is, as our contributor points out, other factors that should be taken into consideration.

AS will be known by probably everyone who reads this article, some very curious effects are produced by talking in an empty theatre or concert hall. In a smaller degree, the same effects obtain in an empty house—empty, that is, of carpets and furniture—the most noticeable being that if one speaks at all loudly a confused echoing din is aroused.

The impression usually created is that unless the speaker employs quite a low tone his words are apt to be drowned by their own echoes—which, paradoxical though it may seem, is exactly what occurs.

But, fill the empty theatre with an audience, or the empty house with its due measure of furniture, and a remarkable difference is evident. We are no longer annoyed by the weird echo effects, since they are reduced to the amount with which custom has familiarised us; in a word, the acoustic conditions have become normal.

Vocal "Heterodyning."

This example will serve to demonstrate the fact that the nature of the environment in which a sound is produced has a very considerable effect upon the way we receive the sound, and may, indeed, so modify it as to make it practically unrecognisable. The actual amount of reverberation which takes place is a most important matter in the designing of theatres, lecture halls, churches, and other public buildings, so that acoustic experts are nowadays almost a profession to themselves.

In a room having very pronounced echo effects the sound of a person speaking may become, as we have seen, very blurred and indistinct. This is because what is termed the "rate of decay" of sounds in that room is very slow. The sound of each syllable is prolonged by reverberation to such an extent that it has not died away sufficiently to permit the following syllable to be properly heard when enunciated; the two mingle and the confused sound resulting is a sort of vocal "heterodyning."

"Unnatural" Effects.

By draping the walls, floor, and ceiling of a room with non-reflecting material this reverberation can, of course, be greatly reduced. Carried to the extreme of eliminating *all* reverberation, speech and music are damped down to an unpleasant extent. The customary resonance and continuity is absent from music, while speech under these conditions is accompanied by a sense of effort, as in outdoor speaking.

Conditions approaching these are considered necessary in the broadcasting studio. Every listener will have appreciated the difference—occasionally so obvious—between an item broadcast from the studio and a following one broadcast, say, from one of the theatres or churches. In the former case, speech is naturally reproduced, because the amount of reverberation transmitted is no more than we are accustomed to in our own homes. In the latter case, however, there is frequently a sensation of emptiness or loftiness; a somewhat chilled feeling is aroused by the unaccustomed echo, and is not altogether dispersed even when answering applause has demonstrated the presence of an audience.

It is evident, then, that the ear will reject as "unnatural" anything except the approximate degree of reverberation to which it is accustomed, and a study of the same property in connection with loud speakers is well repaid by the enhanced control over the quality of the reproduction which is thereby gained.

Given a reasonably distortionless detector, followed by well-arranged amplification stages, and the whole efficiently handled, it is safe to say that the placing of the loud speaker in the room, and the nature of the room itself, are the supreme factors in deciding whether or not the reproduction shall possess that pleasing quality of naturalness which everyone desires.

It is impossible to lay down any hard and fast rules in this connection. The problem presents an interesting field of experiment for the amateur, and I would urge all who are striving towards the goal of national reproduction to break away from the conventional "loud-speaker-on-top-of-cabinet" attitude. More often than not the best position for the instrument is found right away from the receiver, and for that reason I never favour sets which have a built-in loud speaker.

The most natural reproduction I ever heard was in—of all places—a wireless dealer's shop! The instrument—one of the "baby" type—was suspended from the ceiling face downwards over one of those opal reflecting bowls familiarly used with electric light. A similar expedient tried at home proved disappointing; evidently the acoustics of the room and of the shop were dissimilar.

Various positions will doubtless suggest themselves to our readers; however, experiment alone can decide whether any particular arrangement is best for a given room, and trial should be made of all the possibilities. The improvement in tone and naturalness which may be obtained in this way is often quite surprising, and one can only wonder at the scant attention given to this point by the majority of loud-speaker users.

A section of the transmitting apparatus at the Riga broadcasting station.

HARD CIRCUITS MADE EASY.

(*Continued from page* 1195.)

grid and the filament, and is connected to the positive terminal of the low-tension battery.

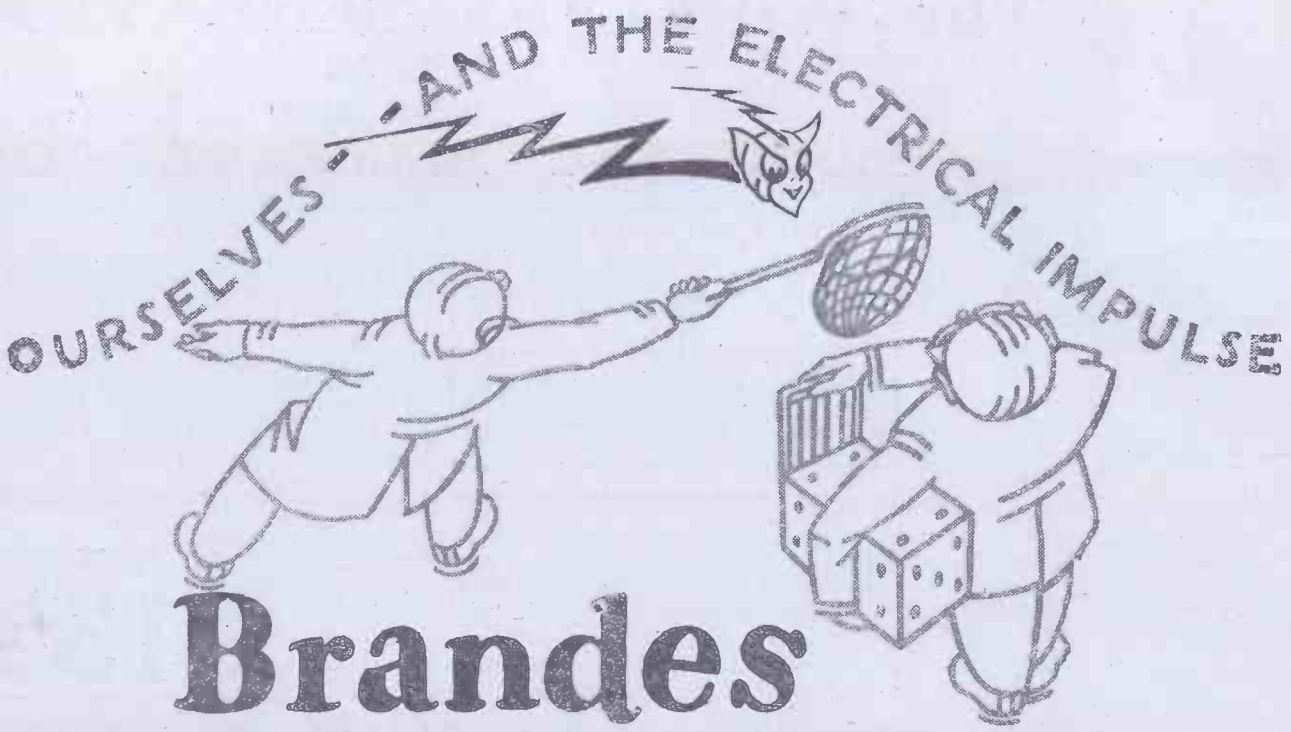
Thus we have, close to the filament, a positively charged body to counteract the effect of the crowd of negative electrons in the neighbourhood, with the result that there is an easy path from the filament to the plate, and no high-tension battery is necessary.

By connecting the rheostat in the positive filament lead, and joining the plate through a reaction coil and the telephones in the usual way to the positive low-tension terminal, the voltage on the plate is made four to six volts above that of the negative end of the filament, and a trifle above that of the positive end, the amount depending upon the voltage reduction which takes place in the rheostat.

The single-valve Unidyne circuit is connected in this way, as shown in Fig. 2, and is an extremely efficient circuit which is delightful to operate. A variable grid leak is advisable in all circuits of this type, as it provides a means for fine adjustment of the degree of reaction employed. It is very important that losses should be reduced to a minimum, and, in particular, very low capacity tuning coils should be employed.

Fig. 3 shows a two-valve set consisting of a detector and note magnifier employing four-electrode valves and no high-tension battery. On account of the efficiency of the Unidyne single-valve circuit for long-range reception, the arrangement given in Fig. 3 provides an excellent circuit for all-round work, and can be thoroughly recommended.

The Unidyne principle can also be applied to reflex and multi-valve sets, and the results obtained are in every way satisfactory.



Brandes

"HULLO! What do you fellows want me for now?"

"Come along, you young imp. Our laboratory experts want a word with you?"

"Shades of Geneva! They want my advice again. Still, take the net and cage away, and I'm with you. You Brandes people have a little more understanding than most; you consult me with due humility. Others, without any knowledge of what I demand, force me to speak. I become refractory; their instruments reproducing radio sound talk less naturally in consequence. You know, they really ought to study me a little more. Here I am, at the beck and call of every soul interested in radio, from a high power station to myriads of embryo Senatore Marconis. I recommend a study of radio acoustics, which means the study of transforming myself, the electrical impulse, into audible sound. I, being the electrical energy, walk right into the receiver of Tom, Dick or Harry, carrying the voice from the studio. To be able to talk just as naturally as the people in that studio I must have the correct scientific elements built into the instrument which reproduces the sound. You chaps have been the only radio builders to consult me to that end. I know you've worried me for seventeen years, but I appreciate the tactful consideration which went with it. I hope you have benefited by my advice; by what I hear of Brandes instruments, you have. Well, lead on to the laboratory, gentlemen; I have an appointment at 2 LO after lunch."

MATCHED TONE HEADPHONES.
The synchronised effort of both receivers discovers greater sensitivity and volume and truer tone. Light, comfortable & sturdy.

THE TABLE-TALKER.
Material used in the construction of goose neck horn eliminates metallic harshness. Adjustable. Height 18 ins., neutral brown finish, padded base.

THE BRANDOLA.
Greater volume with minimum current input. Large diaphragm gives fulness to upper and lower registers. Walnut plinth, electro-plated fittings.

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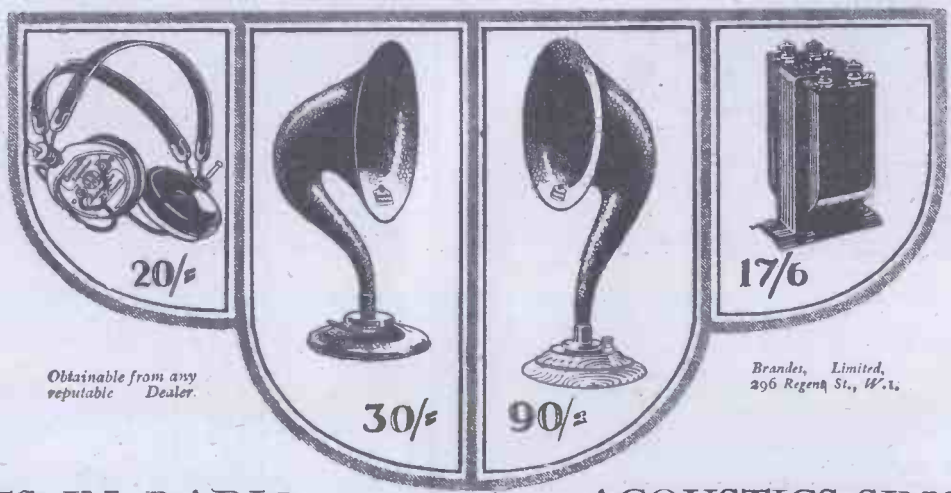
Ratio 1 to 5. High amplification of applied voltage, together with straight line amplification frequency curve.



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EXPERTS IN RADIO ACOUSTICS SINCE 1908

84/239

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The correct grid leak for a valve

makes all the difference to the results obtained from your receivers. Consider the Watmel Variable Grid Leak. Not only does it allow you to apply the exactly correct grid leak value to your detector valve, but by virtue of its ingenious construction ensures that value being *maintained*. And then the Watmel Fixed Condensers—built in a different way to eliminate edge losses, no wax is used in their construction. Mica sheets securely clamped between the plates render it impossible for the capacity to vary. One hole fixing is provided. And now they are sold at *reduced prices* — made possible by our greatly increased production.

—and the best possible condenser

Grid Leak (Black Knob) ·5 to 5 megohms **2/6**

Anode Resistance (Red Knob) 50,000 to 100,000 ohms **3/6**

10,000 to 50,000 ohms (Green Knob) **3/6**

THE **WatMel** WIRELESS CO., LTD.,
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Fixed Condensers ·00005 to ·002, 2/-, reduced from 2/6.
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Combined Grid Leak and Condenser, 2/6, reduced from 3/-.
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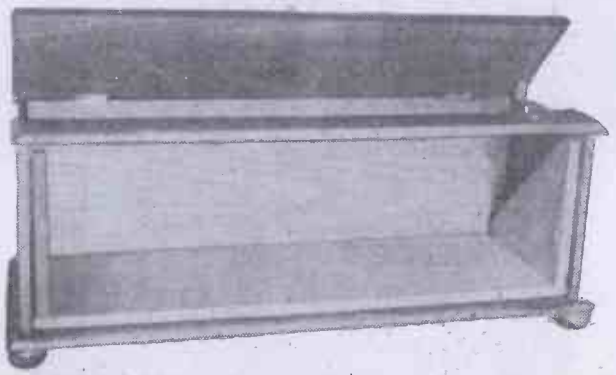
CAXTON 4-VALVE CABINET

Made for Editor of Wireless Magazine for Set "As good as money can buy" described in issue February, 1925.



Cash with Order. Fumed Oak ... **£1 5 0**

or Real Mahogany polished **£1 14 0**

With detachable recess fitted Base Board to mount 21 in. by 7 in. panel to slide out of Cabinet front.

Extra 10/- with two beaded front doors totally enclosing fitted panel.

Cabinet overall length 22½ ins. Width 8½ ins. Height 9 ins.

Polished with the new enamel that gives a glass hard surface that cannot be soiled or scratched.

SENT FREE.—Catalogue of standard Wireless Cabinets in various sizes and woods. Special Cabinets made to customer's orders.

PACKED AND DELIVERED FREE IN U.K.

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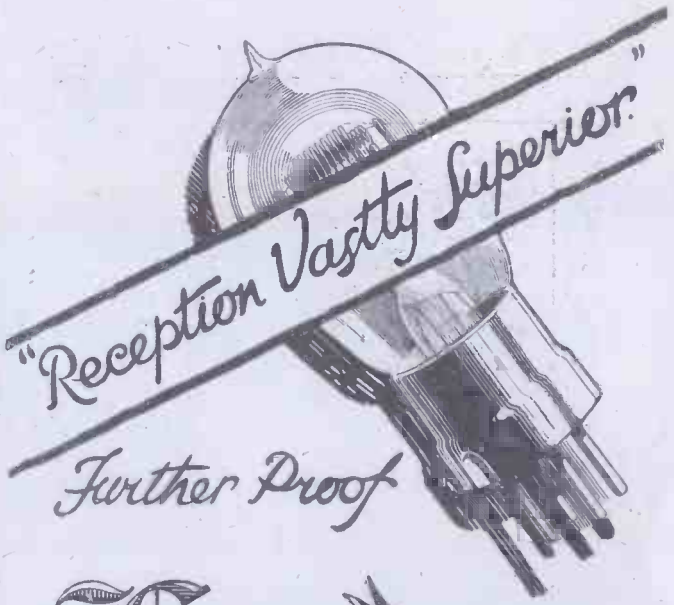


Louden VALVES

BRIGHT EMITTERS 4/6

Filament Volts	4·5 to 5.
Filament Amps.	0·4
Anode Volts	40 to 80.

Made in two types.

F1 (Plain Louden) for Detection and L.F. Amplification

F2 (Blue Louden) for H.F. Amplification.

DULL EMITTERS 8/- and 9/-

	(4-VOLT.)	(6-VOLT.)
Filament Amps.	0·1.	
Anode Volts	40 to 80.	

Each made in two types
FER 1 for Detection and L.F. Amplification.
FER 2 for H.F. Amplification.

N.B.—These valves consume only one-seventh of the current taken by ordinary bright emitters. They will work straight off a 4-v. or 6-v. accumulator without alterations to filament resistances or set. **When ordering please state clearly the type and voltage required.**

All Fellows apparatus can be inspected and purchased at 20, Store Street, Tottenham Court Road, W.C., and 34, Bridlesmith Gate, Nottingham.

READ THIS.

Messrs. Fellows Magneto Co., Ltd. *December 1st*, 1925.

Dear Sirs,

It may interest you to know that the 18/- by means of which I have been able to purchase another pair of your wonderful valves was saved in three months (through reduced expense for charging accumulators) by the first pair of Louden Valves which I began to use at the end of August last.

In addition to this we have greatly increased the hours during which we use our set, and reception has been vastly superior to that obtained from valves of any other make that we have tried.

Until your advertisement brought "Louden" dull emitters into our home, we did not know the capacity of our set or the perfection of broadcasting as we now know it, thanks to you.

Yours faithfully,
H. C. (Bromley). Dec. 1925.

Now fill in the coupon below and you will enjoy reception similar to that described. Have you our 40 pp. illustrated catalogue? It is FREE.

To THE FELLOWS MAGNETO CO., LTD.
CUMBERLAND AVENUE, PARK ROYAL, WILLESDEN, N.W.10

Name.....

Address .....

.....

Herewith Remittance Value.....

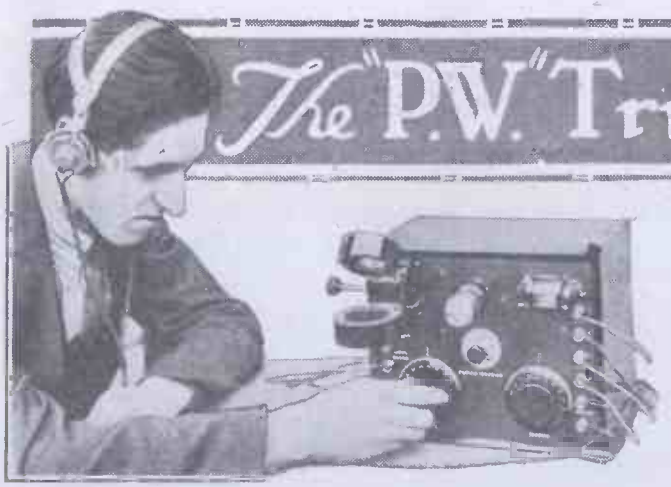
Please forward me.....*Louden Valve(s) Type*.....

on conditions as per your advertisement.

Please write clearly in Block Letters, enclose postage (4d. for each valve), and register Cash or Treasury Notes.

P.W. 23/1/26. E.P.S.74.

The "P.W." Trinadyne 1 Valver

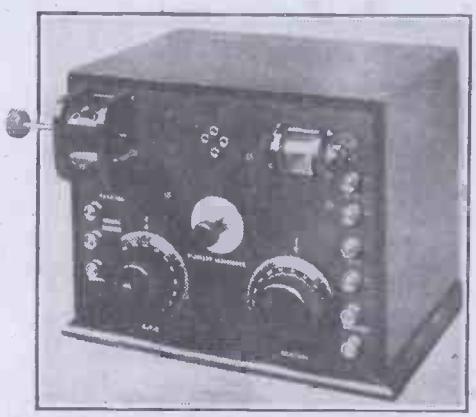


The Set designed and described by
P. R. BIRD
(Assistant Technical Editor).

Constructional work by
G. V. COLLE and C. A. MEADOWS
(Technical Staff).

THIS receiver has been designed on an easy-to-make basis and, as will be seen from the photographs, employs a flat panel upon which are mounted all the components. The circuit employed is one that is especially well known to readers of POPULAR WIRELESS, for it was in this journal that it first achieved publicity.

The circuit arrangement is due to Mr. J. English, and since it was introduced to the public in the pages of "P.W.," it has attained an astonishing success, and made a great reputation as an exceptionally economical receiver. Whilst the receiver is capable of very good long distance results, it has reached its enormous popularity chiefly owing to its success as a powerful reproducer of signals from the local station. Although only one valve is employed it is, under good conditions, quite capable of working a small loud speaker. Moreover, the signals are uncommonly clear and free from any form of distortion, probably due to the fact that a crystal is employed as rectifier.



A view of the complete Trinadyne one-valver.

LIST OF COMPONENTS.

1 Panel, 10 x 8 x ¼ in., with cabinet (Peto-Scott)	13	6
1 Lamplugh low-loss ·0005 variable condenser	17	6
1 Wates' "K" type ·0005 variable condenser	11	6
1 Yesly 2-way coil holder	7	6
1 Lissen H.F. choke	10	0
1 F.A.R. L.F. transformer	15	0
1 Mick-Met. crystal detector	4	6
1 Precision rheostat	3	0
1 Watmel fixed condenser (·0003)	2	6
4 Flush-mounting valve sockets (Peto-Scott)		6
9 W.O. type terminals	1	1½
Wire, screws, transfers, etc.	2	6

Series-Parallel Tuning.

Referring to the theoretical diagram of the circuit which appears upon this page it will be seen that superficially the connections resemble those of a crystal detector with an L.F. amplifier. This similarity is, however, rather misleading because the behaviour of the circuit is very different from the simpler and well-known "hook-up," and results are enormously louder.

It will be seen that the two-aerial-terminal system of tuning is employed, which allows the variable condenser that tunes the aerial circuit to be placed either in series or in parallel with the aerial tuning coil, as desired. The former arrangement is generally better when receiving stations which transmit upon a wave-length of 400 metres or less, whilst the latter is generally employed for the higher B.B.C. stations, and invariably when it is desired to receive 5 X X.

Better than Reflex.

Despite the fact that the circuit has a crystal detector arranged across the aerial tuning inductance, its action is very much akin to that of an ordinary reflex receiver, where the crystal detector and the primary of the L.F. transformer are joined in series across a tuned anode circuit, or across the secondary of an H.F. transformer. One of the great disadvantages of the usual arrangement is the fact that the crystal, being in the plate circuit of the valve, is easily upset and thrown out of adjustment, owing to the comparatively heavy currents flowing in that circuit. Probably one of the chief reasons for the popularity of the Trinadyne is this fact of the comparative success of the crystal detector, when, removed from the plate circuit of the valve, it is placed, as shown, across the aerial tuning inductance.

The action of the circuit would appear to be rather involved, partaking, as it does, of some of the characteristics of two entirely different circuit arrangements. Nevertheless, the receiver is extremely easy to operate, and it is probable that this simplicity of control is another factor in the great success it has scored in comparison with the ordinary one-valve Reflex set, which also employs one valve and a crystal detector. There is a good deal of the super circuit in the behaviour of the Trinadyne, and, like most circuits of this nature, it will probably be found that, when operating upon the long wave-lengths round about 1,600 metres, some of the characteristics of the circuit are unavoidably lost; and the receiver, therefore, is generally at its best when working upon the short waves used by the main and relay stations of the B.B.C.

The H.F. Choke.

Readers who tried the original Trinadyne circuit will notice that in this model several modifications have been introduced. The most important is the introduction of an H.F. choke in the grid circuit of the valve. It was found that without this choke there was a tendency for the H.F. impulses flowing in the tuned aerial circuit to escape to earth. The connection of the small fixed condenser between the aerial terminal and grid of the valve afforded a partial path of escape which was completed by the self capacity of the L.F. transformer that is connected to earth. The introduction of the choke between the grid and O.S. of the L.F. transformer was found to constitute a marked improvement especially upon fairly weak signals.

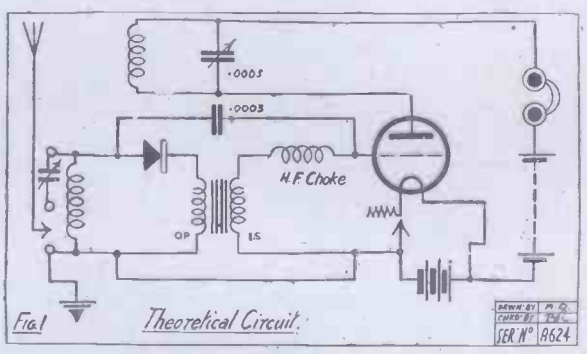


Fig. 1 *Theoretical Circuit.*

Either a bright or dull emitter valve may be used successfully in this circuit and excellent results have been obtained with

(Continued on page 1202.)

TRINADYNE. ONE-VALVER

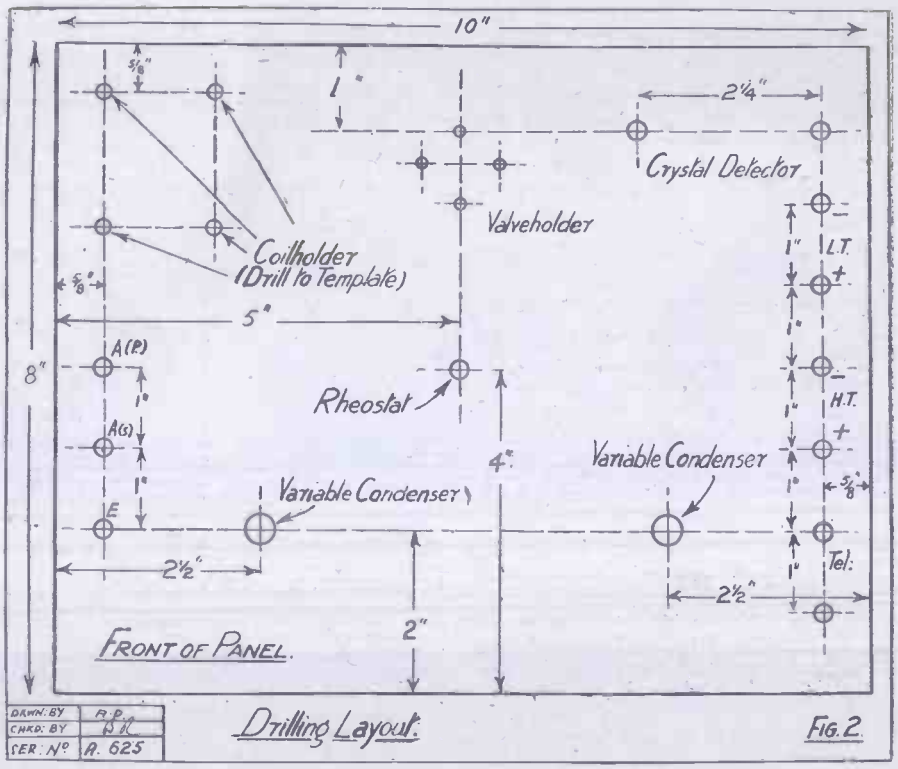
(*Continued from page 1201.*)

general purpose valves or those which are designed for H.F. or first L.F.-stage work. It will be seen from the photographs that the filament resistance is of the wire-wound type, having a resistance of about 30 ohms. A carbon-compression rheostat could be used instead, if desired, but there is plenty of room for the wire-wound type if of reasonably compact dimensions.

Upon test this particular model of the Trinadyne gave exceptionally good results as regards volume, so that if possible the reader is recommended to adhere closely to the particular components which were employed in this instrument. A full list of these, together with the prices, will be found on the previous page.

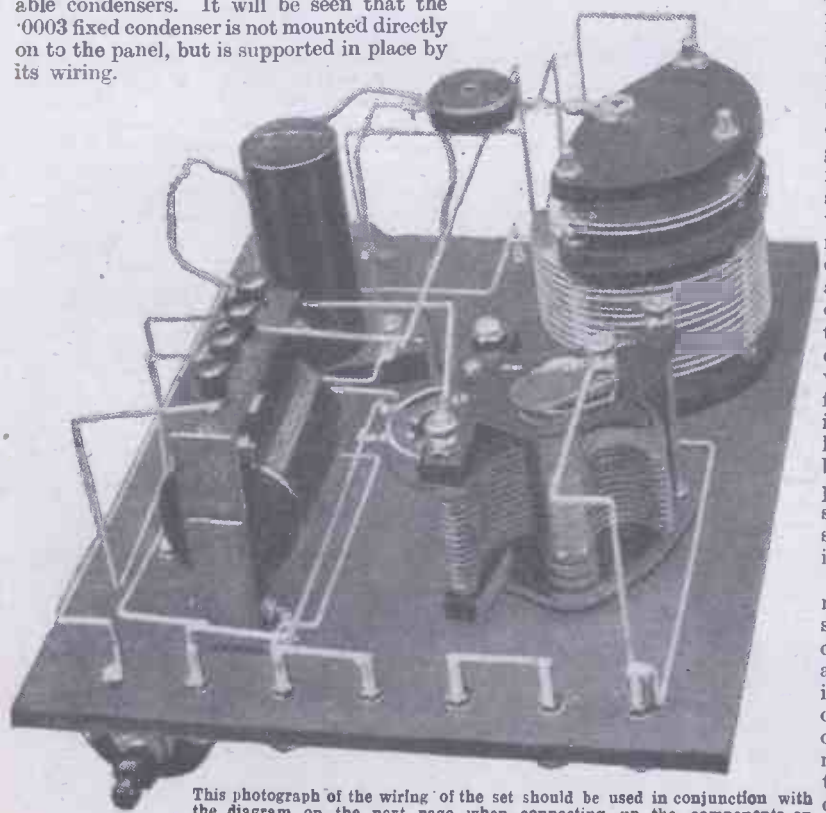
Mounting the Components.

Construction is commenced by attention to the panel and case. When these have been satisfactorily prepared the panel itself must be marked out for drilling. A drilling diagram, giving the essential dimensions, will be found on this page. The next operation is the mounting of the components. This will present no difficulty to the experienced constructor, but, for the benefit of the novice, it may be advisable to state that the valve legs should be mounted first and then the terminals. The ends of these should be filed off ready for soldering before the larger components are mounted upon the panel. Then the rheostat is placed in position followed by the coil holder, transformer, H.F. choke and variable condensers. It will be seen that the ·0003 fixed condenser is not mounted directly on to the panel, but is supported in place by its wiring.



Drilling Layout. FIG. 2.

The wiring is carried out with any fairly stout gauge of copper wire, that actually used upon the model under discussion being square section tinned copper wire, 18 S.W.G. If a different make of L.F. transformer is to be tried instead of the make shown in this article, it is a good plan to wire up the leads to this component with flexible wire. The reason for this is that it may be necessary to reverse I.P. and O.P. or I.S. and O.S. in order to get the full results of which the receiver is capable, and this operation is, of course, very much facilitated if flexible leads are being employed instead of stiff wiring.



This photograph of the wiring of the set should be used in conjunction with the diagram on the next page when connecting up the components on the set. Note the positions of the H.F. choke and the by-pass condenser.

The connections should be completed as shown in the diagram on the next page, the actual order in which the connections are made is unimportant so long as all the points are connected in accordance with the wiring diagram. It is a good plan to wire the filament circuit first, following this by the other close-to-the-panel leads. When the wiring has been completed it should be checked over carefully from the list of point-to-point connections which is given at the end of this article.

Hints on Operation.

As has already been stated, the operation of the receiver is not at all difficult, and even a novice will soon get to know "the hang" of the tuning controls. The main tuning is carried out upon the left-hand variable condenser, and this should be rotated in conjunction with the right-hand condenser which is connected across the moving coil. The distance between the two coils (that is to say, the "coupling") will be found to affect results greatly, especially when the station tuned in is as much as 12 miles or more distant. As the initial tuning is carried out by means of the left-hand variable condenser it is advisable to use a condenser which is fitted with the vernier movement in this position. If desired, the right-hand condenser can also incorporate a vernier adjustment, and this will be found to give an extremely fine control of the receiver, although, if only one vernier condenser is to be used, it is better to employ this for the aerial tuning.

Filament Control.

When using the Trinadyne for other than the local station, the importance of the filament resistance as an extra control should not be overlooked. One of the commonest faults in one-valve sets, especially where fairly good volume is desired, is the tendency to burn the filament at a higher temperature than necessary. This is decidedly bad practice, and it is as well to always bear

(*Continued on page 1203.*)

TRINADYNE ONE-VALVER.

(*Continued from page 1202.*)

in mind the rule that the filament current should always be as low as is consistent with good results.

POINT-TO-POINT CONNECTIONS.

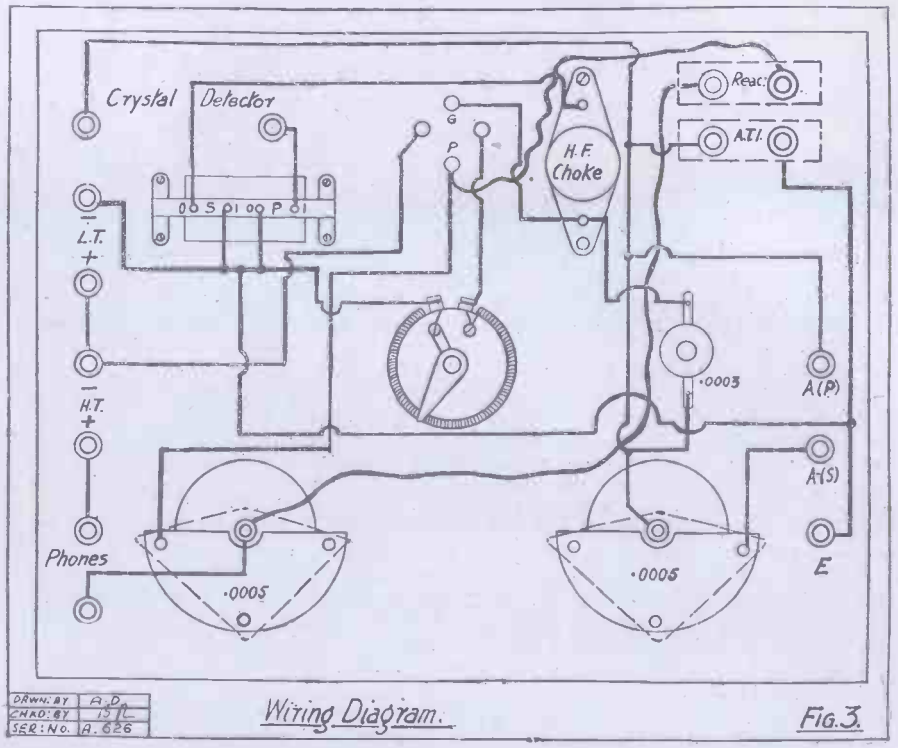
Aerial parallel terminal to moving plates of first ·0005 variable condenser, plug of fixed coil holder, and one side of crystal detector, also to one side of the ·0003 fixed condenser.

Aerial series terminal to fixed plates of first ·0005.

Earth terminal to socket of fixed coil holder, O.P. and I.S. terminals of L.F. transformer, and to L.T. negative.

L.T. positive is connected to one filament socket of the valve holder. The other filament socket is taken to one side of the rheostat, the other side of the rheostat being connected to L.T. negative. L.T. positive is joined to H.T. negative.

The other side of the crystal detector is taken to I.P. of transformer. O.S. of transformer to one side of H.F. choke, other side of choke and ·0003 fixed condenser and to grid socket of valve holder. Plate socket of valve holder to fixed plates of the second ·0005 variable condenser and to socket of moving coil holder; plug of moving coil holder and moving plates of condenser are taken to one 'phone terminal, the other 'phone terminal to H.T. positive.

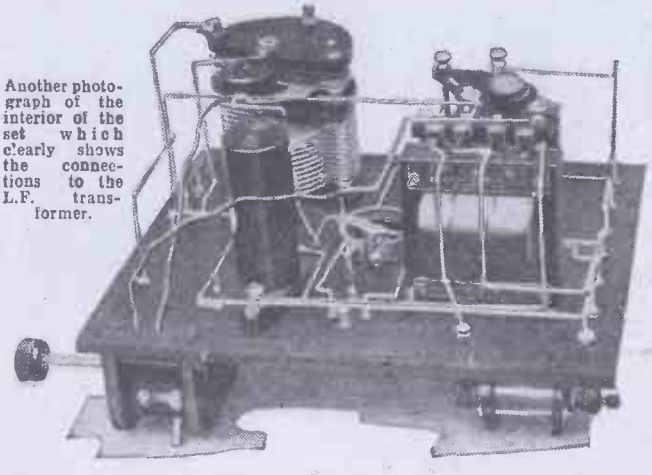


Wiring Diagram. Fig. 3.

There are really two complete sets incorporated in the Trinadyne one-valver—a crystal and L.F. amplifier, and an H.F. oscillator unit.

For instance, if the coupling or anode coil is untuned or uncoupled to the aerial coil a straight crystal and L.F. amplifier is the result; but if the coupling coil is brought up to the aerial coil the H.T. impulses passing to the grid of the valve by means of the bypass condenser allow reaction effects to be obtained, and the valve acts, in effect at any rate, as an H.F. amplifier.

The Trinadyne will show surprising amplification on close stations, but on distant transmission it will need more delicate crystal adjustment before maximum signal strength is obtained. This is necessary because the initial impulses will be weak, and so the L.F. side of the set will not be operating at its best, and the tendency will be for the valve to devote more of its energies to H.F. or "reaction" amplification. Thus the most must be made of the impulses provided by the reaction effect by using a well designed detector capable of fine adjustment so that the L.F. impulses may be as strong as possible before they are passed to the valve for L.F. amplification.



Another photograph of the interior of the set which clearly shows the connections to the L.F. transformer.

SERIES OR PARALLEL TUNING?

MOST receivers are fitted with either the three terminal system popularised by "P.W.," or a switch by means of which either parallel or series aerial condenser tuning can be obtained, but the rules governing to some extent the use of such an arrangement may not be clearly understood.

A very brief survey of these will, it is hoped, prove of value to at least a small number of "P.W." readers.

Parallel aerial condenser tuning, increasing as it does the capacity of the aerial circuit, tends to cause "damping." Such is not very noticeable, except when instable receivers are employed, and then it will prove not a fault, but an advantage. The introduction of a certain amount of "damping," causing the grid circuit to oscillate less freely, will reduce oscillation trouble and introduce a condition of greater stability. Valve sets employing several stages of H.F., and most reflex receivers, should for this reason invariably employ parallel aerial condenser tuning. Indeed, it frequently happens that to do so is essential.

On the other hand, with "sluggish" receivers which do not oscillate freely, series tuning should be employed.

Long Wave-lengths.

Contrary to listeners' general belief, series tuning can be employed for the higher wave-lengths as well as for the lower ones. Parallel tuning is generally specified for 5 X X for the simple reason that when this is adopted a 150 or 200-turn coil can be used. For series tuning in the case of 5 X X a 300-turn coil is required, and this is, of course, both larger in dimensions and greater in price to buy. Not a very great deal of difference in respect of signal strength will obtain in the case of series and parallel tuning for the higher wave-lengths, and as the selectivity factor will be more or less equal, then the advantage lies with parallel tuning for that purpose.

Series Tuning Preferable.

With the lower band of wave-lengths, say up to 600 metres, series tuning is preferable and quite an advantage in regard to signal strength frequently obtains as against parallel tuning. It is unnecessary for the purposes of this short article to enter into the theory of the subject, but a reiteration of the simple practical rules may prove useful.

Either series or parallel tuning *can be* used. Series tuning permits free oscillation and, for stable receivers, including all types of crystal sets, is preferable to parallel tuning up to about 600 metres.

Parallel tuning will tend to stabilise critical receivers, but except for such is only to be advised for the higher wave-lengths, such as that of 5 X X.

Technical Notes

Conducted by our Staff Consultant, J. H. T. ROBERTS, D.Sc., F.Inst.P.

A NUMBER of readers have written to this journal complaining that they have received 4-electrode valves, for the Unidyne circuit, which were unsatisfactory. This has led to an investigation of the matter, and it has been found that a considerable quantity of very inferior valves have lately been introduced on to the market. Some of these have been examined by this journal, and found, in some cases, to have loose bases, and to contain a reddish powder on the electrodes and in many cases on the inside walls of the glass; in some cases filaments were touching grids, and grids were touching each other.

As the proper working of the Unidyne depends so vitally upon the valve, it is very important for those who wish to make up the circuit to use only the valves which have been examined and recommended by the inventors of the circuit in question, and I am informed by Messrs. The Ludgate Radio Co., 56, Ludgate Hill, E.C., that they are the sole suppliers of the genuine Thorpe K4 and U.C.4 and U.C.5 valves. The way to be *absolutely sure* of getting a genuine Unidyne valve, as recommended by the inventors, is to send *by post* for it to the Ludgate Radio Co., as above.

I understand that legal proceedings are being taken by The Ludgate Radio Co., in order to prevent the passing off of spurious valves as "genuine Thorpe K4." Any readers who find that they have been supplied with valves answering to the description mentioned above are requested to communicate with the Ludgate Radio Co., or with this journal, mentioning where they obtained them.

Extending the Broadcast Band.

A good deal of heartburning has been caused by the proposal—not to take effect at once, but in the comparatively near future—to widen the band of broadcast wave-lengths from 300-500 to 200-600. It is stated that some of the stations may take wave-lengths down as low as 250 metres or even 200 metres. The reason for the proposed extension of the broadcast band is because there are some 200 stations operating within a comparatively limited area on the present band, whereas the band should only allow of perhaps half that number.

The reason for the heartburning is because the change of wave-length of some of the stations will naturally mean certain alterations to existing broadcast receiving sets. It is true that to the technical man or to the experimenter the alteration is the matter of a few minutes and of comparatively little expense. But, nevertheless, there must be a very large number of people in this country who regard their wireless receiver in much the same way as they regard their gramophone. This section of the public will perhaps feel a certain injustice when they find that they have to have something done to their sets which they cannot do for themselves, and which will involve even a few shillings which they never bargained for. On the other hand, it must be admitted that the greatest genius cannot foresee every eventuality, and if the changes in wave-length are necessary, there is nothing else to be done.

The International Broadcast Tests.

On January 25th and 27th, the B.B.C. will broadcast special programmes to America in connection with the International broadcast tests, which were referred to in these notes some time ago. These transmissions will take place between 4 and 5 a.m. G.M.T. from London, Daventry and Bournemouth on the 25th, and from Daventry, Aberdeen and Cardiff on the 27th.

In this connection, the Dutch Ministry for the Colonies announces that short-wave experiments have been arranged with a view to establishing regular communication with the Dutch East Indies. These tests will be made by station PCUU on 42 metres, and by station PCMM on 25 metres.

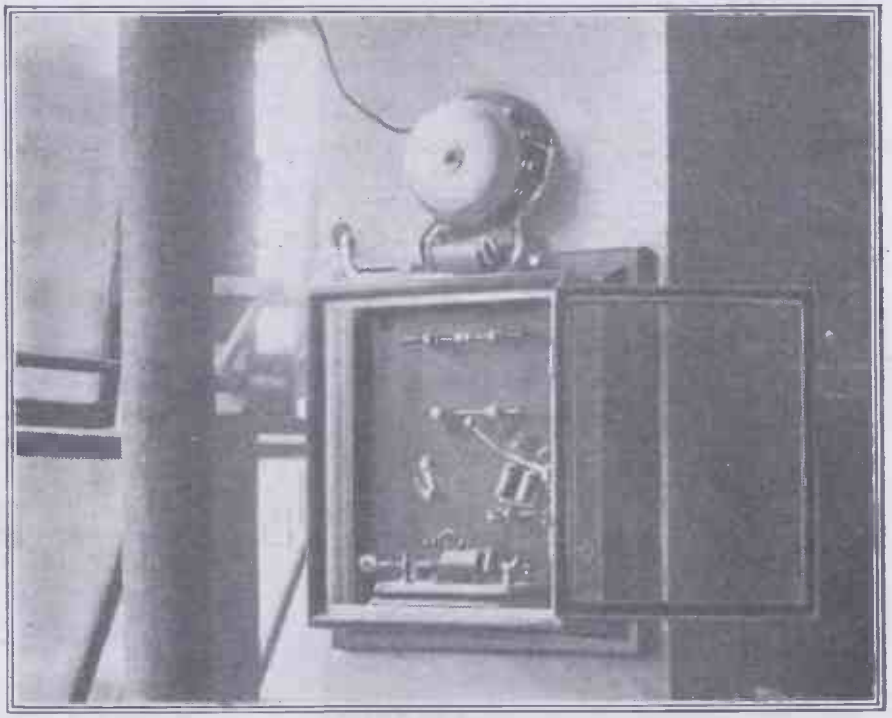
Why Valves "Go Out."

