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# Popular Wireless

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No. 244. Vol. X.

INCORPORATING "WIRELESS"

February 5th, 1927.

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HOW TO BUILD THE "SELECTIVE" THREE.

Some Neutrodyne Troubles—By Capt. H. J. Round, M.I.E.E.

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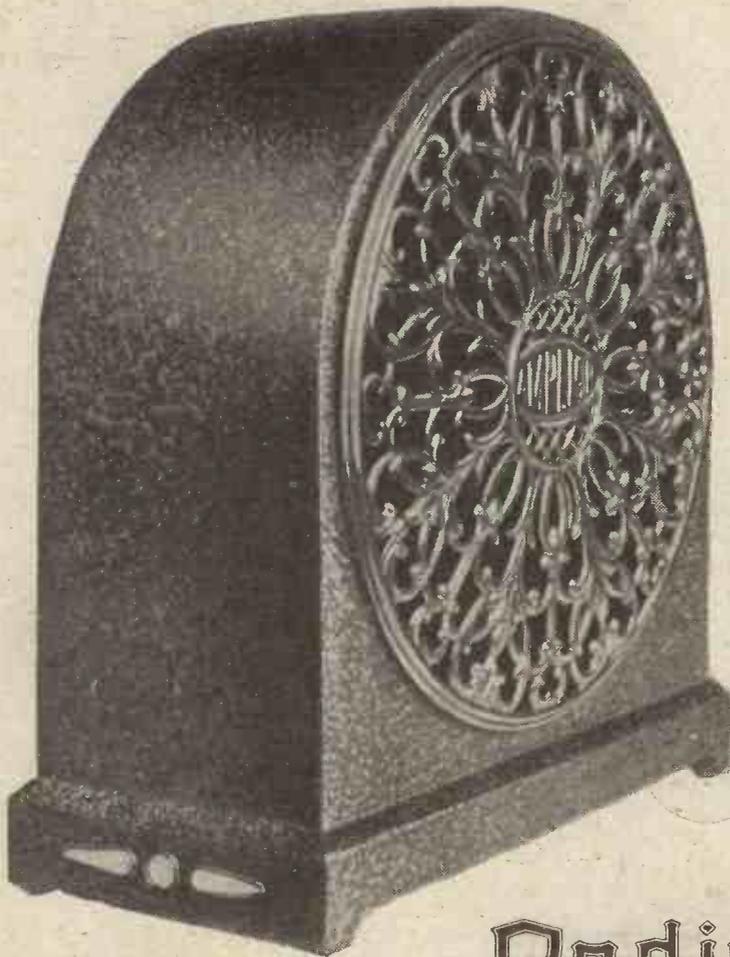
# MARCONI VALVE TYPE K.L.1

**APPROXIMATE DATA:**

<i>Fil. Volts</i>	.. 3.5	<i>Fil. Current</i>	.. 2 amperes
<i>Anode Volts</i>	.. 100	<i>Amp. factor</i>	.. 7.5
<i>Impedance</i>	.. 5,500 ohms	<i>Normal Slope</i>	.. 1.36 ma/volt

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Get a good  
loud speaker!



JUST as it pays to get a good pair of shoes, a good hat and good clothes, so does it pay to get a good loud speaker. It will last, it will look well always, it will give enduring satisfaction, and though it may cost a little more in initial outlay it will prove to be an economical investment in the long run. Good loud speakers, moreover, are not necessarily expensive—the world-famous AMPLION is obtainable in 21 different varieties at prices ranging from 38/- to thirteen guineas and every Amplion carries with it a service guarantee which infallibly ensures satisfaction.

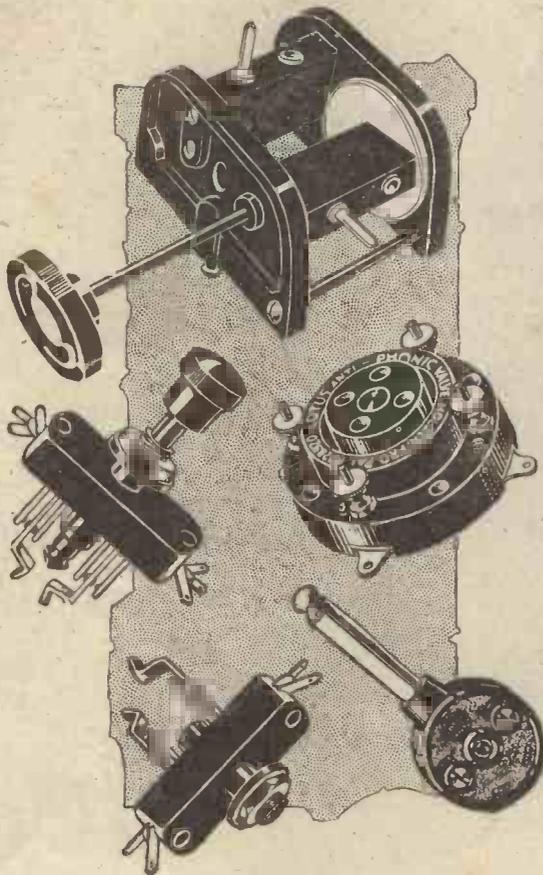
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"For Better Radio Reproduction"

# BEST FOR ANY SET

Guaranteed efficient in construction and design, "Lotus" Components are good enough for the most elaborate set, and yet reasonable enough in price for the least ambitious.

Improve the appearance and get the most out of YOUR set by using "Lotus" Components.



## "LOTUS" VERNIER COIL HOLDER

(Pat. No. 244251)

*The Moving Block CANNOT fall.*

Holds the heaviest coil securely in position and prevents fading away of volume. Vernier movement reduces speed of moving coil block by eight times. Made for left or right hand.

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For outside panel mounting—2-way	...	...	7/-
Do.	do.	3-way	10/6
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Do.	do.	3-way	12/6

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*Absorbs shock, protects valves.*

Springs and valve sockets locked together to make definite and permanent connection. Made with terminals and without, also with Grid Leak enclosed in Bakelite base, which eliminates unnecessary wiring and soldering.

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Combination Grid Leak and Terminal Valve Holder	...	...	3/9
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All Anti-Microphonic Type.

## "LOTUS" JACK AND SWITCH

Designed to occupy the minimum space, being only 1½ in. deep. Of the finest Bakelite, they have nickel-silver springs and contacts of pure silver. Soldering contacts can be made to suit any wiring. One-hole fixing.

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Jack No. 3, as illustrated	...	...	2/6
Others from 2/- to 3/-	...	...	
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Others from 2/6	...	...	

## "LOTUS" JACK PLUG

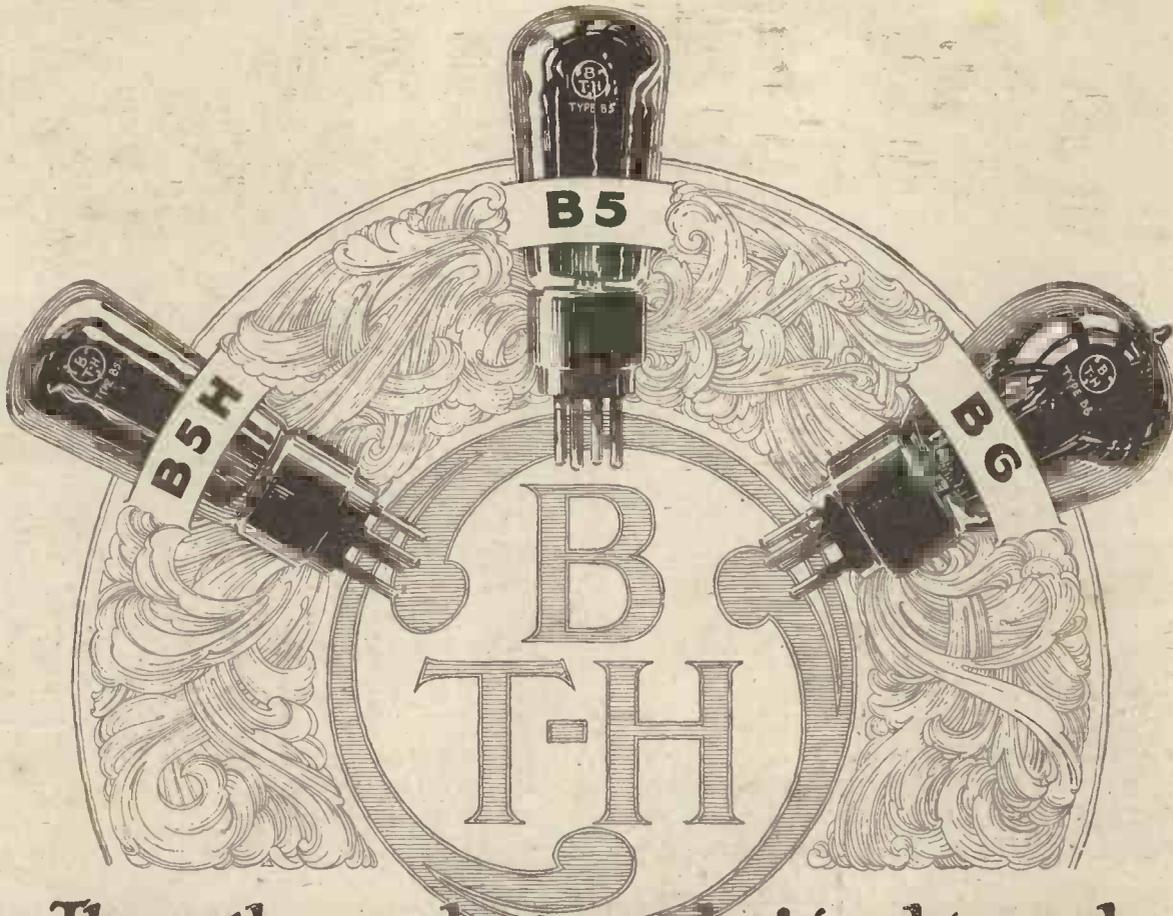
For use with "Lotus" Jacks, but can be adapted for use with any other type by means of spring sleeve fitting supplied with each. Best Bakelite mouldings and nickel-plated brass parts. To fix, the wires are placed in slots and gripped into position by a turn of the screw cams.

Price, 2/-.

FROM ALL RADIO DEALERS;

# LOTUS COMPONENTS

GARNETT, WHITELEY & CO., LTD.  
 LOTUS WORKS, BROADGREEN RD., LIVERPOOL



**These three valves are designed to work perfectly together on a small 4v. accumulator or dry battery.**

<b>B.5 H.</b> .....	<b>14/-</b>
Filament Volts.....	2.8
Filament Current.....	0.06 amp
Anode Volts.....	40 to 120
Amplification Factor.....	17.5
Impedance.....	55,000 ohms
<b>B. 5.</b> .....	<b>14/-</b>
Filament Volts.....	2.8
Filament Current.....	0.06 amp
Anode Volts.....	20 to 80
Amplification Factor.....	7
Impedance.....	17,000 ohms
<b>B. 6.</b> .....	<b>18/6</b>
Filament Volts.....	2.8
Filament Current.....	0.12 amp
Anode Volts.....	40 to 120
Amplification Factor.....	8
Impedance.....	12,000 ohms

With the introduction of the new B.5.H. Valve, there is now available a complete range of super-efficient valves for 4 volt batteries. The B.5.H. Valve is intended for the H.F. stages, the B.5 for detector, and early L.F. stages, and the B.6 for the final L.F. stage.

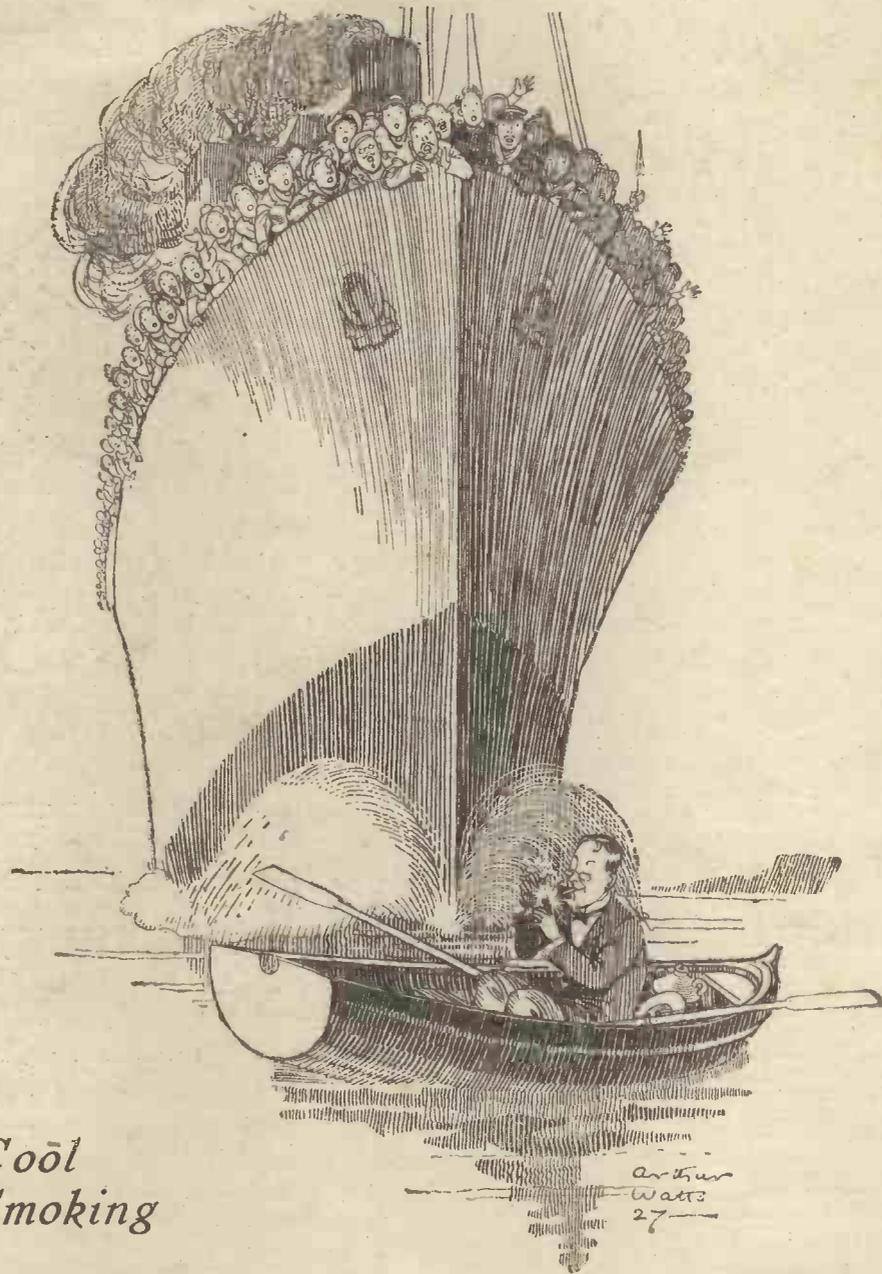
These three valves provide a combination of incomparable

efficiency and economy for multi-valve sets using 4 volt accumulators or dry batteries. A 3 valve set for example, equipped with one of each of the three types would require a total filament current of only 0.24 of an ampere, and could be operated for over 80 hours for a single charge on a 4-volt 20 ampere-hour accumulator.

*If you use, or wish to use, a 4-volt battery you will get the finest possible reception at the lowest possible running cost by equipping your set with one or more of the valves illustrated above.*

# B.T.H. VALVES

PLAYER'S MEDIUM NAVY CUT CIGARETTES, WITH OR WITHOUT CORK TIPS.



*for Cool  
Smoking*



REGD. NO. 154015

# PLAYER'S

Navy Cut

# CIGARETTES



10 for 6d.    20 for 11½d.

50 for 2/5    100 for 4/8

# Four First-Class Receivers

are described in the February issue of  
**MODERN WIRELESS**



Every radio enthusiast should make sure of the February issue of MODERN WIRELESS (now on sale, 1s.). Four very special sets are described in full, with complete working diagrams: The "Wanderer" Five, a really splendid long-distance loud-speaker receiver; the Midget Reinartz Receiver, a compact, cheap, and easily handled one-valver; a modern Short-Wave Receiver which uses two valves, designed and described by the famous amateur transmitter,

Mr. E. J. Simmonds, M.I.R.E., F.R.S.A.; and the "Skyscraper," a two-valve set embodying every modern refinement and capable of real DX results. There are many other special articles, including: The Problem of Blind Spots, Aerial Efficiency, Making a Tone and Filter Unit, and My Five-Valve Set, by Capt. H. J. Round, M.I.E.E. (Chief Research Engineer of Marconi Co.). Don't miss this splendid number. Be sure to ask for

# MODERN WIRELESS

February Issue Now on Sale.

1/-

Buy a Copy TO-DAY.

# The Radio Mail

For long service  
**Cossor**  
every time!

Published periodically in the interests of Valve Users

## A Sensational Valve Test

Cossor Valves hurled from aeroplane to prove that new Kalenised filament is practically unbreakable

When the cat becomes entangled in the leads to your Receiver—writes our Special Correspondent—and brings the outfit crashing to the floor, don't despair. You won't find it necessary to replace three or four costly valves—at least not if you are using the ones I saw subjected to a most amazing test at Edgware a week or two ago.

In company with Mr. Sissons Relfh, of *Amateur Wireless*, Mr. Wheatley, of *Popular Wireless*, and Mr. Thompson, of *Wireless World*, I was invited to witness an unusual kind of test. It was nothing short of dropping valves from an aeroplane in full flight. It seemed a new sort of a joke—one usually reserved for the first of April. I was loth to go—the whole thing appeared to be so incredible. What else could one expect to find but a few fragments of broken glass? However the voice on the 'phone was insistent. "Please come—the others have promised—and we know you'll only kick yourself afterwards for missing the most thrilling valve test you are ever likely to see." That fixed me! As a journalist I am all out for thrills!

On arrival at Highbury we were duly taken around the works and invited to choose a dozen Stentor Two valves from among a huge stock ready for despatch. We were then asked to insert them into the ordinary kind of folding carton and after sealing them to number the boxes for ready identification. I should mention that no cotton wool or corrugated paper was used to protect the valves. On arrival at Stag Lane Aerodrome the parcel of valves was handed to Captain Barnard with instructions that they should be thrown overboard at a height of not less than 500 feet. As there was a spare seat in Captain Barnard's "Moth", my friend Mr. Relfh, of *Amateur Wireless*, accepted the opportunity of seeing what Edgware looks like from the air.

They climbed into their seats, a mechanic gave a few preliminary turns

to the propeller. "Contact," cried Captain Barnard, and with a roar the machine dashed forward. In a few minutes it was back over our heads. "Look out—here's the first one," someone exclaimed, as a small object was seen to be falling rapidly to the ground. There was a general rush to pick up the first valve ever to be thrown out of a 'plane. The box was badly dented, but the seal was intact, and vigorous shaking failed to disclose whether there was anything loose within. "Here's another," was the shout, and glinting in the bright sunlight—tumbling over and over in its mad plunge earthwards was another little blue and yellow box. This time luck was against it. There was an ominous rattle as the carton was shaken—the pilot told us afterwards that this box crashed against the tail 'plane. And so at regular intervals these wonderful little Cossor Valves were showered down upon us. Like the parable "some fell on stony ground and some by the wayside"—three did fall on a concrete road and one landed with a resounding crash upon a corrugated iron roof.

But all—except one—were retrieved and taken—under strict supervision—back to Highbury. Mr. Thompson, of the *Wireless World* made himself responsible for their safe custody. I don't think that the great Mr. Maskelyne himself would have been able to have substituted new valves without Mr. Thompson's knowledge!

On arrival at the works, the seals are broken and the valves removed. As we surmised, the one which struck the tailplane is badly smashed. And now everyone is keyed up with excitement. One by one the valves are inserted into a socket—a switch is moved, and the needle swings over to say "All's well." Every filament is intact. It is incredible. Even the valve which is smashed also registers a bull's eye. Eleven unbroken filaments out of eleven valves—well

might we be proud to think that this amazing test took place in England. Surely British valves are the best in the world. As *Popular Wireless* in their issue of January 8th remarked in commenting upon this test, "It now remains for some manufacturer to agitate a valve in a cocktail-shaker and then try it with a steam-roller!"

### Flashes from the Test

Captain Barnard himself was so sceptical that the aeroplane test would not succeed that he bet a member of the aerodrome ground staff that at least half the valves would be smashed to pieces. Captain Barnard is now half-a-crown poorer!

There is no truth in the rumour that A. C. Cossor, Ltd., are proposing to perform the same test with five hundred valves over Trafalgar Square.

Nor do they propose to utilise this method for delivering valves to their wholesale depots.

In deference to the wishes of the passenger Captain Barnard was earnestly requested not to loop the loop!

After reading details of this test in *Popular Wireless* one man wrote us that as he found a Cossor bright emitter on the refuse heap at the Welsh Harp which gave him good service for two years, he intended searching the aerodrome at Edgware for the missing one. And his name wasn't McPherson either!

### How long should Valves last?

—the filament has the last word every time!

In the early days of Broadcasting we were lucky if valves lasted six months. If perchance one gave a whole year's service it was something to be shouted from the house tops. Now science has taken a hand in the game, and has given us a filament which will last for thousands of hours.

Interviewed at the works of A. C. Cossor, Ltd., the Chief Research Engineer gave our representative some details of this new Kalenised filament. "It is fundamentally different," he said, "to other types of filament inasmuch as it operates practically without heat. In the past the chief trouble with filaments has always been their brittleness due to the constant contraction and expansion whenever the current is switched on and off. Because the Kalenised filament never contracts or expands its nature does not alter. It is as pliable after 2,500 hours as on the first day it is made." "Then," presumably, asked our representative, "it does not lose its emission." "No," he answered, "because the electron stream is given off by the Kalenised layers and not by the metal core itself. The metal core serves merely as a conductor of electricity. There is another point, too, which ought not to be forgotten. And that is the wide latitude of working voltages enjoyed by this marvellous new filament. A year or two ago every receiving set was embellished with a rheostat knob for every valve. Delicate filament control became a fad. Non-technical people were scared off wireless—they couldn't understand the array of knobs. Now we are much more sensible. Any receiver fitted with Cossor Valves needs only an On-and-Off Switch. It doesn't require any variable rheostats—the Kalenised filament in a Cossor 2-volt Dull Emitter starts giving off its electron emission at 1.2 volts and reaches its maximum at 1.8 volts. Even a fully charged accumulator won't harm it—although of course it won't give any louder results."

### The Curse of Microphonic Noises

Science discovers a new remedy

There is nothing more irritating than to use a valve afflicted with microphonic noises. Let anyone walk across the room—or touch the table on which the receiver is placed—and immediately there is a warning "Ping!" from the loud speaker. Microphonic noises can come from a variety of causes—but there are two principal ones. A very common reason is a badly designed mounting system within the valve. Sometimes the grid—or the anode for that matter—is not sufficiently rigid. It can move—very imperceptibly, of course, when any vibrations are set up. But generally the fault lies with the filament. Stretched taut, as a violin string, the average filament is very apt to vibrate—and once set in motion these tiny vibrations, unseen of course by the human eye, continue for quite a long time.

Now a new method of filament manufacture has been discovered which ends this curse. It is embodied in the new Cossor Kalenised filament.

Imagine, if you will, a glass tumbler struck a sharp blow by a spoon. A clear musical note is set up due to the vibrations of its edge. But hold it with string or paper tape and what happens? It is as silent as the grave. The vibrations are damped out. This simple parallel will show why the Cossor Kalenised filament is free from all suspicion of microphonic noises.

The wire core is surrounded by kalenised layers of non-metallic material. The vibrations are smothered at their source.

This exclusive Cossor feature is particularly important in power valves, and it is interesting to note that technical experts have—without a single exception—commented strongly upon the exceptional purity of tone of the new Stentor Power Valves.

### A new valve

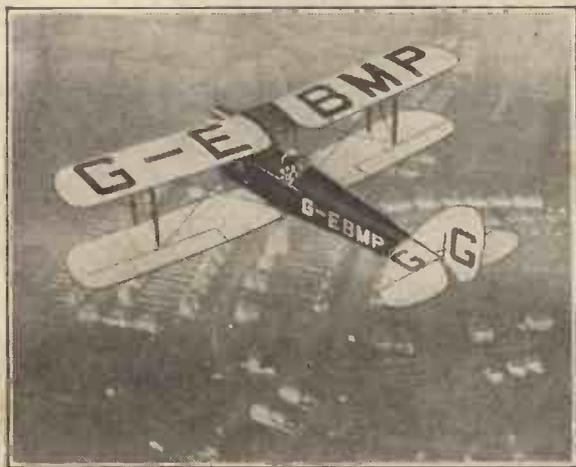
—the Cossor 2-volt R.C.

VALVE design has been advanced one step further by the introduction of the wonderful new 2-volt Cossor Resistance Coupling Valve. I.F. amplification with resistances or chokes has long been recognised as giving the purest reproduction. Its universal acceptance has only been delayed through the lack of suitable valves. The new Cossor R.C. has an amplification factor of 40 and is absolutely non-microphonic. Filament consumption 1 amp. Your Dealer stocks it.

14/-

## Cossor

—the valve which serves you longest



The De Havilland "Moth" carrying out the Test

# Popular Wireless

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## RADIO NOTES AND NEWS.

The Human Touch—An Irish Yarn—Valve DX.—Another Kind Offer—"Poor Old Jo(e)"—Night Schools Up-to-date—Weather Reports—The Fleetway 'Flu.

### The Human Touch.

THERE is no denying that a fine old squawk has been set up about the abolition by the B.B.C. of nuns and nannies in favour of ordinary ladies and gentlemen in spattees and pullovers. But I am not sobbing my heart out about the murder, either on my own account or that of the youngsters, because I really don't believe that anything like a majority of them care twopence. As for the kids in my house, the only time they will listen to the wireless is when someone wants them to go to bed. Yet I think this gesture of the B.B.C. is destructive of "the human touch" and is therefore a bad sign. (We believe the Uncles and Aunts are shortly to be reinstated.—Ed.)

### "Facsimile" Telegraphy.

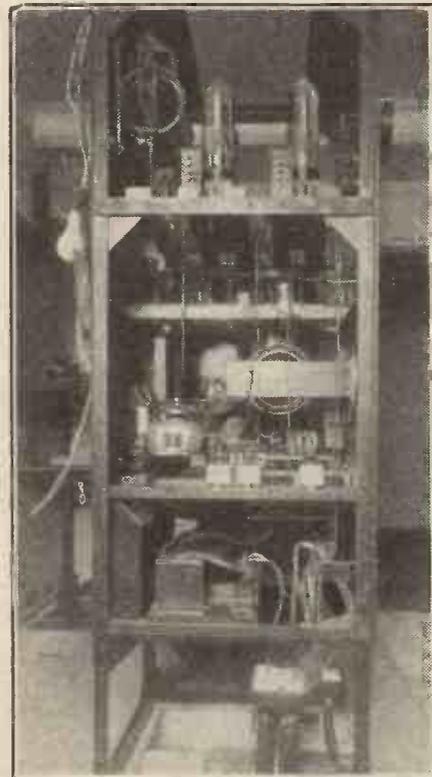
MARCONI'S latest, a system which permits the transmission of telegrams in facsimile, rather knocks the bloom off the joke about the old lady who would not accept a telegram as genuine, on the score that it was not in her son's handwriting. That reminds me of This Week's Bonehead, who wouldn't believe his loud speaker because, he said, "Electricity can't have a Yorkshire accent and a sniff."

### An Irish Yarn.

ALL you fellows who have been doing critical work with crystals might as well put up the shutters, for you cannot beat this. The Rev. Dr. Ellison, of Armagh Observatory, writes to a Belfast newspaper and states that on January 3rd, about noon, the Observatory sent 2,500 feet of wire into the air by means of a kite, and "earthed" it. When it was "earthed" it was connected also to a seven-and-sixpenny crystal receiver, and "all the North American radio stations were heard with as much ease and loudness as Daventry would be on a set of several valves."

### Benjamin Franklin, the Radio Fan.

SO now we know that all the B.B.C. has to do in order to give successful transatlantic relays is to get a crystal set and tie it to an "earthed" wire 2,500 feet



Part of the transmitting gear at the station WRNY, New York.

long, with most of the feet up in the air. The learned doctor gravely continues; "The experiment was, of course, a repeti-

tion of that of Benjamin Franklin a century and a half ago, when he drew down lightning from a thunder cloud." Guess and calculate that the American broadcasting people will be tickled to death to know that their programmes sounded like Ben's lightning. Knights of the C.W. are hereby advised that they need not in future report any "pick ups" nearer than Japan. I can't chronicle such small beer in these columns (Ha!).

### An Interesting Hint.

THE reader who sent me the cutting from Belfast, and whose superhuman restraint in refraining from comment thereon I admire, tells me that he made the "wave-trap" described in "P.W." for January 8th, and takes off his hat to it. He adds that by turning the switch to the third position and inserting a "permanent" crystal and a pair of 'phones between the terminals E1 and E2 a very useful receiver results, and the valve batteries can be cut out during S.B. transmissions, thus saving current without removing the trap from the set proper when anything specially good is being broadcast by the local.

### Transmitting Note.

MR. R. H. LAUDERDALE announces that he is now working telephony and C.W. on 170 metres and 45 metres; call sign G2DL, and would welcome reports sent to 3, High Street, Penze, London, S.E.

Mr. C. O. Jervis, 59, Kingsdown Road, Leytonstone, E.11, reports that he has heard 5 ON Wanstead at 11.30 a.m. and 7 p.m. on January 16th. No doubt 5 ON will be glad to know his signals got so far and finally escaped from Mr. Jervis' loud speaker and 2-valve set.

(Continued on next page.)

## ANOTHER MAGNIFICENT FREE GIFT TO READERS

Each copy of next week's specially enlarged number of "Popular Wireless" will contain

### Four MORE Sixpenny Blue Prints

giving full details of a further four popular receivers.

Place an order with the newsagent now and make sure of YOUR copy.

## NOTES AND NEWS.

(Continued from previous page.)

