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THE "STETHOCRYS"—SOMETHING NEW IN CRYSTAL SETS (See Page 175)

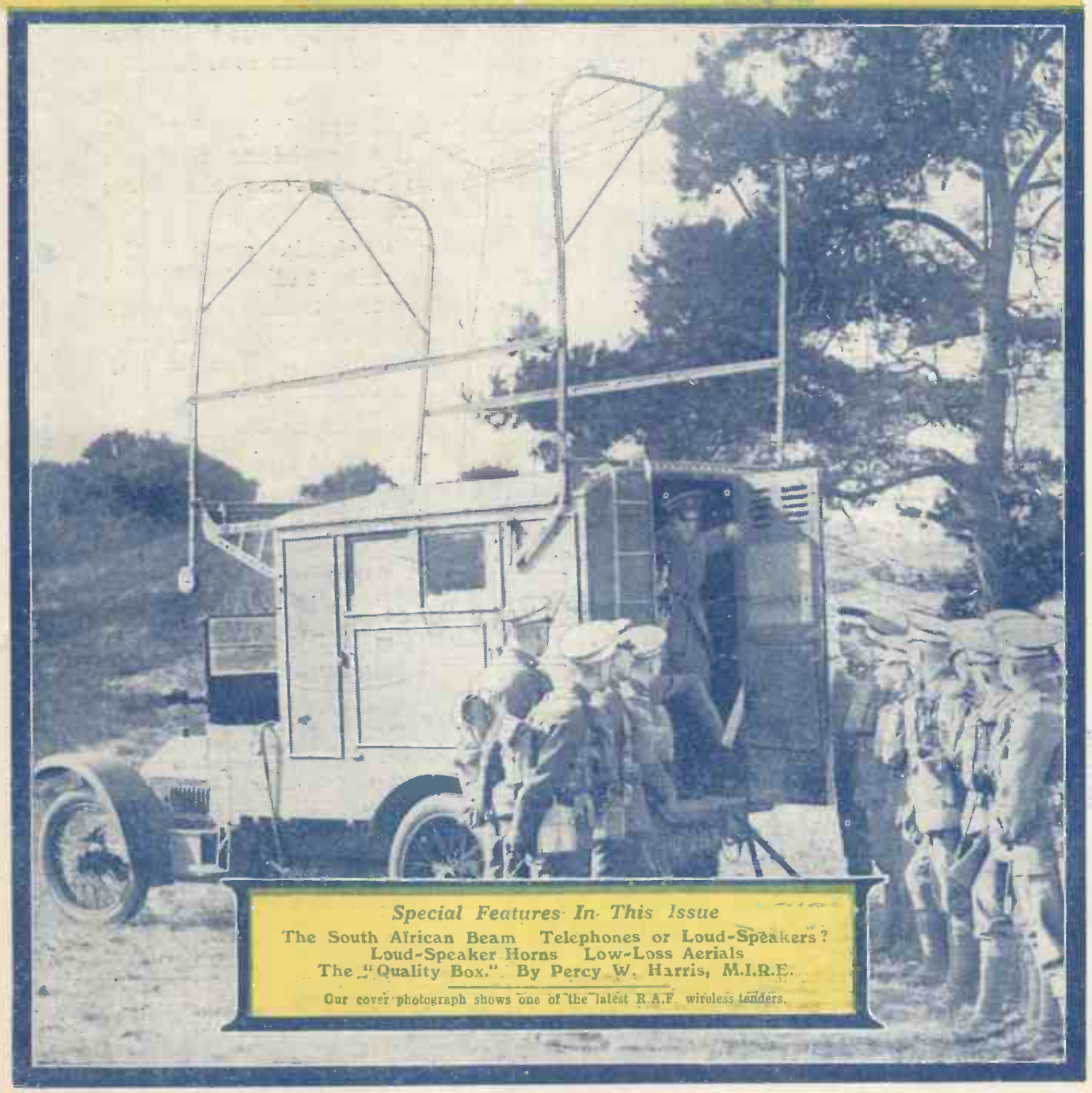
Popular Wireless

Every Thursday
PRICE
3d.

No. 251. Vol. XI.

INCORPORATING "WIRELESS"

March 26th, 1927.



Special Features In This Issue

The South African Beam Telephones or Loud-Speakers?
Loud-Speaker Horns Low-Loss Aerials
The "Quality Box." By Percy W. Harris, M.I.R.E.

Our cover photograph shows one of the latest R.A.F. wireless tenders.

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A PROMINENT place is given to Lotus Valve Holders amongst the components advised for the highly successful circuits described in "Radio for the Million," the interesting booklet issued by the makers of the famous Mullard Master Valves.

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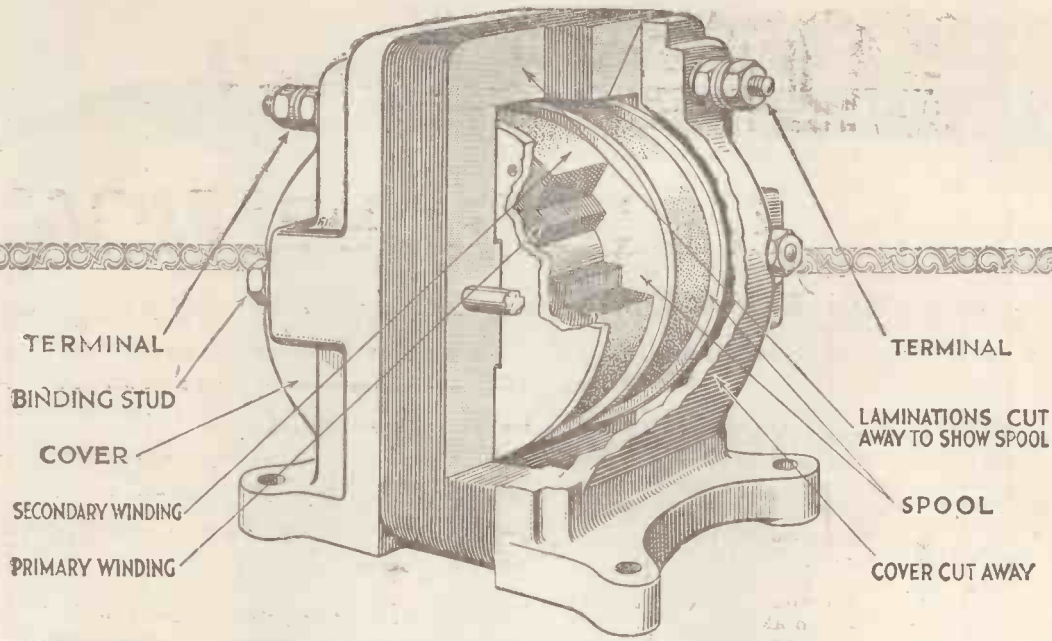

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MADE IN TWO RATIOS 2 : 1 and 4 : 1

B T-H

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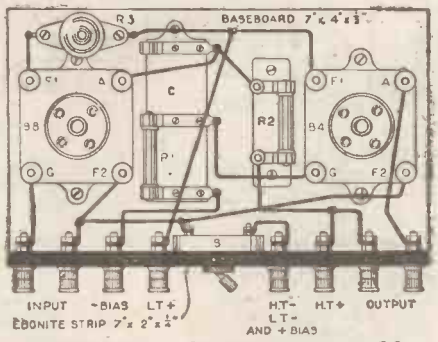
2752

The British Thomson-Houston Co. Ltd

THE "RESISTOR" AMPLIFIER



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R.1.....2 megohms R.3.....25 ohms
R.2.....2 megohms C.....·001 uF.

A 2-Stage Amplifier for 10/- (or less)

Important to Crystal Users

AS a user of a crystal set you obtain a degree of purity in reception which is unsurpassed by any other method of rectification. You have perhaps wished for sufficient volume to work a loud speaker, but have been loth to lose the crystal set purity. With the introduction of the B.T.H. B.8 Valve, you can retain the purity, obtain the volume, and construct the necessary amplifier for a few shillings. How to do this is explained in the "RESISTOR" Booklet— a copy of which will be sent you if you fill in and post the coupon on this page.

The diagram for a two valve amplifier shown above is taken from the "Resistor" Booklet, and its amazing simplicity is immediately apparent. No transformers are used in this or any "Resistor" circuit, thus combining maximum purity with minimum cost. Nor is there any loss of volume in consequence.

The "Resistor" Booklet contains all necessary details for the construction of this amplifier. Full details are also given for building 2, 3, 4, and 5 valve "Resistor" receivers. Theoretical and working diagrams are included, with photographs of the complete receivers, lists of components and point-to-point wiring schedules.

Characteristics of the B.8 Valve.

Fil. Volts	Fil. Amps.	Anode Volts	Amplification Factor	Impedance
1.8 to 2.8	0.1 at 2 v.	150	50	180,000 ohms.

It will be noted that the filament is rated at 1.8 to 2.8 v. The B.8. will function perfectly throughout this range. It can be used directly from a 2-volt accumulator, or from a 4 or 6 volt accumulator with suitable resistance.

Price 14s. 0d.

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AMPLIFICATION FACTOR 50

COUPON 2773C

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Dear Sirs,
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2773

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RADIO COMPONENTS

Mean BETTER *Radio.*

From the moment you install a "Cosmos" Component into your set the difference both in appearance and performance is remarkable.

"Cosmos" Anti-Vibration Spring Valve Holder.—The shock-absorbing element in the "Cosmos" Valve Holder is not a stiff flat spring or sponge rubber which absorbs moisture, but a separate spiral spring for each leg. This construction gives maximum elasticity.

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The "Cosmos" Rheostat.—The principal features of the "Cosmos" Filament Rheostat are its sturdy construction and reliable, smooth movement. The contact arm cannot easily be damaged, having its movement on the inner side of a porcelain bobbin which carries the windings. Other pleasing features of this Precision Rheostat are the handsome knob and dial, ONE HOLE fixing, and the small space it occupies.

Made in four types, two of which are double-wound for DULL or BRIGHT VALVES and one a Potentiometer.

Description	Ohms.	Current.	Price.
			s. d.
Single Wound ..	6·0	1·0 amp.	4 6
Double „ ..	20	·4 „	5 0
„ „ ..	34	·2 „	5 0
Potentiometer ..	300	—	6 0

The "Cosmos" Permacon is an ideal fixed condenser, being light in weight, of guaranteed accurate capacity, and having the lowest possible losses.
The dielectric is mica and each condenser is tested at 500 volts during inspection. Nickel-plated cases give them a particularly neat appearance.

·0001 mfd.	1/6	·001 mfd.	1/8
·0002 „	1/6	·002 „	1/10
·0005 „	1/6	·005 „	2/8
·0003 „ (with clips for grid leak)	1/8	·01 „	3/9

The "Cosmos" Resistance Coupling Unit.—Real purity of reproduction can only be obtained with resistance capacity coupling. The "Cosmos" Coupling Unit with a suitable valve is as effective as an ordinary transformer coupled stage. It avoids all distortion and effects considerable economies in first and operating costs. Designed primarily for use with the "Cosmos" S.P. Blue Spot Valves, it can be used successfully with any valve having an amplification factor of 30 or more. Special attention is directed to the following advantages of the "Cosmos" Coupling Unit:

(1) It takes up little space in a set.
(2) It is not liable to be broken.
(3) It has permanent resistance values.
(4) It allows for simplified wiring.
(5) It is economical in L.T. current (S.P. Blue Spot Valves consume 0.09 amp.).
(6) It is economical in H.T. Battery consumption (less than 1/20 normal).

And lastly, its use results in purity of reproduction without loss in volume.

Type "O" the Unit alone 8/6
Type "V," the Unit incorporating spring valve holder (as illustrated), 10/6.
Suitable valves for use with this unit are "Cosmos" S.P.18/B. and "Cosmos" S.P. 55/B.

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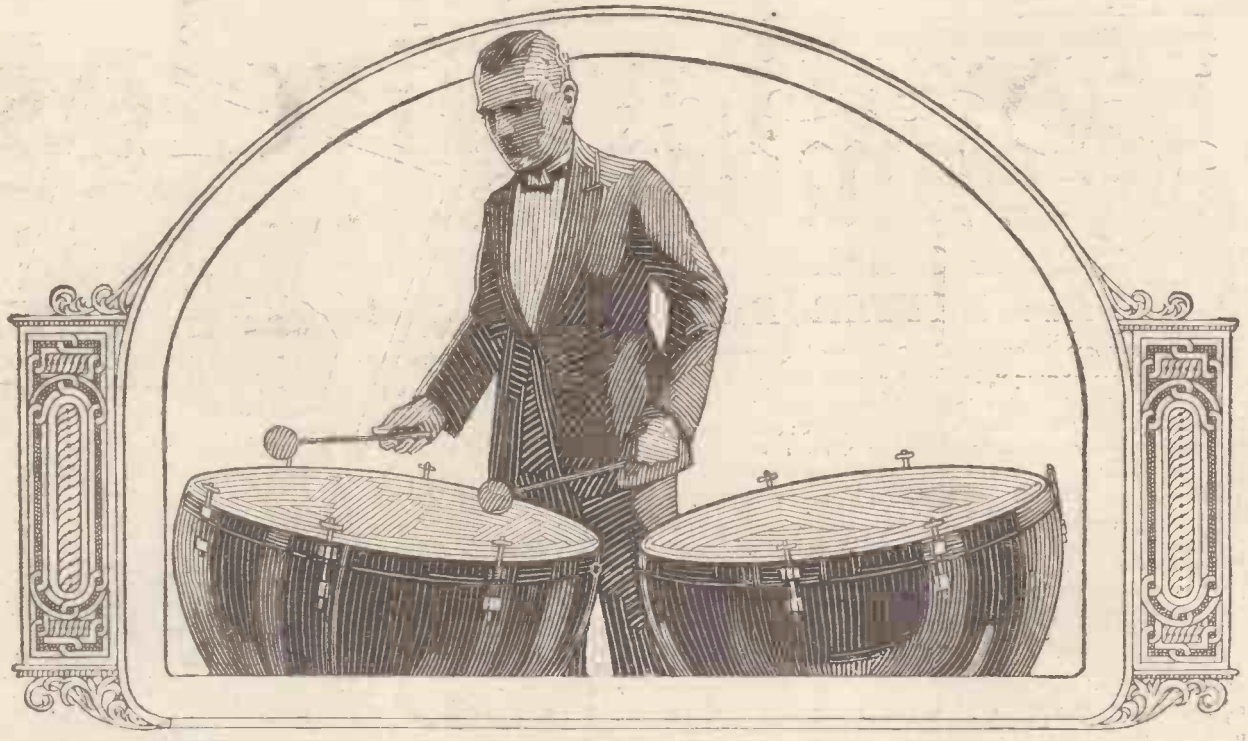


The music of the drums

—Let the new Cossor R.C. Valves bring out their full, mellow tones

EXPERTS in sound reproduction have always admitted the shortcomings of Radio. They have known that, owing to technical difficulties, the elusive low notes, more often than not, have been entirely lost. This is why wireless music is so frequently thin and colourless—the lower registers are missing.

But now Cossor—by another stroke of genius—has evolved a far better valve for Resistance or Choke coupling which ensures an equal amplification of all notes—from the deep rolling chords of the organ to the shrill pipe of the flute.

These wonderful new Cossor R.C. Valves herald the dawn of a new era. With their aid it is now possible for wireless to be practically indistinguishable from the original. Every inflection of the voice and each varying shade of tone is faithfully recorded by the Loud Speaker.

Get acquainted with these wonderful Valves today—there is a great musical treat awaiting you—such volume and grandeur of tone that you must be thrilled at the heights to which Radio has now risen.

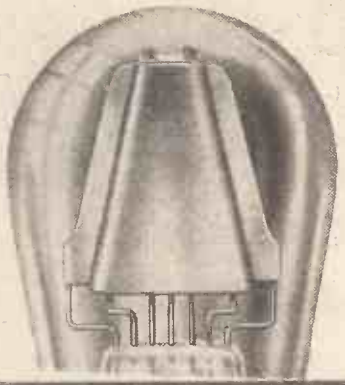
Cossor R.C. Valves

THEIR outstanding success is, in great measure, due to their Kalenised filmaent. Although glowing almost without heat this filament emits such a torrent of electrons that Cossor R.C. Valves possess an amplification factor much higher than that of any other make of valve. Whilst—due to the patented method of construction—microphonic noises are definitely abolished.

For Two Volts:
210R.C. Impedence, 70,000 ohms Amplification factor, 40. Consumption ·1 amp. 14/-

For Four Volts:
410R.C. Impedence 80,000 ohms Amplification factor 40. Consumption ·1 amp. 14/-

For Six Volts:
610 R.C. Impedence 80,000 ohms. Amplification factor 50. Consumption ·1 amp. 14/-



Other Cossor Valves

THERE is a complete range of Cossor Valves available for 2, 4 and 6 volt accumulators all consuming ·1 amp. There are also the famous Cossor Stentor Power Valves—Stentor Two, 215P (Consumption ·15 amp.) **18/6**; Stentor Four 410P (Consumption ·1 amp.) **18/6**; and Stentor Six, 610P Super Power Valve (Consumption ·1 amp.), **22/6** From all Wireless Dealers

Cossor Valves are 100% British

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Editor: NORMAN EDWARDS, M.Inst.R.E., M.R.S.L., F.R.G.S.

RADIO NOTES AND NEWS.

Better Late Than Never—New Zealand Starts—The Die-Hard—The Super Fee—Rugby Telephony—A Brand New Profession—Jo'burg Again—The Experimenter.

Better Late Than Never.

A LONG-STANDING reproach against the country will be eliminated by the institution of the time signal service from Rugby, which is being arranged. For many years British mariners have had to check their chronometers by foreign stations.

New Zealand Starts.

TWO powerful broadcasting stations have been erected at Auckland and Christchurch, and others will be built at Wellington and Dunedin. There is your meat, you globe-listeners. Who will be first with Australia or N.Z.? May it be a "P.W." reader and a "P.W." receiver.

The Die-Hard.

I SEE by the newspapers that our old friend Mr. R. M. Ford has issued yet another mighty counterblast against the Post Office's authority in the matter of wireless licences. He has no licence and declares that he will not get one till the P.M.G.'s authority is made good. Well, the P.M.G. is authorised enough for most of us; meantime, pending the fall of the axe, so long as Mr. Ford does not *interrupt* wireless signals of any kind, nobody cares!

The Super Fee.

IT is reported that the famous tenor, John McCormack, has asked the B.B.C. for a fee of £2,100 for half an hour's broadcasting. Seven tenners a minute for a tenor! Surely, if silence is golden, singing is platinum. Mr. McCormack, it is said, gets such a fee in America.

Rugby Telephony.

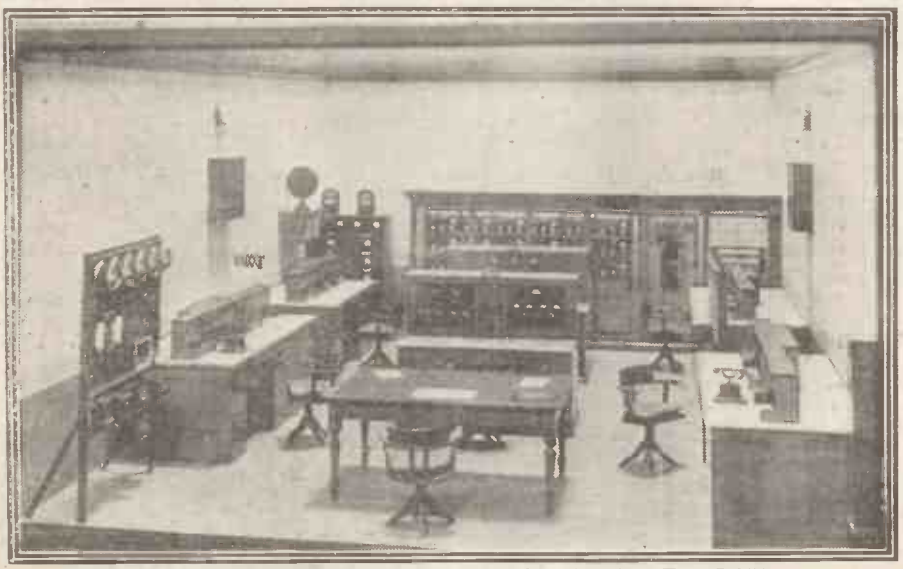
THE long-distance telephone service from Hillmorton has been extended to Cuba, at £2 per "number engaged," or £17 8s. for the first three minutes. It is a sensational arrangement, but of doubtful commercial value to the Post Office. There is going to be a fine old bill for we taxpayers to foot for P.O. wireless.

A Brand New Profession.

SPECIAL training for speaking before the microphone may now be had in a new section of the Royal Academy of Dramatic Art which has been started in conjunction with the B.B.C. As broadcasting develops there will be an ever-increasing demand for persons with good "microphone voices." How little it was foreseen in 1922 that wireless telephony would make such a stir, with new professions, revolutions in the concert world and Presidential speeches from Washington dinning in the ears of the descendants of the men who fought and lost at Bunker's Hill.

Jo'burg Again.

THE station at Johannesburg having failed financially under official management, mere low, common, money-grubbing private enterprise has had the pluck to take on the job. African Theatres, Ltd., is to try and carry on the good work. The station is to be moved to Bloemfontein and replaced by a bigger one. In order to reduce the number of "pirates," no sales of sets or parts are (legally) to be made to persons without licences. Here's wishing luck to the new enterprise.



The model of the 2 L O control room which was on show at the Ideal Home Exhibition.

The Experimenter.

A FUNNY story emanates from the Post Office of a lady who took out a receiving licence and, having tried several sets without getting satisfaction, wrote and asked whether she could exchange her wireless licence for a dog licence in respect of a dog she had on a month's trial. The question now arises as to whether the adventurous lady will next ask for a gun licence with a view to disposing of the dog.

Community Laughing.

AFTER having poked fun at the American attempt it has come as a blow to me to learn that the B.B.C. is planning to spread the infection of risibility on a large scale, by organising chain laughter. As the "stunt" is *sub judice*, so to speak, I propose to bob down until the verdict has been announced, but I will not conceal the fact that I fear the laughter will be forced. The result is a gamble and the idea footling.

(*Continued on next page.*)

NOTES AND NEWS.

(Continued from previous page.)

especially in a Corporation with such exaggerated notions of the dignity and sublime functions of broadcasting.

"Peelers" and Progress.

THE rapidly increasing interest of the police in the employment of radio in their work is specially gratifying to yours truly, because on a sweltering day in 1922 I had the honour and agony of lecturing on radio as applicable to police work, in the old L.C.C. Council Chamber at Spring Gardens, before most of the Chief Constables of the country.

My Worst Ordeal.

MY surviving impressions are of the intense interest exhibited in my remarks and the abominable acoustical properties of the Chamber. Also, as usual, the demonstration receiver decided to quit just at the critical moment. The *mauvais quatre d'heure* which followed, and the final success of the "show," is yet another story.

More "Liberty" in America.

THE U.S.A. generally seems to let things get to the point of "Inferno with the lid off" before it decides to act, but when it does act—oh, boy! Take radio, for example. We all know what a maelstrom of coal-black mammies, ukulele babies, and Kentucky homes the American ether has become, and now Washington has begun to get in some of its fine work on the problem of untangling it all.

Miss Isabel Jenkinson, of Messrs. Mullards, is engaged to Mr. Nevill Maskelyne.

The Pay—And the Prospects.

FIRST, five Commissioners at £2,000 for the first year's service and £6 per day's service thereafter. As the appointments are for six years the total pay they will draw is a matter of simple arithmetic. These officials are to be censors, classifiers of stations, assigners of wave bands, power and transmission times, and regulators of "the purity of the transmissions." In short, these five radio dictators are going to have a busy life and I should think that their fingers will have become spatulate with dial-twisting, and their ears elephantine, by the time they have served their six years.

Chitos Again.

ENTHUSIASTIC adherents to the "Chitos" circuit continue to write in its praise. Jack M. (Morayshire) rolls up with the usual tribute—and a real fine letter, full of meat. A red-hot fan, believe me, is this Scot. He has practically all Europe under his dial fingers, and when he has more siller to play wi' no "uncle" this side of the Red Sea will be safe from Jack's critical mind.

Telling Them Off.

MR. M. got thirty-two stations on his Chitos, and also heard a friend ordering a taxi per line telephone. He is intrigued about the power of WG Y, which is variously reported to be 50 kw. and 3.5 kw. What's the odds, Jack? Get his signals and let the lave go by ye. Aberdeen is badly heterodyned by Zurich, and the Spanish stations are very naughty altogether. I believe you. They are no good for testing wave-meters with. Jack is sitting waiting for the high-power Jap to start up That will be telegraphy, lad D'ye ken the Morse? Write again, for I like ye fine.

The Early Riser.

M. (E. Finchley), using the Simmonds 10-metre panel, rises in the small and early to listen to KDKA Excellent going on two valves. Try the "Armstrong Super," and see what can be done on one valve. It will open your ears. Say! What is the earliest milkman you have picked up?

Jan Kiepura the young and famous Polish tenor, who was recently broadcast.

A Generous "Ultra."

MR. I. T. VANNER, Sutton Waldron, near Blandford, Dorset, who writes in no uncertain tone of eulogy about the "P.W." Ultra crystal receiver, has almost a complete set of "P.W." for the past three years, and anybody who will pay carriage, including cost of carrier to station (five miles), can have them as a gift. New readers will probably compete fiercely for such a prize, for it contains one complete year's spare-time occupation and enjoyment.

More Back Numbers Going.

MR. S. A. HOOKER, 156, Hainault Road, Leytonstone, E.11, has "P.W." Nos. 2 to 100, for disposal gratis to anyone sending adequate postage.

"P.W." Continental.

MR. R. J. JACKSON, College Cottages, Old Hall Green, Ware, Herts, is languishing for "P.W." No. 143, as his life will be insupportable unless he constructs the "P.W." Continental set. He should write to Mr. Vanner, whose offer appears above.

"S.O.S."

A POIGNANT cry comes from Mr. C. S. Richards, 2, Windsor Road, Torquay, whose receiver is more successful with trams than B.B.C. stations. Mr. Richards appears to have tried every remedy except moving to some tramless paradise. If any reader has solved the problem for himself he would be positively brutal to withhold the answer from the distressed fellow-fan whose address I give. If all comes out right at last, I hope "Ariel" may be let into the secret.

"Ham-Handed" Henry.

PROFESSIONAL garageurs are reported to be very peeved because of a recent advertisement of an accumulator, which was headed, "Ham-handed Henry at the garage down the road cannot ruin this accumulator." Bless me, no one ever pulled off a mild joke yet but what some highly irritable fellow thought the cap fitted him. I suffered grievous wrongs from garages before I connected the house to the mains, though I don't brand all Ford lodging-houses as cell ruiners. But I have met, in the flesh, Ham-handed Henry with his dud voltmeter. Haven't you?