A reader writes to say that a valve which he had been using for some weeks suddenly "went out," although there had been no alteration in the set or the accumulator, and no rheostats were being used; and he asks the reason.

It is impossible to state the reason, particularly without knowing the circumstances in more detail. But I may say that this kind of thing is by no means uncommon. In considering the manner in which a filament "burns out," it is necessary to bear in mind that the popular idea that the filament gradually becomes thinner with age, remaining the same at all parts, is quite erroneous. It is true that the filament becomes thinner, but if it did so uniformly, there would be little trouble. The fact is that the filament has some part or parts at which it is, initially, somewhat thinner than the average.

Since the current is the same at all parts of the filament, it follows that the part that is a little thinner is also a little hotter. The rate of thinning is, therefore, greater at this part, and so the discrepancy in the thickness is increased with the age of the filament; in other words, the relative thinning becomes worse, and when you adjust the current to be about right for the majority of the filament, you are more and more overloading the thin spot.

Eventually this thin spot gives out, and the filament "goes out," as my correspondent's did. In many cases, the burnt-out portion is so small that it is impossible to see any break on examining the filament through the glass.



Very heavy atmospherics, which frequently precede storms, cause this bell to ring and warn power station attendants that extra current for lighting may be required.

Concerning "Silvering."

In this connection, I frequently receive inquiries from readers with regard to the "silvering" as they often call it, on the inside of the glass of a valve. The questions frequently concern the relative efficiency of a brightly silvered valve and one which is badly silvered or not silvered at all.

I believe I mentioned this matter recently in these notes. The "silvering" is not silvering, but a deposit of magnesium which

(*Continued on page* 1230.)

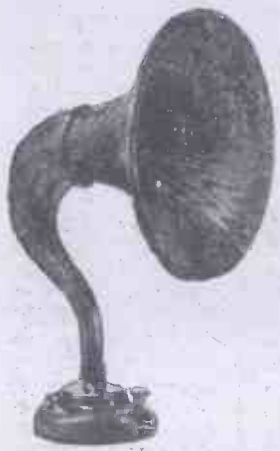
Of artistic finish in Mahogany, and "Sound" design. **£4 15s. 0d.**

"Sound" Perfect

Junior Model. Height 19 ins. Produces full round tones. In Black, 35s. *Grained various wood finishes,* 37s. 6d.

AMONG the A.J.S. range of Loud Speakers are models for all requirements, ranging in price from 35s. to £22 10s. Each model is noted for its faithful re-creation of speech and music over the whole musical scale. They are non-resonant, but the presence of overtones relieves the sounds produced of that soul-less quality so often associated with the reproduction of music. The presence of these overtones gives full tone-colour and just that subtle atmosphere which makes all the difference between reproduction that is reasonably good, and the re-creation of speech and music which is remarkable in its fidelity to the original.

We do not *specialise* in Black Loud Speakers, but in those with flares of Mahogany or Oak, Cabinet models, and those with metal flares hand-coloured and grained to resemble fine woods. This work is carried out with such skill that it is often difficult to realise that they are not built up from the woods they are made to resemble.



Standard Model in Metal, height 24 ins. Grained various wood finishes, £4 5s. 0d. *In Black matt or stove finish,* £4 0s. 0d.

Model with Flare in Mahogany or Oak. Height 24 ins. Price £4 15s. 0d.

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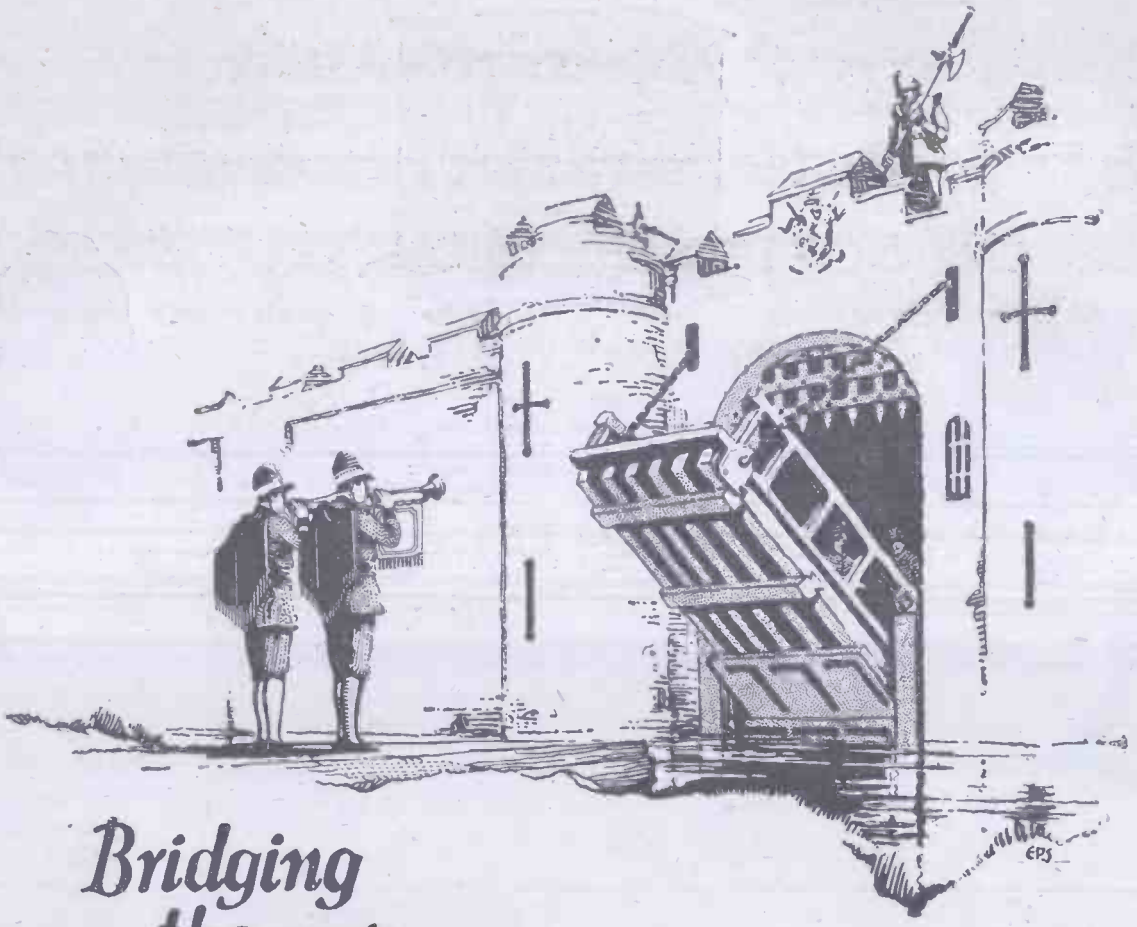

Bridging the gap

Among the many specialised requirements of the Wireless Experimenter, the need undoubtedly exists for a condenser designed to give an unbroken tuning range when a "change-over" is necessary from series to parallel working. With an ordinary variable condenser a gap occurs in the wave-length range at the point where the "change-over" is necessary.

The Duwatcon, however, has been specially designed to overcome this difficulty. It is so constructed that when used in the series position its *normal* maximum wave-length is obtained at about 120° on the scale. Further rotation of the knob, however, causes a further increase in the wave-length until, when the movement is completed at 180°, the wave-length is slightly greater than that which would be obtained by switching the condenser to "parallel" and turning the knob to zero again.

Positive connection to the moving plates is secured by means of a phosphor-bronze strip—a special feature found in all Dubilier Vanicon Variable Condensers.

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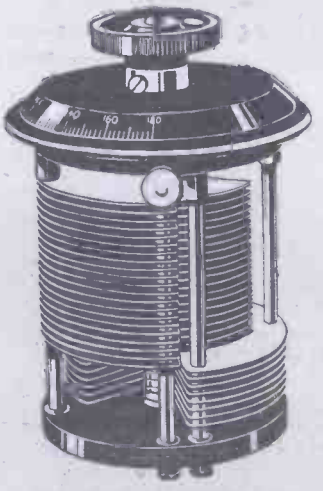

The Dubilier Duwatcon Variable Condenser. Capacity 0·0007 mfd. Price 30/-

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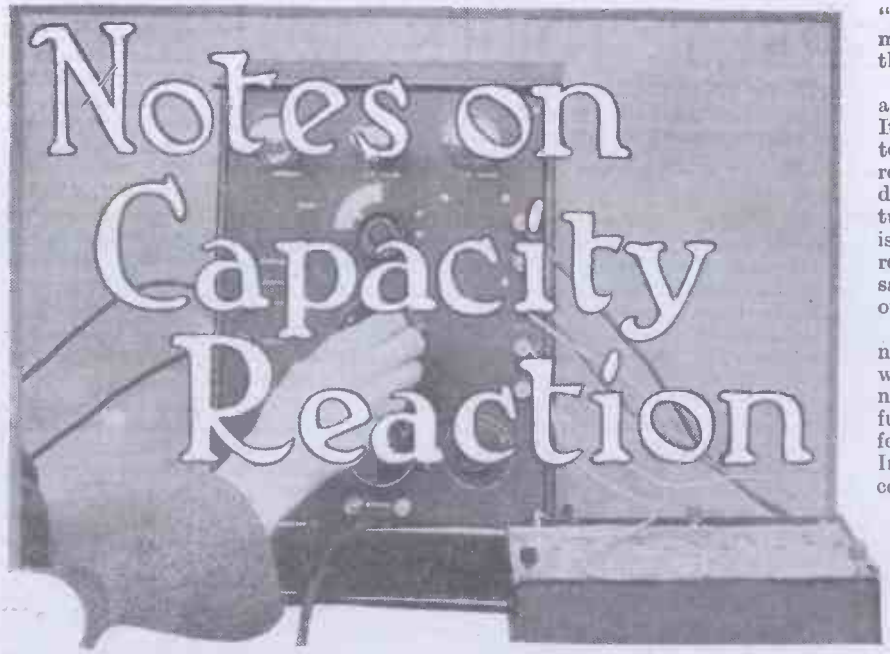
Notes on Capacity Reaction



By Lieut.-Commander. H. W. SHOVE, D.S.O., R.N.

WHEN the grid and anode circuits of a valve are tuned to the same wave-length, the valve will inevitably oscillate, unless some damping is applied to one or other of the circuits. This is because there is always a capacity coupling between grid and anode in the valve itself. The hand-back of energy through this coupling provides the simplest form of capacity reaction, shown in Fig. 1. This arrangement is particularly to be recommended to the beginner, on account of the case of handling it.

Loose Coupling.

With some valves, however, and particularly if the aerial system is not of fairly low resistance (and the damping therefore small), such a set will not oscillate. In order to obtain maximum sensitivity, a small coupling condenser can then be added, as at "A". Alternatively, and perhaps preferably, loose coupling may be used, as in Fig. 2. The degree of damping now depends on the tightness of the coupling of aerial and C.C. coils. This circuit, though not so easy to handle, is a great improvement on that of Fig. 1.

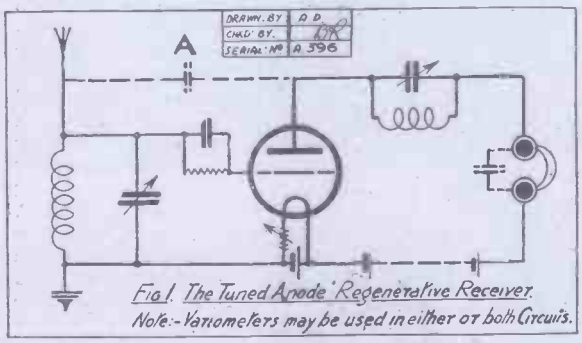


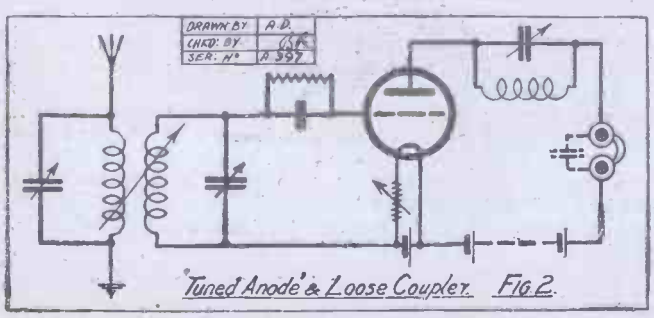
Fig 1. The Tuned Anode Regenerative Receiver.
Note:-Variometers may be used in either or both Circuits.

A Standard Circuit.

Fig. 3 shows the standard capacity reaction circuit, in which only the grid circuit is tuned, but the H.F. impedance of the anode circuit (helped, if necessary, by the choke coil L_2) allows of an adequate feed-back through the comparatively large condenser, C_2. Success with this circuit depends in a large measure on proper proportioning of the choke coil to the reaction condenser. A No. 100 coil as choke, and a ·0003 mfd. condenser have given good results on the 300–500 metre band. This is out and away the most convenient method of introducing reaction into a variometer tuned set (as in Fig. 3). But it is equally applicable when the aerial is tuned by a coil and condenser.

The Ultra-Audion.

The "extreme case" of capacity reaction is reached in the "Ultra-audion" circuit, where the connection between grid and anode is direct, instead of by a condenser. But a "semi-Ultra-audion" (if the clumsy term may be pardoned) circuit, arranged as in Fig. 4, may be found rather less prone to oscillation. A fixed coil can be used here, instead of the usual variometer employed in this type of "Ultra-audion," and without the necessity for special stabilising devices, such as variable grid-condenser, etc. The choke for this circuit should be fairly large (say 200–250 turns) the condenser about ·0005 mfd. The writer has been very successful with this circuit.



Tuned Anode & Loose Coupler. Fig 2.

Smoother Control.

Capacity reaction is not used nearly so widely as it would be if its merits were better appreciated. It has the following advantages over the usual magnetic, "swinging-coil" method:

(*a*) Smoother control, it being far easier to arrange for "vernier" adjustments of a condenser than of a coil holder.

(*b*) Easier setting to a predetermined mark. It is a simple matter to note accurately the reading of a condenser dial and reset when tuning-in again. It is far more difficult to return exactly to the same angular setting of a coil holder.

Indeed, the holders now on the market which provide for noting this angle for future reference are few and expensive. In America, vario-couplers are used. But these circumscribe the wave-band which can be covered.

(*c*) In the writer's experience, alterations of reaction setting upset the tuning of a capacity reaction receiver is less than when magnetic reaction is used.

(*d*) Capacity reaction is far easier to provide for in a set designed to be used with a frame aerial.

As regards efficiency, there seems nothing to choose between well-designed sets using either method.

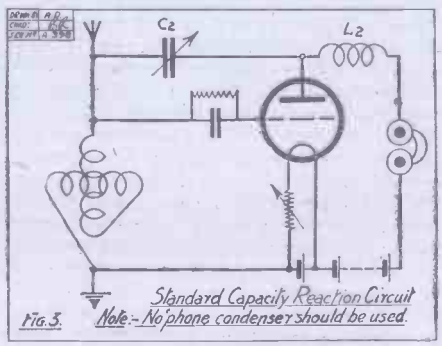


Fig. 3. Standard Capacity Reaction Circuit
Note:-No 'phone condenser should be used.

In conclusion, it is interesting to note that the reaction control introduced into the 1926 Unidyne is what could almost be termed a "negative" capacity reaction. In this case the provision of a capacity path bypassing an H.F. choke prevents oscillation, while at certain minimum capacities reaction occurs through a permanently set coil coupling.

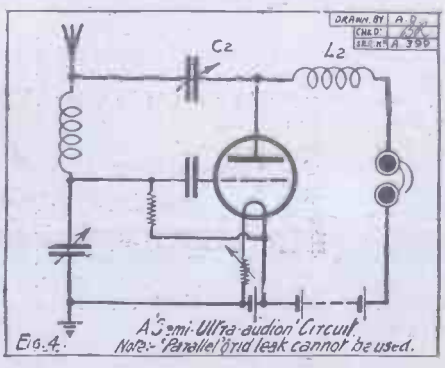


Fig. 4. A Semi-Ultra-audion Circuit.
Note:- Parallel grid leak cannot be used.

CURRENT TOPICS.

By THE EDITOR.

Reducing Interference—Extending the Wave-length Band—An Unsuitable Scheme—Television—The Baird and Belin Claims.

CAPTAIN ECKERSLEY has been telling the daily press representatives about a new scheme for the reduction of interference between broadcasting stations.

Briefly, he has stated that, as a result of the conferences between the broadcasting authorities—arranged under the auspices of the International Radiophone Bureau—it is proposed that the broadcasting wave-band for the B.B.C. be extended by 100 metres on each side. The present wave-band is 300 to 500 metres and the extension would make it 200 to 600 metres.

It has also been stated that there are possibilities that some B.B.C. stations may reduce their wave-lengths to 250 metres; and there is even a possibility of reductions, in some cases, below 250 metres, but not lower than 200 metres.

Captain Eckersley has expressed his opinion that listeners need not be afraid of any revolutionary change, at any rate, not for another year or so, and that existing apparatus will not be rendered obsolescent. It seems extremely likely that these changes in wave-lengths will be made, but not until 1927.

The Effect on Listeners.

We fail to see why such a radical alteration in wave-lengths is necessary. British broadcasting stations now operate on wave-lengths from 300 to 500 metres, with the exception, of course, of 5 X X on 1,600 metres, and we are given to understand that over one and a half million people have taken out broadcasting licences. Many thousands of these licensees have a technical knowledge of wireless and are probably keen constructors of their own apparatus, but there is no doubt that the majority of licensees possess wireless sets without knowing anything about technicalities.

Furthermore, a very large percentage of sets owned by this type of licensee are purely broadcast receivers, primarily designed for the reception of British broadcasting on the wave-lengths from 300 to 500 metres. If the new wave-length band is adopted it will mean that these sets will have to be altered and, no doubt in a good many cases, very radically altered.

Only a Rumour?

The amateur with technical knowledge, and the experienced home constructor, will have no difficulty in rebuilding a set so that it will tune to the new broadcast wave-lengths; but in hundreds of thousands of cases licensees will either have to obtain the advice and help of a technical friend or they will have to pay for their sets to be altered. As the Wireless Correspondent of the "Observer" stated in a recent issue of that paper, "The non-technical listener will be badly 'flummoxed.'"

Captain Eckersley rather deprecates the suggestion that the adoption of these new wave-lengths would cause disquiet and annoyance among listeners. In our opinion, he under-estimates the seriousness of the new proposal.

We are sure that if the B.B.C. adopt such a plan they will create widespread indignation among listeners. The scheme is generally unsatisfactory and does not get at the root of the trouble.

Mr. Reith has already given an indication of what he considers to be a solution to the interference problem, and it is a solution which we heartily commend—namely, the reduction of the number of British broadcasting stations of medium power and the erection in their place of a limited number of super broadcasting stations, similar to 5 X X.

But any scheme which involves a drastic alteration in wave-lengths and, therefore, necessitating a drastic alteration in standard broadcast receivers, will not only be condemned by the vast majority of listeners in this country but will, we feel sure, do the B.B.C. a considerable amount of harm in the long run, and we strongly advise them to scrap this scheme in favour of one which will not create so much annoyance among the ranks of listeners.

An A.J.S. loud-speaker outfit provides a comfortable winter evening fireside diversion.

We understand that an official of the B.B.C. has stated that the wave-length changes are "only a rumour." But there is usually no smoke without fire.

* * *

A good deal has been said of late, especially in the daily press, of the experiments being carried out by Mr. J. L. Baird, a young Scottish inventor, who has for some years devoted his energies to the problem of television.

Mr. Baird has been invited by the Royal Institution to give several well-known scientists a demonstration of his television apparatus.

According to one daily newspaper, after two years' research work Mr. Baird has succeeded in perfecting his apparatus, which is now able to transmit and reproduce at the receiving end the face of a person at the sending station. One paper states that television has reached the "stage of a commercial proposition," and shortly a company, which has taken over Mr. Baird's invention, intends to place upon the market compact, home television sets. The Postmaster-General has been approached in the matter of granting television permits.

Any Limit.

The outstanding difficulty in the television problem, as attacked by Mr. Baird, has been in connection with the light sensitive cell. As explained in many previous articles in POPULAR WIRELESS, the speed of signalling involved makes it extremely difficult to obtain an adequate response from the light sensitive cell. Mr. Baird claims to have overcome this. Distance is no difficulty; he has stated "If television can be made to travel six inches it can be transmitted to any limit within which sound can be broadcast."

Mr. Baird has also stated that, "I do not transmit photographs, or want to. That has been done long ago. I transmit whatever comes before the transmitting end of my apparatus—its movement and form, with full detail. Television stands in the same relation to movement as broadcasting does to sound."

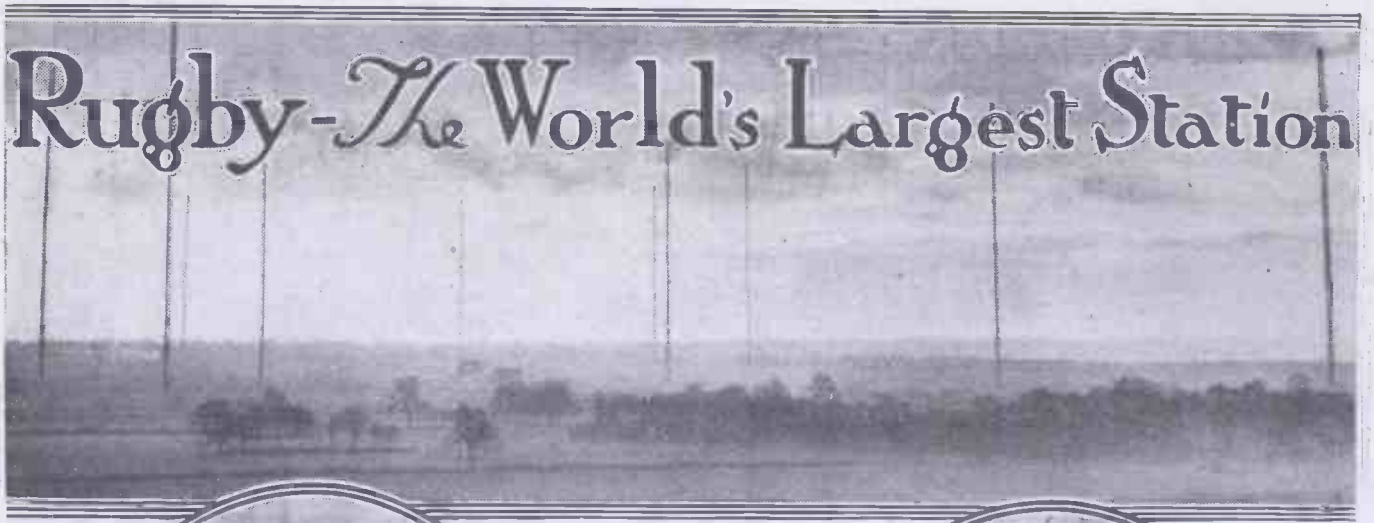
We understand that 500 television receivers are being made, and that they will cost anything from £30 to £50 each.

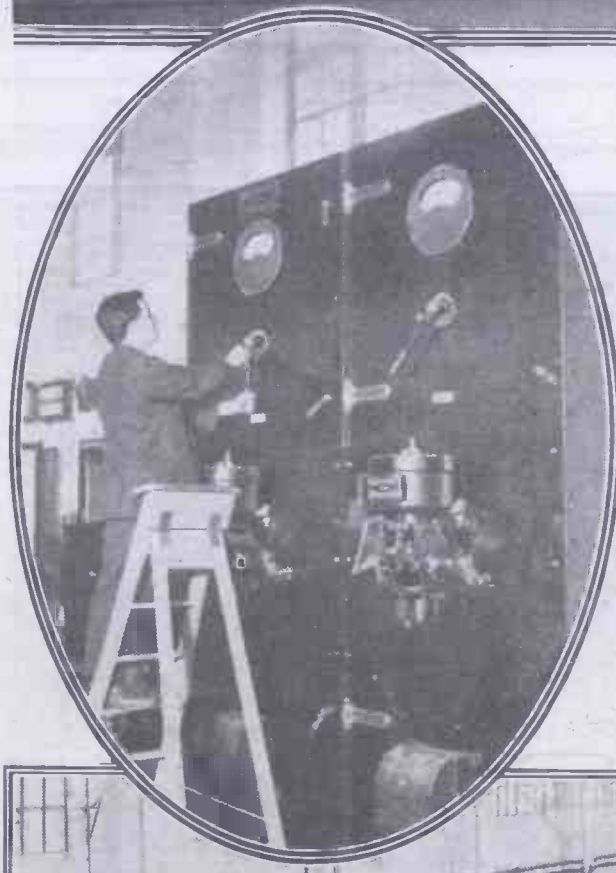
News has also reached us from France that M. Edouard Belin, the well-known French inventor, has made great advances with his system of television. Our Paris correspondent informs us that, in the course of an interview with M. Belin, the latter stated that there was one snag to be overcome, namely, in connection with an amplifying process which he is developing. M. Belin stated that in the course of the next week or two he will be certain, one way or the other, whether he has finally solved the television problem.

Difficult as the problem of television is, and sceptical as many scientific men are as to its final solution within the next few years, we can but reiterate the hope that Mr. Baird's efforts will be crowned with success, and that before very long the bands of listeners-in will be swollen by a band of enthusiasts who have in advance been dubbed "lookers-in."

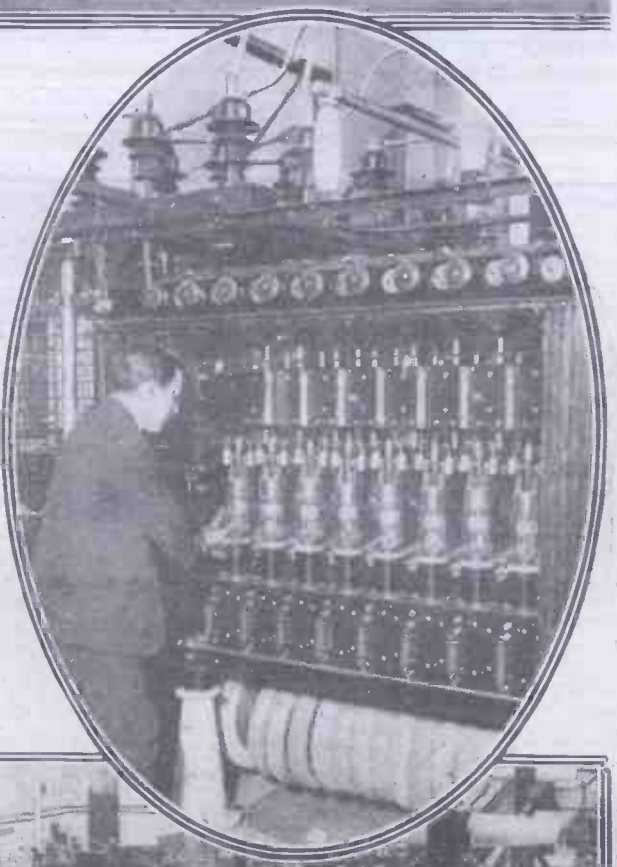
In next week's issue we shall publish a short account of the progress made by Mr. Baird and M. Belin to date.

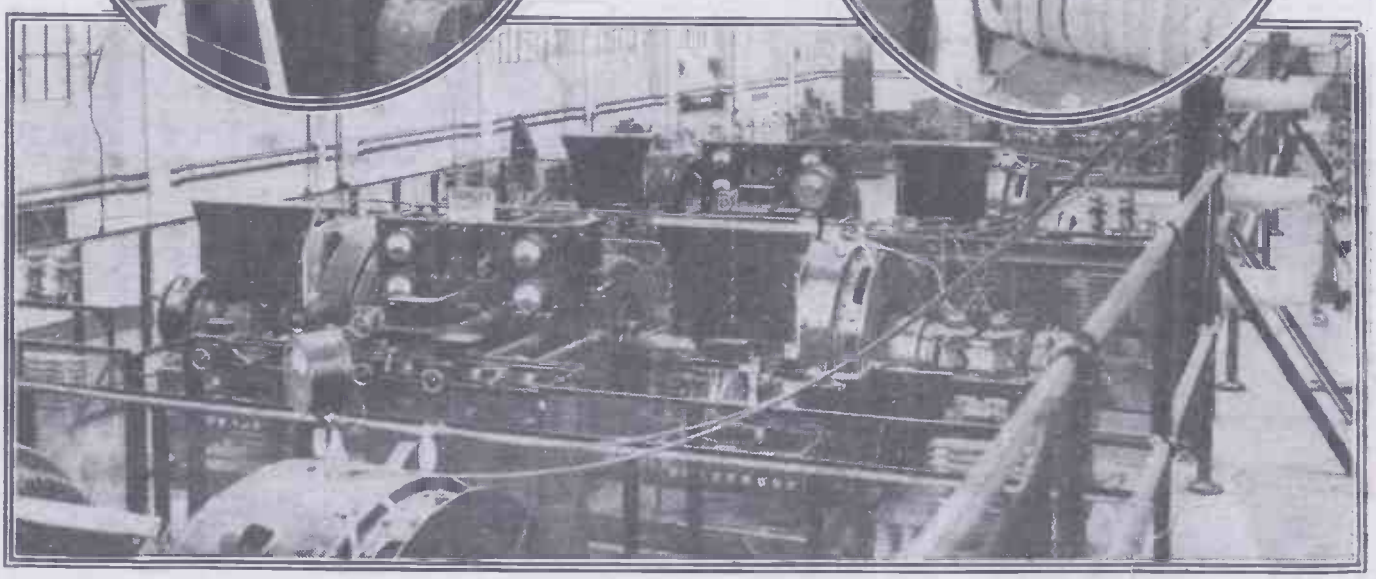
Rugby—The World's Largest Station





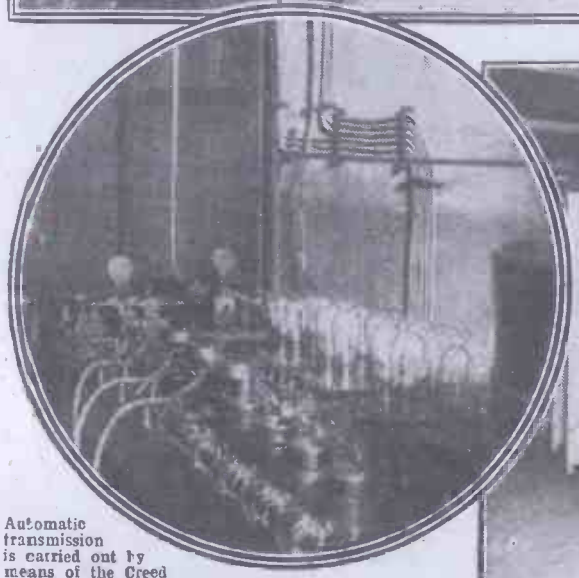
(Left). Setting one of the controls on the D.C. switch cubicles at Rugby. (Right). This photograph shows one of the valve power units with its bank of water-cooled valves. These units are protected by sliding iron gates, one of which can be seen on the right of the picture. Note the large insulating pillar supporting the panel.



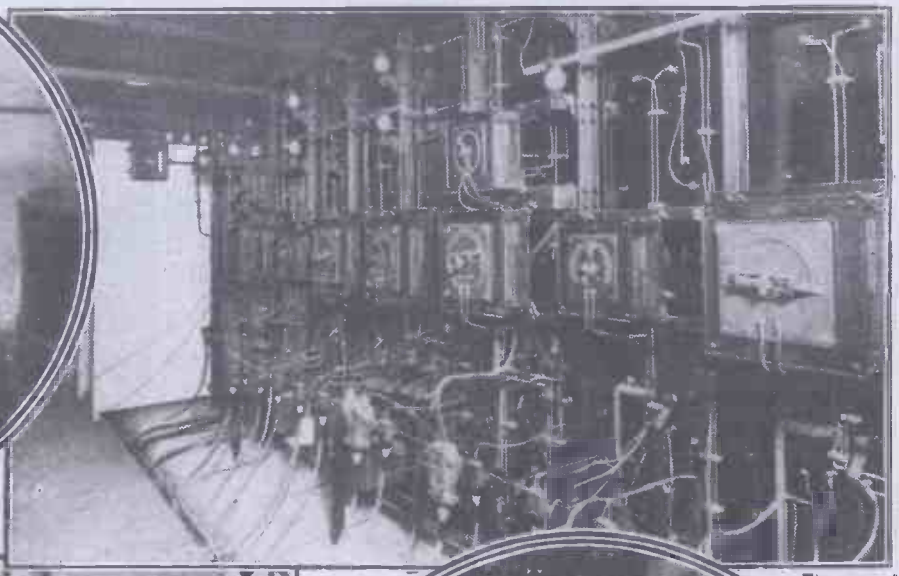


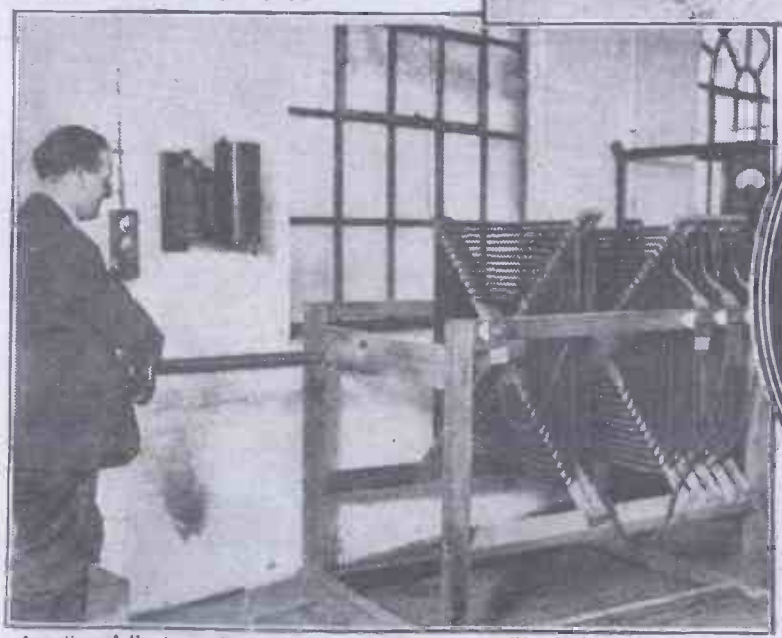
A view of the main power generating hall. This room is fitted with a travelling crane in the roof, so that the generators can be moved in case of breakdown.

A corner of the valve room, showing the power units, exciter panels and control table.

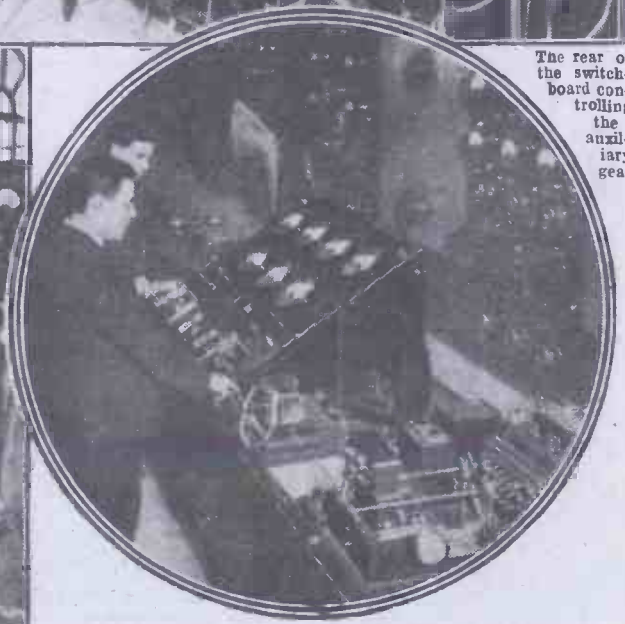


Automatic transmission is carried out by means of the Creed apparatus shown in this photograph.





A section of the transmitter—the intermediate stage amplifier loading coil—is shown in this picture of the Rugby station.



The rear of the switchboard controlling the auxiliary gear

A corner of the control table. The photograph depicts the land-line apparatus and the control panel.

A Collection of Practical Suggestions for the Busy Amateur.

By OSWALD J. RANKIN.

THE busy experimenter who constructs his own apparatus will find the following ideas well worth considering. It often happens that one hits upon an apparently good idea which, while serving its intended purpose in a perfectly satisfactory manner, is nevertheless not quite suitable for commercial purposes, a fact which is often brought home with a thud to many well-meaning inventors. The writer recently devised the simple and very

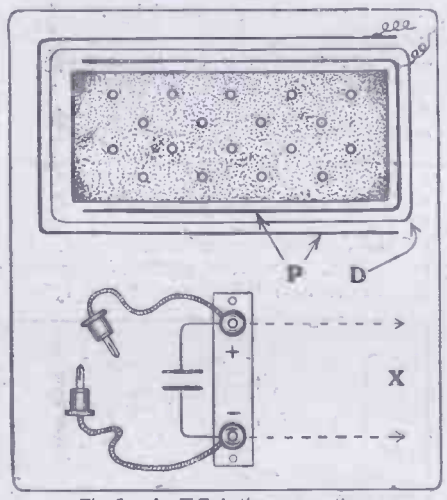


Fig. 1. An H.T. battery suggestion.

useful arrangement outlined in Fig. 1, which consists of a combined high-tension battery and reservoir condenser, the latter component comprising two large sheets of tin-foil, P, which are attached to the outside walls of the battery casing and separated in the usual way by means of a waxed paper dielectric, D.

A Novel Condenser.

This idea was turned down by a well-known firm of battery manufacturers on account of one or two little difficulties presumed on the constructional side and also because the foils and waxed paper, even when covered with a protective cardboard wrapper, might become damaged when passing through the usual trade channels, in which case a possible dielectric breakdown might occur and short-circuit the battery. However, the individual constructor of home-made apparatus, having acquired the very desirable habit of making a "job" of anything and incidentally knowing how to handle any piece of apparatus which may not be designed for use in conjunction with sledge-hammers and crow-bars, may confidently undertake the construction of this device which will prove a simple, cheap and highly successful substitute for the more usual form of shunting condenser.

The idea is here represented in its most simple form. The exact size of the tin-foil sheets will depend on the dimensions of the battery casing; they should be cut about 1 in. smaller than the depth of the casing so that there is a space of ½ in. between the top and bottom edges of the foils and casing, the sheet of waxed paper being cut to the same dimensions as the casing, or, in other words, 1 in. wider than the foils. Lengthwise, each foil should embrace the two sides and one end of the battery casing (*see* Fig. 1).

Value Not Critical.

The method of attaching the foils and dielectric to the casing is simplicity itself; attach the first foil direct to the casing by means of some thick shellac varnish, bind the waxed paper evenly and tightly over this, all round the casing, allowing about ¼ in. overlap at the joint, and then attach the second foil. Take one flexible connecting lead from each foil and then bind several complete turns of ordinary brown paper very tightly over the completed condenser and secure same by means of shellac or seccotine. It is, of course, most important that the foils lie perfectly flat against each side of the dielectric. The amateur with some previous experience in condenser construction will encounter no difficulties in this direction.

Cut a slot in one end of the battery lid and over this secure a small ebonite strip which is provided with two ordinary terminals. Connect the condenser leads and the two wander-plugs direct to the shortened terminal shanks, place the lid in position, and all is ready for use. The connections are clearly shown in the lower sketch (Fig. 1), where it will be seen that the circuit leads, X, are also connected to the two terminals. Any section of the battery tapped off by the wander-plugs will, of course, always be shunted by the condenser. The value of the condenser (above ·5 mfd.) is in no way critical; the capacity stored by the two large foils fitted to an average size battery in this manner will be found quite sufficient. A little difficulty might be encountered when making the connections from the foils; the writer has used small slip-on paper fasteners quite successfully.

A Condenser Box.

Fig. 2 shows a modification of the idea where two or more 2 mfd. Mansbridge condensers may be arranged integral with the H.T. battery by building up a simple wooden box for the battery and providing a separate compartment at one end to accommodate the condensers. The sketch shows the connections for two condensers used on a battery which is tapped off into two sections. One side of each condenser is connected to the negative wander-plug, the other two sides being connected to the two positive wander-plugs, via terminals, as described in the previous example.

A three-ply wooden lid is attached to the top of the box, clearance holes for the

(*Continued on page* 1212.)

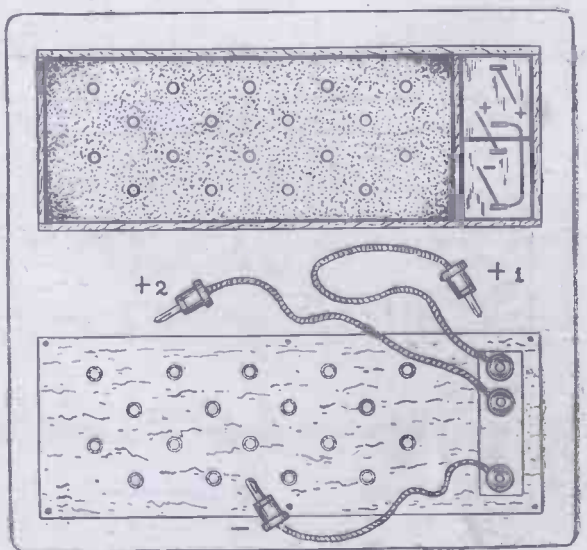


Fig. 2. An extension of the idea shown in Fig. 1.

IDEAS FOR EXPERIMENTERS.

(*Continued from page* 1211.)

wander-plugs being bored in same to correspond with the battery sockets. These holes can be bored perfectly accurate if an impression of the battery sockets is first taken on a sheet of blotting paper, cut to exact size, and used as a template. The three terminals, which are mounted on a strip of ebonite, should be marked "Positive No. 1"; "Positive No. 2"; and "Negative." The circuit connections are of course made to the two terminals.

A Useful Accessory.

When working with four or five valves which are each provided with separate H.T. positive connections, a shunting condenser is more or less necessary across each tapping and the common negative. The best arrangement here is to provide an independent shunting box as shown in Fig. 3, and simply connect the circuit leads to one row of terminals and the wander-plug leads to the other row.

As will be seen from the sketches in Fig. 3 the arrangement of this device is exceedingly simple. Three, four, or five 2 mfd. Mansbridge condensers are mounted on an ebonite panel which is also fitted with the necessary terminals. It will be seen that the terminals are connected together in pairs, across the panel, so that one row may be regarded as extension points or otherwise junctions provided for the sake of convenience.

These connections may be made by means of copper tape links, clamped firmly under the terminal nuts, or by means of ordinary busbar wire bridges, as desired. One side of each condenser is connected to a common lead which is joined to the negative terminal, separate leads being taken from the other sides of the condensers to their respective positive terminals or bridges. Thus it will be seen that by connecting all circuit leads (that is, circuit leads which would otherwise be joined to the one H.T. positive tapping) to the bottom row of terminals in the lower sketch, and the wander plugs to the top row of terminals, each section of the battery tapped off by the plugs will be shunted by an independent condenser.

The panel should be fitted to a small cabinet in the usual way. Such a device represents what is probably one of the most useful pieces of apparatus one can possess; it completely solves the problem of connecting up shunting condensers in a neat and convenient manner, and the extra terminals greatly facilitate matters in respect to circuit-to-battery connections.