## Valve DX.

THE first reader to report long-distance broadcast reception, following my recent query, is F. H. B., of Shepherds-well, near Dover. With a 5-valve set on January 16th (2.50 a.m.) he got strong signals from W I A B (Miami, Florida), and the racket continued till he closed down at 5.15 a.m. Yeh! Not so bad. And the next, please!

## Another Kind Offer.

MR. P. D. WALTERS, 58, Carlton Hill, St. John's Wood, N.W.8, has heaps of back numbers of "P.W.," dating back to No. 1, and will be pleased to send not more than two copies each to persons who will enclose sufficient postage, stating volumes and numbers required. The offer applies only to numbers prior to December 1, 1926.

## Rough on W.S.

A WRITER of a letter to the daily Press says that "the only plays that are effective over the wireless are the classics. Comedy is completely lost." Surely this gentleman, notwithstanding he writes from the Forum Club, is a candidate for some of the educational talks! Am I dreaming, or did that second-rate author, Shakespeare, write some excellent comedies? And is not "She Stoops to Conquer" a classic? Moreover, I am doubtful whether we could not call even "Charley's Aunt" a classic.

## "Poor Old Jo(e)."

SO the Jo'burg broadcasting station has had to close down for lack of funds. This is, I believe, the first-tragedy of its kind. Even broadcasting cannot live without money, and the Jo'burgers seem to have forgotten the fact. That's the worst of "diamond rushes," they take folks' minds off the joys of jazz and the uplift of the ukulele. But—perhaps the burghers are not so patient as we are on a diet of chamber music, keyboard exercises, and compulsory education.

## Night Schools Up To Date.

AND talking of that, what about this?—as the ostrich said to the humming-bird who bragged about its egg. I have before me two dainty little booklets issued by the B.B.C.—goodness knows why they do these things. One is all about its transmissions to schools, and I note therefrom that on March 7th some of our young hopefuls will have their education interrupted by a talk on "The Mangrove Swamps of the Rufiji Delta." This, mark you, to a pack of young rascals who probably couldn't tell you the postal rates to Spain and Japan, or draw a map of Lancashire.

The other is a programme of the talks for us, up to April. Oh, joy! "How Foreign Offices and Embassies Work," is one subject. The answer is, "Eleven till three." Another is "Some Architectural Problems of Today." How to fit the garage in without pushing the fowl-house over. What?

## A Surprising Pump.

AT last month's exhibition at the Physical Society, Mullard's had an extremely interesting show, but, valves apart, the best item was the won-

derful Holweck Molecular Pump, which is used for obtaining the high degree of vacuum required for valves. This gadget runs at a speed of 4,000 revs. per minute, and the clearance between the rotor and the stator is only 1.5-thousandths of an inch. Still, that's pretty generous for molecules, anyway. The degree of exhaustion obtainable with this pump is 0.000015 mm. The amount of air left in the valve after an interview of that nature is about half that to be had in a third-class smoker on a Cup-tie day.

## ANOTHER 2/- GIFT FOR READERS!

Next week four more Sixpenny Blue Prints will be given away with every copy of "POPULAR WIRELESS."

ORDER YOUR COPY NOW!

## "Our Committee."

THE most hopeful sign I have seen since January 1st is the formation by the B.B.C. of an advisory committee consisting of representatives of the chief "listeners'" organisations. It shows that, at any rate, the B.B.C. "means willing." But it is to be hoped that the committee is, in the average, of a good medium-brow quality. Just suppose it were packed with Chamber Music Charlies!

## SHORT WAVES

Broadcasting Query.  
Is listening lessening?—"Sunday Pictorial."

We listened some time to a programme drawn up by the blind, but came to the conclusion that it was really better suited to the deaf, and switched off.—"Yorkshire Telegraph and Star."

Sir Walford Davies' suggestion that the angels may hear our broadcast programmes seems a complete answer to the question, "O Death, where is thy sting?"—"Star."

"How much do you charge for your rooms?"  
"From ten pounds per month up."  
"But I'm only a poor Scotch broadcaster."  
"In that case it's ten pounds per month down."—"South African Wireless Weekly."

When constructing a wireless set, the thing to remember is that it is the relative connections which need to be got right.—"Daily Paper."  
Especially if they happen to be rich maiden aunts!

A well-known singer who was recently broadcasting from the Albert Hall remarked afterwards how successful the concert had been, and asked if her voice had filled the hall. Someone was heard to remark that he was sure it had, for he had seen several people leaving to make room for it.

Safety First.—The new wireless telephone to New York costs five pounds per minute. Scotsmen with weak hearts are advised to send postcards as usual.—"Sunday Pictorial."

"Do you believe in auto-suggestion?"  
"Is that the system where you keep on repeating, 'Every day I get better and better, and you get well if you're poorly?'"  
"That's it."

"Well, I believe in it. Every day for the last three months I've said to myself, 'Some day I'll get a summons for not having a wireless licence,' and sure enough it came yesterday."—"News of the World."

## An Athletic Knight.

QUITE naturally, the Scotch newspapers sang more lustily than any others when Mr. Reith, of the B.B.C., was created knight. One of them, in an anthem intended to glorify Scotch brawn (not edible), reminds its readers that Sir J. C. W. Reith once walked from Glasgow, up Ben Lomond and back, all in one day. Splendid! But I'll bet he uses the lift at Savoy Hill. Anyway, why did he walk up Ben Lomond? That's not the way to England. I suppose he found it out on top, and that accounts why he walked back the same day.

## Rugby Radio.

NO, not the "white elephant" housed by the Post Office in Warwickshire and which has trumpeted "all over the globe." I refer to the broadcast description of the England and Wales match. It was as tame a bit of oratory as one could hear in a day's march round the Bands of Hope of Golder's Green. I put on an old sweater, pushed the furniture back, and prepared to die of excitement, but it might have been a game of draughts. We must take lessons from America in this particular form of sport reporting.

## Weather Reports.

WHAT is the use of the B.B.C. giving us all this jargon of the meteorologist in its weather reports? What the precise significance of a "secondary depression" moving across Iceland in the direction of Yarmouth is, I am left to imagine. Similarly, waves of high or low pressure don't mean much to the ordinary man; weather, to him, means rain, hail, snow, fog, or sunshine, but chiefly rain.

I vote for the plain, unvarnished prophecy, and no camouflage about depressions. The weather supplies the depression.

## Revenge by Radio.

I SEE that Professor Low has been receiving letters from people who imagine that they are being persecuted and injured by wireless. I have received at least a dozen such letters during the past ten years, and they are sad or funny according to the way one considers them. The queerest case I know is that of a ship's carpenter, who told me that people in Rio follow him all over the world by radio and blacken his brass buttons by the same means.

They also hit him in the back when he bends down. A clear case of lumbago. However, I know he turns up periodically at Marconi House for a "cure," and he has implicit faith in Senatore Marconi's power to effect that.

## The "P.W." Flu.

THE Editor tells me that they are having quite a merry time at the "P.W." offices just now owing to the "mild attack" of flu that is visiting this country. Quite a number of the Technical staff are down with it, including Mr. G. P. Kendall and other members of the Queries Department, so perhaps readers will be kind to them if they do not get their replies as promptly as they might during the next week or so.



IT seems difficult, indeed, to get anyone to express a concise opinion upon the present and future working of the Trans-atlantic Radiophone. Fortunately, the poor thing hasn't a past as yet, and so is immune from blame on that score. On the whole, prominent business men and others to whom the new service would, if successful, be of the greatest use, do not seem to have been in any tremendous hurry to test it, and out of a dozen kings of commerce whom I approached with the object of getting them to give an account of their chat to the U.S.A., I was surprised to find that not one had yet done so.

The last call I made was upon Mr. Gordon Selfridge. Mr. Selfridge (I thought) is probably the most go-ahead business man in London; Mr. Selfridge is the head of a store that is as well-known in America as it is in this country; furthermore, Mr. Selfridge is an American. Who more likely than he to have taken the earliest opportunity of ringing up one of his business friends in the States?

And yet:

"Although I send a great number of cables to America every week," Mr. Selfridge told me, "it has not yet struck me to use this new telephone system."

"But why?" I asked. "Surely to a man like yourself who has to be constantly in touch with the U.S.A., the telephone would be infinitely easier than cabling and, in addition, save you any amount of valuable time. It takes some hours before a reply to a cable you send to America can reach you; on the radiophone you can get your answer at once."

**Too Much Time Wasted.**

Mr. Selfridge smiled a trifle sardonically. "You get your answer at once when you ask your question," he said, "but how much time do you lose while you're waiting to put it? Of course, as I say, I've had no actual experience of the service, but I have a shrewd suspicion that it has very much the same vices as other systems of telephone communication.

"Only this morning, for instance, I wanted to ring up Paris. My secretary and myself between us put in a good half-hour's work getting through and, that accomplished, neither my correspondent nor myself could hear what each other said!

\*-----\*  
 By **GORDON SELFRIDGE**  
*(in an exclusive interview with  
 "ARIEL").*  
 \*-----\*

After shouting in vain at each other for about ten minutes we had to give it up and settle the matter by telegram. Of course, it doesn't necessarily follow, but if it takes



A recent photograph of Gordon Selfridge.

half-an-hour to get through to Paris, which is a matter of hundreds of miles away, what about America, which is thousands?"

"Then you haven't much faith in this new invention?"

"On the contrary," was the reply, "I think it has boundless possibilities. Undoubtedly it is a step in the right direction. America and Britain are the two greatest commercial nations in the world to-day, and for the good of the trade of both it is absolutely essential that we should have some means of instantaneous communication. The present system of cabling is,

I admit, somewhat slow, but at least one can get on with other jobs while waiting for a reply, in the sure certainty that that reply will eventually come along. It seems to me you might sit with your ear glued to the telephone for a whole day and then not be any farther forward.

"But, from the very inception of broadcasting, I've been looking to wireless to provide us with some means of quick intercourse, and I believe this radiophone is that means in its very early youth."

"Then," I asked, "what do you suggest will have to be done before the trans-atlantic 'phone becomes a real, practical, everyday proposition? The service may be rather slow in working at the moment, but the remedy for that can be only a matter of time."

**Secrecy Essential.**

"That's quite true, I grant," answered Mr. Selfridge, "but there are other matters that every business man will take very strongly into account. The question of secrecy is a very important thing indeed. 'Tell the world' is a fine business slogan, but one doesn't necessarily want to follow it all the time. Under the present conditions, while a man is putting through a big contract with someone on the other side, his biggest business rival might 'listen-in' to every word that is being said and get in before him. And that's a risk that very few would care to take. Make the service secret, and you remove one of its greatest drawbacks. And when you have done away with all these obvious faults, the one which looms most important of all in most minds will, I suppose, remove itself."

"And that—"

"—is the question of cost," Mr. Selfridge finished. "Fifteen pounds is a good deal of money to spend on something that may or may not be satisfactory when you get it. But, no doubt as the service improves and becomes really efficient—which I am convinced it will—more and more people will use it, with a consequent reduction in the charge for a call. But the question is, can the majority of people afford to try out the radiophone at fifteen pounds a try-out? I don't think they can, and it's a pity, because it looks to me as if the system is more suited to domestic

*(Continued on page 1400.)*

## WHAT CONSTITUTES THE IDEAL LOUD SPEAKER?

Are we rapidly approaching the ideal in loud-speaker design? Our contributor is of the opinion that we are, and that, moreover, the ideal will be British made when it does arrive.

By A. J. BOYINGTON.

THE other day I was privileged to hear two of the latest achievements in acoustics. The first was one of the newest gramophones which—to one who still held lively recollections of the old-time phonograph, with its cylindrical records and the nasal travesty of music it produced—was a revelation.

The second shock was provided by one of the latest loud speakers. And here, again, if contrast were needed, one had only to recall the tin-trumpet-and-Brown's-carpiece combination which served one in that capacity for the old Hague concerts. We are indeed progressing rapidly toward the ideal loud speaker.

### A Vital Factor.

But what constitutes the ideal? The loud speaker is certainly one of the most important factors in that perfect reproduction—or acoustic synchronisation, as it is sometimes called—for which we are all striving. At the same time, one must admit, it is the single component which usually falls lamentably short of the needs of the occasion. More imitation science is quoted in relation to the loud speaker than in almost any other portion of the radio receiver field, while the most extravagant claims are made even on an amazingly slim foundation.

The loud speaker, in fact, can be regarded as the "neck of the bottle" as far as sound reproduction is concerned. Even assuming that the various functions performed in turn by the transmitter and the receiver are in acoustic synchronisation, if the loud speaker is not also in accord the whole programme is spoiled. It is tantamount to having an opera, with inspired music fitted to a beautiful libretto and staged with most effective settings, sung by incompetent performers—the faulty rendition ruins the whole.

### Three Conditions.

The ideal loud speaker, therefore, must fulfil three definite conditions. First, it must be omnitonal: in other words, it must reproduce every tone in the audible scale from the highest to the lowest—from the top shrill note of the soprano or the highest squeak of surprise, to the lowest rumble of the *basso profundo* or the deepest bourdon of the organ.

Secondly, it must be equitonal. It must not show a preference for certain tones or groups of tones whilst arbitrarily suppressing others. Even reproduction over the whole musical scale must be its aim. And lastly, it must have what may be termed sonority, or the quality of giving full volume without distortion—a condition upon which natural reproduction primarily depends.

To return to the first requirement: if the lower tones are missing (which has been the case with the majority of loud speakers

until recently), a thin, metallic, and unnatural effect will be produced, highly reminiscent of that happily obsolescent phonograph. On the other hand, if the higher tones are disregarded, speech will develop a booming quality and become unintelligible, the higher-pitched musical instruments will be lost, and the general effect will be of echoing hollowness as though the studio were in a large vault.

The medium register of tones, of course, is rarely—if ever—omitted even in the

they seem to fairly "pop out" at the listener in a manner at once distracting and inartistic, while the slighted or omitted notes are no less disconcerting in their effects.

Thus, the various notes comprising a single musical chord receive different treatment, and the result is a strange and inharmonious jangle. Or a scale played, say, on the piano, will not hold uniform quality from note to note—some will sound stressed and others softened. In vocal reproductions this means the loss of those delicate intonations and shades which are more than half the charm of speech or song. Evidently, then, the ideal loud speaker must be equitonal.

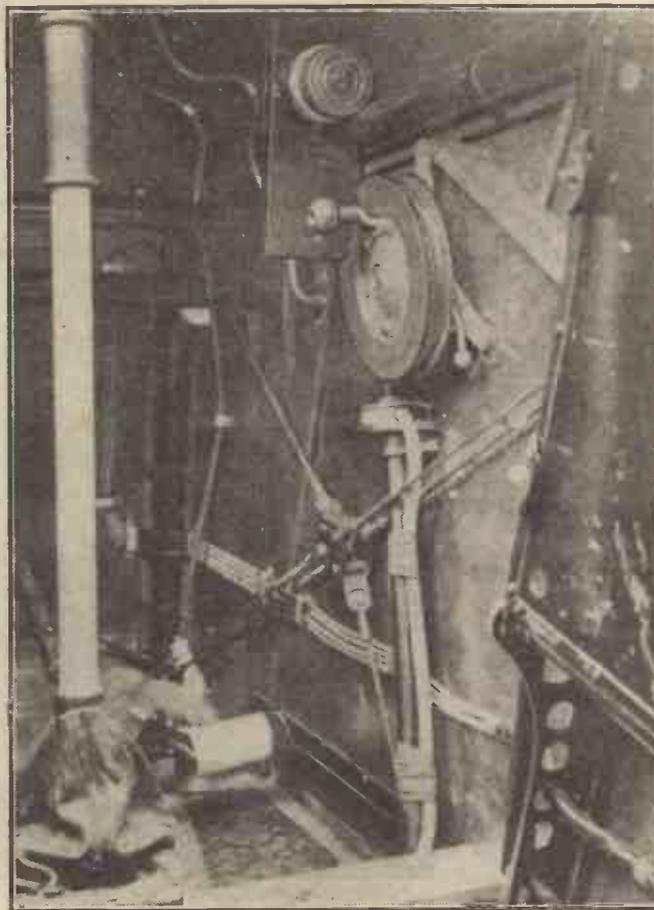
### Suppressed Volume.

Sonority, or volume, does not have such a pronounced influence on natural reproduction as the foregoing. Nevertheless, its good or ill effects are very noticeable. Have you not noticed that reducing the volume below a certain optimum point causes the lower musical notes to

drop out? This necessarily upsets the "balance" of the various instruments when an orchestral piece is being rendered, noises in the room appear more pronounced, and a decidedly inferior effect is produced.

If the case is reversed and the loud speaker overloaded with volume, the effect is deafening and oppressive. Every instrument has its happy medium—the point is reached when the volume is neither too low to be pleasantly audible nor so loud as to make ordinary conversation impossible. If too low, the attention of the listeners will wander and interest in the programme will be lost. If too high, the owner of the receiver will either be forced to apologise to his friends for peculiar and unnatural tone effects, or to his neighbours for being a nuisance.

Given an efficient and correctly operated receiver the majority of modern loud speakers approximate very closely to these three essentials. Moreover, it is worthy of note that our own engineers and manufacturers have been responsible for the most outstanding progress towards the ideal instrument. It is a feather in the cap of the home radio industry that the world's finest loud speakers are British-made, and one may venture to predict that when the ideal instrument arrives it will bear the same reassuring label.



The winding gear employed for lowering and raising the aerial on one of the latest British air-liners.

worst models. Such a defect would be absolutely fatal, as it would cut out all intelligible speech and reduce musical reproduction to a mockery.

### Uneven Reproduction.

A failure to fulfil the second requirement gives rise to a series of somewhat similar faults, though not in so extreme a measure. An instrument which is not equitonal spoils the smooth flow of music. Certain notes are exaggerated to the point when

# The Selective Three

This exceptionally efficient three-valve receiver, specially constructed for "Popular Wireless," will enable constructors to cut out their local station and receive other transmissions without trouble, many stations being heard at good strength on the loud speaker.

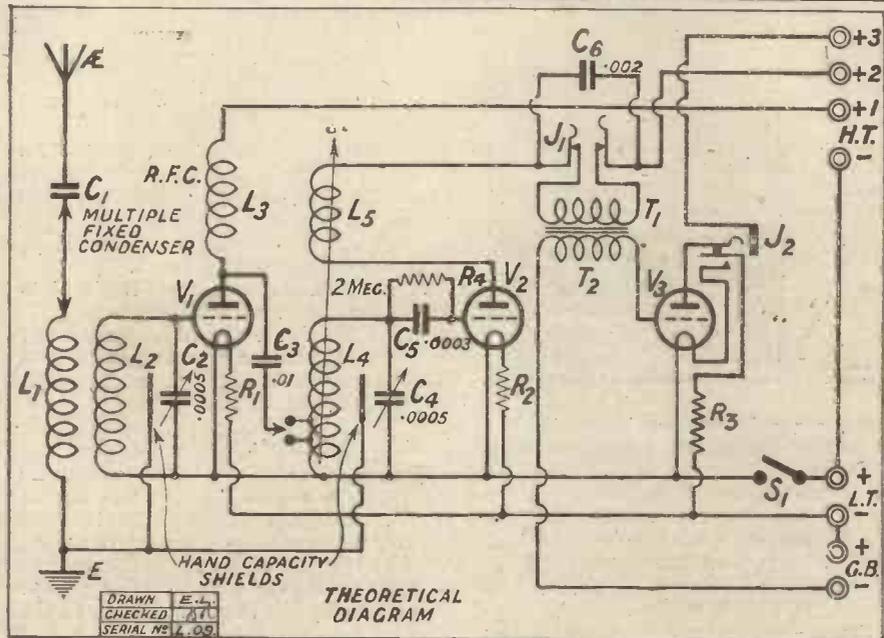
By H. J. BARTON CHAPPLE, Wh. Sch., B.Sc. (Hons.),  
A.C.G.I., D.I.C., A.M.I.E.E.



THERE are many methods adopted by different constructors in efforts to secure the desired degree of selectivity which will enable them to tune in that

## APPARATUS AND COMPONENTS REQUIRED.

- 1 Trolite panel (wavy pattern), 16 x 8 x 1/4 in. (F. A. Hughes & Co., Ltd.)
  - 1 Mahogany cabinet with baseboard to take above panel, and 8 in. deep (The Aircraft Co.)
  - 2 .0005 S.L.F. variable condensers with slow-motion friction-drive (Omond Eng. Co., Ltd.)
  - 3 Anti-microphonic valve holders (Igranic Electric Co., Ltd.)
  - 1 Two-coil holder (Lotus), (Garnett, Whiteley & Co., Ltd.)
  - 1 "Success" H.F. choke (Beard & Fitch, Ltd.)
  - 1 L.F. transformer, type AF3 (Ferranti, Ltd.)
  - 12 meg. "Dumet ohm" grid leak (Dubilier Condenser Co. (1925), Ltd.)
  - 1 .0003 fixed condenser with grid leak clips (Dubilier Condenser Co. (1925), Ltd.)
  - 3 Fixed resistors with screw bases (Burndept Wireless, Ltd.)
  - 2 Baseboard mounting single coil sockets (Beard & Fitch, Ltd.)
  - 1 .002 fixed condenser (Watmel Wireless Co., Ltd.)
  - 1 .01 fixed condenser (mica) (Telegraph Condenser Co., Ltd.)
  - 1 Multiple fixed condenser (.0001 to .0015) (C. A. Vandervell & Co., Ltd.)
  - 1 Double-circuit jack, closed (The Formo Co.)
  - 1 Single-circuit jack, open, with filament control (The Formo Co.)
  - 2 Plugs (one for telephones and one for loud speaker) (The Formo Co.)
  - 10 Insulated terminals marked Aerial, Earth, Grid-, Grid+, L.T.-, L.T.+ , H.T.-, H.T.+1, H.T.+2 and H.T.+3 (Belling Lee, Ltd.)
  - 2 Ebonite terminal strips, 8 x 2 x 1/4 in. and 2 x 2 x 1/4 in. (Burne Jones & Co., Ltd.)
  - 1 Filament switch (Igranic Electric Co., Ltd.)
- Quantity of Glazite for wiring-up, length of rubber-covered flex, 1 spring clip, 11 spade terminal tags, five ordinary terminals and 2 ebonite strips, 2 1/2 x 3/4 x 1/4 in. and 2 1/2 x 3/4 x 1/4 in.

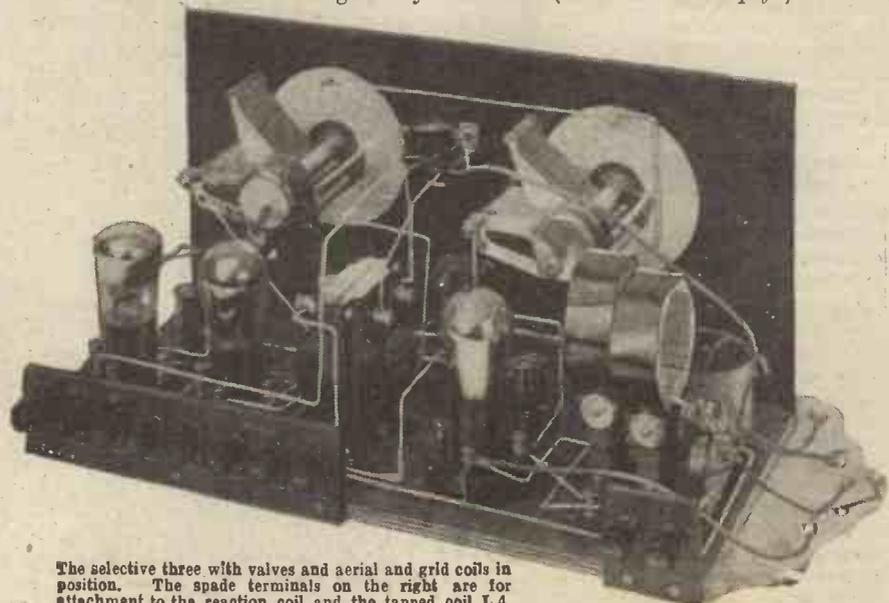


station "just a little farther away" at the expense of the local station. Any suggestion of distance generally leads to a receiving set a certain air of superiority over those designed purely for the nearby station, since there is always the satisfaction that a choice of programmes is thereby made possible.

It has become more or less generally

accepted fact that one stage at least of high-frequency amplification is necessary if any sort of DX work is desired. This does not necessarily imply that the controls of the receiving set should be many or unduly complicated, and the exercise of a little ingenuity always enables the constructor to overcome possible troubles in this

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The selective three with valves and aerial and grid coils in position. The spade terminals on the right are for attachment to the reaction coil and the tapped coil L4.

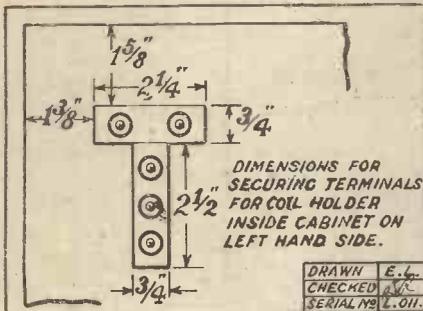
## THE SELECTIVE THREE.

(Continued from previous page.)

direction. Too many knobs to handle are apt to make the inexperienced a little dubious as to his capabilities for manipulating the set with a fair measure of success.

### Easy to Control.

The three-valve receiver to be described in this article is the outcome of a desire to provide a piece of apparatus which, while retaining a reasonable degree of flexibility, is not difficult to control.



There are only two condenser dials to tune in addition to the magnetic reaction control, the employment of fixed resistors obviating the necessity for adjusting any filament rheostats. By suitably choosing the coils the two condenser readings can be made to match so that the searching for and logging of different broadcasting stations is materially assisted.

A glance at the theoretical diagram of connections will make clear the scheme followed in designing the receiver. The reaction coil  $L_3$  in the anode circuit of the detector valve has a magnetic coupling, which can be varied, with the grid coil  $L_1$  of the same valve. This allows the strength of the received signals to be controlled, and, as is usually the case, the most sensitive condition is just off oscillation point.

To compensate for the constants of different aeri-als at varying frequencies, the aerial coil  $L_1$  may be tapped, or better still, use should be made of the multiple fixed condenser  $C_1$ , and  $L_1$  can then be an ordinary plug-in coil of suitable size.

### The Circuit.

The coil  $L_2$  has a tight magnetic coupling with  $L_1$ , and is tuned by a .0005 condenser. The H.T. of  $V_1$  is applied to the anode via a high-frequency choke  $L_3$ , and the high-frequency currents pass through the fixed

.01 condenser,  $C_3$ , to the coil  $L_4$ , which is tapped fairly close to the filament end. Another .0005 condenser,  $C_2$ , tunes this tapped coil, and the signals are rectified by the aid of the usual .0003 condenser and 2 meg-ohm grid leak.

The primary winding  $T_1$  of the low-frequency transformer  $T_1 T_2$  is connected in the anode circuit of  $V_2$  through the medium of a double-circuit (closed) jack  $J_1$ , while in the anode circuit of  $V_3$ , the low-frequency amplifying valve, there is a single circuit (open) jack,  $J_2$ , with filament control. By this means the tele-phones can be plugged into  $J_1$ , if the use of only two valves is desired, and the third valve is not switched on until the plug is inserted into  $J_2$ , the filament circuit of  $V_3$  then being automatically closed.

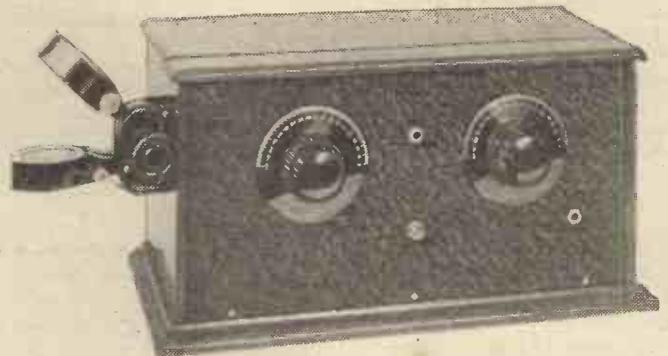
A .002 shunting condenser is placed in parallel across the outer springs of  $J_1$ , for although with the Ferranti transformer employed a condenser is incorporated in the component it will be necessary when only two valves are in use.

### Constructional Details.

Turning attention now to the components and materials required for the construction of this receiver, a complete list is given together with the maker's names. Of course, other components of sound quality, such as are advertised in the columns of this journal, can be employed without detriment to the

final results, but care must be given to any possible alteration in lay-out when depart-ures are made from the list.