Mr Martyn C. Webster, one of the announcers at Glasgow.

"Howlers."

THERE has appeared lately the usual annual collection of schoolboy "howlers," so I beg to append a few of my own gleaning:

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

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

"Broadcasting programmes were invented by Marconi in a valve set, thus being made a senatter in Ittaly, which is the same as a consirvative at home."

ARIEL.

SHORT WAVES.

Mr. T. A. Edison does not think that radio will ever oust the phonograph. Then we can only say that the value of radio has been overestimated.—"Punch."

* * *

Inhabitants of a certain island are very superstitious about wireless. We understand that they consider it unlucky to break a valve on a Friday.

* * *

JUST AS GOOD.

It is suggested that all new houses to be built should be fitted for wireless and refrigerators as a matter of course. And, of course, if one got the plugs mixed, some of these improving lectures would freeze the ice-cream just the same.—"Sunday Pictorial."

* * *

Warrant issued in a wireless cage.—(Daily Paper).

We hope this won't cause a shortage in cat's-whiskers.

* * *

"What has the criminal to be afraid of these days?" asks a reformer. There must always be the haunting fear of being sentenced to a long term of jazz bands, wireless programmes and amateur concert parties.

—"London Opinion."

* * *

The noise of the Niagara Falls has been broadcast.—News Item.

A noise, no doubt, but not a very Big Noise for America.

—"Birmingham Gazette & Express."

* * *

"Longest radio 'phone call. San Francisco rings up London," runs headlines in the "Daily Herald." An exasperated reader affirms that this is impossible; he says the longest 'phone call occurs when his secretary's fiancé rings her up during office hours.

* * *

Programmes of the kind are not accepted if they are of a sufficiently high standard.—Reported statement of the B.B.C. A cynic says he has long suspected this.

—"Birmingham Daily Mail."

* * *

"Can't make out what's wrong with my set," exclaimed Jones. "I've heard nothing from it for the last half hour."

Friend (consulting programme): "It's all right, old chap. They're just broadcasting the moves of the big chess match."

—"News of the World."

Telephones or Loudspeakers?

The newcomer to wireless is always faced with the problem denoted by the title of this article. In these pages our contributor discusses the question and presents the pros and cons of the two methods of reception in a straightforward and concise manner.

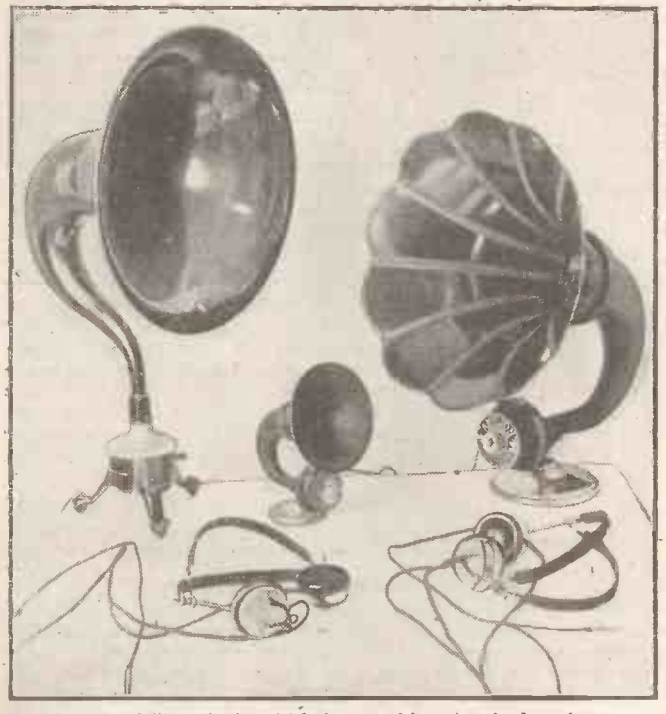
By H. J. BARTON CHAPPLE, Wh.Sch., B.Sc. (Hons.), A.C.G.I., D.I.C., A.M.I.E.E.

AT the present time it is quite the usual practice amongst wireless enthusiasts to judge the performance of their receiving sets by the number of broadcasting stations that can be tuned in on the loud speaker. Of course, this does not necessarily imply that all the stations are heard at *full* loud-speaker strength, but as long as the respective programmes can be listened to with comparative ease, this represents the aim of many listeners. Now, one might ask, quite justifiably, why the receiver is not credited with the total number of stations heard, without adding the phrase "on the loud speaker." Is it just to lend weight to the argument that this or that particular set is "par excellence," or is it a sign of the times that we are reaching the state where loud speakers are becoming the accepted means of reproducing signals, and telephones are out-of-date?

Relative Costs.

I feel that every good purpose will be served if we review the whole situation in an impartial manner, for many arguments are heard with the subject of telephones and loud speakers as the basis. From questions of first cost the palm is naturally awarded to the telephones, but this will be negatived somewhat in large families where the number of people who demand to be in a position to listen to the programmes, at any time, necessitates the purchase of three or four pairs. Listeners having in their possession only a simple crystal set must perforce resort to the use of telephones, for the strength of the resulting signals is insufficient to work the loud-speaker mechanism to produce really audible signals. The addition of L.F. valve amplifiers puts a different complexion on the situation and, of course, sets having two or more valves will give the required signal strength for loud-speaker work on one or more stations.

Let us then continue to cite the advantages and disadvantages of the two instruments in an effort to arrive at some definite conclusions. After wearing a pair of telephones over the ears for some time they are inclined to become uncomfortable, while the continual pressure of the ear-caps against the head in many cases produces headaches. In addition, beads of perspiration accumulate on the caps and diaphragms, and unless wiped off are liable to cause the metal diaphragm to oxidise. This rusting can be guarded against if a very thin layer of vaseline is, however, spread over the diaphragm surface. Unless recourse is made to shouting, speaking between individuals is almost impossible, but if pleasure is being derived from the particular items broadcast, outside interruptions are undesirable, so this can hardly be looked upon as an objection, unless the signals are so faint that any form of external noise is barred. The last mentioned fact has formed a favourite topic for cartoonists and humorists in illustrating exaggerated situations.



A representative collection of telephones and horn-type loud speakers.

The length of the cord between the head receivers and the set, of necessity, restricts movement, but the desire to forsake the comfort of one's easy chair does not frequently arise. Owing to their portability, pairs of telephones are apt to become the victims of carelessness, being dropped on the floor or left in odd corners, a procedure which does not add to their useful life, for the delicate reproducing mechanism is damaged by rough usage. It is a very good plan to make provision for hanging the 'phones in convenient positions so that they are to hand when wanted. Many listeners have adopted the practice of running a length of extension wire round the floor skirting or chair-rail in the dining-room, so that it terminates in two pairs of terminal plugs, one on each side of the fireplace, hooks being fixed for accommodating the telephones.

Efficient 'Phones.

This array of facts, if examined with care, cannot be said to constitute formidable objections to the use of telephones, and to counter them we have the generally accepted fact that the reproduction of speech and music, with telephones of reputable make, is better than with many types of loud speakers. This is perhaps to be expected when we realise the number of years that have been devoted to the perfection of the telephone receiver, as compared to the number given to research in loud-speaker problems. Manufacturers, however, are now producing particularly good instruments, as a result of the natural impetus given to the trade by the rapid growth of wireless as a source of entertainment. The problems that have to be overcome in the design of the loud speakers

(*Continued on next page.*)

TELEPHONES OR LOUD SPEAKERS

(Continued from previous page.)

themselves, and the cognate subject, the correct reproduction of sound, are manifold, and this, of course, has retarded somewhat the perfection of the instrument.

As is the case with the ordinary telephone, the basis of most loud speakers is an electro-magnetic system consisting of a permanent magnet, shaped according to the type of container, which attracts a metal diaphragm or reed connected to a diaphragm. Small coils are added to the magnet limbs, and the speech currents in passing through these coils produce a varying magnetic field, which is superimposed upon the existing one. The design of this system must be such that the movement of the diaphragm is proportional to the magnetic field producing it, or distortion will make its presence felt.

Suppression of Low Notes.

It will also be appreciated that the natural frequency of any vibrations of the diaphragm must be outside the acoustical range, otherwise certain notes will be amplified out of proportion to their correct values, producing ringing effects. This property is utilised with advantage in some cases. Owing to the variation of impedance with frequency, in the case of transformer or choke coupling on the L.F. side, the low notes of the musical scale are apt to be somewhat lost in reproduction, but the natural frequency effects just mentioned can be employed to bring them up to the desired strength, though the details of design are very intricate.

The type of horn utilised has a great influence on the reproduction of sound, for if the horn fails to possess the correct shape, interferences will occur due to reflections and the resulting sound will be distorted or partially annulled. Damping effects due to the materials employed in construction also have a marked bearing on the final results. The low-pitched notes suffer if the air-length of the horn is insufficient, and this is very marked in the small types of loud speakers. Questions relevant to the influence of the horn naturally do not arise in the many forms of cone loud speakers now on the market, for the air column is directly influenced by the large diaphragm, which must be coated with or made from some non-absorbent material.

More Power Required.

With the idea of appealing to the artistic tastes of potential customers, great skill and ingenuity is being brought to bear on many of the loud-speaker models now on sale. What to some people is an unsightly horn is concealed by being shaped compactly, but unless extreme care is taken they are liable to suffer from acoustical defects. The objections previously mentioned in connection with telephones do not hold with loud speakers, viz., restriction of movement, liability to damage by sudden movement, discomfort from pressure on the head, absence of conversational facilities, etc. On the other hand, however, sound reflections from the walls and ceiling of a room, which are not present with telephones, are apparent with loud speakers.

A popular modern type of cone loud speaker.

To get all stations at full loud-speaker strength demands a very efficient multi-valve receiver, whereas for telephone strength one, or perhaps two, of the valves on the L.F. side could be dispensed with, thus effecting a definite saving in receiver first costs and battery running costs. It is inevitable that there should be different standards of loud-speaker strength amongst the wireless fraternity, but after all this is solely a matter for personal judgment. Provided the individual concerned is satisfied with the volume and quality of sound emanating from the loud speaker, that is all that really matters. Much will depend on the musical tastes coupled with the size and type of room where installed, and the resulting sound reflections.

A Brief Summary.

For the purpose of making initial tests on a receiver, or when searching the ether for new stations, telephones are generally to be preferred, but care must be taken when passing the tuning point of the local station or the ear drums will experience an unpleasant shock from the large volume of sound. Of late much has been said about people who operate their loud speakers in a thoughtless manner, and thus give annoyance to neighbours by the unnecessary volume of sound, frequently of a quality leaving much to be desired. This error of judgment is overcome readily by a reduction of power, the resulting decrease in volume generally giving improved quality, and after all it is quality not quantity that should be the criterion of working.

Now what is the result of these deliberations on the problems connected with preference for telephones or loud speakers? We find that each has its respective advantages and disadvantages fairly evenly balanced, and it would be difficult to find sufficient reasons for one or the other to be wholly dispensed with. In such an embracing subject as wireless the arguments for and against the methods adopted for reproducing the sounds, emanating in the first instance from the transmitting station, must be weighed up in conjunction with individual tastes and requirements. (See tabular summary). Both telephones and loud speakers have their spheres of usefulness, and, personally, I feel the situation is best met by using each as occasion dictates.

IMPORTANT POINTS SUMMARISED.

Telephones.	Loud Speakers.
1. Restriction of movement.	1. No restriction of movement.
2. Liable to be carelessly handled.	2. Seldom necessary to touch the instrument when once installed.
3. Unpleasant effects after long wear on head.	3. Absence of these effects.
4. Conversation between individuals difficult.	4. Household routine unaffected.
5. Sound wholly concentrated.	5. Sound reflections from walls and ceiling often troublesome.
6. Splendid reproduction.	6. Improvements in reproduction still necessary.
7. No disturbance to neighbours.	7. Disturbing to neighbours unless volume is controlled.
8. Low first cost.	8. High first cost.
9. Reduction in number of L.F. valves to hear desired stations.	9. Efficient multi-valve receiver generally necessary.

TESTING CRYSTAL SETS.

FOR the listener who uses a crystal set, or a set employing a crystal detector, a simple buzzer is extremely useful.

Special high-note buzzers can be obtained, and these are really the best for the purpose. They give an especially high and clear note in the 'phones. If, however, an old electric bell is at hand, this may be used as a substitute for a buzzer. The gong and hammer should be removed, making quite certain that the buzzer contacts are not damaged in the operation. By placing a piece of cardboard or folded paper between the heavy iron armature and the contact spring, and then stretching a rubber band round the whole mechanism, a fairly high and even note results. The buzzer is then connected in series with some form of switch—an ordinary bell-push button is one of the most convenient—and one or two dry cells. One end of a wire is now joined to the small screw which adjusts the vibrating mechanism, and the other end of this wire is connected to the earth wire of the receiving set.

The "QUALITY BOX"

An easy-to-make instrument which will help you to obtain first-class loud-speaker reproduction.

By P. W. HARRIS, M.I.R.E.

WITH the use of modern power valves, high anode voltages, and more particularly the super-power valves, which are rightly becoming increasingly popular, the current flowing in the plate circuit of the last valve reaches a much higher figure than it is advisable to pass directly through loud-speaker windings. This current, it will be remembered, consists of a steady plate current, superimposed upon which are the audio-frequency modulations producing the sound we desire to hear. All loud speakers utilise some form of magnetic movement, and the steady current in the plate circuit when passed through the windings usually holds the diaphragm in a state of tension. Obviously there is a limit to the travel of this diaphragm, and if the steady current is high, the amount of additional diaphragm movement possible is limited by the strength of the steady plate current. If, now, we remove the direct current component, either with a transformer or a filter, leaving only the modulated current to pass through the loud speaker, we increase the useful load that can be given to the instrument, at the same time protecting our windings from the possibility of a burn-out.

COMPONENTS REQUIRED.

One ebonite panel, 6½ by 6 by ¼ in.
Six terminals.
Four 1 mfd. Mansbridge condensers of any reliable make.
One 20-henry choke coil. (That shown is R.I. Ltd. Other suitable makes are also available.)
Suitable box to take unit.

Protecting the Loud Speaker.

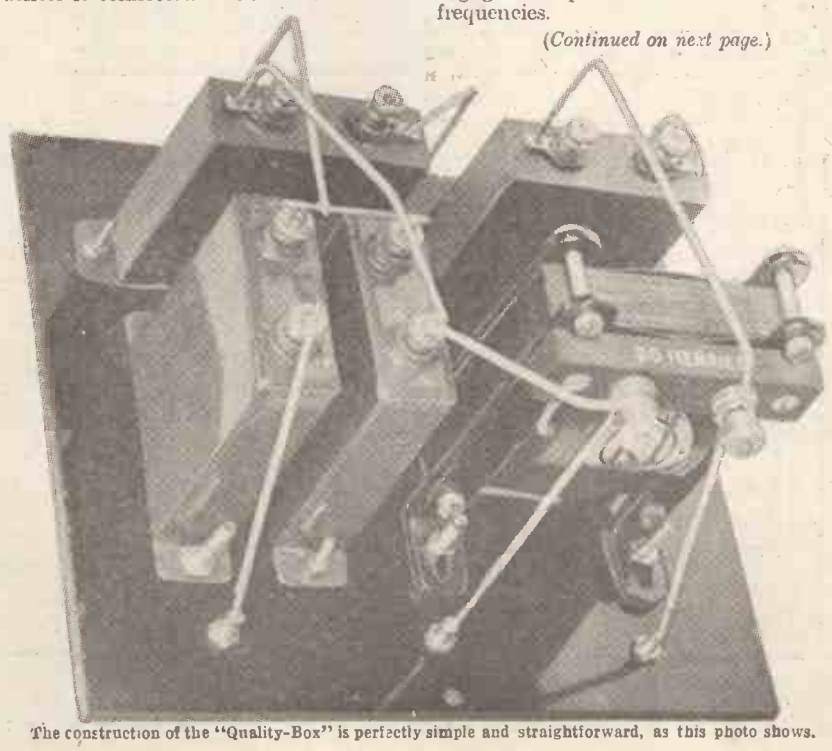
While transformers or filter units are built into many receivers, such units are often identical, and one can be made to serve for several sets; thus effecting considerable economy. The filter unit I am describing is in regular use in my laboratory, and is invariably attached to the output side of the receiver, the loud-speaker leads being taken to the output terminals on the filter rather than to the set itself. Frequently, too, considerations of space make it awkward to place Mansbridge condensers inside the receiver, and for this reason two 1 mfd. Mansbridge shunting condensers are included in the unit.

Examination of the photographs and drawings will show you that there are six terminals, two for connection to the loud-speaker terminals of the receivers, two for the loud speaker itself, one terminal for H.T. positive 1, and the other for L.T. negative.

It is becoming increasingly common to use only two high-tension tappings on a receiver, and as each tapping needs its own Mansbridge condenser, two are therefore required—one for connection from H.T. positive 2 to low-tension negative, and the other from H.T. positive 1 to L.T. negative. H.T. positive 2, however, is connected in the set directly to "loud-speaker positive," and as there is a L.S. positive terminal on the filter unit, the H.T. positive Mansbridge condenser is connected up within the unit itself. The other side of each Mansbridge condenser is connected to the "low-tension negative" terminal of the filter, which is joined to low-tension negative on the set. H.T. positive 1 of the filter is connected to this particular tapping on the set.

The filter itself consists of a 20-henry choke coil connected directly across the loud-speaker positive and loud-speaker negative terminals, thus allowing the high-tension current to flow from H.T. positive 2 to the plate of the last valve. Joined to the two ends of this choke are two 1 mfd. Mansbridge condensers, the other side of each of which goes to an output terminal for the loud speaker. It will thus be seen that the steady plate current goes through the choke winding, and the alternating differences of potential set up across the ends of the choke by the modulated current cause audio-frequency currents to pass through the loud-speaker windings, as the two Mansbridge condensers offer negligible impedance to these alternating frequencies.

(*Continued on next page.*)

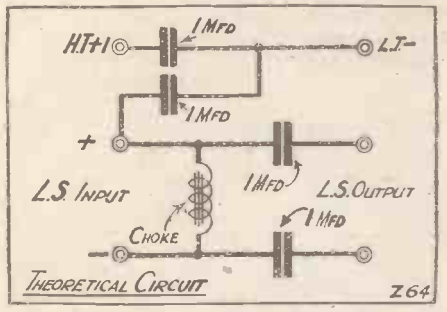


The construction of the "Quality-Box" is perfectly simple and straightforward, as this photo shows.

THE "QUALITY BOX."

(Continued from previous page.)

Constructional work and wiring up is simplicity itself and requires no explanation other than that given in the wiring diagram. In the case of sets where Mansbridge condensers are already fitted, the additional Mansbridge condensers in this unit simply



go in parallel, and thus add to the advantageous effect of the existing condensers.

Neither box nor panel are standard sizes, and, as a matter of fact, the panel was cut from waste ebonite and the box made up of odd pieces of wood. The arrangement of components in the unit is unimportant, so that variations of layout can be made with no sacrifice of efficiency. This will enable many experimenters to use up suitable boxes they may have handy.

The use of two condensers in the filter unit, while not novel, is less usual than the use of one, but has the distinct advantage that neither lead to the loud speaker itself is "live." With the more usual method of a choke coil and one condenser, one of the loud-speaker leads is connected to H.T. positive, and the earthing of this lead may be the means of ruining your H. T. battery. In the present filter unit, either lead can be earthed with impunity, the only effect being the complete absence of signals in your loud speaker.

MUSIC IN EVERY ROOM.

From a Correspondent.

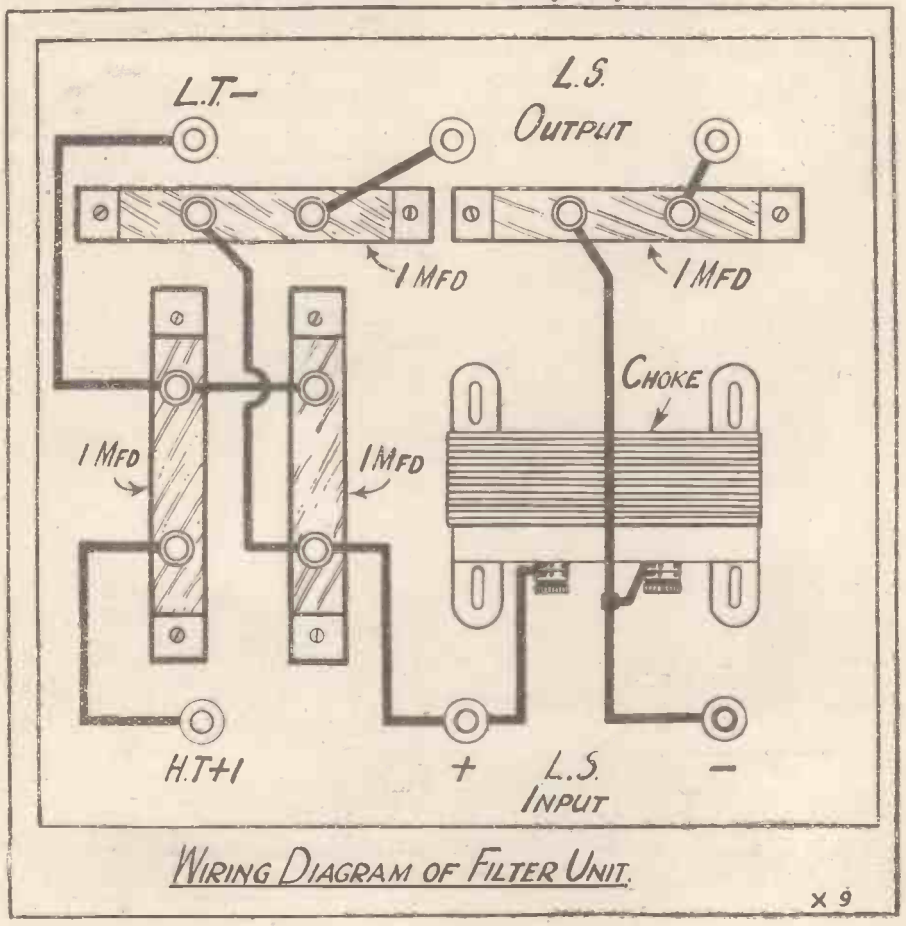
SOMETIMES the loud speaker is wanted in one room, sometimes in another, and the problem of providing for music in every room is not always found easy to solve.

One excellent method, which has given long and satisfactory service, is to use ordinary coil-plugs in every room, mounted inconspicuously upon a wall or skirting board. The loud speaker is provided with a corresponding plug and socket on its lead, and then it is plugged into the holder wherever it may be required as easily as a coil is inserted.

The extension wires to the different sockets should be kept apart and not run side by side, a good plan being to have one lead under the carpet or round the floors, and the other one over the picture rail or doors.

The actual wire for the extensions should not be of fine gauge, but should be as stout as is conveniently possible. No. 18 D.C.C. is a handy size to use, as it is easily bent and inconspicuous, but strong enough to stand all necessary mechanical strains.

When the coil holder in each room is joined across these wires, all the "points" will be "in parallel," and all are continuously ready for service.



Wiring Diagram of Filter Unit.

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MAKING THE MOST OF A SMALL LOUD SPEAKER.

By HUMPHREY PURCELL.

WHILE it is quite true that a small loud speaker will not give the same results with a moderately powerful set as a full-sized instrument, it is nevertheless surprising how much some of them will stand without overloading. If, however, the horn is small and has a relatively narrow flare, the reproduction may lack roundness and sound thin when the loud speaker is asked to give a little more volume than usual.

In such circumstances it is worth while trying the effect of placing the loud speaker in a corner of the room with the horn facing the junction of the two walls. This will sometimes have a quite surprising effect on the tone and on the volume of the reproduction.

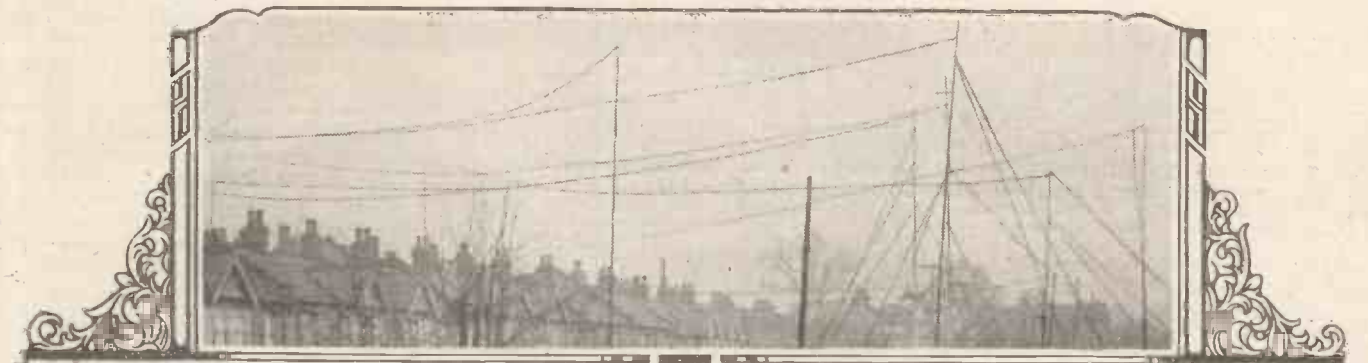
Another experiment worth trying is to disconnect the horn altogether and connect the base to the tone-arm of a gramophone.

If a suitable adaptor is not to hand, one may be improvised by rolling a piece of stiff paper into a tube, securing the edge of the paper with either seccotine or gummed paper tape. Alternatively, the rubber portion of an "anti-splash" device raided from a kitchen tap may be found to fit. Used in this way, an Amplion "Dragonfly" movement gives splendid tone.

Some Tips on Tone.

In the case of large diaphragm loud speakers, users will no doubt have discovered for themselves that the reproduction is appreciably affected by the position of the instrument in relation to the walls of the room and large pieces of furniture. Purest results are usually obtained when the loud speaker is placed at least one foot away from a wall, and then with its diaphragm parallel to the wall. However, "purity" is a somewhat relative term, and is in fact largely a matter of taste. Some listeners, therefore, may prefer to take advantage of the increased volume to be obtained by standing the loud speaker in a corner so that the angle of the walls provides a reflector in much the same way as the bowl of a "Decca" gramophone.

If, in spite of various experiments, the loud speaker refuses to satisfy your demands for purity of speech and music from a set which is not obviously too powerful, and in which reaction is not being pushed too far, do not conclude at once that the loud speaker is at fault. It is a good rule to suspect batteries first, valves next, transformers third, and loud speaker last.



LOW LOSS AERIALS.

A short article of general interest.
By E. C. H. JONES, B.Sc.