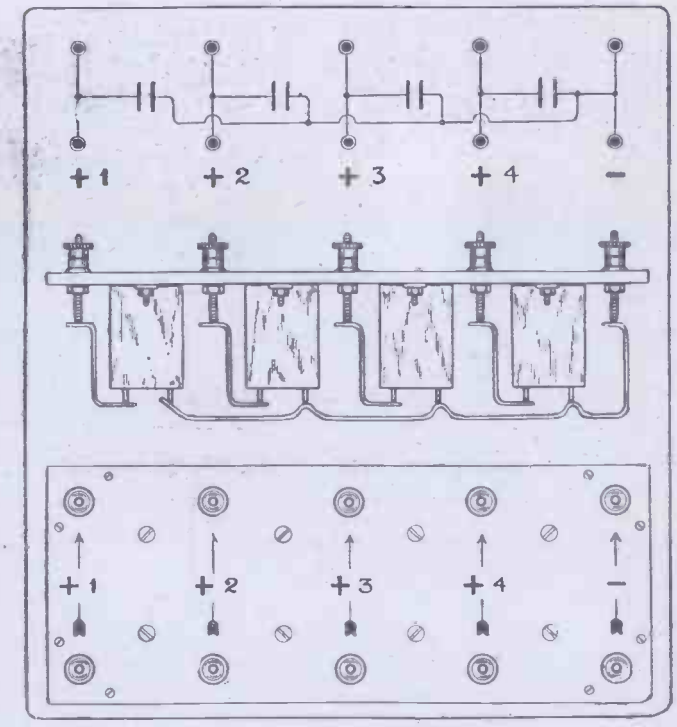


Fig. 3. The method of connecting the H.T. condensers.

H.F. Coupling Units.

Fig. 4 shows another very simple but extremely useful device which every experimenter should possess. This may be described as a resistance-capacity valve coupling unit, an experimental component for use in the plate circuits of H.F. amplifiers employing the very stable resistance-capacity method of coupling the valves.

The upper diagram shows two H.F. valves arranged on this principle, and it will be seen, in the plate circuit of the first valve, that if we make four terminal junctions at the points marked X, and arrange the complete coupling as a separate unit as shown in the lower sketch, it can then be easily and quickly connected up in any experimental circuit. This, of course, obviates the otherwise troublesome operation of handling each of the three components separately. The 70,000 ohms resistance, R1; the ·0003 mfd. fixed condenser, C; and the 2 megohms resistance, R2, are simply mounted on a small ebonite panel and connected up as shown, to four terminals marked "Plate," "H.T. pos.," "L.T.," and "Grid." to which the circuit connections are made. The panel may be mounted on a block of wood which is well recessed to clear the terminal and other nuts, but a much better job is made by using a shallow cabinet and by wiring up the components under the panel. For sake of uniformity and general convenience the writer uses the Wates' "K" type of

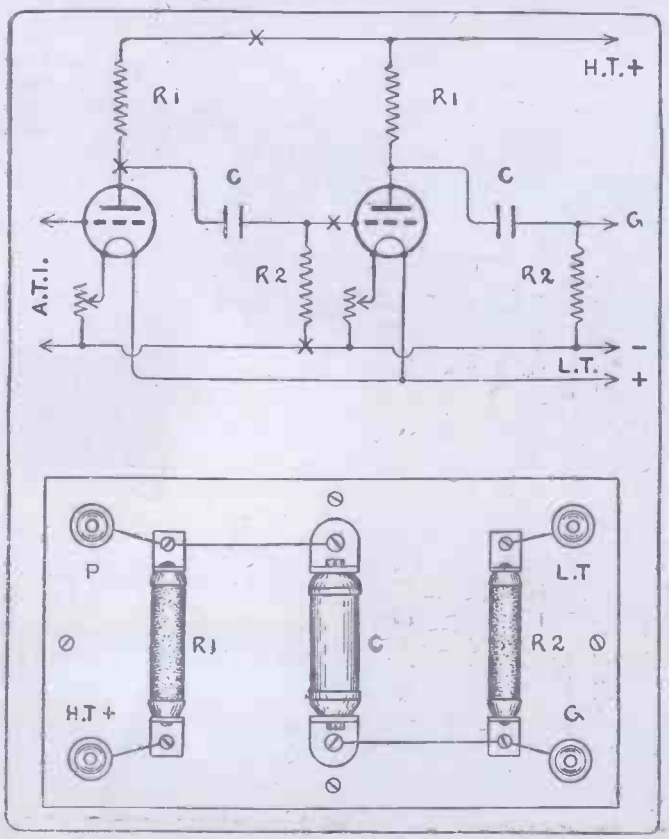


Fig. 4. Circuit and practical wiring diagrams of the H.F. resistance coupling units.

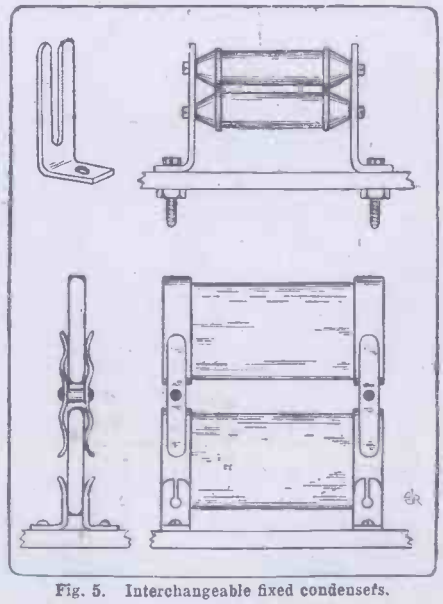


Fig. 5. Interchangeable fixed condensers.

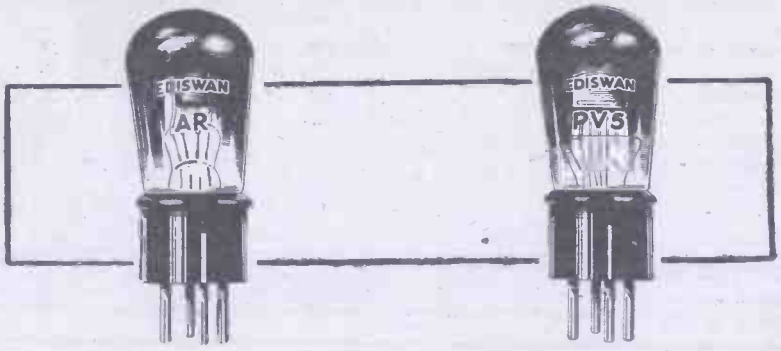
fixed condenser, as shown. A really complete experimental outfit would include at least two and preferably three of these units.

If the average experimenter handles one component more frequently than another it is surely the fixed condenser, and if provision is made for quickly connecting one condenser in parallel with another, at every

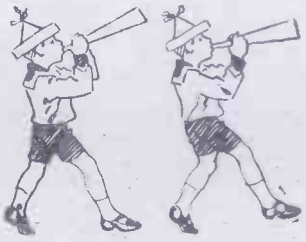
(*Continued on page* 1214.)

THE HAPPY FAMILY

"Affinities"



There is a decided affinity, a quite definite link between each Ediswan Receiving Valve and Ediswan Power Valve. The Receiving Valves are supplied either H.F. or L.F. and the best Power Valve to use is shown in the table opposite.



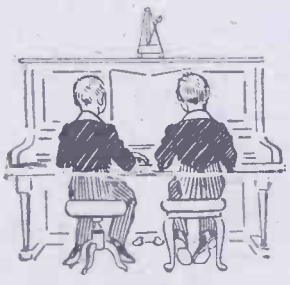
They always get on well together. It's like that in every large family. Always two that will work—or play—better with one another than with anybody else. Every Ediswan valve has its family affinity. It gives good service in any conditions . . . the *best* service when it is employed with its "twin."

The Valves to Use.

Receiving.	Accumulator or Battery Volts.	Power.
A.R. - -	6	*P.V.5*
A.R.D.E. -	2	*P.V.6*
A.R. 06 -	3	*P.V.8*

With these groups and Ediswan H.T. and L.T. Accumulators the ideal is attained.

THE EDISON SWAN ELECTRIC CO., LTD.,
123-5, Queen Victoria Street, London, E.C.4.



Ediswan Valves are entirely British Made.

EDISWAN VALVES
Will Improve ANY Set

THE REPAIR OF TRANSFORMERS.

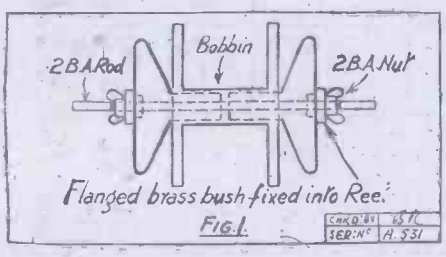
FROM A CORRESPONDENT.

ONE of the more serious casualties which a receiver may suffer is the breakdown of an L.F. transformer, and although the necessary re-winding is not a very simple matter, there is no reason why it should not be undertaken by the amateur, who will thereby not only learn more about the secrets of his hobby, but will save money.

Let us assume that the fault has been traced to a certain L.F. transformer and that the continuity test reveals, say, a broken winding. It is usually the primary which suffers, and if the secondary is wound on the same bobbin as the primary it will mean that you will have to unwind it in order to reach the fault, whereas if the windings occupy separate bobbins your work will be halved.

Dismantling the Transformer.

Dismantle the transformer by taking off all the clamps and core stampings, and unwind the wire. It is not advisable or worth while to use the original wire for repairs. When you have got it all off weigh the wire taken from the winding



which is faulty; this will be sufficient guide to the amount of new, but similar, wire which must be purchased.

Before unwinding take note of the depth of the original windings. If you fill up with new wire to the same extent you probably will not be far out in the number of turns, and to ascertain the exact number of turns used originally is not very practicable.

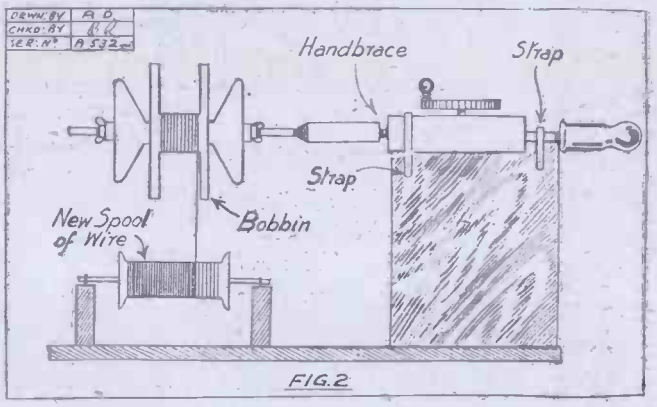
In the re-winding process care should be taken not to wind too tightly, as you may crush the centre of the bobbin, or the wire may break later on owing to the expansion and contraction of the bobbin.

An Improvised Winding Machine.

Having unwound, obtain a 2 B.A. screwed brass rod, about 6 in. long, and two nuts and two flanged bushes. These can be got from a dealer who supplies condenser parts. Next, obtain an ordinary wooden cotton-reel with large flanges and hub of small diameter. Cut this in half and assemble the bobbin-holder as shown in Fig. 1. The brass rod passes through the transformer bobbin and the two halves of the reel, which last are kept in position by the brass bushes and wing-nuts. The hubs of the reel should be fitted into the hole of the bobbin, the brass bushes into the holes of the reel, and the nuts tightened up. If the bobbin sides are very weak reverse the halves of the reel so as to support the sides.

Next fix a hand-brace to a stout piece of wood on a base, as shown in Fig. 2, and with this grip one end of the brass rod, taking care to have the turning handle of the brace facing upwards. Underneath the empty bobbin mount the spool of new wire on a brass rod supported on two wooden blocks (Fig. 2). Four screws or brads, two on each wooden block, will serve to keep the rod in place.

Now comes the winding. The free end of the new wire should be soldered to one of the old end wires. This end should be given one turn round the bobbin and its loose end brought out and twisted round the spindle to keep it out of the way during winding.



Make sure that you wind in the same direction as was wound the original wire and that you bring the ends out at the original positions. The actual winding is not a long job, especially when a little practice has been experienced. The wire should be guided on to the bobbin with a finger and thumb of one hand, the other hand operating the drill.

Completing the Repairs.

If you have to wind the secondary as well you must take great care of the insulation between it and the primary. As a rule the original insulation is not worth using again. On completing the winding of the primary solder on the other end wire and fix this also round the spindle to keep it clear. Then cover your primary with Empire cloth, insulating tape or very thin fibre sheet and proceed to wind on the secondary. The wire will probably be No. 44 or No. 46, and should be double silk covered.

IDEAS FOR EXPERIMENTERS.

(*Continued from page 1212.*)

possible point throughout the system, one saves a good deal of time and also adds to the general utility of his outfit. Fig. 5 shows simple methods of connecting two or more "K" or McMichael type fixed condensers in parallel so that capacity-loading may be carried out in a convenient manner. With the former type it is only necessary to provide a pair of slotted clips with extended uprights to take any number of condensers, as shown in the upper sketch; with the latter type two spring brass clips are shaped as shown on the left of the lower sketch and firmly riveted together, a small spacer washer, equal in length to the width of the condenser end contacts, being placed over the rivets, between the clips.

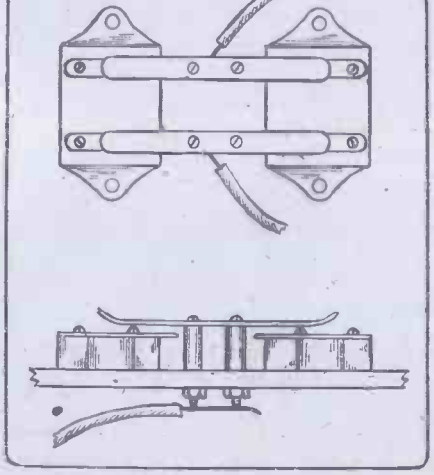


Fig. 6. Clip-holders for Dubilier condensers.

The general arrangements of both types of clips is clearly shown in the sketches. The Dubilier type of fixed condenser may be arranged in a similar manner by providing two simple spring brass clips which are clamped tightly to the panel by means of bolts and spacing sleeves in the manner indicated in Fig. 6. The small screws on the condenser contact tongues should, of course, make good contact with the under side of the clips.

L.F. Amplification.

Such an arrangement for interchanging of fixed condensers will be found extremely useful when new circuits are being tried out, or a new receiver is being tested. In very many cases a slightly larger or smaller grid condenser, 'phone or loud-speaker condenser, or the shunt capacity across the L.F. transformer makes all the difference between fair and good reception.

In the case of low-frequency amplification where resistance-capacity coupling is being used the value of the coupling condenser is not critical, but is very important, and if possible should be varied until best results are obtained. Too small a condenser will cut out many of the low tones, and so various values should be tried.

INTERPLANETARY RADIO COMMUNICATION

By E. J. G. LEWIS.

Is Mars inhabited ? If so, will we ever be able to get into communication with that planet by means of radio ? Our contributor advances some interesting speculations.

RADIO, since its introduction to the human race, has always appeared to form the most probable means of communicating across space the news of the inhabitation of our family of planets by intelligent forms of animals. We on our earth can study the other members of the solar system and speculate as to whether they are peopled by beings such as we are, with similar desires to bridge the vast distances between the planets with an exchange of scientific information that will help us and them to more fully appreciate the wonders of the universe.

For a long time there has been one particular planet singled out for special consideration by those who favour the theory of life on other inhabitable planets. Mars has stirred the minds of men ever since it was discovered that it was the miniature of our world. Its polar caps of snow melting and diminishing in extent under the higher temperature of their summer ; its markings passing through the colour stages so like those of our vegetation under the influence of spring, summer, autumn, and winter, have led us very strongly to suspect that there is vegetation ; and as there is air, which is proved by the snow and clouds, it is quite possible that animal life exists. As Mars is older than the earth, the animal life should be in advance of our own, so that the highest animal on their scale should have greater knowledge of his world and the universe than we have of ours owing to his longer experience.

This article only deals with the radio side of the question, so that we will assume that the Martians have discovered how to utilise the ether for the purpose of communication by telephony and possibly television. Perhaps they have gone past that stage into telepathy, which, after all, is only another method of radio communication as yet undeveloped.

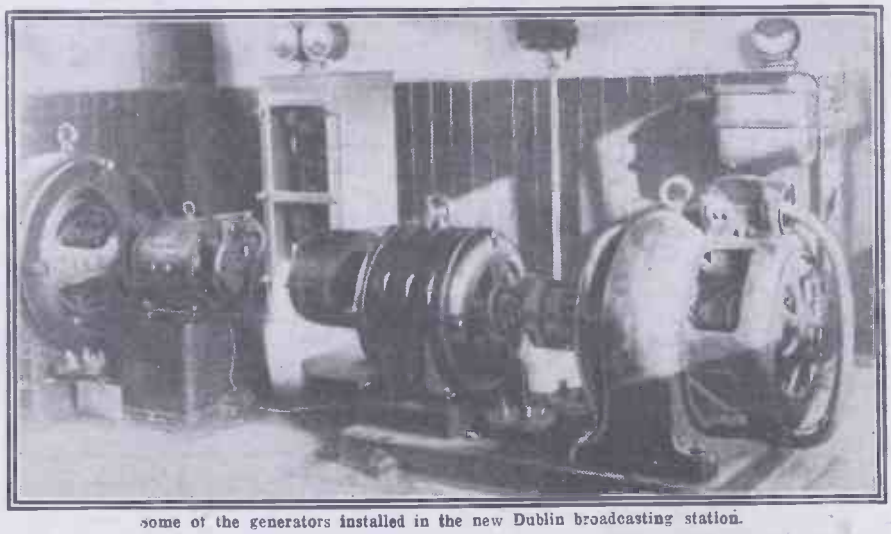
"P.W.'s" Recent Tests.

Now, taking radio as we know it, there has been much said, written, and thought about the possibilities of establishing communication by means of radio between Mars and ourselves. So far we have had a few private attempts to receive signals on long wave-lengths of several thousand metres, and the technical staff of this journal made a magnificent effort on behalf of science to bring in the elusive signals on a long wave-length which some people have received and thought to have emanated from Mars.

A French scientist ridicules the idea of the long waves received as having been sent by Martians. He says : "If the Martians have wireless they would have had it 50,000 years ago, and signals they might have sent us would have remained unanswered. Why should we think that they send to us during the first years of our use of wireless ?" Even if those long waves were not from Mars, I cannot understand his argument. He has only considered the transmitting side of the question. If their receiving apparatus is as sensitive as their transmitters are powerful they might have detected some disturbances in the ether round us, and as music is an international language it is quite possibly appreciated on other inhabited worlds and, at any rate, could not be mistaken for the ordinary atmospheric disturbance.

Concluding that the received music from our stations came from an intelligent race of beings they would suspect our earth, as from their astronomical observations they would have noted that our planet supplied every need to any animals living on its land surfaces. They would then probably make another attempt to get into communication with us. Still, this is not so much in support of the theory that the long-wave signals already received by some experimenters came from Mars, but that there is not yet sufficient proof to make decided statements either way.

One important theory relating to the atmosphere of this and other similar planets must, however, be fully considered when dealing with the possibilities of receiving communications from Mars. The Heaviside layer presents a serious barrier to any ordinary means of radio reception from Mars, both in getting the signals away from Mars and in receiving them on the earth. Of course, the theory of the layer is not definitely proved, but as it explains many, if not all, of the problems connected with long-distance transmission, it has enjoyed great popularity among men of authority.



Some of the generators installed in the new Dublin broadcasting station.

Heaviside Layer as Aerial ?

The problem of getting radio signals past the two layers of ionised air when attempting communication between any planet and themselves must have been considered by the Martians, and it is quite likely that they have devised other means of energising the ether outside their Heaviside layer. If the ether presents no resistance to the generated waves it is probable that disturbances, once started, will continue for ever and, if space follows the conception of Einstein and is curved, might even find their way back to the place of origin in countless years to come. That, however, is another story.

A method by which the Martians may have tried to overcome the barrier of the Heaviside layer is one in which they used the layer as an aerial. This at first may seem ridiculous, but on closer investigation it will be seen that the layer has every requisite property of an oscillatory closed circuit. As it consists of ionised air and gases, it constitutes a conductor, and, as such, could be set in oscillation by means of high aerials supported by kite balloons.

An Interesting Experiment.

These balloons could also support pipes with nozzles pointing upwards, and through these pipes a powerful blast of lighter-than-air conducting gas could be forced, so connecting the aerial with the Heaviside layer. The gaseous aerial would convey the oscillation, the wave-length of which would be either at the estimated natural wave-length of the layer or of one of its harmonics. The planet is insulated from its Heaviside layer by the ordinary air just as ours is, so that the necessary condenser effect is present. By discharging this condenser at its own frequency or that of our system, they might be able to set our Heaviside layer in oscillation.

For those experimenters requiring something new to turn their minds to, it would be interesting to make up a tuner capable of tuning to the wave-length of the Heaviside layer and its harmonics. A wave-length corresponding to that of the Martian layer (and its harmonics) could also be investigated. The diameter across our Heaviside layer is about 8,026 miles. The circumference is thus about 40,942,972 metres. Whether this will be its natural wave-length is debatable, as it might be about four and a half times this figure as in an ordinary aerial.

Taking the first figure and assuming this to be the wave-length, we can from the formulæ, wave-length $= 1884{\cdot}96 \times \sqrt{LC}$, find the necessary inductance and capacity of our receiving circuit, as LC equals $(\text{wave-length} + 1884{\cdot}96)^2 = (21{,}190)^2$. L and C are in microhenries and microfarads respectively, so that 21,190 mhy. and 21,190 mfd. would give us the wave-length. The inductance is too low and the capacity is too high at these figures, so that we can increase the inductance, at the same time reducing the capacity until we get to more usual values as regards the capacity.

BROADCAST NOTES

By O. H. M.

The International Tests—Film Criticisms—Broadcast Sermons—A "Talk on Talks"—A Man Hunt Suggestion!

LISTENERS interested in DX work should not fail to remember that the International Radio Broadcast Tests are due to commence next week on Monday morning and will continue till the end of the week. This is the third time the tests have been arranged and judging from the results attained in 1924 we are justified in expecting still further and notable successes.

One surprising feature of these tests is the great interest which is shown in them by all the countries concerned. American keenness for long distance reception has always been conspicuous, but in the previous tests there has been no less enthusiasm in the various European countries co-operating in the endeavour to interchange broadcast programmes.

It is expected that the B.B.C. will make every effort to relay the American programmes, especially in view of the successful tests which were carried out across the Atlantic earlier in this month. On this occasion the British programmes, specially transmitted from our high-power station at Daventry, were picked up in the United States and successfully retransmitted.

A feature of the experiment was the fact that many of the American broadcasting stations were inter-linked, either by land-line or by radio, and consequently it was possible to broadcast the Daventry programme to millions of listeners situated in all parts of America.

The Broadcasting Committee.

The Government Committee under the chairmanship of the Earl of Crawford and Balcarres, K.T., which is investigating the whole subject of broadcasting in this country is busily collecting evidence from various sources. Meetings are being held in the House of Lords, and evidence is being given from such important and varied interests as represented by the Radio Society of Great Britain, Mr. Filson Young, the Radio Association, the Performing Right Society, the N.A.R.M.A.T., Sir Walford Davies, Mus. Doc., Sir Hugh Allen, Mus. Doc., and Secret Wireless, Ltd.

At the time of writing, no indication has been given of the date upon which the final report may be expected, but the whole business is being expedited as much as possible.

Radio Film Criticisms.

An interesting point has emerged in connection with Mr. G. A. Atkinson's broadcast film criticism. Mr. Atkinson has been endeavouring to help good British films over the microphone. The effect of his criticism is regarded as so potent that it has had a curious and quite unexpected reaction.

It happens almost invariably that those British films which Mr. Atkinson praises are at once put up in price, so high that the smaller exhibitors cannot afford to touch them. The result of this is that some of these admittedly excellent films reach a much smaller proportion of the population than they would have done in the absence of broadcast criticism. And now the question is raised whether broadcast film criticism does more harm than good.

It has been seriously suggested that the B.B.C. should abandon this feature. I disagree. It is part of the duty of the B.B.C. as a public service to make a contribution to the forces that are endeavouring to establish a healthy British film industry. Difficulties with rentals are incidental, and probably only temporary. They do not affect the main issue.

Religious Broadcasts.

Keen listeners, and particularly those who take the programmes on Sunday, seem generally agreed that the B.B.C. is definitely right in putting out a brand of religious teaching peculiarly its own. But there is undoubtedly a growing feeling that the present system of the selection of preachers leaves a great deal to be desired.

It was only natural that in its early stages the B.B.C. should spread its net as widely as possible with the advice of its local religious committees.

The result has been that all schools of religious thought within the category of the reasonably orthodox have had fair innings. There is no complaint that any one persuasion has had the advantage. But this policy of the wide net was bound to lead to a very uneven standard of performance. Hundreds of eminent clergymen and ministers have preached into the microphone. Not more than thirty have proved to be successful broadcasters. There has, therefore, been a tremendous amount of waste of sacred wisdom. Nor has it been the policy to allow the successful broadcasters to give repeat performances, with the outstanding exception of the Rev. H. R. L. Sheppard, whose broadcasting efforts have been so consistently excellent that they have accentuated the deplorable feebleness of some others.

I am not alone in the belief that the time has come for the B.B.C. to pick out the twenty or thirty best broadcast preachers and work them in rotation, whatever may be their sectarian allegiance.

Cutting Out Dullness.

It is true that Mr. Stobart's "Talk on Talks" had an extraordinary response from those listeners who are keen on the serious side of broadcasting. But I am not entirely convinced that all the five thousand enthusiasts who wrote to the B.B.C. in praise of talks are anxious that the talks should continue to be given in the same form as at present.

It looks as if the recent effort to dovetail the talks into the programmes so that they will have entertainment value has not succeeded. The reason for this is probably the impossibility of arranging in advance both a good and a flexible syllabus of talks. Accepting this as the case, I think that it would be a good plan to explore the possibilities of a new technique.

First of all, despite microphone tests, it would be idle to deny that too large a proportion of the "authorities" who talk are bad broadcasters. Secondly, while the censor is careful to expunge from the talks everything incompatible with the B.B.C. licence, he does not appear to regard it as in his province to add brightness and vitality to some of the monumental examples of dullness which creep into the syllabus.

I think it should be laid down that all talks should be rewritten in a style suitable to the medium and that they should be broadcast by the author only when he has mastered the technique.

* * *

Then, again, there should be much more variation in the method of delivery. The interview handled after the manner of George Grossmith will teach much more philosophy and ethics than many series of well-balanced lectures.

* * *

I was much interested to hear the other day of a new idea for request programmes which the B.B.C. has adopted. The scheme is to announce S.B. the numbers of three or four receiving licences known to be "live." The names of the holders of these licences will be unknown to the B.B.C. until they have applied in answer to the announcement. They will be invited to suggest programme items, and out of each group of these suggestions will be built up a programme. I am looking forward to hearing the first of these programmes.

A Real Man Hunt.

I hope the B.B.C. goes ahead with the "Man-hunt" proposal made by Mr. Donald Calthrop.

I can imagine a real man-hunt all over the country, with occasional broadcast clues, causing a much more general interest than the problem of "Who killed Robertson."

* * *

Two new comedians will make their microphone debut on February 10th from the London station. They are Messrs. Hatch and Carpenter, reputed to be dangerous rivals of Messrs. Layton and Johnstone.

* * *

The special Drake programme from London, between 8.30 and 9.30 on January 28th, will be the occasion of the revival of some famous music which had a great vogue in the "sixties" of last century.

* * *

Sara Allgood is billed for broadcasting on February 21st, when she will probably appear in an Irish play.

Money Prizes £5 £3 £1

A COMPETITION.

These three prizes will be given to the three purchasers of "Power" Coil Holders who make the nearest correct estimate of the total number of wireless receiving licences in force on January 31st, 1926. The following figures may assist you in making your estimate:

December 31st, 1924, **1,140,119** July 31st, 1925, **1,379,275**

What you have to do:

There are two conditions of entry attaching to this competition.

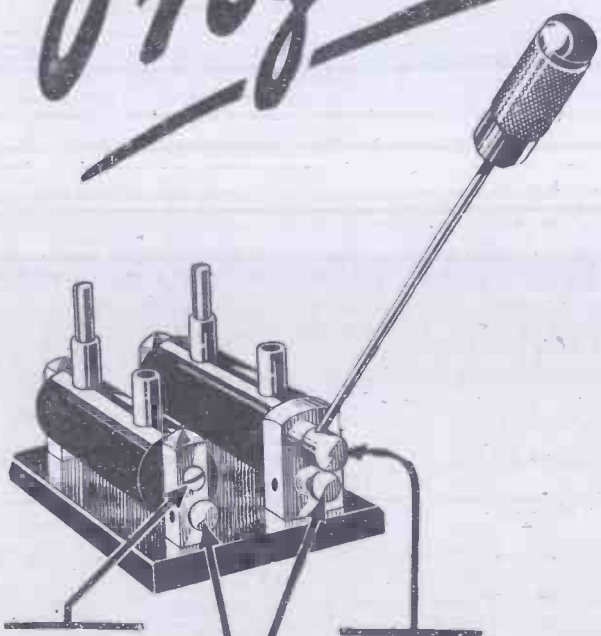
1. You must purchase a "Power" Coil Holder, using the coupon below.
2. You must fill in your local wireless dealer's name and address on the coupon.

The coupon should be carefully filled in and sent to us, together with a postal order for 4/6. On receipt of this we will at once forward to you a "Power" 2-Coil Holder as described and illustrated on this page.

As soon as the licence figures for January 31st are available (which will be about February 21st) cheques will be posted to the winners of the competition: the result will also be published in POPULAR WIRELESS on March 3rd.

No entries can be received after January 30th, though the coupon can still be used as an order form if desired. You may send in as many entries as you like: but each one must be on a separate coupon and each coupon accompanied by a 4/6 postal order for a coil holder.

POWER WIRELESS LTD.



Second coil adjustable.

Above or Under-Panel Connections.

Smooth adjustment and coil instantly locked in desired position.

2 Coil Holder

POWER COIL HOLDERS.

These new Power Coil Holders embody several important features which make them far more useful and accurate than any other coil holders yet produced.

The predominating feature is the patent ***locking device;*** the moving coil can be instantaneously locked in any position by giving a slight twist to the handle.

This locking arrangement will be appreciated by every user of a wireless set, as it ensures that the coils will remain in the positions at which they have been set.

Another important feature is that reliable connections can be made readily from above or under the panel.

There are several other special points in the design which make Power Coil Holders the best yet made. The price of the 2-coil holder is

4/6

We also make fixed and moving single coil holders and a 3-coil holder.

POWER WIRELESS LTD.
WEXHAM ROAD · SLOUGH · BUCKS.
E.P.S 27

TO WIRELESS DEALERS.

The object of this competition is to increase the sale of "Power" Coil Holders through the Trade. We are anxious to get into touch with all members of the Trade who wish to handle this exceptional coil holder. If your name is entered on a coupon by anyone who enters for this competition, you may be sure that we shall lose no time in getting into touch with you.

In any case, we welcome Trade enquiries and we shall be very glad to hear from you.

COUPON.

Please send me a "Power" 2-Coil Holder, for which I enclose P.O. value 4/6.

I wish to enter for the competition. My estimate of the wireless receiving licences in force on January 31st, 1926, is.....

Name of local dealer.....

Address.....

I agree to accept the decision of Power Wireless Ltd., as final.

Signature.....

Address.....

FOREIGN RADIO NEWS.

FROM OUR OWN CORRESPONDENTS.

Radio and Social Work.

THE municipality of Elberfeld, in Westphalia, inspired by the example recently set in Russia, has decided to apply radio to practical social uses. The town was recently endowed with a broadcasting station, and the Town Council has voted a money appropriation which will enable receiving sets with loud speakers to be installed in every social and charitable institution in Elberfeld, in hospitals and almshouses, public libraries, etc. The appropriation is apparently not to be an annual affair, but is in the form of a sum of money sufficient to enable the cost of the installations to be borne from the annual interest of it. In honour of the man who did most work in introducing broadcasting into Germany, the fund is to be called the Hans Bredow Foundation.

The action of Elberfeld is stirring up other German towns, and there is some likelihood of the example being adopted by several leading cities.

New Spanish Station.

The new Radio-Castilla station is now broadcasting on a 304-metre wave-length. Orchestral music and singing form the bulk of its programmes, which are transmitted on Tuesdays and Fridays from 3.30 p.m. to 5 p.m., on Wednesdays and Saturdays from 5.30 p.m. to 7.30 p.m., and on Sundays, Mondays, and Thursdays from 9.30 to midnight.

New Feature at Radio-Toulouse.

Courses in practical photography and in dancing, with full explanation of the latest exotic dances together with musical accompaniment to the professor's remarks and, presumably, the listeners efforts, are the latest innovations introduced by that most progressive of French broadcasting stations, Radio-Toulouse. Every Sunday afternoon there will be readings and critical comments on the latest important literary work published.

First Algerian Amateur.

The first radio amateur station in Algeria has started operations. It is set up by M. Charles Chechau, at Algiers itself, and has been classed in the fifth group with the number 8 I R. The wave-length he uses is from 180 to 200 metres. He asks all amateurs or stations picking him up to communicate with him at 31, Rue Denfert-Rocherau, Algiers, French Northern Africa.

Another Powerful Station.

The Brussels daily "Le Soir" is raising a fund by public subscription for setting up a powerful radio station in the Belgian Congo. The costs are estimated at 300,000 Belgian francs for the erection of the station.

Radio and the Floods.

In the rescue measures taken during the terrible floods that devastated large parts of Belgium, the Netherlands, and the Rhine valley recently, and rendered many thousands of people homeless, radio played an important part.

Bulletins as to the degree of rise of the flood were issued constantly by the broadcasting stations in the Liége province, the one chiefly affected, together with warnings to the population of villages and farms which enabled the people to remove themselves, and in many cases some of their valuables, to a place of safety.

Radio amateurs within the area undertook the task of ensuring a constant service of listening, in order to pick up the messages and immediately advise their neighbours.

New Swiss Regulations.

The text has now been published of the new regulations applying to radio amateurs in Switzerland. Hitherto the cost of the annual licence for the possession of a receiving set has been ten Swiss francs, and this figure is now increased to twelve.

Breaches of the regulations will entail very severe money penalties. One concession is, however, granted, and that is that it is no longer necessary to fill in a yard-long schedule couched in intricate and technical language in order to secure a licence. This may now be done by simple letter or even by telephone call—provided the latter is promptly followed up by the necessary cheque or money order.

Traders and manufacturers are invited to submit wireless sets and component parts to the "P.W." Technical Dept. for test. All tests are carried out with strict impartiality in the "P.W." Test Room under the supervision of the Technical Editor, and the general reader is asked to note that this weekly article is also intended to provide a reliable and unbiased guide as to what to buy and what to avoid.—EDITOR.

A REPRESENTATIVE selection of "Cosmos" components was recently sent us for test by that well-known and progressive concern, Metro-Vick Supplies, Ltd. They arrived well packed and consequently undamaged, although the journey from Manchester to London is a most strenuous one for goods of any description. We will deal with the various items individually.

The Cosmos anti-vibration valve holder for baseboard mounting.

Cosmos Low-Loss Square-Law Variable Condenser.

Of quite original design, this variable answers all modern "low-loss" requirements, being provided with metal end plates, earthed moving vanes, and minimum insulating material. A braided flexible wire pig-tail is used. A reducing gear knob is employed, and this is coupled to the main spindle of the condenser by means of a neat spring belt which, being very elastic, can be stretched and the knob mounted as a "remote" control on the panel if required. Thus the 10—1 ratio vernier movement can be isolated from the "hand capacity" area. However, the latter cannot be intense owing to the metal end plates and earthed rotor. Hardened steel bearings are a special feature of this Cosmos component.

In general it is very substantially made and given throughout the finish of a precision instrument. The movements of both the dial and the slow-motion device are smooth and free from backlash. A low minimum and a maximum capacity commendably close to that specified are further noteworthy features. The ·0005 mfd. sells at 17s. 6d, and the ·00025 at 15s.

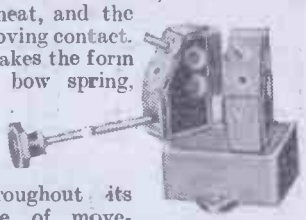
Cosmos Micrometer Two-Coil Holder.

This is provided with a very novel movement. The handle can be used to swing the moving coil through a 90 degree or greater arc, while it can be rotated in order to provide a fine vernier adjustment. It is an excellent piece of mechanism, solidly constructed, and its metal parts are very heavily nickel-plated. The retail price is 6s. 6d. for panel mounting and 7s. 6d. complete with base.

The Cosmos lead-in

Cosmos Double-Wound Filament Rheostat.

The main features of this component are its strong porcelain bobbin, which is unaffected by heat, and the protected moving contact. This latter takes the form of a stout bow spring, and provides a smooth positive contact throughout its entire range of movement. One hole mount-



The Cosmos coil holder with base

(*Continued on page* 1224.)

APPARATUS TESTED.

(*Continued from page 1222.*)

ing is arranged for. Two ranges of resistance are included, and, these being in series, operate continuously.

The rheostat is strongly constructed of obviously high-class materials. On test we discovered that the minimum ranges were slightly understated, but not to an extent to cause the slightest trouble. Two models are available, both at the standard price of 5s. The resistance of these are 18 + 2 ohms and 30 + 4 ohms.

Cosmos "Permacon" Fixed Condenser.

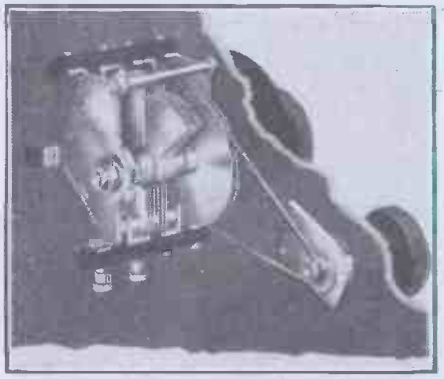
This is a stout little article, neat, and modelled in accordance with modern minimum casing practice. The several samples tested by us proved to be electrically efficient, holding their charges well and providing very slight capacity errors. Prices range from 1s. 6d. for the ·0005 to 3s. 9d. for the ·01 mfd. A ·0003 mfd. "Permacon," provided with permanent grid leak clips, is available at 1s. 8d. The Cosmos grid leak (of the "cartridge" type) retails at 1s. 6d., and has a resistance of 2 megohms.

Cosmos Anti-Vibration Valve Holder.

Undoubtedly this is one of the neatest "anti-microphonics" we have yet examined. In appearance it is very similar to an ordinary valve holder, and is almost as compact. A patent concealed method of "springing" is introduced, and, although it occupies such little space, the "play" is ample. The sockets are sunk for safety purposes, and a drilling template is provided. It is sold at 3s. 6d. A baseboard mounting model is also listed at 4s.

Cosmos Lead-in.

Here is another novel device. It consists of a threaded brass rod, at each end of which is an ebonite cone screw and a terminal. It can be fitted through any size of window frame hole from $\frac{3}{8}$ to $\frac{5}{8}$ in. diameter



Showing how the "slow motion" control of the Cosmos low-loss variable condenser can be mounted well away from the main component.

of any length up to 6 or 12 in. The two ebonite cones screw into the ends of the hole and provide perfectly watertight joints. The spindle or rod, it will be seen, is insulated by air throughout the majority of its length, and a better insulator could not, of course, be employed. A 6 in. Cosmos lead-in is sold at 1s. 8d. and a 12 in. at 1s. 10d., and is both an efficient and inexpensive substitute for the ubiquitous "tube."

Cosmos Hydrometer.

As well as being provided with a figure scale, this Cosmos hydrometer is marked with clear indications such as "Half Charge," "Full Charge," etc., a feature that will appeal to both listeners and amateurs possessing accumulators. A hydrometer is a very useful instrument, and at 3s. 6d. this Metro-Vick component should be ensured of a very ready sale. Too much reliance should not be placed on specific gravity readings as an indication of a battery's condition, but, nevertheless, they provide a very useful and adaptable method of obtaining ideas as to what is happening sufficiently accurately for most purposes.

In conclusion, we would like to record that, in our opinion, the above-mentioned Cosmos products leave no room for criticism. They bear evidence of thoughtful design and careful production, and are reasonably priced.

* * *

Messrs. The Cable Accessories Co., Ltd., have asked us to point out that in all recent advertisements concerning their cabinet loudspeakers, ORPHEUS should read ORPHEAN and DULCETONE should read DULCET.

WHEN replying to advertisements please mention "Popular Wireless and Wireless Review" to ensure prompt attention. THANKS!

RADIOTORIAL

All Editorial Communications to be addressed to The Editor, POPULAR WIRELESS, The Fleetway House, Farringdon 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 and 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 contributions to be addressed to The Editor, The Fleetway House, Farringdon Street, London, E.C.4. 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 Editor desires to direct the attention of his readers to the fact that, as much of the information given in the columns of this paper is of a technical nature and concerns the most recent developments in the Radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and trader would be well advised to obtain permission of the patentees to use the patents before doing so.

PATENT ADVICE FOR READERS.

The Editor will be very pleased to recommend readers of POPULAR WIRELESS *who have any wireless inventions to patent, or who desire advice on patent questions, to our patent agent. Letters dealing with patent questions, if sent to the Editor, will be forwarded to our own patent advisers, where every facility and help will be afforded to readers.*

TECHNICAL QUERIES.

Letters should be addressed to:
Technical Query Dept.,
"Popular Wireless,"
The Fleetway House,
Farringdon Street,
London, E.C.4.

They should be written on one side of the paper only, and MUST be accompanied by a stamped addressed envelope.

Queries should be asked in the form of the numbered questions: (1), (2), (3), etc., but may be accompanied by a short letter giving any necessary additional particulars as briefly as possible.

For every question asked a fee of 6d. should be enclosed. A copy of the numbered questions should be kept, so that the replies may be given under the numbers. (It is not possible to reproduce the question in the answer.)

IMPORTANT.—If a wiring diagram, panel lay-out or list of point-to-point wiring is required, an additional fee of 1/- must be enclosed.

Wiring diagrams of commercial apparatus, such as sets of any particular manufacture, etc., cannot be supplied. (Such particulars can only be obtained from the makers.)

Readers may submit their own diagrams, etc., for correction or for criticism. The fee is 1/- per diagram, and these should be large, and as clear as possible.

No questions can be answered by 'phone.

Remittances should be in the form of Postal Orders.

Questions and Answers

RESULTS WITH A REFLEX.

"FLAT-DWELLER" (Hammersmith, London, W.)—I am unable to erect an outdoor aerial, so I wish to use a frame aerial. Would a one-valve dual circuit give good strong broadcasting in the 'phones at this address?

At your distance a set of this kind will generally work quite satisfactorily with a frame aerial. The frame should take the place of the A.T.I., the tuning condenser being in parallel. You will not get loud speaker strength, of course, but on 'phones the signals should be quite loud.

Before trying a frame aerial, however, we would advise you to see what results can be obtained with three or four wires hung across the room and joined to the set in the usual manner. This aerial, if placed so that it is directional for 2 L O, should give better results than the frame, while the usual tuning apparatus of the set will need no modification. If the frame aerial is used, the variable condenser tuning the aerial must be in parallel.

(*Continued on page* 1228.)

RADIOTORIAL QUESTIONS & ANSWERS.

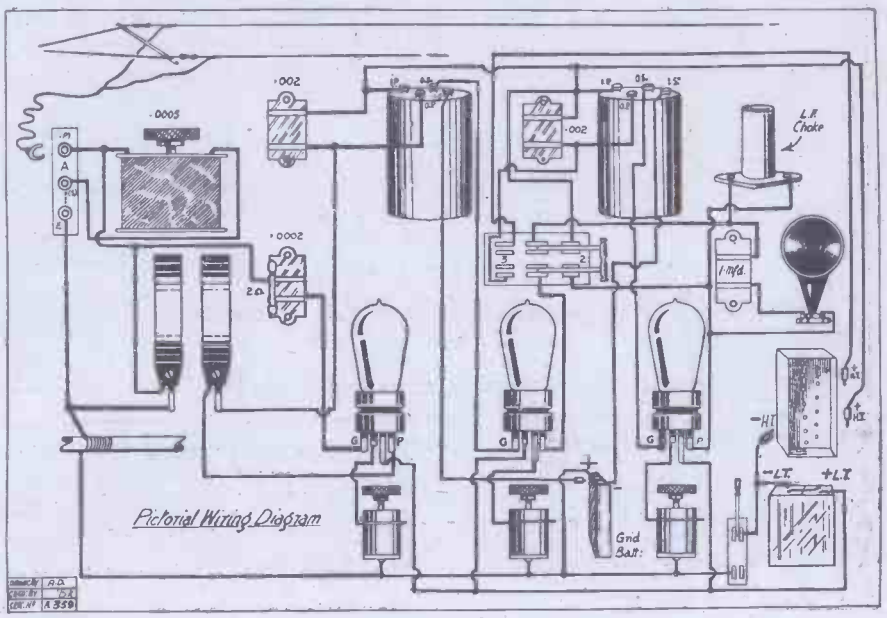
(Continued from page 1226.)