Ensure correct panel alignment by



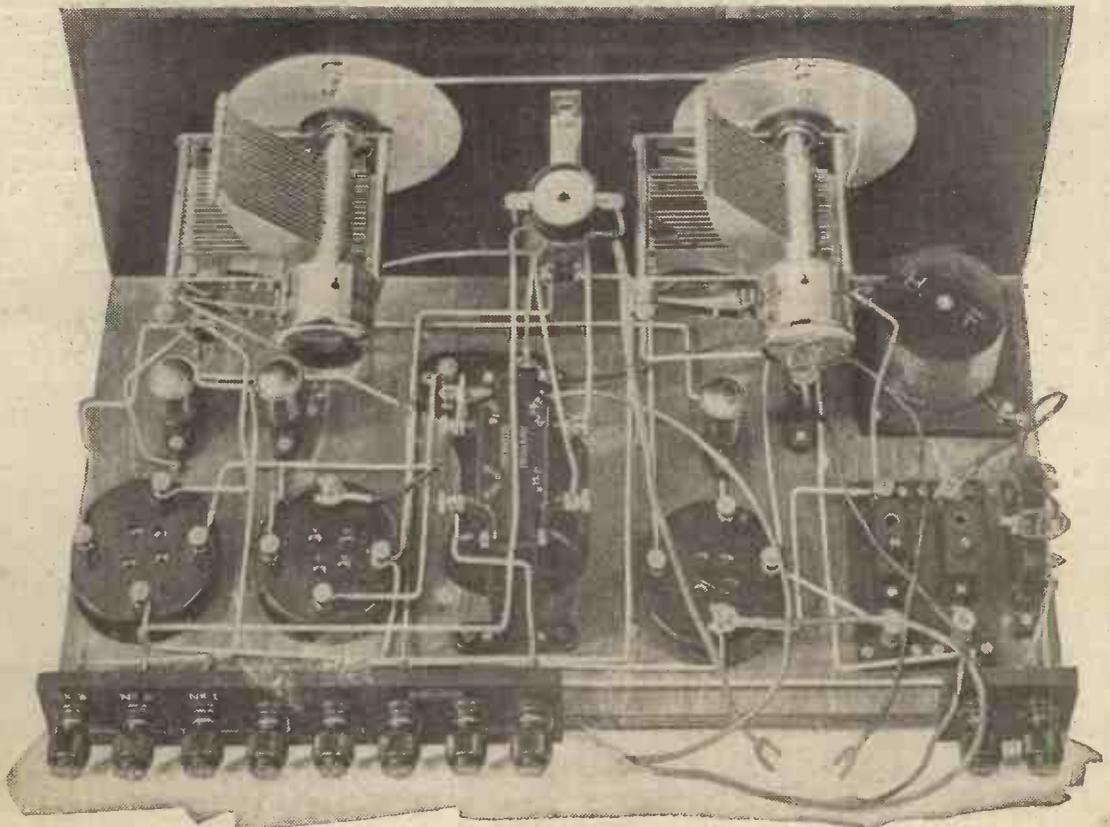
The use of a wavy panel greatly enhances the appearance of the set.

mounting the panel and terminal strips against the baseboard edges when the base-board is inside the cabinet. Screw the necessary components to the baseboard approximately in the positions shown by reference to the photographs and wiring diagram, since the lay-out is quite compact. Now attach the two-coil holder on the left-hand side of the cabinet.

In order to prevent the detachment of the leads to the coil blocks of this holder when withdrawal of the set from its cabinet is desired, I have mounted inside the cabinet, immediately behind the holder, five terminals, as shown in Fig. 1 (a), the method of securing the terminals to the ebonite strips being indicated clearly in Fig. 1 (b).

Short, flexible leads can now be soldered to the terminal shanks before screwing to the side of the cabinet, the right lengths

(Continued on next page.)



A clear illustration of the baseboard components and the wiring. The positions of the various parts can be easily seen.

# THE SELECTIVE THREE.

(Continued from previous page.)

being afterwards cut off and inserted under the screws of each coil block, with one lead for attaching to the tapings on the fixed coil. Flexible leads terminating in spade tags may then be attached to the necessary points on the components as indicated in the wiring diagram. To prevent possible trouble on test, the wiring, on completion, should be carefully checked.

Insert the valves in their respective holders

and then test in the usual manner, which is now so familiar to readers of this journal, to see that they light correctly and that the insertion of the separate H.T. plugs into their sockets does not cause any increase in brilliancy when a small voltage is applied.

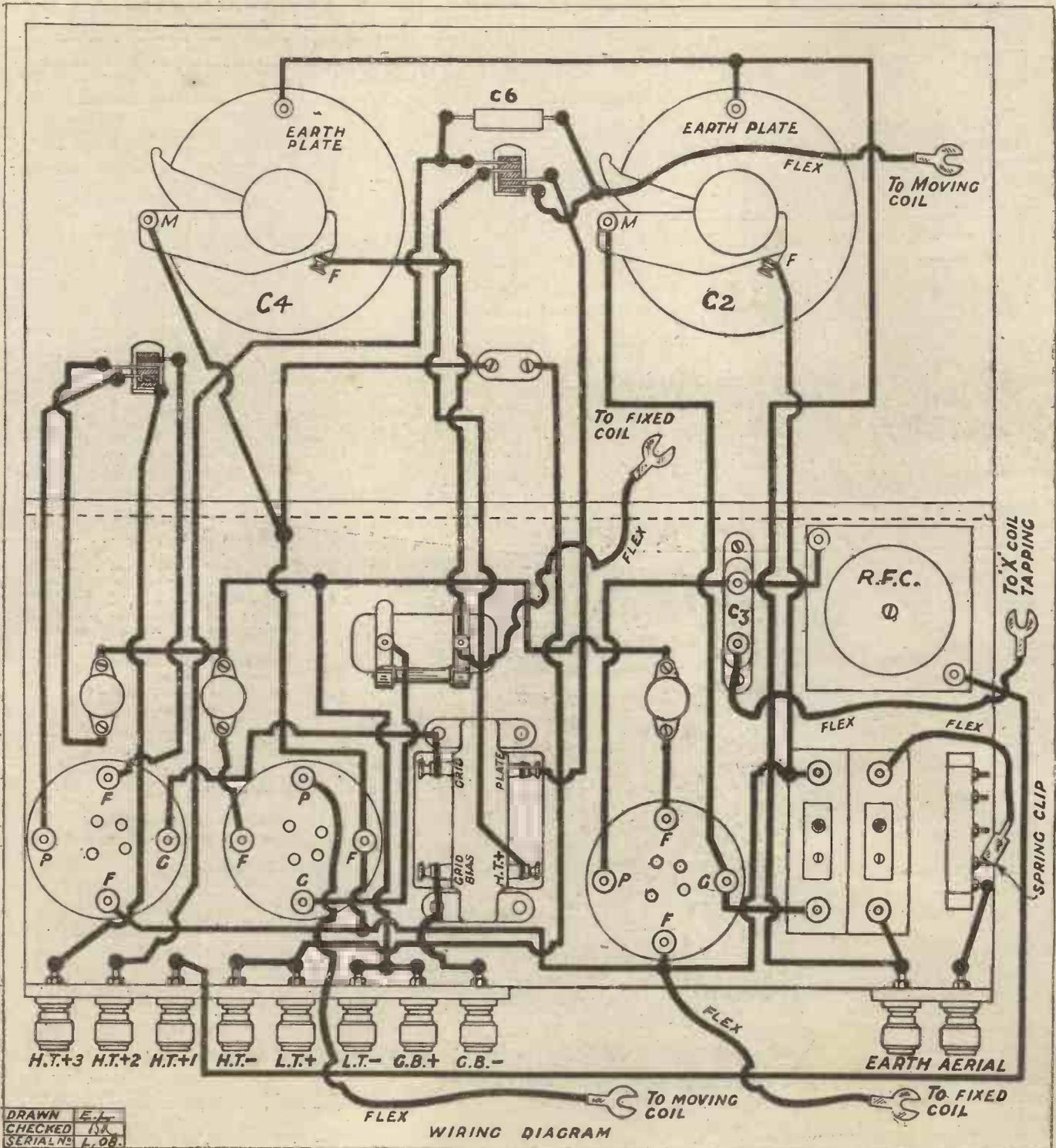
### Necessary Coils.

All is now ready for the aerial test. Since the aerial is not tuned a tapped plug-in coil can be used for  $L_1$ , with  $C_1$  cut out of circuit, but it is preferable to use an ordinary plug-in coil and try various capacity values with the series multiple fixed condenser to find the best combination.

On an aerial of average size and efficiency 10 miles north-west of London, the best coil and capacity combinations for the ordinary broadcast band were found to be:  $C_1 = .0002$ ,  $L_1 = 40$ ,  $L_2 = 60$  or  $75$ ,  $L_4 = 60$  or  $75$  Lissen "X" and  $L_5 = 50$ . On the higher wave-lengths satisfactory results were given with  $C_1 = .0004$ ,  $L_1 = 200$ ,  $L_2 = 250$ ,  $L_4 = 250$  Lissen "X," and  $L_5 = 150$ , or, of course, the equivalents in lettered coils in both cases.

Many efficient valve combinations are possible with this receiver. The first two valves may be of the high impedance type, such as the H.310, H.512, D.E.2 H.F., A.R. .06 (red line), etc., while the last valve

(Continued on next page.)



DRAWN E.L.  
 CHECKED L.S.  
 SERIAL NO. L.08.

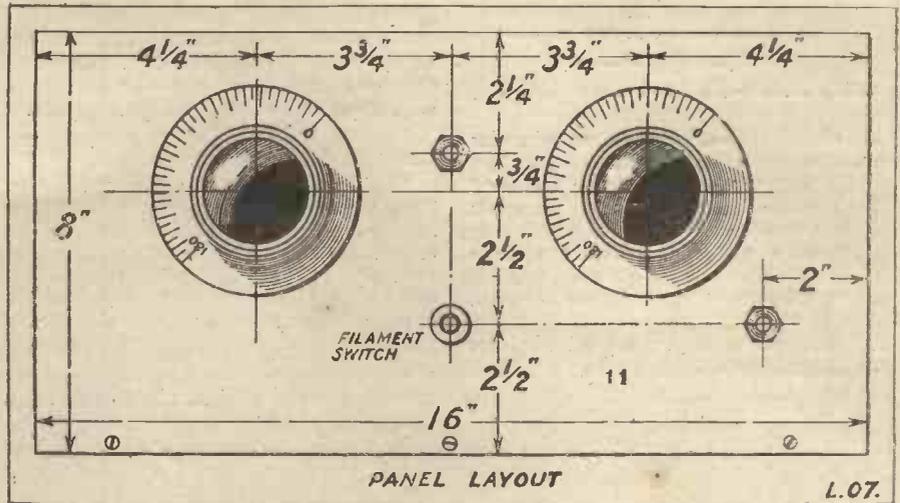
# THE SELECTIVE THREE.

(Continued from previous page.)

must be of the special L.F. low impedance type typified by P.M.4, L.525, D.E.5, B.4, etc.

As for high-tension values, these should be of the order of 80 to 90 volts for  $V_1$ , 40 to 50 volts for  $V_2$ , and 100 to 120 volts for  $V_3$ , but reference should be made to the valve data sheets to determine the makers' recommendations, especially for the grid-bias voltage on the L.F. valve.

During tests on the receiver, the following stations were among those heard on the loud speaker at moderate to full strength: Newcastle, Dublin, Manchester, Bournemouth, London, Voxhaus, Frankfurt, while on the long-wave side there was Hilversum, Daventry, Radio-Paris and Königswusterhausen. Several other Continentals were heard, both on the telephones and loud speaker, but were unidentified, while 2 LO gave moderate loud-speaker strength with two valves.



end of grid leak and condenser and other end of this to fixed plates of  $C_4$ .

L.T.+ to one side of switch, the other side of same being joined to moving plates of  $C_1$ , and thence to the remaining filament terminals of  $V_1$ ,  $V_2$  and  $V_3$  valve holders.

P. of  $V_3$  to spring of  $J_2$  and socket of  $J_2$  to H.T.+3.

G. of  $V_1$  to moving plates of  $C_2$ , and fixed plates of  $C_2$  to socket of  $L_2$  coil holder and thence to positive filament terminal of  $V_1$  valve holder.

Join together hand-capacity shields of  $C_2$  and  $C_1$  and thence to earth terminal.

Join long spring of  $J_1$  to H.T.+2, spring

making contact with this long spring to H.T.+ terminal of transformer, plate terminal of which to spring making contact with short spring of  $J_1$ . Join  $C_6$  between short and long springs of  $J_1$ .

Join flexible lead between socket of  $L_1$  coil holder and one capacity tag of  $C_{11}$ , one end of the lead terminating in a spade tag and the other in a spring clip.

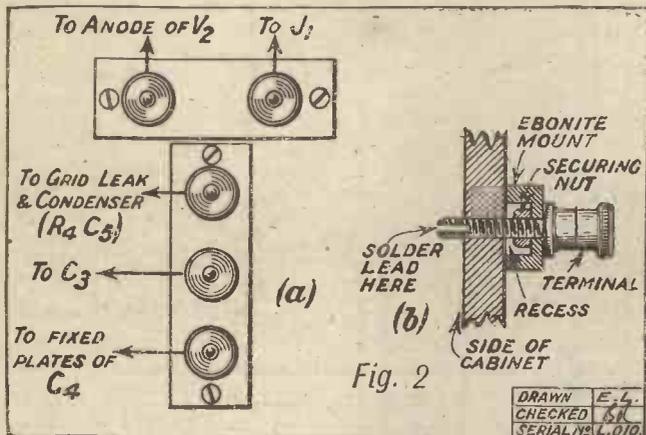
Join flexible lead with spade tags between remaining side of  $C_3$  and "X" coil tapping terminal of  $L_4$ .

Join flexible lead with spade tags between  $F_1$  terminal of  $V_1$ , which is joined to moving plates of  $C_2$ , and pin terminal of  $L_4$ .

Join flexible lead with spade tags between junction of  $R_1$ ,  $C_4$  and  $C_5$  and socket terminal of  $L_4$ .

P. of  $V_2$  to one terminal of  $L_3$  by flexible lead with spade tags, and flexible lead must now be joined between remaining terminal of  $L_3$  and short spring of  $J_1$ .

Wire terminals of two-coil holder according to Fig. 2.



## POINT-TO-POINT CONNECTIONS.

Join aerial terminal to 000 of  $C_1$  and earth terminal to pin of  $L_1$  coil holder.

Pin of  $L_2$  coil holder to G. of  $V_1$  valve holder. Join together one end of each fixed resistor  $R_1$ ,  $R_2$ , and  $R_3$ , and thence to L.T.- terminal.

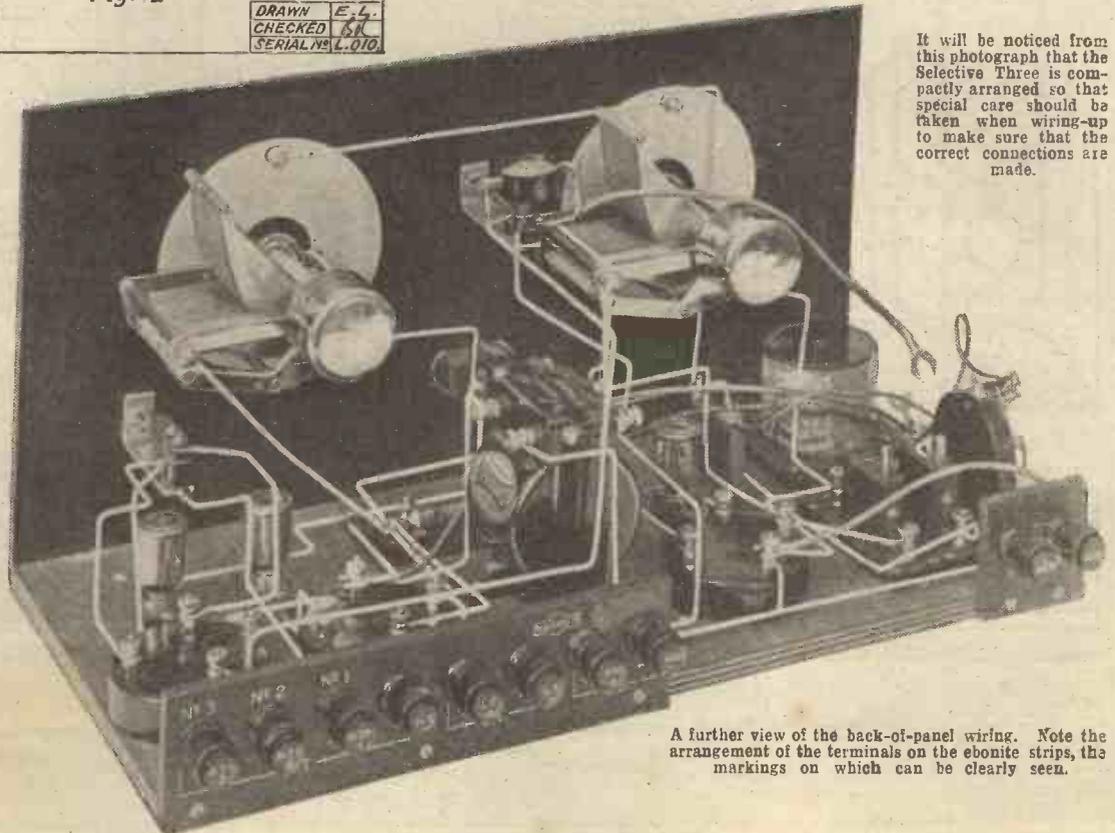
P. of  $V_1$  valve holder to one end of  $C_3$ , thence to one end of choke, the other end of choke being taken to H.T.+1.

F. of  $V_1$  valve holder to remaining end of  $R_1$ , F. of  $V_2$  valve holder to remaining end of  $R_2$ , and F. of  $V_3$  valve holder to top lug of jack  $J_2$ , the next lug being taken to remaining end of  $R_3$ .

L.T.+ to H.T.- and L.T.- to G.B.+.

G.B.- to grid-bias terminal of transformer and grid terminal of same to G. of  $V_3$ .

G. of  $V_2$  to one



A further view of the back-of-panel wiring. Note the arrangement of the terminals on the ebonite strips, the markings on which can be clearly seen.



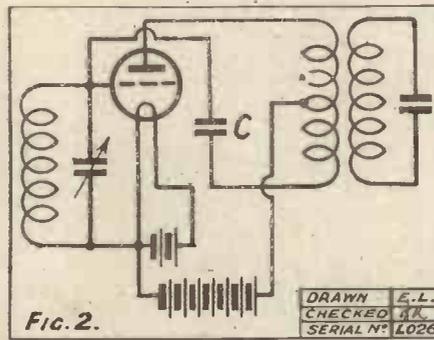
# SOME NEUTRODYNE TROUBLES.

The generation of what are known as parasitic oscillations in neutralised circuits often causes troubles that are difficult to trace. In this article our contributor explains what happens, and how these faults may be remedied.

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

WHEN an alternating voltage is applied to the grid of a valve an alternating current can be obtained in a circuit attached to the plate of that valve. As is well known, there is a very considerable magnification of energy in this arrangement. It seems at first sight that there should be no limit to the amount of amplification possible with a single valve, because it does not waste energy to charge and discharge the grid of a valve, if there is sufficient grid bias on the valve so that the grid circuit is non-conductive. Of course, actually, the circuit that is attached to the grid of the valve cannot be made without resistance losses in it, and the voltage that is applied to the grid must be considered as being produced at the expense of these losses in the grid circuit, and the true energy magnification of the valve is the ratio of the amount that can be obtained from the plate circuit divided by the amount used up in the grid circuit. Even if this limitation could in some magical way be removed there is another difficulty in the way of getting great magnification. The grid is not completely isolated from the plate, even when the valve filament is switched off. There is a capacity between this grid and plate, so that any alternating energy that is

Two ways in general have been used for preventing this action happening. One is to never let the valve magnification be big enough to put back in the grid circuit sufficient to make the system oscillate, and



this is usually accomplished by putting in the circuits of both grid and plate some form of resistance. It is fairly obvious that on very low frequencies the energy getting back will be small because the condenser is too small, so that we shall not have to put much resistance in our circuits, but as the frequency steadily rises, more and more energy gets passed back, so that one will have to increase the resistance until one arrives at a frequency where the valve will hardly magnify at all, due to the wastage in the resistances.

### How Neurodyning is Obtained.

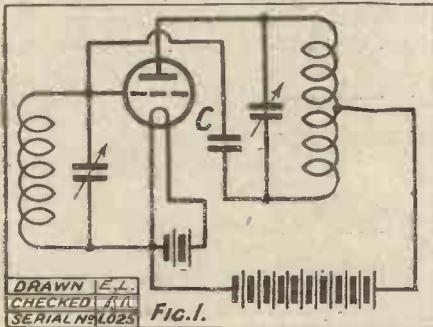
A more useful way of preventing this back-flow of energy is that known as neurodyning. The trick involved in this neurodyning can be considered in this way. The plate circuit of the valve has alternating current in it. Suppose at any moment the plate is swinging positively, this will induce a charge on the grid. If we can now find another place on the plate circuit which at the same moment is swinging negatively and we can apply this negative induction to the grid at the same time as the first positive induction, the two effects will balance out.

The basic circuit for doing this is that shown in Fig. 1, where the plate coil is fed with its high tension at the centre, the valve current flowing through only one half of the coil, and we now have one end of the coil swinging positively while the other is swinging negatively. This negative end can now be used to apply to the grid an opposite potential to the other end of the coil by means of a condenser, C, of the same capacity as that between the grid and the plate. Various alternative methods of doing this balancing can be devised, such as that shown in Fig. 2; but they are, at least superficially, the same thing.

It has recently been found out that such arrangements, although they do not pass back into the grid circuit energy of the frequency we are immediately dealing with—i.e. the frequency to which the circuits are tuned—energy of other frequencies can be passed back, and in consequence such an arrangement may oscillate, although it will not oscillate on the frequency we are tuned to. Fig. 3 shows Fig. 1 redrawn, and Fig. 4a is the same figure with the valve replaced by a small capacity and the batteries removed. It will now be seen that if the two halves of the plate coil oscillate so that both ends are positive at the same moment, then it is possible for energy to flow back to the grid circuit and in consequence oscillation may take place, particularly if the grid circuit is made up in the same split way as the plate circuit, as is liable to happen when one is cascading two or three valves, as in Fig. 5. The period of these oscillations will be very high, and care has to be taken in neutrodyne circuits, particularly with three or more high-frequency stages, to prevent the energy flowing back in this way.

### Astatic Coils.

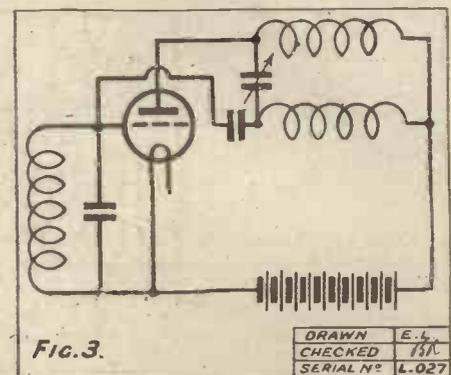
Two methods have been adopted to prevent this trouble occurring; one method is to make the grid circuit and the plate circuit in such a way that although their natural periods are the same for the wavelength we are dealing with, for these short waves their natural periods are very different indeed, and Fig. 3 is nearer this than Fig. 5. The original Hazeltine neutrodyne adopts this method, whether accidentally or not, and I have used this idea in various receivers, particularly in the Straight Eight, where the coils between the valves



in the plate circuit must necessarily have a voltage on the plate, and this voltage will induce current into the grid circuit.

### Preventing Oscillation.

I mentioned before that the energy magnification is the ratio of the input to the output, and it is easy to see that if the output circuit can put back into the input circuit, through the valve, more energy than was originally put into the input circuit, something curious is going to happen, because, obviously, what is being put back will go through the valve again and be magnified, and the process will go on indefinitely; in fact, as we know now, the valve circuits will oscillate.



are as shown in Fig. 6. The circuit in Fig. 5 would be very liable to produce short-wave oscillation, and actually this does happen if the correct precautions are not taken. Adopting this idea of making the wave-

(Continued on next page.)

## SOME NEUTRODYNE TROUBLES.

(Continued from previous page.)

lengths of the circuits very different from one other, I arrange that the split coils are wound alternately in different ways, and the way I most generally use is to wind a coil, say, quite normally, and tapped in the centre, and the second coil I wind the two

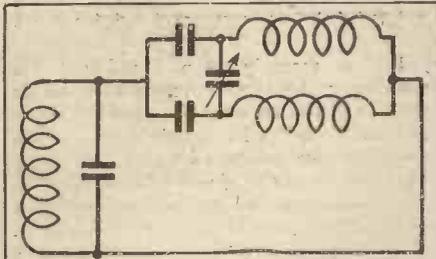


FIG. 4.

DRAWN E.L.  
CHECKED MK  
SERIAL NO L026

halves on the spindle in the opposite sense. The inductances of the coils for the normal wave are arranged to be equal, but it will easily be seen that for short wave production the astatic and non-astatic coils will be of different inductance.

### Stabilising Resistances.

Another method, due to Mr. G. W. Wright, is as shown in Fig. 6, where damping resistances are inserted in the grid circuits in such a way as to damp very seriously the short-wave oscillating circuit. These resistances are quite possible to arrange so that there is practically no loss on the normal wave-length being used. Various other ways, no doubt, can be found of preventing these parasitic oscillations, but they will, I think, depend upon one of these two principles.

It is sometimes very hard to trace out these short-wave oscillations when one is building up a receiver, as the effect of them is very often merely to weaken one's general reception, and one tends to look for trouble in valves or batteries rather than the correct place; but I have found that by placing a

Sometimes, however, the short-wave oscillations occur in a modulated way, modulated as a sort of squeak, and they can then be very easily recognised. Tendencies to oscillate on other wave-lengths occur in transmitting circuits as well as in receivers. I can well remember the trouble I had a few years ago at Camarvon when paralleling fifty power valves. Although all my circuits were tuned to 14,000 metres the system refused to oscillate at any other wave-length than 95 metres, usually with serious damage to a valve every time it happened. In this case the reason for the oscillation was that with such a large number of valves in parallel the whole system could oscillate, some of the plates of the valves going negative and others going positive, the wave-length being decided by the busbar system. I have actually heard of a wave-length as low as five metres being produced in this way. The method used to overcome this trouble was to insert damping resistances in the correct places, thus lessening the tendency to oscillate.

'phone terminals on the set should then be replaced by a valve socket and valve leg for positive and negative terminals respectively.

If two or more 'phones are used it is

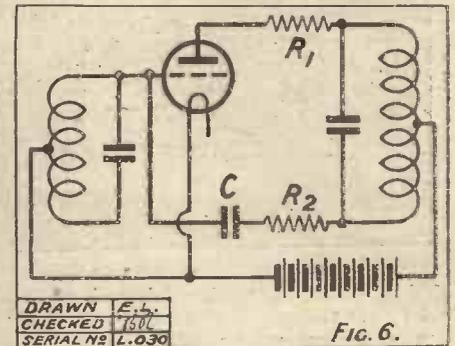
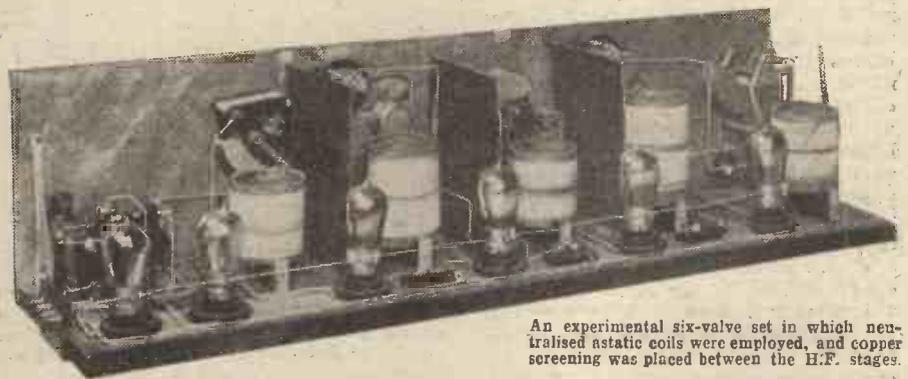


FIG. 6.

DRAWN E.L.  
CHECKED 150L  
SERIAL NO L.030

simplicity itself to connect them in series. A neat way of fixing valve leg and socket to 'phone tags is to obtain pieces of brass



An experimental six-valve set in which neutralised astatic coils were employed, and copper screening was placed between the H.F. stages.

## IMPROVED 'PHONE TAGS!

By P. C. T.

ALTHOUGH the positive lead on most good makes of 'phones is marked distinctly, it is surprising how often the leads are

tubing  $\frac{1}{8}$  in. long and tap one end of each for a distance of  $\frac{1}{8}$  in. to take the thread, generally 4 B.A., of the valve leg and socket, which are cut off to  $\frac{1}{8}$  in. A small hole is then drilled and tapped in the side of the tubing to take a grub screw, which when screwed home holds the 'phone tag.

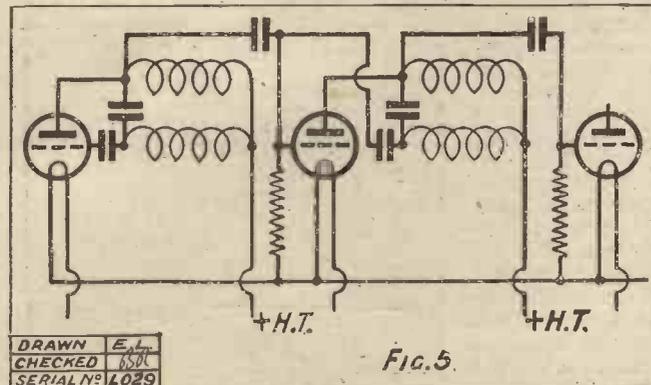


FIG. 5.

DRAWN E.L.  
CHECKED 150L  
SERIAL NO L029

finger on various terminals when tuned in to a station, a terminal can be found which prevents the oscillation when touched, and the normal signals being received will strengthen up very greatly. This test can be used to find out if the trouble is occurring,

positive when there is no output filter circuit.

To make sure of always connecting the 'phones the right way to a receiver the positive lead should be fixed to a valve leg and the negative to a valve socket. The

### Making Sure.

On a crystal set it is of little importance how the 'phones are connected, but with a valve receiver it is essential that the positive lead of 'phone or loud speaker should be connected to H.T.

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# TECHNICAL NOTES.

A Weekly Feature Conducted by  
Dr. J. H. T. ROBERTS, F.Inst.P.

THE old argument about the so-called Heaviside layer seems to be as far from being concluded as ever. Some new experiments have lately been carried out by the United States Department of Scientific Research in connection with polarisation in long-wave transmission. It will be recalled that a considerable amount of work was recently done on the polarisation of the shorter waves by Dr. Alexanderson, and these experiments have now been extended to the longer waves up to 15,000 metres. It has been found that the reflection from the Heaviside layer is by no means so simple a matter as has usually been thought.

A plane-polarised wave striking the Heaviside layer may, in certain circumstances, be transformed from a plane-polarised wave to an elliptically-polarised wave, this being, of course, due to the presence of two components out of phase. If the usual direction-finding apparatus be used for the reception of the wave polarised in this way, indeterminate readings will be obtained, and it is now believed that this gives the effect known as "night variation" in bearings. The effect is more particularly pronounced at sunset, but it is also troublesome throughout the night, and during the winter months it persists even during the daytime.