THE article on the question of low-loss aerials, in POPULAR WIRELESS, No. 242, will interest all who are trying to obtain the utmost economy of working consistent with satisfactory results in their receiving sets, as well as those who are interested in efficiency for efficiency's sake.

Living in Bristol, I have tried to obtain satisfactory loud-speaker reception (Daventry and Cardiff) in an ordinary dwelling-house, using a two-valve set (det. and 1 L.F.). This result I have now attained, but not before I had obtained the utmost

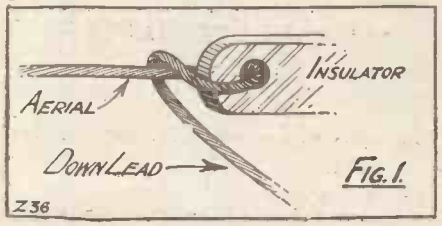


FIG. 1.

efficiency from my aerial possible under the circumstances.

Both in height and general lay-out of the aerial, an outdoor one, I have found it impossible to conform to conventional practice, but by experimenting with the lead-in, I have considerably improved the volume and strength of the signals received.

The ideal aerial, according to Mr. Dowding, should be ". . . . suspended in space, touching nothing but the aerial terminal of the set, and being yards away from anything else."

This I had set out to achieve as far as possible, and because of the satisfaction derived from greater efficiency the manner of achieving it may be of interest.

The problem is a simple one, but in face of a variety of lead-in tubes, etc., offered to the wireless amateur, one that is apt to be overlooked. All that is necessary is to so insulate the last five or six feet of the aerial wire itself that it may be attached directly to the aerial terminal of the receiving set, thus dispensing with a number of connections which often act as leak paths for the aerial current.

An Efficient Lead-In.

I am using a single length of 7/22 stranded copper wire (bare) 75 ft. in length from the farthest insulator to the aerial terminal of the receiving set. All strain on the aerial is taken on the length suspended between the two posts, and the down lead, although straight, is not taut.

This is arranged by a twist of the aerial wire as it leaves the insulator (Fig. 1).

The last six feet of the down lead I insulated by first cutting off six feet of ordinary black insulating tape and winding it round the wire longitudinally, keeping it securely in position by winding thread around it. (Previous to winding on the tape, I passed the wire through some good rubber tubing, ¼ in. in diameter, purchased from a chemist's, and pushed it along the wire to give sufficient room to wind on the tape and thread.)

It was then easy to draw the rubber tubing down over the tape, the one fitting closely over the other. The end of the rubber tubing exposed to the weather was protected from rain by a wrapping of insulating tape.

This insulated portion of the aerial was carried through a glass tube of appropriate diameter obtained from a chemist, an ordinary spade terminal was soldered to the end of the wire, and this fitted to the aerial terminal of the set. Fig. 2 shows the

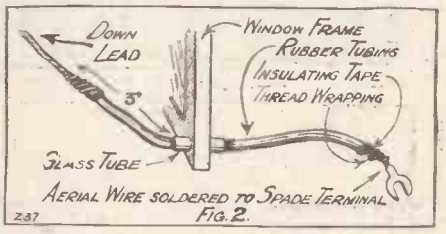


FIG. 2.

insulated portion of the aerial with the layers exposed for the sake of clearness.

An earthing plug and wire, similar to the one described by Mr. Dowding in the article referred to above, may easily be fitted if desired. Personally, I content myself by attaching the spade terminal to the earth terminal of the set when switching off.

This arrangement of the aerial gives surprisingly better results than any I have tried, and is inexpensive and easy to adopt.

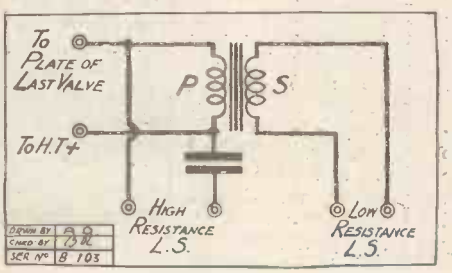
A TELEPHONE TRANSFORMER TIP.

TO those readers who possess telephone transformers of approximately 10 to 1 ratio the following may appeal.

The idea is to use the primary as an L.F. choke, so that it may be employed for shunting the windings of a high-resistance loud speaker to prevent the H.T. passing through it. The transformer can still be used for its original purpose, namely, coupling loud speakers of low resistance to the sets.

A sketch is given below of the suggested arrangement.

As will be seen, a ·5 mfd. fixed condenser is used in series with one high-resistance loud-speaker lead, so as to prevent the H.T.



passing through the windings of the loud speaker. The action of this arrangement is now well known, and therefore will not be entered into here.

The transformer and condenser can be fixed permanently in the set, and two pairs of loud-speaker terminals provided on the panel, one pair for any low-resistance loud speaker, and the other having the condenser in series with one lead inside the set for the high-resistance loud speaker.

With this arrangement the telephone transformer serves a dual purpose, with the additional advantage that both loud speakers have their windings fully protected against breakdowns due to heavy H.T. currents.

CURRENT TOPICS.

By THE EDITOR.

Success of the "Beam"—Day of the High Power Station Over—More About 2 H D—Further Developments Expected.

OUR readers will be interested to know that the trial of the Beam wireless system between England and Australia, which concluded last week, has proved successful, and has demonstrated that the Post Office requirements could be fulfilled.

One of the clauses of the Post Office contract is that the Beam stations have to

One of the B.B.C. exhibits at the Ideal Home Exhibition was the scale model of 5 X X shown on the left of this photo.

be capable of communication at a speed of one hundred words each minute during a daily average of seven hours. The fact that during the tests with the Beam system between England and Australia these very difficult conditions were observed is a feather in the cap of the Beam system, and of Senatore Marconi, Mr. Franklin, and all his assistants who have done so much to accelerate the progress and success of the Beam system.

Congratulations.

Now that the Post Office conditions have been satisfied, the progress of the Beam system should be even more rapid than hitherto, and the day when England and all parts of the Empire are in communication with each other via the Beam system does not seem so very far distant. Certain it is that the day of the high-power station to all intents and purposes is over.

Instead of gigantic pretentious transmitters like Rugby, costing thousands and thousands of pounds to build and to maintain, carrying out, as a rule, not too satisfactory service, we shall have a network of Beam stations which will not only operate more efficiently but less expensively.

We should like to offer our congratulations to Senatore Marconi and all those concerned with the development of the Beam, on the very rapid success obtained, and to wish for the future an equally rapid success and a further development of a very remarkable system of transmission.

The controversy between the Manchester Radio Scientific Society and the Post Office continues. We recently had the pleasure of a visit from Mr. Kemp, the Chairman of the Manchester Radio Scientific Society, who called at this office and related in detail the incidents which led up to the G.P.O.'s interference.

Mr. Kemp's Visit.

The day he came to London and called on POPULAR WIRELESS, Mr. Kemp also paid a visit to the G.P.O., and a visit to his M.P. at the House of Commons. The result of the interview at the Post Office was that the Postmaster-General's decision was not to move in the position he had taken up.

It is now possible, we understand from Mr. Kemp, that the Manchester Society will take its apparatus out of the country and will conduct the remainder of its experiments abroad. Mr. Kemp has stated that the society has had offers from two countries, both European, in this respect.

Here is a pretty kettle of fish! An important amateur society, which has done a great deal of useful work, is now practically forced to clear out of its mother country to conduct its experiments in peace and quiet, without the pettifogging interference of a bureaucratic Government department! It is, indeed, enough to make one despair of freeing Government departments from intolerance and red tape.

"Interference Did Not Matter!"

Mr. Kemp quite rightly explained at the Post Office that he considers his Society has achieved important results in radio research. The Society does not seek any commercial gain. The Society, in fact, is quite willing eventually to hand over its apparatus and the results of its research to anybody representing the public, whether it be the Post Office, the B.B.C., or anyone else. The Society wants to make its experiments more complete, transmit a proper programme, etc., but the Post Office states that the Society may only transmit the same musical scales over and over again, etc.

Further, the Society has had the 440 metres wave-length taken away from it, although it is still allowed to use this for Morse transmissions. The absurdity of this is amply illustrated by the fact that Mr. Kemp has pointed out to the Post Office that if the station transmitted Morse on 440 metres there would be more interference with other stations than if wireless telephony were used.

According to Mr. Kemp, the reply made was that *interference did not matter*; the main object of the Post Office seems to have been to stop making the transmitted programmes of interest to the public!

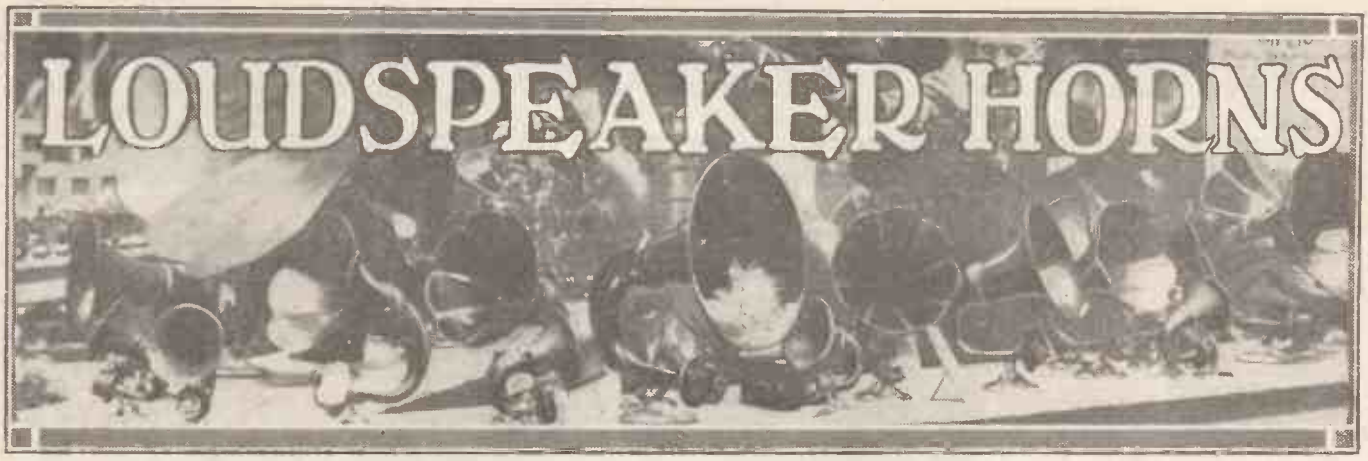
Again, as Mr. Kemp has pointed out, the statement about interference contradicts previous statements made by the Post Office. It has been contended that if the station was causing interference the obvious remedy was to allow it to use the same wave-length as the Manchester station—that is, 386·4 metres, when, of course, it is not being used by the Manchester B.B.C. department. But it was replied that such a concession could not be made.

The Manchester Radio Scientific Society are naturally not satisfied with the wave-length of 150 to 200 metres, because most of the members have perfected their receivers for the transmission of waves on 440 metres, and a new wave-length would involve complicated and in many cases very expensive alterations.

We are very glad to hear that Mr. Kemp is not going to drop the matter on behalf of the Society and will see that it is raised again in the House of Commons. In the meantime, the Society is making plans to finish its experiments abroad, and if events move unhappily, and the Society does have to go abroad, we sincerely hope that the pressure of public opinion will make the Postmaster-General realise that his treatment of the Manchester Radio Scientific Society is resented in every part of the country where common-sense fair treatment is valued.

The wireless operator on the new army tanks is snugly tucked away at the back, as shown above.

LOUDSPEAKER HORNS



The results obtainable from a loud speaker depend to a very large extent upon the design of the horn, as will be realised from the following interesting article.

By A. JOHNSON-RANDALL.

I WONDER how many readers realise what a big difference the design of a loud-speaker horn makes to quality. A friend of mine once bought a well-designed and expensive instrument, and very shortly afterwards tried the experiment of adapting a small horn from another 'speaker to fit the base of the larger instrument. I asked him what his idea was in carrying out this fairly difficult piece of work.

"Oh," he said, "you see the large instrument takes up a lot of room. The bigger horn certainly enables a greater volume to be obtained, but for ordinary reception the smaller horn is quite adequate. The 'music' is in the base of the instrument."

An example of a curved horn with large flare.

So my friend really thought that by combining the smaller horn with the expensive movement he was going to get just the same quality as would be obtained with the complete instrument which had been so successfully designed.

The results he actually obtained were marked, to my ear, by a distinct raising in pitch; or, in other words, by a decrease in the lower musical frequencies.

The length and shape of the horn base is actually a very important bearing upon the reproduction. In addition to this, the orifices of the big and little ends of the horn have to be considered.

Low Notes Poor.

Most horn loud speakers are weak on the low tones; in fact, I expect you have noticed that the bass usually has a "drummy" sound, if it comes through at all.

Designers are, of course, aware of this, but they are up against a big problem. They can improve the bass by making the horn longer, but, unfortunately, anything bigger than about four feet becomes unwieldy, and therefore unpractical for ordinary use.

Many attempts have been made to obtain the greatest length in the smallest space; for instance, bending the horn in two or three suitable places enables the height and bulk to be reduced. This in turn introduces another difficulty. The length of path of the sound wave on the inside of the bend will be less than that on the outside, and this difference tends to produce detrimental results.

Avoiding Reflection.

Some designers have tried to overcome this difficulty by splitting the horn up into sections, thereby making the difference in the length of path at the bend very much smaller. The problem is not by any means new, since gramophone manufacturers have come up against precisely the same trouble in their attempts to improve reproduction, and, indeed, much useful information can be obtained by studying the methods adopted by the designers of these instruments. In the case of loud speakers, the method is, of course, more applicable to those of the enclosed cabinet type.

The diameter of the big or output end of the horn is of importance. By the ordinary laws of sound, reflection will occur at the point where the sound wave emerges into the open. This is undesirable, since it prevents the whole of the sound energy from being used usefully in the form of radiated energy. The reflection effect can be made comparatively unimportant, however, by adopting the well-known method of using a horn with a gradually increasing opening. This method, which follows a logarithmic law, has been adopted by practically every manufacturer of the ordinary type of loud speaker used for broadcast reception. In any case, whatever the type of horn used, the output should be kept as large as possible.

Another type of horn is that which has straight sides, and this is probably the most convenient type for the amateur to attempt, if he wishes to try his hand at making horns of various lengths. In experimental work of this nature wood can be employed without difficulty. Of course, there is nothing to prevent the more serious listener from trying some experiments with the logarithmic horn. Thin wood is fairly easy to work with the aid of steam. To those so inclined, I would recommend the study of Captain H. J. Round's valuable article given in the October, 1926, issue of "Modern Wireless."

Some Interesting Data.

Captain Round, in his article, gives a series of curves which he has evolved, and from which it is possible to determine the dimensions of a horn to cut off at a given frequency. For instance, a horn to reproduce frequencies down to about 300 cycles would have to have a length of approximately 36 inches, with a diameter at the big end of 11 inches.

Similarly, to reproduce down to 100 cycles, the horn would have a length of approximately 12 feet, and a big end diameter of 33 inches.

Attempts have been made to produce artificial bass by employing the laws of resonance in the design of loud speakers, but most of these efforts have resulted in unnatural sounds, which show up very badly against the real thing.

In my opinion, the loud speaker of the future will tend in the direction of the "cone" type for ordinary household use, but who is there who can safely predict what will happen a year, or even six months, hence, with such a progressive science as that of wireless?

A well-known loud speaker, which is built upon the straight principle.

You can use the Lissen Transformer as a choke

by making this one simple connexion

Perhaps for your next circuit you will need an L.F. Choke. If so, here's a useful wrinkle: *use a LISSEN Transformer.*

To change the LISSEN Transformer into a Choke you simply connect the O.P. and I.S. terminals. To disconnect is but a second's work when you want a LISSEN as a Transformer again.

Used either as a Choke or as a Transformer a LISSEN will give you pure reproduction—amplifying fully every note, every tone, every harmonic, every overtone, against a background entirely free from noise. There are many high-priced transformers which cannot do that.

TEST IT YOURSELF

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L. 309

TECHNICAL NOTES.

A Weekly Feature Conducted by

Dr. J. H. T. **ROBERTS**, F.Inst.P.
(Staff Consultant.)

Screened Coils.

MOST of the screens or shields used with high-frequency coils in this country are of the cylindrical type, made in one piece and secured upon a suitable base, but I notice that a "box" type of shield has been introduced by the Aluminium Company of America, under the name of the Alcoa Shield, which has certain advantages in that it can readily be taken to pieces, or assembled from the component parts. The parts consist of the four sides and the top and bottom, which are in flat rectangular sheets of aluminium, and the corner-pieces are of angle-castings of aluminium, slotted so as to receive the edges of the four side-pieces. The corner-pieces are described as "extruded corner posts." When the screen is assembled it measures 5 × 9 × 6 in., but it is evident that the size can easily be modified by cutting down the side plates. It is, in fact, specially designed to be of the greatest use to the greatest number of set owners, and it is claimed that if it does not suit your size requirements you have only to spend a few moments in cutting the sheets to the required size, these sheets being easily cut, easily worked and the shield being permanent when assembled. Another advantage of the box shield being in the form described is that it can be sold in a comparatively small package, whereas the package would need to be much larger if the shield were sold assembled; in other words, it has an advantage corresponding to that of the well-known types of collapsible cardboard box. No doubt shields of this type will soon make their appearance on the English market.

Reflex Listening.

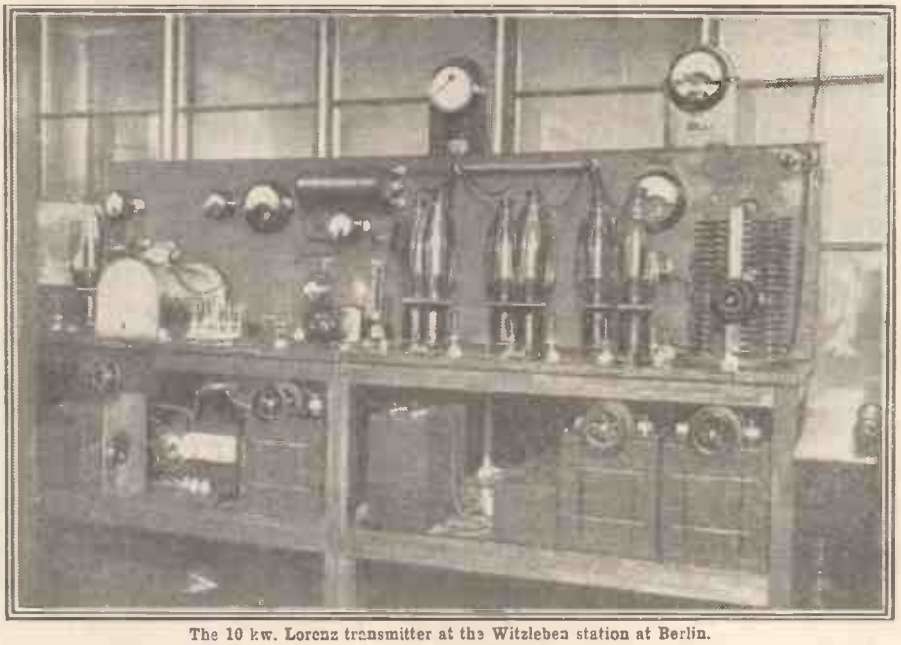
A somewhat novel use for earphones has been made by an organist in Baltimore, who wears the headphones while playing the organ and is thereby enabled to listen to the sound of the organ as it reaches the broadcasting microphone. The console is about 40 ft. away from some of the more distant organ pipes and consequently the performer notices a distinct lag between the sound which reaches his ears direct from the pipes and that which reaches him *via* the microphone and the headphones. It has been found that certain organ tones register better than others of greater power but different pitch and, consequently, when broadcasting, the organ is played in a manner entirely different from that used in an ordinary recital. Certain pedal notes, according to the organist, are better not used at all when broadcasting.

The church organ, although a favourite instrument with the majority of music-lovers, is one of the most difficult to record on the gramophone record or to broadcast over the wireless. One reason for this is that, unlike most other instruments, the organ is in reality a whole battery of instruments, and unless proper attention is given to this combination of organ tones, some of them will not do themselves justice and will be likely to yield mediocre or even unsatisfactory results when transmitted by the microphone. Another reason is that, owing to the fact that some of the pipes are necessarily considerably further away from the microphone than others, it becomes important either to employ multiple microphones, or to employ a very sensitive microphone at a considerable distance from the organ, so that the percentage differences in the distances of different parts of the organ from the microphone become comparatively insignificant.

By wearing the headphones and listening, in effect, to the actual sound of the organ as broadcast, the organist is much better able to know how to manipulate the instrument to get the best broadcast effect.

Comparing Loudness.

Have you ever considered to what degree a sound must change in volume for the change to be noticeable to an average ear? It has been found, as a result of experiments, that the average person is generally able to notice a decided difference in intensity between two sounds if the actual difference in volume is about 25 per cent. Thus, if one signal has an intensity or loudness reckoned as unity, the average person will be able to tell that another signal of the same kind is definitely louder if, in fact, its intensity or volume is not less than about 1·25 units. Telephone engineers sometimes use the term "transmission unit" and it can be shown that a difference in intensity of 25 per cent is equivalent to a difference of about one transmission unit.



The 10 kw. Lorenz transmitter at the Witzleben station at Berlin.

Developments.

Mr. Hugo Gernsback, the well-known American "popular" scientist and publisher, lately, in an interview published in one of his journals, gave some very interesting views as to the future development of wireless. He compared its progress, in the first place, with that of the automobile, and showed that whereas experiments and improvements have been going on in the latter for very many years, radio has reached a similar stage of development in the comparatively short space of about three or four years.

Amongst the matters which Mr. Gernsback considers offer most obvious scope for development or improvement, he mentions first the H.F. coils and tuning condensers of the set. Variable condensers are used, he points out, for the purpose of altering the wave-length of the circuit, but the same result may be obtained by using a coil without a condenser, after the fashion of a variometer. Variometers are, of course, used quite extensively, but they lack in range of adjustment and in sharpness of tuning. This, according to Gernsback, is a subject which deserves much more attention than it has hitherto received.

"Condenserless."

A tuning coil may have its "constants" varied by operating it on the harmonica principle, that is, by opening and closing the convolutions of the coil, or pulling it out and letting it contract again, like a spiral spring. Tuning can well be carried out in this way, but so far the method has been found impracticable for general use. Any method, however, which would permit of condensers being dispensed with would be a very great advantage; it is thought that the condenserless receiver will have much smaller losses, and will, therefore, give greater efficiency than corresponding sets at present in use.

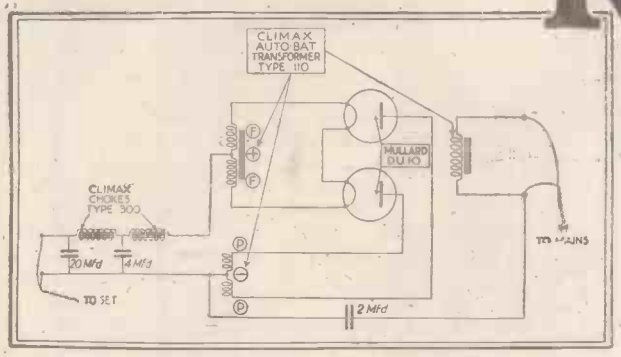
Cold Valve.

The cold valve comes under review as a distinct possibility for the very near future—Mr. Gernsback is of the opinion that the cold valve will be a commercially accomplished fact within the next ten years. One of the obvious suggestions in this connection is the use of an electrode treated with radio-active material, and it appears that De Forest patented this method some years ago.

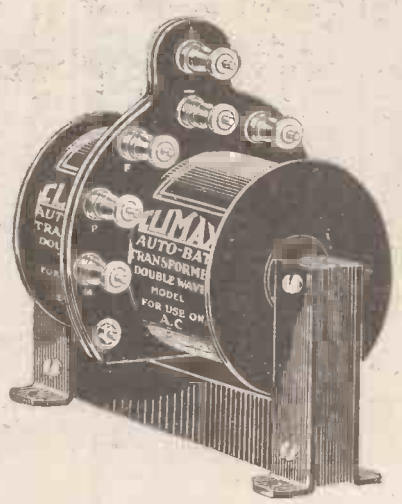
There are certain important difficulties in the way of making a valve on this

(Continued on page 199.)

Radio without Batteries



You will find the circuit diagram illustrated above, and which appears in No. 2 issue of Radio For The Million, quite simple to work from. All the necessary connections are clearly indicated and it will take very little time for you to build yourself this simple money-saving unit.



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See "Radio For The Million," No. 2 issue.

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YOUR LAST VALVE

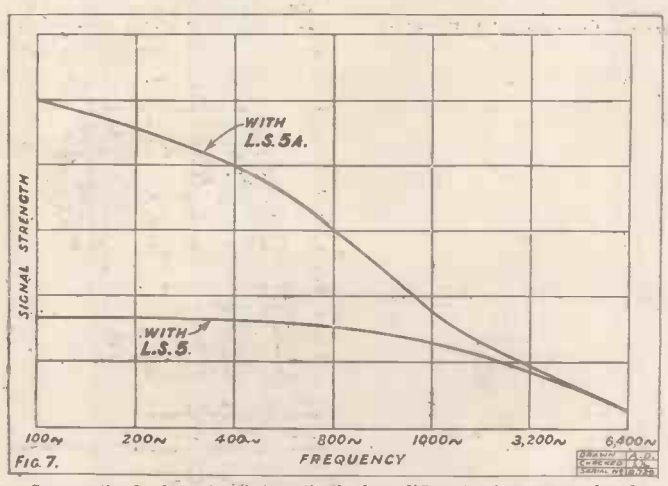
The second and concluding part of this article discusses the question of output in relation to tonal quality.

By Capt. H. J. ROUND, M.I.E.E.

THE output circuit of the last valve is a very troublesome one to consider because the ideal absorber of energy—the resistance—is no use to us. Nearly all loud speakers work by a magnetic action and to produce this magnetic action a number of turns of wire are usually wound on an iron core, and these turns of wire, when a current is passed, produce a force proportional to that current. It is fairly obvious that if our loud speakers were designed so that over the whole frequency range they produced the same effect in the air for equal forces, then we should have to arrange that the current was the same at all frequencies with the same input to the grid of the power valve. But loud speakers have, to a great extent, been designed experimentally, and in the experiment there has always been taken into consideration the inductive winding which produces the force.

The Effect of Valve Resistance.

It is interesting to take this winding of a loud speaker and note the effect of the inductance of this winding and its resistance when it is placed on the power valve, and in Fig. 7 I have drawn the current flowing through the same loud speaker with two different valves, one of the L.S.5 type and the other of the L.S.5A. For purposes of comparison the current flowing has been reduced to the same value at a frequency of 10,000, because other questions enter as to the absolute values which can be obtained with these two valves, and for the moment I am only interested in comparative currents at different frequencies.



Comparative loud-speaker "strengths" where different valves are employed.