GOOD LOUD-SPEAKER CIRCUIT.

"THREE-VALVER" (Barkingside, near Ilford, Essex).—What are the connections of a good three-valve loud-speaker circuit? I should like series and parallel tuning for the aerial, so that the set can be used for Paris and 5 X X as well as for ordinary broadcasting wave-lengths.

Please show a double-pole double-throw switch for cutting-out the last valve when not required, and a choke for protecting the windings of the loud speaker.

The accompanying pictorial diagram shows the connections for a set of this type. With the appropriate plug-in coils, it is suitable for all wave-lengths, or a tuning-unit can be employed to cover the desired stations without the necessity of changing coils. Two L.F. transformers are employed (one "first-stage" and one "second-stage"), and the loud speaker is shunted across an L.F. choke, so that no direct current traverses the windings. The circuit is suitable for either bright or dull-emitter valves.



INTERFERENCE FROM IGNITION.

H. P. B. (London, W.).—I have replaced the magneto on my electric lighting plant by the spark coil method of ignition. During the time that the engine is working I find that it is practically impossible to use my wireless set. Before the spark coil was employed it was possible to receive with the lighting set working. Is it possible that the spark coil is directly responsible for this interference?

A spark coil forms a type of wireless transmitter capable of giving out one of the most flatly tuned waves it is possible to obtain. This means that the interference it is capable of causing is very great. To successfully eliminate this at a distance before 70–100 yards from the receiver is practically impossible.

The method of limiting this interference is as follows: Employ a special screened sparking plug, such as is used in aeroplane engines to eliminate this trouble. (Note.—This also applies to interference from magneto ignition.) The ignition leads should be covered with copper braiding and the spark coil or magneto totally enclosed by a metal box, or screen, and earthed.

Enclosing the ignition leads in metal tubes and earthing these will also be quite efficient in place of the copper braided ignition leads.

Electric lighting leads from the plant which pass near to the ignition system will also cause trouble, and must be treated in a similar manner to the ignition leads—i.e. surrounded by a metal screen which is earthed.

HOWLS ON A NEUTRODYNE.

E. P. P. (Leyton).—I have an American neutrodyne receiver. It seems to work all right, even on distant stations. It is stated that the receiver does not oscillate or produce "howling." How is it, then, that I pick up howls just the same as with my three-valve reaction receiver? I can be listening-in on a station, and without going near the set it will squeal just like the regenerative circuit when looking for a carrier.

If you have neutralised the receiver properly, there should be no howling when tuning in. However, howls can be produced even in crystal sets by an improperly tuned regenerative receiver in the neighbourhood. If your receiver is working properly you will pick these up, but it is not the fault of the receiver, but the fault of an operator of a regenerative receiver allowing his set to oscillate.

CALCULATING WAVE-LENGTH.

B. N. (Streatham).—What is the formula used for calculating the wave-length of a circuit?

The wave-length depends upon the constants C and L (capacity and inductance), so that you must know both C and L before you calculate the wave-length. Having determined C and L the wave-length is given by $\lambda = 1885\sqrt{C + L}$ where C is in mfd. and L in mhy.

For the Constructor

DRILLING & TAPPING SIZES.

B.A.			WHITWORTH.		
Size.	For Tapping	For Clear'nce	Size in.	For Tapping	For Clear'nce
0	11	6	1/16	3/64	52
1	17	10	3/32	5/64	41
2	25	12	1/8	3/32	30
3	29	20	5/32	1/8	4m/m
4	33	27	3/16	9/64	12
5	39	30	7/32	11/64	2
6	43	34	1/4	3/16	6½m/m
7	47	39	5/16	1/4	8m/m
8	50	44	3/8	13/64	10m/m
			7/16	15/64	11½m/m
			1/2	17/32	33/64

TECHNICAL NOTES.

(*Continued from page* 1204.)

has been "flashed" or vaporised during the manufacture of the valve, for the purpose of taking up the remaining gas in the bulb after the pumps have done their work. Some manufacturers use magnesium and some use other substances, these materials being known as "getters." The nature of the deposit on the glass depends principally upon the nature of the getter which has been used and, generally speaking, the appearance of the deposit is no indication of the merit of the valve at all.

The "window" which is sometimes found at the pip of the valve, is due to the deposit of the getter having been driven off the glass again during the sealing-off process of the bulb from the pumps.

In many cases this window, although it is accidentally (or incidentally) produced, is very useful, as it enables you to look inside and see when the filament is at the proper temperature for normal working.

Rectalloy Trickle Chargers.

Messrs. The Rectalloy Co. inform me that they have received an enormous number of inquiries for the rectalloy trickle charger, which was described in this journal recently, and that they have sold a large number of these chargers and also the various parts, in the latter case for the use of constructors who wish to make up their own chargers. Many reports have also been received by them as to the efficient working of the chargers from those who have purchased them or made them up from parts.

A New Grid Leak.

A new type of grid leak is based on the principle of electrolysis, a thread of absorbent wick being enclosed in a glass or other suitable insulating tube and soaked in the necessary electrolyte; for example, a solution of copper-sulphate in water. Cotton wool pads are introduced at the ends of the tube, to make the necessary contact with the resistance element, and the whole is then tightly sealed, leads being brought out in the usual way. It is claimed that this leak is extremely constant in operation, although it would seem to be liable to considerable variation owing to the drying-up of the electrolyte, the shift of the electrolyte from one position to another, and the change in the composition of the electrolyte after the passage of a certain amount of electricity.

A Wind-driven Generator.

The battery-charging problem in out-of-the-way country parts should be solved very neatly by an arrangement made by Messrs. F. A. Wilkinson, Ltd., Gretton, near Kettering. This consists of a small wind-driven dynamo, of the high-speed, permanent-magnet type, mounted upon a swivel platform, so that the propeller is maintained head-on to the wind.

Switchboard, ammeter, fuse, change-over switch, and automatic cut-out are all provided, the latter being so arranged that the battery cannot discharge itself through the generator if the voltage of the latter should fall below that of the battery. Two batteries are recommended, one to be on charge whilst the other is in use. In this way, the battery on charge takes up power whenever the wind is favourable.

ALL communications respecting advertising must be made to the
SOLE ADVERTISEMENT AGENTS—
JOHN H. LILE LTD.
4 Ludgate Circus London, E.C.4.
'Phone No.: CITY 7261

Correspondence

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

LIGHTING PLANT INTERFERENCE.

The Editor, POPULAR WIRELESS.

Dear Sir,—I am situated at Uckfield, and have a four-valve set. We have a lighting engine for our electric light. When we have the engine going for charging purposes, we hear the engine on the wireless, and sometimes it entirely ruins reception. We think this is due to the fact that we have a Ford coil in place of a magneto. When we had a magneto at first we could not hear the engine.

Yours truly,
HAROLD P. BUXTON.

60, Westbourne Terrace,
Hyde Park.

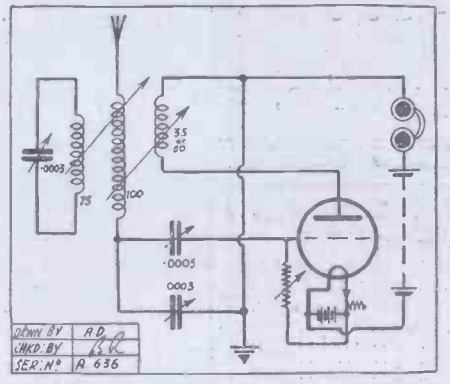
IMPROVED CHITOS.

The Editor, POPULAR WIRELESS.

Dear Sir,—I enclose herewith a diagram of an addition I have made to the "Chitos," which I hope may be of interest to some users of this circuit.

I do not claim that it is original, but I do not remember having seen loose coupling arranged quite in this way—probably because of my very limited knowledge of wireless. I first stumbled across it while trying "stunts."

With this addition, I can, at will, cut 2 L O out completely and tune in others. For the sake of experiment, I have tested it with four stages of transformer-coupled L.F. with the Savoy Bands playing, and the result is silence. This, at a distance of 8½ miles from London is, I think, a good test.



My method is to tune-in London to its loudest with the trap coil at its loosest coupling and then, with this coil tightly coupled to the aerial coil, adjust the condenser until London disappears. Other stations can then be tuned-in in the usual way.

One stage of L.F. added is a great improvement. So far, I have logged with one valve: Cardiff Birmingham, Newcastle, Petit-Parisien, Toulouse, Dortmund, Radio-Iberica. With one stage of L.F. added, I have so far added Belfast and Barcelona (Radio Catalana) to this list.

Yours faithfully,
Surrey. JAMES LINEHAM.

A SUCCESSFUL ONE-VALVER.

The Editor, POPULAR WIRELESS.

Dear Sir,—The following results on a single-valve set may interest you, as the circuit was one described in Circuit No. 10 of the "P.W." supplement, "The Valve Experimenter." I completed the set over the week-end, but did not have a chance to test it until recently.

5 I T, eleven miles away, came in at loud-speaker strength, working an Amplion loud speaker easily.

2 L O, 120 miles (approx.), faint on 'phones.

5 X X, forty-five miles, loud-speaker strength, was excellent. Radio-Paris, 330 miles (approx.), good 'phone strength. Radio-Toulouse, quite good 'phone strength.

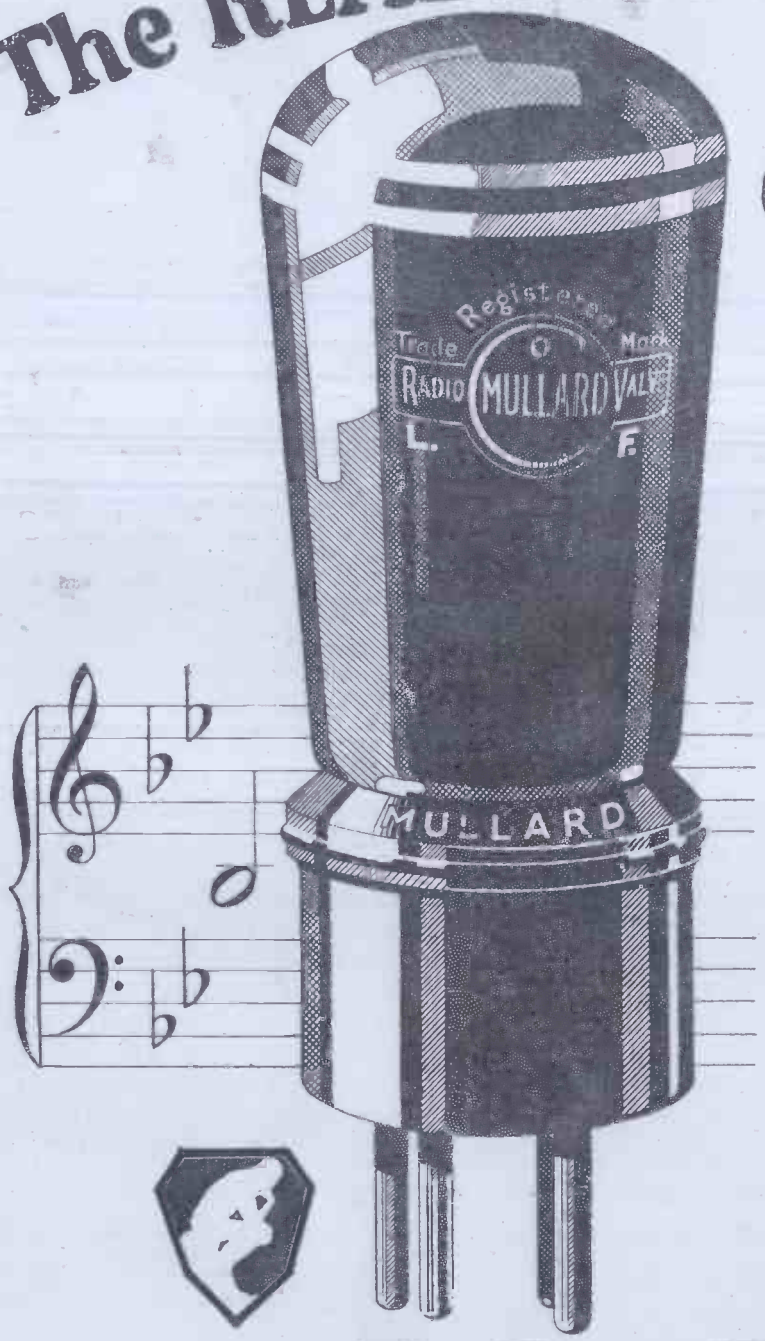
The valve is a Cossor Wuncell. Radio-Toulouse was received with 39 volts on the plate and 1·7 across the filament. Radio-Paris comes in well with 59 volts H.T. I can hear 5 I T distinctly with 3 volts H.T. and the filament just very dully glowing. My coils were home-made and rather roughly made too. If any reader would like further particulars I should be pleased to give them to him.

Tuning on wave-lengths 300–600 metres is very sharp, and vernier controls on coils and condensers is distinctly advantageous.

Wishing your paper a very prosperous New Year.

Yours respectfully,
Vale Street, Upper Gornal, A. V. NORTH.
Near Dudley, Staffs.

The REAL Pure tone Valve



GIVES EVERY NOTE ITS TRUE VALUE

DESIGNED to give pure and strong amplification in all L.F. stages. Produces abundant volume free from distortion and will operate all loud speakers.

MULLARD DOUBLE GREEN RING VALVES

Type D.3 for 2-volt accumulator - - - - 14/-

Type D.06 for 2 or 3 dry cells or 4-volt accumulator 16/6

NOTE: MULLARD D.3 DOUBLE GREEN RING VALVE IS A 2-VOLT POWER AMPLIFIER.

GET ONE FROM YOUR DEALER

Mullard

THE · MASTER · VALVE

ADVT. THE MULLARD WIRELESS SERVICE CO., LTD., BALHAM, LONDON, S.W.12

¶ *The illustration shows a simple but really effective loud speaker horn—that can be covered with fancy paper or painted so as to resemble a factory article—made for a few pence by following the easy directions supplied with every 'Lissen' Loud Speaking Unit, a new Lissen product yielding results equal to the most expensive instrument on the market and sold at the record low price of* **13/6**

A powerful loud speaker that costs less than headphones

The complete Unit with 'Lissen' Reed attached ready to receive a cone—or any other diaphragm working on the reed principle.

The 'Lissen' Reed Attachment (patent pending). Price 1/-.

Showing method of attaching Reed to the 'Lissen' Loud Speaking Unit.

Hardly credible—but true. For less than the price of a pair of 'phones you can buy the 'Lissen' Loud Speaking Unit that only needs the addition of a horn to make it a powerful, full-sized instrument, equal in volume, purity and tone to the most costly on the market.

Any horn will do. If you have a spare one in the house from a gramophone or a loud-speaker it will serve admirably. If not, there are directions with every 'Lissen' Loud Speaking Unit and full-sized patterns, telling you how to make a simple but attractive and really efficient horn for a few pence. Or, by using the Lissen Reed (price 1/- extra), a cone or any other diaphragm working on the reed principle can be quickly made and fitted, yielding results equal to an expensive speaker. By removing the sound-box and substituting the 'Lissen' Unit, any gramophone can instantly be converted into a loud speaker.

Make this test. Go to your nearest dealer and ask him to put on the most expensive loud speaker in his stock. Then put the same horn on the 'Lissen' Unit—keep the input voltage the same, no matter how high—and see if you can notice any difference.

LISSEN LIMITED

Lissenium Works, 8-16, Friars Lane, Richmond, Surrey.

'Phone: Richmond 2285 (4 lines). 'Grams: "Lissenium, Phone, London."

All Applications for Advertisement Space in POPULAR WIRELESS AND WIRELESS REVIEW to be made to JOHN H. LILE, LTD. (Sole Agents), 4, Ludgate Circus, London, E.C. 4. 'Phone: City 7261 (2 lines)'

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POPULAR WIRELESS AND WIRELESS REVIEW, January 30th, 1926. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

HOW TO MAKE A THREE-VALVE "DOUBLE DUAL" RECEIVER.

Popular Wireless

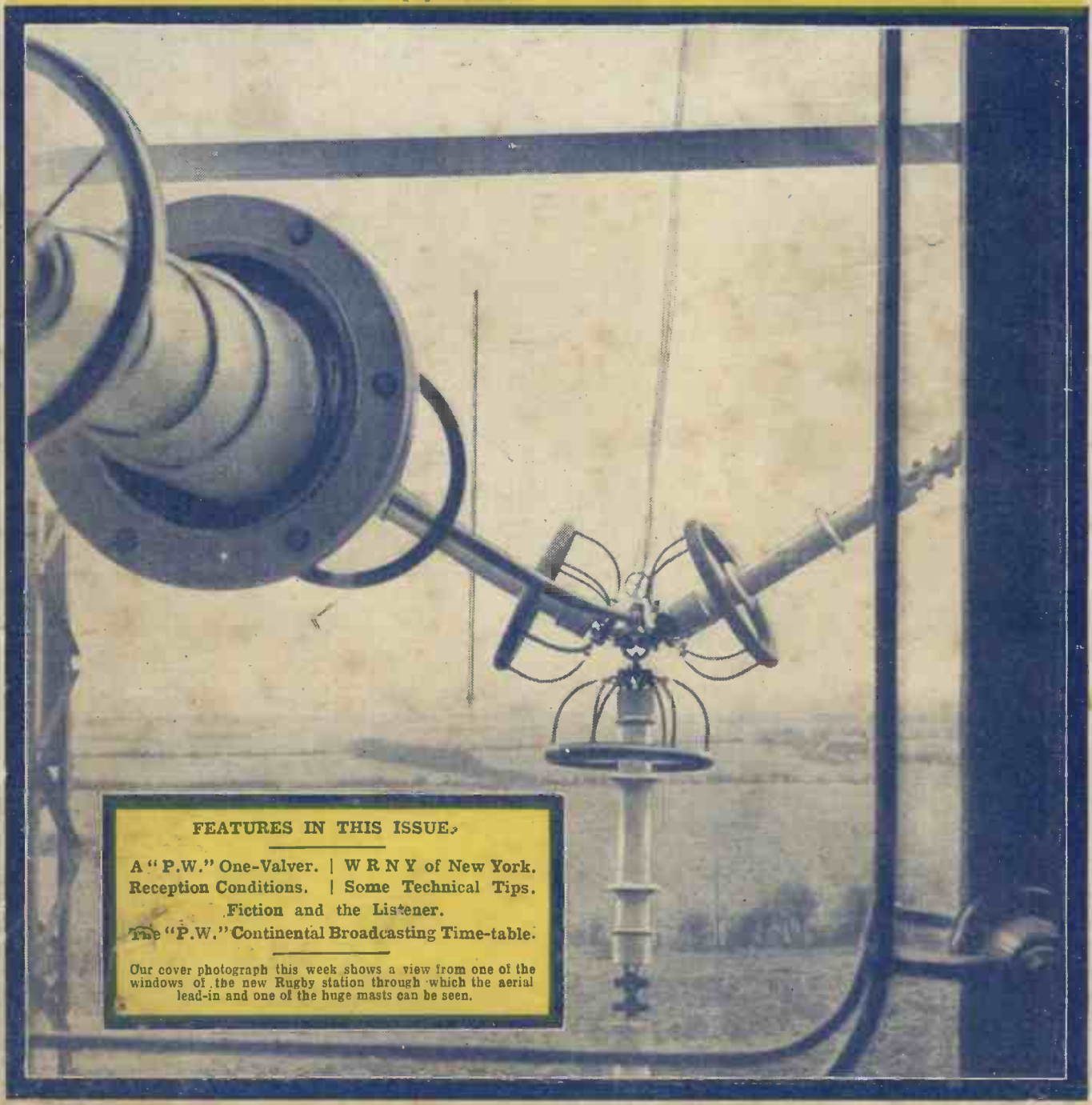
Every Thursday PRICE 3d.

No. 192. Vol. VIII.

and Wireless Review

January 30th, 1926.

Scientific Adviser : SIR OLIVER LODGE, F.R.S., D.Sc.



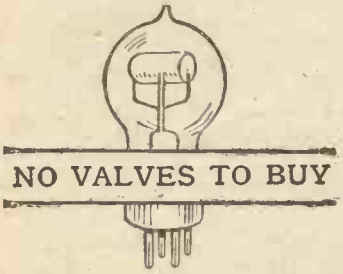
FEATURES IN THIS ISSUE.

A "P.W." One-Valver. | W R N Y of New York.
Reception Conditions. | Some Technical Tips.
Fiction and the Listener.
The "P.W." Continental Broadcasting Time-table.

Our cover photograph this week shows a view from one of the windows of the new Rugby station through which the aerial lead-in and one of the huge masts can be seen.

Brown

Brown Crystal Set, £2.

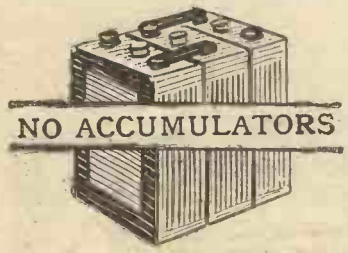


NO VALVES TO BUY

Dull Emitter Valves cost 14/- each. It takes a 2-valve Set to operate an ordinary Loud Speaker. Valves need renewal when burnt out. The Crystavox uses no valves—it works straight from your Crystal Set.

NO H.T. BATTERIES

A high tension battery will cost about 15/-. It will last about six to nine months according to the size of your Set and the amount of current it requires. The Crystavox uses no valves and therefore requires no high tension battery.



NO ACCUMULATORS

A good Accumulator will cost about 15/- and will require charging at periodical intervals — a constant expense. If you use a simple Crystal Set and a Crystavox you'll save the constant expense of Accumulator charging.

The only Loud Speaker which works direct from a Crystal Set

WITHIN 75 to 100 miles from Daventry thousands of Crystal users are now finding that they can get Loud Speaker results direct from their Sets by means of the wonderful Crystavox. Here is a super-sensitive Loud Speaker, which for purity of tone and economy of upkeep, is absolutely unrivalled. In fact, it requires no valves or accumulators—just attach it to your Crystal Set in place of the headphones and you will obtain a volume of sound sufficient to fill the entire room. No technical skill is required. Think what this means to you. Just tune in at any time and you can obtain perfect Loud Speaker reproduction—not a whisper but real volume. Any member of the family can use it—its simple mechanism is proof against mishandling.

Try this Test:
Owing to the wide variation of local conditions it is not possible to guarantee that every Crystal set will work a Crystavox. The test is this: Tune in to greatest strength and hold the headphones 12 inches from the ear. If the signals can still be heard your Set is sufficiently powerful to operate a Crystavox.

For those fortunate enough to live within easy reach of a Broadcasting Station, the use of a Crystavox with a Crystal Set is by far the cheapest, most reliable and most economical method of enjoying Wireless.

£6

S. G. Brown, Ltd., N. Acton, London, W.3

Retail Showrooms: 19 Mortimer Street, W.1.
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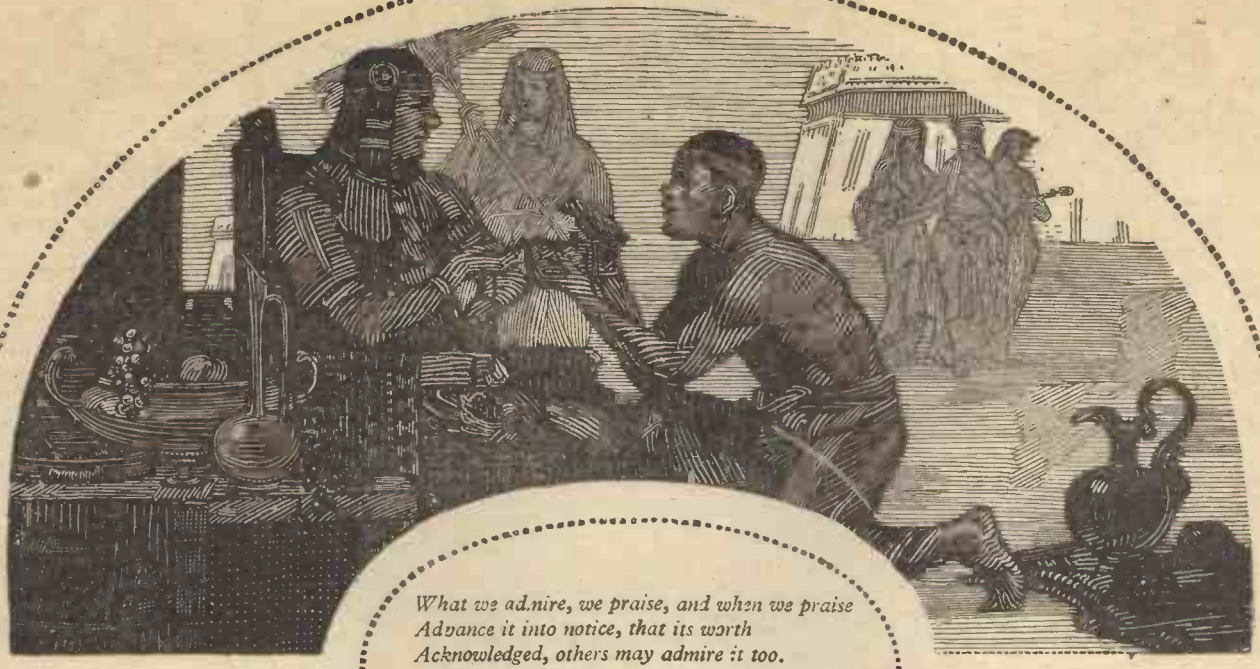
The **CRYSTAVOX** *A Loud Speaker working from a Crystal Set.*

Gilbert Ad. 4450



What we admire, we praise, and when we praise
Advance it into notice, that its worth
Acknowledged, others may admire it too.

COWPER

"That its worth acknowledged . . . . . "

JUST how strong is the wireless public's loyalty to the Wuncell Dull Emitter is demonstrated by the fact that the year just passed was easily the most successful in the history of the Cossor Valve.

A very large proportion of Wuncell users are those who first became acquainted with the peculiar merits of Cossor Valves through the original P.1—the most popular Bright Emitter ever placed upon the British market.

During the past two and a half years the public have had ample opportunity to test out the Cossor Valve under every possible condition. Invariably they have found it supersensitive to a degree, productive of a beautiful fullness of tone and exceptionally trustworthy. They have proved that the arched filament combined with the electron-retaining hood-shaped Grid and Anode is responsible for a standard of efficiency which cannot be duplicated by any other make of Valve. Consequently once they have chosen their valves, Cossor users are not to be weaned from them.

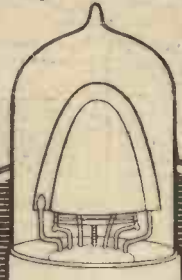
Month by month this circle of enthusiasts is widened by those discerning men who are desirous of obtaining the finest possible valve service. With the Wuncell they are realising that the working costs of a Valve Set are reduced to a level never before believed possible.

For 2-volt Accumulators.

W.1. For Detector and L.F. use - 14/-
Consumption: .3 amps.

W.2. (With red top) For H.F. use - 14/-
Consumption: .3 amps.

W.3. The Loud Speaker Valve - 18/6
Consumption: .5 amps.



For 2, 4 or 6 Volts.

W.R.1. Similar to W.1, but with special resistance which can be short-circuited when not required - - 16/-

W.R.2. Similar to W.2, but with resistance as above - - 16/-

Cossor W3

Cossor Valves

A. C. Cossor, Ltd., Highbury Grove, N.5

Gilbert Ad. 4438

Popular Wireless

Scientific Adviser: Sir OLIVER LODGE, F.R.S.
Consultants: Dr. J. H. T. ROBERTS, F.Inst.P. J. F. CORRIGAN, M.Sc. A.I.C. C. E. FIELD, B.Sc.

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Technical Editor: G. V. DOWDING, Grad.I.E.E.
Assistant Technical Editors: K. D. ROGERS, P. R. BIRD.

RADIO NOTES AND NEWS.

Radios Biggest Bargain—The Broadcast Scare—International Radio Week—2 L O Sits Down—The P.M G's. Veto—The Unidyne in Hong Kong—A Roundabout Route.

Lend Me Your Ears!

FRIENDS, Romans, Agriculturalists, lend me your ears! Have you ever stood before a bookstall and said to yourself:

"'P.W.' or not 'P.W.'—
That is the question.
Whether 'tis better to make a change sometimes,
Buy this, buy that, read about super-men,
Vain-pomp-and-glory kind of thing—
Or buy the trusty old 'P.W.'
That spurns superfluous technicalities,
And tells you how to make a top-hole set
From sixpenn'orth of wire and a bare bodkin?"

Have you?

Radio's Biggest Bargain.

IF ever you are tempted in this way—and who is always wise?—don't let it be next week, for "P.W." is offering the most remarkable three pennyworth of radio value in history. Inside each copy will be given away one, two, three, *four* blueprints! Each of these comprises a pictorial, theoretical, and large back-of-panel diagram, together with a list of components and a brief description of the set. Anybody could make one or all of these sets from the blueprints, but just to simplify simplicity every one of the sets will be described, with photographs, by the "P.W." technical staff.

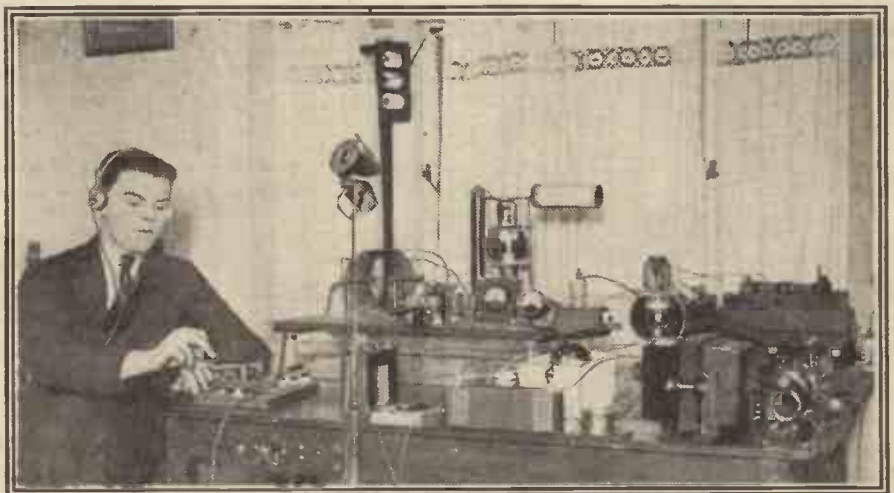
Honestly, I think you will agree that next week's "P.W." is the last word in the wonders of wireless. Don't take a chance when you can have a certainty, but get your order in now.

The Broadcast Scare.

YOU remember that "News Bulletin" parody which scared some listeners into the belief that a mob was loose in London sacking the Savoy Hotel, and all the rest of it? In all the fuss that has been raised about it, I do not remember seeing or hearing a reference to the real humour that lies behind such a broadcast. We in Britain knew the truth, or found it out easily enough, but what about our foreign audience listening to 5 X X? Remember the possibilities of imperfect reception, imperfect translation, and the chances of it being misunderstood abroad. I have often pointed out that radio is now a British ambassador, and a good ambassador doesn't mind an occasional joke.

Wave-length Sharing.

AS there are not enough wave-lengths to go round, wave-length-sharing is to be tried in Europe, and the Bournemouth station is participating in the tests. The idea is that far-distant stations, if suitably situated, should be able to use similar wave-lengths without interference. This would leave more room in the ether, so results will be watched with interest.



A well-known North London experimenter, Mr. R. L. Royle, operating at his station at Palmers Green (2 W J).

International Radio Week.

THIS is International Radio Week, and once again all the various countries are co-operating in an exchange of programmes. For the benefit of American listeners, the B.B.C. has arranged to relay special early-morning programmes, and the long-distance listening thus made possible will provide some interesting data when the results are tabulated.

An Extension of the Tests.

THE Americans have planned to extend their Radio Week so that when the transatlantic tests are finished there should be inter-American tests. This is a development that is likely to occur on this side also, and as broadcasting grows we shall doubtless have an inter-European week, another week for Europe-Asia tests, and so forth. Radio is like a snowball, isn't it?—the further it goes the bigger it grows. International Radio Week gives us a once-a-year chance of measuring the snowball.

Radio in India.

IT is announced that the Government of India has given permission to the Indian Radio Company to erect two new high-power broadcasting stations.

These stations are to be situated at Calcutta and Bombay, and both will employ a power of 12 kilowatts.

An interesting record for Indian reception was set up recently by a Calcutta amateur, who picked up broadcasting from the Moscow station. Part of the programme was the opera "Carmen," and the singing was clearly reproduced upon the loud speaker.

Modern Methods Conquer Jungle.

CAPTAIN STEVENS, an airman who has been carrying out exploration for the U.S.A., is strongly in favour of wireless for the explorer. He reports that the obstructions of intense heat, a humid atmosphere, dense jungle overgrowth, and

(Continued on next page.)

NOTES AND NEWS.

(Continued from previous page.)

the like, had no effect upon the efficiency of radio communication. From the heart of South Africa he succeeded in exchanging direct daily messages with London, New York, and New Zealand, upon a portable set, with a wave-length of 80 metres.

The Triotron Valve.

A FORTNIGHT ago, under the heading "A Reader's Experience," I called attention in these columns to some letters I had received regarding the Triotron valve. In fairness to the makers of this valve I am bound to admit that they must have a large number of completely satisfied purchasers in this country, for a number of readers immediately took up the cudgels on behalf of the Triotron.

More Readers' Results.

OVER a dozen letters on the subject reached me by the very first post following publication of the letter I quoted. They came from in and around London, and without exception they recounted favourable results with the Austrian valve.

The letters of complaint are now well outnumbered by the letters of praise, so I think the former must have been due to a faulty batch of valves, or some temporary manufacturing flaw such as all firms are liable to.

2 L O Sits Down.

WHEN reporting a recent breakdown at the London broadcasting station, the "Daily Sketch" headed the news-item, "2 L O Sits Down."

There was no suggestion that the person responsible ought to be made to sit up.

Trouble in Ireland.

A WIRELESS licence in the Irish Free State costs one guinea, as compared with ten shillings in Northern Ireland. This fact has been noticed by the audience of the Dublin station, 2 R N, and consequently the job of station director there is no bed of roses, at all, at all. There is a loud clamour for more variety in the programmes, which have been largely confined to musical items—and the short hours of working and failure to broadcast upon Sundays have occasioned much unfavourable comment.

Relays from Across the Border?

THIS matter of the Dublin station shows what a barrier-breaker wireless broadcasting can be. According to the Dublin correspondent of "The Times," there is an almost general demand now for the relaying of some of the B.B.C.'s programmes from Daventry, or even from Belfast.

After all, it's the quality of the programme that matters, isn't it?

Outposts of Civilisation.

MEMBERS of the Royal Canadian Mounted Police are proving that radio is an invaluable asset to a winter in the Arctic Circle. At one time the northern posts maintained contact with civilisation through a supply ship, which arrived once a year in the middle of summer. During the night of the Arctic winter they were absolutely isolated, but now every post is equipped with wireless. Canadian and American stations can be tuned in all the year round, and this year the posts have been equipped with special short-wave sets.

Clothes Line Aerials.

THE old rule that an aerial should always be as high as possible still holds good in the majority of cases, but it is surprising to find what can be done upon "clothes-line" aerials. A Hinckley reader tells me that, using the "P.W." Long-range Loud-speaker Set, he received a Czecho-Slovakian station at good loud-speaker strength, upon an aerial only 12 ft. high!

Those Short-Wave Stations.

THE report that the B.B.C. was changing over to short wave-lengths did not find much credence, despite the fact that it was widely published. There are many obvious disadvantages of such a course, and although I have often speculated upon the possibilities of a short-wave station to keep the Empire in touch with British broadcasting, I have never met anyone in authority who advocated short waves for *short*-range broadcasting.

SHORT WAVES.

"I have a good wireless set, but it is not used so often as it might be just because I can't hear what two out of every five musical performers are saying or singing. A man may have the best tenor voice or baritone voice—or any other kind of voice—in the world, but if the listener can't hear every word he is singing the performance is a failure."—Sir Harry Lauder.

* * *

"Of the ten vessels posted as 'missing' last year only one was equipped with wireless. This fact constitutes a remarkable tribute to the value of wireless as a factor making for safety of life at sea."—"Lloyd's List."

* * *

"Alternative Daventry programmes are necessary so that the 'grousers' will be satisfied by having two things to 'grouse' about instead of one."—Captain Eckersley, Chief Engineer of the B.B.C.

The P.M.G.'s Veto.

APART from the fact that there is no proof that short waves would serve Britain better than the 300/500 metre band of wave-lengths, the alteration would prove too costly as a practical proposition. A wholesale alteration of receivers to take in the 100/200 metre band, would cost the public *ten million pounds*, or more. The Postmaster General has the last word upon wave-lengths, and he would take a lot of convincing before he sanctioned such a sacrifice.

A Correspondent Wanted.

READERS abroad who would like to correspond with a British radio enthusiast should make a note of the address of Mr. J. Lippold, 33, Campion Terrace, Leamington Spa, Warwickshire. He is 19 years of age, interested in radio practice and theory, and very keen on DX work, so there should be plenty of scope for interesting epistles.

Disposing of Your Old "P.W.'s."

"REMEMBERING how much pleasure they have given me, I hate to throw away my old 'P.W.'s,' but what is one to do when space is precious?" asks a reader at the end of a technical query.

Well, I'll tell you. Since the hospitals have been equipped with wireless they have become positively greedy for wireless literature. Many a patient, lying in bed and waiting for his appendix to be cut out, occupies his mind by cutting out the last valve, or some similar radio-surgery.

So take a bundle of your old copies up to the local hospital, give the Matron my love, and note how she smiles when she recognises "P.W."!

The Unidyne in Hong Kong.

UNIDYNE-USERS will be interested in the experiences of a reader who writes from Kowloon, Hong Kong. He says: "About a week ago I constructed a one-valve Unidyne and after experimenting with it for a few hours I succeeded in tuning-in music and speech from K R C (Kellogg Radio Corporation), Shanghai, on 356 metres.

Considering the distance between this port and Shanghai (800/900 miles), also the transmitting power of that station, which is only 100 watts, I think the results obtained with my one-valver without H.T. are splendid."

Radio to the Pole by Air.

I HEAR that an order has been placed with the Marconi Co. for an extensive wireless outfit for Roald Amundsen's airship, in which he hopes to make a trip to the North Pole. It will consist of a standard receiver for Morse or broadcasting, and a telegraphic transmitter.

6 N K.

THE call-sign 6 N K has been allotted to Mr. Ronald J. Denny, 1, Hillside, Waverley Road, Weybridge, Surrey, for pure C.W. on 45 and 23 metres. Transmissions upon the former wave-length are starting forthwith, and reports and Q.S.L. cards will be welcomed and answered by return.

A Roundabout Route.

IT'S a long, long way from Chefoo to Chile, but when a short-wave radio station in the Chinese town called up recently, it was a Chilean amateur who offered to take the message and pass it on to its destination in America. Moreover, the latter part of the operation did not take long, for in response to a call the first reply was from a San Francisco amateur, and the route followed by the message was Cheefoo (China), Chile, and California!

The Critic and Massa Johnson.

THE B.B.C. cannot give varied programmes without providing some amusing contrasts. There was a good case recently, when the Literary Critic was talking of the importance of correct pronunciation. He quoted a book by the Poet Laureate, and spoke about giving vowel-sounds due importance; and then there followed nigger minstrels! Massa Johnson asked one of these gentlemen what a "gozinta" was, and, after due consideration, one of them said:

"Ah know; two gozinta four, four gozinta eight," etc!

How the poet and critic must have shuddered, if they heard!

ARIEL.

Fiction & the Listener

An Interview with the well-known Novelist, Miss Ruby M. Ayres.

By "ARIEL."

WHEN I went to discuss Broadcasting from a novelist's point of view, with Miss Ruby M. Ayres, the first thing I looked for in her pretty house in Harrow was a wireless set.

I saw an attractive garden, a telephone, lots of fascinating old china, pretty chintz, a business-like typewriter, a friendly dog answering to the name of "Soda," a piano, a gramophone—but not a sign of a wireless set, crystal or otherwise.

Miss Ayres, busy transferring a new story straight from her brain to the clicking keys of her typewriter, seemed to interpret my unspoken question.

"A receiving set?" she queried. "No, I haven't got one, and what is more I don't intend to have one, till programmes get brighter and better. I listen in quite a lot at the houses of my friends, and believe me, I would sooner journey to London and spend half an hour in a real concert-hall, or a genuine theatre, than listen for three hours to the wireless efforts of invisible artistes."

Two Distinct Aspects.

In everything she says and does Miss Ayres is very downright and decided. She knows her own mind, and does not hesitate to state her opinions, clearly and decidedly. As things are at the present time, she does not like wireless so far as its programmes are concerned.

"For wireless itself, as a marvellous invention, I have the truest, profoundest admiration," said Miss Ayres. "Obviously it is destined to be one of the greatest forces in the history of mankind. But to ask the average man or woman to take an interest in the type of programme provided to-day is stretching tolerance a little too far."

"So you have no set of your own?" I remarked, hoping for further comments.

"No. People are always urging me to get a set, but I am not to be persuaded. In my mind's eye I see, over and over again, a vision that confronted me not long ago at a friend's house. We had been to dine, and after dinner four headphones appeared. I sat with three men to keep me company, listening in. Honestly, I don't remember what we listened-in to, it made as little impression on me as that! All I can tell you is that in less than ten minutes two of those men were lying back in their chairs fast asleep, with their headphones securely clamped to their ears! Well, if broadcasting has that sort of effect on the public it is expected to amuse, there must be room for some improvement somewhere, don't you agree? So whenever I am urged to become the owner of a set I say, quite firmly, 'No; not till programmes are warranted to keep us awake!' Do you blame me?"

Frankly, I did not; but I wanted to know something about Miss Ayres' own experiences as a broadcaster.

"You did some broadcasting yourself, didn't you?" I prompted her.

She smiled reminiscently.

"I did. Not so long ago, either, round about last Christmas I think. The authorities at 2 L O asked me to go there one day and say something about the best way to keep up-to-date when writing short stories. Personally, I would sooner have written a short story expressly for a listening-in audience, and read it to them; but

Miss Ruby M. Ayres.

they didn't ask for that. So I prepared a few notes on the way I think short story writers should keep up-to-date—keeping an open mind, travelling, reading, following the political, dramatic, and musical trend of the day—and away I went to 2 L O."

"How did you like broadcasting?"

"Shall I confess," said Miss Ayres, "that my strongest inclination was an overpowering desire to giggle? It was all so solemn, so silent, so constrained. That bare, canvas-walled room, the air of intense silence and quietude, the restricted movements. The muffling of every sound—rather like one's idea of life in a padded cell! I sat there for some time listening to other people singing or speaking into the microphone; then my turn came.

A Warning.

"The announcer said something about me, then moved silently away and motioned to me to step up to the microphone. Speaking partly from notes and mostly from memory, I said what I intended to say, filled all the time with the frightful sound of my own lonely voice in all that stillness! It oppressed me so much that half-way through I actually *did* giggle. I'd been longing to laugh, all the time, and when I got home that night some friends who came to dinner said, 'What was amusing you? We were listening-in, and we distinctly heard you giggle!' Which is rather an awful warning on the effect of one's behaviour in the Broadcasting Holy of Holies."