## Sensitivity and Selectivity.

It is not commonly realised that the selectivity of a receiving set is affected not only by the dimensions and other qualities of the aerial, but also by those of the earth lead.

The length of the earth lead has an influence, as well as the type and thickness of wire used.

It is preferable to use thick, stranded wire, and it has sometimes been found, in practice, that it is better to insulate this wire up to the point at which it enters the ground. This, at any rate, is the belief of many experimenters, although it is rather difficult to see what object can be served by insulating an earthed wire. It is conceivable that slight potential variations may find their way to the wire; but, personally, I am inclined to think that, provided the wire is sufficiently thick for the purpose, it is immaterial whether it is insulated or not.

Talking about selectivity, it is often believed that the longer the aerial the greater the receptive efficiency of the set. This, however, may be—and is frequently—quite a misapprehension. If the wave-length received is above 1,000 metres, it is reasonably correct to assume that greater signal strength will be obtained with a longer aerial. Having regard, however, to the fact that the wave-lengths used in broadcasting are usually between 300 and 500 metres, it may be that a long aerial may bring with it important disadvantages.

In general, it will be found that for the

reception of broadcast an aerial of about 40 to 60 ft. in length gives the best results. Somewhat greater lengths may give greater signal strength, but this advantage will be obtained at the expense of selectivity; whilst if the aerial be reduced to 20 or 30 ft., an increase in selectivity will be obtained but at the expense of signal strength. An all-round length of about 50 to 60 ft. will usually be found to give good signal strength with a fair measure of selectivity.

## Short-Wave Valves.

With the increasing attention which is being devoted to short-wave work—I mean, between, say, 10 and 50 metres—it seems likely that there will be forthcoming a supply of valves specially designed to operate at these low wave-lengths. So far, the average short-wave experimenter has had to rely upon the smaller transmitting



A recent photograph of Dr. J. H. T. Roberts, our chief consultant.

valves which are already on the market, but here he has to contend with the fact that the valves were never designed for use at very high frequencies.

It would seem, however, that quite a useful market is now arising for small-power valves specially designed for short-wave work, and therefore the short-wave experimenter may look forward to being adequately catered for in this respect.

## Microphone Amplifiers.

Experimenters who use microphone amplifiers are sometimes in doubt as to the type of transformer which should be used. Of course, a great deal depends upon the circumstances in any particular case; but, in general, it is not sufficient to use an ordinary low-frequency inter-valve transformer. It will be found that the impedance of the primary is too high, and the step-up ratio of the transformer is too low. What

is usually required with a microphone is a transformer having a fairly low primary impedance and a fairly high step-up ratio.

An interesting experiment is reported from Guatemala, where a farmer who happens, also, to be a wireless enthusiast connected an aerial to a lime-fruit tree which was old and regarded as practically useless, with the result that the tree was rejuvenated and bore fruit exactly as it had done in its palmy days. This result was attributed to the fact that the aerial served as a path for atmospheric electrical discharges. It has long been known that frequent slight electrical discharges will sometimes have the effect of stimulating the growth of living plants, and systems of so-called "electro-culture" have many times been tried. It has often been thought that the electro-culture has been attended with success, but, owing to the many other conditions which influence the growth of a tree or a plant, it has been difficult to ascribe any result obtained to any particular factor.

## Definite Results?

In the experiments with the lime-fruit tree (and other experiments were tried, using several "aerials" attached to different parts of the tree) the conditions were so

governed that it was possible to ascertain that the results were due to the electrical stimulation of the tree.

A curious application of a wireless receiver has been made by one of the United States power companies, who have used a receiving set for the purpose of locating a break in a power cable. For this purpose a super-sensitive receiver is employed, using a loop as the collector of energy, and this is carried in a motor-car along the track of the cable which is under examination. It is found to be a very simple matter to locate the fracture in the cable (even though the cable may be underground) owing to the stray noises picked up by the receiver.

A well-known member of the Institute of Radio Engineers has carried out an elaborate series of tests, by means of a cathode

(Continued on page 1399.)

# HOW WE TOOK 2/7 OFF THE PRICE OF A BATTERY—

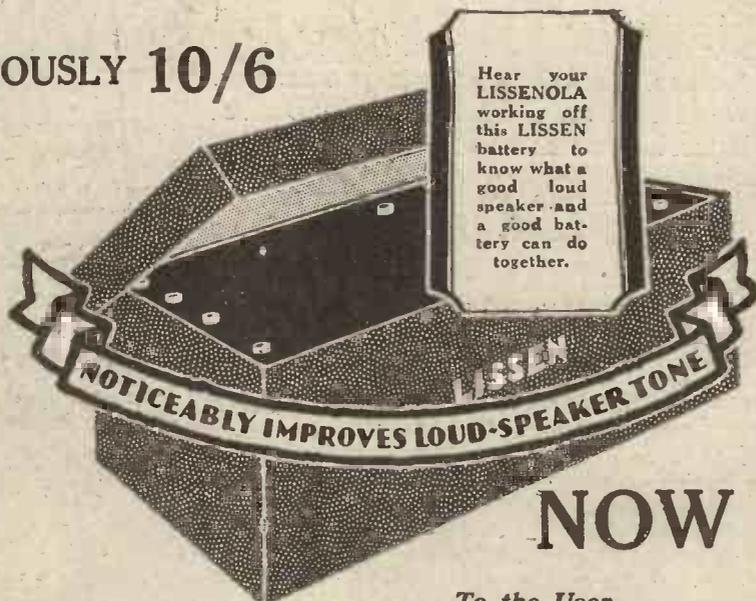
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# PARALLEL OR SERIES?

THE easiest way of explaining the meanings of the terms series and parallel to anyone not too well acquainted with the principles of electricity is as follows: Two components connected up in series are so joined together that the current flows through each one in turn; when two components are connected in

A simple and interesting explanation of two important terms.

By G. V. DOWDING, Grad.I.E.E.  
(Technical Editor.)

the effect of placing things in parallel results in a simple addition of individual values, but in others something much more complex happens. And when we confuse the issue by connecting different components to one another such as when we join a fixed condenser across an H.F. choke, we leap right from the elementary class to the real technical institute!

But, for the time being, we will confine ourselves to components of a kind. Now diagrams and drawings can be very informative, but we feel sure that by the means of the accompanying photographs we will be able to clear up some of those points which may have caused at least some of our readers a little perplexity in connection with "series" and "parallel."

First of all, let us take batteries. Every battery contains a number of cells and each cell has two terminals, one marked positive (plus or +), and the other negative (minus or -). A cell of the Leclanché type, such as is employed in dry batteries used for H.T. or grid bias purposes, will have a voltage of approximately  $1\frac{1}{2}$  volts, while an accumulator cell will have a voltage of approximately 2 volts. The capacity of either type will vary in accordance with the size of its elements. When the cells of a battery are connected in series the resultant capacity will be but the capacity of one cell, but the voltage will be that of one cell multiplied by

the number of cells connected in series. Thus, 10  $1\frac{1}{2}$ -volt cells, connected in series, will provide a voltage of 15 volts.

The same number of cells connected in

parallel will provide but the voltage of one cell with the capacity of 10. See Fig. 3, which shows a number of accumulator cells connected up both in series and parallel. In this case, remember that the voltage of each individual cell is 2 volts. All very simple, is it not? But we wonder how many listeners employ 4-volt accumulators to run 2-volt valves, wasting in the process many valuable ampere hours of capacity in overcoming the wasteful resistances of high value filament rheostats. Obviously, if the two 2-volt cells of similar sizes, which go to form a 4-volt accumulator, were connected in parallel instead of series, double the capacity would be available, although only the 2 volts of pressure could be obtained.

"The Weakest Link."

But what happens when accumulator cells of different sizes are used together? Supposing we have one cell marked "20 ampere hours" and another "40 ampere hours." These two joined in parallel give 2 volts with a capacity of 60 ampere hours; but when they are connected in series 4 volts pressure is available, although the effective capacity will be only the capacity of the smaller cell, 20 ampere hours. This should be very carefully noted. And when a number of cells of different sizes are connected in series the resultant capacity is always the capacity of the smallest cell. Without enlarging on the point unnecessarily, we can just add that a number of cells in series can be likened to a chain, the strength of which will be the strength of

(Continued on next page.)

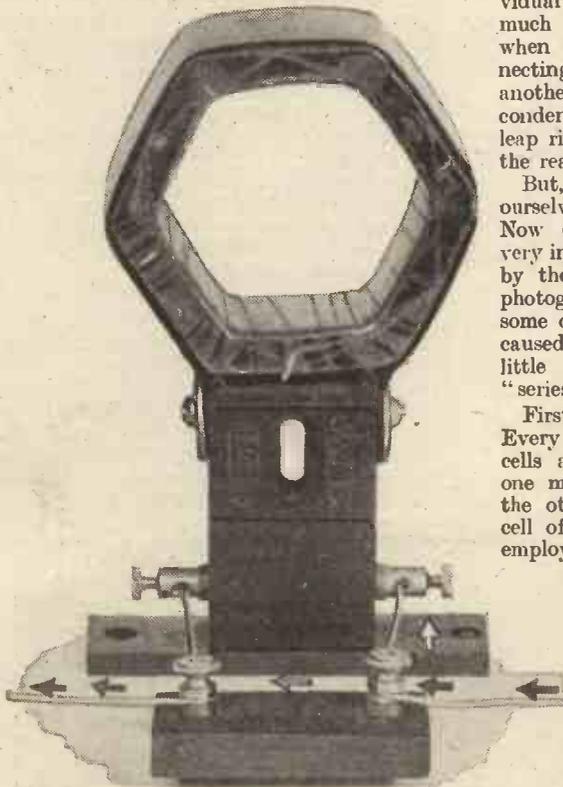


Fig. 1.—A fixed condenser connected in parallel with a plug-in coil.

parallel two paths are offered to the current and this divides and flows through each component simultaneously. There are objections to these explanations, but we will ruthlessly over-ride these by ignoring them in this article!

In Fig. 2 we show a fixed condenser connected in series with an H.F. choke, while Fig. 1 depicts a fixed condenser joined up in parallel with a coil.

Now, unfortunately, it so happens that the effects of series and parallel connections are not always the same. In some cases

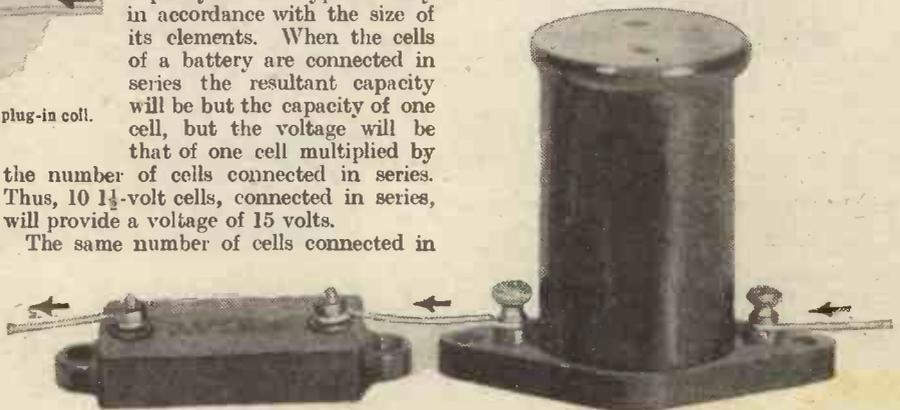


Fig. 2.—A fixed condenser and an H.F. choke joined up in series. The arrows indicate a direction of current flow.

# AN ECONOMICAL PANEL.

BY A CORRESPONDENT.

THE increase in popularity of the three, four and five-valve sets has required, up to the present, the use of large ebonite panels. This, in itself, has added to the cost of the set both from the professional and amateur points of view. Any method, therefore, which would tend to cheapen, without loss of efficiency, the initial outlay, would be greatly welcomed by everyone.

For the purposes, then, of this latest experiment an ordinary piece of mahogany was purchased and finished to the required size—i.e. 28 in. by 7 in. by  $\frac{1}{2}$  in. Mahogany was chosen on account of its hardness,

appearance, and ease in working. The requisite holes for the component parts were drilled; then, prior to the treatment of the panel to prevent leakage, and primarily with a view to the ultimate appearance of the wood, it received a coating of the brown stain generally applied to mahogany. This did not take long to dry, and in two hours a wax preparation was well rubbed in into the front and sides, thus forming the nucleus of the insulation.

Next came an application of oil and finally the front and exposed parts were French polished, so giving it a handsome appearance and completing the insulation. (It

should be noted that the French polishing was done by one of the contributors, who is not a professional French polisher, and consequently no extra cost was entailed.) The holes also were given a liberal dose of this polish, particularly those taking the variable condensers.

### A Substantial Saving.

As the set was a four-valve Neutrodyne (1 H.F., 1 detector, and 2 L.F.), it was essential to fix to the panel two variable condensers, four rheostats, one three-pole two-way switch, and seven terminals. The results obtained showed that the efficiency of the set was quite up to the standard of a set of the same design, using an ebonite panel. But the cost of the mahogany was only one-fifth that of the other panel, the amount expended on the wood being 2s. 6d., and on the preparation 6d., a total of 3s. Not only was there a saving of 80 per cent., but the appearance of the set was greatly enhanced.

## PARALLEL OR SERIES?

(Continued from previous page.)

the weakest link—in this case the links being individual cells.

When we deal with coils we have only one factor of primary importance to consider, and this is inductance. Inductance and capacity are necessary for tuning circuits to certain wave-lengths. In a straightforward aerial tuner most of the capacity is supplied by a variable condenser. Increasing either inductance or capacity increases the wave-length tuning and decreasing either decreases the wave-length tuning. The inductance of two coils in series is merely the sum of the individual inductances. The effective inductance of a coil of 100 microhenries connected in series with one of 150 microhenries is 250 microhenries. But when coils are connected in parallel the resulting inductance is always something less than the inductance of the smaller coil. For two coils the simple

$$\text{rule is } L = \frac{L^1 \times L^2}{L^1 + L^2}$$

That is, the two inductances multiplied together are divided by the same two inductances added together. In the case of our two previously mentioned coils it is 15,000 divided by 250, which is 60, and this 60 can be expressed in microhenries.

When more than two coils are connected in parallel the above rule cannot be applied, and we have to bring in the reciprocal rule. But this is not so fearsome after all. Here it is:

$$\frac{1}{L} = \frac{1}{L_1} + \frac{1}{L_2} + \frac{1}{L_3}, \text{ etc.},$$

or the reciprocal of the total inductance equals the sum of the reciprocals of the individual inductances. In a previous article entitled "Repressing the Rheostat" we fully explained this little excursion into mathematics.

And it is worth noting that inductances are calculated in exactly the same way as resistances. Those who carefully read the above-mentioned article should know exactly how to deal with inductances in series and parallel, for the methods of calculation are identical.

Now, condensers in series can be dealt with similarly to inductances or resistances in parallel and condensers in parallel follow the simple rule of addition applicable to resistances or inductances in series. In fact, the calculations involved in the separate treatment of inductance, resistance, and capacity are identical, although unfortunately, in the case of the last-named, the above indicated reversal of rules is necessary. But don't confuse the ampere-hour capacity of accumulators with the capacity of condensers, these are very different.

### Note These Points.

Let us pause awhile and tabulate our facts.

The simple rule of the addition of individual values applies to:

1. The capacity of condensers in parallel.
2. The ampere hour capacity of accumulators or dry battery cells in parallel.
3. The voltage of accumulator or dry battery cells in series.
4. The inductance of coils in series.
5. Resistances in series.

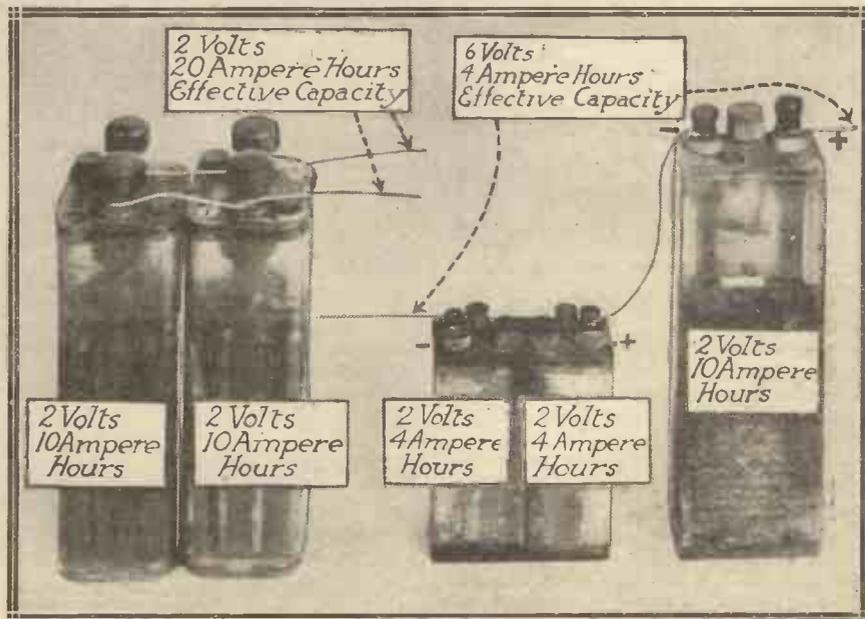
The more complex reciprocal rule applies to:

1. The capacity of condensers in series.
2. Resistances in parallel.
3. Inductance of coils in parallel.

The calculations involved in series-parallel arrangements are quite as simple as any of the foregoing. Supposing two condensers are connected in series and then another condenser is connected across both. First of all, the effective capacity of the two condensers in series is worked out, and as there are only two, we can dodge the "reciprocals" and can use the easy rule. Therefore, the two values can be multiplied together and then this result divided by the sum of the two capacities. To this figure should be added the capacity of the condenser connected in parallel.

Were these condensers resistances, we should first of all add the resistances of the two in series together, and then apply either the reciprocal or the easier rule (which applies only to pairs) to this figure, and that of the paralleled resistance.

A little elementary arithmetic and a little common-sense are all that is necessary to advance the amateur a long way on the road of L's and C's, Mics and Mu's!





## What are the ideal conditions for Distant Reception?

A DARK night with rain pouring in torrents and the wind whistling through the trees. A good receiver, well charged batteries, and a stage or so of H.F. amplification incorporating **MH** BARREL TYPE TRANSFORMERS: these are the ideal conditions for long distance reception.

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# MAKESHIFT VALVES.

An interesting and informative article describing some experiments carried out by the writer with home-made "valves."

By J. F. CORRIGAN, M.Sc., A.I.C.  
(Staff Consultant.)



Fig. 1.—A home-made valve.

IT must not be presumed that the experimental valves described in this article are in any way intended to supplant any of the many excellent types of commercially made valves which are at present on the market. But it is a psychological fact that no matter how perfect a scientific device may be, the true constructional amateur always finds a source of pleasure and interest in constructing such a device with his own hands, no matter whether it be inferior or not to the manufactured article.

It is for reasons such as the above that I wish to place before the reader of these columns some fairly detailed instructions on the making of simple types of thermionic valves. These valves, if constructed with reasonable care, can be made to function very effectively in a simple circuit. Naturally they are not anything like as sensitive as any of the beautifully made commercial valves, nor can they be said to be economical in their current consumption. However, the fact that they will give results, and that their construction is not a matter of any great difficulty will, no doubt, cause many readers to become interested in their properties, and to try their hands at making them.

## Simple Two-Electrode Type.

Let us first of all deal with the construction of a very simple type of two-electrode valve. All we require for this purpose is a 4- or 6-volt electric bulb, such as those which are employed for the headlights of motor-cars or motor-cycles, and for similar lighting purposes. If possible, the filament of the bulb should be a carbon one. However, this requirement is not essential. Care should be taken to see, however, that the glass of the bulb is not unduly thick, for, within certain limits, the thinner the glass of the bulb, the more readily are results obtained when such a bulb is utilised as a valve.

Having acquired a bulb of the above nature, take two narrow strips of tinfoil or silver paper and fasten these around the sides of the bulb in the manner shown in Fig. 1. Owing to the curvature of the bulb, it will usually be found an extremely difficult matter to make a really neat job of this exterior silver paper lining. Fortunately, however, the exact contour of the metal lining around the exterior of the bulb does not matter so long as the metal linings are continuous.

The metal bands may be fixed to the glass by means of a little good gum, although I have found the use of celluloid photographic negative varnish to be more satisfactory. In attaching the metal-foil bands to the glass of the bulb, great care must be

taken to see that none of the gum, celluloid varnish, or whatever adhesive is used, gets on to the outer surface of the bands, otherwise, owing to the insulating nature of these adhesives, effective electrical contact with the metal-foil bands would be rendered impossible.

After attaching the exterior metal-foil bands to the glass of the bulb, the whole article should be placed in a warm oven for an hour or two in order to allow of thorough drying of the adhesive. After this period, the valve will be ready for experimental use.

The valve will, of course, require some form of mounting before it can be used. However, it is not a difficult matter to devise such a mounting. Any small piece of wood will do for the purpose and, as will be seen from a glance at the illustration,

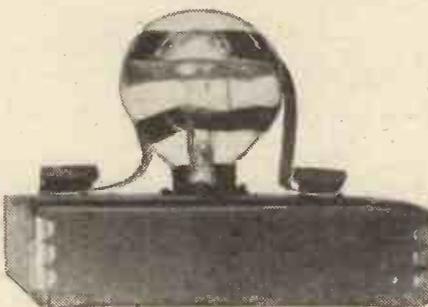


Fig. 2.—Mounting the home-made valve.

Fig. 2, even the lid of a cardboard box can be brought into service for this purpose, provided that it has been well impregnated with paraffin wax beforehand in order to render it insulative to an H.T. current.

The illustration, Fig. 2, indicates the method of making contact with the external bands of the bulb, such contact strips being composed of copper foil.

The circuit in which such a valve can be used may comprise any simple valve rectifying circuit, the exact manner of wiring up the improvised valve being depicted in the diagram, Fig. 3. The L.T. battery for the purpose of heating the filament should be of the usual 4- to 6-volt accumulator variety and, in passing, it may be said that in order to operate the valve effectively, the filament must be heated to the greatest possible brilliance. On the average, an H.T. current of about 40 volts will be sufficient to apply to the plate of the valve.

## How It Works.

The mode of operation of such an improvised valve is not difficult to follow. The ordinary filament of the electric bulb acts as the electron emitter, the plate or anode of the valve comprising the external metal-foil bands around the glass of the bulb. When the filament is heated to a reasonable degree of brilliance, it gives rise

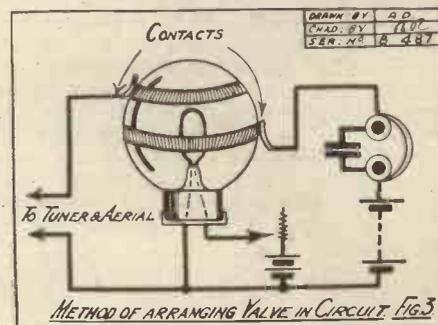
to an electron emission, a portion of which finds its way through the glass of the bulb, thus coming in contact with the external anode.

Now, the amount of electron leakage taking place through the glass depends upon several factors, each of which may vary in bulbs of different construction. For instance, the electron leakage through the glass is governed by the exact disposition of the filament, the thickness of the glass, and also the temperature of the glass. This is an important point to observe, for when the glass becomes warm from the heat of the filament the electron leakage through the glass is improved, and consequently the effectiveness of the valve increases. On account of this fact, a carbon filament bulb is rather more effective to use as an improvised valve because it gives rise to a greater degree of heat, despite the fact that the actual electron emission from the filament may be less abundant than that obtained from a thin metallic filament.

## A More Efficient Type.

A rather more efficient type of valve may be constructed from one of the familiar "dual-filament" electric bulbs, such as those which are employed for motor headlights. In these bulbs one of the filaments can be made to glow brilliantly, whilst the light given out by the other is much feebler, the whole bulb forming a "high-low" arrangement for dimming purposes.

In order to make use of an electrical bulb of this type as a radio valve, it is first of all necessary to remove the base of the bulb in order to effect a necessary alteration of connections to the filaments. In removing the base from the bulb, a small, sharp-pointed instrument, such as a stout hatpin or knitting needle, may be used, and, with a little care, the base will come away from the glass without any great trouble. The operation is, of course, tedious, and it may be hastened by soaking the bulb in a strong solution of caustic soda for a few hours beforehand in order to soften the cement. Another method of removing the base of the bulb is to apply a few drops of some strong mineral acid, such as nitric or hydrochloric acid, very carefully around the joint. The acid will not attack the glass, but it will,



of course, eat into the metal base, and therefore its action should be carefully controlled.

However, having removed the base of the bulb, separate very carefully the connecting wires of the filaments, and bring out the two wires leading to the "bright" filament of the bulb. These should be carefully marked and, if possible, insulated. They form the leads to what is going to the

(Continued on next page.)

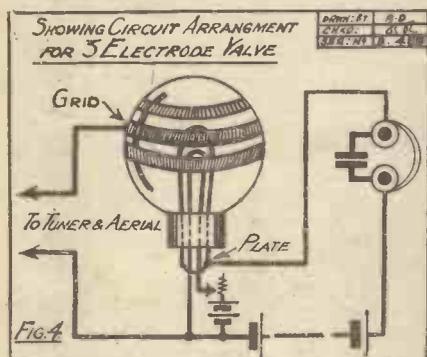
## MAKESHIFT VALVES.

(Continued from previous page.)

filament of the valve. The other two leads to the "dull" filament of the electric bulb should be joined together, and a lead taken from them. This lead must also be carefully insulated. This second filament of the bulb forms the plate or anode of the valve.

### A Third Electrode.

Having made the above re-arrangement of the connections, the next thing to do is to supply the valve with a grid, thus converting it into a 3-electrode valve. In such a device, the only type of grid which can be employed is what we may call an "external grid." This latter is made by cementing a strip of metal foil around the exterior of the bulb in the manner illustrated in the diagram Fig. 4. Connection to this external band of metal-foil may be made either by means of a contact strip in a manner similar to that shown in the photograph, Fig. 2, or



else a thin wire lead may be soldered to the metal-foil band by means of some plastic metallic cement.

The valve will be now ready for use and, as before, some form of mounting should be provided for it. However, in order to test out the capabilities of the valve only a very crude form of mounting is necessary. In fact, the valve may be merely laid on its side on an insulating surface.

The mode of wiring up the connections to this three-electrode valve is indicated in the diagram, Fig. 4. As before, the filament of the valve should be heated to its greatest degree of brilliance consistent with the safety of the filament. In operating the valve, begin with a plate voltage of 20, then gradually increase this to 75 or 80. The exact plate voltage required will be found to be a matter for trial, and no general rule can be laid down respecting it.

### "Good Crystal Strength."

As in the case of the simple two-electrode valve described previously, the efficiency with which this home-made valve will function is dependent upon several factors. The exact arrangement of the filaments in the bulb, the thickness of the bulb glass, the exact temperature and mode of construction of the heated filament are factors which all come into play in determining the efficiency of the valve when used as a rectifier.

Speaking generally, however, a valve of the above type will give reception of a

variety which we may call "good crystal strength" at a distance of up to 15 miles from a main station. That is, of course, provided the valve is employed in any ordinary simple one-valve rectifying circuits. The valve will not work in regenerative circuits, nor will it act as an amplifier under any of the usual conditions, the reason for this latter fact being that it would require the use of a specially wound transformer designed to meet the impedance of the bulb. I must, however, haste here to mention that the above observation is by no means put forward in any dogmatic manner. It has been merely based on experience, and if any experimenter does succeed in getting a valve constructed on the above principles to work as a simple L.F. amplifier, he would render a service in carefully noting the conditions and tabulating his results for the benefit of other experimenters.

In working with valves of the above nature, the amateur will very likely have to resist a great temptation to raise the filament heating current to more than safe limits, especially as he will find by actual trial that the brighter the filament glows the louder do the signals become. It should be borne in mind, however, that the majority of these small bulbs which are sold are designed for working on 4 volts, and therefore the use of any greater voltage will quickly destroy the life of the filament, if it does not burn it out altogether on one single occasion.

### Obtaining Results.

After all, these makeshift valves, although their construction and operation will be a matter of interest to many keen radio experimenters, are, at the best, merely crude approximations to the conventional and professionally constructed valve and, being such, they cannot be expected to give results of the same efficiency as those which are forthcoming from the use of a commercial valve. Nevertheless, any interested experimenter who possesses one or two small electric bulbs in good condition may spend quite a profitable time in constructing and experimenting with improvised rectifying valves of one or other of the types described above. The most effective results are hardly likely to be obtained at the first "try out," but a few readjustments of the conditions under which the valves operate, together also with a little patience on the part of the operator, will be sufficient to show that even such a simple device as an ordinary electric bulb can, under certain conditions, be made to act as a radio rectifier.

## OUT OF THE EARTH.

FROM A CORRESPONDENT.

THE frequent use of the term "Earth Potential" and the fact that the "earthed" portions of a wireless set are commonly regarded as uniformly "blank" may have led numerous amateurs to believe that an earth led is a route for H.F. and L.F. currents into an abyssal calm. But placid Mother Earth can return a Roland for an Oliver and can hand out currents of her own.

This fact is well worth emphasising now that so many ultra-sensitive receivers are

used with direct "earths." It is quite a common practice to employ "outdoor" aeriels and earth with super-hets, while thousands of receivers incorporating two and more stages of H.F. amplification are operated under these conditions.

And earth currents can be of considerable dimensions at times. Pressures of as much as 500 volts and currents amounting to 50 milli-amps have been recorded, although it must be admitted that such cases are exceptional.

### Cause of Earth Currents.

But with a sensitive radio outfit very small voltage and current fluctuations indeed will cause trouble and a few volts P.D. varying across an earth lead may result in the production of a noisy "background," or even in loud "statics."

Earth currents seldom appear to be of a constant nature and comparatively large fluctuations are sometimes noted. Some earth currents are due to leakage from power mains, but generally the larger ones are produced by some natural means. It is not thought that earthquakes or internal disturbances in the earth have anything to do with them, but it has been observed that when the Aurora Borealis in the Arctic regions is of a varying character earth currents are most active. These conditions generally synchronise with "magnetic" storms of fairly violent natures.