It will be seen at once from the curve that the lower resistance valve gives a greater ratio of current at the low notes to the high notes than the high-resistance valve, and this is the first difficulty that enters into consideration of the output circuit, that one has first of all to obtain a valve for the loud speaker one is dealing with which will give us the desired tone value.

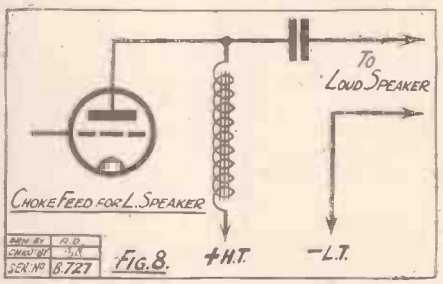
Suppose we get the desired tone value with an L.S.5 valve, we should not get the right tone value with an L.S.5A. It would be too low toned, and if altering the winding of the loud speaker is not permitted, the correct thing to do is to put a ratio transformer in between the valve and loud speaker.

In the simple case where we are using dry batteries, I have indicated that to increase our power about the best thing to do is to raise the voltage. Raising the voltage does not seriously alter the resistance of the valve, so that if our loud speaker can stand the additional current, if our tone is right on, say, 120 volts, it will still be right with three times that power at 200 volts. There is not likely to be any difficulty in the loud speaker not standing the alternating current unless, of course, the diaphragm chatters, but the increased direct current obtained by raising the voltage may possibly cause trouble, and in that case the well-known choke condenser feed arrangement, shown in Fig. 8, can be used, but when we come to working on accumulators or on the mains, the question of low-resistance valves and parallel valves introduces the necessity of a re-wound loud speaker or a transformer. To re-wind the loud speaker I think will probably be the best solution. If with the present loud speaker one valve gives the right tone value, the turns on the winding should be reduced to one half for four valves in parallel, the winding wound, of course, with thicker wire in the same space as before, and so on.

Increasing the Low Notes.

Many who have tried paralleling valves to get more power must have been disappointed in no apparent increase, although their milliamperes may have gone to double. And the same thing may have happened to those who have used lower resistance valves.

But actually a careful test will show that lowering the resistance of the valve in any way increases the lower notes in strength, but it may not seriously increase the high notes if the impedance of the loud speaker is high; but by carefully readjusting the output circuit, either by winding alteration or a transformer, the full increase of power can be obtained *with the same tone.*



A popular method of shunting the steady plate current.

It is very difficult to follow out the behaviour of the valve with this inductive winding when we are running more or less to the limit of power available from the valve, and here our grid and plate meters will tell us more than most calculations, although if one can use the characteristics properly the question can be worked out with them.

If one is running too far down the characteristic, this will show by a

(*Continued on next page.*)

The Cosmos S.P.55R power valve is often used for last stage work.

CHANGING OVER TO 2 VOLTS.

The 2-volt valve has deservedly come into it own.

By HUMPHREY PURCELL.

ONE of the most noticeable features of the valve manufacturers' new lists is the preponderance of the 2-volt class and the 6-volt class. The 4-volt valve is very nearly (but certainly not quite) left behind. The reason is, of course, that the dull-emitter valve working off a 4-volt accumulator or off two or three dry cells came into popularity on the score of low current consumption. But now the 2-volt valve, consuming ·1 or ·12 amps. is definitely more economical than the 4-volt valve at ·1 of an amp., and equally economical with the 3-volt valve at ·06.

Those amateurs who must keep down current consumption are therefore turning to the 2-volt valves, but there is a difficulty in the way of those who already possess one or more satisfactory valves requiring 3 or 4 volts, and do not desire to scrap them. They do not relish the idea of buying a complete set of new valves, or of wasting current by cutting 4 volts down to 2 volts for their new valves by means of resistances. There is a way out, however.

Adapting the Accumulator.

Many valves rated at 3 volts can be worked quite satisfactorily with a 2-volt accumulator provided the H.T. applied to the plate is kept low. Thus a B.T.H. B.5 will do good work as a detector with 30 volts or less applied to the plate via the transformer primary Similarly an S.T.41 recently tried as a first stage L.F. amplifier with only 2 volts across the filament, gave perfect results in conjunction with two 2-volt valves. In this case the H.T. voltage was about 100 applied through a resistance of 80,000 ohms.

A 4-volt valve cannot be used in the last position (that is to say, as a power valve) with only 2 volts, but on the other hand a 3-volt power valve may function satisfactorily in the first L.F. stage if resistance coupled. It depends on the valve. The amplification will not be as great as with a valve of the H.F. type, but the results may be purer if the volume handled is considerable. In any case, the experiment is worth trying.

When the change over to 2 volts has been made, the cells of the 4-volt accumulator should be connected in parallel in order to obtain a 2-volt supply. It is better to do this than to use first one cell of the accumulator and then the other cell, because the cell which is left standing will lose part of its charge, or possibly become sulphated.

YOUR LAST VALVE.

(Continued from previous page.)

kick-up of the milliampere meter. If one is running into grid current, this will show up on the grid meter. How much kicking can be allowed of both meters will be a matter for one's own personal judgment by ear. The worst notes for giving the milliamperemeter kick (without grid kick) are the bass notes, and I estimate the best grid setting is so that on a moderately low note the grid meter and milliamperemeter just kick together. The milliamperes necessary to get this condition will be a little heavier than those given for the ideal resistance output case.

This brings one to a rather interesting point in the design of resistance amplifiers, which tend to pass through practically all frequencies which are produced at the transmitter.

Some of these frequencies are very low and possibly of not much use to us in ordinary loud speakers, less so in the horn type than in the cone type, as these low notes have a habit of causing blasting more than the high frequencies, and I think it is quite possible that some of the bad effects with resistance-capacity amplifiers are due to this and there is definitely a tendency to put a transformer in between the two last stages, its chief effect being to keep down these very low frequencies, although that is not possibly the only effect.

Varying the Tone.

It seems that in this review of the situation, so far I have jumped apparently illogically from the pure resistance output circuit to the real almost wattless circuit; but, fortunately, on comparing valve outputs of different valve arrangements, the same arguments apply quantitatively. The output circuits can be altered quite considerably, if necessary, to give different tone values. For instance, a resistance in series with your loud speaker does not reduce the high tones so much as the low tones; and if, in addition, a condenser shunt is placed across the resistance, and the latter increased, the high tones can be left exactly as before, or even increased, and the low tones cut down at will. Shunting loud speakers with condensers to soften the high tones is well known and often used.

In considering the use of these different forms of energy supplied to the power valve, I have taken up, first of all, the case of dry batteries; and, secondly, that of accumulators or the mains. I have pointed out that probably when one is using dry batteries it is better to increase the voltage and the current at the same time rather than to increase the current only for getting increased power. In the case of dry batteries, any economy of discharge is of great value. Normally at, say, 100 volts, we use a discharge rate of 2·7 milliamps on a D.E.5 or, possibly, a little bit more. If we were to parallel two valves of this type, these milliamps would be doubled and, of course, with proper precautions in the output circuit, we could increase the output power to double.

Decreasing Plate Current.

There is a well-known method, however, of preventing the increase or actually decreasing the milliamps that need be used when using two valves. If one valve is allowed to take care of the alternating current on one side of the swing, and the other valve to take care of the alternating current on the other side of the swing, it is fairly obvious that we can put much more grid bias on each valve.

The D.E.5A wide mesh-grid power valve.

Owing to the curvature of the valve characteristic, it is not possible to go to zero current on each valve, but it is quite possible to drop each of these valves from 2·7 milliamps to one milliamp, and, with the two in parallel, we should have a discharge rate of two milliamps. Of course, when modulation starts, these milliamps will go up, but this effect is only transient and is not nearly so serious as a heavy discharge rate all the time.

The power delivered by these two valves would be about one and a half times that given by one valve, and a rise of voltage to 140 volts will give us twice the power at about half the milliamperes.

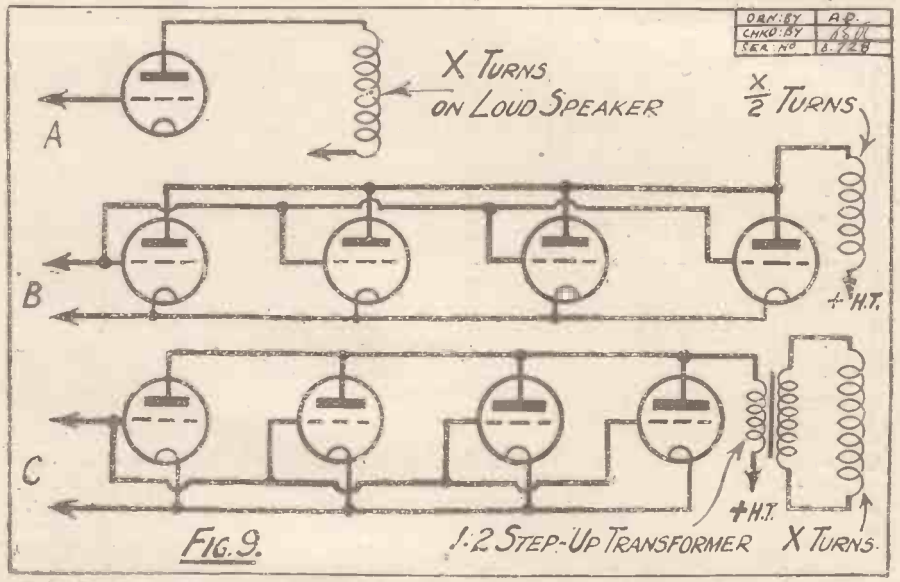


FIG. 9.

If "A" gives correct tone, then "B" will give four times the power with the same tone. In "C" the same power as in "B" will be obtained with the same tone.

The SOUTH AFRICAN BEAM

BY A SPECIAL CORRESPONDENT.

Cape Town, February, 1927.

SLOW, but sure, progress is being made with the South African Beam. Very little publicity has been given up to the present regarding developments at this end of the link, but reticence was a wise policy for the Marconi Company to adopt. It is now possible, however, for me to state exactly why the Beam to South Africa has been held up so long. and what the position is at the moment in the Cape.

Most people know now—although very few appreciated the fact a little while ago—that Beam wireless was to a great extent still in the experimental stage when Senatore Marconi first introduced it to the various Dominions and negotiated with the parties concerned to go ahead with his new system. Erroneous impressions were created in the minds of the public because they knew nothing about it, and because Marconi was shrewd enough not to commit himself by saying too much. What Marconi did know was that the fundamentals of his Beam were all right. Given time it could be brought to perfection in every Dominion. He hoped, perhaps, that having perfected one link of the system by experiment, the completion of the remainder would more or less follow suit and be easy. But the contrary has proved to be the case. We know that a broadcast receiver—or transmitter for that matter—functions differently with every change of site.

"Marconi Has Triumphed."

This is where the general public went wrong. They imagined that when Marconi contracted to install his Beam system in the Dominions that it was a finished product—standardised, sealed, ready for use—that he was talking about. One cannot remember that he laboured the point about the need for exhaustive tests when once the stations were erected. But why should he? He was confident that his system was sound and that it represented an improvement; and neither he nor anyone else could say then what tests and modifications would be necessary to bring each separate link of the system to perfection.

Marconi knew, however, that every bit of real testing—which actually has resolved itself into experiments rather than tests—would have to be carried out from the stations themselves, completed and equipped for working in every detail.

A gamble, it is true, to be compelled to first erect a chain of expensive stations on their permanent sites and then carry on with experiments! But, unfortunately, there was no alternative. Only under actual working conditions could Marconi discover how far laboratory results were true. Wireless is full of vagaries. Its elusive and inconsistent qualities are its one weakness. But this can always be overcome with patience and brains. The Marconi Company has both. The man in the street who criticises the Beam without knowing the facts has little of either. The world is now beginning to realise that Marconi has triumphed. This interim period of testing, modifying, and more testing has been an uphill struggle for the great inventor. His reputation—to say nothing of an immense fortune in the way of capital laid out—he has staked on the success of his own pet child—the Beam. And at last he is coming through with honours. Public impatience is rapidly being replaced by confidence and admiration.

The Klipheuval Station.

The South African Beam stations need not be described to any great length, because they follow very closely the stations in England and Canada which have already been described in detail. Klipheuval, where the transmitting station, depot, and repair shops are located, is a country place 30 miles north of Cape Town. Several hundreds of acres of open veld land belong to the Marconi Company here, and the view to the north is unobstructed. Table Mountain and the Peninsula rise in a blue haze to the south. There is plenty of room on the site to expand the Beam system to other countries; in fact, it was this object that prompted the purchase of so much ground. Since the successful Beam telephony tests between England and Canada, the subject has been much discussed here. At Klipheuval, however, there is ample space for separate aerial systems—telegraphy and telephony—to all the Dominions, if needed.

The power plant to operate the transmitter takes up most of the room in the large new building where transmitter and dynamos are housed. There is in addition a

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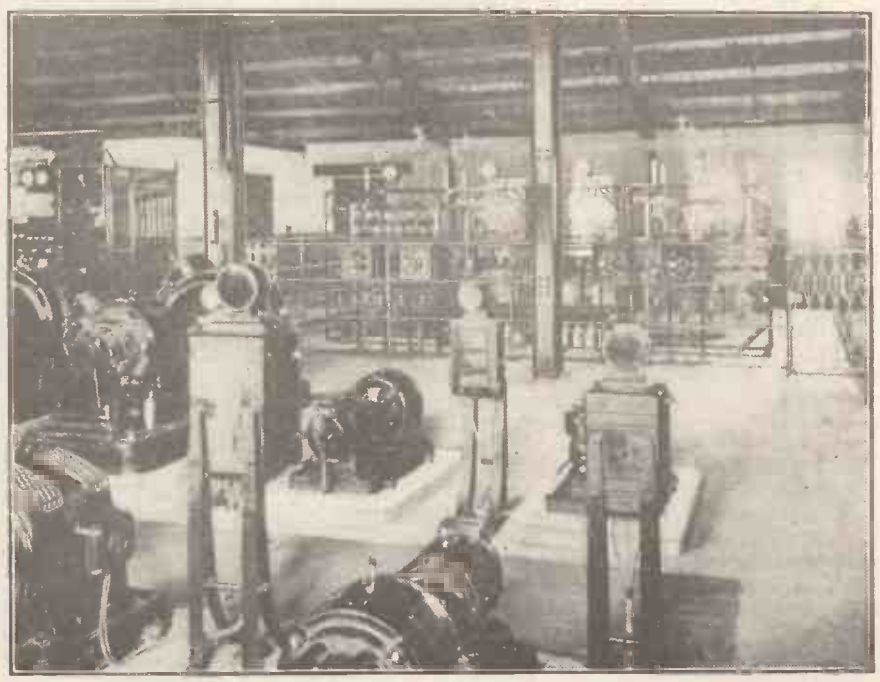
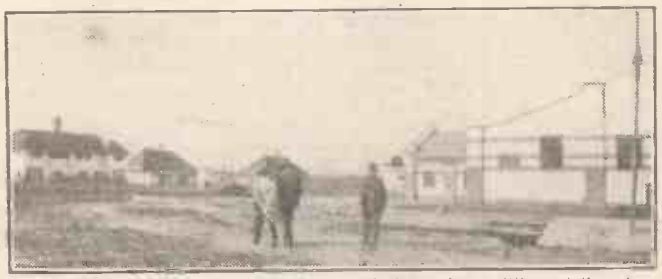


A corner of the "Machinery" hall at the Bodmin Beam Station, which operates with both South Africa and Canada.

THE SOUTH AFRICAN BEAM.

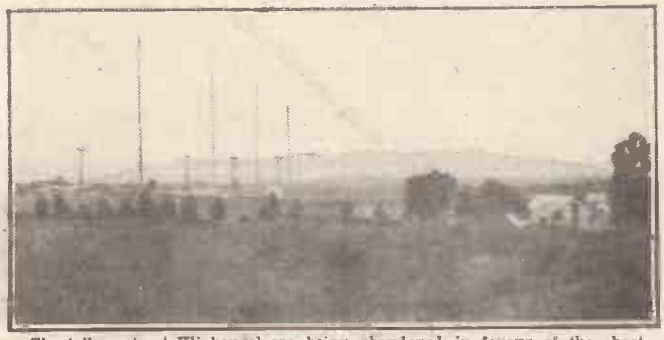
(Continued from previous page.)

row of semi-detached dwellings to accommodate the European staff. All the buildings are artistically designed and built on the pattern of old Cape Dutch styles. Everything is new and spotlessly clean at Klipheuval, including the native compound which has also sprung up.



The new staff quarters at the Klipheuval Beam transmitting station in South Africa.

The receiving station is at Milnerton—four miles north of the Mother City. The lay-out of the aerial system is identical with that at the transmitting station: five masts in a line holding four spans of vertical aerial wires and reflectors, two spans for day working and two for night. As mentioned just now, numerous tests, or rather experiments, have been carried out. Night working has been easy from the beginning, and the last time signals came through from Bodmin on 35 metres a portion of the receiver was cut out of circuit as the strength of signals was overpowering. 35 metres for night working has been definitely decided upon, and one half of the aerial systems are now being adjusted permanently to operate on this wave. It takes a fortnight to change the aerial from one wave-length to another.



The tall masts at Klipheuval are being abandoned in favour of the short ones also shown, now that the Beam is to be used.

Down to 16 Metres.

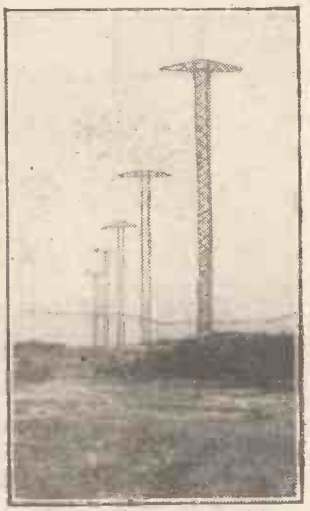
Satisfactory daylight working with England has caused the most trouble so far. Readable signals came through on higher wave-lengths, but not sufficiently loud all day and every day for high-speed automatic working. It has now been decided to go down to 16 metres for day working. Certain additional equipment to bring about this change was required from England, hence the most recent hold-up, but it is confidently hoped that final tests will be proceeding at the end of the present month (January). A further change from 35 and 16 metres respectively is not anticipated by the engineers. For some reason signals are at their faintest when they reach South Africa; 6,000 miles seems to coincide with a maximum diffusion period in Beam-wave propagation. Communication with Australia from England has proved to be much easier. This is but one of the eccentricities revealed by test under working conditions—a matter which I touched upon earlier. Nobody could foresee this. It is merely a stroke of bad luck for South Africa, and it will probably mean that Australia will be ready before us.

One great advantage, the full significance of which was not realised with early tests, is the fact that the reflector at the receiving end acts as a screen for atmospherics arriving from behind. The effect of this is an appreciable increase of signal strength against an unusually quiet background. Only by listening-in to short-wave broadcast can one appreciate the extent of the improvement, although short waves are normally well below and fairly clear of atmospherics.

Atmospherics.

So far, I am told, the Canadian station near Montreal has reaped the most benefit on this score. Canada's atmospheric region lies to the west—directly behind the receiving reflectors—and trouble from X's is now seldom experienced. In South Africa, however, terrible atmospheric storms occur on the Karroo. A line from our Beam stations to the west of England cuts the edge of this region. In the Cape, therefore, we may expect to get more interference from this source, although it has not been a great nuisance up to the present. The engineers are aware of the fact, but it causes them no alarm. They are convinced that nothing will interfere with them on 16 and 35 metres. Let us hope they are right.

From the foregoing it will be seen that South Africa is not ready for Beam telephony yet. Telegraphy must be first fixed up. The local branch of the Marconi Company (The Wireless Telegraph Company of South Africa, Ltd.) have received no instructions whatever about telephony trials, although they are greatly interested in what the British G.P.O. is doing along the Canadian link.



The masts at the Beam receiving station at Milnerton, four miles from Cape Town.

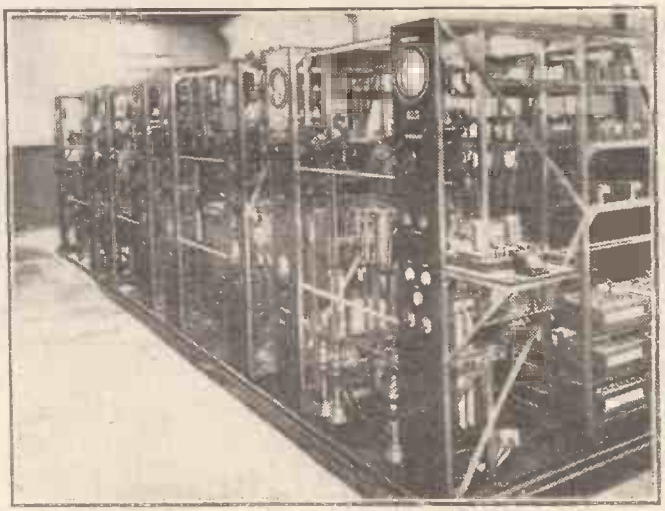
Public Enthusiasm.

Public enthusiasm about things wireless is on the increase in the Cape. To have read that the Beam will probably be the means of bringing to this country not only telegraphy, but commercial telephony and broadcasting from England as well, has made everybody sit up and take notice! The British G.P.O. are apparently hustlers now that they have got the Beam. Like a child with a new toy, they are anxious to test it right out. And South Africans are glad to hear of it, for they have been isolated long enough.

It is not anticipated that the present Beam stations will be used for anything else but telegraphic communication, but owing to the inherent directive properties of the system duplication is not accompanied by any serious difficulties.

Once the Beam really proves itself—and there is every indication that this will very shortly happen—who knows but what there may not be, not only one link, but several parallel links connecting Great Britain and her far-flung Empire?

With a cheap method of communication, such as the Beam should prove to be, trading relations, also, will be greatly facilitated.



Some of the transmitting apparatus at the Bodmin Beam station.

The "Stethocrys."

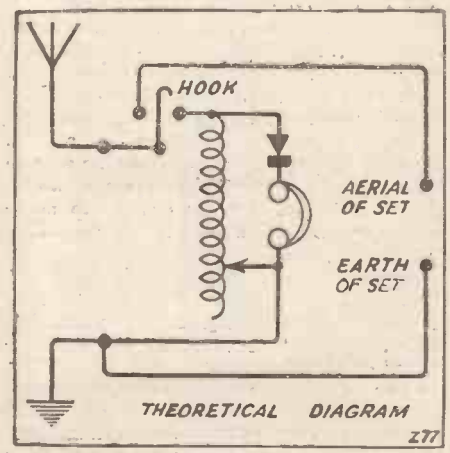
Here is something new in the way of crystal sets that should prove of considerable nterest to all practical amateurs.

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

(*Technical Editor.*)

THIS little piece of apparatus can be described equally well as either a receiver or a "device." And it should appeal equally to both the crystal and the valve man, and to both the amateur and the experimenter. From all of which it will be evident that the instrument must be a versatile article!

It has oft been said that necessity is the mother of invention, and if the Stethocrys can be classed as an invention, then of truth was it born of necessity. In the course of a week, or even in the course of a day, I test a number of sets "on aerial," and



some of these sets prove very cantankerous indeed. During these tests, it is essential that I should be able to check up the transmission of the local station and to check the efficiency of the antenna system and its connections. A sudden cessation of signals may not always mean a faulty set, or, on the other hand, no signals at all indicates nothing at all if there are no signals, unless it be the fact that there *are* no signals!

A "Radio Watchman."

The Stethocrys was designed as a sort of radio watchman. And I have found it to be simply invaluable. The aerial and earth leads running from one of my antenna systems are permanently connected to two terminals on the Stethocrys. To two more terminals on this little device, which is mounted on the wall, are connected the aerial and earth leads, and these are taken to the set under observation. A pair of telephone receivers permanently joined to the Stethocrys hang upon its hook.

While the 'phones are on this hook the aerial is connected straight through to the set in use, and the receiver portion of the Stethocrys is out of circuit. But if you lift the 'phones off their hook and put them on, the set is disconnected and the Stethocrys automatically connects itself up and becomes a full-blown crystal receiver. And being left permanently tuned to the local station and having a permanent type of detector, signals are at once heard.

When the 'phones are removed and hung upon their hook again the Stethocrys switches the aerial back to the set and retires into inactivity. It is for all the world as though the Stethocrys were an ordinary telephone receiver connected directly by landline to the local station. Don't imagine from all this that I do all my set testing on the local station, but one invariably commences thus, and when a set proves lively in this direction then one begins to "reach out."

Has Many Uses.

I hope I have indicated how useful the Stethocrys can be to an experimenter. Now what about the average constructor? Well, I suggest that an automatically standing-by crystal set is even more of a necessity in his case, for when, or if, his set tends to develop noises or to "fade away," he has a reliable means of obtaining evidence as to whether the trouble is due to external causes if he uses a Stethocrys.

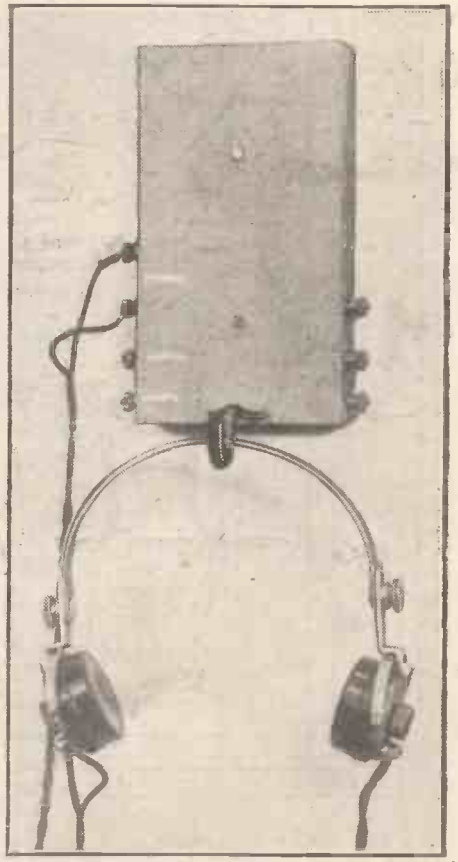
For the crystal man the Stethocrys will form a novel and efficient crystal receiver. By connecting two of its terminals together and hooking it up to an aerial and earth as an ordinary set, it will automatically earth the aerial and disconnect itself when the 'phones are hung on its hook, and replace itself in commission when they are removed. To conclude these opening remarks, I will be very disappointed if a very large number of my readers do not agree with me that the Stethocrys is a novel and very useful instrument.

Not an Expensive Instrument!