An Original Suggestion.

I asked Miss Ayres what she feels about the possibilities of broadcasting short stories. She replied:

"I think the possibilities are vast, but they have not begun to develop yet. One day, I believe the public for broadcast fiction will be the greatest in the world; and a new generation of writers must grow up to cater for it.

"Stories by wireless ought to be very, very popular, but they will have to be the right kind of stories. And somebody has to be found who will make a study of the best kind of story for broadcasting purposes. My own belief is that such stories must be light, but really interesting; above all, that they must be short, and crammed with vital 'alive' dialogue. Diffuse descriptions of scenery and character can have no place in such stories. Character must be conveyed through dialogue, and descriptive writing reduced to a minimum.

"There is a great future for the writer who can cater for the Fiction-Loving Listener-in. And when the stories are written, the right kind of artiste must be found to broadcast them. Of one thing I am positive—it must be somebody with a sympathetic voice! If I had to select people for such work I would ring up all the business houses in London possessing private telephone exchanges; and the operator who answered a casual inquiry with the most sympathetic voice and phrasecology would be my choice for a broadcaster of fiction!"

"What made you think of that?" I inquired.

"Can't say exactly," said Miss Ayres, "unless it is that in my journeys to America I have been so keenly struck by the voices of certain operators on business switchboards. And if you come to think of it, I think you'll admit that London has the same striking voices, with a real personality behind them."

"I wonder—do you think that the development of broadcasting stories at night is likely to make people read less?"

(*Continued on next page.*)

SOME TECHNICAL TIPS.

FROM A CORRESPONDENT.

ONLY grid leaks of guaranteed make should be purchased, as many of the cheaper makes differ by several hundred per cent from their nominal value, some of the cartridge leaks having nothing inside them at all, and presumably relying on the inferior grade of ebonite employed to form the leak.

Variable leaks of the compression type seldom prove satisfactory in use, and the writer prefers the semi-liquid type. The only faults to be found with the latter are: (*a*) their liability to dry up after protracted use, and (*b*) the fact that, owing to the viscosity of the material used, they do not rapidly settle to a steady value when the plunger is withdrawn. The best type of variable leak is undoubtedly the type which is adjusted through the medium of a switch arm and studs, although this type does not appear popular, probably on account of the fact that it takes up more room behind the panel.

Resistances and Valve Holders.

Similar remarks apply to anode resistances, only in a more marked degree, since any variations in these components make themselves plainly heard in the telephones. A large number of sets are now being made with L.F. resistance-capacity coupling, and for this purpose especially the writer would urge the importance of using wire-wound anode resistances, which although rather more expensive will save much trouble and give better quality reproduction.

Avoid composition valve holders like the plague. The composition is often leaky, and when this is not the case it has a very high value of specific inductive capacity, rendering the holders useless for anything but low-frequency stages. If you must use valve holders, use turned ebonite ones.

Plain valve sockets are far more satisfactory, cost considerably less, and look quite as nice, particularly if they are cleaned and lacquered. The best arrangement is undoubtedly the modern low capacity valve socket of which there are several types on the market. They are frequently advertised in "P.W.," and possess the advantage of extremely low capacity, longer leakage path, neat appearance, and a saving of space both above and below the panel.

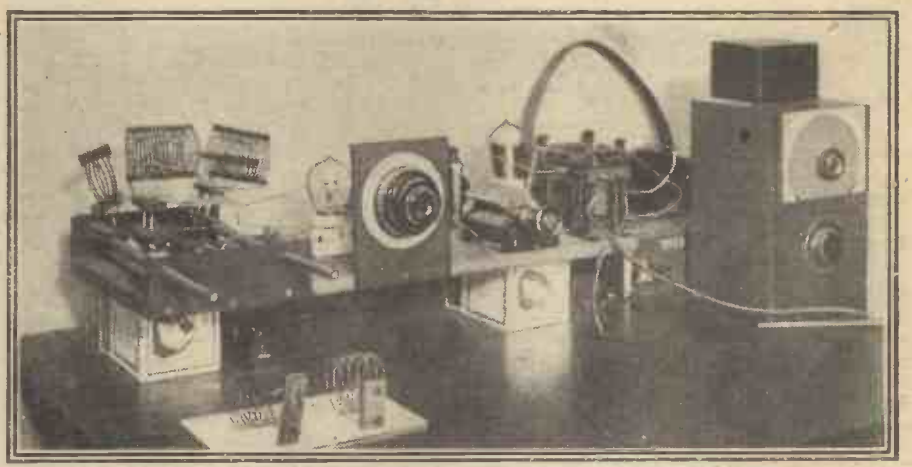
Wire and Wiring.

In wiring your set make soldered joints wherever possible, but remember that ebonite, and more particularly moulded composition, softens readily under the influence of heat; therefore, see that terminals, contact studs, etc., are not loosened in the soldering process. Fluxite, Rozinal and Britinol are all excellent fluxes to use, but a smear of flux is quite sufficient, and even then the joint should be wiped after soldering to remove any superfluity of flux. Use a hot soldering iron (just hot enough to turn the flame green), and make all joints quickly to prevent excessive flow of heat. A file or a piece of emery cloth rubbed over the ends of terminal stems, etc., will enable the joints to be made more readily.

Of late, the use of heavy round or square busbar wire has spread, and it cannot be denied that an attractive appearance is gained thereby, but it should be borne in mind that connections are made primarily for utility, and that, particularly in the H.F. stages, they should be as short and small as possible, even though this means sacrificing the nice parallel appearance of telegraph wires so beloved by the novice. Heavy wires, also, possess considerable inertia, and soldered joints to them are consequently more easily broken by the slight jars and vibrations of every-day usage. Taking all things into consideration, there is nothing to be gained by the use of larger wire than 20 S.W.G. tinned copper, except in the filament circuits of multi-valve receivers. If this wire is stretched hard before using it will be found sufficiently rigid and neat in appearance.

The Use of "Glazite."

A very good plan in wiring is to make all L.T. and earth connections first, keeping these about one eighth of an inch away from the panel. Low-frequency connections and direct connections to H.T. + can then be made on a plane about half an inch away from the other connections, the H.T. connections being preferably protected with insulating sleeving or Glazite wire. Finally, make your high-frequency connections farther away from the panel, and watch carefully to avoid undue proximity between plate and grid leads.



Mysterious flashes which destroyed a £9 valve we saw at Mr. Royle's amateur station at Palmer's Green. Above is shown the short-wave receiver used for receiving New Zealand stations.

FICTION AND THE LISTENER.

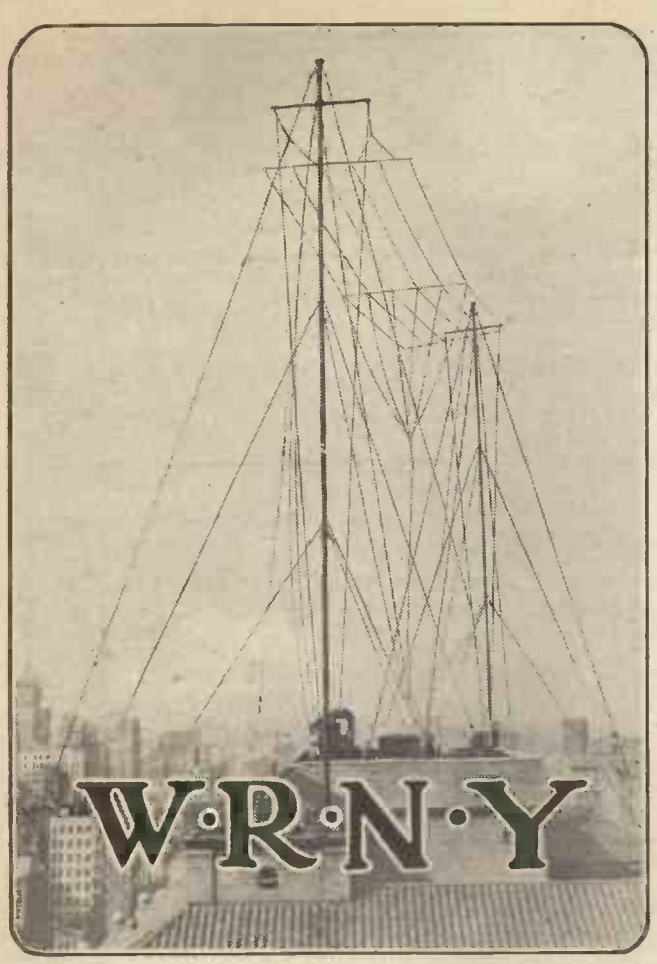
(*Continued from previous page.*)

Miss Ayres pondered a minute.

"If developments take place on the right lines, it might; but that will open up endless new channels for writers and publishers, too. What it takes away with one hand it gives back with the other. Just as broadcasting songs has sent up the sale of music and gramophone records, so the broadcasting of good fiction will lead to a huge demand for permanent published editions of stories that grip a million listeners. In the end, I think the broadcasting of stories will lead to greatly increased fortunes both for writers and publishers. But as things are now—no."

A final question as to the best way to improve programmes, especially from a woman's point of view, caused Miss Ayres to say: "Let them have a woman who has a shrewd all-round outlook on their advisory council. Someone who could edit a paper ought to be admirable; someone who can keep a steady finger on the public pulse, and follow its slightest movement. When we get a brilliant woman 'editing' programmes from a woman's viewpoint in conjunction with a brilliant man looking after masculine interests, we may arrive somewhere near perfection!

"The preparation of a wireless programme, to my mind, is very much like the editing of a vast paper with a daily circulation of over a million subscribers. The gifts that make for success in one case should lead, eventually, to success in the other. If I had my way, I would give a great newspaper magnate control of B.B.C. programmes for a month and watch the result!"



Some Details of a Popular American Station.

By L. W. CORBETT.

(Our Resident Correspondent in New York.)

IF I kept your editor posted with detailed descriptions of all the American broadcasting stations to open, not only would it be necessary considerably to add to the present size of "P.W.," but it would certainly be essential to publish special "New American station" numbers about fifty-one times a year (fifty-two times leap year).

However, I feel quite justified in giving a short description of some of the novel features of one of New York City's new broadcaster, W R N Y, operated by "Radio News," and situated atop the Hotel Roosevelt at 45th Street and Madison Avenue.

So much for preliminaries.

Good Reports Received.

W R N Y operates on 258·5 metres—that is 1,160 kilocycles—with an output of 500 watts.

Reports of reception have been received from distances of nearly 2,000 miles—when the transmitter was in an experimental stage—so there is no reason why England should not send in for confirmation of reception next.

The generators are housed on the twentieth floor of the building while the studio is on the eighteenth. There are several innovations, one of the chief being an harmonic suppressor which entirely rids the broadcast modulator carrier wave of all mush and harmonics, usually found so troublesome.

For a lightning arrester a simple 4,000 ohm resistance is connected between the aerial and ground terminal.

In order that the emitted wave may remain always at the regular frequency, a special meter is installed in such a manner that an alarm will be rung immediately if anything miscarries.

A Novelty.

A novel feature by which W R N Y can be recognised between numbers, is its constant "staccatone" signal which is on the air before the announcer speaks and between selections. This characteristic note, similar to that of a cuckoo, gives a sure method of identification which will assist DX listeners.

W R N Y is the premier high-class, high-power station in the States to go on a decidedly low wavelength of its own accord.

In the control room there is a table containing nearly 100 pairs of wires leading into the panel coming from the control-room, the reception-room, the main office, and the public address system of the hotel.

For distribution at this public address system pick up is available by microphone from any room in the hotel. By this system, an instant's notice to the guests' rooms, dining-rooms, lobbies, etc., of the hotel, makes available for use at the station any addresses, speeches, or other announcements being made anywhere in the hotel.

There are, in addition, leads from the control-room to the hotel public address system on the first floor of the hotel, so that any programmes being given by W R N Y may be available to the guests of the hotel through loud speakers connected with the public address system.

The programme policy is very different from anything else on the air. Radio "hook-ups" for example are being broadcast as a regular feature by a new system worked out by Mr. Hugo Gernsback, editor of "Radio News."

Educational Programmes.

A one-valve circuit can be broadcast by this system in four minutes, and a seven-valve super-het. in about eight minutes.

More than 50 per cent. of the time is devoted to the usual entertainment numbers—all of the highest class, while the rest of the time can be used for the dissemination of scientific information and addresses.

"Radio News" is, of course, in an excellent position to provide this latter matter.

It is not denied that the object of W R N Y—the "Novelty Station" as it is called—has been set up for publicity purposes, but no direct advertising will be allowed.

Listeners are not advised as to the contents of forthcoming issues of "Radio News," for instance—but the advertising value accrues from the bare announcement:

"W R N Y, the 'Radio News' station at the Hotel Roosevelt, calling . . . ."

Finally, that journal will be very pleased to hear from amateurs in Great Britain and elsewhere who have picked up broadcasts from W R N Y. The station has not been in operation very long, and reports from DX listeners can be of the greatest assistance, besides being mere records of achievement, either in transmission or reception. So write over and tell us if you hear anything from W R N Y.

Tuning the transmitter at W R N Y before commencing to broadcast.

FOUR BLUE PRINTS FREE.

NEXT WEEK'S TWO SHILLING GIFT TO READERS.

UNPRECEDENTED VALUE.

WITH every issue of "P.W." on sale next Thursday, at the usual price of 3d., we shall present to readers *FOUR 6d. BLUE PRINTS.*

These Four Blue Prints will, for the sake of convenience, be given away in one large sheet measuring 35" x 18", but readers can very easily cut the sheet along the dotted lines specially provided, into four separate sheets.

THE Blue Prints given away next week give Theoretical and Pictorial and Lay-out diagrams of the following circuits :

1. Detector Valve with Reaction. 2. One-Valve Reflex and Crystal Detector (Tuned Anode). 3. One-Valve L.F. Amplifier. 4. H.F. and Detector, Tuned Anode Coupling and Reaction on Anode.

FOUR BLUE PRINTS FREE.

(In Value 2/-)

With Every Copy of "P.W." on Sale week ending February 13th, the following Blue Print Circuits will be given free:

1. H.F., Det. and L.F. (with switch for cutting out last valve).
2. Two-Valve L.F. (with switch to cut out last L.F.).
3. Valve-Crystal Reflex and L.F. Amplifier.
4. Unidyne Det. with Reaction.

EIGHT MORE 6d. BLUE PRINTS FREE TO READERS.

WITH the issues of "P.W." for week ending February 13th and 20th, eight more Blue Prints will be given away—four with each issue.

THESE Blue Prints have been specially prepared by our own draughtsman, and represent a valuable gift which every reader should obtain.

With the next three issues of "P.W." our readers will be able to secure 12 representative Blue Print Circuits, free with their copies of "P.W." ; but at the end of our three weeks' gift scheme, a charge of 6d. per Blue Print will be made.

A VERY comprehensive series of Blue Prints has been prepared—at the moment 15 Blue Prints are ready, twelve of which we are giving away. Readers who wish to obtain the other three Blue Print Circuits, and the additional Blue Prints published from time to time, will be charged the extraordinarily low price of 6d. per Blue Print.

FULL details of other Blue Prints in preparation will be published shortly.

FOUR BLUE PRINTS FREE.

(In value 2/-)

With Every Copy of "P.W." on Sale week ending February 20th, the following Blue Prints will be given free:

1. Crystal and L.F.
2. Det. and L.F. (with switch to cut out L.F.).
3. Two-Valve Reflex (Valve Det.).
4. Detector and Two L.F.

ORDER YOUR NEXT WEEK'S COPY OF "P.W." NOW.

DON'T MISS THESE USEFUL BLUE PRINT GIFTS.

CURRENT TOPICS.

By THE EDITOR.

The Savoy Orpheans—The "London Revolution"—What Did They Think in Russia?—The Wave-length Scare—The Real Explanation.

IN this week's issue, under "Broadcast Notes," our correspondent "O. H. M." publishes a final and absolute explanation for the Savoy Orpheans' withdrawal from the B.B.C. programmes. The Savoy Hotel Company has decided to cease the broadcasting of the bands associated with the Savoy Hotel, namely, the Savoy Orpheans, the Havana and the Tango bands, on February 27th, in spite of statements to the contrary.

At the moment of going to press there have been no negotiations, and, so far, no move in this direction has been made from 2, Savoy Hill. There is no doubt that the decision of the Savoy Hotel Company to withdraw their famous bands from the broadcasting programmes has caused profound regret among listeners throughout the country.

Broadcasting has not "made" the Savoy Orpheans, any more than it has "made" Chaliapin, Paderewski, or Sir Harry Lauder. Long before the Orpheans broadcast every member of the band was a well-known and established star. Yet it is an undoubted fact that their broadcasting for the B.B.C. has widened their popularity in areas of the world, which, in the ordinary course of events, would probably have never had the opportunity of hearing them.

That they are the best-known band in the world is no exaggeration. Even Sousa and his band, world-famous although it is, never reached such universal popularity.

From a sentimental as well as an artistic standpoint it is safe to say that the Savoy Orpheans will be missed by listeners throughout the world.

* * *

The B.B.C. have had many criticisms levelled against their programmes, but never before have they had such an unconscious compliment paid them in connection with Father Ronald Knox's broadcast skit.

It would seem that Father Ronald Knox is a most realistic broadcaster, and the B.B.C. might do worse than engage him as an honorary dramatic adviser.

In a talk recently broadcast from Edinburgh, he gave a picturesque representation of an imaginary revolution, such as the blowing up of the Houses of Parliament and the looting of the Savoy Hotel. A preliminary explanation was broadcast, but it appears that a good many listeners missed this explanation and listened to Father Ronald Knox without knowing what was actually happening.

The consequence was that many listeners all over the country were firmly convinced that the B.B.C. was broadcasting a news bulletin, describing the outbreak of a "revolution in London." Messages were received by the B.B.C. from all parts of the country, and inquiries like this were made:

"Is it true that the House of Commons is blown up?" "Has the Savoy Hotel been looted?" "What has happened to Big Ben?"

A Philosophical Explanation.

It is curious that so many people should have been deluded by this talk. Father Ronald Knox was speaking in an unmistakably ironical voice, and the very nature of the whole thing should have convinced most listeners that they were listening to a highly imaginative if realistic skit.

In connection with this broadcast we think readers might be amused by a true story which came within our own experience. A very old lady friend of a member of the staff of POPULAR WIRELESS happened to be listening, but, on the whole, Father Ronald Knox's skit puzzled her.

She could not make head or tail of it, and so she asked her new Irish maid, a girl who had just left County Clare to take up her work in London. The old lady called this girl in and asked her to listen to Father Knox and see if she could make anything of what was being broadcast.

The Irish girl put the 'phones on and listened with a puzzled frown on her face for a minute or two, and then said:

"I should not worry, mistress, it's nothing. It's a Saturday night, and they have probably had a *drop in!*"

It is a pity that a good many other listeners in this country did not think of such a philosophic explanation.

Anyway, the B.B.C. have provided, quite unconsciously, a first-class scare which will be talked about for many a day to come.

A Precious Thought.

We have noticed that no newspaper has remarked on the possible effect of this broadcast in Soviet Russia. It would be highly gratifying to think that Trotsky, or any other such person in Russia, was listening when Father Ronald Knox broadcast.

We sincerely hope they *did* miss the explanatory preface to the skit. Imagine the feelings of real revolutionists when they heard the B.B.C. announcing that "London was in the hands of the revolutionists!" It being Saturday night. Trotsky probably went out and allowed one or two of his friends to stand him a glass of vodka. It is a precious thought, and one which we would give a good deal to believe to be true!

And, further, we would have given a good deal more to have been present when the heads of the revolutionary government in Russia and elsewhere suddenly discovered that the highly spiced accounts of the blood and thunder outbreaks in London were merely an offspring of an exceedingly clever ecclesiastic humorist.

* * *

The wave-length scare seems to have died down quite suddenly. It would seem that listeners may rest assured that no alterations of any consequence will take place in B.B.C. wave-lengths until 1927. Even then the B.B.C. definitely denies the possibility of their wave-lengths being raised to more than 550 metres, or being lowered less than 250 metres.

It is possible that Continental broadcasting stations will, in some cases, be lifted to as much as 600 metres. But in this country such an alteration would mean interference with shipping and other Government stations, and so that decision may be definitely ruled out.

The Wave-length Question.

What is likely is that the International Radiophone Bureau at Geneva will attempt to bring the broadcasting authorities of Europe together to agree on a scheme for the limitation of broadcasting stations in this and other countries, and for the erection in their place of a limited number of high-power broadcasting stations similar to 5 XX.

Captain Eckersley has already pointed out that on the present band of wave-lengths allotted to British and Continental stations not more than 50 broadcasting stations should be allowed to operate, if interference is to be really eliminated.

But a working compromise could be effected, he thinks, in such a way as to allow 101 broadcasting stations to operate with the minimum of interference. Captain Eckersley would, for instance, allocate one wave-length to, say, a Russian station, and allow a Spanish station to duplicate that wave-length. The distance separating stations with duplicate wave-lengths would be worked out so that there would be but little possibility of the ordinary listener being jammed by two broadcasting stations on one wave-length.

Captain Eckersley.

Captain Eckersley admits that this scheme is more or less an ideal, and that no opportunity has yet been afforded to the authorities for testing its efficacy. But the International Radiophone Bureau and all the broadcasting authorities concerned are evidently not going to sleep on this problem, and they are showing great enthusiasm and initiative in attempting to find a solution which will cause as little inconvenience as possible to the ordinary listener.

If Captain Eckersley can get such a scheme working, or if he can, by exercising his wit and authority, do something quickly to reduce interference between broadcasting stations, he will have earned the heartfelt gratitude of every keen wireless enthusiast.

Technical Notes

Conducted by our Staff Consultant, J. H. T. ROBERTS, D.Sc., F.Inst.P.

A NEW process for the marking and decorating of wireless panels is known as Veri Chrome; it corresponds to lithography, although in detail it does not resemble it. The great advantage of this new process over the more conventional engraving is that the time required for the marking of a panel, and consequently the cost, is very greatly reduced. Once the imprint is prepared, the cost of marking the panels is no greater for an elaborate design than for a simple one. Furthermore, whereas with engraving the colour is practically limited to white, with the new veri chrome the colours can be as desired, even gold and silver being easily employed.

Another advantage of this process, which results from the circumstances mentioned above, is that the graduations, etc., which are usually marked or impressed on the dial, may now be impressed on the panel. In fact, a knob and pointer will do exactly the work of the dial with this new system.

Automatic Charging Switches.

An American device has lately appeared on the market, which facilitates the work of charging batteries in charging stations, where constant attention is sometimes necessary. This device is in reality a voltmeter relay, and it is connected to the battery in such a way that when the battery voltage reaches the "fully-charged" value, the relay operates a switch and cuts off the charger, putting it into circuit again when the battery voltage falls below the safety limit.

The principle of the device is really very simple, and is one which has been used for similar purposes before. In fact, the device, even in its present form, is by no means novel. There are also many drawbacks to a device of this kind: for one thing, it is necessary to employ practically the mechanism of a voltmeter, which, although suitable enough for an instrument to be used at a charging station, would make the device too delicate and too expensive for sale to the ordinary wireless user. Secondly, the voltmeter has to be connected permanently to the battery, which means a constant drain on the battery charge.

It may interest my readers to know that I was considering this very problem some months ago, and I discarded the voltmeter principle for the reasons stated above, amongst others. I eventually evolved, however, and patented a device which depends upon the use of a bi-metal strip, this having the important advantage that it is sluggish in its action, as well as being very rugged and cheap in construction, and unaffected by mechanical disturbances (which, with the type of device mentioned above, would be liable to set it off if it were just on the point of operating). Moreover, it does not draw any current from the battery at all. The device which I have worked out can be made very cheaply and is very small in dimensions, about 1 inch by 1½ inches and ½ inch high. The models so far tried out work very successfully, and the article will appear on the market in due course.

A New Insulator.

A reader, Mr. H. Taylor, of 82, Windmill Lane, Smethwick, Birmingham, sends me an account of a new type of aerial insulator which he has designed, which should be of interest to readers of these columns. The particular feature of the insulator is that it is provided with a brass bush with a taper hole, into which is inserted a collet tapered to suit the hole in the bush and having three radial saw-cuts to allow for contraction when tightened up. The aerial wire is passed through the hole, and is thus gripped tightly when the nut is drawn up. In this way, the insulator is tightened on the wire and secures a hold without the need for any loops or twists in the aerial wire. The net result is that the aerial wire passes in continuously to the lead-in.

The insulator is simple in construction, and I have no doubt that any readers requiring further information on this matter will be able to obtain the same from the correspondent whose name and address I have already given.

Novel Tapped Coil.

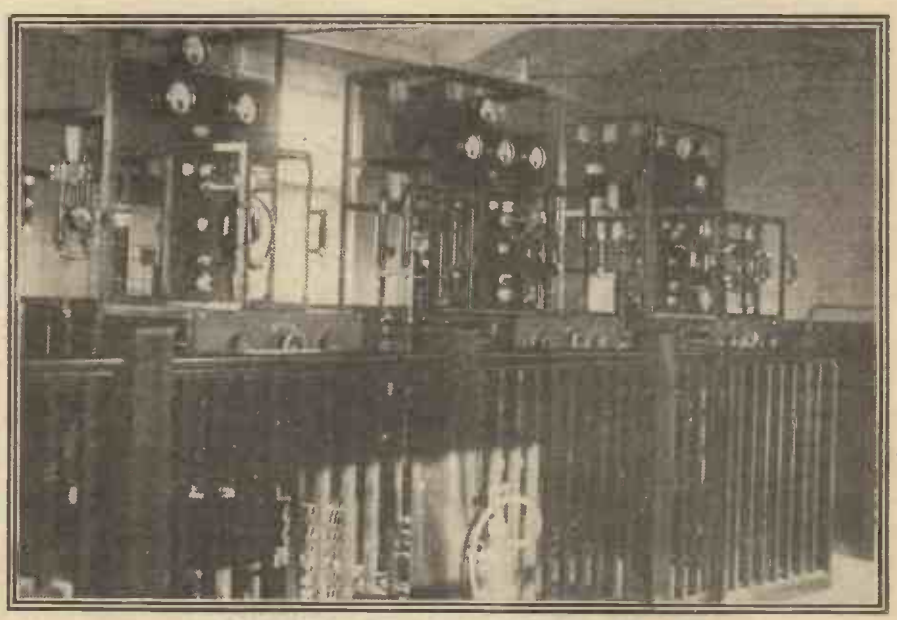
I have also a letter which may interest some of my readers, relating to the multiple coils which I mentioned in these Notes recently. I have not space to discuss this letter at any length, but I may quote the principal part as follows: "I have recently perfected a variable coil in which *all* the wire is always in use at the various settings—therefore, no dead wire is present.

"The coil is a 'sideways' wound coil, all wire at right angles to the axis, very open spacing, centre open with no supporting material. The potentials are, of course, definitely on either side of the coil giving maximum coupling. It is normal in size, 3½ in. diam., 1⅝ in. overall. It is encased in an ebonite mount, with clear celastoid sides and is operated by a sleeve switch around the circumference. It is found to have very low capacity and high inductive value."

Readers interested in this matter may be put into touch with the correspondent on request.

The G.E.C. Low-Loss Condenser.

I hear very good reports of the new G.E.C. low-loss slow-motion variable condenser, and I have myself formed a very favourable opinion of this instrument. It is characterised particularly by the slow-motion device, which is, in effect, a friction-vernier operated by springy discs clipping a bevel wheel; by this arrangement, backlash is completely eliminated. In addition to the slow-motion, the condenser is provided with an extra large "knob," which still further helps in the micrometer motion of the plates.



A section of the transmitter at the new Dublin broadcasting station.

Another New Coil.

A new type of coil which has appeared on the foreign markets, but which I do not recollect having seen over here, is based somewhat on the design of the large inductances used for high-power transmitting stations. It is made from bare copper wire wound into a flat spiral so as to be self-supporting, the whole being then mounted upon the usual base plug. In this way there is almost an entire absence of insulating and supporting material which would increase losses and self-capacity.

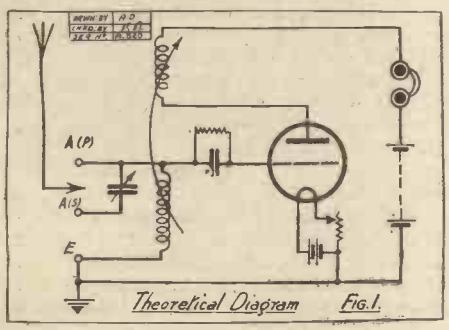
The particular point of interest about the coil is the ingenious method by which the wire is shaped so as to stand up without adjacent turns touching each other. This

(*Continued on page* 1275.)

A "P.W." One Valver

Designed and described by
G. V. DOWDING, Grad.I.E.E.
Constructional work by
G. V. COLLE
and
C. A. MEADOWS
(*"P.W." Technical Staff.*)

DESPITE all the changes in fashion and alterations in design which have taken place in valve sets since broadcasting started, there is one set which retains its original popularity, namely the straightforward single-valve set. There are several reasons to account for this, including the simplicity of its construction,



Theoretical Diagram FIG. 1.

but the reliable results and good reception which may be obtained even by a novice are the chief cause of this receiver's undying popularity.

In the set which is now to be described there is nothing unusual or exceptional in either the circuit itself or the components used. It is, therefore, a perfectly straightforward and easy-to-build set, the construction of which may be undertaken by the beginner with every confidence.

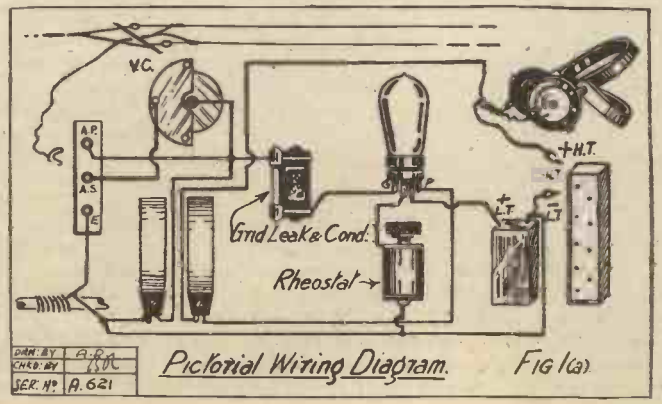
The Results Obtainable.

For the sake of those totally unacquainted with wireless—and it is rather surprising to find that there are still large numbers of people whose experience of broadcasting is non-existent or negligible—it will be advisable to explain what may fairly be expected in the way of results from a one-valve set. The most important reservation to make is that such a set, even under very favourable conditions, is incapable of giving loud-speaker results.

Used with the 'phones, however, it is astonishing what results may be obtained with a single-valve set of this type.

When situated within ten or twelve miles from a main broadcasting station, five or six pairs of 'phones may be worked at quite good strength, and this, of course, implies that the set is very much in advance of even a good and suitably-designed crystal set.

As regards distant reception, the difference is even more marked. It is very difficult to give figures, owing to the different degrees of skill in handling the receiver, and to the variety of aerial and earth systems with which it is used; but, speaking generally, it may be said that at least half-a-dozen broadcasting stations can be tuned in upon a one-valve set in almost any part of Great Britain. It is no very uncommon thing for such a set to receive signals direct from broadcasting stations in America. Nevertheless, this must not be expected as a regular thing, as these stations can only be received when reception conditions are unusually favourable. Moreover, a good aerial and earth system is essential for long-distance work, and, most important of all, the operation of the receiver must be in skilled and experienced hands.



Pictorial Wiring Diagram. FIG 1(a)

Turning now to the particular receiver which is to be constructed, it will be seen from the photographs that the set is of neat appearance and presents no unusual features. The three terminals on the left, two of which are for aerial and one for earth, afford a means of using the receiver with equal facility either upon long or short waves. When receiving signals from stations with a wave-length of 450 metres or less, the aerial lead is connected to the terminal marked "series," and the parallel terminal is left without external connection.

Tuning for Long Waves.

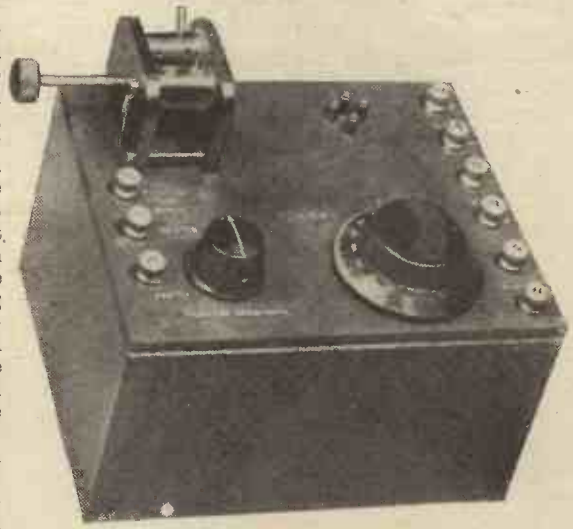
For the longer wave-lengths "parallel" tuning is employed. All this entails is that the aerial lead should be connected to the terminal marked "parallel," and then a short strip of wire is connected between the series terminal and the earth terminal. (In both cases, of course, the earth lead is connected to the earth terminal.) The coils to be used for most broadcasting stations will be of the usual "broadcasting" sizes, and a 50-turn in conjunction with a 75-turn coil will be found to cover the lower wave-length requirements in nearly all circumstances.

The valve employed can be either of the bright emitter type, with which an accumulator will be essential, or of the dull emitter type. The L.T. and H.T. batteries should be in accordance with the valve maker's specifications. This means to say that, where a dull emitter valve of the ·06 type is employed, a large dry cell can be used for the low-tension supply. The telephones should be of the ordinary high-resistance type, and either 2,000 ohms or 4,000 ohms will be found to give excellent results.

(*Continued on next page.*)

COMPONENTS REQUIRED.

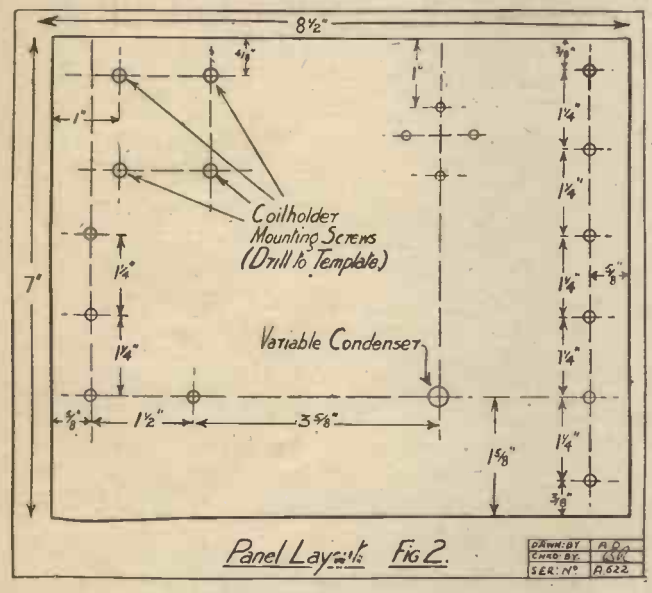
1 Panel, 8½ × 7 × ¼ in. .. .. With cabinet (Peto-Scott)	8 6
1 Lamplugh low-loss variable condenser (·0005)	17 6
1 Yesly 2-coil holder	7 6
1 Yesly rheostat	6 6
1 Watmel grid leak and condenser (2 meg., and ·0002)	2 6
1 Set "security" valve sockets ..	1 0
9 W.O. type terminals	1 1½
Wire, screws, transfers, etc.	1 6


This photograph shows the layout and the neat appearance of the complete receiver.

A "P.W." ONE-VALVER.

(Continued from previous page.)

The actual construction is commenced by squaring up the panel to ensure that this is a good fit for the case. It is then marked out in accordance with the drilling diagram, which will be found below. This gives the necessary dimensions for the various components which are detailed in the list given on the preceding page. If other components are used, it will be found that the manufacturers of coil holders, etc., give a template with each component which will enable the constructor to easily fix the exact positions.



Panel Layout. Fig 2.

Drilling the Panel.

Drilling is carried out by means of one of the small hand drills such as can be obtained from any wireless shop, or the ordinary carpenter's brace can be employed for the purpose. In such a case, in order that the jaws of the brace will "bite" on the wireless drills, a short length of fairly stout wire should be wound round and round the latter to form a kind of spring. This will, in effect, increase the thickness of the shank of the drill, and so enable it to be held securely in the brace.

When the panel has been drilled, it should be freed from all dust, etc., and then the components are mounted upon it. It is, of course, important that the drilling for the valve legs should be very carefully done, as inaccurate spacing here will mean that a difficulty will always be experienced when the valve is inserted into its sockets. The filament resistance may be of the wire-wound or compression type, there being plenty of room upon the panel for either of these, if of standard shape.

It is a good plan to mount the terminals first of all, and then to file the ends ready for soldering before the other components are mounted upon the panel. This obviates the chance of brass dust from the terminals finding its way between the vanes of the variable condenser, which would result in faulty contact.

After the terminals, the valve sockets should be mounted, then the rheostat, and finally the coil holder and variable condenser.

There is no need to fix the grid leak and condenser to the panel itself, as this component is quite easily supported by its own wiring. When all the components are ready (and, incidentally, this is a good place at which to make quite sure that all the components are in good working condition—condenser not shorting, etc.) the wiring is carried out as indicated by the wiring diagram which appears on page 1249.

Connecting Up.

For the connections of the actual receiver shown in the photographs, No. 18 square-section tinned copper wire was employed, but any other fairly stout wire may be used instead, if desired. It will be seen that the connections to the movable (reaction) coil are made by means of flexible leads, the ends of which are soldered respectively to the lower telephone terminal and to the plate socket of the valve-holder.

Whilst it is undoubtedly a very great advantage if all the connections at the back of the panel can be soldered, there is no reason why screwed down connections should not be employed if the former method is for any reason impossible. In such a case, of course, it is essential that all the connections should be very clean, and they must be screwed as tightly as possible. It is, however, far better to solder the connections, and this is quite easily carried out if the soldering iron is kept well-heated and perfectly clean.

As it is important that none of the soldering flux should flow under the panel (especially between the valve connections), great care must be taken that the soldered joints should be kept perfectly clean. This is easily managed if it is remembered that directly a joint is made, and whilst the metal is still hot, it should be wiped over with a clean rag.

It will be found that the flux is easily removed whilst it is liquefied by the heat, but if allowed to remain for more than a minute or so it will become tacky and extremely difficult to remove from the back of the panel.

POINT-TO-POINT CONNECTIONS.

Aerial parallel terminal to socket of fixed coil holder, fixed plates of variable condenser, and one side of grid leak and condenser, the other side of same being connected to the grid socket of valve holder.

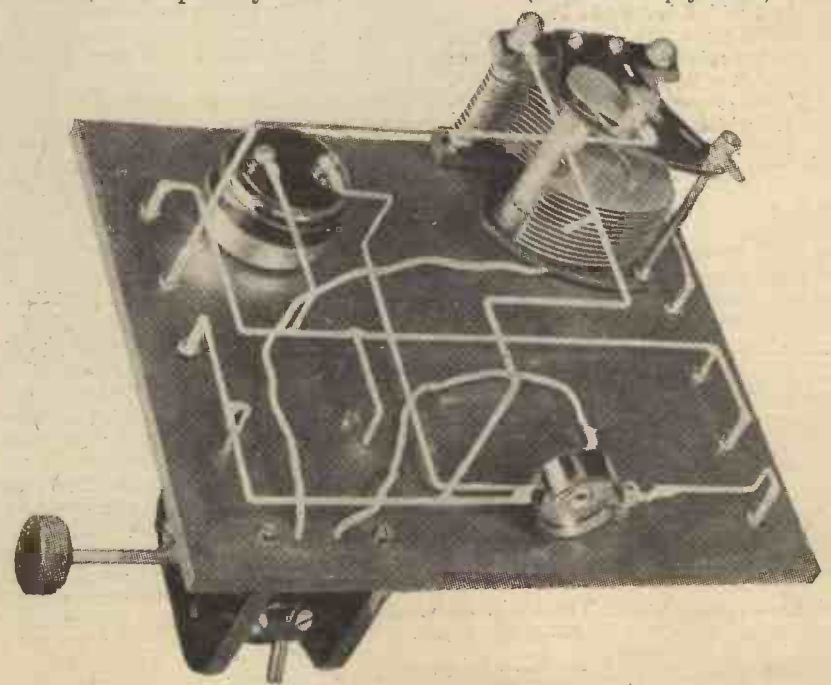
Aerial series terminal to moving plates of variable condenser, earth terminal to plug of fixed coil holder and to negative L.T. L.T. negative is connected to H.T. negative and to one side of rheostat, other side of rheostat to one filament socket of valve holder. Remaining filament socket of valve holder is connected direct to L.T. positive.

Plate socket of valve holder to plug of moving coil holder, socket of moving coil holder to one 'phone terminal, other 'phone terminal to H.T. positive.

An Important Tip.

When all the wiring has been carefully done, the connections may be checked from the point-to-point description which appears on this page. The final operation is the engraving of the panel, or the affixing of the transfers, if these are used. The set is then ready for test, and may be connected up to the batteries. For the benefit of the novice, it may be advisable

(Continued on page 1249.)



The simple nature of the wiring is clearly illustrated by this view of the back of the panel. Note how the grid leak and condenser is supported

for Better Components

THE increasing demand for components of quality is the surest indication that constructors realise the importance of building radio receivers and amplifiers with reliable parts, if they wish to obtain the best results from their outlay and their work. A.J.S. specialise in well-made components.

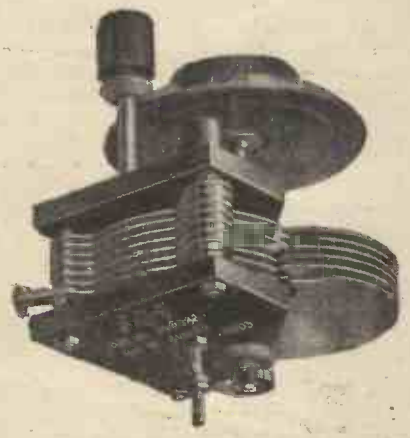
The A.J.S. Coil is an example. It is highly efficient owing to its small high-frequency resistance and low distributed capacity. It is the most reasonably priced efficient *protected* coil obtainable. The case is moulded *back and front*, with the coil size in an ivorine disc on the side. The fittings are nickel plated.

INDUCTANCE COILS

Nos. 20, 25, 35, 40, 45, 50, 60, and 75 - - - - - - 3/-

The set 20 to 400 inclusive, £2 10s. 0d. List price bought single, £2 15s. 9d.

100	4/3
150	4/6
200	5/-
250	5/6
300	6/-
400	6/6



VARIABLE CONDENSERS

These are true low loss condensers, with direct reading vernier movement. Complete with dial and knob.

·001 - -	13/6
·0005 - -	10/6
·0003 - -	9/6
·0002 - -	8/6

The Variable Condenser is truly a low-loss model, with a very low minimum capacity, is of the straight line wave-length type, and each has a direct reading vernier movement. Compare the prices.

Conscientious constructors are considering the choke method of intervalve coupling, it has many points in its favour, besides that of making better radio reproduction possible.

Full details of these and other components may be obtained in our Publication No. 115 which will be sent on receipt of the coupon.

A·J·S

A. J. STEVENS & CO. (1914), LTD.,
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Telephone: Regent 7161-2. *Telegrams: "Ajayessco, Westcent, London."*

Glasgow Showrooms: 223, St. George's Road, Glasgow.