Now the longer the earth lead that is used between the surface of the earth and the buried metal plate or other object to which it is attached, the greater will be the potential difference set up across it by varying earth currents should such be in evidence in the immediate vicinity. But currents induced into such a portion of a wireless receiving system do not necessarily extend to the receiver itself or have any practical effect on it. But there is danger of this when the latter is not insulated properly throughout, including such items as the loud speaker or telephone receivers.

### May Be Quite Large.

And for this reason. Two buried earths connected together form a complete circuit through which a current will always flow. This current may be very small indeed, so small as to be almost negligible, but on the other hand, it may be quite large—that is, speaking in micro- or even milli-amps. This current will be generated in a similar manner to that which is generated in a primary battery and may be reinforced by stray currents due to leakage from electric tramcar or other systems and by others due to natural causes—such as were referred to above.

When long loud-speaker extension leads are used many paths for earth currents between the earth used for the set and other earthed points can be opened if close attention is not paid to insulation. And to such in minor and major degree may be due many strange noises in many sets.

The most efficient earth from an ordinary reception point of view may be the one that collects the most interference from earth currents. Such are not often the cause of any trouble at all in the case of straight-forward two-, three- and four-valve sets, but supers of various kinds are always safer on frame aeriels or well insulated "capacity earths," or counterpoise aeriels, as they are more correctly termed.

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# Keeping It Secret

ACCORDING to a prominent Post Office official, the new wireless telephony service to New York, although not absolutely secret, is difficult to intercept. This authority claims, in fact, that it is impossible to overhear a London-New York conversation with an ordinary broadcast receiving set. In order to do so, he adds, special apparatus is necessary, together with considerable skill in using it.

At the same time, reports of the interception of transatlantic messages upon a wave-length of 5,760 metres have been received from a number of quarters, including places so widely separated as South Africa and Vienna.

The problem of devising a "secret" system of wireless telephony is one that has already occupied the attention of wireless experts. Long before the opening of the London - New York service, it was realised that the possibility of eavesdropping might seriously prejudice the success of radio telephony in commercial competition with cable or line communication, where absolute secrecy is preserved.

It must be admitted, however, that although it is possible—with a certain amount of possibly misplaced ingenuity—to "tap" the London-New York "radio" this fact does not appear to have deterred people from using the service. It is probable that if complete secrecy were to be offered at a high tariff and lack of complete secrecy at a lower rate, the latter service would in most instances be preferred.

### Varying Frequency.

One of the most obvious methods of securing a certain degree of secrecy is to use a "wobbling" carrier-wave at the transmitting station instead of keeping to a constant frequency. This can be done, for example, by continually altering the setting of a variable condenser or variometer in the circuits of the master control, and so causing the radiated energy to fluctuate in wave-length.

The change of tune may be controlled by a clockwork or other motor geared to the variable condenser or variometer, and driven either at a constant or irregular speed.

In order to hear the whole of a message radiated in this manner, the tuning of the receiving set must obviously be varied at the same rate as the transmitter. This

\*-----\*

Now that transatlantic telephony communication is an accomplished fact, there remains the all-important task of making those communications secret—a task which, as our contributor shows, is not easy, but is, nevertheless, quite possible of accomplishment.

By J. C. JEVONS.

\*-----\*

necessitates the fitting of special clockwork mechanism at the receiving end driven at the same speed as that used to control the transmission.

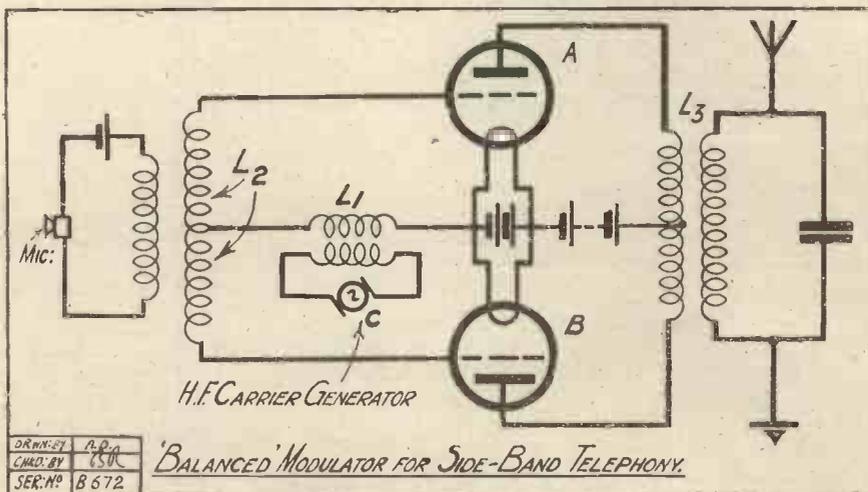
### Side-Band System.

Unfortunately this system has not proved very successful in actual practice. By merely

ever, provided with a number of filtering circuits designed to cut out the interfering tones, and to allow the "clear" message alone to get through to the telephones.

Whatever may be the virtue of this suggestion it is certainly not the one at present employed on the London-New York service. From the reference made to the fact that interception is "difficult" upon an ordinary receiving set, it would appear that the partial degree of secrecy is due to the suppression of the normal carrier-wave. In other words the message is sent out upon one side-band only of the carrier-wave. In this way it is differentiated from the ordinary type of transmission as used in broadcasting.

Although the actual processes involved in modulating a carrier wave with speech signals are perhaps too intricate to interest



using a broadly-tuned or aperiodic receiving aerial it is usually possible to intercept most of the message, particularly at fairly close range. Under such conditions the incoming signals naturally vary considerably in strength, but not to a sufficient degree to ensure secrecy.

Another plan that has been proposed is to introduce at the sending station a mixture of confusing notes which, when received upon an ordinary set, overlap with the spoken message and so render it unintelligible.

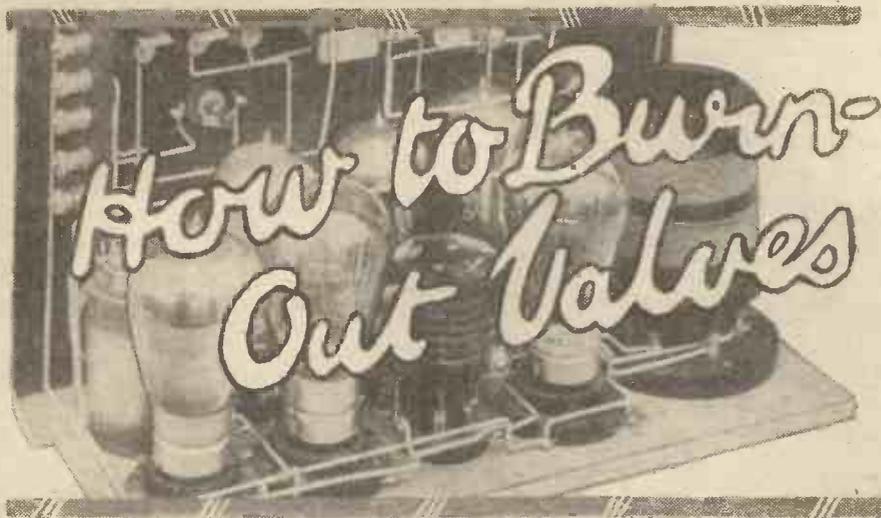
The authorised receiving station is, how-

the average listener, he is probably aware that the net effect is to produce three different frequencies.

The first is a wave having a frequency equal to the sum of the frequencies of the speech currents and the carrier-wave. The second is a wave having a frequency equal to the difference of these two components. The third is the pure unmodulated carrier-wave.

As the latter does not carry in itself any of the speech currents it is, in a sense, wasted

(Continued on next page.)



By HUMPHREY PURCELL.

IT is a commonplace that every experimenter burns out a valve—or more than one—sooner or later. This is one reason the seasoned “fan” never throws away a tube, no matter how poor a specimen, so long as it will function. For when risks are to be taken, it is much less trying to chance your arm with a row of has-beens than with an array of the newest supers whose filaments (confound them!) give no sign of glow. If the poorer valves give results of a sort on a new hook-up, it is a simple matter to replace them by better valves (disconnecting the H.T. positives while making the change), and start afresh without any qualms as to a mistake in wiring.

#### A Common Cause.

The most common cause of burn-outs, in the bitter experience of the writer, is neglect to disconnect the H.T. battery during alterations. It is no argument, when pulling out a valve, or plugging in a different one, to say, “It doesn’t matter if this does go west. I have never liked it.” For if

that valve is placed on the holder sideways, it may bring disaster to all the valves in the set. Even when the alteration is merely the moving of a grid-battery plug to a different tapping, the plug may slip from the fingers and touch the H.T. battery or a wire connected to H.T. positive, and thus bring disaster (in a set where H.T. negative and L.T. positive are connected). To fiddle with the innards of a set (to change a grid leak, for example) without disconnecting the H.T. battery is, of course, sheer folly.

#### Peculiar Burn-outs.

A burn-out which brought surprise as well as grief to a friend of the writer’s was caused by disconnecting all battery leads and lifting the set off the table without putting the rheostats to the “off” position. The L.T. leads trailed across the H.T. battery, and a very tiny firework display cost two guineas. Another disaster was caused by disconnecting a detector unit from an amplifier without disconnecting batteries. The lead to O.P. touched a

filament lead. Yet another was caused by using flex to make connections to a transformer on which the terminals were set close together. A stray strand of the O.P. flex touched a strand connecting with I.S. The owner deserved to lose those valves, even though the price at that time was 27/6 each!

It will be noticed, incidentally, that several of the calamities described might have been averted if H.T. negative had been connected to L.T. negative instead of L.T. positive. There are arguments in favour of both policies, but generally speaking “negative to negative” is the safety-first plan.

#### Rough Treatment.

Apart from actual burning out, there is one other practice that can be thoroughly recommended as a means of shortening the life of a valve. That is, to tug it out of its holder sharply, or to push it home with a click. As a matter of fact the writer has never yet known a valve to die peacefully in its holder. Death, in one shape or another, has always come violently.

valves rises and falls simultaneously, and the net transfer of energy across the coil L3 will be zero, the two currents balancing each other out. Therefore, so far as the aerial is concerned, it will radiate no carrier-wave energy.

If, however, speech currents are applied by the microphone across the input coil L2, the normal condition of balance is upset. At any one moment, say, when the upper part of the coil L2 is positive, the lower end of that coil will be negative. These voltages are, of course, applied simultaneously to the grids of the modulator valves, but in this instance will give rise to a differential effect, as in the case of a push-pull amplifier.

As the plate current of one valve increases, under the influence of a positively-charged grid, that of the second valve decreases owing to its negative grid voltage, with the result that modulated side-bands of carrier energy are transferred from the coil L3 to the transmitting aerial.

As previously stated, these side-bands cannot be converted into intelligible speech by ordinary methods of crystal or valve detection, unless a local oscillator is used at the receiving end to supply the missing carrier-wave component.

\* \* \* \* \*

**“KEEPING IT SECRET.”**

(Continued from previous page.)

\* \* \* \* \*

energy so far as the task of carrying the speech across the ether is concerned. It is, however, an essential factor in the process of detecting or restoring the original message at the receiving end.

If, therefore, the carrier-wave is not radiated from the transmitting aerial, the modulated side-bands, although they transfer the essential speech-sounds to the receiving station, cannot alone be reconverted into their original form by ordinary crystal or valve detection.

A way out of this difficulty is found by adopting the expedient of supplying, at the receiving end, local oscillations having the same frequency as the missing carrier-wave. The side-bands and the “local” oscillations will then combine to restore the original speech in intelligible form.

For instance, a back-coupled oscillating valve, if adjusted to the frequency of the original carrier-wave will restore the

missing “carrier” and enable the original signal to be reconstructed.

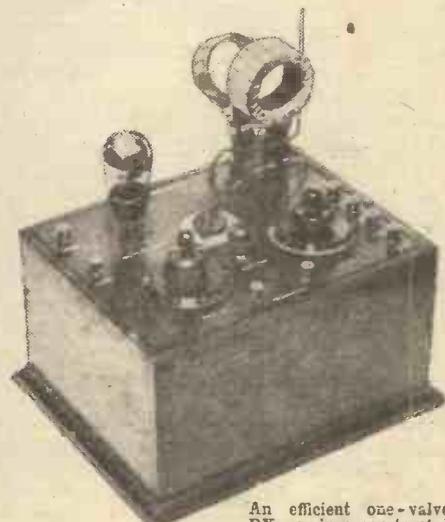
In those cases where interception of the London-New York messages has been reported, it is probable that some such method has been adopted. It should, of course, be unnecessary to remind any listener who may succeed in “tapping” a private message that he is strictly bound by the terms of the Postmaster-General’s licence not to divulge or communicate such matter to any other person.

#### Suppressing the Carrier.

The arrangement employed for transmitting messages, whilst at the same time suppressing the main carrier-wave, is illustrated in simplified form in the diagram, in which two modulating valves, A and B, are shown mounted symmetrically, back to back. The carrier-wave generator, C, is coupled to a coil, L1, arranged in the common grid circuit of the two valves.

It will be seen that any voltages induced by the source C into the coil L1 will be applied to both grids simultaneously, and in phase, because both grids are connected to the same end of the coil.

Accordingly, the plate current of both the

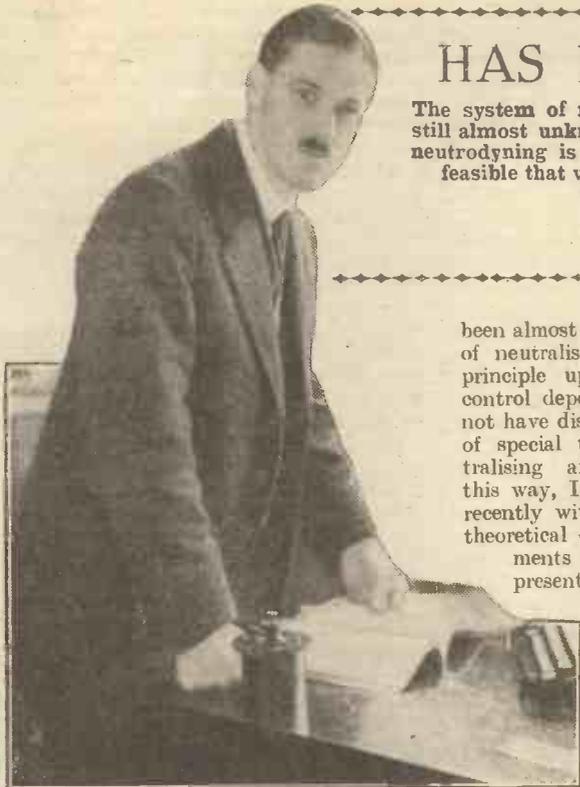


An efficient one-valve DX receiver constructed by a reader of “Popular Wireless.”

# HAS NEUTRALISING MISLED US?

The system of neutrodyning was introduced at a time when special H.F. valves were still almost unknown. With modern valve and set design in many cases the need for neutrodyning is not so acute, and in this article Mr. Harris shows that it is quite feasible that we may be leaning on a broken reed where neutralising is concerned.

By PERCY W. HARRIS, M.I.R.E.  
(Editor of "The Wireless Constructor.")



been almost entirely abandoned in favour of neutralising methods, and while the principle upon which the potentiometer control depends seems very bad, may we not have discovered for ourselves a number of special troubles inherent in the neutralising arrangements? Reasoning in this way, I began a series of experiments recently with the object of deducing not theoretical conclusions but practical arguments from any facts that should present themselves. The results have been so interesting that I think POPULAR WIRELESS readers would like to hear of them.

Let me say at once that I do not wish to decri the neutralising methods of obtaining stability. Their superiority over potentiometer control is, in many cases,

so easily demonstrated as to put the matter beyond argument, but from this we should not deduce that it is a better method in all cases, for in some special circumstances, of which I am about to speak, the potentiometer method of control seems to have distinct virtues.

Considering matters carefully, it will be found that many neutralising schemes serve to balance out not only the feed-back due to the inter-electrode capacity in the valve, but also that due to stray capacities exterior to the valve, as well as some of the effects of stray fields. To what extent have our troubles in the past been due to feed-back due to inter-electrode capacity, and to what extent to factors other than this? I have come to the conclusion that in most cases the chief trouble has been due to causes outside the valve itself.

American receivers as sold in the large cities are practically all five-valve sets, with two stages of radio frequency, a detector, and two stages of audio frequency. Recently a number of "de luxe" sets have been placed on the American market with three stages of radio frequency and three of audio frequency, the latter often being resistance or choke coupled. In the main,

however, the most popular sets are those with two stages of radio frequency, and anyone who has tried them knows that their sensitivity and selectivity are of a very high order. The H.F. transformers used are of the "low-loss" variety, tuned either by separate condensers or by some adaptation of "gang control."

### Surprising Statistics.

Now, we all know that with two efficient stages of radio-frequency amplification the tendency to self-oscillation is pronounced. A number of manufacturers, licensed under the Hazeltine patents, utilise the Hazeltine neutrodyne method of obtaining stability. A larger number of manufacturers are not licensees under the Hazeltine or any other neutralising patents, and yet make receivers with two stages of tuned radio frequency—sets which are both sensitive and selective. Figures in my possession show that (a) the type of five-tube radio receiver having the largest sale

WHEN, a few years ago, a certain wireless company needed a special kind of receiving apparatus, the first instruments installed possessed unexpected defects. A device to remove these defects was soon fitted, but this in turn developed troubles of its own. By the time various attachments and compensating devices had been incorporated the complete receiver appeared a fearsome object.

### Potentiometer Control.

Subsequently it was found that the work done by the complicated apparatus could be performed far more efficiently and simply by using only half the number of valves and controls, for the man who solved the problem had merely reverted to the original device and cured its troubles in a simpler

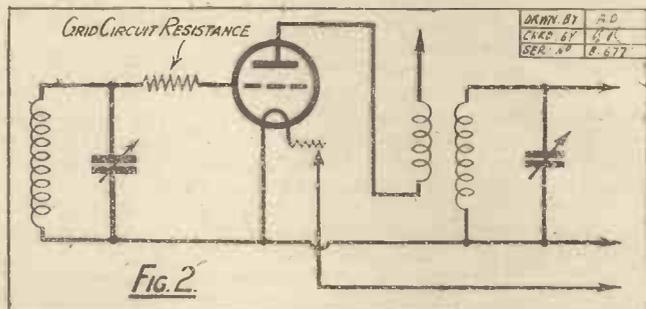


Fig. 2

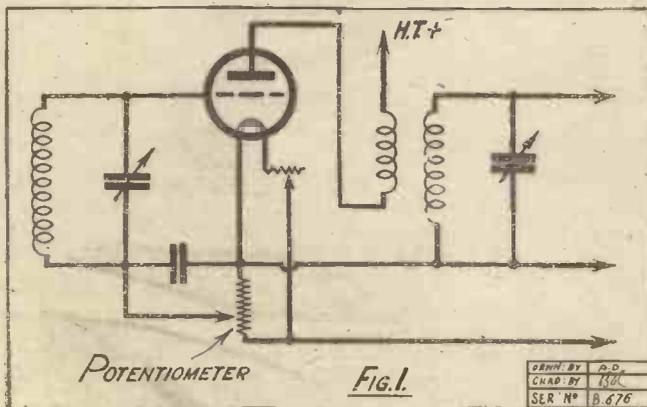


Fig. 1

way, the cure being unaccompanied by any diseases of its own.

I sometimes wonder whether we are not all liable to fall into similar errors in the design of our wireless receiving sets. The potentiometer method of stabilising has

been almost entirely abandoned in favour of neutralising methods, and while the principle upon which the potentiometer control depends seems very bad, may we not have discovered for ourselves a number of special troubles inherent in the neutralising arrangements? Reasoning in this way, I began a series of experiments recently with the object of deducing not theoretical conclusions but practical arguments from any facts that should present themselves. The results have been so interesting that I think POPULAR WIRELESS readers would like to hear of them.

is not neutralised, and (b) more five-valve sets of the un-neutralised variety are sold than of the neutralised. In giving these facts I am not expressing any opinion as to whether the neutralised sets are more or less efficient than those which are not neutralised—I am simply stating the fact that a very large number of sets containing two stages of radio-frequency amplification—sets which are both sensitive and selective—are sold in America and obviously give satisfaction to their owners.

### Stabilising Resistances.

An examination of those sets which are not neutralised shows that the spacing of coils has been carefully arranged to give the minimum interaction, and stability is obtained by (a) a resistance in the plate lead going to the H.T. battery, (b) a resistance in the grid circuit of the H.F. valve, (c) a combination of either or both of these methods with a special variable coupling between the primary of the transformer and the secondary.

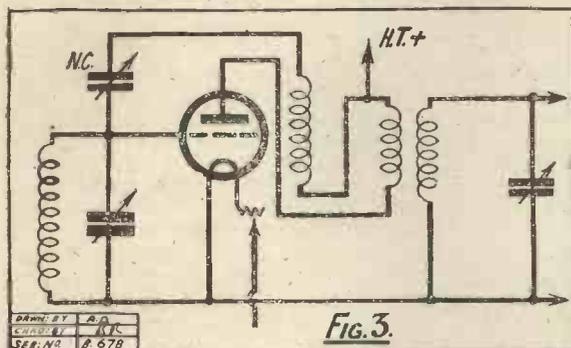
The introduction of a resistance in the grid circuit interests me quite considerably, as it is obviously a "losser" method

(Continued on next page.)

## HAS NEUTRALISING MISLED US?

(Continued from previous page.)

belonging to the same family as the potentiometer method. Remembering the amount of positive bias it was necessary to place on the grid of the relatively low efficiency valves in use two or three years ago, and bearing in mind that the modern valves of much greater efficiency have a far higher tendency to oscillate, it occurred to me to make a few experiments to see just how much loss it was necessary to intro-



duce into a modern circuit to stabilise it if—and this is a very important point—proper precautions were taken to prevent interaction between parts of the circuit other than the valve itself.

A good line of investigation appeared to be in connection with the screened coils now manufactured by a number of makers. Conclusions drawn from the use of one coil only, or from one stage of H.F., may be very misleading. I therefore decided to build up a receiver with three stages of radio-frequency amplification, a detector, and one stage of transformer-coupled note-magnification. Such an arrangement of circuit should, if efficient, give admirable results with modern valves, provided stability could be obtained without too high a loss of efficiency.

### Results Obtained.

If really adequate amplification could be given by the radio-frequency side, one efficient stage of audio-frequency amplification should be good enough for loud-speaker work on any station within range of the instrument. The usual trouble with a set possessing three stages of radio-frequency amplification is that of the multiplicity of tuning controls, and while this can be simplified by the use of "gang" condensers, such condensers are expensive, and, unless carefully balanced, both in the manufacture and afterwards by means of some separate control, are liable to give much trouble. On the other hand, two controls give very little more trouble than one, and a simple way out of the difficulty appeared to be to tune two of the coils at a time, using two "twin" condensers for the purpose. The receiver, then, has but two tuning controls, both of which read to approximately the same figure.

Considering such an arrangement in detail, it will be seen that it is possible to control three of the grids by potentiometer,

the fourth (that of the detector) not needing such control. Some thought given to the matter led me to arrange for two potentiometers, one to control the first and second grids and the other to control the third grid. The receiver was thereupon made up—not in a straggling form along the experimental bench, for results obtained in this way are often most misleading—but in what may be termed a "practical form" in the space occupied by a standard panel, baseboard and cabinet.

The results obtained with this receiver far exceeded my expectations, for in the first place the amount of positive bias to "hold the circuit down" was very small—far less than we were accustomed to use with the old open coils and transformers. One particular point impressed me at once. We might reasonably assume that if the potentiometers were adjusted to give stability at the positions of minimum readings on the tuning condensers, the set would be very "dead" when a greater part or all of the '0005 mfd. condensers were in circuit. In actual practice, once the set had been stabilised on the lower readings of the condensers, it was still sensitive enough to bring in a large number of foreign stations at full loud-speaker

strength between 70° and 100° on the 100° condensers. True, the strength of these stations could be brought up still further by readjusting the potentiometers, thus lessening the positive bias, but the difference between the signal strength with potentiometers set for stability on the lower readings and that on the high was far less than one would expect.

The high-frequency transformers used in these screened coils were of the type known

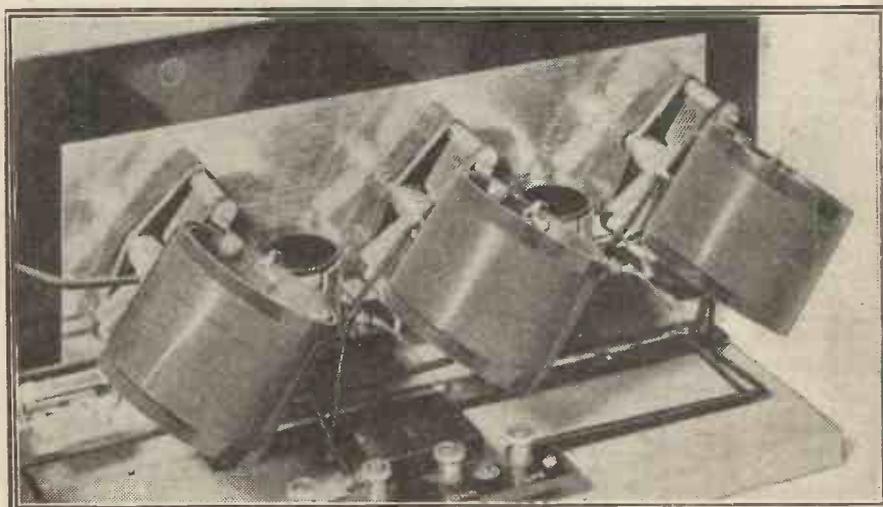
transformers was too weak for these valves. In case anyone should assume that lack of balancing between the double condensers was the cause of this, I may say that balancing condensers were used in all these tests to make sure that all four radio-frequency circuits were properly in tune.

We now come to the point of selectivity. This, as might be expected, was a variable factor, depending upon the method of rectification used, the degree of positive bias, and the type of valve. By choosing valves of suitable impedance and amplification factors, a very high degree of selectivity was obtained—adequate for all ordinary needs. On an outdoor aerial the sensitivity of the set was comparable with that of a good super-heterodyne using seven valves and an efficient frame aerial of reasonable dimensions.

### Effect of Neutralising.

While giving these facts, I must warn readers that too many conclusions must not be drawn from them. For example, it is quite evident that an appreciable part of the stability obtained in this receiver was due to the damping introduced by the metal screens, and, indeed, an examination of some of the commercial American receivers shows that eddy currents set up in the condenser plates by the fields of the radio-frequency transformers are deliberately made use of to obtain stability. At the same time, the reduction of interaction between fields, due to the screening of the coils, had a powerful influence on reducing the amount of positive bias necessary to obtain stability, while the comparatively weak coupling between primaries and secondaries was again an important factor in determining the results.

Trouble is sometimes found in using three stages of radio-frequency with screened coils and some neutralising methods. For this reason it occurred to me to combine the potentiometer control method with



A popular form of lay-out where neutralised circuits are employed. A certain amount of damping is introduced by the proximity of the condensers to the coils.

as "split primary," and after getting excellent results with one type of valve, I tried the experiments with a whole range of valves and soon found that with the potentiometers fully to the negative side many of the valves would not oscillate at any position of the condensers. This meant, among other things, that the coupling between primary and secondary of the

the neutralising method to see what happened. A special set was therefore made up along conventional lines with screened coils and a neutralised circuit. It was found that after all balancing adjustments had been made, there was still some instability on the lower readings of the condensers (not due to parasitics). Two of

(Continued on page 1375.)



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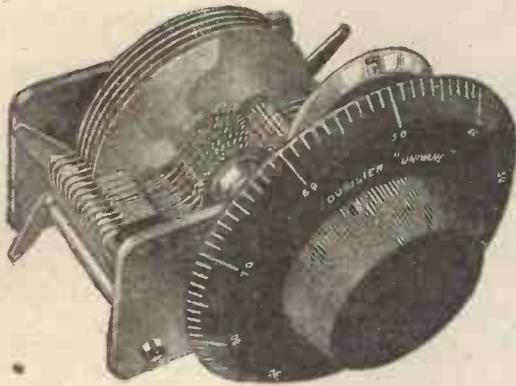
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**HAS NEUTRALISING MISLED US?**

(Continued from page 1372.)

the grid returns were then connected together and brought to a potentiometer, and, of course, when the potentiometer slider was on the negative side the effect was precisely the same as when the potentiometer was not inserted. Next the slider

inside a screen. Without the screen the set oscillated smoothly throughout its whole range, and by adjustment of filament resistance and grid leak, could be brought below the oscillation point so as to be in its most sensitive condition for distant reception. Placing the screen over the coil immediately stopped all oscillation, and the circuit could only be made to oscillate with the greatest difficulty on a few degrees at the lower end of the condenser scale. No amount of readjustment of filament voltage or grid leak value would induce oscillation over any appreciable portion of the condenser scale.

In using screened coils, then, we must consider them as compromises. There is no question that they do serve a very useful purpose by restricting fields, thus enabling us to make sets more compact than would otherwise be the case. Furthermore, they certainly reduce local "pick-up," one of the bugbears of wireless receiver design. At the same time they must not be considered as magical devices or cures for all

receiver exactly, and for this reason is likely to have more trouble with his neutralising. Furthermore, the average home experimenter wants to try a large number of different kinds of valves, and quite likely those valves he has on hand at the moment are not quite suitable for the particular set he desires to build.