Now the construction of the Stethocrys calls for just a little skill and ability to handle simple tools. But, in my opinion, no radio enthusiast can call himself a *constructor* unless he can handle little jobs like this. But I expect that there are many readers of "P.W." who would be able to turn out a Stethocrys capable of shaming the original model in point of appearance and craftsmanship. Anyway, it is not an expensive instrument to make. Mine cost me but the price of a crystal detector—2s. 3d. I think it was! Anyway, the whole thing consists of nothing but wire cardboard, a few terminals and pieces of scrap material, such as are to be found in almost any home.

I am not going to give a list of parts required, or a list of point-to-point connections, for I feel sure that these would

(*Continued on next page.*)



The "Stethocrys" is not merely an automatically aerial-earthing set. The simple action of hanging up or taking off 'phones does much more than this.

THE STETHOCRYS.

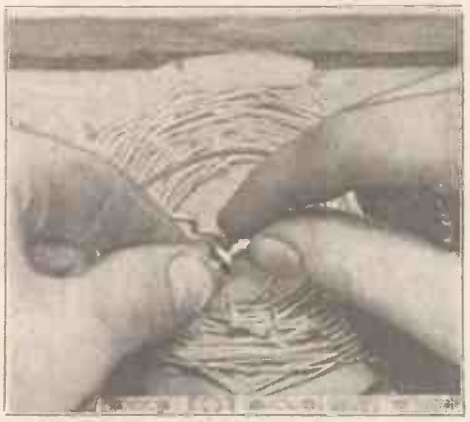
(Continued from previous page.)

prove quite unnecessary. The first requirement is a small cigar box, one having dimensions around about 8½" x 4¾" x 1¼". If one such is not available at home the nearest tobacconist will always oblige, especially if the request is backed up by a small purchase. Failing a cigar box, a case must be constructed, and for such a purpose ordinary three-ply wood is excellent.

The lid of a cigar box is generally hinged with paper, but in our case this must be supplemented with a strip of linen or very thin leather securely glued or seccotined in position. If some spare ebonite is on hand the whole job can be improved by substituting the wooden bottom and the two long sides for ebonite, although the well-seasoned cedar wood usually used for cigar boxes is an excellent insulating material.

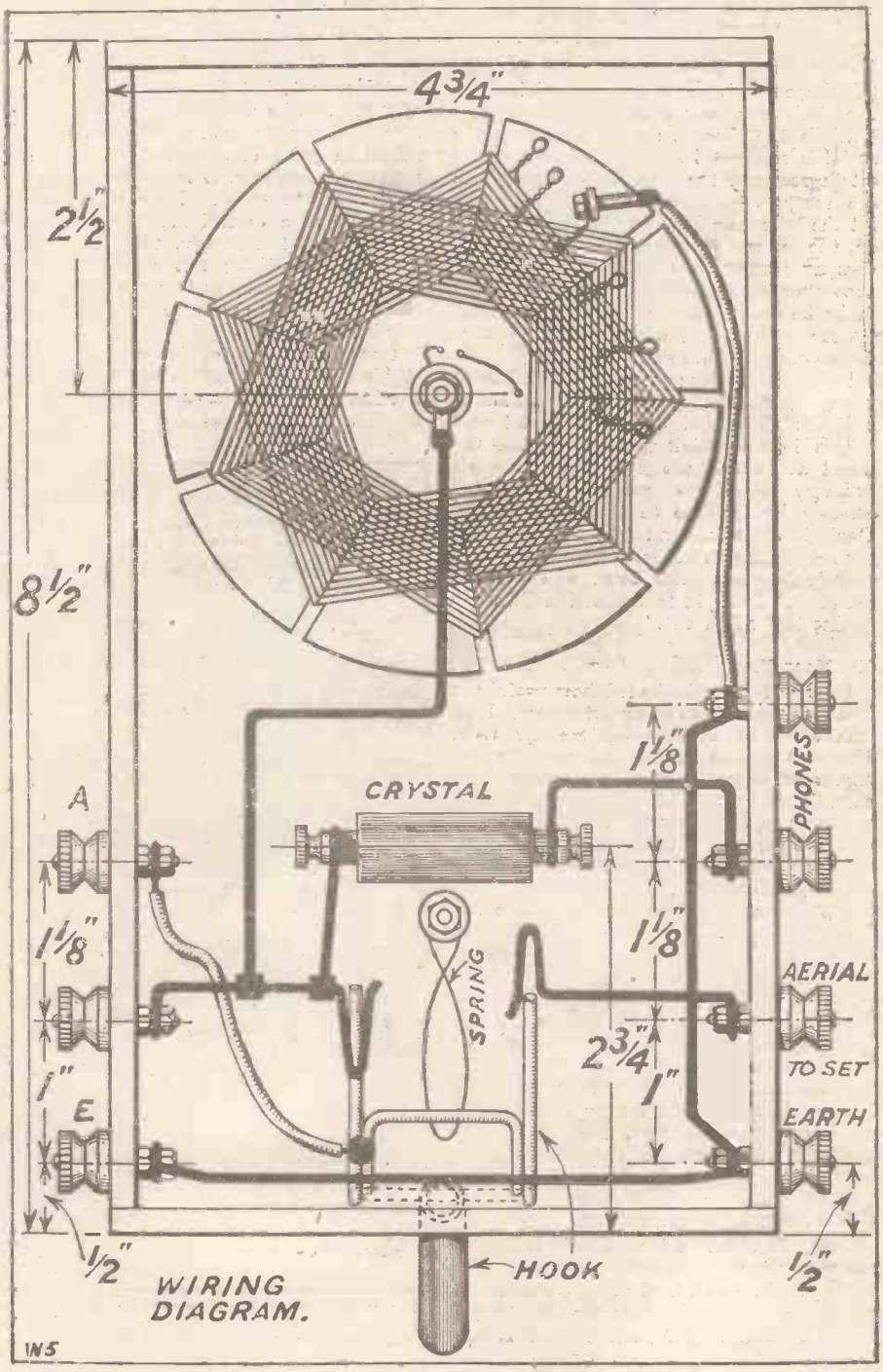
Making the Hook.

The next task is the fashioning of the hook. Now it is not essential that you should adhere very strictly to the specifications of my particular Stethocrys; perhaps some of you may be able to arrange things in even a more efficient manner than I have done. But for the benefit of those readers who like to work to definite measurements I will describe in detail every stage of construction as I undertook it.



The coil tapping is almost as quickly carried out as with a switch, and the method is equally effective.

I had some 12 S.W.G. copper wire by me, and I took 11 in. of this and carefully straightened it. I then bent it exactly in the middle, afterwards bending the two ends out at right angles 2¼ in. from their ends. Both of these were then bent backwards at right angles, 1½ in. from their ends. The double portion was then bent into a hook form. I then took 2¾ in. of the same copper wire and bent it so that it would fit in between the prongs of the hook. Then I drilled two holes near the bottom of the back of the cigar box into which the hook prongs were passed.



The Contact Pieces.

The other piece of wire was then fitted between the prongs and securely soldered in that position. This bridge piece acts both as a baffle for the spring and in the capacity of keeping the hook in position. It must, of course, permit of just a little play in the hook. This should be able to move quite freely within an arc of about ½ in. Actually, it will not need to move anything like this when the instrument is working.

Now the contact pieces can be prepared. These, in the original model, consist of 18-gauge tinned hard copper wire, and this appears to be very suitable. I have asked our chief draughtsman to do the best he can to illustrate the shape of these contact pieces, and I think you will find that the drawings will be quite self-explanatory.

Now the action of the hook switch is quite simple. Only one of its prongs is in contact at a time. When the hook is depressed the right-hand prong (looking at the back of the instrument) makes contact while the other prong is completely disengaged. When the hook is released the reverse happens.

The Switch Action.

There is sufficient spring in the square section wire to allow the prongs to force the contacts open just a little, and thus a "self-cleaning" action besides robust electrical contact is assured. I am certain that I can leave the rest of this switching business to the individual ingenuity of my readers. As I said before, it is very probable that many of them will be able to make a better job of it than I did—and my Stethocrys has been working for some time now and has never given the slightest trouble.

(Continued on page 179.)

THE "STETHOCRYS."

(*Continued from page* 176.)

Before the contact pieces are mounted it will be necessary to fix the terminals, for to two of these they are anchored. After the terminals have been screwed in position the contacts can be adjusted and secured. I not only held them in position with nuts but soldered over these nuts as well, thus making the whole thing very permanent.

Next, the spring must be prepared. I was fortunate, for I had at hand some steel wire which was once in use as a spring in a very cheap toy engine. But a piece of clock spring of medium size can be used, or failing that a small spiral spring could be employed, but this would have to be taken to the bottom side of the box, for it would have to act as a pulling spring and not as a pressure spring. But I would prefer the latter type as this can be mounted more easily. The photographs show how the spring is fixed, and it will be observed that it is so bent that it tends to push the hook baffle away from the back of the box.

Winding the Coil.

Everything can now be wired up except the coil and crystal. Of these more anon. Eighteen gauge square section wire should be used for the wiring and everything should be soldered. I am not going to give the wiring in detail, as this is so simple and the diagrams and photographs so clear that nobody could possibly go wrong.

I used a "Griphco" permanent detector, and found it to be in every way quite satisfactory, but a detector of the semi-permanent type could be used. There are the R.I. and the N.M.C. and many others that will fit in quite well and give good service. The method of mounting the detector will depend upon the type used, but in the case of the "Griphco" it can be held quite comfortably in position by its own connections of 18 gauge square section wire.

The former of my coil was cut from waxed cardboard. I first cut a 4 in. circle. and then marked out on this a central circle of 1½ in. diameter. Then I sliced out nine slots and wound on the wire, not in and out each successive slot, but missing a slot each time. I used 26 gauge cotton covered and first of all wound on 40 turns and then made a tapping loop. I then wound on a further 25 turns, taking tapping loops at each five turns. These loops are just loops! You stop the winding, twist a little loop, and then carry on winding. The wire is not cut or broken.

Insulating the Hook.

The loops must be bared and scraped clean, after which the coil can be mounted by passing a small screw through its centre and through the back of the box. I made this screw serve a double purpose by taking the inner end of the coil to it, and then joining the 18 gauge wire of this screw with a soldering tag and, of course, another nut to hold this in position.

A small piece of flexible wire is then required. To one end should be soldered a soldering tag and to the other a small terminal or nut and screw. This latter is used for making connection to the tapping loops. A lead or so here and there to complete the wiring according to the circuit shown and the instrument is ready for the final clean up—and adjustment of the hook contacts if necessary.

A piece of rubber tubing should be slipped over the hook in order to insulate it from the headband of the 'phones which will hang upon it. An ebonite or porcelain hook would be much better, but such would be difficult to obtain.

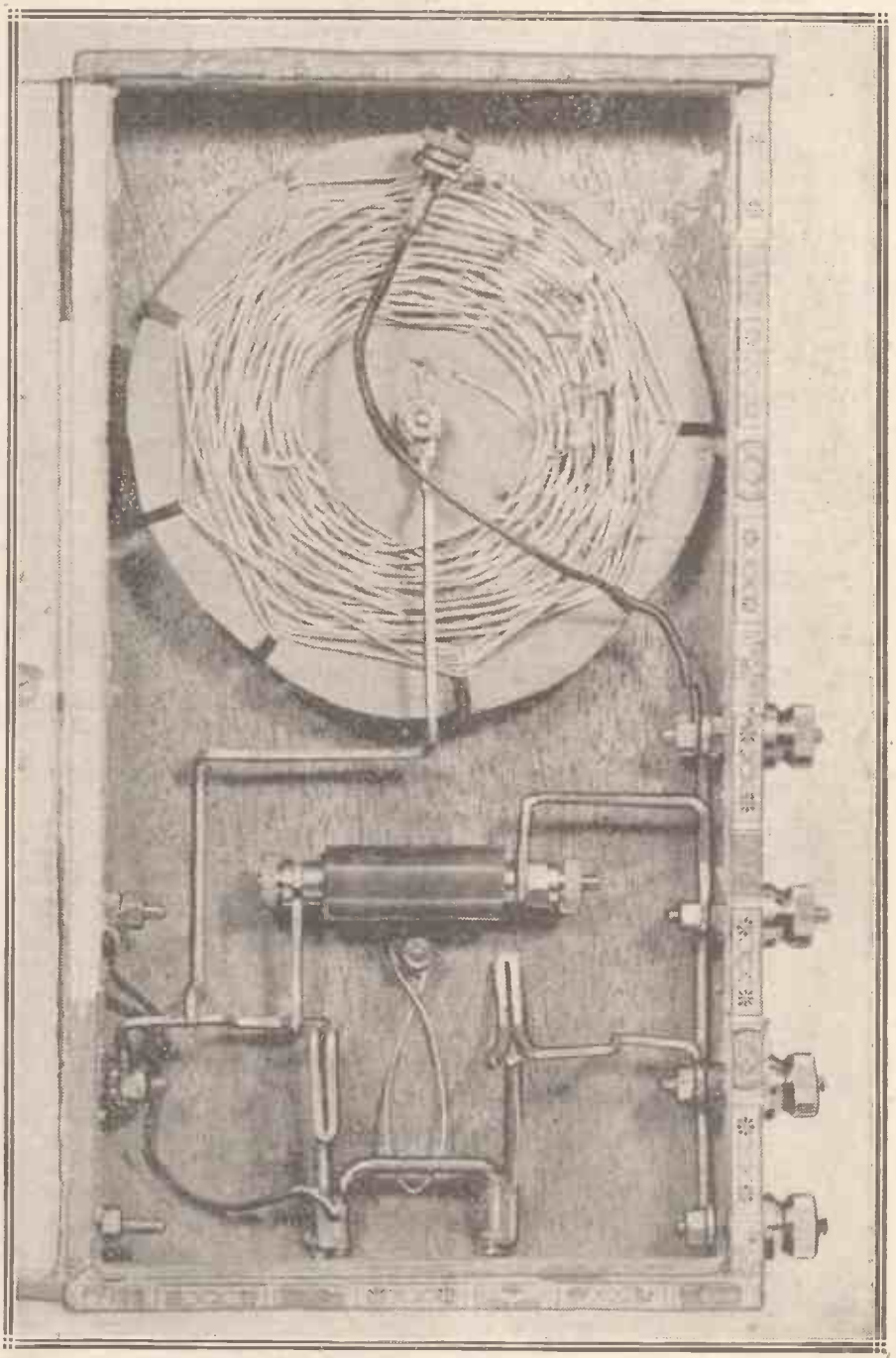
The Instrument in Use.

The Stethocrys can be mounted upon the wall by driving screws through the lid of the box. Rawlplugs are to be advised here. The whole box will then swing on the lid and allow access to the innards to enable the crystal to be adjusted. Needless to say the tuning will not be required to be altered once the necessary setting has been discovered unless the local station changes its wave-length.

When the Stethocrys is used purely as a crystal set the two terminals marked "A" and "E" "of Set" should be connected together with a piece of wire or with a metal strap. Then, when the 'phones hang upon the hook the crystal is disconnected and the aerial joined direct to earth.

When the instrument is used with another set as a "Radio Referee," the above-mentioned two terminals should be connected to this other receiver—in both instances the aerial and earth leads remain upon the Stethocrys aerial and earth terminals.

The centre terminal of the three on the right (from front) is not used in either case.

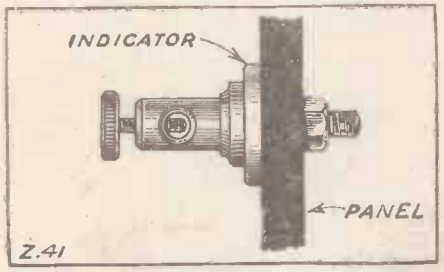


This photograph almost makes the wiring diagram superfluous, and used in conjunction with this, every detail of construction and wiring should be made perfectly clear.

MORE HINTS AND HOOKUPS.

L.T. TERMINAL INDICATORS.

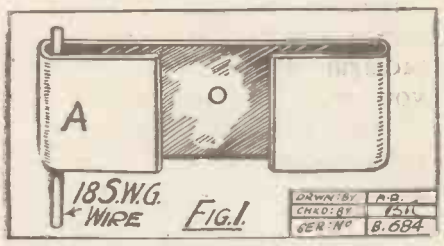
EXCELLENT indicators can be made from two red and green counters, such as used for various games. Drill a hole in the centre of each to admit the terminal shanks to pass through, seeing that you put the red on the positive terminal and the



green on the negative. Next you will have to screw the terminals to the panel by means of the nuts, as shown in the sketch. These counters are likely to be made of bone, and thus prove to be excellent insulators for a wood panel if one is placed at each side of the panel.

UTILISING SCRAP BRASS.

Among the junk that invariably goes into one of the writer's boxes are the thin brass terminals from worn-out flash-lamp batteries. They tear away easily, and come in useful for quite a number of purposes. For example, when bent and punched or drilled, as in Fig. 1, they make very effective clips for linking together other flash-lamp batteries into an H.T. battery for use with a one or two-valve set. When bending over the ends



of the strip, it is a good plan to press the pieces together (using pliers) over a bit of 18 S.W.G. wire inserted at the points marked A. This gives a certain springiness to the clip when the wire is removed.

Excellent soldering tags may be made from these strips. Provided they are thoroughly clean, the solder will run very easily, and the brass can be cut with ordinary scissors to any desired shape or size. A whole strip may be used if desired as a tag to be attached to a home-made fixed condenser.

The brass of these strips is perhaps rather thin for use in constructing angle-pieces designed to support heavy components, but a couple of L-shaped pieces screwed down tightly to a baseboard will hold a paxolin or cardboard coil former securely in an upright position, and strips suitably bent with round-nosed pliers can be used as holders for a grid leak.

L.F. BREAKDOWNS.

These breakdowns are often referred to as burn-outs, but a moment's consideration will show that the small anode current taken by a valve is quite incapable of burning out the winding of the transformer. These breakdowns are, in actual fact, the result of surges set up in the primary winding due to sudden interruptions in the H.T. supply.

The primary winding when in use has a certain amount of energy associated with it in the form of a magnetic field in the core, and if the H.T. current is suddenly cut off, a high voltage is generated in the transformer winding (many times the value of the H.T. voltage used). This high voltage breaks down the insulation between turns at one end of the winding, and produces a spark discharge which melts the wire at that point. If broken-down transformers are carefully unwound, the evidence of this procedure can be seen, together with the characteristic green discolouration produced by high potential discharges.

To avoid this trouble, the amateur is advised to take the following precautions:

(1). Switch on the H.T. before lighting the valves.

(2). Always light the valves gradually by means of the filament rheostats, or, if it is desired to preserve the settings of these, by means of one rheostat connected in the common L.T. lead.

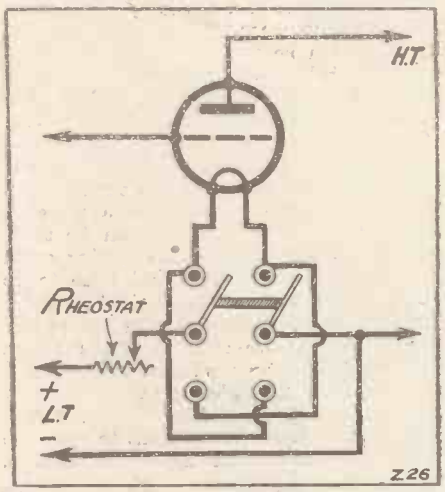
(3). Turn off the valves gradually by means of the rheostats, before removing the H.T. plug.

(4). Always dim the valves before making any alteration in the H.T. voltage.

By following these precautions you will avoid breakdowns both in L.F. transformers and in 'phones and loud speakers.

AN L.T. REVERSING SWITCH.

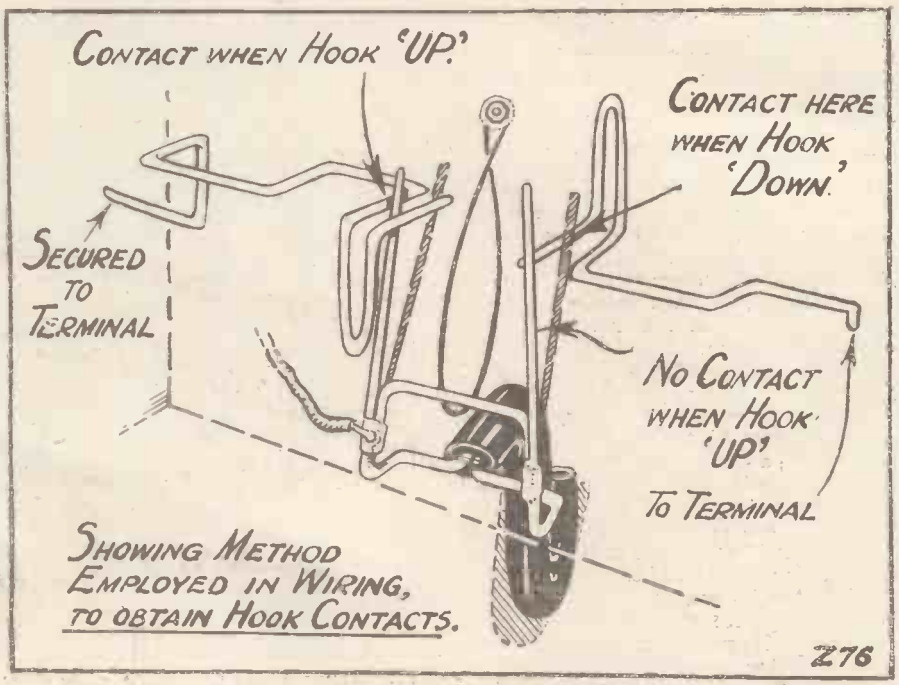
It has been supposed on occasion that a valve filament becomes weakened by sending the current through it continually in one direction only, the suggestion being made that the negatively charged electrons tend to depart from the filament



at the end to which the negative lead of the battery is connected, and that this effect untimately causes a local weak spot in the filament.

Whether this effect is observed in the majority of cases, and especially in modern valves, is doubtful. However, if any amateur who is troubled with continual filament breakage would like to try out a method of reversing the direction of the filament current at will, in order to lengthen the life of the filament, here is the necessary circuit.

From the diagram it will be observed that the use of a double-pole change-over switch is necessitated. Such a switch may, of course, be secured on the panel or even at the side of the cabinet.



This picture shows in detail the essential mechanism of the "Stethocrys," which is described in the three preceding pages.

BROADCAST NOTES.

FROM OUR BROADCASTING CORRESPONDENTS.

A Challenge to the Broadcasting Monopoly—B.B.C. and Contracts—The Queen's Hall—Sir Harry Lauder—B.B.C. and Press Club—Shakespeare's Birthday—An Imaginary Conversation—Is Chivalry Dead?—Hull Takes Daventry—Community Singing at Aberdeen—Nelson Keys and Florence Smithson—An Experiment in Alternatives—Sports Talk Change at Cardiff.

A Challenge to the Broadcasting Monopoly.

POPULAR WIRELESS understands that a serious and determined challenge to the broadcasting monopoly is about to be made.

Secret Wireless, Ltd., the venture sponsored by Sir Patrick Ford, Mr. Chisholm, and Sir Walter de Frece, having failed to carry out their original plan, have now turned their attention to the transmission of entertainment by electric light wires.

Such success has attended their recent experiments at Birchington, in Kent, that the promoters have attracted the financial and moral support of Mr. Gulliver, the music-hall "king," and the Holborn District Council, where the new transmissions are to be introduced to the public. Work is understood to have commenced on a special studio at the Holborn Empire.

The opinion of distinguished counsel is that there is nothing to prevent these transmissions being developed unless special legislation is brought in. The main object of the enterprise is to rival the B.B.C. Both Savoy Hill and the Post Office are in possession of all the facts of the experiments and the plans. The Post Office believe they already possess powers to counter the project—but if it should turn out that they have not, then the necessary new powers will be sought at once from Parliament.

On the programme side the new broadcasters propose to confine themselves to light entertainment and news. They believe that they will be able to put out news at all times of the day and the night, and they will concentrate on racing results and betting odds.

In this connection they believe that they will enlist the active co-operation of a group of newspapers which may disavow the news agreement made with the B.B.C.

B.B.C and Contracts.

The floors of Savoy Hill are literally strewn with broken contracts. First of all, there was Ella Retford; then followed Maidie Scott, and others are believed to be in hand. The B.B.C. are reconsidering their whole policy in respect of variety. This they are bound to do in self-defence.

It was hoped that the variety artists themselves would take some joint action to secure the right to earn a little extra money by broadcasting. This was the course followed so successfully in Germany. But no such action is contemplated in England. Therefore the B.B.C. are making plans to secure their independence of the music-halls.

It is probable that they will build up a staff of contract variety artists, drawn from both sides of the Atlantic. These artists will be wholly supported by broadcasting, and will be barred from appearing on any of the halls of the hostile syndicates. Some time must elapse before this enterprise is in working order. In the interval, there is likely to be less variety in the programmes. The B.B.C. cannot be blamed.

The Queen's Hall.

While the war between the music-halls and the B.B.C. intensifies in bitterness, the struggle between the concert-hall and the B.B.C. has given way to an armistice, during which quite friendly discussions are taking place with a view to saving the Queen's Hall for good music.

There is no sign whatever of the intervention of benevolence. If the Queen's Hall is to be saved it will have to be through some business arrangement between the parties most intimately concerned, that is, the music-publishers, the B.B.C. and the gramophone industry. A solution is not likely to emerge for some time. It is satisfactory to note that the B.B.C. has maintained the initiative throughout these negotiations.

Mrs. Jack Hylton telephoning the new song, "Shepherd of the Hills," from New York to London by the new Radio service.

Sir Harry Lauder.

Sir Harry Lauder, who gets back from America in April, will be engaged in film work for some time. This being the case, he will be available for broadcasting. Savoy Hill has given no indication as yet as to whether he is to be invited to appear at the microphone in the near future. Such an engagement would be universally popular.

B.B.C and Press Club.

The main part of the London programme on the night of Saturday, April 23rd, will be relayed from the Press Club, where the annual Ladies' Night celebration will be in progress. The artists for the occasion will include such favourites as Tommy Handley, Mabel Constanduros, Maurice Cole, Dale Smith, the Wireless Chorus, and the London Radio Dance Band. The second news bulletin will also be relayed from the Press Club. Sir J. C. W. Reith will be among the guests of the Press Club for the evening.

Shakespeare's Birthday.

"The Merchant of Venice" will be specially produced in a London studio to commemorate the anniversary of the Bard of Avon's birthday. Incidentally, it is hoped that the B.B.C. will be able to turn the occasion to account in connection with the sale of Shakespeare Heroine Books on behalf of the Shakespeare Memorial Fund.

An Imaginary Conversation.

Miss Viola Tree and the Hon. Maurice Baring are giving an imaginary conversation between two classical personages in the London studio on April 6th. This should be most entertaining.

Is Chivalry Dead?

Miss Rose Macaulay and Mr. C. du Garde Peach will debate this subject by broadcast on April 1st.

Hull Takes Daventry.