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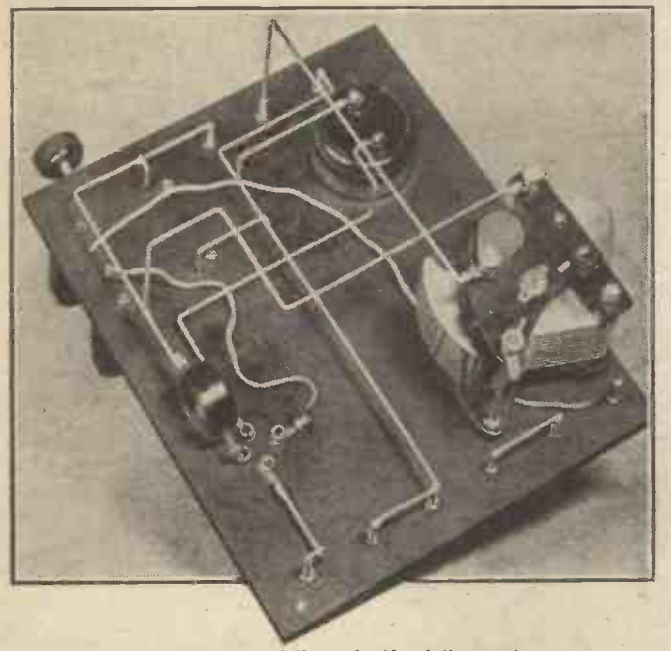
P.W. 30/1/26

A "P.W." ONE-VALVER.

(*Continued from page* 1246.)

to state that great care must be used not to touch the H.T. leads upon any part of the set except their respective terminals, or the valve may be burnt out, or else the battery shorted and damaged.



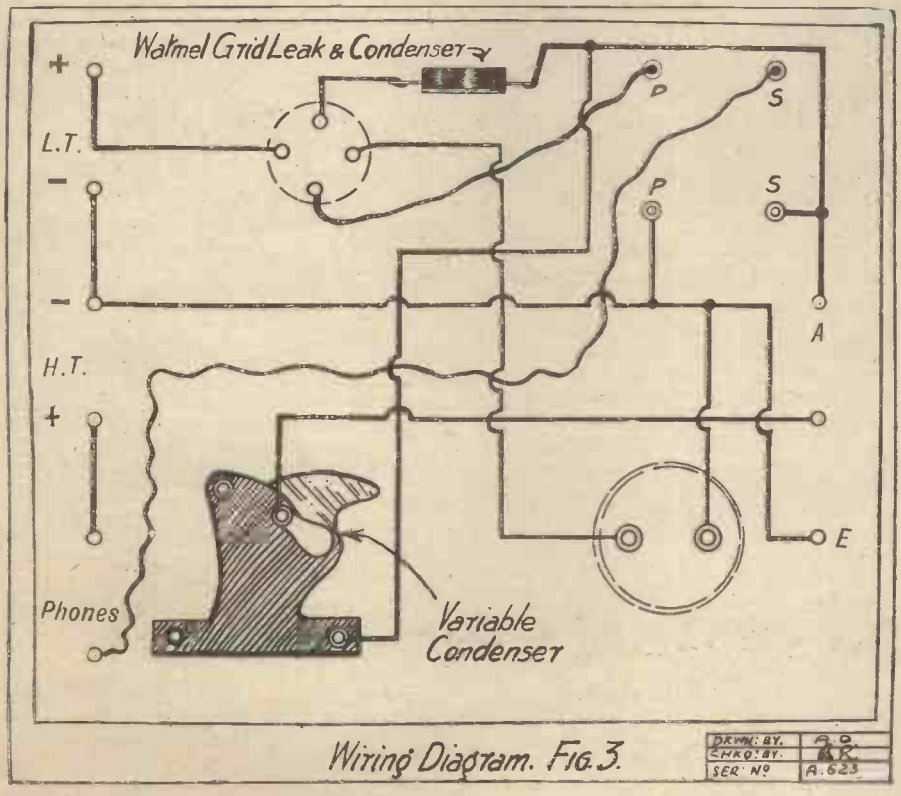
Another view of the underside of the panel.

Reaction Coil Connections.

If, when the set is operated, it is found that the effect of the reaction coil is to diminish signals, instead of strengthening them, when it is brought nearer to the aerial coil, all that is necessary is the reversal of the flexible leads to the reaction coil. Should this happen to be your first valve receiver, it would be a good plan to refer to POPULAR WIRELESS No. 180, which can be obtained from the Amalgamated Press Back No. Dept., Bear Alley, Farringdon Street, E.C.4., price 4d. post free. In the "Radiotorial" columns of that issue will be found a brief description of the operation of such a set, and of the control of oscillation, an understanding of which is essential if the full capabilities of the set are to be exploited.

It has already been stated that the long-distance capabilities of a one-valve set depend to a large extent upon skill in operating it. Such skill comes by practice, but it cannot be too clearly emphasised that such practice should not be carried out whilst the local station is broadcasting, or you may spoil the entertainment of a whole neighbourhood.

For the novice who has no experienced friend to instruct him in the art of handling reaction, the best way to gain a knowledge of it is to carefully read the hints published from time to time in the "Radiotorial" columns. He is also referred to the article in POPULAR WIRELESS, No. 187, where the subject is treated briefly under the title "Searching for Distant Stations."



Wiring Diagram. Fig. 3.

ODDS AND ENDS.

From a TECHNICAL CORRESPONDENT.

TO derive the fullest advantage from the use of a super-heterodyne set you should use a frame (or loop) aerial. The reason is that the frame aerial adds selectivity to remarkable amplification, and as a matter of fact the two fall naturally together, for although the loop is directional it is a bad "picker-up" of electro-magnetic energy and must therefore be used with a powerful amplifier in which one or more stages of H.F. are included. Lord Weir's "steel houses" are going to complicate life for the users of super-hets., and are certainly a blow at the rising popularity of the indoor aerial of any kind.

In building super-het. sets remember that the thicker the screen the better. There is a *lower* limit to the thickness of the screen beyond which it is not worth while to go; but (if you can afford it) you can make the screen as thick as you like and the results will be all the better. Similarly, if upkeep costs are no object, use "bright emitters" for your super-het.

Screening a Super-Het.

Although the screening of super-hets. must be pierced for the connecting wires, keep those wires as short as possible. All coils used for coupling should be as small as possible.

Where a common H.T. battery is used with several valves in cascade, as is usually the case, an examination of the diagram of connections will show that all the valves are coupled conductively through the internal resistance of the battery, a condition which tends to instability. Hence, in order to diminish the effect, the H.T. battery should be shunted by a fixed condenser of 1 or 2 microfarads, and the H.T. leads should be twisted together or else made of flat copper strips with their faces placed together and insulated from each other by rubber or ebonite sheet.

"Capacity to earth" effects are responsible for many failures. The dictum to be observed is simply this: keep the set, the batteries, the earth, aerial and loud speaker leads off the earth, that is to say, off the floor and away from the walls—especially with multi-valve sets.

A Rough Searching Installation.

If you are searching for a source of interference, apart from jamming by other stations, put the tags of a pair of telephones into the step-up terminals of a telephone condenser, and put the telephones on your ears. This arrangement makes a good rough searching installation. Walk around, like you do in the Christmas tapping game of "Hot and Cold," till you begin to hear noises in the telephones. The writer once discovered an ordinary press "ticker" in this way, and was able to stop the jamming of war communications. Similarly, he located a "fault" in a tramway circuit, which was jamming war-work, after he had walked with his transformer and telephones along a London street, to the delight of the idle populace and amid the profane remarks of the non-scientific.

BROADCAST NOTES.

By O. H. M.

The Savoy Bands—A Correction—Theatre Broadcasts—The Broadcasting Committee—The Copyright Question—The Sheffield Rumour.

IN writing about the stopping of broadcasting by the Savoy bands in POPULAR WIRELESS for week ending January 16th, I unfortunately conveyed a wrong impression as to the reasons for the withdrawal of the Savoy bands from the broadcasting programmes. I said that the reason for the discontinuance of broadcasting the Orpheans and other Savoy bands was because the Savoy Hotel Company had asked for higher terms than the B.B.C. was prepared to pay. This, I am now given to understand, is not the case. The question of terms, I am told now, never arose, and, in any case, would not have affected the broadcasting of such an important feature as the Savoy bands.

There have been a good many misunderstandings about the Savoy band's decision not to broadcast, but I am now in a position to be able to state the absolute and final explanation.

No Negotiations.

What really happened was that the Savoy Hotel Company, as a matter of private policy, decided to cease the broadcasting of their bands and, when the time for the renewal of their agreement automatically came up for consideration, they conveyed their decision to the B.B.C. There have been no negotiations of any kind, and, as far as I am aware at the moment of writing, no move has been made in this direction by the B.B.C.

I should like to express my regret in these notes that in my reference to the Savoy bands in POPULAR WIRELESS for January 16th, I conveyed a wrong impression.

That they have attained extraordinary popularity, and that they will be universally missed by listeners, goes without saying, and one can only express the hope that, even at this last minute, some lucky chance will make it possible for the Savoy Orpheans to be retained in the broadcast programmes.

* * *

I am glad to hear that on Sunday, February 7th, there is to be a broadcast of Christchurch College Choir from Oxford. This should provide some first-class singing. And, by the way, while on the subject of Oxford, I am reminded that there is still no move to install a microphone at Cambridge. It is rumoured that the reason for this is the reluctance of the University Senate to become identified with a medium of "synthetic art."

* * *

It is reported that there is a chance of Cissie Loftus broadcasting as the week's feature towards the end of February. I sincerely hope this comes off. It is bound to be of exceptional general interest.

* * *

Major Owen Rutter, who shortly will broadcast a talk on "Head Hunters," promises some new and thrilling anecdotes of experiences among cannibals. Accounts of personal experiences of this kind make excellent material for broadcast talks, and provide a better form of variety than that exemplified in Father Knox's "burlesque revolution."

* * *

On Friday, February 12th, the B.B.C. propose to broadcast excerpts from the "Blue Kitten." It is good to see the reappearance of theatre broadcasts. During the past few months there has been a noticeable "falling off" on this side of the programmes. The reason may have been, of course, that the B.B.C. had exhausted all its twenty-six theatre broadcasts for 1925. My own belief, however, is that there is some concerted move on the part of the theatres to prevent even the twenty-six excerpts per annum being taken.

* * *

The Broadcasting Committee has resumed its public sessions, and has been hearing a wide variety of evidence. The chief surprise, so far, was provided by the evidence given by Mr. Burnham on behalf of the National Association of Radio Manufacturers and Traders.

Our Resident Correspondent in New York, Mr. L. W. Corbett, who broadcast from W G Y, etc., during the International Broadcast Tests.

It was fully expected that the "Narmat" would plump for the retention of broadcasting by trade interests. The event has proved otherwise. Mr. Burnham advocates "a public body" on which will be represented a wide variety of interests, including the newspapers, the theatres, the music industry, the arts, and the radio industry.

It is reserved, however, that the radio industry should retain a controlling voice. The only other surprising evidence of consequence comes from Mr. Hamilton Fyfe, who believes that the function of news distribution is to pass inevitably from the newspapers to wireless telephony.

* * *

There are rumours of serious trouble impending between the B.B.C. and the Performing Rights Association on the one hand, and the Society of Authors, Playwrights, and Composers on the other hand. A friend of mine in the latter society tells me that the B.B.C. has been using copyright material without permission since the beginning of this year.

Apparently, the arrangement for a new agreement has not yet been completed, and meanwhile the programmes are going on as usual. The point at issue seems to be whether the B.B.C. should pay £30,000 or £40,000 this year to the owners of copyright. I gather that the negotiations have reached a complete deadlock, and that the two societies may seek an injunction at any moment. If this step is taken, and if the injunction is granted, then a most extraordinary situation will arise. The programmes prepared weeks ahead will have to be recast, and only non-copyright matter used. But I hope the matter will not get into the courts, especially as I understand that the B.B.C. has offered arbitration.

A Grave Danger.

There has been general consternation in Sheffield because of a rumour that the B.B.C. proposes to close down its station there. But now in the cold light of after analysis the whole mistake appears to have been due to a confusion of terms.

The essential question is, "When is a broadcasting station not a broadcasting station?" It is quite true that in connection with the new high-power regional system of transmitters contemplated by the B.B.C. it is suggested that certain relay transmitters shall be replaced by much more efficient regional transmitters. This does not mean that any towns will lose stations that are at present in existence. On the contrary, local programmes are to be strengthened and developed, the only difference being that they will have a bigger audience than was the case before.

Take Sheffield, for instance. At present it possesses a relay station, working on 500 watts, and having a crystal area of about five miles. With the exception of about two programmes a week, the station relays London or Daventry. Under the new scheme the Sheffield staff and studio would remain, but the transmissions would be made from some suitably central point as far away as possible from areas of electrical disturbance. This regional transmitter would have a power of about 10 kilowatts, and a thirty-mile crystal area. There would be two wave-lengths, one of which would put out the Sheffield programmes to the whole district—this, mark you, every day. And still some "experts" are telling the Sheffield people to contract out of the B.B.C. in order to have their municipal broadcasting system.

Although this point of view is obviously absurd, there is nevertheless a moral for the B.B.C. in it. The real point is that the plans for reconstructing the British system appear to be hung up. Only the vaguest generalities emerge from Savoy Hill. And an alarming symptom is that as time goes on the statements appear to get more vague and more general.

This won't do. Personally, I believe that the B.B.C. is not at fault, but that the Post Office is the guilty party.

But from the point of view of the service in 1927, it doesn't matter who is to blame. The hard fact is, that unless the scheme is put through within a few weeks, British broadcasting will be in grave danger of a fatal technical decline in 1926. I hear that several members of Parliament will raise the issue when Parliament meets.

RECEPTION CONDITIONS.

VITAL NECESSITIES.

By K. D. ROGERS.
(*Assistant Technical Editor.*)

Part II (*conclusion*) : The Receiver.

The first part of this article was published in "Popular Wireless" No. 188, Vol. VIII, dated January 2nd, 1926.

IN the first part of this article we discussed the various types of aerial available for the reception of both local and distant stations. so that it now remains for us to turn our attention to the receivers to be used—the second vital condition necessary to the reception of wireless signals.

As in the case of the aerial system the receiver should be chosen and designed for the special task it is intended to do. That is the ideal and we will discuss that first, though I know it is often impossible for listeners to have more than one set. But we will consider the compromises later on.

For the moment let us suppose that we want to listen to both the local and distant stations and can indulge in the luxury of two receivers—one for each purpose. Take the reception of the local first.

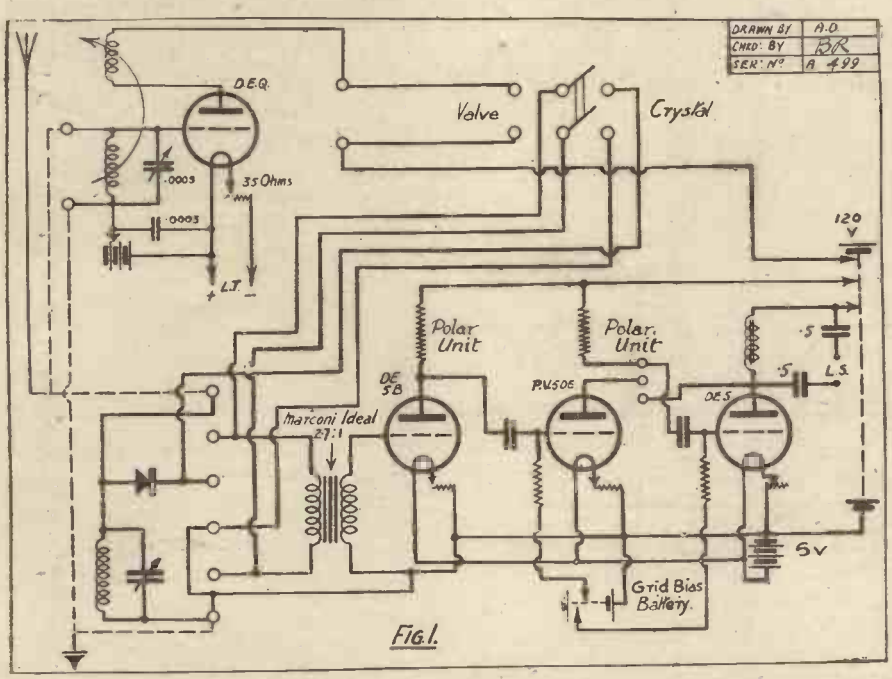


FIG. 1.

It will depend upon the distance of the listener from the transmitter as to the type of set he will require. We will assume he wants to work a loud speaker.

Within 12 miles a crystal detector can be used with success if the station to be received is a main one, or five miles if a relay. 5 X X we will not consider, as its range differs with locality.

Valve or Crystal Available.

After this crystal will be required an L.F. amplifier, which, I suggest, should contain three stages with a switch to cut out the last. We are considering the best now, and so we can afford to use resistance capacity coupling and adequate power valves. If more than 12 miles separate the listener from his local source of broadcasting he must use a valve detector with reaction available, if necessary, or else he must use an H.F. amplifier, with a crystal to follow. Personally, I prefer the former, as it is more easy to operate and, if well designed, will give very pure signals. The writer has arranged his receiver in two parts. One containing the three-valve amplifier and a crystal detector for close local work, and a separate unit which can be switched in so that a valve detector can be used for 5 X X or any other purpose if desired. The amplifier can also be switched on to any other receiver by means of external switches, but that is another story.

Anode bend rectification is used for the valve and a D.E.Q. valve, the circuit for local work then being as shown in Fig. 1.

Those who cannot afford to use resistance coupling (it is a little more expensive to run) should try Fig. 2, which, when well designed, should give good results, though, as grid leak rectification is used, reproduction may not be quite as pure as when the anode bend rectification method is employed.

The choke used to shunt the steady plate current across the loud speaker is of great assistance in obtaining pure results, and should always be used as it does not in any way cut down the signal strength. There are many suitable chokes on the market, or the constructor can use one of the windings of an old L.F. transformer. The two condensers (Fig. 1) stop the plate current from passing through the loud speaker, and nullify any likelihood of H.T. leakage if extension leads are employed. The L.F. impulses which give rise to the signals can, of course, pass through the condensers and so operate the loud speaker.

For long distance reception I prefer the circuit shown in Fig. 3. It is stable and easily operated, while I think it gives a quieter background than does the more popular tuned anode method of coupling the H.F. valves. It will be seen in the diagram that a potentiometer is employed to control the grids of the first two valves, and this should be included, though in some cases it may be found that best results are obtained with a potentiometer arm on the negative side of the winding.

Ultra-Selectivity.

Those who require ultra-selectivity will find that two stages of neutrodyned H.F. amplification will give them all that they require, though, in my opinion, such a receiver is a little too difficult to handle for the average listener.

This because when the set is properly adjusted the selectivity is so great that a wave-meter is usually required to find any other than the local station. The neutroformers are usually wound on 3 in. diameter tubes, having about 26 turns for the primary and 50 or 55 for the secondary, the latter being tuned in each case.

Now let us consider the case of a man who does not wish to have more than one set and wants that set to serve for both the local and more distant stations. If he wants to operate a loud speaker he will have at least one L.F. valve, and, from the point of view of purity, it will be best to make arrangements when building the set to provide grid bias for that valve.

Then, again, if he requires distant stations he will require at least one stage of H.F. amplification, and a fairly selective circuit in order to cut out his local station, which is almost sure to jam him rather badly. For this listener I should advise the use of a receiver such as was described in POPULAR WIRELESS, No. 173, under the heading of The "P.W." Four-valve Set.

This set has four valves with switching arrangements so that the last valve can be

(*Continued on next page.*)

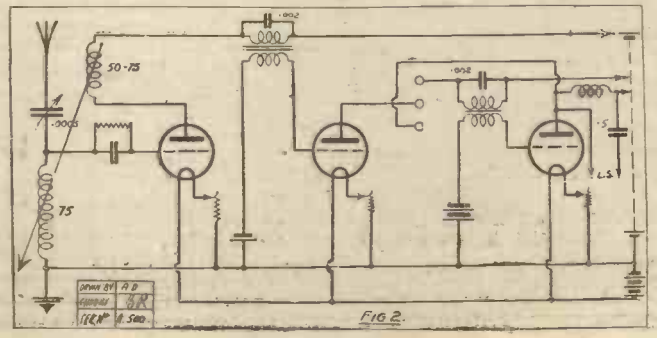


FIG. 2.

A USEFUL UNIT.

FROM A CORRESPONDENT.

THE unit illustrated on this page and described hereunder was designed to cover a long-felt want; that of allowing different makes of H.F. transformers to be used on a set that is wired to suit only one particular make.

It can also be used for reversing the connection to the primary and secondary, and is thus particularly useful when trying out a reflex set (having an H.F. transformer) for the first time.

The unit is very easy to make, and can be constructed by anyone having the few tools required for building a wireless set.

The parts required are: one piece of ebonite rod $1\frac{5}{8}$ in. diameter, $1\frac{1}{2}$ in. long, one disc of ebonite $\frac{1}{8}$ in. thick and $1\frac{5}{8}$ in. diameter, eight valve legs, four valve sockets, some thin rubber-covered flexible wire, one dozen 4 B.A. lock nuts, and three 6 B.A. countersunk screws $\frac{3}{8}$ in. long. The piece of ebonite rod is first taken in hand. This should have faces which are perfectly flat, as one face has the disc of ebonite fitted to it.

Fitting the Valve Sockets.

Now mark on one of the faces the position of four valve sockets by means of a valve template.

When this has been done, drill the four points so marked with a drill that is slightly smaller in diameter than the valve *sockets*. Probably the drill will be about $\frac{1}{4}$ in. diameter.

These holes should be drilled very accurately and must extend through the whole length of the ebonite. The valve sockets are then driven into the four holes *after the threaded portions have been cut off.*

A clear idea of the construction of the unit can be obtained by the above photograph.

The disc of ebonite is then marked in a corresponding way with the valve template, but four valve legs are screwed into the disc instead. The four holes must therefore be drilled and tapped 4 B.A. (or whatever the size of thread is used on the valve legs) for the purpose.

Three further holes 6 B.A. clearance and countersunk are then drilled in the ebonite disc $\frac{1}{4}$ in. from the edge and at equidistant points round the surface, so that when completed the disc can be screwed to the piece of ebonite rod holding the four valve sockets.

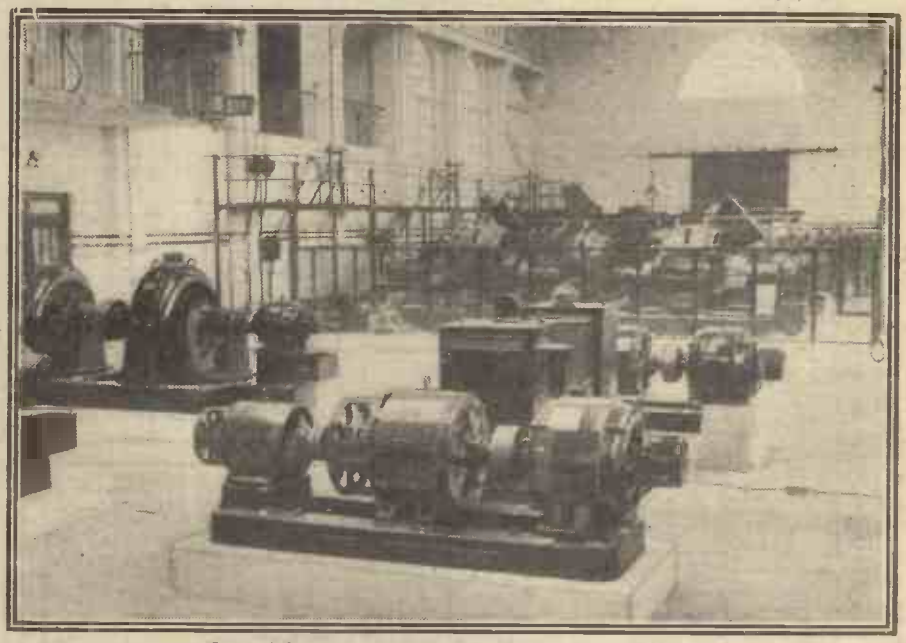
Four pieces of flexible wire each about 3 in. long and soldered to the top of the screwed portions of the valve pins projecting from the ebonite disc complete this portion of the unit.

Four holes $\frac{1}{8}$ in. diameter are then drilled in the piece of ebonite rod, so that the four valve pins can be inserted through the ebonite and into the sides of the valve sockets. These holes should be drilled $\frac{5}{8}$ in. from the surface which had the valve sockets driven in. The photograph will make this clear.

To complete the unit, drill four further holes $\frac{1}{8}$ in. diameter, about $\frac{1}{4}$ in. from the other surface of the ebonite and opposite to the four holes through the length. The flexes are passed through these $\frac{1}{8}$ in. holes *from the inside*, and then joined (by clamping between two 4 B.A. nuts) to the four extra valve pins.

The ebonite disc is screwed to the bottom surface of the ebonite and the unit is complete.

Constructors can deviate from these instructions according to their ingenuity, but must remember that the valve pins in the ebonite disc must not touch the valve sockets unless the pins are inserted in the sides of the latter.



Some of the generators employed at the new Rugby station.

RECEPTION CONDITIONS.

(Continued from previous page.)

cut out, and, both on test and in the hands of readers, has proved exceedingly satisfactory. For the man who does not require very loud loud-speaker signals, or merely wishes to use 'phones, the same receiver, but with the last valve omitted, should prove very satisfactory. There are, I know, a large number of stunt circuits, such as the Chitos, the Ultra-Audion, and the Hopwood, which will give, with careful handling, exceeding good DX results, and quite good signals from the local station, but, from a general purpose point of view, they are hardly applicable, and the choice of either of these must be left to the constructor himself. Personally, without in any way attempting to decry the advantages of these super sets, I am of the opinion that, with perhaps the exception of the neutrodyne and the super-heterodyne, there is nothing that is likely to beat the more old-fashioned straight circuits, such as those which have been described.

In conclusion, however, I ask readers to drop me a line giving me their experiences of DX reception, both from a musical enjoyment point of view and from that of sheer romantic or scientific interest. There seems to be a diversity of opinion amongst listeners as to what really *can* be done in the way of DX broadcast reception, and if those who possess fairly powerful receivers would let me have their experiences, I am sure they would be not only interesting but extremely valuable.

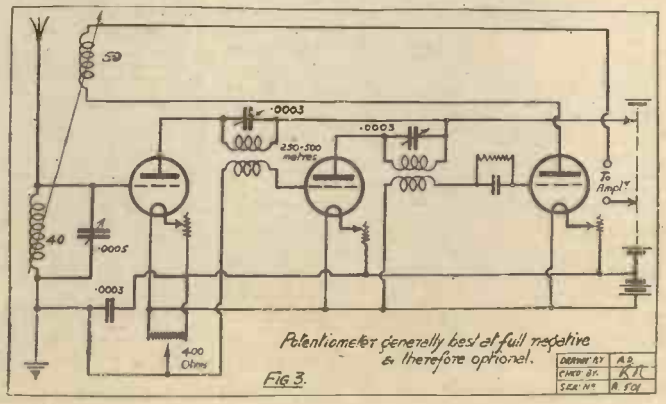
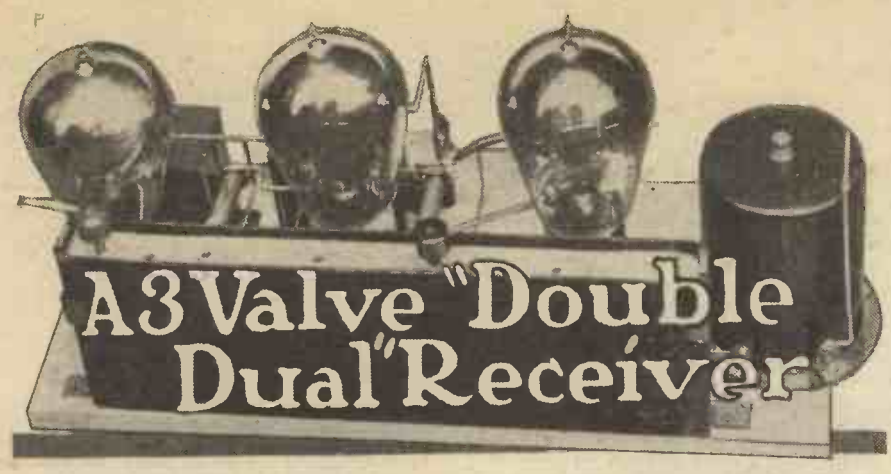


FIG 3.



A 3 Valve "Double Dual" Receiver

The Set Designed, Constructed and Described by
J. MACKINTOSH.

This receiver will appeal to the ambitious amateur. A glance at the photos will show that the constructional work calls for skill and patience—but a study of the circuit diagram and the results will also show that the 3-Valve "Double Dual" is a set well worth the labour of building.

THE question is often asked: "Which is the best receiver?" Needless to say, it is a question which cannot easily be answered. So many things have to be taken into account—economy, range, volume, selectivity, purity, and ease of handling. Unfortunately, all these very desirable qualities are somewhat difficult to embody in one receiver—e.g. the "Super-het." is the most selective of sets, with a splendid range and volume, and it is comparatively easy to handle; nevertheless, it fails badly in the matter of economy—not so much in first cost as in running and upkeep.

Not a Simple Set.

This reason alone is sufficient to debar the super-het. from being used very generally, unless developments take place which reduce the number of valves to about four, or perhaps five for a powerful set. For the man who does not consider cost, and who wishes to evade the powerful "local" and search afield, then undoubtedly the super-het. is "the" set.

Another person may wish for nothing but the local station with plenty of volume; to him I would recommend a detector valve (or a good carborundum crystal if within four or five miles' range), followed by one or two stages of L.F. amplification. The set about to be described is a reflex receiver, with very good range, excellent stability, and a capability of reproducing faithfully both speech and music. As two valves only are used for telephone reception, the receiver is economical.

Before starting to describe the set, it should perhaps be pointed out that it is a little advanced for the novice. I say this to prevent any heartburnings on the part of the absolute beginner who fails to get the best out of a receiver of this kind.

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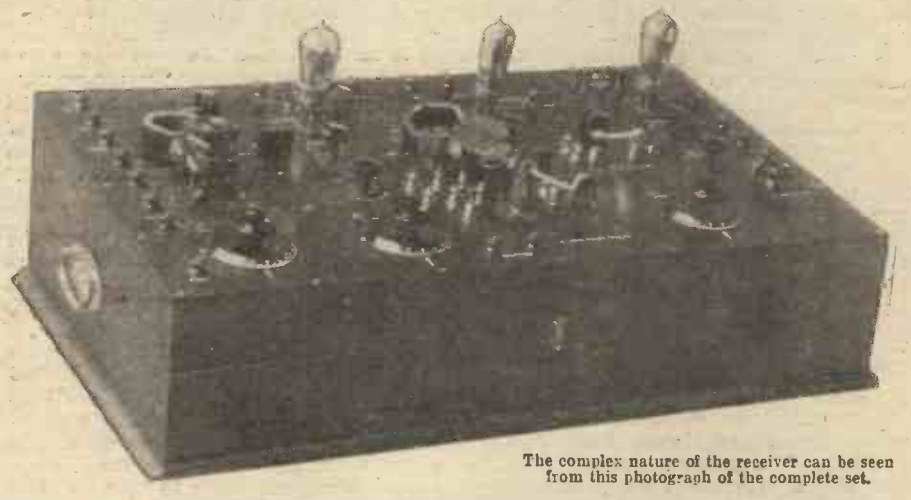

The complex nature of the receiver can be seen from this photograph of the complete set.

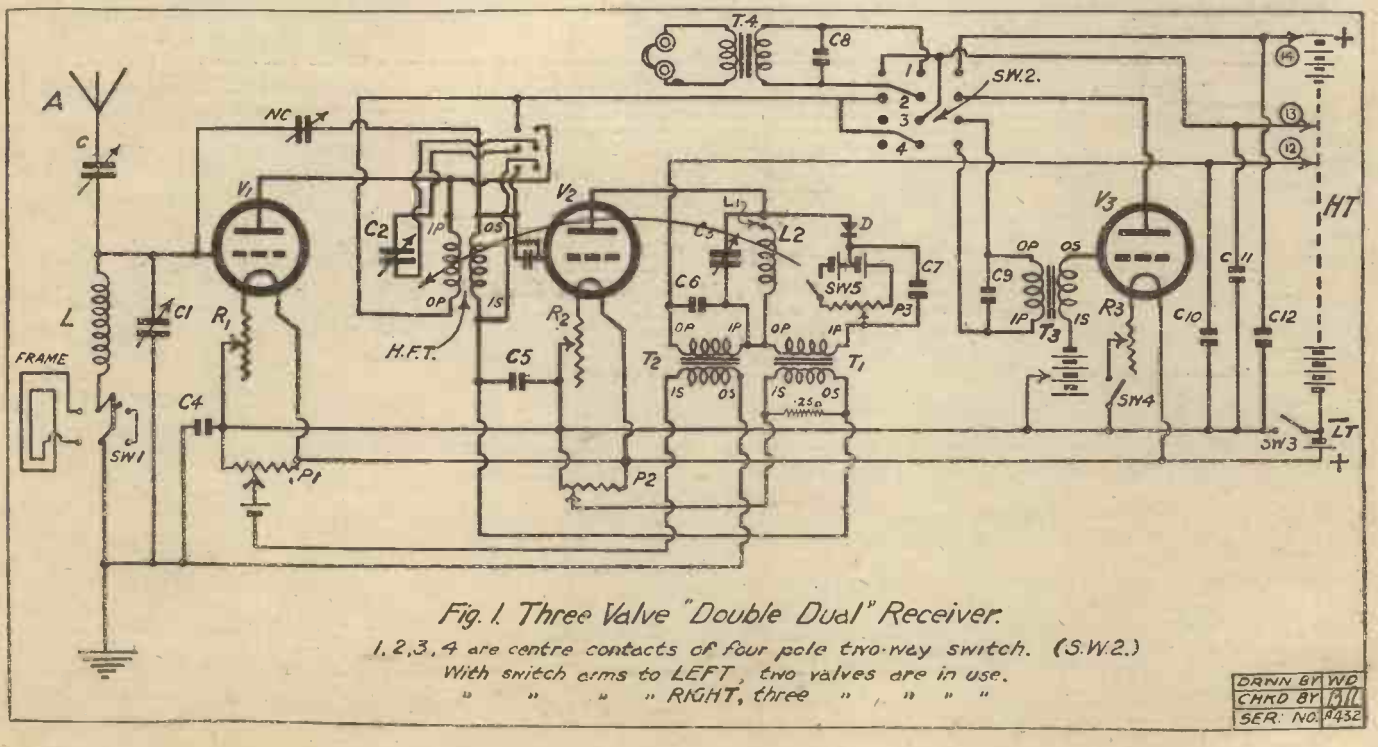

Fig. 1. Three Valve "Double Dual" Receiver.

1, 2, 3, 4 are centre contacts of four pole two-way switch. (S.W.2.)
With switch arms to LEFT, two valves are in use.
" " " " RIGHT, three " " " "

DRAWN BY WD
CHKD BY MIL
SER. NO. 8432

3-VALVE "DOUBLE DUAL" RECEIVER.

(Continued from previous page.)

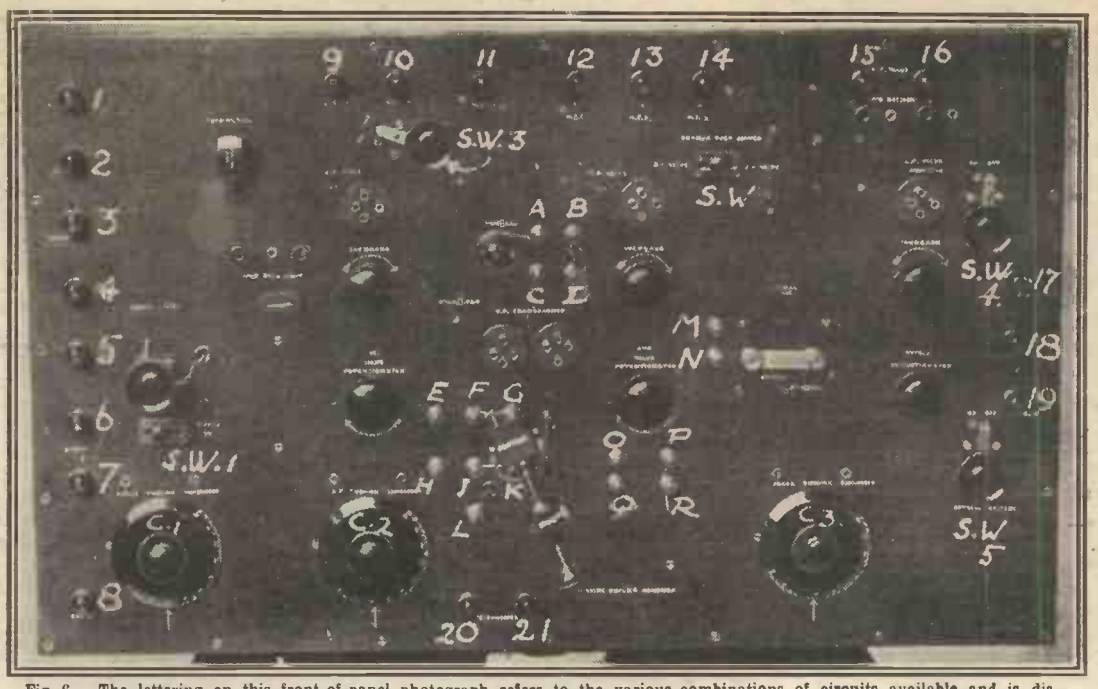

Fig. 6. The lettering on this front-of-panel photograph refers to the various combinations of circuits available and is discussed in the text.

Reflex receivers have acquired a rather unenviable reputation for howling, although personally the author's experience of them has always been highly satisfactory, and to be compared with the stability of the proverbial I.V.I. Provided the reader has a fair experience, and has preferably experimented with a single-valve reflex, then little difficulty should be met with if reliable and well-spaced components are properly wired up. Some difficulty may be met with in tuning, as three circuits have to be handled.

After experiments which began early in 1923, it was decided to build a cabinet set incorporating the circuit shown in Fig. 1. As a matter of fact, this set was completed during International Radio Week (1924), and the first telephony station heard was Stockholm (S A S A) calling C Q in both telephony and Morse.

Three Reflex Stages.

The schematic arrangement of Fig. 1 is given in Fig. 3.

During the course of experimenting three valves were actually worked successfully as "dual" amplifiers. (See "P.W." No. 121, of September 24th, 1924, page 141.) This combination, however, had its disadvantages, inasmuch as it had to be operated by a person skilled in the use of wireless apparatus, and none of the three valves could be used as a power amplifier.

Good Components Necessary.

If V1 was worked as such, then the H.F. component suffered at the very stage where it counted most—i.e. during its first amplification. It was decided, therefore, to utilise two valves as dual amplifiers, a crystal for rectification, and a third valve as a power amplifier. The results obtained from such a combination have been fully justified, and I have yet to hear a three-valve set which can compare with it in range, volume, and purity of tone. Do not expect, however, simply to wire up some cheap components and get marvellous results! You won't! But you may get the biggest "noise" you ever heard from three valves!

Turning to Fig. 1, and studying it in conjunction with Fig. 3, it will be observed that the H.F. impulses in the aerial circuit are first amplified by V1, and then passed to the grid of V2 by the H.F. transformer H.F.T. After further amplification by V2, these impulses are rectified by the carborundum crystal D, and are then fed to the grid of V2 by the L.F. transformer T1.

Action of the Circuits.

From the anode circuit of V2 the amplified L.F. impulses are passed to the grid of V1 by the L.F. transformer T2, and are further amplified. The resultant signals

(Continued on page 1259.)

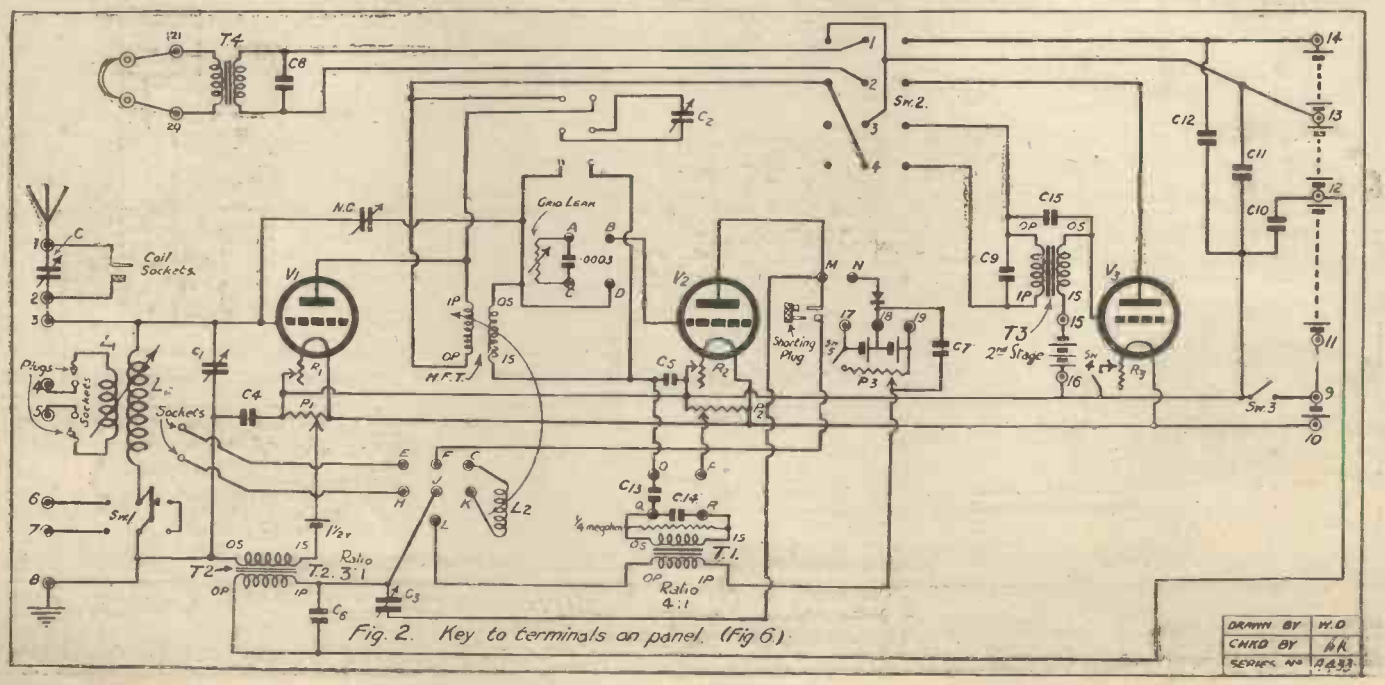

Fig. 2. Key to terminals on panel. (Fig 6.)

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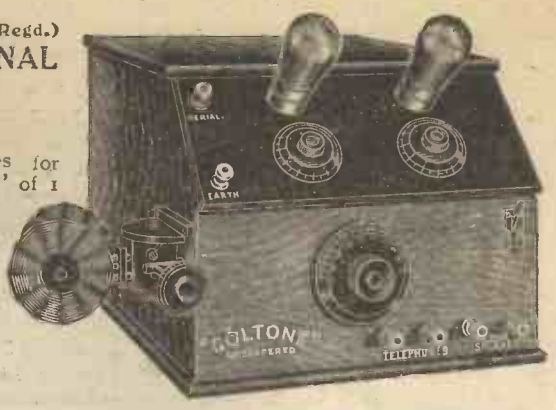
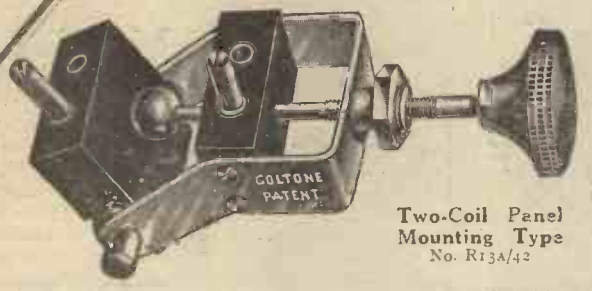
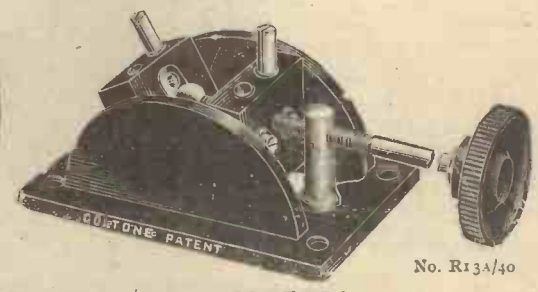


"GOLTONE" MICROMETER REGULATING COIL HOLDERS.