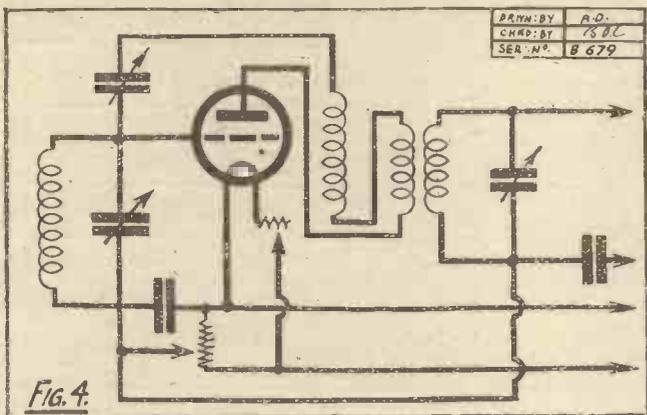
A wide experience of home constructors' troubles has led me to the conclusion that the process of neutralising a set offers considerable difficulties, whereas the use of the potentiometer to obtain stability is extremely simple. For the highest possible efficiency there is no question whatever that one of the modern balancing methods is the best, but receivers using them require careful design, and, if results equal to those obtained by the designer are to be obtained by the home constructor, the designer's set must be copied very closely. By combining potentiometer and balancing methods, we give the home constructor a latitude he will find very useful.

**A Compromise Advisable.**

By carefully avoiding interaction of fields, by suitable screening, multi-stage high-frequency receivers can be built and reproduced by the home constructor with the certainty of obtaining really highly sensitive results with great simplicity of control.

Once more, then, we are reaching the position of compromise. I urge all experimenters not to overlook the potentiometer in developing their high-frequency receivers. My own experimental five-valve set has shown me what remarkable results are obtainable without neutralising methods, and has also revealed the fact that too much credit has been given to neutralising in the good results we now obtain with our multi-valve sets.

I shall be glad to hear from readers who carry out experiments on the lines I have indicated as to the results they obtain and to have their opinions on the subject of neutralising as applied to modern circuits.



arm of the potentiometer was slightly advanced until the instability was removed, whereupon the set was found to be stable throughout its whole range, with little appreciable loss of selectivity or sensitivity.

Looking back over our radio-frequency experiments for the last few years leads to the following conclusions.

1. Coupling between primary and secondary of the earlier radio-frequency transformers was far too tight, giving both magnetic and capacitive feed back requiring considerable positive bias to stabilise the circuit.
2. Capacitive and inductive couplings between circuits, other than the feed back in the valve itself, made further damping necessary.
3. The use of low-capacity valve sockets, careful wiring, and a much weaker coupling between primary and secondary of the transformers has reduced the feed-back between circuits to a greater degree than is generally realised.
4. Stability obtained in neutralised circuits using screened coils is due at least as much to damping introduced by the screen as to the balancing effect of the neutralising condenser.

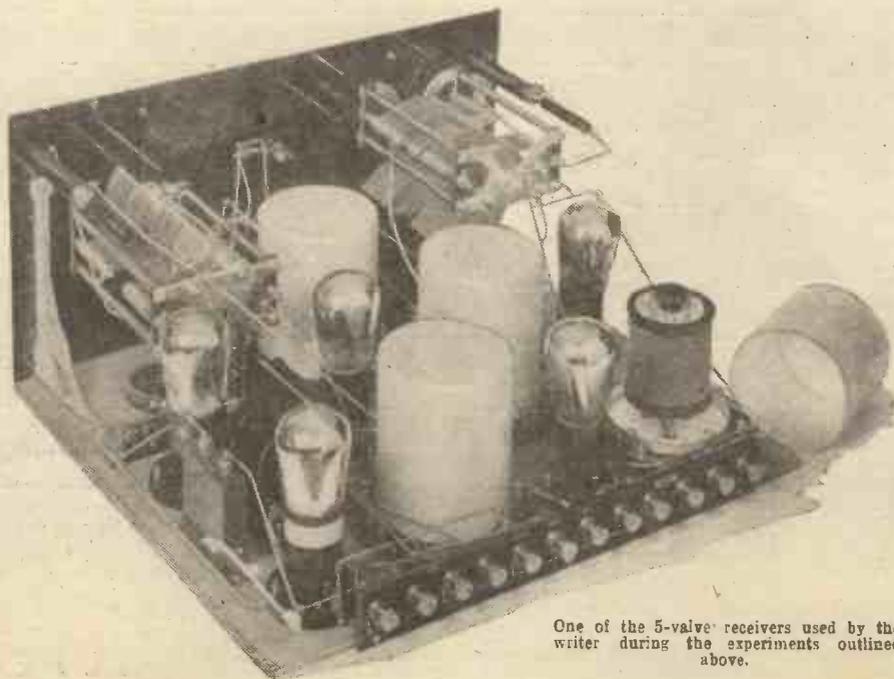
**Damping Caused by Screens.**

Pursuing still further investigations in regard to damping introduced by screens close to the coils, an Ultraudion receiver was made up and by a suitable choice of anode voltage, grid leak value, the valve, and other factors, the set was made to oscillate over the whole range of a .0005 mfd. condenser. The Ultraudion circuit, as readers will probably know, is rather a peculiar arrangement due to Dr. Lee de Forest, in which the set normally oscillates, and is kept off the oscillating point by adjustment of filament temperature and by grid leak value.

The coil used in these experiments was of the "six-pin" variety, designed for use

radio troubles. Nor must we exaggerate the importance of balanced circuits in obtaining stability. The difference between the home constructor and the commercial set manufacturer must be borne in mind, and tends to widen as the radio art advances.

The factory-built receiver can be designed with dead accuracy reproduced with the same accuracy and sold specifically for particular makes and types of valves. Furthermore, such a receiver can be carefully neutralised at the factory, and this neutralisation will remain constant so long as the particular valves specified are used. The home constructor, on the other hand, is less likely to reproduce the



One of the 5-valve receivers used by the writer during the experiments outlined above.

THE "POPULAR WIRELESS" VALVE GUIDE—continued.

4-VOLT L.F. VALVES—continued.

Make of Valve	Type	Fil. Volts	Fil. Amp.	Anode Volts	Grid Bias	Impedance	Amp. Fac.	Price	Remarks	Make of Valve	Type	Fil. Volts	Fil. Amp.	Anode Volts	Grid Bias	Impedance	Amp. Fac.	Price	Remarks
B.S.A. Ltd., Small Heath, Birmingham.	P.425	3.5-4.4	0.23	130 max.	2-8	5,000	6.8	8.6	Power valve (P.425A—bayonet fitting)	MARCONI—Marconi House, Strand, W.C.2.	R. D.E.3	4.0	0.7	30-100	0-6	40,000	9	8.0	General purpose
B.T.H. Thomson-Houston Ltd., Crown Hse., Aldwych, W.C.2.	P.485	4.0	0.9	130 max.	3-12	7,000	6.0	35.0	Super power valve (bayonet fitting)	MARCONI—Marconi House, Strand, W.C.2.	D.E.3B, D.E.4, F.E.3	2.8, 2.8, 3.8, 4.0	0.06, 0.06, 0.30, 0.7	20-80, 20-80, 20-120, 0-15	0-4.5, 0-6, +6-15 (inner grid)	22,000, 56,000, 10,000, 20,000	17, 14, 7, 4.5	14.0, 14.0, 18.0, 10.6	General purpose, Res. coupling, Power valve, Four-electrode valve
BURNDEPT—Burndeft Wireless Ltd., Bedford St., W.C.2.	H.L.310	3.0	0.1	45-90	1.5-3.0	20,000	6.5	14.0	General purpose	METAL—John Rae Ltd., 60, Blackfriars Rd., S.E.1	D.E.V.	3.0	0.2	20-80	0-4.5	24,000	6	25.0	Special type
C.A.C.—Valve Distrib. Co., 10, Rangoon St., E.C.3.	B.E.L.F.	3.5	0.5	40-100	1.5-9.0	12,000	5	6.0	L.F. valve	MULLARD—Mullard Wireless Service Co., Mullard House, Denmark St., W.C.2.	P.M.3, P.M.4, P.M.245, S.4, S.5	3.8-7, 3.7, 3.8, 3.0, 3.0	0.1, 0.1, 0.25, 0.2, 0.2	50-100, 50-100, 50-150, 20-60, 20-100	0-6, 0-6, 0-22, 0-6, 0-3	16,000, 7,000, 3,500, 14,000, 100,000	—, —, 3.15, 6, 22	14.0, 18.0, 22.0, 22.0, 22.0	General purpose, Super power valve, General purpose, Anode bend det., res. coupled L.F.
CLEARTRON—Cleartron Radio Ltd., 1, Charing Cross, W.C.2.	C.T.08	3.0	0.08	30-100	0-6	18,000	7.5	14.0	General purpose	NELSON—Nelson Electric Co., 138, Kingston Rd., S.W.19.	R.L.F.	3.8	0.05	50-100	0-6	22,000	6.7	8.0	Det. and L.F.
COSMOS—A.C. Cossor Ltd., Aberdeen Wks., Highbury, N.	W.R.1	1.6-6	0.3	30-120	0-3	30,000	10	16.0	Res. coupling (spec. base)	NEUTRON—Neutron Ltd., Sentinel Hse., Southampton Row, W.C.1.	G.306, G.410	3.0, 3.3	0.06, 0.1	—	—	25,000, 20,000	7, 11	11.0, 11.0	General purpose
EDISWAN—Edison-Swan Electric Co., Queen Victoria St., E.C.1.	W.R.2	1.6-6	0.3	30-120	0-3	30,000	10	14.0	Resistance Coupling	OCTRON—Neutron Ltd., Sentinel Hse., Southampton Row, W.C.1.	L.406	3.5-4	0.06	20-100	0-6	12,000	6.7	12.6	L.F. valve
DEXTAUDION—E.E.C. Ltd., Fitzroy Square, W.1.	Point 1. (Black)	3.8	1	90	3-4.5	10,000	10	14.0	Power Valve	H.S. Electric Ltd., 32, Charlotte St., Birmingham.	H.R.408, L.408, L.P.430	3.7, 3.7, 3.7	0.08, 0.08, 0.30	80-120, 60-120, 60-120	0-3, 0-6, 0-9	50,000, 16,000, 9,000	18, 10.6, 5	10.6, 10.6, 10.6	Res. coupling, General L.F. and det., Power valve
EDISWAN—Edison-Swan Electric Co., Queen Victoria St., E.C.1.	Point 1. RC(Blue)	3.8	1	120	6-9	5,000	5.0	18.6	Power Valve	OSRAM—G.E.C. Ltd., Magnet House, Kingsway, W.C.2.	R. D.E.3, D.E.3B, D.E.4, F.E.3	4.0, 2.8, 2.8, 3.8, 4.0	0.7, 0.06, 0.06, 0.30, 0.7	30-100, 20-80, 20-80, 120 max., 20-120, 6-15	0-6, 0-6, 0-4.5, 0-9, +6-15 (inner grid)	40,000, 22,000, 22,000, 10,000, 20,000	9, 8, 7, 14, 4.5	8.0, 14.0, 14.0, 18.0, 16.6	General purpose, General purpose, Res. coupling, Power valve, Four-electrode
EDISWAN—Edison-Swan Electric Co., Queen Victoria St., E.C.1.	Point 1. Stentor	3.8	1	120	3-6	5,000	5.0	18.6	Power Valve	QUIKKO—J. W. Pickavant, Quikko Works, Lombard St., Birmingham.	D.E.V., D.E.2, L.F., D.E.2, H.F., P.4, B.E.L.F., B.E.H.F.	3.0, 4.0, 4.0, 4.0, 3.5, 3.5	0.2, 0.2, 0.2, 0.2, 0.5, 0.5	20-60, 120 max., 120 max.	0-4.5, 0-7.5, 0-4.5	24,000, 14,000, 45,500	6, 5, 14	25.0, 8.0, 8.0	Special tubular type, General purpose, Res. coupling
ELKA—L. Kremner, 48a, Shudehill, Manchester.	P.V.8	3.0	0.12	60-120	4-10	10,500	6	18.6	Power valve	RADIO—Radon Ltd., Bollington, nr. Macclesfield.	408 L.F., 400 H.F., 4 V.L.S., Pyramid 2, Pyramid 3	3.7, 3.7, 3.8, 3.8	0.06, 0.06, 0.06, 0.34	60-120, 60-150, 60-120, 40-120	0-6, 0-9, 0-9, 0-9	18,000, 60,000, 10,000, 8,000	7.2, 20, 8, 5.6	10.6, 10.6, 15.0, 17.6	General purpose, Res. coupling, Power valve, L.F. and last stage
FRBLAT—L. Kremner, 48a, Shudehill, Manchester.	P.V.4	3.5-4.0	0.35	60-120	3-7	9,500	6	18.6	Power valve	RADIO—Radon Ltd., Bollington, nr. Macclesfield.	Pyramid 2, Pyramid 3	3.8, 3.8	0.06, 0.06	60-120, 60-150	0-9, 0-9	10,000, 8,000	7, 5.6	10.6, 15.0	General purpose, Res. coupling, Power valve
LOUWEN—Audion Radio Co., Dorset St., W.1.	A.R.L.F.	4.0	0.75	30-80	—	15,000	7.5	8.0	General purpose	RADIO—MICRO—H. D. Zealander & Co., 124, Minorics, E.1.	D.E.06, D.E.06	2.7, 2.7	0.06, 0.06	40-100, 40-120	0-6, 0-6	19,000, 59,000	5.7, 10.6	10.6, 10.6	L.F. and gen. pur., Res. coupling
LOUWEN—Audion Radio Co., Dorset St., W.1.	D.	3.5-4.0	0.15	20-100	0-4.5	—	—	—	General purpose	RADIO—MICRO—H. D. Zealander & Co., 124, Minorics, E.1.	H.F.	3.5	0.1	40-250	—	8,000, 10,000	—, —	8.6, 11.0, 12.0	General purpose, Power valve, Super power valve
LOUWEN—Audion Radio Co., Dorset St., W.1.	A.V.L.	3.8-4	0.5	20-100	—	—	—	4.11	Amplifier	RADIO—MICRO—H. D. Zealander & Co., 124, Minorics, E.1.	Special Power New	3.5, 3.5	0.06, 0.1	40-80, 40-250	—, —	30,000, 8,000, 10,000	—, —, —	8.6, 11.0, 12.0	General purpose, Power valve, Super power valve
LOUWEN—Audion Radio Co., Dorset St., W.1.	L.	3.8-4	0.25	30-100	—	—	—	4.11	L.F. valve	RADIO—MICRO—H. D. Zealander & Co., 124, Minorics, E.1.	Special Power New	3.5, 3.5	0.06, 0.1	40-80, 40-250	—, —	30,000, 8,000, 10,000	—, —, —	8.6, 11.0, 12.0	General purpose, Power valve, Super power valve
LOUWEN—Audion Radio Co., Dorset St., W.1.	P.	3.8-4	0.25	100-200	—	—	—	4.11	Power valve	RADIO—MICRO—H. D. Zealander & Co., 124, Minorics, E.1.	Special Power New	3.5, 3.5	0.06, 0.1	40-80, 40-250	—, —	30,000, 8,000, 10,000	—, —, —	8.6, 11.0, 12.0	General purpose, Power valve, Super power valve
LOUWEN—Audion Radio Co., Dorset St., W.1.	L.A.101	4.0	0.3	60-200	—	16,000	—	12.6	Power valve	RADIO—MICRO—H. D. Zealander & Co., 124, Minorics, E.1.	Special Power New	3.5, 3.5	0.06, 0.1	40-80, 40-250	—, —	30,000, 8,000, 10,000	—, —, —	8.6, 11.0, 12.0	General purpose, Power valve, Super power valve
LOUWEN—Audion Radio Co., Dorset St., W.1.	L.A.74	3.0	0.06	50-100	—	16,000	—	9.6	General purpose	RADIO—MICRO—H. D. Zealander & Co., 124, Minorics, E.1.	Special Power New	3.5, 3.5	0.06, 0.1	40-80, 40-250	—, —	30,000, 8,000, 10,000	—, —, —	8.6, 11.0, 12.0	General purpose, Power valve, Super power valve
LOUWEN—Audion Radio Co., Dorset St., W.1.	Triple Valve	4.0	0.5	60-300	—	16,000	—	9.6	New 3-stage L.F. amplifier	RADIO—MICRO—H. D. Zealander & Co., 124, Minorics, E.1.	Special Power New	3.5, 3.5	0.06, 0.1	40-80, 40-250	—, —	30,000, 8,000, 10,000	—, —, —	8.6, 11.0, 12.0	General purpose, Power valve, Super power valve
LOUWEN—Audion Radio Co., Dorset St., W.1.	F.F.R.1	4.0	0.1	40-100	0-6	13,000	6	8.0	Det. and L.F.	RADIO—MICRO—H. D. Zealander & Co., 124, Minorics, E.1.	Special Power New	3.5, 3.5	0.06, 0.1	40-80, 40-250	—, —	30,000, 8,000, 10,000	—, —, —	8.6, 11.0, 12.0	General purpose, Power valve, Super power valve
LOUWEN—Audion Radio Co., Dorset St., W.1.	F.F.R.2	4.0	0.1	40-100	0-6	24,000	12	8.0	Res. coupling	RADIO—MICRO—H. D. Zealander & Co., 124, Minorics, E.1.	Special Power New	3.5, 3.5	0.06, 0.1	40-80, 40-250	—, —	30,000, 8,000, 10,000	—, —, —	8.6, 11.0, 12.0	General purpose, Power valve, Super power valve
LOUWEN—Audion Radio Co., Dorset St., W.1.	P.F.R.1	4.0	0.2	60-200	3-12	20,000	18	11.0	Power for res. coup.	RADIO—MICRO—H. D. Zealander & Co., 124, Minorics, E.1.	Special Power New	3.5, 3.5	0.06, 0.1	40-80, 40-250	—, —	30,000, 8,000, 10,000	—, —, —	8.6, 11.0, 12.0	General purpose, Power valve, Super power valve
LOUWEN—Audion Radio Co., Dorset St., W.1.	P.F.R.2	4.0	0.2	60-200	3-12	20,000	18	11.0	Power for res. coup.	RADIO—MICRO—H. D. Zealander & Co., 124, Minorics, E.1.	Special Power New	3.5, 3.5	0.06, 0.1	40-80, 40-250	—, —	30,000, 8,000, 10,000	—, —, —	8.6, 11.0, 12.0	General purpose, Power valve, Super power valve
LOUWEN—Audion Radio Co., Dorset St., W.1.	308 L.F.	2.8-3	0.06	80 max.	0-6	25,000	7	9.0	Det. and L.F.	RADIO—MICRO—H. D. Zealander & Co., 124, Minorics, E.1.	Special Power New	3.5, 3.5	0.06, 0.1	40-80, 40-250	—, —	30,000, 8,000, 10,000	—, —, —	8.6, 11.0, 12.0	General purpose, Power valve, Super power valve
LOUWEN—Audion Radio Co., Dorset St., W.1.	312 P.V.	2.8-3	0.06	120 max.	0-6	18,000	8	9.0	Power valve	RADIO—MICRO—H. D. Zealander & Co., 124, Minorics, E.1.	Special Power New	3.5, 3.5	0.06, 0.1	40-80, 40-250	—, —	30,000, 8,000, 10,000	—, —, —	8.6, 11.0, 12.0	General purpose, Power valve, Super power valve
LOUWEN—Audion Radio Co., Dorset St., W.1.	406 L.F.	3.8-4	0.06	80 max.	0-6	18,000	8	15.0	Det. and L.F.	RADIO—MICRO—H. D. Zealander & Co., 124, Minorics, E.1.	Special Power New	3.5, 3.5	0.06, 0.1	40-80, 40-250	—, —	30,000, 8,000, 10,000	—, —, —	8.6, 11.0, 12.0	General purpose, Power valve, Super power valve
LOUWEN—Audion Radio Co., Dorset St., W.1.	412 P.V.	3.8-4	0.06	120 max.	0-6	12,000	8	15.0	Power valve	RADIO—MICRO—H. D. Zealander & Co., 124, Minorics, E.1.	Special Power New	3.5, 3.5	0.06, 0.1	40-80, 40-250	—, —	30,000, 8,000, 10,000	—, —, —	8.6, 11.0, 12.0	General purpose, Power valve, Super power valve
LOUWEN—Audion Radio Co., Dorset St., W.1.	434 P.V.	3.8-4	0.34	120 max.	0-6	12,000	8	15.0	Power valve	RADIO—MICRO—H. D. Zealander & Co., 124, Minorics, E.1.	Special Power New	3.5, 3.5	0.06, 0.1	40-80, 40-250	—, —	30,000, 8,000, 10,000	—, —, —	8.6, 11.0, 12.0	General purpose, Power valve, Super power valve
LOUWEN—Audion Radio Co., Dorset St., W.1.	470B.F.	3.8-4	0.7	80 max.	0-3	25,000	7	7.0	Gen. purpose (for res. coup. use, H.F. type, see H.F. tables)	RADIO—MICRO—H. D. Zealander & Co., 124, Minorics, E.1.	Special Power New	3.5, 3.5	0.06, 0.1	40-80, 40-250	—, —	30,000, 8,000, 10,000	—, —, —	8.6, 11.0, 12.0	General purpose, Power valve, Super power valve

(To be continued.)

# AN AMAZING SUCCESS

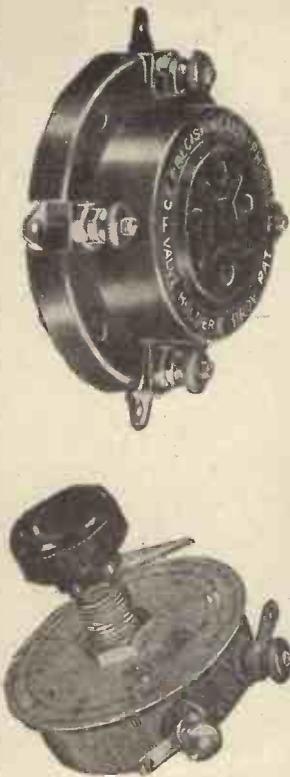


## SPECIAL NOTICE.

Owing to the extraordinary success of S.T. valves, as evidenced by the tributes from all wireless journals, and the fact that the sales of my valves are going up by leaps and bounds, I find it physically impossible to continue to initial with my own hand and pen the test certificate on each valve box. After January 27th, a rubber stamp or other similar method will be employed.

The huge increase in sales has necessitated this step, but the policy of being personally responsible for the extremely accurate tests of every S.T. valve is in no way altered. On the other hand, I shall have more time to attend to such matters.

(Signed) JOHN SCOTT-TAGGART.



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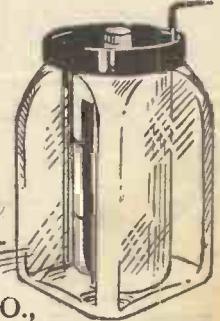
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# BROADCAST NOTES.

BY OUR BROADCASTING CORRESPONDENTS.

The Prime Minister Again—One Recital Dropped—Mr. Stenson Cooke's Talks—The Children's Hour—Short Story Readings—Progress at Belfast—Dance Music on Sunday—Seaside Nights Again—The First Alternative—Miss Crue Davidson at Glasgow—Mr. Lloyd George Takes a Hand—The "A.B.C."—Queen's Hall Future—Plymouth to Calcutta—Surprise in Salvation Army Service—Soccer from Swansea—B.B.C. Controller in Switzerland.

## The Prime Minister Again.

THE Prime Minister is to be heard on the ether once again, the occasion being the Annual Dinner of the Chamber of Shipping on February 16th. Mr. Baldwin is very popular as a broadcaster, quite apart from his official position. Listeners still remember how he scored off his opponents at the General Election in which he delivered his broadcast address from a studio and not from a public hall.

## One Recital Dropped.

As a result of the present move to lighten the programmes, the 8.45 recital is to be dropped at once. Popular music will be substituted.

## Mr. Stenson Cooke's Talks.

The revived offensive against Mr. Stenson Cooke's A.A. talks appears to have gained some ground. It is understood that this feature will shortly disappear from the programmes, and will be replaced by talks sponsored by a rival motoring organisation. The change is not likely to be any more popular than a recent change in the Children's Hour.

## The Children's Hour.

The B.B.C. yielded quite neatly and gracefully over the Children's Hour. No announcement has been made; but this programme feature is now restored in all its details, including avuncular relatives.

## Short Story Readings.

Plans are in hand for a new series of short story and dialect readings by well-known authors. Names already mentioned in this connection are P. G. Wodehouse, Somerset Maugham, and A. E. W. Mason.

## Progress at Belfast.

The Belfast B.B.C. Station appears to be much more popular among its listeners than has ever been the case before. There is more co-operation with civic and state bodies. An example of this will be provided on February 9th, when in co-operation with Queen's University, Belfast, a special concert given in the University Hall will be relayed by the B.B.C.

## Dance Music on Sunday.

It is believed to be the intention of the Governors of the B.B.C. to introduce dance-music from Daventry on Sunday afternoons and evenings. The dancing habit has long since ceased to be confined to weekdays, and this step would do much to promote the popularity of the new authority.

## Seaside Nights Again.

The Seaside Nights so popular in the programmes last year are to be revived and extended this year. These taken in

conjunction with frequent appearances of the new permanent Concert Party and the Roosters, are all on the side of the "anti-talk pro-entertainment" faction at Savoy Hill.

## The First Alternative.

There is already much discussion about what is to be done with the first alternative wave-length, which will be working from Daventry in the autumn. Power will be of about 15 kw. and on a low wave, so that it should be alternative in the service areas of 5 X X and 2 L O. Most listeners would like continuous jazz; but it is unlikely that this will be conceded. The more probable fate of the first of the new waves is as a dumping ground for the stuff that at present encumbers the 2 L O and 5 X X entertainments. There is quite a proportion of the duller educational material which is actually forced on the B.B.C. by interested bodies and by Government

## NEXT WEEK.

Do not miss your copy of next week's "Popular Wireless,"

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BLUE PRINTS**

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Departments. If all this can be cleared off the Daventry and London waves, then these programmes can be enormously brightened. The uplift merchants can do their worst on the new Daventry wave, which nobody will tap.

## Miss Crue Davidson at Glasgow.

It is a sign of a considerable strengthening of the Glasgow programmes in the afternoons that Miss Crue Davidson, the eminent Scottish contralto, has been engaged to broadcast from Glasgow S.B. to Scotland on Friday, February 4th. Apparently the disciplinary action against Glasgow contemplated at Savoy Hill over the time-signal fuss is not to be taken as yet. Edinburgh has not abandoned hopes, however, of ousting her commercial rival in the ether.

## Mr. Lloyd George Takes a Hand.

The movement for separate Welsh broadcasting has claimed the attention of Mr. Lloyd George, who is now considering whether this might not be turned into a useful political issue. Since the breakdown

of the negotiations for the broadcasting of the 1927 Eisteddfod, the feeling against the B.B.C. has appreciably hardened in North and Mid-Wales. There is insistent clamour for an entirely separate service and organisation. Post Office returns show that the licence revenue from the whole of Wales is a good deal less than the cost of the Cardiff Station alone. Therefore, the Welsh are already receiving a subsidy from English listeners. If the B.B.C. were to withdraw entirely from Wales, the revenue available locally would just about maintain the Swansea relay station working less than half the number of programme hours it works at present. So nothing will come of this new movement whoever sponsors it politically. When the West Country Regional Station is established next year, the listeners in North Wales will have a better service, and will have as much Welsh as they can stomach.

## The "A.B.C."

Mr. Archibald de Bear is reviving his "Anti-Broadcasting Company," the "A.B.C." which was launched with such a flourish at the time of the Sitwell fracas. It is understood that various moves by intermediaries to heal the breach between Mr. de Bear and the B.B.C. have only had the effect of intensifying the bitterness and the outbreak of large-scale hostilities cannot be long delayed.

## Queen's Hall Future.

The Governors of the new B.B.C. are understood to be considering a number of proposals for absorbing or "trustifying" the Queen's Hall. It would seem probable that this great centre of music will belong to the B.B.C., or at least be under the control of the B.B.C. by the end of 1927.

## Plymouth to Calcutta.

Mr. Eric Dunsfan has been followed to India by Mr. S. Wallich, the popular and efficient director of the Plymouth Station. Mr. Wallich will be in charge at Calcutta.

## Surprise in Salvation Army Service.

A special Salvation Army Service and Appeal will be broadcast from London on February 20th. The service will contain a surprise feature.

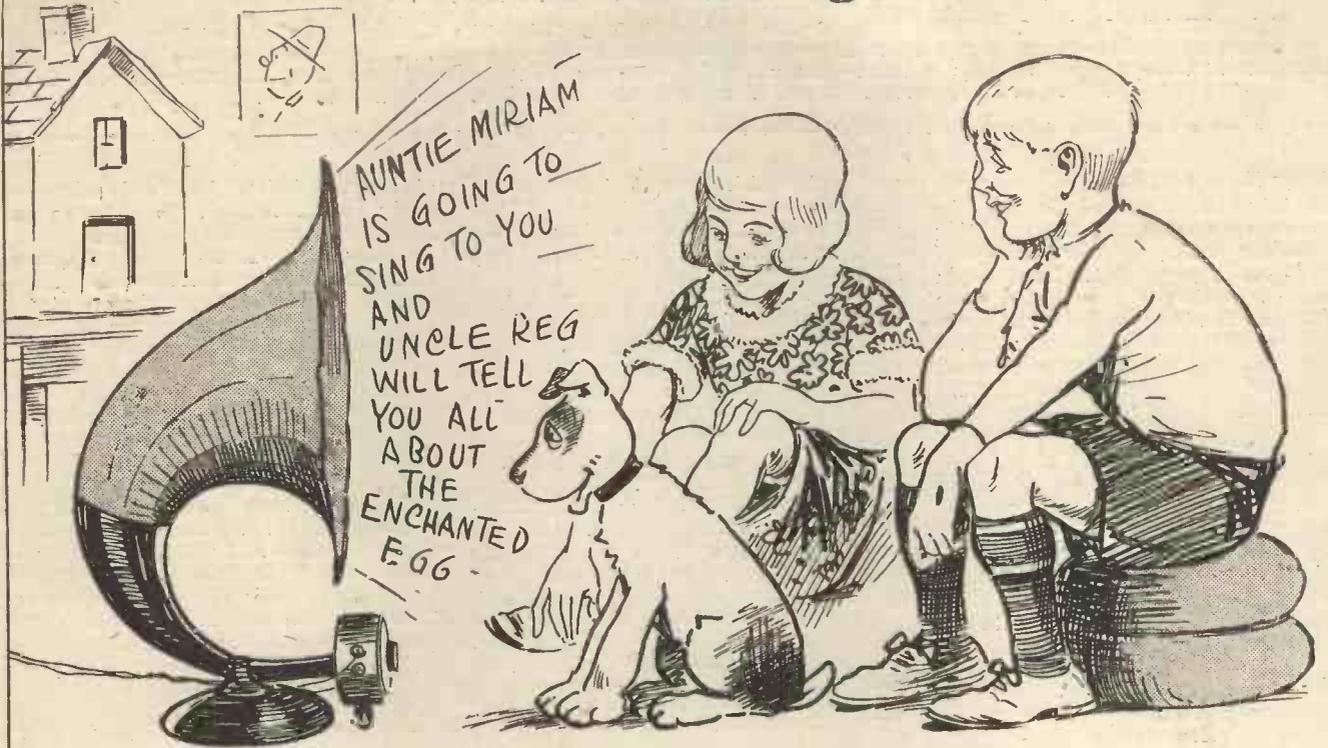
## Soccer from Swansea.