Beginning in April, Hull will relay the Daventry morning programmes on Mondays and Thursdays from 11 to 1.

Community Singing at Aberdeen.

Aberdeen, which claims to be the first station in the world to broadcast Community Singing, is relaying a special concert of this kind on Wednesday, March 30th. The concert is being given at Turriff.

Nelson Keys and Florence Smithson.

Florence Smithson, the popular actress, and Nelson Keys are touring the main British stations during the weeks beginning April 25th and May 2nd.

An Experiment in Alternatives.

On Tuesday, April 5th, in the first part of the main programme, London will broadcast selections of musical comedies, while Daventry will be putting out Sir Hamilton Harty's symphony concert at Manchester. In the second half of the evening the rôles will be reversed. The effect on listeners will be carefully noted at Savoy Hill, where people are busy trying to solve the difficult problem of suitable contrasts as a basis for the new system of distribution.

Sports Talk Change at Cardiff.

The weekly sports talk at Cardiff—an important feature for Welsh and West Country listeners—is being changed from Saturday to Thursday, the latter being considered more suitable for the purpose. This change is to be introduced in the first week of April.

AN UNUSUAL TWO-VALVER.

The Editor, POPULAR WIRELESS.

Dear Sir,—The following circuit, which I recently worked out while trying the Sharman receiver. I feel to be worthy the attention of many. It gives remarkably good results on local and comparatively distant stations, and, to my way of thinking, ranks with the "Trinadyne" and "Hnle" circuits. According to the degree of pressure on the crystal the oscillation is controlled, and when that pressure is correct (easily done), the set oscillates some time before L.F. reaction takes place.

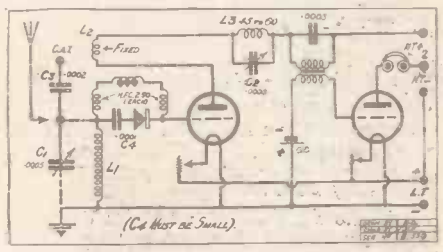
In conclusion, I think that only the inveterate "circuit monger" will pull the set down once made up, although, as drawn, while being reasonably selective, it is not the last word therein.

The system might be applied to any detector valve having L.T. negative to earth.

Yours faithfully,
L. PRIDDIS.

10, King Alfred Terrace,
Winchester.

P.S.—In my own case I find the H.F. chokes unnecessary. Several obvious variations are no gain, but this one is good.



SHORT-WAVE RECEPTION.

The Editor, POPULAR WIRELESS.

Dear Sir,—I read with great interest the letter of Mr. Manby re his reception of K D K A on the short waves.

As this was apparently his first attempt at the reception of this station on the short waves, I consider that his results were most remarkable. Let me make it quite clear that I do not doubt the accuracy of his report. No doubt he has made many more attempts, and it would be very interesting if he would let us know the results of these attempts, and also the strength at which his reception of this station is most consistent.

The letter of Mr. Best was also interesting; but opinions of *well received* may differ greatly. Up till reading Mr. Manby's letter I always considered that I was receiving K D K A well, but although I have two good stages of L.F. (I normally use one stage) I have never yet been able to put it through the loud speaker.

My average reception is that I can just follow the programme with detector alone; sometimes the call sign can be heard, sometimes not. In other words, if it was just a little weaker I shouldn't hear it at all. I might add that I have a good pair of 'phones and low-loss ears.

In a certain wireless journal a week ago a receiver was described that would receive on the short waves, and upon the broadcast band, constructed from the usual ordinary good components, with quite an ordinary circuit. It was stated that this receiver would bring in thirty or more Continental and American short wave stations on the loud speaker, using two valves only. K D K A could be received with the aerial removed 8 feet away from the receiver. Moreover, even on a bad night, K D K A could be received on the loud speaker. I do not propose to comment upon this.

I should like to see further correspondence from Messrs. Best and Manby, and any others who are interested in the reception of short-wave stations, including the short-wave transmitter of W G Y. I might mention that I get much better results from the 32/79 M. transmitter than I get from K D K A. The wave is remarkably steady, and the signals are an L.F. stage louder.

I write this letter in all humility, knowing that my receiver is not necessarily as good as others, and also that reception at my home is not necessarily the same as reception elsewhere in this country.

Trusting, sir, that you can find space to publish this in our paper, POPULAR WIRELESS.

Yours faithfully,
THOMAS CRUNDWELL.

56, Church Road, Bexley Heath, Kent.

NEXT DOOR'S BROADCAST.

The Editor, POPULAR WIRELESS.

Dear Sir,—When receiving 5 XX on my four-valve Western Electric receiver, I have been constantly jammed by what I thought a foreign station, but, having tuned to receive the interference clearer, I found that I was receiving the conversation which was taking place in the house of my next-door neighbour, who has a crystal set, with aerial practically parallel with mine.

Has any reader of POPULAR WIRELESS had similar experience?

Yours faithfully,
"CANAL."

P.S.—The reception is quite clear, and can be tuned as though it were being broadcast.

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 WAVE-TRAP THAT WORKS.

The Editor, POPULAR WIRELESS.

Dear Sir,—The wave-trap of which particulars were given recently in POPULAR WIRELESS fully justifies its name.

Using this upon a very flat-tuning two-valve set, the following results were obtained:

Received at good 'phone strength, with no trace of London.—Wave lengths: 304·7, Hamburg; 389·6, Toulouse; 384·6, Manchester; 379·7, Stuttgart; 373, Madrid. London in background, tuning difficult.—Wave-length: 365·8, Leipzig. 361·4, London. London cut out, but tuning difficult.—Wave-length: 353, Cardiff. No trace of London.—Wave-lengths: 337, Copenhagen; 326, Birmingham; 319, Dublin.

The test was made while an orchestra was performing at 2 L O. Daventry was readily cut out and Radio-Paris received at full strength.

Yours faithfully,
W. W. WOODMAN.

61, Hanover Road,
Willesden, N.W.10.

L.S. SET FOR A "LOOPED AERIAL."

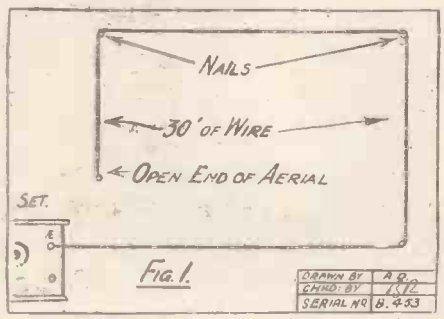
The Editor, POPULAR WIRELESS.

Dear Sir,—As a flat-dweller, it occurred to me to fit up a circuit that may appeal to others who may not have room for outside aerials, or prefer, for neatness, the use of the indoor.

The aerial on which I conducted this experiment was wound round four nails, spaced at a distance to cover thirty feet of wire, and left open at one end, as Fig. 1.

The aerial-wire used was ordinary electric lighting flex. I am situated about seven miles from 2 L O, and my flat is approximately fifty feet from the ground floor. Good loud-speaker strength was coming in from the local station without distortion.

On the headphones, Bournemouth and Manchester come in fairly well. The coils cover all B.B.C. wave-lengths except 5 XX.

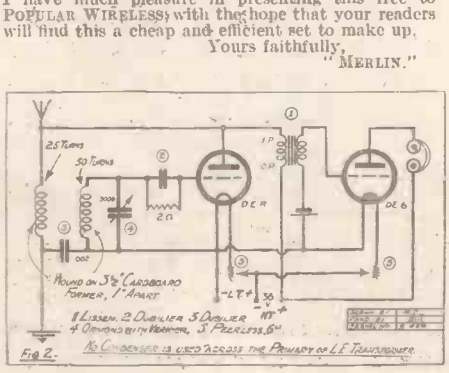


The tuning is fairly critical, also the adjustment of the filament rheostat of the first valve, which controls to a large extent the reaction. As will be seen by the circuit attached, the aerial coil is semi-aperiodic; in which case the length of aerial should not be increased too much, as this factor governs the strength of oscillation.

Of course, an outside short single aerial will give slightly superior results.

The attached diagram gives the circuit in detail. I have much pleasure in presenting this free to POPULAR WIRELESS, with the hope that your readers will find this a cheap and efficient set to make up.

Yours faithfully,
"MERLIN."



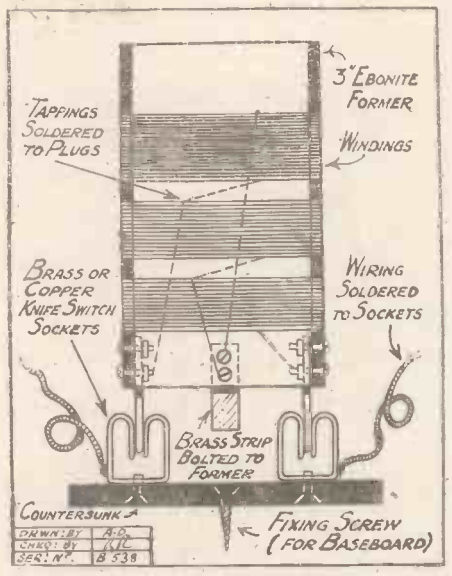
PLUG-IN SOLENOID COILS.

The Editor, POPULAR WIRELESS.

Dear Sir,—As an amateur who constructs and experiments with many sets I have had many tips for gadgets from the various papers, and as a thank-offering which I hope may be acceptable, I enclose you a rough sketch of a fitting which I find more useful than any other as regards "finnicky" work with the new circuit coils, and which you might think worthy of showing your readers, as they can so easily make them for a few coppers.

Yours faithfully,
WM STEPHEN.

31, Howland Street, London, W.1.



NATURAL REPRODUCTION.

The Editor, POPULAR WIRELESS.

Dear Sir,—Your correspondent, "Maltese Cross," writing in the February 12th issue of POPULAR WIRELESS, states that "several transformers actually gave better results than the make mentioned by Mr. Baggs,"—i.e., the A.F.3. I think that everyone who pretends to have any knowledge of L.F. transformers knows that there are not *several* transformers giving better results than the A.F.3, and if "Maltese Cross" will compare the curve of the A.F.3 with the curves of any other make of transformer he wishes, he will find there is only *one* other make of transformer that equals the A.F.3.

Yours faithfully,
GORDON A. SMITH.

Sidcup, Kent.

HAS ANY OTHER READER HEARD THIS STATION?

The Editor, POPULAR WIRELESS.

Dear Sir,—It may interest your readers to know that I received W I O D, Miami Beach, Florida, in the early hours of a recent morning between 3 a.m. and 4 a.m. on a wave-length of 247 metres. I was using a three-valve set—1 H.F., det., 1 L.F. Reception was good at times but fading was rather marked. Incidently, I should be much obliged if anyone can supply me with copies of POPULAR WIRELESS dated January 31st, 1925, February 7th, 1925, and February 14th, 1925. I will refund postage.

Wishing "P.W." continued success.

Your faithfully,
D. C. GATTIKER.

"Mon Desir," Boreham Wood, Herts.

MORE LOUD CLICKS

The Editor, POPULAR WIRELESS.

Dear Sir,—Like your correspondent "E. Liminator" I also have experienced loud clicks in the loud speaker, but I cannot agree that these are due to switching on and off of electric lights, as same have been heard during the morning transmissions. In this neighbourhood the majority of houses use gas, only a few tenants having installed electric light, and I consider that the clicks occur too frequently to be lights going on or off.

However, "E. Liminator's" experience and mine agree, inasmuch as it is only on the Daventry wave-length that the noises are heard, and further, like him, I also shall be very pleased to hear of a cure for this mysterious trouble.

In conclusion, might I state that I appreciate very much the simple, yet efficient, constructional details which appear in "P.W."; for that reason I purchase no other.

Best wishes,
"D. C. MAINS."

(Continued on page 197.)

IMPORTANT ANNOUNCEMENT!

The CYLDON Research Dept. have produced an entirely new type of Variable Condenser named—

THE CYLDON LOG MID-LINE

This new condenser is a great advance over all others, and easily surpasses in performance the Square Law and Straight Line Frequency types.

It is designed on the

LOGARITHMIC PRINCIPLE

the shape of the vanes is approximately between square law and straight line frequency.

When multiple-tuned circuits were first simplified by the ganging of condensers, the square law pattern was the nearest approach to perfection, but we realised that the tuning was limited to a portion of the scale. At each end was silence due to the out of balance, owing to the shape of vanes following a straight line Wave-length curve.

Our research department immediately tackled the problem, and after many months extensive experiments we have produced a new shape vane following a logarithmic law, which has very decided advantages over all other condensers.

With these new Condensers tuned circuits are balanced over the entire scale.

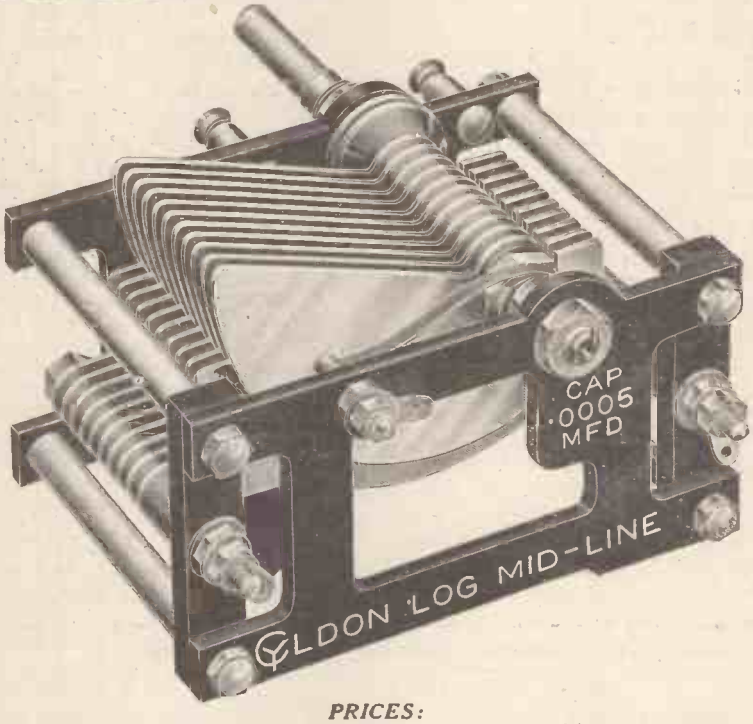
In multi-tuned circuits, all dial readings are identically the same when two or more condensers are in use.

Stations are much more evenly distributed over the whole scale.

THIS NEW CYLDON ACHIEVEMENT IS THE FIRST VARIABLE CONDENSER MADE IN THIS COUNTRY ON THE LOGARITHMIC PRINCIPLE

Constructors who have gang condensers of the square-law pattern will appreciate that this new advance in design was not foreshadowed until the advent of gang circuits, and we think they will appreciate that as the science of Radio progresses, new inventions must necessarily come.

This new condenser is such a great improvement that in future all our gang condensers will be built up with Log Mid-Line units. They are the latest and greatest advance in Condenser design, and there is not the slightest doubt that the Condenser of the future will be the Cyldon Log Mid-Line.



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·0005	-	-	-	-	17/6
·0003	-	-	-	-	16/6
·00025	-	-	-	-	16/-
·0002	-	-	-	-	15/6

With 4 in. Knob Dial. If dial is not required deduct 2 -

NEVER MIND WHAT YOUR CIRCUIT IS—GET

CYLDON

(PRONOUNCED SIL-DON)

LOG MID-LINE CONDENSERS

From your dealer, or direct from :

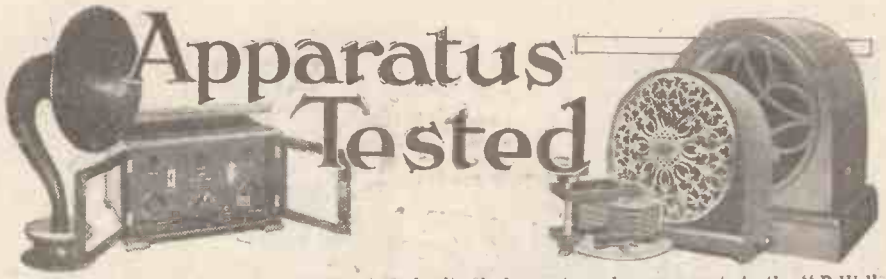
SYDNEY S. BIRD & SONS, Cyldon Works, Sarnesfield Road, Enfield Town, Middx. *Telephone : Enfield 0672.*

CYLDON

TEMPRYTES

THE BEST MEANS OF VALVE CONTROL. PRICE 2/6 EACH. MOUNTING 1/6 EACH

FULL PARTICULARS & VALVE CHART FREE ON REQUEST



Traders and manufacturers are invited to submit wireless sets and components 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.

SCREENED WIRE IMPROVEMENT.

MESSRS. WARD & GOLDSTONE inform us that, following up our suggestions made recently in these columns, they have decided to add a layer of fine, pure rubber to their screened wire in addition to the coverings of well waxed cotton. This will be, of course, a vast improvement, and will eliminate all possibilities of trouble occurring when the material is subjected to high voltages.

It is interesting to note that our Mr. J. R. Wheatley, who specialises in L.T. and H.T. mains units and other such devices, strongly recommends the use of screened wire for wiring receivers which employ the new K.L.1 valves. He does not advise the earthing of the metal covering.

FOR HOLDING BIAS BATTERIES.

Looking through the advert. pages of "P.W." one could be excused for coming to the conclusion that every conceivable requirement for the radio constructor is amply catered for, but it is possible, even highly probable, that this is quite an illusionary effect produced by the multitude of makes and types of components and accessories. For instance, up till quite recently we have thought it necessary to carve grid-bias battery clips out of scrap brass and what not, and doubtless many thousands of amateurs have done likewise. Now, however, Messrs. A. H. Hunt, Ltd., of Croydon, have placed grid-bias battery clips on the market at 6d. per pair. Another little problem solved! No further does the need arise for the unmechanical amateur to leave his grid-bias battery swaying about loose on the baseboard or wedge it in between an L.F. transformer and an R.F.C.!

A PRICE REDUCTION.

We are informed that owing to increased demand and the subsequent increased production and improved methods of manufacture, those well-made Lewcos Coil Screens and bases have been reduced in price from 15s. to 12s.

LAMPLUGH POTENTIOMETERS.

Although potentiometers are not used in many modern receivers, there are still in vogue many popular hookups for which such a component is essential. There are several points of importance in the design of an efficient potentiometer, and these are all embodied in the Lamplugh, one of which was recently submitted to us by Messrs. Lamplugh, Ltd., of Birmingham. For instance, it has the necessary high resistance of 500 ohms, while the wire is of a very serviceable gauge and is not flimsy. The moving contact is protected, as it is arranged to run round the inner diameter of the resistance element. The contact is, too, a special spring device which, compensating widely for inequalities of the surface over which it rides, provides a smooth and positive adjustment. Three substantial terminals and soldering tags are fitted, and the component is arranged for one hole panel mounting. A large engraved dial and milled knob and pointer give it a dignified appearance on the panel.

THE NEW COSSOR VALVES.

We have just had an opportunity of testing the new Cossor 6-volt range of valves, commencing with the high *mu* "resistance-capacity" valve and going right down the impedance scale to the Stentor Six. All the four valves are undoubtedly extremely efficient, and although

(*Continued on page 188.*)

A Copy for the asking

BY sending three halfpenny stamps to cover cost of postage and packing we shall be pleased to post to you ONE FREE COPY of the most valuable book describing the standard coils for every modern type of receiver. Pin Connections are given for every type of Standard Six Pin Coil.

COLVERN COILS

This reproduction indicates the internal pin arrangement of the Colvern Featherweight Former to accommodate the Colvern Interchangeable Primary.

¶ The former is constructed of the highest quality genuine moulded Bakelite, ensuring a completed inductance of extremely low high-frequency resistance.

¶ Colvern Low Loss Inductance Formers may be purchased in two styles; wound to standard specifications, or unwound for home-winding.

¶ Supplied in varying types to suit every purpose—for use with or without standard screened coils.

¶ Wound on costly and extremely accurate machinery which permits the production of space-wound coils to a high degree of uniform accuracy.

¶ The only Skeleton Six-pin Former fitting into Skeleton Base with a consequent higher ratio efficiency than any other similar type of coil.

¶ Universally approved by the expert set designers on the Press and with leading manufacturers.

¶ The only range of coils allowing the use of an interchangeable primary winding.

THE COLLINSON PRECISION SCREW CO., LTD., Provost Works, Macdonald Rd., WALTHAMSTOW, LONDON, E.17.

When it storms or sleets or blows!!

Will your aerial stand the test of the equinoctial gales this year?

You can be independent of all outdoor aerials if you use a Ducon.

It fits into an electric lamp holder and turns your lighting mains into an aerial.

It consumes no current whatever and is absolutely safe to use and handle.

There are many interesting ways in which a Ducon can be invaluable to you.

Every Ducon is guaranteed by us and we shall be pleased to supply you direct in case of difficulty.

May we send you a copy of our illustrated Ducon leaflet?

There are more than 500,000 Ducons now in use.

THE · DUCON

10/-

M.C. 269

DUBILIER

ADVT. OF THE DUBILIER CONDENSER CO. (1925), LTD., DUCON WORKS, VICTORIA ROAD, NORTH ACTON, W.3

APPARATUS TESTED.

(*Continued from page* 186.)

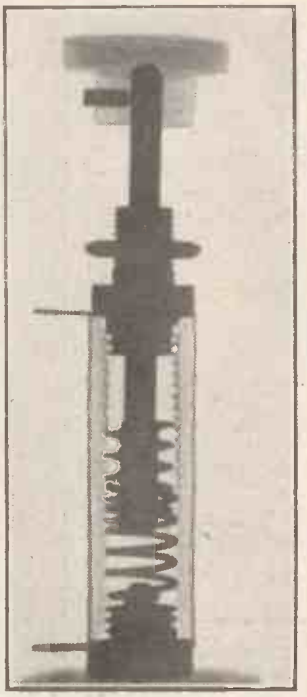
one of the H.F. valves was a little off colour and inclined to be insensitive, this is probably an unusual occurrence, as all the others were extremely lively. Lively, that is, in the sense in which they should be lively, giving full amplification while being easily controlled.

The first of the series, the 610 R.C. valve, operates at well under the rated 5·5 volts, and takes rather less than .0·1 amp. It has an impedance of about 70,000 ohms, and an amplification factor of 50. It should be used with an anode resistance of 500,000 ohms. The H.F. valve (610 H.) operates excellently in all H.F. circuits requiring a moderate impedance and amplification factor (20,000 and 20), and also forms a good second-stage resistance capacity amplifier if properly grid biased. The L.F. valve, with a *mu* of 8 and impedance of 8,000, is an excellent valve, while the Stentor Six is, as we have said before, a real super power valve.

WIRE-WOUND VOLUME CONTROL.

We recently received a Wire Wound Volume Control from Automobile Accessories (Bristol), Ltd., 93-95, Victoria Street, Bristol. It is styled the "P.D." and is quite a neat well-made little fitment. It is provided with 16 contact points over which rides a small switch arm. The resistance element is totally enclosed. Shunted across the terminals of a loud speaker, it provides a perfect control, and used in conjunction with the ubiquitous choke-condenser bypass system, is a method which can be employed without fear of causing distortion. A volume control is really something a little more than a mere refinement, and we recommend loud-speaker listeners to try the effect of including a component such as the "P.D." in their sets.

There is one point well worth the attention of makers of volume control devices, and that is that it would be to their advantage to publish the ranges of resistance covered by their products. This is seldom done. A volume control is merely a variable resistance giving fairly high ohmic values, but such a component is often urgently required for other purposes, especially by experimenters. The "P.D.," we discovered on test, covers a range of from about 1,500 ohms to 5,000 ohms. The retail price is 7s., which is very reasonable, in view of the fact that it is wire wound.



An X-ray photograph of Leslie McMichael's popular "M.H." neutrodyne condenser.

"MIC" LOW-LOSS ALL-WAVE TUNER.

A device that will enable aerial tuning and reaction covering both normal broadcast wave-lengths and Daventry to be obtained without coil changing, is sure to prove popular if marketed at a reasonable price. The "Mic" Low-Loss All-Wave Tuner has a range of from 200 to 2,000 metres, with a ·0003 mfd. variable condenser, and costs 19s. 6d. It is very compact and occupies but little more panel space than a small variable condenser.

And it operates efficiently, too, and this makes it all the more regretable that we should have a rather serious criticism to make concerning its construction. That the assembly of this unit is rather on the flimsy side is a detail, for once safely mounted, it would not be subjected to severe mechanical stresses and its reaction coil and tuning coil switch movements are perfectly smooth. But the whole of its casing consists of celluloid, which is a most inflammable substance. An accidental touch of a hot soldering iron, and the whole component commences to disintegrate. And soldering tags are fitted, of course! These should be removed when soldering wires to them, but how many constructors do this?

With a non-inflammable casing, this component would have our hearty approval—the makers should consider the advisability of introducing such.

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 enquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

As much of the information given in the columns of this paper concerns the most recent developments in the Radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

Readers' 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. The envelope should be clearly marked: "Patent advice."

Questions and Answers

A DULL PANEL SURFACE.

J. W. (Bellingham).—"How is the shiny ebonite surface of a panel made dull black, instead of shiny?"

The panel is laid flat upon folded newspaper or other soft surface and then rubbed down with fine emery-cloth until all the "shine" has disappeared. The rubbing can be done with a circular movement, or backwards and forwards across the panel, but it is better to do it systematically than to just rub anyhow.

When thoroughly clean in this way, brush off the dust, etc., and smear a little mineral oil upon a soft cloth, rubbing this evenly over the whole surface. This will give a black surface, that can be polished with a dry cloth into a dull black lustre.

SCALE OF SIGNAL STRENGTH.

"DX LISTENER" (Wellingboro').—"Looking through some of the old correspondence columns I find many references to stations being received 'at R 4,' or at 'R 6,' the numbers apparently signifying the strength. What is this scale?"

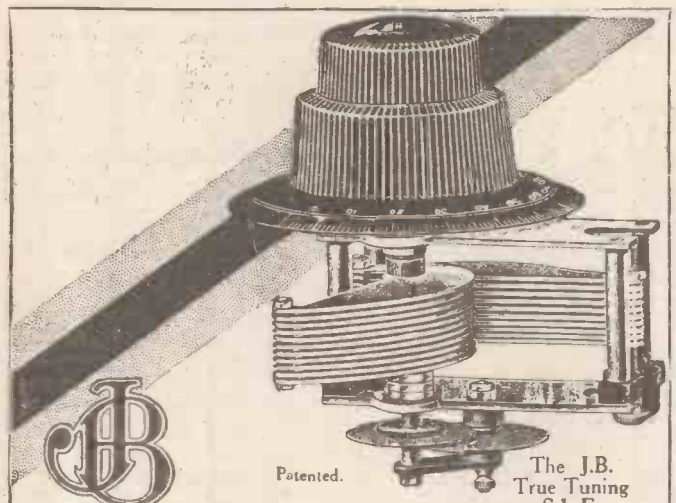
It is usual to classify signal strength in this way by the numbers R1 to R9, the former indicating extremely weak reception, and the latter very strong signals. There is no absolute authority on the subject, but the usual classification is as follows: R1, extremely weak and almost inaudible; R2, audible, but not strong enough to read all the time, the slightest fading or disturbance being enough to drown the signal; R3, just readable, but with difficulty; R4, quite clear and readable; R5, fairly strong; R6, strong; R7, signals loud; R8, very loud (i.e. "small loud speaker strength"); R9, extremely loud.