Patent No. 4037/24.



Two-Coil Panel Mounting Type
No. R13A/42



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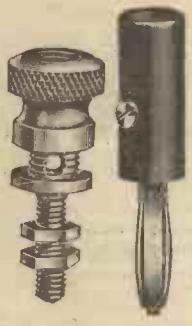

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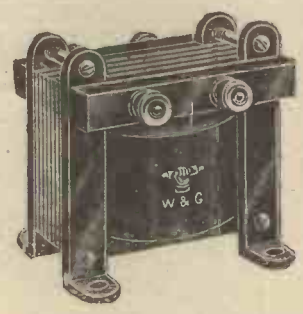

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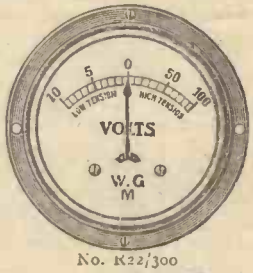

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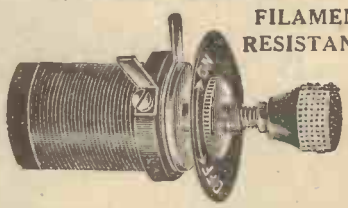

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3-VALVE "DOUBLE DUAL" RECEIVER.

(*Continued from page* 1256.)

can then be either switched on to the 'phones or amplified by the power valve V3. T3 is an L.F. transformer (preferably of power type). When switched into circuit, T3 passes the L.F. component from the anode circuit of V1 to the grid of V3.

It will thus be seen that V1 amplifies weak H.F. and strong L.F., while V2 amplifies strong H.F. and weak L.F.

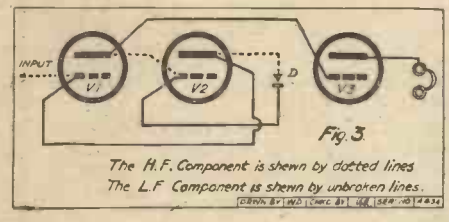


Fig. 3.

The H.F. Component is shewn by dotted lines
The L.F Component is shewn by unbroken lines.

V3 is simply an L.F. amplifier. The amount of work done by the first two valves is better distributed by this method than it would be if the L.F. impulses were first fed to the grid of V1 and then passed to V2 for the second stage. There is this little point against the "inverse reflex" method: to work V1 as a successful second stage L.F. amplifier, a small amount of negative grid bias is essential, with a fair amount of high tension. Worked under these conditions, V1, I should imagine, does not do justice to the weak H.F. captured by the aerial.

Most ordinary sets using two H.F. valves are generally anything but stable, owing to the inherent capacity present in all four-pin type valves, and the capacity effects existing between various components, etc. It was decided, therefore, to "neutrodyne" the first valve only, depending on the damping imparted by the crystal to the anode circuit of V2, to hold V2 in check. This arrangement worked excellently on trial. The neutrodyne method used is due to Professor Hazeltine, and is his original one.

Neutrodyning the Set.

The neutrodyne condenser is now generally connected between the grid of V1 and a tapping taken off the secondary of the H.F. transformer. This tapping is usually nearer to the I.S. than the O.S. end of winding. As it was intended to use plug-in transformers, this secondary-tapping method had to be abandoned, and the neutrodyne condenser connected directly to the O.S. end. The connections to the plug-in transformer H.F.T. are important, and must be strictly adhered to.

A reversal of phase is necessary in the secondary winding of H.F.T., and this is obtained by connecting *I.P. (beginning of primary) to plate of V1, and O.S. (end of secondary) to grid of V2.* It is equally important to note that the windings must run in the same direction. It does not matter whether this be clockwise or anti-clockwise, but *both primary and secondary windings must be wound on in the same direction.*

With the neutrodyne condenser N.C. connected up, and the windings of H.F.T. incorrectly connected, it would probably be quite impossible to stabilise V1—the effect of N.C. being simply to add to the capacity existing between the electrodes of V1 instead of balancing it out.

The neutrodyne arrangement is shown in Fig 4. L can be either the aerial coil (as it actually is in Fig. 1) or the secondary coil of an H.F. transformer. The valve capacity of V is represented by the dotted condenser C, and the disturbance is supposed to originate at A. A current tends to flow through C and establishes a capacity coupling between the anode and grid circuits of the valve. L1 is the anode coil, L2 the neutralising coil (actually the primary and secondary coils respectively of an H.F. transformer).

The upper ends of L1 and L2 should be of opposite polarity, and therefore it is essential to adhere to the connections denoted. I am aware that most manufacturers of H.F. plug-in transformers recommend that I.P. (input primary) be connected to anode, while I.S. (input secondary) should go to grid. In actual use, however, the writer could discern scarcely any difference between the two methods of connecting the secondary. The tuning, of course, varied. A noticeable difference was observed when the primary connections were reversed. The neutralising condenser is C1, and a current of opposite phase to that flowing through C is established through C1 in the direction of the arrow. C1 is made variable to allow of adjustment, and thus the capacity of V can be neutralised or balanced out.

Large Panel Employed.

The circuit having been decided on, it was necessary to fix on the size required for the panel. After much deliberation, this was made 30 in. by 18 in., erring somewhat on the large side. The panel *could* have been made much smaller, but as there are three L.F. transformers, one telephone transformer and three variable condensers incorporated in the set (all these components can create untold trouble by interaction when mounted close together), it was decided to take no risk of interaction or capacity coupling effects.

It is not proposed to give a fully dimensioned drawing. Fig. 5 shows the chief dimensions.

The main terminals (1 to 21) are placed $1\frac{3}{8}$ in. from edge of panel, the minimum distance between any two of them being $1\frac{1}{4}$ in. The experimental or switching terminals A to R vary in distance, but a fair idea of their location and distance apart may be gauged from Fig. 6. The size of panel decided upon allows plenty of room for all components, but, as I have already said, this size could be curtailed somewhat. This should be done, however, only by the experienced amateur.

When the various components have been mounted, the wiring should be proceeded with. Nothing less than No. 18 S.W.G. should be used. The writer's set was wired with No. 14 S.W.G. in some parts, while No. 16 S.W.G. was used in others. Round section wire was used throughout. The L.T. circuits should be wired up first, the wiring being run close to the panel. When the rheostats, potentiometers, and filament legs of valve holders have been wired, then commence with the aerial circuit. Looking at Fig. 7, this is the right-hand side of the photo.

No difficulty should be met with if a little thought is given to the position of each wire. It is advisable, of course, previously to "tin" every terminal shank, and after the tinning process it will be found advantageous to re-tighten all the nuts. The writer uses two nuts on each terminal. Do not forget to connect the moving plates of C1, C2, and C3 to the points of low potential—in the case of C1, to earth; C2 to O.P. of H.F.T.; and C3 to terminal "J" (Fig. 2). The wiring of SW2 (change-over switch) should be left till the last.

Recent Modifications.

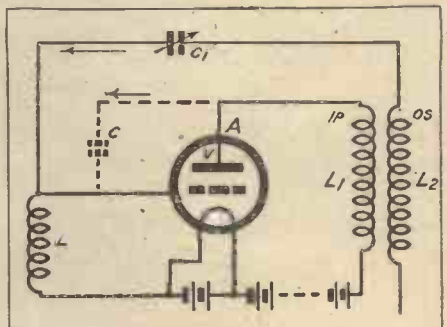
The usual rules about keeping all grid and plate leads as short as possible, and well spaced from each other, should be adhered to. The "backing piece" of thick ebonite which can be seen in Fig. 7 (underneath the crystal detector), situated centrally between R2, R3, P2, and P3, was placed in position solely to give rigidity to the crystal detector. It is bolted to the panel in six places, and, in the writer's case, is more of a necessity than a luxury. The panel, being so large and of $\frac{1}{4}$ in. ebonite ($\frac{3}{16}$ in. would have been preferable), tends to give a little, and when using C3 it was noticed that the crystal developed a "rustle," or slight rushing noise, due to the adjustment being slightly variable.

The "backing piece," however, solved the problem, and the panel can now be deliberately pushed around the crystal without interfering in the slightest with its adjustment. Several alterations have been made since the photographs were taken.

1. The condenser (fixed) C, in Fig. 7, has been replaced by a ·001 mfd. variable condenser (as shown in Fig. 1).

2. The loading coil sockets (see Figs. 6 and 7) have been taken out of aerial circuit and joined across the condenser C, as shown in Fig. 2. A series wave-trap or a series condenser is thus available at will.

3. It will be observed there are two plug-in sockets available for the H.F. plug-in transformer in Fig. 6. The left-hand one



Neutrodyne Arrangement.

Fig. 4.

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(originally intended for experimental work) has now been replaced by a double-pole, double-throw, anti-capacity switch of Burndept make, which is used to connect C2 across either the primary or the secondary winding of H.F.T. (see Figs. 1 and 2).

4. The wiring into circuit of the plug-and-socket connections (shown by shorting plug situated behind crystal detector in

(*Continued on next page.*)

3-VALVE "DOUBLE DUAL" RECEIVER.

(Continued from previous page.)

Fig. 6, and between R2 and R3 in Fig. 7) has now been re-designed so that L2 can be:

(1) Split into two separate sections;
(2) Plugged into the "Polar" universal coil holder or
(3) Plugged into the previously mentioned plug-and-socket connections behind detector.

In the case of (2) or (3), the coil holder not in use has to be short-circuited by a suitable plug—otherwise a break exists in the anode circuit of V2.

The arrangement can be seen in Fig. 2. Supposing a No. 100 coil was required for L2, a No. 75 coil could be plugged into the holder in series with M and F, and a No. 25 into the Polar holder (i.e. connected to G and K). A slightly more delicate control of reaction is obtained by this split coil method, as the small coil is used to apply reaction instead of the large coil. In actual practice it will be found that a No. 35 or 50, plus the No. 75, will be required to give about the same reading on C3 as when the No. 100 was used alone.

Mention has not as yet been made that the set being described has four available circuits:

1. A two-valve reflex—V1 dual with V2 detector.

To obtain this circuit (see Fig. 2), join A to B, C to D, E to F, H to J, and O to P. The plugs of L1 should be connected to sockets of E and H. M and N, L and J should be left disconnected, but the shorting plug should be placed in position, joining M to F. Valve 1 is acting as a dual amplifier, while V2 is the detector.

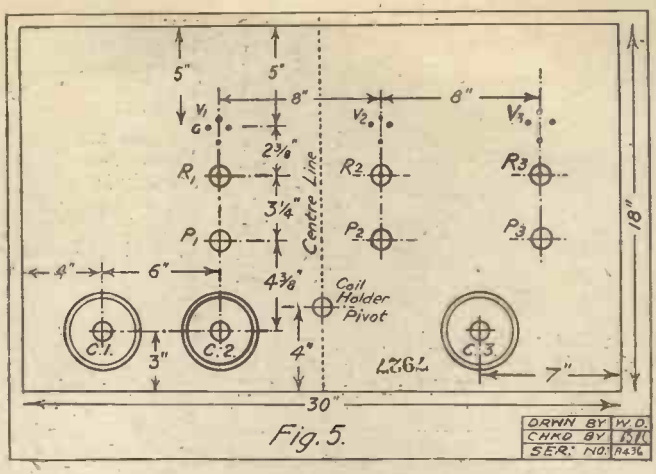


Fig. 5.

The grid leak and grid condenser are shown connected across A and C. The slider of P2 should be put to the positive end, as most detector valves of the 2-volt type (or most detectors of any type for that matter) work best thus.

Reaction is now obtained on the aerial circuit by virtue of L1 in the anode of V2 being coupled over L in the grid circuit of V1. Reaction on the H.F.T. is obtained by disconnecting E—F, H—J, and connecting F to G and J to K. Coil L2 is now in the anode of V2 and is coupled over H.F.T.

The "Double-dual" Circuit.

The reaction coil can, of course, be placed in the position close to M and reaction effects be obtained by tuning it with C3. In the writer's set, this can actually be done without V2 oscillating. If the neutrodyne condenser is purposely mis-tuned, both V1 and V2 oscillate easier. V1 can, of course, be made to oscillate on its own by gradually increasing the capacity of N.C.

Used thus, N.C. can be utilised as a fine adjustment for applying reaction. The power valve is added to this circuit in the usual way, by throwing over SW2, switching on V3, and adjusting the 3rd H.T. tapping—i.e. terminal 14. The grid bias should be adjusted.

To obtain the "double-dual" circuit connect B to D, O to Q, P to R, F to G, J to K, L to J, and M to N. The short-circuiting plug shown in Fig. 2 should be inserted, and L2 plugged into its appropriate holder. The slider of P2 should now be put fully to the negative end, as V2 is now being worked as a dual amplifier. If O is not connected to Q, C13 (·006 mfd.) then comes into play. The signal strength is no better than using the direct connection—the advantage being that the filament control is not at all critical as it sometimes is with some valves using O connected to Q. Grid bias, usually 1½ volts, should be used on V1. The cell can be inserted between the arm of P1 and I.S. of T2.

As plenty of signals are always available on 600λ, this is the best wave on which to test out a receiver. Plug in an L60 or L75 in the aerial socket, the aerial being connected to terminal 3, a Sullivan's No. 1 or 2 in the H.F.T. sockets, and an L100 in the Polar Universal holder. The crystal should be adjusted on actual signals by moving the arm of P3 from one end to the other. Generally, the arm will be found to be near the centre of the winding. The adjustment of C1 will depend on the aerial and coil in use. C2, when of ·0005 mfd., will give 600λ about 110° on a Sullivan's No. 1 and about zero on a No. 2. C3 (·0005) will give 600λ about 40°–50°. The set can be tested, of course, on any wave, but care should be taken to cause no interference by oscillating.

Hints on Operation.

Once signals are heard, P3 should be adjusted, when it will be found that the signals—whether Morse or telephony—can be heard when the arm of P3 is a certain distance from the centre of winding, and whether the arm is to the *left or right* of centre. One side, be it negative or positive, is usually much better than the other, and this is easily observed on adjustment of the arm.

The pressure on the crystal should be very firm and varies according to the piece in use. Good carborundum is an absolute necessity, as much of it sold is "dud." Reaction should be obtainable by coupling L2 over H.F.T. If signals weaken, simply turn over L2. If the coupling is tightened too far, the set will howl loudly at low frequency, or what sounds like low frequency. A good test for the correct wiring up of the double-dual circuit is to pull out L2 from its holder. When O is connected to Q the set will "roar," but when O and Q are disconnected except for C13, the set will give peculiar "clicks" at long intervals.

(Continued on page 1263.)

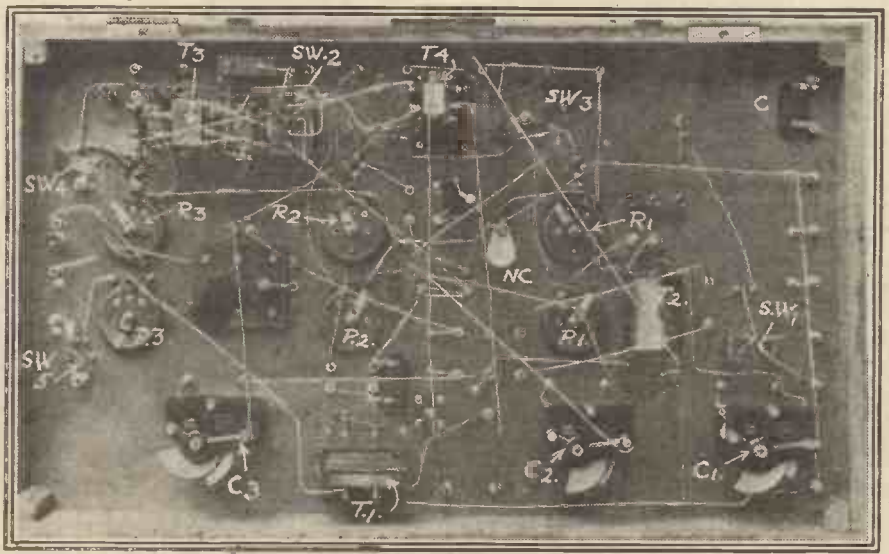


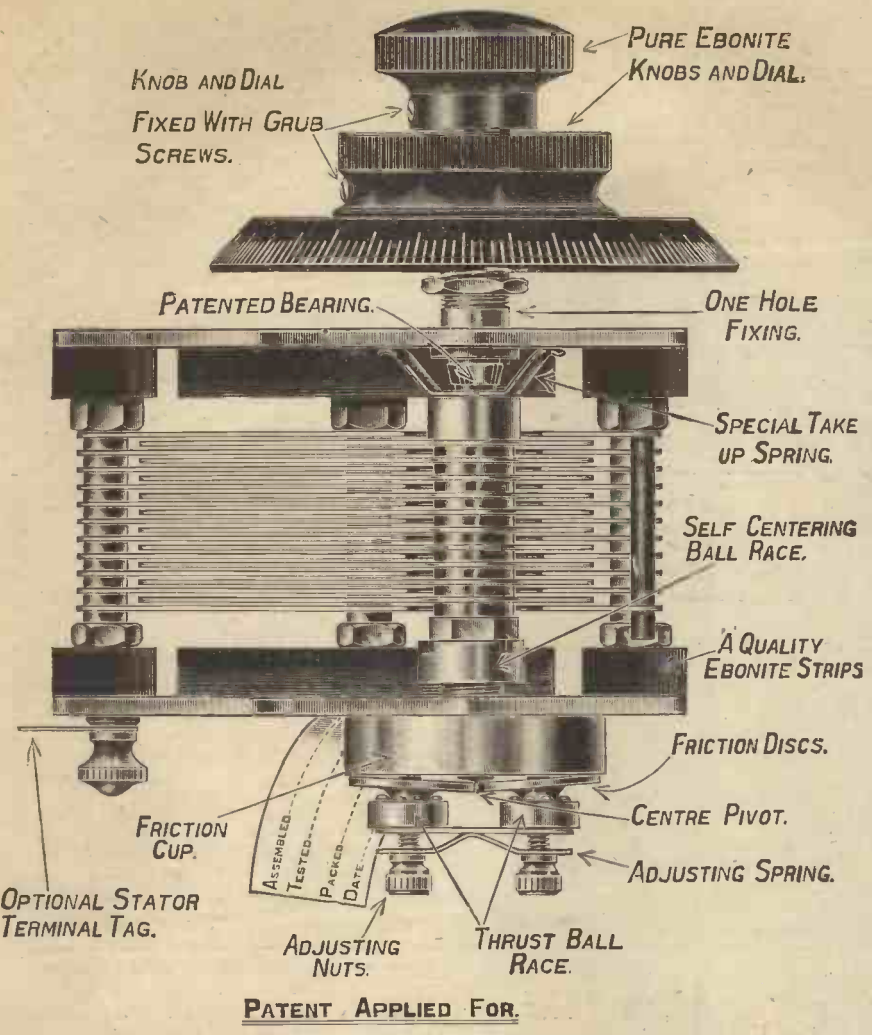
Fig. 7. A photograph of the interior of the set showing the disposition of the components and connections.

2. A two-valve reflex—V1 dual with V2 detector—with additional power amplifier.

3. A two-valve "double-dual" with crystal detector.

4. A two-valve "double-dual" with crystal detector, with additional power amplifier.

The first circuit is comparatively simple and easy to handle, two tuning controls only being necessary. In this case the anode coil of V2 is untuned and is used solely as a reaction coil coupled to either L or H.F.T.



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3-VALVE "DOUBLE DUAL" RECEIVER.

(*Concluded from page* 1260.)

No mention has yet been made of the adjustment necessary to neutrodyne the set. When all the condensers are set (when tuned) towards zero, and especially when using the series condenser C, the valve V1 and possibly V2 will oscillate. Screw in the neutrodyne condenser slowly, at the same time swinging C1 to and fro across its tuned adjustment. The set should stop oscillating when the plates of the neutrodyne condenser (a Bowyer-Lowe) are so separated that a half-crown piece can easily be inserted between them.

Increasing Selectivity.

That is, the distance between the plates should be little more than the thickness of half-a-crown. This adjustment will vary with different valves and different sets, but will generally be found to be somewhere near the dimension given. The tuned reaction coil L2 should be in a position of minimum coupling with H.F.T. when the neutrodyne condenser is being adjusted. A readjustment of N.C. will alter very slightly the readings of C1 and C2 for a given station.

Referring to Fig. 2, terminals 4 and 5 have sockets connected to them, into which can be plugged the plugs attached to L1. The aerial can then be connected to terminal 4, and 5 connected to 8—the earth remaining on 8. This arrangement gives an aperiodic aerial coil with variable loose coupling. It is more selective than direct coupling; for the B.B.C. band an L.40, 50 or 60 can be used. The smaller the aerial coil, the more selective does the set become, but signals become weaker.

One of the best aerial tuning arrangements to use is the series-parallel. With the aerial on 1, connect 2 to 3. C is then in series with the aerial and C1 in parallel with A.T.I. The value of C should not be reduced below about ·0001 mfd.—possibly round about 20° on a ·001 square law condenser. If C is kept low in value, and C1 not too low, the arrangement is very selective; keeping C high in value and C1 low in value results in stronger signals but less selectivity.

Suitable Valves.

On Daventry's wave a slight loss is noticeable even when the series condenser is used at full valve—i.e. ·001 mfd. In this instance, no series condenser should be used.

Connecting an appropriate coil across C in Fig. 2 results in a series wave-trap when the aerial is on 1 and 2 is connected to 3.

The following 2-volt type of valves have been tried: B.T.H. B.3, Ediswan, Cosmos S.P.18, D.E.R., W.1 Cossor, W.2 Cossor, P.V.6 D.E. and D.E.6. The last two are suitable in the last stage for power amplification. The greatest amplification ever obtained was when using 3 B.T.H. B.4's. The set in this case was slightly difficult to neutrodyne, owing to the tendency of the valves to oscillate.

The S.P.18 is an excellent valve for dual work; one peculiarity is that the potentiometer in the case of V2 has no control whatsoever. When the arm is put fully to the positive side, the volume remains exactly the same. When used in position V1, S.P.18 does not require any bias, although the potentiometer arm should be fully negative. It might be advantageous in other cases, from the point of view of cutting down plate current, to use a 1½-volt cell, as shown in Fig. 1.

The best combinations are: *1st Valve.*—Cossor W.2, Cossor W.1, S.P.18, D.E.R., S.P18. *2nd Valve.*—Cossor W.2, Cossor W.2, S.P.18, B.T.H. B.3, Cossor W.2. *3rd Valve.*—D.E.6 or P.V.6 D.E. The last combination is about the best, as two S.P.18's are inclined to be too microphonic. V2 requires 50-60 volts H.T., V1 requires 70 volts (about), 80-90 will increase signal strength slightly with corresponding bias, V3 requires up to 120 volts with about 9 volts grid bias. V1 and V2 can be linked as regards H.T. and about 60-70 volts used. This is perfectly satisfactory in practice.

The actual values of the fixed condensers used should perhaps be stated: C4 = ·0015 mfd. (could be ·001), C5 = ·0005 mfd., C6 = ·001 mfd. (could be ·002), C7 = ·006 mfd. (could be up to ·01) (not essential), C8 = ·003 mfd. (could be ·001 up to ·003). C9 = ·002 mfd., C10, C11, C12 each about 1 or 2 mfd., C15 = ·0001 mfd., C13 = ·006 mfd., C14 = ·0005 mfd.

DX Results Achieved.

The values are not very critical within reason, and depend to a great extent on the components used. In the case of C4, some sets—i.e. single valve reflex—work well with ·0005 or even without a condenser. In the case of T1 and T2, transformers are now being marketed with a very low self-capacity between and across the windings, and these are not always suitable in the positions T1 and T2.

No description of a set seems complete without at least some of the long-distance results achieved. The set will tune to the low waves, and K D K A has often been received on his low wave. (See "Getting Down to K D K A," "P.W." No. 149, vol. vii., page 285.) Over twenty American broadcasting stations have been tuned in, including a record "bag" of twelve in two hours one minute. Two valves only were used. In the latter instance, ten of the stations were readable and two were not. The "bag" included W B Z, W J A R, W G Y, P W X and W F I, with K D K A on both long and short waves. The conditions were extremely favourable. Not even a "Super Het." will give consistent reception of many "Americans" under unfavourable weather conditions, so do not expect too much.

Frame Aerial Reception.

On the home stations results are very good—sometimes on the loud speaker, three valves being used. For 'phones two valves give ample strength, Daventry at Inverness being readable 3 to 4 ft. from speaker.

On the *frame aerial* numerous stations have been tuned in, and include amongst others: W G Y on 2 valves (good 'phone strength), K D K A on 3 valves (very weak); W B Z on 2 valves (very weak), Petit-Parisien on 2 valves (weak), Plymouth on 2 valves (weak), Sheffield on 2 valves (weak), San Sebastian (Spain) on 2 valves (very weak), several German stations on 2 valves, most main B.B.C. stations on 2 valves.

For frame aerial work the tuning is very critical, and operating must be of the very skilled variety.

In the reflex set an "R.I." permanent detector works well, but owing to its extreme stability carborundum is preferable. The "R.I." needs no extra potential, and such was only used by the writer for long-distance crystal reception.

FOREIGN RADIO NEWS.

From Our Own Correspondents.

Chess on Short Waves.

THE announcement is made in Paris that arrangements are being made for chess to be played between leading French and American players, the moves to be transmitted by short wave-length radio messages.

New Spanish Station Opens.

The new Carthagena station has now started work. After some experimental transmissions, the wave-length has been fixed at 335 metres. The hour of daily broadcasting is from 7 p.m. to 10.30 p.m., Spanish time.

Some time ago the rival Madrid stations came to an agreement to split up the day between them, so as to avoid any rivalry or mutual interference. The Radio-Iberica station, however, the call sign of which is E A J 6, found that in this division of time it had got the worse of the bargain, so it now has broken the agreement and will resume its old broadcasting time—from 9.30 p.m. to midnight.

The other Madrid station, E A J 4, usually known as Radio-Castille, has returned to its previous wave-length, 304 metres.

Serbia to have New Station.

The new radio broadcasting station at Agram (Zagreb) will, it is officially announced, be opened on March 1st.

Ice-Warnings by Radio.

The Governments of the various states bordering on the Baltic are organising a service of radio warnings to shipping as to the state of the ice.

The stations participating so far belong to nine states, and are as follow: Sweden, seven; Germany, five; Denmark, three; Russia, Finland, Latvia, two apiece; and Dantzig, Memel and Esthonia, one each.

During the past few weeks a modified experimental service has been in working, and it has proved to be of inestimable use to mariners in a sea the winter navigation of which is rendered particularly hazardous by ice.

Radio-Geneva Denies Rumours.

The broadcasting station Radio-Geneva issues a denial of press stories to the effect that recent changes in its organisation are due to financial depression.

Austrian Licences.

From official statistics just published, it appears that, for the size of the country,

(*Continued on page* 1276.)

THE "POPULAR WIRELESS" CONTINENTAL BROADCASTING TIME-TABLE.

Specially compiled by ROBERT R. PECORINI, M.Inst.R.E. ("2RI").

Transmiss'n Starts G.M.T.	Transmiss'n Ends G.M.T.	Station and Call Sign	Wave-length metres	Frequency kilo-cycles	Days of the Week	Nature of Transmission
05.40	19.15	Koenigswusterhausen (LP)	2525	119	Daily (throughout day)	Wolff's Press Service.
05.55	06.05	Hamburg*	392.5	764.3	Weekdays	Time.
05.55	06.05	Bremen	270	1075	"	Usually relay Hamburg.
05.55	06.05	Hanover	296	1013	"	"
05.55	06.05	Kiel	233.5	1284	"	Relay
06.00	20.00	Koenigswusterhausen (L P)	4000	75	Daily (throughout day)	News.
06.25	06.30	Hamburg*	392.5	764.3	Sunday	Time.
06.35	06.42	Lausanne (H B 2)	305	983.6	Weekdays	Weather (local).
06.40	06.46	Eiffel Tower (F L)	2650	113.1	"	"
07.12	16.10	Amsterdam	1955	153	Daily (except M., Sat.)	News, Bourse.
07.30	08.30	Frankfurt-on-Main*	470	638	Sunday	Concert.
07.30	08.30	Cassel	273.5	1096	"	Relaying Frankfurt.
07.30	18.50	Koenigswusterhausen (L P)	2900	103.4	Daily (throughout day)	T.U. News Service.
07.30	10.30	Leipzig*	452	663.7	Sunday	Sacred music&Service.
07.30	10.30	Dresden	294	1020	"	Relaying Leipzig
07.30	08.05	Eberfeldt	240	1249	"	Sacred Service.
07.30	08.05	Munster*	410 (287)	731 (1045)	"	" "
07.30	08.05	Dortmund	283	1060	"	Relaying Munster
07.30	08.45	Koenigsberg	463	648	"	"
07.30	11.00	Voxhaus (Berlin)*	505&576	594 : 521	"	" "
07.30	11.00	Stettin	241	1244.8	"	Relaying Berlin
07.50	08.07	Vienna	530	566	Weekdays	Markets.
07.50	08.07	Graz	399	752	"	Relaying Vienna.
08.00	08.10	Koenigsberg	403	744	"	Markets
08.15	08.30	Marignane	1525	196	Daily	Weather.
08.45	10.15	Copenhagen*	308	973	Sunday	Sacred Service.
08.45	10.15	Odense	950	316	"	Relaying Copenhagen.
08.45	10.15	Hjörring	1250	240	"	"
09.00	09.20	Voxhaus (Berlin)*	505&576	594 : 521	Weekdays	Markets and Weather.
09.00	10.00	Vienna (R W)	530	566	Sun., Wed.	Organ and Choir.
09.00	09.10	Oslo*	382	785	Friday	Markets.
09.00	09.10	Aalesund	515	582.5	"	Relaying Oslo.
09.00	09.35	Helsingfors	522 : 317	574 : 946	Sunday	Service.
09.00	10.00	Komarov (O K B)	311	965	"	News, Concert.
09.00	09.15	Leipzig	452	663.7	Sunday, Thursday	News.
09.05	09.30	Leipzig*	452	663.7	Weekdays	"
09.30	10.00	Rome (1 R O)	425	706	Sunday, Thursday	Sacred Concert.
09.30	10.15	Radio-Berne	301.5	995	Alternate days	Organ music.
					Sunday	Religious Service.
09.40	10.30	Bloemendaal	345	869	"	"
09.42	09.50	Toulouse (M R D)	1525	196	Daily	Weather. "
10.00	11.30	Stockholm* (S A S B)	427	702.5	Sunday	Sacred Service.
10.00	11.30	Gefle (S M X F)	212	1419		
10.00	11.30	Eskelstuna (S M V X)	243	1234.5		
10.00	11.30	Orebo	218	1376		
10.00	11.30	Kalmar	253	1185.5		
10.00	11.30	Norrkoeping (S M V V)	260	1154		
10.00	11.30	Joenkoeping (S M Z D)	265	1131		Relay Stockholm.
10.00	11.30	Fœlun (S M Z K)	370	810		
10.00	11.30	Sundsvall (S A S D)	545	550		
10.00	11.30	Linkoeping	467	642		
10.00	11.30	Boden (S A S E)	1200	250		
10.00	11.30	Karlsborg	1350	222.1		
10.00	11.30	Gothenburg	288	1041.6	Sunday	Sacred Service.
10.00	11.30	Karlstad (S M X C)	221	1357.4		
10.00	11.30	Trollatan (S M X Q)	332	903.7		Relaying Gothenburg.
10.00	11.30	Varberg	340	880		
10.00	11.30	Malmoe (S A S C)	270	1111	Sunday	Sacred Service.
10.00	11.30	"	270	1111		Irregularly relays Stockholm as also does Gothenburg.
10.00	11.30	Barcelona (E A J 13)	460	652	Sunday	Sacred Concert.
10.00	11.00	Zurich	515	582	"	Concert.
10.00	11.00	Vienna (O T W)	400	750	Daily	Tests.
10.00	11.45	Sokolnicchi (Moscow)	1010	297	Tu., Thur., Fri., Sat.	Political Lecture.
10.00	11.50	Voxhaus (Berlin)	505&576	594 : 521	Daily	Concert.
10.00	11.00	Leipzig*	452	663.7	Sunday	Educational Talk.
10.00	11.00	Oslo	382	785	"	Sacred Service.
10.00	10.10	"	382	785	Weekdays	Bourse.
10.00	10.15	Toulouse	441 : 680	680 & 1666.6	"	Market prices.
10.00	10.15	Munich*	485	618	Wednesday	Chimes.
10.00	10.15	Nuremburg	340	882	"	Relaying Munich.
10.00	11.50	Breslau*	416	721	Sunday	SacredService&Music.
10.00	11.30	Stratnitz (Prague) A D	546	549.6	Daily	Concert.
10.00	11.50	Gleiwitz	251	1195	Sunday	Relaying Breslau.
10.00	11.50	Voxhaus (Berlin)*	505&576	594 : 521	Weekdays	Worker's Concert.
10.00	11.30	Vienna	530	566	Sun., M., W., Th.	Concert.
10.00	10.10	Koenigsberg	463	648	Weekdays	Weather.
10.05	11.40	Hilversumn (H D O)	1050	285.7	Sunday	Divine Service.
10.30	11.30	Munster*	410	732	Sunday	Concert.
10.30	11.50	Eberfeldt	240	1249	"	"
10.30	11.50	Koenigswusterhausen (L P)	1300	231	"	Orchestra, Esperanto.
10.30	11.30	Radio-Berne	301.5	995.	"	Concert.
10.30	11.30	Stuttgart	443	677	"	Sacred Service.
10.30	12.30	Koenigsberg	463	648	"	Concert.
10.30	11.30	"	463	648	Weekdays	"
10.45	11.00	Leipzig	452	660	"	Weather.
11.00	11.10	Zurich*	515	582	"	"
11.00	11.30	Voxhaus (Berlin)	505&576	594 : 521	Sunday	Orchestra.
11.00	12.00	Frankfurt-on-Main*	470	638	"	Concert.
10.00	11.15	Eiffel Tower (F L)	2650	113	Tu., W., Th., Fr., Sat.	Markets, Cotton.
11.00	11.50	Leipzig	452	663.7	Weekdays	Music
11.00	11.10	Helsingfors	522 : 317	574 : 946	"	Weather.
11.15	11.20	Eiffel Tower F.L.	2650	113	Daily	Time.
11.20	11.25	" " "	2650	113	" ex. Sun.	Fish prices.
11.30	12.25	Breslau*	416	721	Weekdays	Concert (stat. orch.).
11.30	12.10	Munster	410	731	"	Bourse, Markets.
11.30	11.40	Stockholm (S A S A)*	427	702.5	Daily	Weather. Bourse, Time (Nauen).
11.37	1143.	Dutch Meteo (K N M L)	1100	272.6	Weekdays (except Thur.)	Weather.
11.40	12.00	Hilversum (H D O)	1050	285.7	"	Police News.
11.55	12.00	Leipzig	452	663.7	"	Time.
11.55	12.00	Frankfurt-on-Main	470	638	"	
11.55	12.00	Radio-Berne	301.5	995	Daily	T.S.,Weather, Bourse.
11.55	12.15	Voxhaus (Berlin)*	505&576	594 : 521	"	" "
11.55	12.15	Breslau	418	717	Sunday	" "
11.55	12.15	Zurich	515	582	Weekdays	" " Bourse.
11.55	12.00	Hamburg*	392.5	764.3	Sundays	Time.
11.55	12.30	Frankfurt-on-Main	470	638	Weekdays	Talk.
11.55	13.00	Rome (1 R O)	425	706	Sundays	Government comm'n.
12.00	12.10	Munich	485	618	"	Time, Weather.
12.00	13.00	Ryvang*	1150	261	"	Divine Service.
12.00	13.00	Odense	950	316	"	Relaying Ryvang.
12.00	13.00	Hjörring	1250	240	"	"
12.10	12.20	Vienna	530	566	"	Time, Weather.
12.15	13.30	Munster*	410	731	Weekdays	Lecture, Concert.
12.15	13.30	Eberfeldt	240	1249	Monday, Friday	Concert. Relays Munster occasionally.
12.15	12.40	Oslo	382	785	Weekdays	Markets: Exchange
12.30	12.40	Lausanne (H B 2)	305	983.6	"	Weather(Zurich),Time.
12.30	13.40	Radio-Paris	1750	171.3	"	Concert.
12.30	13.40	Toulouse	441 : 180	680 & 1666.6	Daily	Music.
12.30	13.40	Zurich	515	582	Weekdays	Piano.
12.30	13.40	Moscow (R D W)	1450	207	"	News, Concert.
12.45	13.45	Radio-Paris	1750	171.3	Sunday	Concert.
12.45	13.45	Hanover*	296	1013	"	Orchestra. Relays Hanover.
12.45	13.45	Hamburg	392.5	764.3	"	T.S.
12.55	1.00	Gothenburg	288	1041.6	Daily	Weather, News.
13.00	13.08	Zurich	515	582	Saturday	Concert.
13.00	14.00	Eberfeldt	240	1249	Sunday	Orchestra.
13.00	14.30	"	240	1249	Weekdays	Time, News, Weather.
13.00	13.15	Toulouse	441 : 180	680 & 1666.6	Daily	
13.00	14.30	Munster	410	731	Sunday	Concert.
13.00	13.10	Stratnitz (Prague) A D	546	549.6	Weekdays	Bourse.
13.00	13.10	Brussels (B A V)	1100	272	"	Children.
13.00	15.00	Leningrad	940	319	"	News. Concert, Talk.
13.05	14.30	Munster	410	732	Saturday	Children.
13.05	15.00	Hamburg	392.5	764.3	Weekdays	Concert; relaying Bremen. Concert.
13.05	15.00	Bremen*	270	1075	"	
13.15	13.40	Toulouse	441: :180	680 & 1666.6	Daily	Orchestra.
13.20	13,30	Voxhaus (Berlin)*	505&576	594 : 521	"	Bourse.
13.30	14.00	"	505&576	594 : 521	"	Lecture.
13.45	13.52	Radio-Paris (S F R)	1750	171.3	Sunday	News, etc.
13.45	14.00	"	1750	171.3	Weekdays	News.Prices,Exchange
14.00	14.30	Voxhaus (Berlin)	505&576	594 : 521	Sunday	Chess.
14.00	15.00	P.T.T.* (Ecole Supérieure)	458	655	"	Concert relay.
14.00	15.00	Lyons la Doua	479	626.3	"	Relaying P.T.T.
14.00	15.00	Pic-au-Midi	350	855	"	
14.00	15.00	Toulouse	315	952	"	
14.00	14.30	Frankfurt-on-Main	470	638	Weekdays	Talk.
14.00	16.00	Breslau	416	721	"	"
14.00	17.00	Munich	485	856.6	Sunday	Concert.
14.00	15.00	"	485	618	Saturday	Women's talk.
14.00	14.30	Voxhaus (Berlin)*	505&576	594 : 521	Sunday	Chess.
14.10	14.30	" "	505&576	549 : 521	Weekdays	Talk. News.

(Continued on next page)

THE "POPULAR WIRELESS" CONTINENTAL BROADCASTING TIME-TABLE.

(Continued from previous page.)