The Wales versus France Soccer Game will be broadcast S.B. from Swansea on Saturday, February 26th, from 2-30 to 4-0.

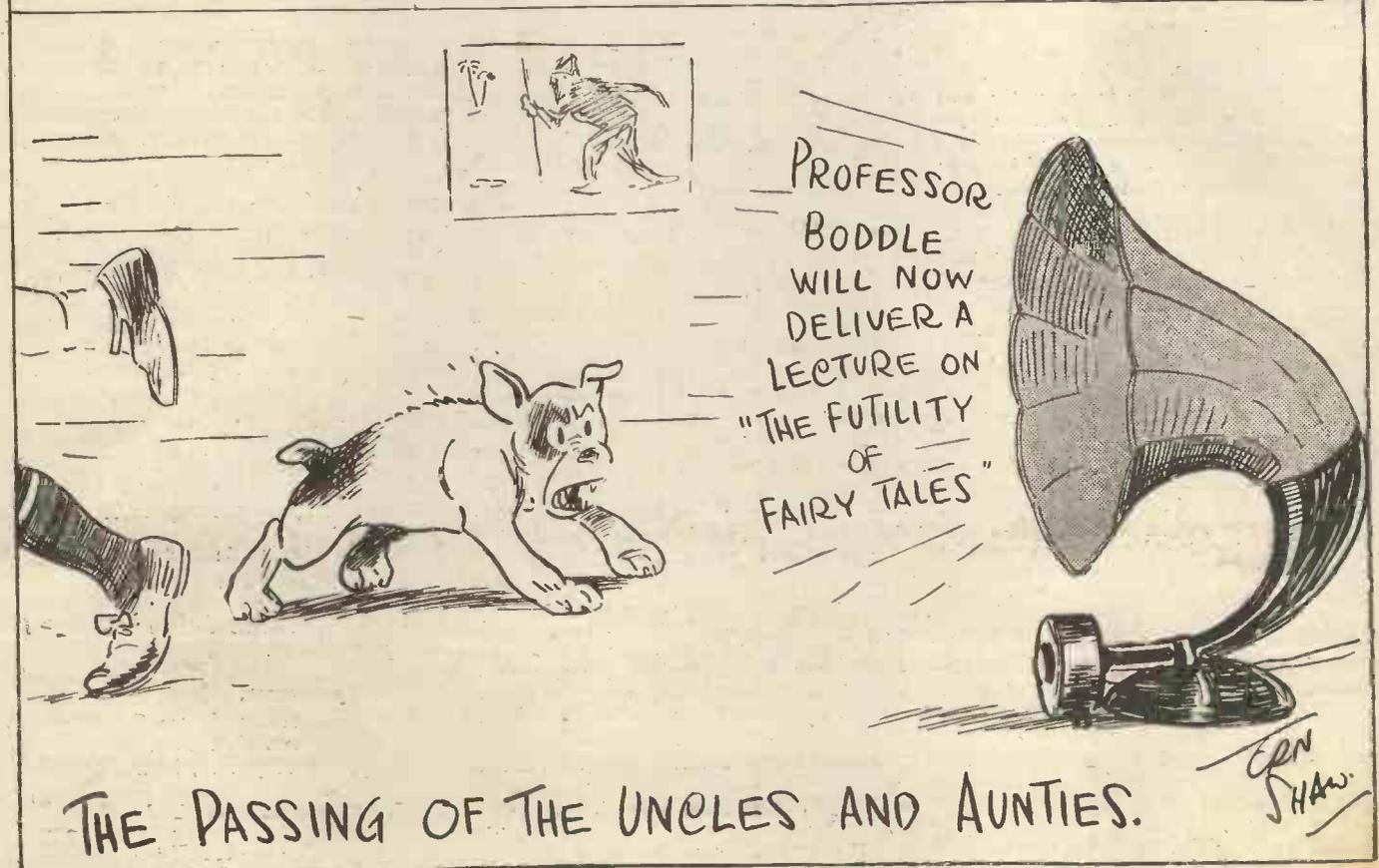
## B.B.C. Controller in Switzerland.

Vice-Admiral Carpendale, the B.B.C. Controller, who has been on extended leave in Switzerland, is reported as having won several trophies in ski-ing and skating competitions.

# THE CHILDREN'S HOUR



AUNTIE MIRIAM  
IS GOING TO  
SING TO YOU  
AND  
UNCLE REG  
WILL TELL  
YOU ALL  
ABOUT  
THE  
ENCHANTED  
EGG

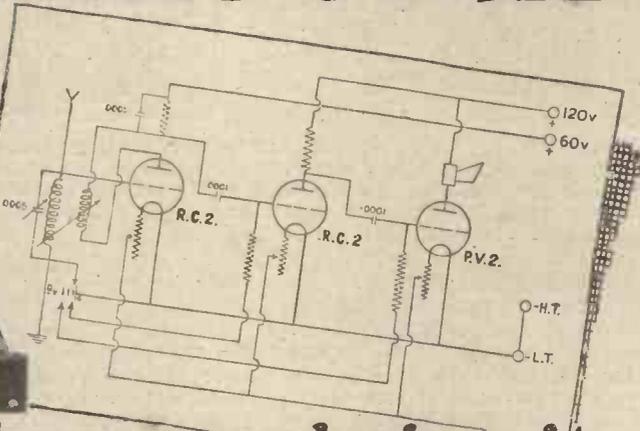
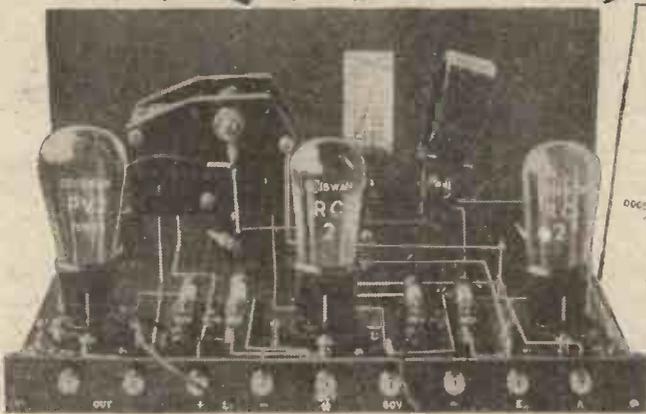


PROFESSOR  
BODDLE  
WILL NOW  
DELIVER A  
LECTURE ON  
"THE FUTILITY  
OF  
FAIRY TALES"

THE PASSING OF THE UNCELES AND AUNTIES.

Edw  
Shaw

# R.C. THREESOME



## Modification of the normal circuit to increase range and selectivity

CONSTRUCTORS have acclaimed the R.C. THREESOME as the leader of receiving sets for pure reception of the local station. In some cases, however, *additional range and selectivity* are required, and not solely a receiver for pure reception of the local station.

To meet this need a method of introducing reaction into the circuit has been devised, and in addition to providing increased range and selectivity to the constructor with a really efficient aerial, it also enables the Threesome to be used on an inefficient aerial, with first-rate results.

There are certain districts

in the country which are known as "blind spots," and others where reception conditions are not good. In all these cases the modification will satisfactorily overcome the difficulties.

### FREE BLUE PRINT & INSTRUCTIONS

In order that the R.C. THREESOME will give satisfaction even in these cases, an additional blue print (which can be laid over the original blue print) has been prepared, together with a leaflet of instructions giving details of the necessary alterations. There is no trouble whatever in carrying out the instructions.

**EDISWAN WIRELESS SERVICE**  
Refer your wireless problems to EDISWAN. Experts will advise you. There is no charge made. Address your queries to Service Department.

**CUT OUT COUPON AND SEND NOW!**

# EDISWAN

V.20

To THE EDISON SWAN ELECTRIC CO. Ltd. (Publicity) 123/5 QUEEN VICTORIA STREET LONDON, E.C.4 Name \_\_\_\_\_ P.W. 5/2/27.  
Please send, post free, presentation copies of. (mark with a cross the literature required)  
R.C. Threesome Instruction Book and Blue Print Address \_\_\_\_\_  
R.C. Threesome Modification Blue Print and Instructions PLEASE USE BLOCK LETTERS \_\_\_\_\_



# Apparatus Tested

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.

### A VERSATILE TUNING UNIT.

THE Wireless Apparatus and Battery Charging Co., of 256, Narborough Road, Leicester, recently sent us one of their Imperial All-Purpose Coils to test. It is a very versatile sort of component. It is about the size of an L.F. transformer of average dimensions, and is in shape a cylinder with convex ends. Two knobs and pointers of similar appearance project from one side, but one has a dial scaling through 180 degrees, from 1 to 7. The latter is an "aerial" control, the former a reaction coil adjustment. Six terminals are fitted to the unit, and with three of these three different sizes of reaction coil are obtainable. The other three include two aerial "tappings" and one earth terminal.

Additionally a plug and socket are fitted, which enables the unit to be plugged into a coil holder like an ordinary coil. Alternatively it can be mounted on the panel similarly to any other tuning unit.

tively it can be mounted on the panel similarly to any other tuning unit.

Altogether, as will no doubt be agreed, the "All Purpose" fully deserves its name, the more so as it can be used as an anode unit, with or without reaction if desired. We carefully tested the sample sent us, and it gave good results. In an aerial tuning capacity it adequately covered a range of from 200 to 3,000 metres, although it was necessary to vary the reaction tapping towards each end of this band.

It is a very compact, well-made unit. The control operates smoothly and efficiently. Its retail price is 27s. 6d., and this, in our opinion, is more than reasonable.

### A USEFUL BOOKLET.

An interesting and informative little booklet entitled "How to Build Your Own High-Tension Eliminator for A.C. or D.C. Mains," has just been produced by

the Telegraph Condenser Co., Ltd., of Wales Farm Road, North Acton, London, W.3. Written by Percy W. Harris, it is illustrated with a number of clear photographs and easy-to-follow diagrams. It is available for any "P.W." reader who sends 3d. for postage and part cost of production.

### TWO CHEAP VALVES.

The following two "Atwil" valves were recently sent in for test by M. Stanley & Co., of 174, London Road, Liverpool.

1-8-2 volts; .25 amps.; 50-150 volts H.T.; impedance 10,000 ohms. Price 6s. 9d.

5-5-6 volts; .25 amps.; 50-150 volts H.T.; impedance 8,000 ohms. Price 7s. 6d.

On test we found that the two-volter made quite a good detector, a fair H.F. amplifier, and a good L.F. amplifier when handling medium inputs. It is stated to be a power valve, but it would not occupy the last stage of a three-valver employing two stages of L.F. amplification without slight distortion occurring. Nevertheless, in receivers of medium sensitivity (two or three valves employing one stage of transformer-coupled L.F., for instance) it gives results out of proportion with its price.

The six-volter was found to be capable of handling much more power, and very creditably occupied the "last" valve holder of a multi-valve set. Amplification of a high order was accomplished without distortion. We agree with Messrs. Stanley when they modestly state that there are better valves on the market, and we also agree with them when they add that the "Atwils" represent excellent value for money on a "costs to results" ratio.

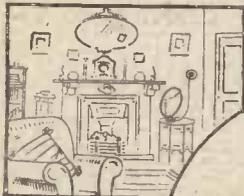
(Continued on page 1384.)

## DECKOREM BRITISH MADE

Neatness and Efficiency in Radio House Wiring is easily and cheaply obtained by using **DECKOREM WALL SOCKET JACKS**

(Prov. Patent No. 16808/26.)

There is a Deckorem Wall Socket Jack that will harmonise with the furniture, wall paper or electric light fittings in any of your rooms.

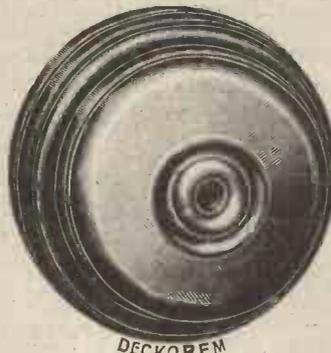


**DRAWING-ROOM**  
Oxy Silver Finish on Mahogany Base

1927 CATALOGUES Now ready for Free distribution. Many splendid new lines are illustrated and detailed. For copies address a Post-card to us, marked 1927 CATALOGUES

Away with all those loose, untidy and badly insulated wires that reduce the efficiency and purity of your radio reception.

Complete your Radio House Wiring before the re-decorating season is here! We supply special wire and insulated staples for the job.



DECKOREM

Say good-bye to those unsightly temporary connections for 'phones and loud speaker. Lose those "cracklings" caused by bad contacts.

Take your 'phones or loud speaker into any room and just plug in to a Deckorem Wall Socket Jack.



**BEDROOM**  
Nickel Plated Finish on Black Base

Special TWIN WIRE and insulated staples that exactly suit house wiring are quoted below:

TWIN WIRE 50' 3/9  
" " 100' 6/9  
Insulated STAPLES Per 100 .. 1/3

**KITCHEN**  
Nickel Plated Finish on White Enamel Base



3/9 Each Series or Parallel type.

3/9 Each Series or Parallel type.

**HOUSEBOAT**  
Oxy Copper Finish on Walnut Base



HERE IS THE SPLENDID SELECTION FOR YOU TO CHOOSE FROM: Nickel Plated, Oxy Silver, Oxy Copper, White Enamel, with any of the following bases. Mahogany, Black, Walnut, White Enamel (OTHER SPECIAL FINISHES TO ORDER.)

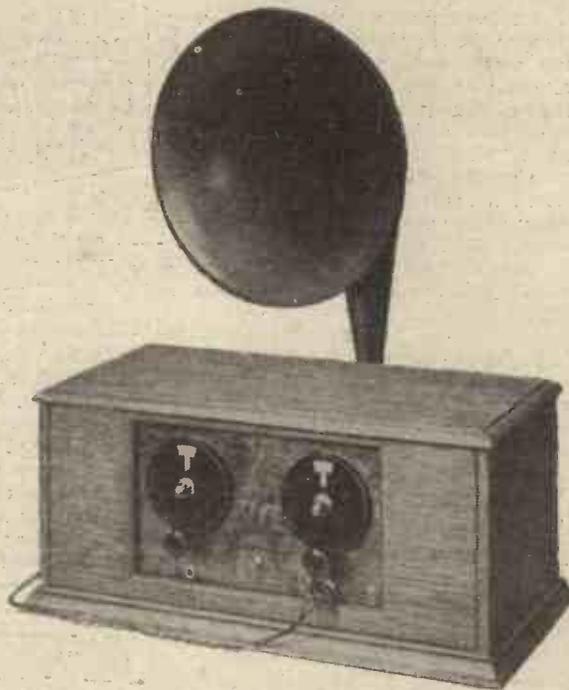
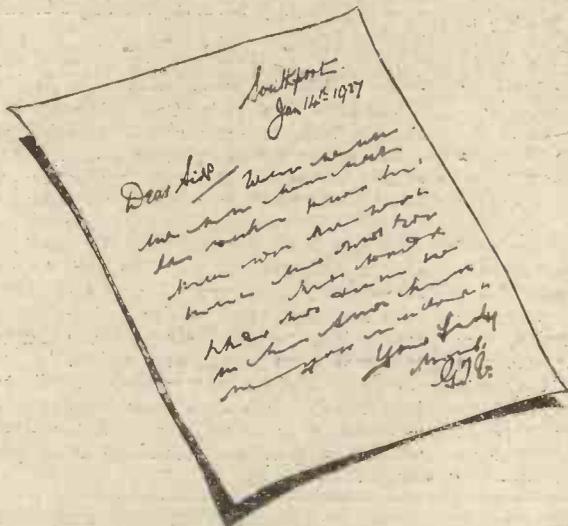
Obtainable from all dealers; or—



Ask your dealer to show them to you.

# 47 Stations on loudspeaker!! with the

# MONOTUNE 3



*Personal Letter to designer, Mr. C P. Allinson, A.M.I.R.E.*

FULL DETAILS IN  
CONSTRUCTONE No. 1

**2/6** Post  
Free

Here is the Receiver which you have been looking for—the Receiver which has but one tuning control and will bring in 47 STATIONS ON THE LOUDSPEAKER.

You can duplicate this Receiver and get these amazing results by following the simple yet comprehensive instructions given in the No. 1 CONSTRUCTONE. 15 photos, diagrams and illustrations leave no detail unexplained.

THE CONSTRUCTONE PUBLISHING CO.  
(Dept. G.) 37, Drury Lane, London, W.C.2

SOUTHPORT,  
January 14th. 1927.

My dear Sir,

Nearly two years ago we put together your "Round the Continent with Two Valves" set, as per "WIRELESS". It was eminently satisfactory and we have used nothing else since, except that we have used in conjunction with it a 2-valve amplifier. We have been delighted up to a few weeks ago.

We then saw your advertisement re the "MONOTUNE 3" in the "Evening Chronicle," and fortified by our past experience—we knew that your name was guarantee for a good thing—we sent for the circuit to the "Monotune" Constructone Co. and set to work gathering together components as stated by you. We determined to follow your directions and advice to the letter. After some delay everything was to hand and the set wired up. Our hopes ran high, but the results exceeded everything we had hoped, imagined or dreamed. The instrument romped away right off and pulled in stations, the names of which we had only read in print.

Last night (Jan. 13th) we heard 47 stations on the loudspeaker using only the two coils you mentioned.

We have listened to and possessed many kinds of sets—one, two, three and four valves—but have never experienced such selectivity, purity and power before. The clarity is really startling, and this is obtained when using the highest or lowest power.

My son, who is an experienced first-class P.M.G. certified wireless operator, said that I ought to write to thank you for the pleasure and intense satisfaction obtained from the "MONOTUNE 3." For selectivity, distant reception, clarity, power and absolute simplicity of control, we know of no equal.

I am quite sure that the results on the preceding counts obtained by this 3-valver cannot be surpassed, if equalled by any 4-valve set.

Gratefully yours,

(Signed) G. T. V.

(The original of this letter may be examined at our office)

**DON'T DELAY—GET IT TO-DAY!**

## APPARATUS TESTED.

(Continued from page 1382.)

### NEW M.H. H.F. CHOKE.

A very cleverly designed H.F. choke has just been placed on the market by L. McMichael, Ltd., Wexham Road, Slough, Bucks. It has been designed to have a value of 60,000 microhenries, together with a very low self-capacity. The windings are accommodated on a slotted barrel former with coned ends. The ohmic value of the device has been kept low, and altogether it is a choke of a very superior nature. We have found it to operate efficiently in both short and long wave receivers, and thus it passes the "acid test" for H.F. chokes.

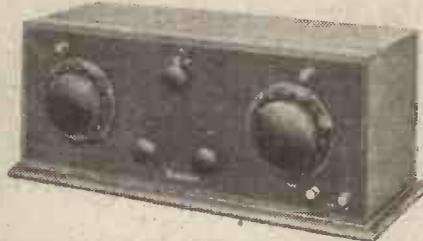
From a constructor's point of view, too, this latest M.H. production has advantages over many others on the market in that it can be baseboard mounted in the usual way, or it can be separated from its base and mounted between clips similarly to anode resistances and other such items.

In conclusion, we can thoroughly recommend this choke to our readers for use in either standard or special sets. Its price is rather below the average for this class of component, being only 9s.

### LAMPLUGH S.L.T. VARIABLE CONDENSERS

We recently received two Lamplugh S.L.T. Variable Condensers, from S. A. Lamplugh, Ltd., of King's Road, Tyseley,

Birmingham. One is of .0005 mfd. (13s.), and the other .0003 mfd. (12s. 6d.) Both are fitted with slow-motion movements, which provide excellent controls. The drive is positive and yet "velvety" and free from "backlash." Nicely engraved dials are fitted. These variables conform to all the normal "low loss" requirements, and very little solid dielectric is incorporated in their designs. They are well made, nicely finished, and leave no room for criticism. Their prices (shown above) are quite reasonable.



This is one of Brandes' receivers. Note the almost severely symmetrical lay-out of the panel.

### EEXLEX TERMINALS.

We have received a further supply of Eelex Trouble Duty Terminals from Messrs. J. J. Eastick & Sons, of 118, Bunhill Row, London, E.C.1. These terminals, which are supplied with indicating lettering, are substantial, yet neat in appearance, and are of a very useful design. They will accommodate either spade or pin type wire terminals, or ordinary wire or plugs. Naturally, they cost a little more than the plain W/O type of terminal, but once

fitted to a receiver they provide insurance against many of those annoying little delays in wiring up batteries, loud speakers, with varying types of terminals, etc.

### A "VARIABLE FIXED" RESISTOR.

Messrs. Bulgin recently sent us one of their baseboard-mounting "Deckorem" "variable fixed" resistors. Having a maximum resistance of 50 ohms, this component takes up but a square inch or so of baseboard area, but it has a height of three inches. Adjustment is by means of a slider which provides an efficient and positive contact. But we notice a tendency for this slider to push turns of the resistance wire together and thus short little bunches out of circuit. But this trouble could be overcome quite easily by slightly rounding the edges of the slider.

### AN INTERESTING SOLDERING MATERIAL.

The Rexo Engineering Co., 2, Ravenscroft Square, W.6, recently sent us a supply of Junit, a wire which needs no solder. It is square in section and carries grooves on two sides in which it holds solder. Thus it is tinned and absolutely ready for just a little flux and the application of a hot iron to complete connections. We have tested samples of Junit submitted to us, and find it easy to handle and consider it well able to make clean, neat soldering work a simple task even when used by even a tyro.

Junit, 17 gauge square section, sells at 1s. per coil, which is quite generous in size, or 3-yard coils 18 gauge at 6d. Two-foot straight lengths are obtainable at 2d. per length.



## A WIRELESS SET and — 'HART' BATTERIES

*Make Winter Evenings Perfect*

TO get the best results and the greatest pleasure from your wireless set always, you simply *must* use "HART" Accumulators.

Their steady voltage, low resistance and big reserve of power ensure reception at its best.

Used for both Low and High Tension Supply "HART" Accumulators "increase the power and improve the tone."

# HART

## THE BATTERY OF QUALITY

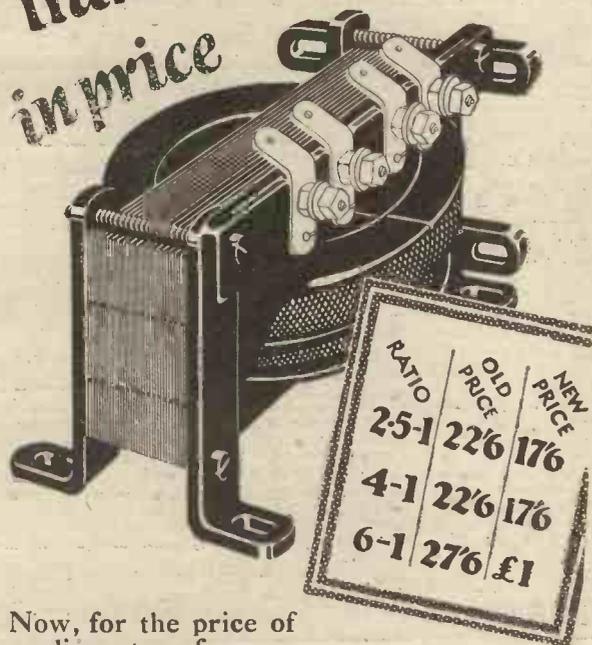
"ENDURO" Model Low Tension Accumulator, 2 volt 10 Ampere Hour  
Price 6/-

"RAY" Model High Tension Accumulator, 20 volt 14/6; 30 volt 22/-

Write for particulars of the full range of "HART" Models to Dept. P.W.

HART ACCUMULATOR CO., LTD., STRATFORD, LONDON, E.15

The famous **PYE L.F**  
transformers reduced  
in price



Now, for the price of mediocre transformers you can get the best on the market—**PYE**.

**PYE & Co.**, were the first wireless engineers to publish a Frequency-Efficiency curve certified by the National Physical Laboratory. Curves of other transformers have been published since, but still the Pye curve is unrivalled.

Many of the most reputable manufacturers have adopted Pye Transformers as standard in their receiving sets. Several Government Departments also use them. Could stronger proof of their efficiency be given?

Compare the Pye Transformers against any other high-class transformer and you will not find its equal for true amplification, purity of reproduction and all round merit.

**W. G. PYE & CO.**,  
Granta Works, Montague  
Road, CAMBRIDGE.

**POINTS OF  
SUPERIORITY**

1. Amplification is uniform on high and low notes, thus eliminating distortion.
2. Parasitic noises are entirely absent.
3. Can be fixed to panel in horizontal or vertical position (see illustration above).
4. Not susceptible to burning out. Voltages up to 300 can be used continuously with perfect safety.
5. Each Transformer is tested by actual measurement of amplification and a guarantee given with each.

For  
**NON-METALLIC  
 LEAK-FREE  
 SURFACE  
 BRILLIANTLY  
 POLISHED  
 BLACK AND  
 MAHOGANY  
 DEAD TRUE  
 STANDARD SIZES**  
**Ebonart**  
**RADIO PANELS  
 STAND SUPREME**  
 PRICE LIST D 262 FROM  
 REDFERN'S RUBBER WORKS,  
 HYDE, CHESHIRE.



**RADIO REGISTERED PANELS**



Inches	Inches
7 x 5, 1/4	6 x 6, 1/2
7 x 6, 1/8	8 x 5, 1/2
8 x 6, 1/4	9 x 6, 1/7
10 x 8, 2/1	11 x 8, 2/3
10 x 9, 2/4	12 x 8, 2/6
12 x 10, 3/4	12 x 9, 2/10
14 x 12, 4/4	14 x 10, 3/5
	1/2 in. thick
	Post Free.

Money back guarantee that each and all Panels are free from surface leakage. Megger test Infinity.

Callers cut any size. Quotations by post, or 'phone Clerkenwell 7853. Samples and prices post free to the Trade.

CROXSONIA CO., 10, South St., MOORGATE, E.C.2

**EASY PAYMENTS**

**LOUD-SPEAKERS, HEADPHONES, H.T. ACCUMULATORS.** Anything Wireless.

Send a list of the parts you are requiring, and we will send you a quotation on monthly payments.

**H. W. HOLMES, 29, FOLEY STREET, Phone Museum 1414. Gt. Portland St., W.1**

**WET H.T. BATTERIES**

BUY BRITISH. Complete Units 3/6 per doz. All goods BRITISH MADE by BRITISH LABOUR. Jars 1/3, Zincs 1/4, Sacs 1/6 per doz. Carriage and Packing extra. Trade inquiries invited.—**Donon Battery Co., 59, Badlis Rd., Walthamstow, E.17**

**ACCUMULATORS ON EASY PAYMENTS**

High-Tension Accumulators built up from 20-volt sections (15/- each). Example: 60-volt H.T. 45/- CASH, or 12/6 DOWN and 6 monthly payments of 6/-. Carriage Paid. Satisfaction or money back. Write for Lists to DEPT. 11, COVENTRY

**DIRECT SUPPLIES LTD., 23 Warwick Row, COVENTRY**  
Any Wireless Goods supplied on easy payments.

**RADIOTORIAL**

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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."

**TECHNICAL QUERIES.**

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

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

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

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

Details of the "P.W." BLUEPRINTS are published fortnightly in the advertisement pages of "P.W."

(Continued on page 1388.)

The children drink food in

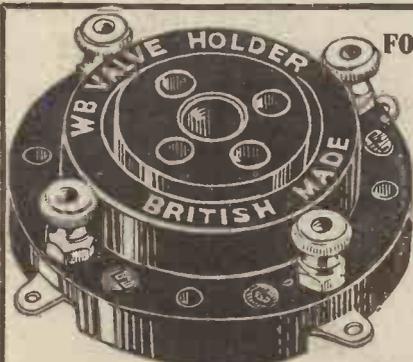


**BOURNVILLE COCOA**

It has delicious flavour too and is— food below pre-war price

'Keep fit on Cocoa'

See the name 'Cadbury' on every piece of chocolate



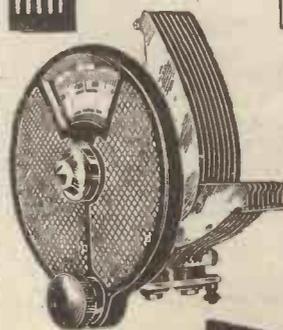
FOR BEST RESULTS

USE **W.B. ANTI-PHONIC LOW LOSS VALVE HOLDERS**

PRICE With Terminals **2/3**

With Tinned Soldering Tags **2/-**

If unable to obtain from your dealer write direct. Manufactured by **WHITELEY, BONEHAM & CO., LTD., Duke Street, MANSFIELD, NOTTS.**



**ULTRA LOW-LOSS**

Straight Line Frequency Condenser Cone Bearings. Braced Vanes. Positive Collector. A real precision job. Condenser only, 0003uF., 0005 uF. **7/6** New Vernier Dial Reduction Ratio 16-1. No Backlash **6/-**

**THE FORMO COMPANY, Crown Works, Cricklewood, N.W.2.**

'Phone: Hampstead 1787. Manchester: Mr. J. B. Levee, 23, Hartley St., Levenshulme 'Phone: Heaton Moor 475.