POSITIVE GRID LEAK RETURN.

N. T. (Great Yarmouth).—"I am building the 'Inexpensive One-Valver' described in 'P.W.' No. 245, and I am thinking of using a . . . . valve for it. I notice that the makers recommend that when this valve is used as a detector its grid-leak return lead should be connected to the positive filament lead, and not to the negative one, as shown. Which connection would give the best results?"

As the makers definitely recommend the positive connection for this valve, in this instance, you should certainly modify the original connections accordingly. With most valves there is very little difference (if

(*Continued on page* 192.)



Patented. The J.B. True Tuning S.L.F.

J.B. Condensers for the MULLARD P.M. CIRCUITS.

No matter what set you build, insist on J.B. Condensers for real efficiency in tuning. J.B. True Tuning S.L.F Condensers are ideal for the "Combine 5." Wireless enthusiasts who are interested in short-wave Receivers cannot do better than use the specially designed '00015 mfd. J.B. models

The J.B. TRUE TUNING S.L.F. complete with 4" Bakelite Dial. Double reduction friction drive, eliminating all possibility of backlash. Ratio 60-1. '0005 mfd., **16/6**; '00035 mfd., **15/6**; '00025 mfd., **15/-** For short wave Receivers, '00015 mfd., **15/-**.

The J.B. S.L.F. complete with 4" Bakelite Dial, '0005 mfd., **11/6**; 00035 mfd. **10/6**; '00025 mfd., **10/-**. For shortwave Receivers, 00015 mfd., **10/-**

JACKSON BROS.
8, POLAND ST-OXFORD ST
LONDON - W.1
Telephone:- GERRARD 7414

Use Guaranteed Coils in your "Combine Five"

Special Interchangeable Coils for this Fine Receiver.

WOUND with green covered wire on a highly polished ebonite former. Winding protected by a transparent covering. Terminals provided for easy connections. Mounted on a polished ebonite 5-pin plug.

MATCHED WITHIN ONE METRE

250/550 metres — 5/- each
1,000/2,000 metres — 8/6 each

Bases for above, fully engraved and fitted with terminals *and* tags, 2/- each.

Combination Resistors. Similar in workmanship and finish to the above. Stringently tested and guaranteed.. .. .. **3/9**

Complete Kit of Components for the Combine Five

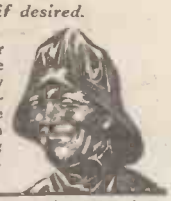
Comprising Ormond Condensers, Coils for 250/550 m., Keystone Neutralising Condensers and H.F. Choke, Marconi and Pye Transformers, and all other parts necessary to complete the set .. .. .. **£11 : 10 : 0**
One Red Triangle Ebonite Panel, 26 in. × 8 in. × ¼ in., ready drilled.. **0 : 15 : 0**
One Polished Mahogany Cabinet, with baseboard .. .. .. **2 : 5 : 0**

Finished Instrument. assembled and wired by expert workmen. Fitted in polished mahogany Cabinet. Aerial tested by Capt. Tingey, M.I.R.E., **£21**
Marconi royalties, £3 2s. 6d.

Deferred payments arranged if desired.

DELIVERY FROM STOCK.

¶ If a complete kit of components is ordered, Marconi Royalties amounting to 12/6 per valve holder are payable.



Send six penny stamps for the new edition of the "Pilot Manual." Fully illustrated, it contains details of many up-to-date Sets. Useful information on assembling, soldering and testing also included.

THE PILOT MANUAL

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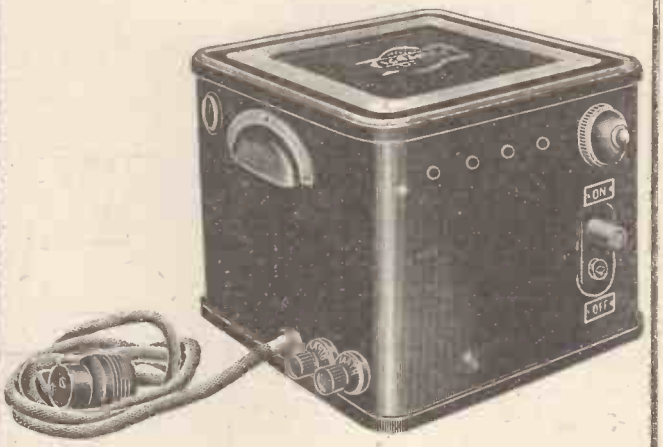


IGRANIC H.T. SUPPLY UNIT

Specially designed to eliminate the slightest trace of A.C. hum, the Igranic H.T. Supply Unit gives ample power direct to the set from A.C. mains. There is no ripple or noise of any kind.

The user can dispense with H.T. batteries or accumulators and gets a constant, inexpensive H.T. supply.

Igranic H.T. Supply Units are of robust construction, totally enclosed. They do not deteriorate, and are safe and clean. They are made in three models in different sizes of receivers. 30 milliamps at 200 volts, 20 milliamps at 120 volts, 5 milliamps at 70 volts. All operate from A.C. mains at 110 or 220 volts, 40-60 cycles.

PRICES FROM £4 . 18 . 0

Write for List No. R.54

RADIO **IGRANIC** ELECTRIC Co. Ltd. DEVICES

149, Queen Victoria Street, LONDON
Works: BEDFORD

Igranic devices are always better

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 190.)

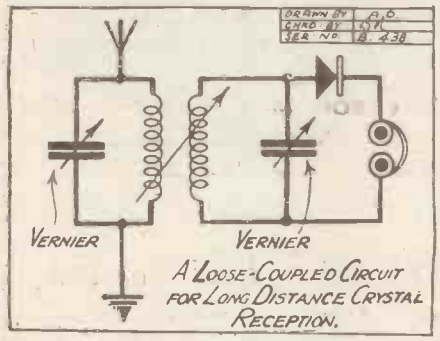
any) to be observed, but occasionally it happens that one connection gives results far superior to the other.

The set can very easily be altered to give a grid-leak-positive-return by taking the grid leak out of its condenser clips. Then replace it so that one end goes under the clip that is connected to the grid-socket of the valve holder, and the other end of the grid leak is connected to a separate clip which must be soldered to the lead joining the L.T. plus terminal to the filament pin of the valve holder.

LONG-DISTANCE CRYSTAL SET.

C. F. E. (Basingstoke).—"Some time ago I remember seeing an article in 'P.W.' giving the diagram for a long-distance crystal set. Two vernier condensers were employed for tuning, and the coils had to be specially wound by the trial-and-error method to suit the aerial with which they were being used. What were the connections for this set?"

The diagram to which you refer is reproduced herewith. The circuit originally appeared in "P.W." No. 241, in an article entitled "Reaching Out with the Crystal."



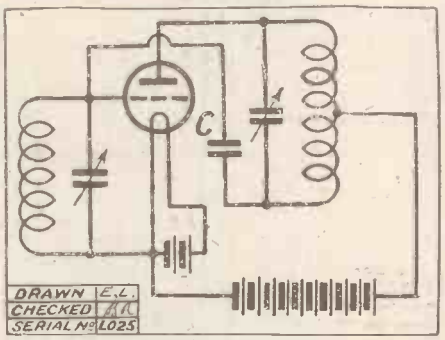
A LOOSE-COUPLED CIRCUIT FOR LONG DISTANCE CRYSTAL RECEPTION.

NEUTRALISING A VALVE.

G. A. B. (Banbury).—"What is the fundamental idea upon which the various neutralising arrangements are based?"

The necessity for neutralising arises from the fact that a valve is not a perfect one-way relay. It is true that small variations in the voltage in its grid will cause corresponding but larger variations in its plate circuit. But as the grid and plate are close together (inside the vacuum) there is a small capacity between them. Consequently H.F. impulses will be able to flow between these two points. As you are doubtless aware, a small capacity affords a path for H.F. impulses, so that the magnified plate impulses are able to get back into the grid circuit, via the inter-electrode capacity.

The physical construction of the valve demands that there should be a certain definite spacing limit between grid and plate, so energy must inevitably be fed back into the grid from the plate.



Therefore the valve will be unstable as an amplifier, and liable to self-oscillation unless this feed-back can be counteracted.

The method of counteracting by a neutralising circuit is shown in the accompanying diagram. The principle involved can be considered as follows:

The plate circuit of the valve has alternating current in it. Suppose at any moment the plate is positive, this will induce a charge upon the grid. If we can now find another place in the plate circuit, which at the same moment is swinging negatively to the same degree, we can apply this negative charge to the grid at the same time as the first positive charge arrives there, and the two effects will thus balance out.

It will be seen that the plate-coil shown in the diagram is fed with its high-tension at the centre-tap, and the valve current flows through the upper half only of the coil. The lower end of the coil will be equally and oppositely charged at any given moment, so it is connected (via a condenser, C) to the grid of the valve. It is important that the value of this neutralising condenser should be equivalent to the

(*Continued on page* 194.)

THE TECHNICAL QUERY DEPARTMENT

Is Your Set "Going Good"?

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

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

Full details, including a revised scale of charges, can be obtained direct from the Technical Query Dept., "Popular Wireless," Fleetway House, Farringdon Street, London, E.C.4.

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

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page 192.*)

capacity already existing between grid and plate circuits. And when the neutralising condenser is adjusted to this value the circuit becomes perfectly stable.

FOREIGN STATIONS ON A CRYSTAL SET.

D. J. A. (Glasgow).—"Is it true that foreign stations can be picked up on a crystal set, even when there is no valve set in the immediate neighbourhood?"

Quite true, according to the experience of scores of "P.W." readers; this feat can only be tested thoroughly by those whose aerials happen to be so situated that it is possible to exclude reception by re-radiation.

Such re-radiation can easily occur where a powerful valve set is tuned to a foreign station, and no doubt many who have picked up "foreign broadcasting" on a crystal set have not actually picked up the signals direct from abroad, but have picked up a sort of relayed foreign programme, coming from a neighbouring valve set that is receiving from the same station with its controls set on the point of oscillation.

On the other hand, those who live in quite isolated parts of the country, or who can pick up different foreign stations *regularly* can sometimes rule out re-radiation; and in these cases there is no doubt that the crystal set *is* capable of picking up broadcasting from stations situated hundreds of miles away.

Many interesting instances of such reception have been reported by readers in our Correspondence columns.

ADAPTING ONE-VALVER TO FLEWELLING.

P. K. T. (Freshwater, I.O.W.).—"I have a ·006 mfd. fixed condenser and a single-pole double-throw switch on hand, and I am told that with these I can adapt my single-valve set (straightforward detector with variable grid leak) to the modified Flewelling circuit. What are the necessary connections?"

The first step is to disconnect the aerial coil and its tuning condenser from the filament circuit. To do this, break the lead that goes from the former to the latter, and insert the fixed condenser between these two points. Then join the aerial-coil-and-condenser side of the ·006 fixed condenser to the centre contact of the S.P.D.T. switch. One outer contact of this switch is then connected to the filament side of the same fixed condenser, and the other outer contact of the switch is connected to a point on the lead between the reaction coil and the 'phones.

When the switch is placed in one position it will be seen that the ·006 condenser is shorted, and the circuit is therefore as it was previously (straight detector). Placing the switch in the other position converts the set into a modified Flewelling.

ADDRESSES WANTED.

The following readers have submitted queries bearing either no address, or an insufficient address.

Will they please communicate with the Query Department, so that their replies may be despatched?

S. C. Stevens.	M. J. Caton.
F. Bayliss.	A. E. Hart.
H. M. Girling.	C. M. Mansell.
C. V. Preece.	A. Moore.
S. Bryant.	G. B. Aldbury.
— Coldwell.	H. Tate.
H. B. Dowell.	C. Richards.
T. R. Parry.	J. Booth.
J. S. Laker.	

CONDENSERS IN SERIES.

P. T. (Hull).—"What is the rule for calculating the total value of different capacities connected in series with one another?"

The rule is that when condensers are connected in series with each other, the total capacity equals the reciprocal of the sum of the reciprocals of the individual capacities.

For instance, if a ·5 mfd. condenser (C_1) is connected in series with a ·25 mfd. condenser (C_2), the resultant capacity (C) will be such that $\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2}$ which in the instance quoted works out at 0·16 mfd.

LAMPS AS RESISTANCES.

C. J. B. (Leytonstone).—"What is the difference in watts per candle power for the various classes of incandescent lamps—i.e. carbon, gas-filled, etc.? I have been using lamps as resistances, and notice that for the same brilliancy some lamps consume very much more current than others."

The carbon lamp takes between 3½ and 4 watts per candle power. The metallic-filament class take anything from about 1 to about 2 watts per candle power, and the gas filled class of lamp takes about ½ watt per candle-power.

For lighting, the latter are much more efficient, as these figures show; but it is often more convenient to use carbon lamps for small charging-boards, etc.

L.F. HOWLING.

"Puzzled" (Pershore, Worcs.).—"What is likely to be the fault when a 3-valve set howls if it is used with an H.T. eliminator, but works O.K. when an H.T. battery is used? The circuit is det. and 2 L.F. (transformer and one resistance-coupled), and the mains supply is direct current at 220 volts. The eliminator is a home-made one, using old L.F. transformer windings for chokes. In order that these should pass enough current, and to prevent magnetic saturation, they have been connected in parallel, but in spite of all precautions the set howls steadily. What can the matter be?"

Probably in building up your smoothing circuit of L.F. transformer windings, condensers, etc., you have formed a circuit in the eliminator of such a value that it tends to "oscillate" at a low frequency, and it is this that gives rise to the howl. In all probability a re-arrangement of the chokes, or the introduction of new ones, would cure the trouble.

VOLUME CONTROL.

F. W. B. (St. Leonard's-on-Sea).—"I have been advised to fit a variable grid leak to my L.F. transformer secondary to control the

(*Continued on page 196.*)

CALLER'S COLUMN

NOT SENT BY POST.

EBONITE GRADE A. Stock sizes, 6 x 6 and 7 x 5, 1/3; 8 x 6, 1/6; 9 x 6, 1/9; 10 x 8, 2/9; 12 x 6, 2/9; 12 x 8, 3/6; 12 x 9, 4/-; 14 x 7, 4/6. ALSO CUT TO SIZE while you wait at 1d. per sq. inch 3/16th; and 2d. sq. inch for ¼ in. Special cheap panels for Crystal Sets.

H.T. BATTERIES. No cheap and nasty batteries sold here, only highest quality at lowest prices. Adico (Trade - test award - best given) 60-v., 6/11; 100-v., 12/11 nett; the new 66-v. Eveready, 9/6; Crown "Polo," 60-v., 6/3; 100 v., 10/11; good quality "K," 60-v., 5/11; 100-v., 9/6; Hellesen's, 66-v., 12/6; 99-v., 21/-; Siemens, 60 & 100-v. stocked; 15 L.T. Hellesen's, 2/6; Adico, 1/8, 2/-, B.T.H. 2/-; Flag, 2/-; Britinniac, 1/8.

CABINETS. — American type, solid polished hinged lid and baseboard. 8 in. x 6 in. x 7 in. deep, 6/11; 10 in. x 8 in. x 8 in., 8/11; 12 in. x 8 in. x 8 in. 10/6 and 12/6; 14 in. x 7 in., 13/6; 16 in. x 8 in., 16/11. Any size made to order in a few days.

HEADPHONE CORDS. Good quality, 1/3, 1/6. Loud Speaker Cords, 1/9. 4-way Battery Leads, 2/-; 7-way, 3/6.

GEARED COIL STANDS. 2-way, 2/3, 2/6, 2/11 up. 3-way, grand value, 5/11. Back of panel from 2/11. All ebonite and best quality. Only needs secing. Penton, Newey G.E.C. Lotus, Polar stocked.

AERIALS.—100 ft. 7/22 Hard drawn, 1/11. Extra heavy, 2/3. Phosphor 49 strands, 1/-. Electron stocked. Special **INDOOR** Aerials, phosphor, with ebonite separators and rubber rings (12 ft. x 8 strands) total 100 ft., 4/6. O.V., 2/6. Rubber Lead-in, highest quality. 10 yds., 1/-; 10 yds., 1/3; 10 yds., 1/6. Extra heavy, 2d. and 3d. yd. R. & B. Twin Flex (best), 6 yds., 10d.; 12 yds., 1/8; 36 yds., 4/-. Ins. Hooks, 2 for 1½d. Egg Insulators, 2 for 1½d. Ins. Staples, 4 a 1d. Earth Tubes. Copper, extra value, 2/3, Climax, 5/- (also at 2/6).

SWITCHES. — On porcelain DPDT, 1/3; SPDT, 10½d. Superior articles. Nickel, Panel Ebonite handle. DPDT, 1/6. SPDT, 1/-. Push and Pull, 9½d and 1/-. All Lissens stocked.

TERMINALS, Etc. — Nickel W.O., 'Phone, Pillar, 1/- doz.; 3 for 4d. Brass do., 10d. doz.; 1d. each. Nickel Valve Legs, 2 for 1½d. Stop Pins, 2 a 1d. Spade Tags, 6 a 1d. Soldering, 3d. doz. Ormond Nuts, 2d. doz. Washers, 12 a 1d. 2 and 4 B.A. Rod, 3d. ft. Only the best sold here. Screw Studs, 2 for 1½d. Pins do Valve Pins, 2 a 1d.

PERMANENT DETECTORS.—Liberty, 3/6. Red Diamond (a topper), 2/-. Lion Micro; latest cannot be equalled, 2/6. Brownie, 3/-. Enclosed Kay Ray, 1/-, 1/3. Service Micrometer, with crystal, 2/9. Burndept 4/-. Mic Met, 4/6.

RED & BLACK Wander Plugs, 2d. and 3d. pr. Spades, 3d. pr. Pins, 2d. pr. Plug & Socket 3d. Clix Wander Plug, 2d. Igranic, 3d.

COIL PLUGS. — Ebonite on Base, 6½d., 7½d. Lotus 8d. Burne-Jones, 1/9. Low Loss, 8½d. Panel, 6½d. Various stocked.

STOP!
4½-volts L.T. Super-size Hellesen, 10/6. Flash lamp Adico, 4½d. each; 4/3 doz. A well-known 6d line, 3 for 1/3. No cheap rubbish sold!

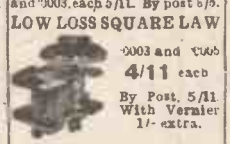
FORMO or FINSTON S.L.F. CONDENSERS

With handsome 4" TRIOLITE dial and knob .. **7/6**
By Post 7/11.

ANOTHER GOOD MODEL

S.L.F., with 4-inch Dial .0005 and .0003, each 5/11. By post 6/5.

LOW LOSS SQUARE LAW



.0003 and .0005 **4/11** each
By Post, 5/11. With Vernier 1/- extra.

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LEWCOS BOWYER LOWE FINSTON COLVERN, WARMEL MAGNUM SCREENED COILS.

ACCUMULATORS.

2-v 40, 7/11; 2-v 60, 9/6; 2-v 80, 12/6; 6-v 100 14/6; 6-v. 40, 13/11. 4 v. 60, 17/11; 4 v. 80, 23/6; 6-v. 60, 26/6; 6-v 80, 35/6. **ALSO** another good make, 1/6 extra on each of above. Post 1/- each

CRYSTAL and ONE VALVE AMPLIFIER (L.F.), in handsome polished cabinet, tested for use, 22/6. Post 1/6. (With D.E. valve, 30/-). Or Complete Set, valve, H.T., L.T., units, aerial Equipment, 5XX coil, 45/11. Post 2/-. Extraordinary Offer.

ASTOUNDING VALVE in L.F. amplifiers in handsome polished box. 1 valve, 16/11. Carriage 1/6.	2-Valve Amplifier, 25/11, or COMPLETE with valves, H.T. and L.T. Units, 44/8. Carriage 2/-.

ALL CIRCUITS, PARTS, COILS and SETS STOCKED.

HEADPHONES. all 4,000 ohms. N. and K. Standard Pattern. 7/11 pair. N. and K. Genuine new lightweight, 11/6, 13/6. Dr. Nesper, 10/6 and 12/11. Telefunken, adjustable genuine (20/- model), 14/11. Brunet, 11/9, 12/11, 14/6, 3 models. ERICSSON (Continental) E.V., 7/11 pair. (Post 6d.)

BRITISH HEADPHONES.
Brown's Featherweight, 20/-
Brown's A Type (Reed), 30/-
B.T.H., 15/-, Sterling, 20/-

GANG Dual .0005.

ORMOND, with dial	32/-
CYLDON, no dial .. Triple .0005.	50/-
ORMOND, with dial	40/-
CYLDON, no dial	70/-
IGRANIC, no dial	75/-
BOWYER-LOWE, no dial	70/-

IGRANIC TRIPLE - HONEY - COMB INDUCTANCE COILS. 30, 2/8; 40, 2/9; 50, 2/9; 60, 3/-; 75, 3/2; 100, 3/6; 150, 3/9; 200, 4/-; 250, 4/6; 300, 4/9; 400, 5/6; 500, 7/-; 750, 9/6; 1,250, 14/-; 1,500, to . **ALL PARTS STOCKED.**

CABINETS. Large stocks of really useful Cabinets kept, or made to order. Solid oak. Glass finish. American type, hinged lid, baseboard.
Post 1/6 each extra.

8" x 6" x 7" deep	6/11
10" x 8" x 8" deep	8/11
12" x 8" x 8" deep	10/6
14" x 7"	12/6
16" x 8"	16/11

S.T. VALVES

CALL HERE FOR LISSEN, BENJAMIN, RADIO-MICRO COSMOS, MULLARD, EDISWAN, MARCONI, COSSOR, OSRAM, JACKSON'S (J.B.) DUBILIER, McMICHAEL SUCCESS, BEARD & FITCH, BOWYER-LOWE, LEWCOS, IGRANIC, EUREKA, ORMOND, UTILITY, FORMO, EDISON BELL, FERRANTI, R.I., POLAR, NEWEY, P. & M., MAGNUM. WE HAVE THE GOODS! CALL AND SEE US. ALL LINES IN DEMAND STOCKED, SPECIAL TERMS. RADIO CLUBS, GENUINE EXPERIMENTERS.

BE SURE YOU ARE AT RAYMOND'S!

LISSEN PARTS (Offered subject to delivery). Var. Gd Lk., 2/6; Lissenstat, 10/6; Major, 7/6; Minor, 3/-; Fixed Leaks, 1/-; Valve-holder, 1/-; Mica Condensers, 1/-; .002 to .006, 1/6; L.F. or H.F. Choke, 10/-; Switches, 2-way or key, 1/6; S.P.P. Pull, 2/6; D.P.D.T.P. Pull, 2/6; Rheostats, 7-35 ohms, 2/6 ea.; B.B., 1/6. Coils, 35, 3/3; 40, 3/3; 50, 3/6; 60, 3/6; 75, 3/6; 100, 4/-; 150, 4/3; 200, 5/-; 250, 5/6; 300, 5/9, X Coils, 50, 6/-; 60, 6/4; 75, 6/4; 250, 9/9; Lissenola, 13/6; L.F. Transformer, 8/6.

R.I. Aerial Tuning Inductance, £1/19/6 each. Permanent Detector, 6/-; 1-Hole Fixing, 6/6. Multi Ratio L.F., 25/-. Standard Ratio, 25/-. Reactive Anode Unit, 25/-. New H.F. Choke, 9/-.

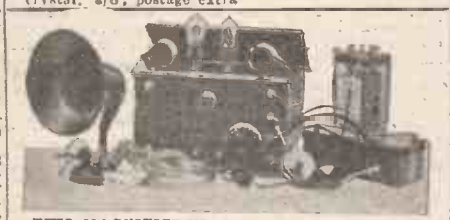
GAMBRELL L.F. TRANSFORMERS. PRICES: Each Stage 1, Ratio 3½ to 1 **25/6**
Stage 2, Ratio 5 to 1

NEUTROVERNIA CONDENSERS (Latest Model) for Panel or Baseboard Mounting. 5/6.

STANDARD GAMBRELL COILS. a/2 4/10, a 4/10, A 5/-, B1 5/3, B 5/6, C 5/9, D 6/3, E1 6/9, E 7/9 F 8/6 G 10/-. Centre-tapped coils, 6d. extra.

GAMBRELL CENTRE TAPPED COILS. B.B.C., 6/-; 5XX, 8/3.

SERVICE. Neutralising Condensers, Panel, 2/6; B.B., 3/6;. Micrometer Detector, with splendid crystal, 3/6; postage extra



THIS MAGNIFICENT TWO-VALVE SET

(D. and L.F.) as shown, in Handsome American Type Cabinet, 12 by 8 Panel.

Complete with Dull Emitter Valves, Tandeo latest Coils, L.T. and H.T. Batteries. Aerial Equipment, 4-way Leads, and

LOUD SPEAKER or 2 pairs 'Phones.

ALL PARTS ENCLOSED

£4.19.6

Carriage and Packing 5/-

30/- DEPOSIT

5 Payments 19/6 each or

Cash £4 19 6

Carriage and packing, 5/-.

STOP!

On £3 orders of our specialities at list prices, we will pay your fare up to 5/-. On orders of £5 fare paid up to 10/- on showing ticket Does not apply to sets or reduced lines.

GRAHAM-FARISH
WEST END DEPOT.
Sold on Money Back Guarantee
Fixed Condensers, 1/-, 1/6; .0003 and Grid Leak, 2/-; for Series and Parallel; Grid Leak, 1/3 each.

LOTUS. — V. Holders, 2/3; with Terminals, 2/6. 2-way Coil Stand, 7/-. 3-way, 10/6, 12/-.

PRANCO. — Midget Bal Cond., 3/9. Panel Brackets, pair 1/-.

NEWEY 2-way geared coil-stand, 6/6. 4-point condenser, 17/6, 15/-.

BROWNIE No. 2. Latest model, 10/6. Complete with pair of high-class 'phones, 4,000 ohms, value 8/11. Aerial wire, lead-in, Daventry Coil, 18/11. Post 1/6.

PETO-SCOTT
Copex Copper Screen and 6-pin Interchangeable Base, 9/6.

Keystone Binocular Coils, 10/6. 5-pin Base, 2/-.

Keystone Neutralising B.B., 5/-. Panel, 6/3. Balancing, 7/6.