Transmiss'n Starts G.M.T.	Transmiss'n Ends G.M.T.	Station and Call Sign	Wave-length in metres	Frequency kilo-cycles	Days of the Week	Nature of Transmission
14.15	14.45	Hamburg*	392.5	764.3	Sundays	Esperanto.
14.30	15.30	Madrid (E A J 7)	373	804	Daily	Concert or Orchestra.
14.30	15.25	Voxhaus (Berlin)	505&576	594 : 521	Sunday	Concert or Children.
14.30	15.30	Frankfurt-on-Main	470	638	Weekdays	Children.
14.45	15.30	Munich	485	618	"	Concert.
14.45	16.15	Reval	350	856.6	"	Testing regularly.
15.00	17.00	Frankfurt-on-Main	470	638	"	Concert.
15.00	16.00	" "	470	638	Sunday	Children.
15.00	17.30	Radio-Berne	301.5	995	Daily	Conc.,Chat.Chil.(Wed.)
15.00	16.30	P.T.T.* (Ecole Supérieure)	458	655	Saturday	Concert.
15.00	16.30	Lyons la Doua	479	626.3	"	Relaying F.P.T.T.
15.00	16.30	Marseilles	350	856.6	"	
15.00	16.30	Toulouse	310	967	"	
Evenings		Dijon	498	602.5	Weekday evenings only	
15.00	16.30	P.T.T.*	458	655	Sunday	Lecture.
15.00	17.30	Stuttgart	443	677	Daily	Concert.
15.00	15.30	Eiffel Tower FL.	2650	113	Weekdays	Bourse.
15.00	15.30	Berlin	505&576	594 : 521	Saturday	Children's Hour.
15.00	17.00	Koenigsberg	463	648	Sunday	Concert.
15.00	15.15	Lyngby (O X E)	2400	125	"	News.
15.10	16.30	Vienna*	530	566	Weekdays	Concert.
15.10	16.30	Graz	399	752	S., M., Th., Sat.	Relays Vienna.
					Tu., Wed., Fri.	Own Concert.
15.15	16.00	Hamburg*	392.5	764.3	Sunday	Operatic Music.
15.15	16.00	Bremen	270	1075	"	Relaying.
15.30	17.15	Munster*	410	732	Saturday	Concert.
15.30	19.30	Madrid (E A J 4)	304	986.5	Tues., Wed., Fri., Sat.	News, Lect.,or Concert.
15.30	17.15	Dortmund	283	1060	"	Relay.
15.30	16.30	Berlin	505&576	594 : 521	Daily	Concert.
15.30	17.00	" "	505&576	594 : 521	Sunday	"
15.30	16.35	Leipzig	452	663.7	Wednesday	Concert.
15.30	16.00	Eberfeldt	240	1249	Saturday	Children's Hour.
16.00		Radio-Lyon	280	1071	Sunday	Concert.
16.00	17.15	Zurich	515	582	Daily	Orchestra.
16.00	17.30	Dresden	294	1020	Thursday	Concert.
16.00	18.00	Breslau	416	721	Saturday	Light Music.
16.00	17.30	"	416	721	Wednesday	Dance.
16.00	17.00	Eberfeldt	240	1249	Saturday	Thé Dansant.
16.00	18.00	Madrid (E A J 6)	392	765	Sun., Wed., Sat.	Concert.
16.00	17.45	Hamburg	392.5	764.3	Sunday	Talk and Concert.
16.30	16.45	Radio-Paris	1750	171.3	Daily	News, Bourse, etc.
16.45	17.00	Eiffel Tower	2650	113	Weekdays	Bourse.
16.45	17.45	Radio-Paris	1750	171.3	Wednesday	Concert.
16.45	odd	Taupsa (R A W)	1800&120	166.6,1250	Daily	Testing.
17.00	19.00	Warsaw	380	789	"	Concert.
17.00	18.30	Radio-Belgique	262	1106.8	Sat., Tues., Thurs.	Concert.
17.00	18.30	Liége (Radio-Wallonie)	285	1052.6	Mon., Wed., Fri.	Concert.
17.00	19.30	Frankfurt-on-Main	470	638	Weekdays	Lecture Talk.
17.00	17.30	Rome (1 R O)	425	706	"	Children.
17.00	23.00	Stockholm (with relays)	427	702.5	Daily	Children. Talk. News. Concert, Dance.
17.00	23.00	Gothenburg	288	1041.6	Daily	Chil. Talk. Con. News. Dance. Sometimes relays Stockholm.
17.00	23.00	Malmoe	270	1111	Daily	As SASB. Sometimes relays.
17.00	20.00	Leningrad	940	319	Daily	Lect.Con. News.Opera.
17.00	18.45	Helsingfors	522	574.7	Mon. Thurs. Sat. Tu	Concert, News.
17.05	17.40	Berlin	505&576	594 : 521	Sunday	Opera.
17.15	17.30	Zurich	815	368	"	News.
17.15	18.00	"	815	368	Weekdays	Children.
17.30	18.30	P.T.T.*	458	655	Saturday	Lecture.
17.30	18.00	Stuttgart	443	677	Sunday	Radio Talk.
17.30	18.00	"	443	677	Weekdays	Lecture.
17.30	18.00	Rome (1 R O)	425	706	Sunday	Dance.
17.30	18.00	"	425	706	Weekdays	Orchestra.
17.30	20.00	San Sebastian (E A J 8)	346	867	Daily	Concert.
17.30	17.45	Radio-Toulouse	441	680	"	Bourse.
17.30	18.30	Graz	399	752	Tues., Wed., Fri.	Lecture.
17.45	18.00	Radio-Paris	1750	171.3	Weekdays	Bourse, News.
17.45	19.15	Berlin	505&576	594 : 521	Sunday	Talk.
17.45	19.15	Moscow (R D W)	1450	207	Weekdays	Concert, News.
18.00	22.00	Stratnitz (A D)	546	549.6	Daily	Concerts (with breaks).
18.00	18.10	Radio-Berne	301.5	995	Daily	News.
18.00	20.00	Madrid (E A J 7)	373	804	Tues., Thurs., Sat.	Concert.
18.00	19.00	Hamburg*	392.5	764.3	Sunday	English.
18.00	19.00	Stuttgart	443	677	"	Lecture : Talk.
18.00	19.00	Zurich	515	582	Weekdays	Concert.[Concert,Talk.
18.00	18.30	Stuttgart	443	677	Monday	Esperanto.
18.00	20.00	Kief	1000	300	Tues., Wed., Fri.	Concert.
18.00	22.30	Bilbao (E A J 9)	415	729	Daily	Concert.
18.00	20.00	Komarov (O K B)	311	968	"	Concert or Dance.
18.00	20.00	Madrid (E A J 6)	392	765	Mon., Thurs.	Concert.
18.05	18.50	Barcelona (E A J 1)	324	926	Weekdays	Concert.
18.10	18.30	" "	324	926	Sunday	Agricultural Talk.
18.10	19.10	Vienna (O T W)	400	750	Weekdays (see Notes)	Testing.
18.15	22.00	" (R W)	530	566	Daily	Talk,News,Concert,etc.
18.15	19.10	Koenigsberg	463	648	Sunday	Talk,Lecture,Weather.
18.15	18.40	Oslo	382	785	Daily	Talk, Time, Concert,
18.15	19.10	Eiffel Tower (F L)	2650	113.1	"	Concert, News. [News.
18.30	19.00	Barcelona (E A J 1)	324	926	Sunday	Recital.
18.30	19.25	Munster*	410	732	Saturday	Lecture, Concert.
18.30	19.15	Rome (1 R O)	425	706	Daily	Govm't Communica'ns
18.50	19.00	Barcelona (E A J 1)	324	926	Weekdays	Press.
18.55	19.00	Eiffel Tower (F L)	2650	113.1	Sunday	News. [Dance.
19.00	21.00	Oslo	382	785	Daily	Orchestra, Concert,
19.00	19.30	Karlsborg	1350	222.1	Weekdays	News, Navig'n, Wthr.
19.00	21.45	Stuttgart	443	677	"	Concert, News, Talk.
19.00	21.00	Barcelona (E A J 1)	324	926	Sunday	Concert.
19.00	19.30	Lausanne	305	983.6	Weekdays	Lecture, Carillon,Time.
19.00	21.00	Berlin	505&576	594 : 521	"	Music.
19.00	22.00	Hamburg*	392.5	764.3	Sunday	Theatre.
19.00	21.00	Cadiz (E A J 3)	360	832.8	"	Organ, Concert, Talk.
19.00	22.15	" "	360	832.8	Weekdays	Music, Dance.
19.00	19.10	Radio Catalana (E A J 13)	460	652	Daily	Time.
19.10	20.40	Koenigsberg	463	648	Sunday	Theatre.
19.10	Irreg.	Hilversum (H D O)	1050	285.7	Weekdays	PoliceNews,etc.,Conc.
19.50	20.30	Zurich	515	582	Sunday	Concert.
19.15	Irreg	Malaga (E J A 25)	325	923	Weekdays	Concert.
19.15	20.15	Radio-Geneva	1100†	273	Sunday	Religious Lecture.
19.15	20.15	" "	1100†	273	Weekdays	Orch., Lecture, News, Esperanto (Tues.).
19.20	20.30	Dortmund	283	1060	Saturday	Orchestra.
19.30	20.00	Leipzig*	452	663.7	Almost daily	Lecture (Thursday), Opera (21,45), News.
19.30	21.30	Eberfeldt	240	1249	Saturday	Lecture, Music.
19.30	22.00	Frankfurt-on-Main*	470	638	Daily	Concert.
19.30	20.00	Lausanne	305	983.6	Weekdays	"
19.30	19.45	Radio-Agen	318	943	Daily	News,B'urse Con.(Tu.)
19.30	21.00	Breslau	416	721	Saturday	"
19.30	21.30	Berlin*	505&576	594 : 521	Daily	Concert, News.
19.30	20.30	Frankfurt-on-Main*	470	638	Weekdays	Concert.
19.30	19.40	Rome (1 R O)	425	706	"	Bourse,News,Weather.
19.30	21.30	Koenigswusterhausen	1300	231	"	Relaying Berlin.
19.30	19.40	Oslo	382	785	Daily	Esperanto Course.
19.30	21.40	Radio-Berne	301.5	995	Daily	Conc., Orches., News.
19.40	21.00	Eiffel Tower (F L)	2740	109.4	"	Concert or Opera.
19.40	21.40	Hilversum	1150	285.7	Sunday	W'kd'ys.:News, Conc.
19.55	22.30	Graz	399	752	Tues., Wed., Fri.	" "
20.00	20.15	Radio-Belgique	262	1106.8	Weekdays	Lecture. "
20.00	21.00	Liége (Central)	205	1919.6	Mon., Wed., Sat.	Concert.
20.00	21.00	Lyngby (O X E)	2400	125	Daily	News, Time, Weather.
20.00	22.30	Copenhagen*	308	973	"	News, Esperanto, Lecture, Concert.
20.00	21.00	Seville (E A J 5)	357	840.3	Sunday	Children.
20.15	20.30	Radio-Lyon	280	1071	Daily	News.
20.15	20.45	P.T.T.*	458	655	Saturday	Talk.
20.15	21.10	Radio-Belgique	202	1068	Weekdays	Music, Lecture, News, Opera (M.W.)
20.15	22.10	" "	265	1131	Saturday	" "
20.15	20.40	Radio-Paris	1750	171.3	Sunday	News Bulletin,Radio Talk.
20.15	20.40	"	1750	171.3	Weekdays	Talk and Bourse.
20.15	21.15	Radio-Geneva	1100	273	Weekdays	Conc., Dance., News (A.T.S.).
20.15	21.00	Dresden	294	1020	Wed. (almost daily)	Talk and News.
20.30	21.00	P.T.T.*	458	655	"	Talk.
20.30	22.00	Dortmund*	283	1060	Saturday	Opera.
20.30	22.00	Munster	410	731	"	Relaying Dortmund.
20.30	22.00	Eberfeldt	240	1249	"	
20.30	21.00	Frankfurt-on-Main	470	638	Weekdays	News, Talk, Sport.
20.30	21.00	Radio-Paris	1750	171.3	Saturday	Concert.
20.30	21.00	Eiffel-Tower (F L)	2740	109.4	Sunday	"
20.30	20.45	Radio-Toulouse	441&180	680	"	Sports, News.
				1666.6		
20.30	21.30	Radio-Lyon	280	1071	Daily	Orchestra.
20.30	21.30	Radio-Belgique	262	1106.8	Sunday	Concert.
20.30	22.00	Seraing-Radio	195	1538	Mon., Thurs., Sat.	Concert.
20.30	20.40	Rome (1 R O)	425	706	Weekdays	Weather, News.

(Continued on page 1272.)

Traders and manufacturers are invited to submit wireless sets and component parts to the "P.W." Technical Dept. for test. All tests are carried out with strict impartiality in the "P.W." Test Room under the supervision of the Technical Editor, and the general reader is asked to note that this weekly article is also intended to provide a reliable and unbiased guide as to what to buy and what to avoid.—EDITOR.

THE Marconiphone Co. are making a generous offer, and one of which no doubt many readers will take advantage. They will post to any "P.W." reader who cares to send a post card or letter to them at 210, Tottenham Court Road, London, W.1, a Marconiphone Log Book, free of charge. We have examined one of these handy little articles, and can assure readers that it is well worth sending for.

* * *

A really efficient five-pin valve holder has been produced by The H. T. C. Electrical Co., Ltd., of 2, Boundaries Road, Balham, London, S.W.12, especially for Unidyne valves. Its design is such that positive self-cleaning contacts are provided for each of the necessary five points even should the pins of the valve not be "open." One of the most common causes of failure in Unidyne sets, and in other types of receivers as well, is badly-made contacts between the pins of the valves and the sockets of the holder. Such can hardly occur when this H. T. C. product is used. This holder is also of very low capacity and is well made and finished. It sells, the panel-mounting model, at 1s. 9d.

* * *

The word "Leclanché" has long since been accepted as a "dictionary" term but, nevertheless, it is hinted by Messrs. Ripaults, Ltd., of King's Road, St. Pancras, that they are the only people who can with right use the words "Leclanché." We believe, however, that there is a certain amount of controversy regarding the proprietary right to the word "Leclanché." However, that is quite beside the point, as a "rose by another name——" etc. As far as we are able to judge the H.T. Battery sent us for test by Messrs. Ripaults deserves to wear the words "Genuine Leclanché" if such a phrase is indication of good quality productions.

It is a 60 volt H.T. battery, and it retails at 12s. 6d. It is well made, but not distinctive in appearance. It is outwardly similar to many other makes. We gave it some severe tests and it stood up to them very well, but a few months must yet elapse before we can gauge its probable "life."

Messrs. Ripaults also sent us one of their L.F. transformers. It is of the "shrouded" type, and the 5-1 ratio model, which sells at 17s. 6d., has 4,000 turns in its primary winding, and 20,000 in its secondary. On test it gave very good results in first stage positions following either crystal or valve detectors. "P.W." readers will

(*Continued on page* 1268.)

The porter switching on the Igranic receiver at the London Hospital.

APPARATUS TESTED.

(*Continued from page 1266.*)

probably meet this Ripault transformer in one or more of our future constructional features.

* * *

A component that will intrigue the DX fan is the Accuratune Dial. It has a smooth, easy, fine-tuning movement, geared down to a ratio of 180 to 1. It is made in America, but is handled in this country by Gaston E. Marbaix, 169, High Street, Shoreditch, E.C.1. An article of the nature of the Accuratune Dial, coupled to an ordinary semi-circle vaned variable condenser renders such a component as efficient for DX work as one of a "square law" character.

* * *

The Varley Magnet Co., Ltd., known better to "P.W." readers, perhaps, as skilful telephone receiver "doctors," have sent us one of their Anode Resistances. It is wire wound, and *bare* wire is used for the purpose; very efficient insulation being achieved by means of silk thread separation, in accordance with the Varley Biduplex system.

The sample sent us is of 80,000 ohms resistance, but the component is also obtainable in 60,000 or 100,000 ohms values. As the makers point out the construction of this anode resistance is such that varying electrical and atmospheric conditions cannot affect it.

It is supplied complete with a substantial base for mounting purposes to which it is fixed by means of two strong spring clips.

This Varley product, which is also handled by that well-known firm, Metro-Vick Supplies, Ltd. (of Cosmos fame), was tested in a special receiver which has just been built and which will be described in "P.W." in due course, and was found to be perfectly efficient. It retails at 7s. 6d.

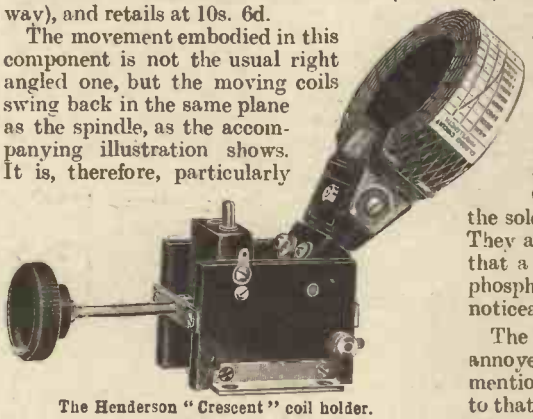
* * *

The new Dimic Coil, produced by L. McMichael, Ltd., is a very neat and useful component. It consists of two small solenoid coils wound on the one former, and so arranged that they can be connected in series or employed separately. We have received samples and on test found them to be quite efficient when used as directed.

* * *

A coil holder of interesting design was recently sent us by Messrs. W. J. Henderson & Co., Ltd., of 351, Fulham Road, South Kensington. It is known as the Henderson "Crescent" Micrometer Coil Holder (two way), and retails at 10s. 6d.

The movement embodied in this component is not the usual right angled one, but the moving coils swing back in the same plane as the spindle, as the accompanying illustration shows. It is, therefore, particularly suitable for back-of-panel mounting, and saves considerable space.



The Henderson "Crescent" coil holder.

The connections to the moving coil are taken via two terminals through small flexible leads incorporated in the holder itself, so that to the latter rigid external connections can be made.

This Henderson product is very well made and the movement is excellent. It provides a "vernier" control which is entirely dependent on the spindle. However heavy the moving coil it cannot fall backwards when at the most acute angles. No springs of any kind are used—it is positive throughout—so that there is an entire absence of harshness or "backlash." It is a coil holder we can recommend to our readers.

* * *

It has been brought to our notice that a large number of spurious Thorpe K4 and U.C. valves have been placed on the market, or, rather, foisted on the public, by some unknown (and unprincipled !) person or persons. This is very unfortunate indeed, because the life centre, as it were, of a Unidyne receiver is its valve.

Readers should note that these "dud" valves are not equipped with the clean, bright, well-finishe "lines" of the products of the Ludgate Radio Co., of 56, Ludgate Hill, E.C., who are the sole agents for genuine Unidyne valves. They are badly made and are distinctive in that a reddish powder (probably an inferior phosphorous "getter") is present and readily noticeable inside their bulbs.

The Ludgate Radio people are very annoyed, because purchasers of the above-mentioned hopeless duds are sending them to that firm with requests for replacements !

RADIOTORIAL

All Editorial Communications to be addressed to The Editor, POPULAR WIRELESS, The Fleetway House, Farringdon 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 and 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 contributions to be addressed to The Editor, The Fleetway House, Farringdon Street, London, E.C.4. 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 Editor desires to direct the attention of his readers to the fact that, as much of the information given in the columns of this paper is of a technical nature and concerns the most recent developments in the Radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and trader would be well advised to obtain permission of the patentees to use the patents before doing so.

PATENT ADVICE FOR READERS.

The Editor will be very pleased to recommend readers of POPULAR WIRELESS *who have any wireless inventions to patent, or who desire advice on patent questions, to our patent agent. Letters dealing with patent questions, if sent to the Editor, will be forwarded to our own patent advisers, where every facility and help will be afforded to readers.*

TECHNICAL QUERIES.

Letters should be addressed to:
Technical Query Dept.,
"Popular Wireless,"
The Fleetway House,
Farringdon Street,
London, E.C.4.

They should be written on one side of the paper only, and MUST be accompanied by a stamped addressed envelope.

Queries should be asked in the form of the numbered questions: (1), (2), (3), etc., but may be accompanied by a short letter giving any necessary additional particulars as briefly as possible.

For every question asked a fee of 6d. should be enclosed. A copy of the numbered questions should be kept, so that the replies may be given under the numbers. (It is not possible to reproduce the question in the answer.)

IMPORTANT.—If a wiring diagram, panel lay-out or list of point-to-point wiring is required, an additional fee of 1/- must be enclosed.

Wiring diagrams of commercial apparatus, such as sets of any particular manufacture, etc., cannot be supplied. (Such particulars can only be obtained from the makers.)

Readers may submit their own diagrams, etc., for correction or for criticism. The fee is 1/- per diagram, and these should be large and as clear as possible.

No questions can be answered by 'phone.

Remittances should be in the form of Postal Orders.

Questions and Answers

AMPLIFIER FOR CRYSTAL SET.

"UNIDYNE AMPLIFIER" (Woking).—Can a Unidyne L.F. amplifier (as described in POPULAR WIRELESS No. 104) be used to amplify the signals from a crystal set so as to work a small loud speaker?

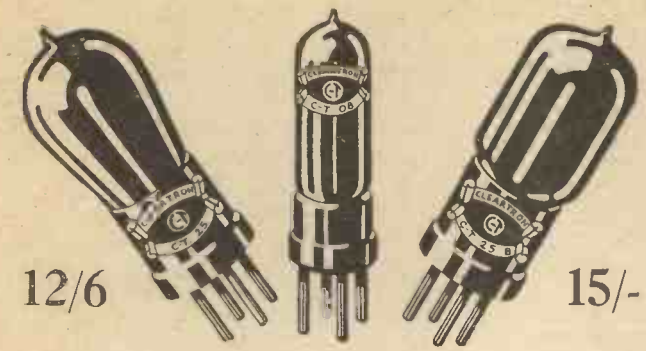
The Unidyne L.F. amplifier is not suitable for use in conjunction with a crystal, because it is a potential-operated device, and the high resistance of the crystal is detrimental to its efficiency.

LOUD-SPEAKER PHENOMENON.

F. R. B. (Oswestry).—Can you explain the cause of a peculiar click that is occurring in my loud speaker? Soon after I have finished using it (say, three or four minutes) it gives a single loud click. At first I thought it was broken, but it seems to work exactly as before

(*Continued on page* 1272.)

America's foremost valve made in Britain's newest factory with British bases for British sets and sockets.



12/6 15/-

CLEARTRON
DULL EMITTER VALVES ARE BRITISH MADE

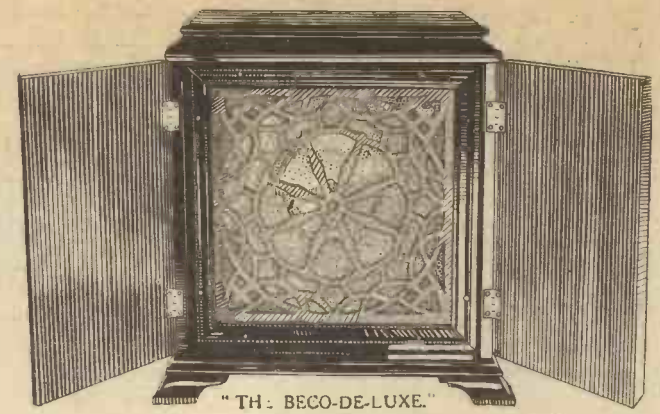
IT has been brought to the notice of Cleartron Radio Ltd. that persistent rumours are being circulated to the effect that their valves are assembled in Birmingham from components made in the United States and imported to this Country. Cleartron Radio Ltd. wish it to be clearly understood that such statements are entirely without foundation, and this Company have every intention of taking whatever steps may be necessary to protect their interests.

Cleartron Radio Limited is a British Company, fostered in British interests by British capital. The Cleartron valve is, and always has been, built of British material by British labour in the Birmingham factory.

CLEARTRON RADIO LIMITED
1, CHARING CROSS, LONDON,
AND BIRMINGHAM
Regent 2231/2. Cleartron, Westrand, London.

CLEARTRON
BRITISH MADE

BECO BECO BECO



"THE BECO-DE-LUXE."

Loud Speaking Excellence

FOR excellent volume, with exceptional purity of tone and clarity, the "Beco" Hornless Loud Speaker is infinitely superior to previous loud speakers. The "Beco-de-Luxe" (British made) is an artistic piece of furniture for any home, and the volume from it will fill a large hall. Obtainable fitted in either oak or mahogany cabinet.

Oak, £5 : 0 : 0. Mahogany, £5 : 5 : 0

BECO
HORNLESS LOUD SPEAKER

Extract from **"BROADCASTER":** "We can unhesitatingly recommend the new 'Beco-de-Luxe' Loud Speaker, for we are of the opinion that on account of its *exceptionally pleasing appearance and splendid qualities* as a reproducing instrument *it has a great future before it.*"

THE small 1926 "Beco"—a very efficient and attractive model—gives unusual volume, with crystal clarity.

"The 1925-26 BECO."

Nickel Plated 52/6 Oxydised Silver or Copper 55/-

Dept. P.W., British Electrical Sales Organisation, 623, Australia House, Strand, W.C.2.

BECO Telephone: CITY 7665 BECO

RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from page 1270.)

except that it now invariably clicks in the way described after it has been used.

The click is caused by the diaphragm escaping from the pull of the permanent magnet and springing into its natural position. Normally, even when not in use, it is strained towards the permanent magnet, but apparently in your case the magnet is weakened, and after a time the natural spring of the diaphragm is able to overcome it.

This would cause a single loud click such as you describe, but you might not be able to detect any weakening of the magnet when the instrument was in use. Be careful not to connect it the wrong way round.

SINGLE OR DOUBLE AERIAL?

J. E. J. (Clapton).—I have been told that a short aerial should be used for the reception of the British broadcasting stations. Is this correct? I had intented to use a 60 ft. double aerial, but have been told that I should use a 60 ft. single aerial for preference, and also that it would be better to use a 60 ft. single than one, say, 90 ft. long.

Your information is quite correct, and a single aerial is better than a double one if it is to be over 50 ft. long. This is taking into consideration the fact that you are using it for broadcasting, of course. With regard to the choice of a shorter single aerial, the reasons why a long aerial is to be avoided are these. In the first place, an aerial has a fundamental wave-length, and to tune to stations sending on various wave-lengths it is necessary mostly to add inductance to it in order to increase its wave-length and bring it to that value where it will correspond or be in tune with that of the desired station. If the natural wave-length of the aerial system is above that of the transmitting station, then the capacity factor must be attacked and reduced by placing a condenser in series. The next point to consider is that of potential. A detector is a potential operated device, and generally it is as well to tap the detector circuit off across points of as great a difference of potential as possible. Therefore, the inclusion in the aerial circuit of a reasonably sized inductance is advantageous. Further, the introduction of capacity is, as is well known, disadvantageous, owing to the damping that results. Therefore, a moderate aerial with a fair amount of inductance in the set is necessary for obtaining efficient results on the shorter and broadcast wave-lengths. It must be added that height is *the* important factor in aerial efficiency.

POLARITY INDICATOR.

P. M. (Leytonstone).—I wish to charge my accumulators from the main, but am at a loss to know which way the current is flowing. Please will you give me details of a cheap "polarity" indicator?

Procure about threepennyworth of sodium sulphate from a chemist and threepennyworth of phenolphthalein. Put as much of the former as will cover a five-shilling piece into a cup half full of warm water and as much phenolphthalein as will cover a farthing. Stir until dissolved. To test this mixture, place leads into it about 1½ in. apart, when the negative lead will turn the surrounding liquid a reddish colour. Shaking the liquid will make the colour disappear. If it is desired to make up the indicator in permanent form it will be necessary to make a container. Obtain a glass tube about 3 in long, and two rubber stoppers to it. Terminals should be fitted tightly through stoppers protruding about ½ in. on the inside. Fill the tube with the liquid, leaving a small air space.

HIGH-RESISTANCE TELEPHONES.

A. E. I. (Peterborough).—It is stated that high-resistance telephone receivers are essential unless a telephone transformer is employed. Surely "resistance" is a misleading term.

Very misleading, and if manufacturers could describe their telephone receivers in terms of, say, so many thousands of turns of wire around the magnets with the *comparatively low* resistance of 2,000 or 4,000 ohms, etc., there would be fewer listeners under the impression that resistance is the quality that tends to enhance the value of the instruments. Actually, of course, resistance is a decidedly unrequired factor.

(Continued on page 1274.)

THE "POPULAR WIRELESS" CONTINENTAL BROADCASTING TIME-TABLE (*continued from page 1265*).

Transmiss'n Starts G.M.T.	Transmiss'n Ends G.M.T.	Station and Call Sign	Wave-length in metres	Frequency kilo-cycles	Days of the Week	Nature of Transmission
20.30	20.45	Radio-Toulouse	441&180	680& 1666.6	Weekdays	Press.
20.30	24.00	Madrid (E A J 4)	304	986.5	Sun., Mon., Thurs.	Concert.
20.40	22.30	Rome (1 R O)	425	706	Daily	Opera or Concert.
20.45	22.00	P.T.T*	458	655	,,	Talk
20.45	22.30	Radio-Paris	1750	171.3	,,	Dance or Concert.
20.45	22.30	Radio-Toulouse	441 & 180	680 & 1666.6	,,	Concert, Talk.
20.50	22.00	Koenigsberg	463	648	Sunday	News, Concert.
21.00	24.00	Madrid (E A J 6)	392	765	,,	Concert.
21.00	22.00	Radio-Berne	301.5	995	Saturday	Dance.
21.00	22.30	P.T.T.*	458	655	Daily	Concert and Tests.
21.00	21.05	Rome (1 R O)	425	706	,,	Time Signals.
21.00	22.45	Oslo	382	785	,,	Time, Dance.
21.00	22.00	Frankfurt-on-Main*	470	638	,,	Theatre or Concert.
21.00	23.00	Sokolnicchi (Moscow)	1010	297	Tues., Thurs., Fri.	News, Lect. or Concert.
21.00	23.10	Barcelona (E A J 1)	325	923	Weekdays	Concert. [cert.
21.00	21.10	Radio Catalana (E A J 13)	460	652	,,	,,
21.00	21.30	Breslau*	416		,,	News, Sport.
21.00	21.15	Seville (E A J 5)	357	840.3	,,	News.
21.00	24.00	,,	357	840.3	,,	News, Talk, Concert.
21.15	22.30	Petit-Parisien*	358	865.9	Sat., Sun., Tu., Thurs.	Concert.
21.30	22.15	Eberfeldt	240	1249	Weekdays	,,
21.30	22.30	Rome (1 R O)	425	706	Daily	Dance.
21.30	22.10	Dortmund	283	1060	Sunday	Dance.
21.30	24.00	Radio-Toulouse	441&180	680:1666.6	Weekdays	Concert or Play.
21.30	22.45	Berlin	505&576	594 : 521	Saturday	Dance.
21.30	22.45	,,	505&576	594 : 521	Weekdays and Sundays (except Saturday).	Chess and Sport.
21.40	21.50	Lyngby (O X E)	2400	125	Weekdays	Weather.
22.00	23.30	Cassel*	275	1091	,,	Concert.
22.00	23.30	Frankfurt-on-Main	470	638	,,	Relaying Cassel.
22.00	24.10	Bilbao (Viscaya) (E.A.J.11)	383	784	Daily	News, Concert.
22.00	23.10	Radio-Cima (E A J 19)	402	745.8	Weekdays	Speech, Music.
22.00	23.00	Hamburg*	395	759	Sunday	Dance.
22.00	24.00	Madrid (E A J 7)	373	804	Mon., Wed., Fri.	Concert.
22.00	21.00	Madrid (E A J 6)	392	764	Tuesdays and Fridays	Concert, etc.
23.00	23.25	Norddeich (K A V)	1800	166.6	Weekdays	Weather, News.
23.00	24.00	Radio-Geneva	1100	272	,,	Dance.
23.00	01.00	Milan	495	606	Daily	Testing.
23.00	24.00	Vienna (O T W)	400	750	,,	Tests (see Notes).
24.00	01.00	Seville (E A J 5)	357	840.3	Sunday	Concert.

NOTES.—Relay stations are mentioned under initial entry of main station. An asterisk (*) marks main station with relays working. The following stations may be occasionally heard testing: Reval, 350 m. (855 kc.); Milan (Sch. Teleg.); Riga. 488 m. (614 kc.); Aalesund, 515 m. (582 kc.); Salamanca (E A J 22), 290 m. (1034 kc.); Vienna (O T W), 400 m. (750 kc.) 07.45,—10.00. 17.00—19.00; Budapest, 588 m. (510 kc.); Amsterdam 700 m. (428.3 kc.): Asturias (E A J 12), 345 m. (872 kc.); Skieen, 201 m. (1498 kc.); Notoden; Barcelona (E A J 18), 300 m. (1000 kc.) PROJECTED STATIONS: Bratislava, 409 m. (733 kc.); Innsbrück (Feb., 1926)*; Bergen: Trondjheim; Tromsol; Stavanger; Christiansand; Rosenbrugel; Salzburg; Klagenfurt; Prague, 530 m. (566 kc.); Ceuta (Spanish Morocco); Varsovie; Cracow; Hammeren, 1900 m. (157.8 kc.); Seville E A J 21.

† Radio-Geneva testing occasionally on 800 m. (375 kc.).
Grenoble temporarily closed. Dijon replaces on evening transmission.

RADIOTORIAL QUESTIONS AND ANSWERS.

(Continued from page 1272.)

NEUTRODYNE 3-VALVER.

In "P.W." No. 189 constructional details were given of the above set. I havo made this up exactly as described, but regret to say my neutroformers look different from those shown in the photographs accompanying the article.

Is there not an error in the gauges of wire stated in the article ?

We regret that owing to an unfortunate misprint the gauges of wire used for winding the primaries and secondaries of the neutroformers were reversed.

The primaries should have been wound with 26 turns of No. 30 gauge D.C.C. wire (with tappings taken at the 13th turns), and the secondaries with 55 turns of No. 24 gauge D.C.C. wire.

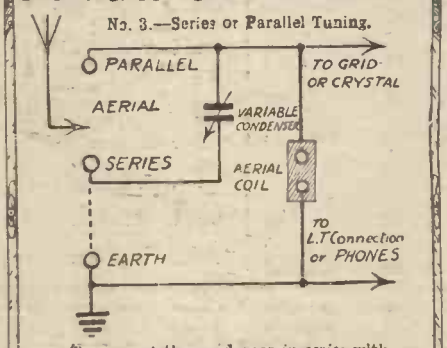
A ¼ lb. of each gauge of wire will therefore be required for the two neutroformers.

BENDING EBONITE.

"CONSTRUCTOR" (Chatham).—Can a thin sheet of ebonite be safely bent, or will it break if an attempt is made ?

For the Constructor

No. 3.—Series or Parallel Tuning.



To connect the condenser *in series* with the coil, fix the aerial lead to the "series" terminal. (The "parallel" termioal is left without external connection.)

To connect up *in parallel*, move the aerial lead to the Parallel terminal and join the Series terminal to Earth, as shown by the dotted line.

In both cases the Earth lead remains connected to the Earth terminal.

The sheet will bend quite well if previously it is thoroughly warmed. This can be done by placing it in boiling water, or a small sheet becomes pliable over the steam from a boiling kettle.

MOUNTING CRYSTALS.

J. F. A. (Richmond Hill, Surrey).—As good contact is essential in crystal sets, would it not be an improvement to solder the crystal to the cup, instead of holding it by a spring clip ?

Ordinary solder should not be used for this purpose owing to the fact that the application of the necessary heat is liable to destroy the sensitivity of a crystal. A solder capable of melting at a very low temperature, such as "Wood's metal," can be used, although even this is not really advisable with some of the patent types of crystals.

As a temporary expedient the crystal can be held in position by packing tinfoil around the inside of the cup, but probably the best method (apart from Wood's metal) is to employ small set screws. By doing so it becomes possible to quickly change the crystal should it be necessary.

A CORRECTION.

In the advertisement concerning Neutron Valves which appeared in page 1221 of last week's "P.W." a rather serious printer's error occurred the word "other" being omitted. The sentence affected should have read "It is more robust than *other* D.E. valves." We tender apologies to our advertiser.

TECHNICAL NOTES.

(Continued from page 1244.)

is done by making the wire of a peculiar cross-section, and by a special method of winding the spiral. Furthermore, in order to increase the H.F. conductivity of the wire, the latter is silver-plated.

A Useful Instrument.

The milliammeter is an instrument which is not sufficiently used by the average amateur. A milliammeter should be included in the plate-supply circuit, if not permanently, at any rate occasionally, in order to see what is the value of the H.T. output. It very frequently happens that the value of the H.T. battery current could be very materially reduced by suitable precautions—one of the chief of which is the employment of the correct value of grid bias.

Unless you know what your H.T. battery is doing, which you can only discover by the use of a milliammeter, you cannot possibly tell whether your set is operating under the most efficient conditions as regards H.T. current consumption.

Visible Indications.

Another point in this connection is that distortion, due to a valve working on the wrong part of its curve, can readily be detected by the value of the plate current, or rather by the departure of the plate-current from its normal value. A drop in the reading of the instrument, for instance, will occur when the valve goes on to the lower bend of the curve. The grid-bias and anode-voltage should be adjusted until the milliammeter needle shews only a slight tremor.

It will be understood that the needle cannot follow the rapid variations in the anode current, and it is only when these variations take a definite bias in one direction that the needle is deflected from its normal position. It is particularly interesting to make tests on these lines on heavily modulated items.

The New Ferranti Transformer.

A very interesting transformer is the new Ferranti intervalve transformer. This has a number of special features which should undoubtedly make for greater efficiency in operation. The most noteworthy feature is the arrangement of the windings. These are in four separate sections, and are separated by tiny ebonite pegs placed radially, each circle comprising twelve pegs, five circles serving to accommodate the four sections.

The laminated core calls also for attention. Instead of the usual two styles of stamping, only one style is used, and this is in the form of a rectangular figure with a central bar, or a double "D." The windings are, of course, placed on the central limb, and slots are made at one end of this limb in order to permit the introduction of the windings.

A further feature worthy of mention is the provision of a small fixed condenser (of the copper-sheet and mica variety) across the primary of the transformer.

The whole of the transformer, with the exception of the outer parts of the core, is shrouded with an iron casing. The ratio is $3\frac{1}{2}$ to 1.

If there is anything in these pages that you do not like, please let us know what it is when writing to us.

FOREIGN RADIO NEWS.

(Continued from page 1263.)

radio is making vast progress in Austria. The number of licences issued on October 31st, 1925, was 173,000, as against 37,000 on the corresponding date in 1924.

Paris Newspaper's Tests.

The Paris "L'Atenne-Intran" intends to carry out tests with wave-lengths varying between 90 and 100 metres on Thursday and Saturday, January 21st and 23rd, from 10 to 11 p.m., French time. The call-sign of the station is 8 E R.

Amateurs getting the messages are requested to send their observations to the paper, 53 rue Reaumur, Paris.

Copenhagen's Wave-length Tests.

The Copenhagen station's usual wave-length for broadcasting is 340 metres, but during the next three weeks it will carry out tests on 337 metres.

Danish listeners are finding that the Berlin programmes reach them with singular clarity now that Stettin station is in working order as a Berlin relay post. The wave-lengths used in relaying are 241, 505, 576 and 1,300 metres.

Radio-Guided Air Service.

Among radio enthusiasts in Paris much interest is being taken in the trial on the Croydon-Le Bourget air service line of a new goods airplane, the pilot of which will be guided during his night flight by a radio-compass. Signals will be radiated at regular intervals which will be clearly audible to the pilot only so long as the 'plane is heading in the right direction. Any deviation from the proper course will thus be automatically made known to him.

It is expected that, if successful, this method will greatly facilitate air services by night.

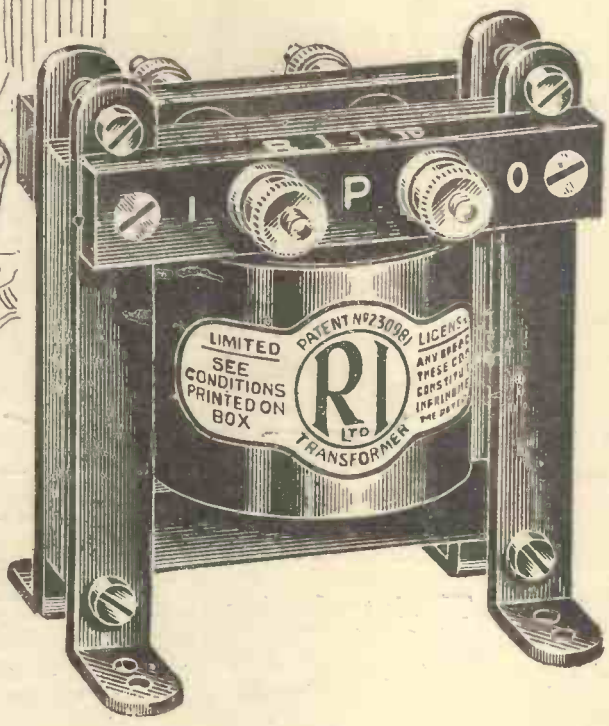
An Expert Combination.

The well-known French radio expert, M. Marius Latour, who, it will be remembered, some time ago succeeded after a sensational case in securing payment of royalties on some of his patents from the Radio Corporation of America, is at present in the United States, where he hopes to establish a combination with the well-known American radio engineer, Professor Hazeltine.

Radio Re-organisation in Holland.

A complete reorganisation of radio concerns in Holland is likely in the near future. There have, for the past year, been many instances of friction, and this has not been alleviated by recent attempts at tinkering up the various existing concerns.

The Government is now taking a hand in the matter, and is understood to be drafting a scheme whereby all radio stations will be grouped together under one recognised authority, the nucleus of which will probably be the H.D.O.



YOU ARE TO BE THE JURY

The Final Decision rests with you. The judge picks out the essential points and puts the case before you in a clear and concise way. His experience and ability enable him to unravel the intricacies and technical details of the case for you, and you value his summing up.

Our long experience and extensive research in the design and construction of Transformers has enabled us to put the case clearly to you. Here are eight points of the **R.I. Transformer** for your consideration.

1. **Low Losses at all audible frequencies.**
2. **Suitability for special or general purposes.**
3. **Equal efficiency for high and low input values.**
4. **Correctly designed windings, with minimum capacity losses.**
5. **Mechanically and electrically sound.**
6. **Specially recommended by eminent authorities for reflex circuits.**
7. **Generous area, both in iron and copper**

AND

8. **Windings protected by hermetically sealed hard fibre tube.**

It is for you to decide. Well over half-a-million wireless enthusiasts have already decided in favour of the famous R.I. Transformer—you cannot have better proof of the efficiency of a component that has obtained a classic name in the Radio Industry.

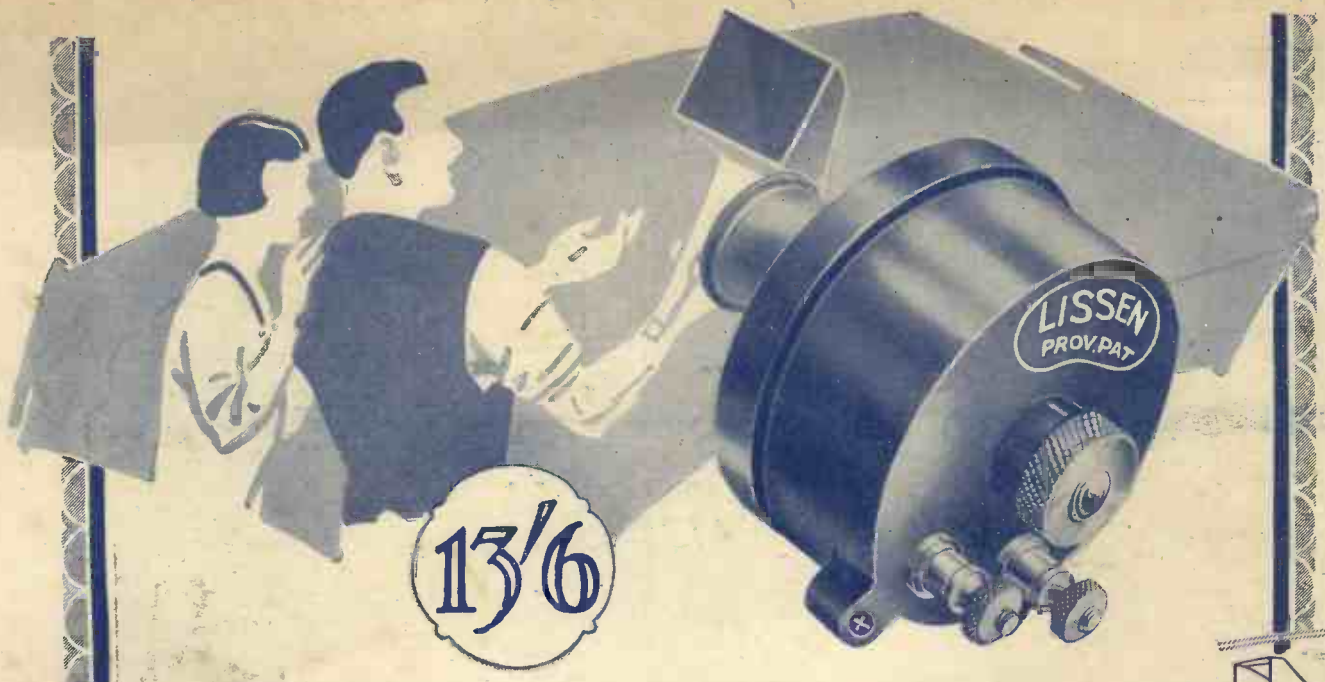
Price 25/-

Write for the R.I. Blue and Gold Catalogue.

RI LTD

THE MARK OF BETTER RADIO

Advt. R.I. Ltd., 12, Hyde St., New Oxford St., London, W.C.1. P.C.18.



Now no home need lack a Loud Speaker

The introduction of the LISSENOLA at the amazingly low price of 13/6 has created an unparalleled stir. Unbiassed critics, seated behind a screen and asked to distinguish between a thirteen-and-sixpenny LISSENOLA and a well-known speaker at five guineas, have been completely at a loss.

Make the test for yourself: go to your nearest dealer and ask him to put on the best loud speaker in his stock. Then use the same horn on the Lissenola, and see if you can notice any difference.

The "Lissenola" instantly converts any gramophone into a loud speaker.

THE LISSENOLA is sold exactly as illustrated above, and with every instrument are simple directions and full-size exact patterns which show you clearly how for a few pence to make a horn of proved efficiency to attach to it. Or if you possess a gramophone or any loud-speaker horn—or any horn or trumpet—that will serve admirably.

GET A LISSENOLA for your home—and build yourself a loud speaker fully equal in performance to the finest that money can buy. You can cover the horn with fancy paper, or wallpaper, and paint it to resemble a factory article. Also by using the "Lissen" Reed (sold separately for 1/-) the Lissenola will carry a cone, or any other diaphragm working on the reed principle.

A cone diaphragm loud speaker can easily be constructed. The illustration shows one method of mounting.

Your dealer will gladly demonstrate and supply—or send postal order direct

BUY THE LISSENOLA

and build your own loud speaker

LISSEN LTD., Lissenium Works, 8-16, Friars Lane, Richmond, Surrey.
'Phone: RICHMOND 2285 (4 lines). 'Grams: "Lissenium, Phone, London."

Full directions for making this horn are given with every "Lissenola."

Another way of utilising the cone diaphragm method of construction.

The "Lissen" Reed Attachment (pat. pending) for use with cone diaphragm loud speaker. Price 1/-.

All applications for Advertisement Space in POPULAR WIRELESS AND WIRELESS REVIEW to be made to JOHN H. LILE, LTD. (Sole Agents), 4, Ludgate Circus, London, E.C.4. Phone: 7261 (2 lines).

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R/R