VALVE HOLDERS
(B.B. Non-microphonic).
Harley, 1/4. Kay Ray, 1/6. Lotus, 2/3; with Terminals, 2/6 Benjamin, 2/9. Burndept, 2/9.

RAYMOND
ANTI-MICROPHONIC VALVE HOLDER.
Board Mounting, 1/3, post 3d.

PARTS IN STOCK FOR THE ELSTREE SIX, SOLODYNE, MEWFLEX, ELSTREEFLEX, 1927 FIVE AND ALL THE CHIEF CIRCUITS

NEUTRALISING CONDENSERS.
Peto-Scott, 5/-, 6/3, 7/6. Osmond, 4/-. Bowyer-Lowe, 7/-. Magnum, 5/-. Service, 2/6, 3/6. McMichael, 4/9. Reaction (Ormond) .0001, 4/-.

RADIO MICRO
(Guaranteed genuine).

3.5-v. .06-a., G.P. ..	5/11
1 8-v. .2-a., G.P. ..	5/11
3.5-v. .3-a., Power	8/6
3.5-v. .1-a., " ..	9/6
1.8-v. .2-a., " ..	10/6

Post 1/- each per valve.

SPECIALS.
.00005 Vernier for Lodge N Circuit, 3/11; Formo Twin Gang, with 4" Dial, 24/6; Ditto, Triple Gang, 33/6; Formo Plugs, 1/6. All Jacks stocked. All Mullard components. McMichael new. H.F. Choke, 9/-; 3-way Geared Coil Stands, 6/6. R.I. Choke (H.F.), 9/-; Cosmos H.F. Choke 6/6; B.T.H. L.F. Transformers, 2-1 or 4-1, 17/6; Igranic Preset Resistor, 6, 10, 30 ohms, 1/3. Rodney P.M. Magnetic Reaction Coil, B.B.C., 9/6.

PLEASE MAKE OUT YOUR LIST FOR ORDERS OVER 20/- IF REQUIRING COMPONENT PARTS FOR ANY SET AND WE WILL GIVE YOU A FIXED INCLUSIVE PRICE.

World's Most Wonderful Crystal
"WYRAY" 1/6

MAGNUM.
Neutralising Condenser, 5/-. Single Coil Mount on Base, 1/9. Aperiodic H.F., 10/-. B.B.C. or 5XX H.F. Transformers, 7/- each.
ALL PARTS STOCKED

SETS OF COMPONENT PARTS

RADIANO "THREE" (*March, '27, Wireless Constructor*). All parts as specified with Terminals. 2 Ormond S.L. Variables, with friction gear, 29/6; 3 Coil Sockets, 5/3; T.C.C. .0003 and Clips and 2-meg. Leak, 5/10; 3 Benjamin Valve Holders, 8/3; 3 Fixed Resistors and Bases, 7/6; On and Off Switch, 1/6; Gecophone 1st Stage L.F., 24/-; Brandes 2nd Stage L.F., 17/6; Engraved Strip, with Terminals and Nuts, 3/6. 2 B.L. Terminals for Front Panel, 1/6; ½ Gross Pinch-on Spades, 1/-; Quantity Rubber Flex, 6d. Total, £5 5 10. Post free for £4 12 6 nett.

2-VALVE REINARTZ DET. and L.F. (*P.W. Blue Print, '25*). 2 B.B. Coil Stands, 2/-; .0003 and Grid Leak, 2/-; 2 Anti-Micro Valve Holders, 4/-; Varley H.F. Choke, 9/6; 1 Igranic L.F., 16/-; .005 and .001, Fixed, 2/6; 9 Terminals, 1/-; .0005 and .0003 Variable Sq. Law, with Knob and Dial, 10/-; Angle Brackets, Wire, Screws, and Transfers, 2/-. Total, 49/-. Post free for 44/- nett.

"A.W." BALLOT 3 (*A. H. Reyner, A.M.I.E.E., 19/2/27*). Original parts. Ormond, .0005 S.L.F., 1 S.M. Dial; Ormond P.M. Vernier, 15 ohm Igr. Rés.; 2-way c.o. Switch, W. & W.; Benj. c.o.; 2 C.A.V. L.F., 2 Lotus V.H.; Benj. .0003, with leak and valve-holder; 2 Fixed Resistors, .0001 Dubilier; R.I. Choke (H.F.), 4 Terminals, Strip, Wire, Screws, etc. List total, £4 15 0. Sent post free for 85/-. Second Selection, 65/-, all good components.

EVERY PURPOSE 2-VALVER (Det. & Mag.) (*P.W., March 19/27*). By L. H. Thomas, Tec. Staff. Easy to build, easy to handle, suitable for all wave lengths. Original components specified. 2 Panel Brackets, 1/-; 2 Ormond Friction Geared .0003 Variable, at 14/6; 1 2-way Lotus L. Handle, 8/-; 2 Benj. Valve H., at 2/9; 1 C.A.V. All-Purpose L.F., 15/-; 2 Rheostats to suit valves, at 2/6; .0003 and 5-meg. Leak, 3/-; Midget Condenser, 3/9; Single Open Jack, 1/6; 2 Mfd T.C.C., 4/8; Fixed, .0003, 1/6; 2 Terminal Strips and 8 Terminals (B.L.), 5/-. Total List, 83/- Sent post free nett. for £3 13s. Second Selection (but includes C.A.V. Transformer and Slow-motion Condenser; all other parts high quality and suitable for set), post free, £2 17 6.

Cabinets, 16 by 8, on sale 17/11
Panels, 16 by 8, from 5/-

EDISWAN R.C. THREESOME. Set of Parts: 2 Ediswan R.C. units, 7/- each; 1 Ediswan P.V.2 valve, 18/6; 2 Ediswan R.C.2 ditto, 14/-; 3 Lotus V.H. at 2/6; 3 Fil. Rheostats at 2/6; 9-v. Grid Bias, 2/-; Lotus 2-way L.H., 7/-; .0005 Tuning Condenser, 6/11. The lot, post free, £3 19 6. (List price, 91/5. With cheaper (but good) rheostats, valve-holder and 2-way, 69/6.

MONODIAL RECEIVER. Original components. ("Wireless") 4 A.P.V. Holders, 10/-; R.I. Multi L.F., 25/-; Pacent Super L.F., 24/6; H.F. Varley Choke, 9/6; Varley 250,000 ohm Resistance, 9/6; On and Off Switch, 1/6; 2 Jacks, 6/-; 4 Fixed Resistors, 10/-; 2 B.B. Neutralising, 10/-; 1 Franco Midget, 3/9; 2 .002 Fixed, 4/-; 2 H.F. Transformers, with 6-pin base ready for use, 21/-; and TWIN GANG ORMOND CONDENSER, 32/-. Total List, £8 4 9. Sent post free, £7 7s. Slow motion dial, 5/- extra.

PARTS FOR NELSON P.M. (as specified by Author). 4 A.M. Valve Holders, 2 Coil Holders, Variable Condensers, 2 .0005, 1 .0003 S.L.F., with 4" Dial, Gambrell Neutrovernia, Mullard 100,000 ohm Anode and Clips, all Fixed Condensers and Leaks, Mullard Everest 100,000 and Stand, R.I. or Varley Choke, B.T.H. Transformer, P/P. Switch, Fil. Rheo., Split Primary H.F. Transformer, with 6-pin base, 2 aerial coils, centre-tapped secondary coils. Post free, £6 10 0.

GRENVILLE (P.M.) AMPLIFIER. 12 Terminals, 2 Valve Holders, Everest 100,000 ohm and holder, L.F. Transformer, Grid Leak 1-meg, .01 fixed (both Mullard), Push-pull switch, Terminal Strip, Wire, and Screws. Total, 31/6. Post free, 25/6.

FRANKLIN P.M. (very highly recommended). 3 Valve Holders, 6/9; Single Coil Stand, 1/-; .0005 S.L. Variable, 6/11; .0003 and 2-meg. Leak, 5/-; 2 100,000 ohm. Everest, with holders, 13/-; 2 .01 Mica Fixed, 6/-; .0003 Mica Fixed, 2/6; 2 1-meg. Leaks, 5/-; Fil. Rheos, 2/-; Push-pull, 1/3; Screws, Nuts, Wire, 1/6. Total, 52/-. Post free, 45/-.

RODNEY (P.M.) 12 Terminals, 1/6; 3 A.M. Valve Holders, 6/9; 2 Single Coil Stands, 2/-; 2 Variable Condensers, .0005, 15/-; 2 S.M. Dials, 12/-; 1 .0003 Sq. Law, with Knob and Dial, 5/-; Neutralising Condenser, 3/6; Rodney Magnetic Reaction H.F. Transformer, 9/6; 6-pin base, 7/6; (B.B.C.) .0003 and 2-meg., 5/-; Fil. Rheos, 2/-; R.I. Choke, 9/-; 100,000 ohms. Fixed, 2/6; L.F. Transformer, Ferranti, 25/-; Fil. Switch P.P., 1/6; Centre-tapped Tuning Coils, 2 Aerial Coils. Post free, 89/6 nett. List Price, 109/6.

LODGE "NO CIRCUIT. 1 var. condenser, .00005 (3 plate), 4/11, with knob and dial; 1 special Silvertown L.F., 21/- (essential); 9 terminals, 1/-; 2 single coil stands, 1/- each; 2-valve holders, 2/3 each; 1 rheostat, 2/-; fixed, .0001, 1/3; 1 variable gd. leak, 2/6. Wire, screws, transfers, plugs, terminal strip. The lot, post free, 32/6 net.

M.C. "THREE." (*"A.W.," Feb. 5, '27.*) 2 .0005 Variable Condensers, Geared or with S.M. Dials, at 16/-; 2 .001 and 1 .001 Fixed Dubilier, at 3/-, 9/-; T.C.C. .0003, with a 2-meg. Grid Leak, 4/10; .0001 Ormond Reaction Condenser, 4/-; 3 Lotus Valve Holders, 7/6; 1 Varley H.F. Choke, 9/6; B.T.H. Transformer, 2-1 (L.F.), 17/6; 3 Resistors, 3/9; 2 Special Coils, ready for use, 4/-; 11 Belling Lee Terminals, 4/2; Terminal Strip, drilled, 1/-; Push-Pull, Benjamin, 1/3. Total, 98/6. Post free, 85/- nett. With cheaper condensers, valve holders, terminals, and fixed condensers, 67/6.

T.C.C. MANSBRIDGE. .0003 S.P., .00025 S.P., .01, .02, 2/4 each; .1, 2/6; .25, .3, 3/- each; .5, 3/4; 1 mfd, 3/10; 2 mfd., 4/8.

L.F. TRANSFORMERS. Ferranti A.F.3, 25/-; A.F.4, 17/6; Eureka Concert, 25/-; 2nd Stage, 21/-; Baby 1st or 2nd, 15/-; Reflex, 15/-; Formo shrouded, 10/6; Success (Black), 21/-; Royal, 20/-; Ormond, newest model, 15/6; Marconi, "Ideal," all stages, 25/- each; C.A.V., 15/-; Pye, 22/6; Gambrell, 2 stages, 25/6; Ideal Junior, 18/6; R.I. 25/-; Multi-Ratio, 25/-.

ORMOND. Square Law Low-Loss. .0005, 9/6; .0003, 8/6; (1/6 each less no vernier); Friction Geared, .0005, 15/-; .0003, 14/6; .00025, 13/6. Straight Line Frequency Friction Geared, .0005, 20/-; .00035, 19/6. S.L.F., .0005, 12/-; .00035, 11/-. SQ. LAW LOW-LOSS DUAL, .0005, 16/- each. Ormond Friction Dial, 10/-. Filament Rheostats, Dual, 2/6; 6 ohms or 30 ohms, 2/-. Potentiometer, 400 ohms, 2/6. Standard, .0005, 5/-; .0001, Reaction, 4/-; Air Dielectric, 2/-; Neutralising, 4/-; Neutrodyne, 2/-. Twin Gang, .0005, 32/-; Triple, 40/-.

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RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 194.)

volume on the loud speaker. Is this a good method, and does it alter the tuning? I am particularly anxious that volume control should be easily carried out, because the set will be left to an old lady to see to, and if tuning is altered every time she would not know how to tune in again."

Tuning is quite unaffected by this method of volume control, but in the circumstances a stud-switch would be preferable to a screw-down grid-leak, as with the former various values of resistance can be brought into circuit more quickly than with the latter.

HARMONICS.

D. J. S. (Bromley, Kent).—"How can the harmonics of a station be determined if the fundamental wave-length is known?"

The harmonics are simply sub-multiples of the fundamental wave-length. As a case in point, if a station were sending on a wave-length of 300 metres, its *second* harmonic would be found by dividing 300 by *two*—i.e. 150 metres.

Similarly to determine the sixth harmonic, all that is necessary is to divide the fundamental (300, in this case) by six. The sixth harmonic of a 300-metre station, therefore, is 50 metres.

TUNED PLATE REACTION.

S. I. H. L. (Sheffield).—"I have discovered that by connecting a ·0003 variable condenser across my reaction coil (50) I can control reaction effects very much better than by swinging-coil reaction. Is this Reinartz reaction?"

The type of reaction that you have discovered is known as "tuned-plate" reaction, and was extremely popular in America a few years ago. It has nothing to do with "Reinartz reaction," though, like this, it is varied by the condenser setting, and not by the coil position.

IMPORTANT NOTICE

THE RULES REGARDING QUERIES HAVE BEEN REVISED PLEASE SEE PAGE 192

COIL NUMBERS.

"INDUCTANCE" (Jersey, Channel Islands).—"Do the numbers printed on a tuning coil correspond with the number of turns in it?"

Yes, most manufacturers number their coils according to the number of turns, so that a No. 35 will be found to have 35 turns, a No. 50, fifty turns, etc.

"THE SPANSPACE THREE."

B. R. (Rugby).—"What wire, former, and number of turns are required for the coils of 'The Spanspace Three'?"

The coils are wound on the standard "screened-coil" formers, using 34 D.S.C. wire.

The number of turns are L1=20 turns; L2=90 turns; L3=90 turns.

Details of these coils were given on the "P.W." Sixpenny Blueprint No. 24, which also shows theoretical, pictorial, and back of panel connections of "The Spanspace Three."

DISTORTION IN 'PHONES.

"PURITY" (Blackburn).—"Is it true that telephones do not distort, and that, unlike loud speakers, they have no 'natural frequency' of their own, to which they respond more readily than to any other frequency?"

No, it is not true, for practically all telephone diaphragms have a marked preference for frequencies round about 900.

The reason that telephones sound purer than loud speakers is probably a matter of degree—there is much less volume of sound, and consequently the distortion present is much less noticeable.

CORRESPONDENCE.

(Continued from page 184.)

CONE LOUD SPEAKERS.

The Editor, POPULAR WIRELESS.

Dear Sir,—Our attention has been called to a short paragraph on page 40 of your issue of March 5th, in connection with your article headed, "Apparatus Tested," to the effect that several types of cone loud speakers are now under your observation.

We beg to draw your attention to the fact that, as owners of a large number of patents covering many types of cone loud speakers, these speakers are also under our observation and we would like to warn your readers against the construction of cone loud speakers which infringe any of our patents.

You are, of course, at liberty to make any use of this letter you like.

Yours faithfully,
H. A. P. DISNEY.
(Secretary.)
Standard Telephones and Cables Limited,
Connaught House, 63, Aldwych, London, W.C.2.

THE "SPANSPACE THREE."

The Editor, POPULAR WIRELESS.

Dear Sir,—The letter which you published from me in a recent issue has resulted in a very considerable post-bag coming to me, chiefly with inquiries as to the means I took to "spread" the stations over the dials.

I am using a ·0002 fixed condenser in series with *each* of the first two variable condensers; this is fitted in the lead to moving plates. If other readers want to make the alteration, I would suggest using McMichael condensers so that various values may be tried, and the condenser removed entirely and a shorting bar put in when Daventry is being received. The ·0002 condenser tunes in from abont 280 to 480 metres on my set, so that listeners who want Bournemouth or Aberdeen will probably find ·0003 or ·0005 a better value to use.

The use of the fixed condensers does not reduce volume at all.

Yours faithfully,
H. B. EVERSHED.
"Florizel," Kingsway, Woking.

POOR B.B.C. STATIONS.

The Editor, POPULAR WIRELESS.

Dear Sir,—Perhaps I am in the wrong shop and should be troubling Captain Eckersley or somebody else instead of you with the following, but letters to the B.B.C. might just as well be deposited in a street drain as be posted to that establishment, so far as recognition is concerned.

Daventry, *the great 25 kw. station*, reaches me on a four-valve set very indifferently and only by the aid of close reaction.

Langenberg, another 25 kw. station, comes through with a wave roaring like the engine of an aeroplane, and on three valves gives good loud-speaker results. In fact, many of the 1·5 kw. Continental stations give better results than Daventry, or any of the B.B.C. stations. In view of the difference in the distance of these foreign stations from Belfast in comparison with Daventry, etc., the results are hard to reconcile.

Another thing, the recent change in wave-lengths has upset a great many people.

The Belfast station (with its inharmonious orchestra) drowns Dublin, Newcastle, and all lower wave-length stations. In fact, the B.B.C. might as well be non-existent so far as I am concerned, as I am obliged to take foreign programmes alone, and yet pay the B.B.C. for other people's work.

As to getting Daventry on a crystal, one might as well try for Mars. This may be a tale of woes, but nevertheless of hard facts. So query, what is wrong in the B.B.C. administration?

Yours truly,
JOHN DONNELLY.
"Glastonbury," Glastonbury Avenue,
Ashley Park, Belfast.

A NOVEL AERIAL.

The Editor, POPULAR WIRELESS.

Dear Sir,—During the recent broadcast of a Rugby International, I heard the whole of the second half on my loud speaker, using my piano in place of the outdoor aerial. I attached two wires to two of the bass strings, forming a V, and connecting to the aerial terminal. There was very little difference of strength from that obtained from the outdoor aerial when working Bournemouth (about twenty miles), but rather weaker from Daventry. I also tried it with a crystal set, but heard nothing but Morse signals.

I am wondering if this has ever been done before; if not, it would solve the problem of aerial for many who have no room for outdoor aerial, providing, of course, they had a piano.

Yours faithfully,
E. C. VINE.
Myrtle House, Bernard Road,
Cowes, I.W.

(Continued on next page.)

CORRESPONDENCE

(Continued from previous page.)

HALE TROUBLES.

The Editor, POPULAR WIRELESS.

Dear Sir,—In a recent number of "P.W." I see a letter from a correspondent who is unable to get oscillation from his Hale set. Perhaps my own experiences with the Hale may be of assistance.

Soon after the description of the Hale appeared in "P.W." I made up a set—a two-valver, Hale and L.F., using two Ferranti A.F. transformers. With this nothing but a faint whisper could be got out of the loud speaker on the local or any other station. Since this was my first effort at making a set myself, I came to the conclusion that I had better keep more closely to the specification as described in "P.W." So I obtained an R.I. multi-ratio transformer and wired it up exactly as described in your journal. With this I get quite good results. It is certainly better than the average two-valver.

With the set in the dining-room, I can tune in the loud speaker in any part of the house on either Birmingham (7 miles), Daventry (30 miles), and even London (100 miles). I imagine that there must be something wrong with my lay-out, since signals continue to come through strongly when the crystals of the R.I. permanent detector are separated. No adjustment of G.B. makes any difference to this. I was not able exactly to follow the lay-out given in "P.W." since I am using an R.I. retroactive tuner in place of coils.

The total failure of the Ferranti transformer in the Hale circuit remained a mystery to me until I read in a subsequent article on the Hale in "P.W." that it is necessary, in the Hale circuit, to completely insulate the transformer. It then occurred to me that the Ferranti transformer has a terminal to earth the casing, which I had duly connected up. I have since verified that the Ferranti functions normally in the Hale provided that the case is not earthed. If this connection is made, signals instantly disappear. I have since mounted the transformer in my Hale circuit on a small ebonite base to thoroughly insulate it, with, I think, improved results for control of reaction.

Possibly it is some trouble of this sort that your correspondent is up against.

Wishing you all success.

Faithfully yours,
HUGH L. ALDIS.

"Glanmire," Ashleigh Road,
Solihull.

The Editor, POPULAR WIRELESS.

Dear Sir,—I fixed up the two-valve "Hale" on publication, and am more than pleased with its performance; it is the "most satisfying" set that I have ever tried, and I have been building sets for four years, anything and everything from a crystal to four valves.

For the last three weeks, however, I have been experimenting in an effort to add a stage of neutralised H.F., but without satisfaction. I am sure there must be a great number of people who would welcome information on this addition.

Gratefully yours,
W. SCHOFIELD.

8, Grafton Street,
Ashton-under-Lyne.

STRONG BRITISH VALVES.

The Editor, POPULAR WIRELESS.

Dear Sir,—I was very interested in the report of the Cossor aeroplane tests which appeared in a recent issue of "P.W." Living in France, I imagined that if the valve filaments could stand up to such extraordinary treatment, they would stand a very good chance of surviving the usual rough handling of the French postal authorities. On two previous occasions I sent to England for other makes of valves—six in all—but on arrival there were only two which I could use, and the surviving filament of one of these was evidently fractured, for it petered out a few days later.

The astounding statements which followed the aeroplane tests prompted me to try my luck again, and I arranged to have three of the new Cossor valves sent out to me. The parcel arrived, in the usual chewed-up condition, and bearing signs of having been used as a collision mat for docking the Channel steamer. Two of the valves were adrift in the wrapper, but fortunately the third, still in its box, was between them. On testing the filaments I was agreeably surprised—they were all intact, and in splendid condition. The valves have now been in regular use for over a month; they are giving results far superior to those obtained from any others I have tried, and I think you will agree with me when I say that the makers' claims for the special kalcined filaments are in no way exaggerated.

In my opinion this little experience is interesting, not only because it substantiates the accuracy of your report, and upholds the makers' somewhat modest claims, but because it proves conclusively that there *is* at last an available valve with a real "long life" filament at a very reasonable price.

Yours faithfully,
OSWALD J. RANKIN.

Petit Nice de Vouillant, Seyssinet (Isère), France.

TECHNICAL NOTES.

(*Continued from page 166.*)

principle, however, the first of which is the fact that the electrical particles from the radio-active substance are emitted with such a high velocity that they are uncontrollable by the ordinary methods adopted in the wireless valve. A valve which required no filament-heating current would obviously be a very great boon, and not the least of its advantages would be the fact that it would be impossible to burn it out.

Selectivity.

Owing to increasing ether congestion (this applies more particularly to the United States than to the British Isles, at any rate so far as B.B.C. broadcasting is concerned) another very desirable development is a simple arrangement for increased selectivity.

For this reason it is believed by many that in crowded areas, as for example in cities and large towns, the outdoor aerial is not only unnecessary for most purposes, but is, in fact, disadvantageous, and that in the future the indoor aerial, and even the loop aerial, will have precedence over others owing to its much greater convenience and freedom from interference.

Quartz Standards.

Following upon my remarks recently on the use of quartz crystals for standardising transmitting circuits, I have received an interesting leaflet from Messrs. A. Hinderlich, F. Lechmere Road, London, N.W.2, which gives a large amount of useful information upon these crystals, together with the prices of the unmounted crystals.

The prices appear to be very reasonable, and vary from 20s. to 60s., which is much less than the prices mentioned previously for the American crystals.

A Correction.

In the advertisement for the Ekco Combined H.T., L.T. and G.B. Unit for D.C. mains in the March 12th issue of "Popular Wireless," the word H.T. should be bracketed with (a), and L.T. with (b). The advertisement then reads correctly.

Fixed Wave-lengths.

If the piezo-electric quartz crystal is suitably arranged as part of a valve transmitter, the frequency of the circuit will remain constant, for years, to a few parts in ten thousand. About 20 harmonics of the standard wave-length are available for calibration purposes. The unique advantage of a quartz crystal suitably arranged is that it absolutely prevents sudden small frequency changes. This greatly increases the range and clearness of a transmitting station, since the receivers, once set, remain tuned in.

Readers interested in this matter cannot do better than write to the address given above for full technical information.

New Talking Pictures.

De Forest's phono-film is now commercially established, and is becoming fairly well-known. Talking motion pictures, in which the synchronising of action and sound is at all times assured, have been announced and demonstrated recently by the American General Electric Company. This process, which is the result of several years of experiment in the General Engineering

(*Continued on next page.*)

TECHNICAL NOTES.

(Continued from previous page.)

Laboratory of the above-mentioned Company, involves only slight changes in the standard motion picture projectors, since it requires only the addition of a sound reproducing attachment and a loud speaker suitable for auditorium use. Both the picture and the sound are recorded on the same film.

One of the demonstrations has been with music to accompany feature films, the music being rendered by a full concert orchestra. Development in this field does not require any change in the technique of making the original film. After the original picture film has been made and titled, the accompanying music is played by a concert orchestra and is recorded on a film. The picture and sound records are then printed on one film in the proper time relation.

Photo-Electric "Eye."

To the casual observer the talking film does not differ from the usual motion picture positive. It is of standard width, but along the left margin there is a strip a small fraction of an inch wide on which is a series of horizontal light and dark bands and lines, of varying width sand intensities.

The film is passed through the reproducer at constant speed and as these light and dark bands pass rapidly before a tiny slit in an optical system, the amount of light is varied. The ever-changing amount of light is received by a photo-electric cell—the electric eye—which is extremely sensitive to any change in the amount of light striking it.

The more light received the more current it will permit to pass through its circuit. This current is amplified and changed from electrical to audible energy by an amplifier and speaker.

Multi-valves.

A good deal has been heard lately about multivalves; these are, in effect, several valves combined within the one glass bulb. A company has been formed in the United States for placing valves of this kind on the market. The particular valves which they are first manufacturing are of the three-in-one variety.

In outward appearance the valve is similar to those in use at the present time except for the fact that four extra terminals are provided in the base for making connection with the upper limbs inside the valve. According to the manufacturers, this valve may be used with any standard receiver with very few changes in the wiring of the set. The volume from one of the new "multivalves" is sufficient to operate a loud speaker when the valve is consuming 0·25 ampere at 5 volts.

A complete receiver may be built with only one multivalve. If extra volume is required at the output, an ordinary power valve may be incorporated in the circuit. The filament is cut into three sections, one for each of the three grid and plate units, connected together in series.

With a super-heterodyne set, two multivalves are required, one for the three intermediate amplifier stages and the other for the two detector stages and the audio stage, and it is claimed that when using this combination a saving in filament current of one ampere is effected. The new valve fits into a standard socket having, as mentioned above, extra connections at the side.

R/R

Printed and published every Thursday by the Proprietors, The Amalgamated Press, Ltd., The Fleetway House, Farringdon Street, 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, 17/4 per annum, 8/8 for six months; 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, March 26th, 1927.

R/B