# LOW H.T. OPERATING COST!

DO you realise what this means to your upkeep expenses?

The indiscriminate use of any nondescript type of H.T. Dry Battery may be costing you several hundred per cent more than is necessary. The new **SIEMENS SUPER-RADIO DRY BATTERY** has approximately  $7\frac{1}{2}$  times the capacity of the usual "small unit" H.T. battery, but only costs  $2\frac{1}{2}$  times as much per volt.

If you possess a multi-valve wireless set you will appreciate the eventual saving which can be effected by installing this battery, long life being one of its special features.

It is the only H.T. Dry Battery recommended by Burndept Wireless Ltd. for use with their receiving sets, a very significant fact which should not be disregarded.

*A copy of our Catalogue No. 650, containing full particulars of the correct type and size of battery to use for any radio purpose, and also hints on the care and maintenance of dry batteries will be sent, post free, on application.*

**SIEMENS BROTHERS & CO., LTD., WOOLWICH, S.E. 18**

## Weak Joints need Strong Treatment

An imperfect joint . . . a tiny leakage . . . gone are the chances of good, long-distance reception.

The Fluxite Soldering Set will fix all joints quickly, and for ever. No trouble . . . no mess . . . and so simple.

**FLUXITE 7/6**  
SOLDERING SET—Complete

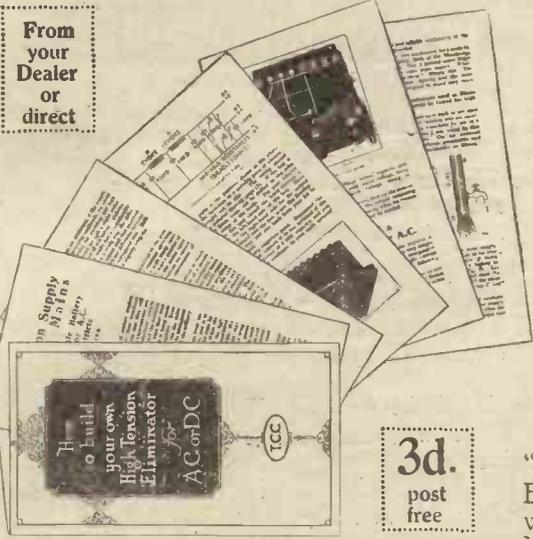
All Hardware and Ironmongery Stores sell FLUXITE in tins, price 6d., 1/4 and 2/8. Another use for Fluxite—Hardening Tools and Case Hardening. Ask for leaflet on improved methods.

FLUXITE Ltd. (Dept. 22)  
Rotherhithe, S.E. 16.



# FLUXITE

From your Dealer or direct



3d. post free

## Build your own H.T. Eliminator

Here's a book that will show you  
how to do it!

enable them to obtain constant H.T. supply at very little cost.

There is a little book available which gives clear concise instructions and easy-to-follow photographs and diagrams which enable them to build their own units. It is called

"How to build your own High Tension Eliminator for A.C. or D.C.," and is written by Mr. Percy W. Harris, M.I.R.E., for appropriately enough, the makers of T.C.C. Condensers.

Write for this booklet—or get it from your Dealer's—and with very little study you'll be able to build an eliminator which, because it is designed and described by an authority, is absolutely efficient and which, because it employs the special T.C.C. 600 volt D.C. Test Condensers, is perfectly safe and reliable. Get your copy to-day. It only costs 3d.



**WHY** continue buying H.T. dry batteries when right in your own home is current waiting to be used. Enthusiasts everywhere, now, are saving money by obtaining H.T. Supply from their electric light mains. At little cost and without skill they are building their own H.T. Eliminators which

## T. C. C. Condensers for Battery Eliminators

**WIRELESS**

SALE BY AUCTION

13, HIGH HOLBORN, W.C.1.

WEDNESDAY, FEBRUARY 9th, at 11.30, and following day. 800 Sets from Crystal to 1 to 7 Valve Sets, Loud Speakers, Headphones, Accumulators, Variable Condensers, Transformers, Amplifiers. House-charging generators, and an immense assortment of accessories, fittings and material in lots to suit large and small quantity buyers. Catalogues from the auctioneer,

HENRY J. SHAW, 85 Newington Causeway, London, S.E.1. Phone: Hop 3862.

**"777" LUMINOUS INDICATORS**

(Red) protect your Valves and Batteries, are a constant warning, prevent your set from being left switched "on", and are STRIKINGLY EFFECTIVE. Model A, 4 or 6 volt, 4 $\frac{1}{2}$  Ohm Resistance, 6d. (State voltage).—"777" Radio Components, Viola Works, Britannia Street, Leicester.

**FREE Send For Our STATION LOG & SPECIAL BARGAIN LIST**

Here is one of a Hundred Bargains. Well finished, Insulated Plug & Socket, red or black. Used in place of terminals. Not engraved, 2d. pair. Postage 1 $\frac{1}{2}$ d. Variometers from 2/-, 2-way Coil Holders from 1/3. Goods below cost price. Must clear.

P. SPARKS RADIO SUPPLIES, 43, Great Portland Street, London, W.1.

**100-PAGE CATALOGUE—FREE!**

Just send a post card to the shop that stocks all wireless goods advertised in this paper.

YOUNGS (GLASGOW) LTD. 40, STOCKWELL ST., GLASGOW.

**RADIOTORIAL.**

Continued from page 1386.)

BACK OF PANEL DIAGRAMS can be specially drawn up to suit the requirements of individual readers at the following rates: Crystal Sets, 6d.; One-Valve Sets, 8d.; One-Valve and Crystal (Reflex), 1s.; Two-Valve and Crystal (Reflex), 1s.; Two-Valve Sets, 1s.; Three-Valve Sets, 1s.; Three-Valve and Crystal (Reflex), 1s. 6d.; Four-Valve Sets, 1s. 6d.; Multi-Valve Sets (straight Circuits), 1s. 6d. Except SUPER-HETERODYNE DIAGRAMS, all of which, irrespective of number of Valves used, are 2s. 6d.

If a list of point-to-point connections is required an additional fee of 1s. must be enclosed. Wiring diagrams of commercial apparatus, such as sets of any particular manufacture, etc., cannot be supplied. (Such particulars can only be obtained from the makers.) Readers may submit their own diagrams, etc., for correction or for criticism. The fee is 1s. 6d. per diagram, and these should be large and as clear as possible.

No questions can be answered by 'phone.

Remittances should be in the form of Postal Orders.

**Questions and Answers****INSERTING GRID BIAS.**

"RATHER WORRIED" (Stockton-on-Tees).—Two or three months ago I bought a 2-valve set from a man who has gone abroad. It worked very well indeed, and he told me it would work a loud speaker easily if I liked to get a better transformer for it, as the one in it was only a very cheap foreign one.

Thinking I would get a real good one I waited and paid 25s. for the transformer, but

now I find I can't connect it up properly. The terminals on it marked Grid, H.T. + and Plate are easy enough to connect up, but what about the one marked Grid Bias? I haven't got any grid bias on the sets

There is no need for you to be worried, "Rather Worried." Although this terminal is marked "Grid Bias," it can be connected just like the other transformer was, i.e., to the lead that goes to L.T. negative.

A much better plan, however, would be to buy a 44-volt tapped grid bias battery, and two plugs for it, with short leads of flex wire.

Then all you need do is to stand the battery inside the set, or conveniently near to it, and place the red plug in position at the + end of the battery. This red plug must be joined by one of the flexible leads to the L.T. negative wiring. The other plug (black) is joined by its flexible wire to the terminal on the transformer marked "Grid Bias," and then the black plug is inserted in the battery at the point which gives clearest and best results on the loud speaker. You will probably find this at the 3-volt position.

**ARE BASKET COILS OBSOLETE?**

T. S. W. (Southampton).—Are the old-fashioned "basket coils" considered to be efficient nowadays? I should like to know, because although I've always had splendid

**TECHNICAL QUERIES.**

Owing to very heavy pressure on the Technical Staff, there is a little delay in despatching answers to readers' queries.

At the moment every effort is being made to get replies posted within about 10 days of receipt, and it is hoped to reduce this period very shortly. Readers can help by making their questions as short and clear as possible.

results from them on ordinary broadcasting wave-lengths, I don't want to include them in my new 4-valver if they have been proved to be inefficient in use.

(Continued on page 1390.)

RADIO

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DEVICES

**"Springmore" Wander Plugs stop where they're put**

The two spring prongs of the Igranic "Springmore" Plug grip tightly into any socket. H.T. battery sockets vary in size but the "Springmore" fits them all. The action of inserting a "Springmore" Plug cleans the inner surface of the socket, thus ensuring good electrical contact always. Each "Springmore" is also a socket into which another "Springmore" may be plugged.



IN RED, BLACK OR GREEN.

3d. each

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Attractive high grade terminals insulated with best quality Bakelite. The insulated heads are non-removable and cannot get lost.

Igranic "Indigraph" Terminals are suitable for connecting solid or flexible wires, 'phone tags, spade terminals, &c. Each terminal is supplied with nuts and washers. In twenty-nine different titles.

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You can do so quite easily and economically with the

## "IDEAL" LOUD-SPEAKER UNIT

With this wonderful unit you can assemble a really powerful loud speaker in your own house, or you can attach the "Ideal" unit to your gramophone.

Strongly made of the best materials obtainable, it is ingeniously designed to allow the most precise adjustments to be made; whilst a clever device protects the delicate diaphragm from damage in the event of the adjustment ring being turned too far.

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Complete with multiple tapings from 0-120 volts. Output approximately 15-25 milliamps.

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If any difficulty write us.

Apply for Free descriptive booklet.

**GAMBRELL BROS. LTD.** 76, Victoria Street, London, S.W.1

Tarr's Ad

## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1388.)

The set is one I am going to take to sea with me—I am a ship's officer—and I prefer basket coils because they take less room than the wound-on-tube type.

Recent tests have again and again vindicated the old-fashioned basket coil as being one of the most efficient types it is possible to employ. As you are used to this type we should certainly carry on with basket coils in the new set—they can be tapped in the same way that the solenoids can, if you are keen on a "split-primary" or a split-secondary circuit, but the degree of coupling has to be carefully watched, both between the primary and secondary and between one pair of coils and another pair.

### SUPPORTING SPIDER-WEB COILS.

"COIL-HOLDING" (Leighton Buzzard).—

What is the easiest method of mounting spider-web coils to project below a panel?

Two good and easy methods are shown by the accompanying photograph. To the right is a spider-web coil mounted upon a terminal, by the simple expedient of bending over one of its projecting sections. (The others have been cut off to make the coil smaller.)

In the foreground is another (larger) coil, mounted upon a short brass strip, as in this instance the

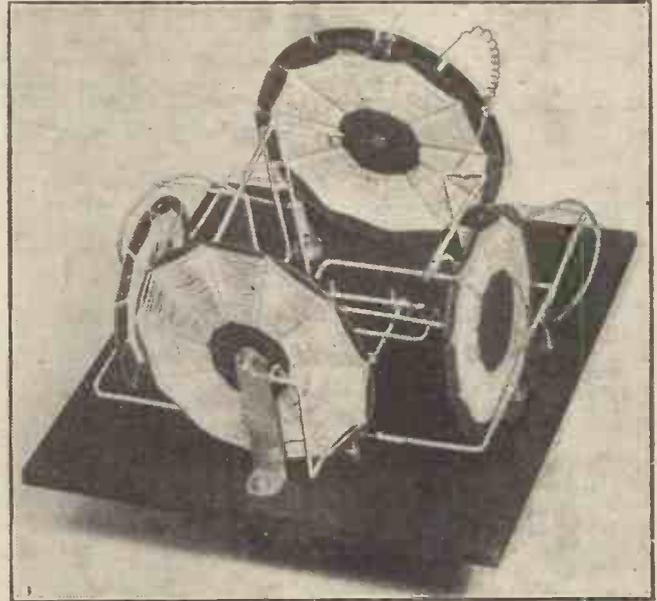
projection of the cardboard former was not long enough to utilise as before.

### "TINNING" A SOLDERING IRON.

R. L. A. (Clacton-on-Sea).—How should a soldering iron be "tinned"?

Heat the iron over gas or a clear fire until it commences to "burn" a little with a bright green-tinted flame. Then file the tip of the iron till each surface is bright and clean. Have prepared a shallow tin lid—such as the lid of the flux, or preferably something a little larger—with some flux and a piece or two of solder inside it. Dip the cleaned, heated iron into this and rub it on the lid, and it will be found that the

(Continued on page 1392.)



Two useful methods of supporting spider-web coils.

# FRELAT D.E. VALVES

## Why Pay More?

YOU cannot buy a better valve than Frelat, even tho' the others cost twice as much. The proof lies with you! Send to-day for a trial valve. The D.E. type K, Detector or Amplifier, costs only 4/11, the new 2-volt power valve 8/6, and they give the best in Radio in tonal purity and volume.

**D E TYPE K**  
2-volt 3amp

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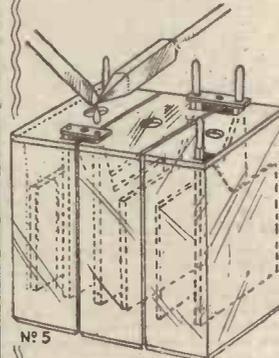
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With every 40 or 60 volts a carrier to fit same given free of charge.

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The Plates are made by a special process which renders them able to hold the charge without deterioration for 7 to 8 months, and after recharge (with ordinary care) will last for years.

**EASILY ASSEMBLED IN 2 HOURS** Champion H.T. Parts are very easy to assemble, in fact, so simple that anyone without experience will find it almost impossible to go wrong.

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Dear Sirs—We have received your goods and are exceedingly pleased with them, etc., etc.  
W.K.

London, 21.1.27  
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W.D., Seven Sisters Rd.

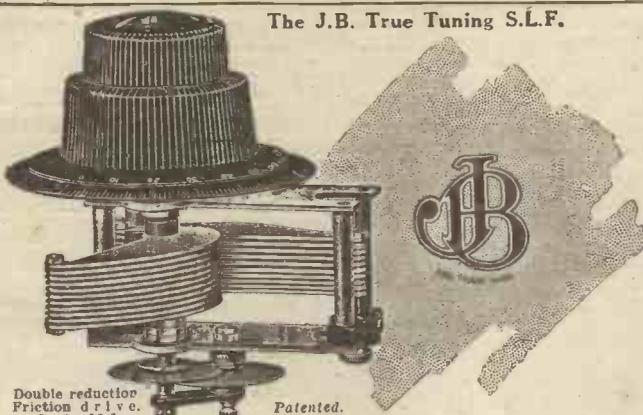
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- Champion Positive Plate, in sealed Cream envelope .. 4d. each.
- Champion Negative Plate, in sealed Pink envelope .. 4d. each.
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# BLUE PRINTS of TESTED CIRCUITS

Every wireless amateur and every wireless constructor will find these "POPULAR WIRELESS" Blue Prints absolutely reliable. They have been most accurately drawn, and every circuit has been tested under normal broadcasting conditions by the technical staff of "Popular Wireless." It will be seen from the complete list given below that the series covers a very wide field. The veriest tyro will find each print most straightforward to follow and the receivers most easy to construct.

**P.W. BLUE PRINT  
Number**

1. DETECTOR VALVE WITH REACTION.
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3. 1-VALVE L.F. AMPLIFIER.
4. CRYSTAL DETECTOR WITH L.F. AMPLIFIER.
5. H.F. (Tuned Anode) AND CRYSTAL, WITH REACTION.
6. H.F. AND CRYSTAL. (Transformer Coupled, without Reaction).
7. 1-VALVE REFLEX WITH CRYSTAL DETECTOR (Tuned Anode).
8. 1-VALVE REFLEX AND CRYSTAL DETECTOR (Employing H.F. Transformer, without Reaction).
9. H.F. AND DETECTOR (Tuned Anode Coupling, with Reaction on Anode).
10. H.F. AND DETECTOR. (Transformer Coupled, with Reaction).
11. DETECTOR AND L.F. (With Switch to Cut Out L.F. Valve).
12. DETECTOR AND L.F. UNIDYNE (With Switch to Cut Out L.F. Valve).
13. 2-VALVE REFLEX (Employing Valve Detector).
14. 2-VALVE L.F. AMPLIFIER (Transformer Coupled with Switch to Cut Out Last Valve).
15. 2-VALVE L.F. AMPLIFIER (Transformer-Resistance Coupled with Switch for Cutting Out Last Valve).
16. H.F. (Tuned Anode), CRYSTAL DETECTOR AND L.F. (with Switch for Last Valve).
17. CRYSTAL DETECTOR WITH TWO L.F. AMPLIFIERS (with Switching)
18. 1-VALVE REFLEX AND CRYSTAL DETECTOR, with 1-VALVE L.F. AMPLIFIER, Controlled by Switch.
19. H.F. DETECTOR AND L.F. (with Switch to Cut Out the Last Valve).
20. DETECTOR AND 2 L.F. AMPLIFIERS (with Switches for 1, 2, or 3 Valves).

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All orders for these Blue Prints should be sent direct to the "Popular Wireless" Queries Department, Fleetway House, Farringdon Street, London, E.C.4, enclosing a stamped addressed envelope and a postal order for 6d. for each Blue Print Ordered.

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with the NEW  
**MAGNETIC  
MICROPHONE  
BAR  
AMPLIFIER**



**PRICE:**  
Complete  
No separate  
Transformer  
required.

# 38/-

An efficient NON-VALVE NOTE AMPLIFIER which yields Three- to Ten-fold Amplification from the Phone Terminals of any Crystal or Valve Set.  
**NO ACCUMULATORS REQUIRED. NO H.T. BATTERIES**  
 Six pairs of Wireless Headphones, or any 2,000-ohms Loud Speaker may be operated from a single 3-volt Dry Battery.

**LOW CURRENT CONSUMPTION.**

The Magnetic Microphone Bar Amplifier uses less than 1 of an ampere, one 3-volt dry cell, at a cost of 3/-, lasting upwards of 300 working hours.  
 No diaphragms. No distortion. No fragile parts. Nothing to get out of order. No microphonic noises. Unaffected by vibration. Compact and easily portable.

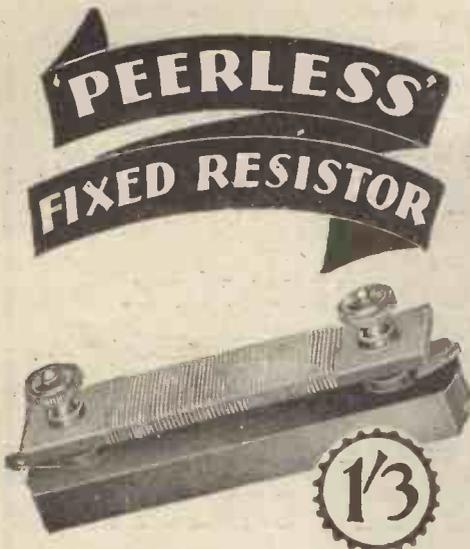
**ANYONE CAN ADJUST IT!**

Amplified Speech and Music as clear as from a good Valve Set. A boon to persons of impaired hearing.

We carry large stocks of valves, components and wireless accessories of every description. We have a highly organised Mail Order Department, and guarantee not only safe but prompt delivery. Save time and money by sending your order direct to us.

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(Dial and Vernier 2/6 extra)
- "Peerless" Master Switch .. 2/9
- "Peerless" Valve Switch .. 3/-

From all good dealers or direct.



**RADIOTORIAL  
QUESTIONS AND ANSWERS**

(Continued from page 1390.)

solder will "run" smoothly over all the surfaces, making the tip of the iron clean and bright.

**AMPLIFIERS' UNSATISFACTORY RESULTS.**

F. E. B. (Sberham, Kent).—The 1-valve amplifier that I got for my set is proving very unsatisfactory—in fact, the set was almost, if not quite, as good without it. What is likely to be wrong?

You don't even say what kind of a circuit your set employs, and as much depends on this, it may be necessary for you to write again, giving us fuller particulars, such as the name or a sketch of the set, or some other means enabling us to visualise your difficulty.

The likeliest cause of the trouble, however, is failure to connect up correctly.

If your present set is a crystal set (not a crystal-relex, but a crystal-without-a-valve set) try joining the amplifier's H.T. neg. terminal to its L.T. neg. terminal by a short length of wire. This may cure the trouble, showing that the amplifier you have was designed as an amplifier for a valve set, and this connection between L.T. and H.T. had been advisedly left off.

If it does not cure the trouble you had better send further particulars, and preferably a sketch showing how the two sets are at present connected together.

**POSTAL QUERIES.**

It is necessary to remind our readers that only in cases where they wish to make suggestions for future articles, to raise points which can be dealt with in print, or to report results, should they write direct to Mr. Harris or other authors.

No guarantee can be given of a reply to any letter addressed in this way, even when a stamped addressed envelope is enclosed, and it is pointed out that all questions of a technical nature must be sent to the Query Department, observing the usual rules. Under no circumstances whatever should remittances of any sort be sent direct to Mr. Harris or any other writer, since such remittances do not pass through our usual system of booking, and it is practically impossible to trace them in the event of any subsequent inquiry.

**"IS BIRMINGHAM FALLING OFF?"**

"DISSATISFIED" (Nuneaton).—Why is it that the voices at 5 I T seem to get farther and farther away each week? When I first got my set, back in September, I had right good loud voices every night. But now I have to listen hard, and very often I miss words here and there. Is Birmingham falling off, or what?

No. We are afraid you can't blame Birmingham; but the fault lies somewhere at your end. Unfortunately, you have omitted to tell us anything at all about your set that would help us to help you, but below we have set out the likeliest causes of your trouble.

(a) Loose or dirty contact of the aerial wire, earth wire, lead-in, or (less probably) a loose or dirty connection inside the set would cause the trouble.

If the set is a crystal set, the cat's-whisker may have become dirty or blunt, or you may have accidentally soiled the crystal surface.

If you live near big factory chimneys, etc., a thick deposit of soot or dirt on your aerial insulators would account for the slow reduction in strength.

If the set is a valve set, the H.T. battery may be running down. Often it does not give out suddenly like the L.T., but gets slower, weaker and weaker, as you describe.

Perhaps you have been a little careless about the correct filament voltage and have tuned the rheostats too far. If so, the valve filaments may be "overrun." This would be indicated, too, by the fact that the filament resistance now has to be "all out" all the time to get best results.

There are several other causes which may be operating in your case, but we will give only two more likely ones.

(Continued on next page.)

**H.T. ACCUMULATORS 27/6**  
60 volts—Price

**ARE YOU WISE —**

to the fact that light weight and low cost may be linked up to high efficiency?

The inexpensive 60-volt 3-amp. hour ELITE High Tension Accumulator, which actually costs under a 1d. to recharge, will do all that other and more expensive makes will do.

Moreover, the unique SEMI-OIL-SUBMERGED feature of the ELITE absolutely PREVENTS SURFACE LEAKAGE LOSSES.

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Type '02 Semi Oil Submerged. 60 volts, complete as illustrated, 27/6, or 4/2 per 10 volt unit.

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Tele.: 1304. Trade supplied. Telegrams: Elite, Halifax. London Distributor: Cecil Pohlman, 77, Great Portland Street, London, W.1.

**TRANSFORMERS REWOUND**  
Transformers, Phones, Loudspeakers, Rewound and Repaired to Maximum Efficiency. All One Price 4/- each. Don't discard if burnt out. All work guaranteed for 12 months. Write for trade terms. TRANSFORM CO., 115, LINKS RD. TOOTING, LONDON S.W.17.

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WHAT IS WRONG?**

If not, let our Information Dept. help you. Under the personal supervision of Mr. C. P. Allinson, A.M.I.R.E., late of RADIO PRESS and ELSTREE LABORATORIES. We can help you out of any difficulty.

We specialise in Super-het., Solodyne and Elstree 6 queries, and in all wireless matters we are at your service.

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Sacs supplied with terminal tops, 9d. doz. extra. Special large, double-size sac, 3/- doz. For Wet H.T. Batteries, Post Free on 3 doz. and over. Packed in special carton with division for each cell. This can be used as a container for battery when made up. Send 6d. for sample complete unit, particulars and instructions.

All parts stocked for building the latest type loud-speaker with the Seamless Moulded Cone.

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**AERMONIC**  
Terminal Strip  
for Baseboard mounting. Clearly moulded in high class bakelite. Interchangeable celluloid labels and soldering tags, ready for fixing. Oblivates cutting unsightly terminal slots at back of cabinet. Simplifies construction and improves appearance.

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2 point 10d.
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5 point - 2/-
6 point - 2/3
7 point - 2/6
8 point - 2/9
10 point - 3/6

## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

These are, first, dust or dirt between the contact studs of a switch, valve legs, or similar places where insulation is important.

And, secondly, rust or some similar trouble in the telephones which may be failing to reproduce what is put into them. If, for instance, a loud speaker is used, demagnetisation of this would give a somewhat similar effect.

### URNS FOR FRAME AERIAL.

"FULHAM FLAT" (Fulham Palace Road, London, S.W.).—I cannot use an outdoor aerial, so I am going to make a frame. I want it to be as efficient as possible—what size should it be, and what number of turns?

We should use a frame having sides 4 ft. square, all the wires being the same length, and not wound one *within* the other, as is sometimes done.

You will need about eight turns of light flex wound round the frame, the turns to be spaced about half an inch apart.

### BACK NUMBERS OF "P.W."

"BACK NUMBER" (Goring-on-Thames).—Where is the best place to obtain back numbers of "P.W."?

Write direct to:

The Amalgamated Press (1922), Ltd.,  
Back Number Dept.,  
Bear Alley,  
Farringdon St.,  
E.C.4.

stating the number required, and enclosing 4d. in stamps.

### VALVE CHARACTERISTICS.

"VALVO" (Soham, Cambridgeshire).—What gives different valves their different characteristics? To the casual observer a pair of them will often look alike and yet be quite unlike in operation. On the other hand, some valves which look very dissimilar appear to be blood-brothers as far as performance in the set goes.

The characteristics of a valve are determined chiefly by the shape and relative positions of its electrodes and partly by the degree of vacuum to which it is subjected.

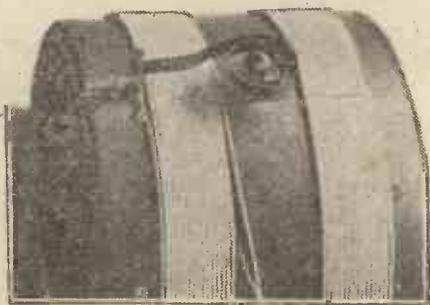
For instance, by using a grid with a close mesh (many threads of wire spaced close together) a valve can be given a high magnification factor and a high impedance.

Now, if other conditions were unchanged, the substitution of an open grid for the close mesh would be found to have the effect of reducing the magnification factor of the valve, and also its impedance.

It is this fact, as well as the need for mechanical stability, etc., that accounts for the wide variations in the arrangement of the modern valve's electrodes.

### VARIOMETER CONNECTIONS.

C. G. (Faringdon, Berks).—What is the surest and safest type of connection for the moving part of a home-made variometer?



The "pigtail," in which a spiral of thin metal is used, as shown in the illustration, is the most satisfactory method of making such a connection.

### PUTTING THE 'PHONES RIGHT.

G. E. A. (Southbourne, Bournemouth).—I have a friend coming to stay with me next  
(Continued on next page.)

## EXPERTS IN RADIO ACOUSTICS SINCE 1908

# IS THIS WHAT YOU'RE LOOKING FOR?

TESTING the new 2-valve receiver at our Works at Slough, on a standard P.M.G. aerial, we tuned in the two Paris stations, London, Daventry, Bournemouth, Birmingham and Newcastle on the loudspeaker. This despite bad screening set up by a large power station not more than 50 yards from the vicinity of the laboratory. We were testing on 66 volts only. You can expect even better from the 3-valve Brandeset.



### THE BRANDESET II.

The new Brandes 2-valve set features simplicity of control and ingenious compactness. Condenser dial, filament rheostat, reaction dial and "throw-over" switch for long or short wave tuning complete the panel controls. Straight line frequency condenser tuning and grid-bias

is employed. The standard coil is suitable for Daventry and no "plug-in" coils need be purchased. The L.T., H.T., and grid-bias leads are plated into one cable from rear of set.

£6 10

(Exclusive of Marconi Royalty and Accessories.)



### THE BRANDESET III.

The new Brandes 3-valve receiver employs the same ingenious characteristics as the Brandeset II, except that an extra stage of Audio Frequency is employed. It has straight line frequency condenser tuning, grid-bias, and is adapted to long and

short wave tuning. Both receivers give most excellent loudspeaker reproduction on a number of stations, and are specially designed for this purpose.

£8 10

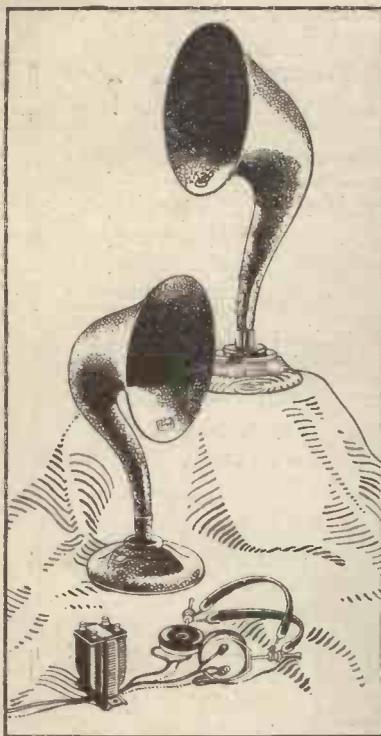
(Exclusive of Marconi Royalty and Accessories.)

# Brandes

From any reputable Dealer.

BRANDES LIMITED • 296 REGENT ST. • W.2

EXPERTS IN RADIO



OLD FRIENDS

THE BRANDOLA

Greater volume with minimum current input. Large diaphragm gives fullness to upper and lower registers. Walnut plinth, electro-plated fittings. **75/-**

THE TABLE-TALKER

Material used in the construction of goose-neck horn eliminates metallic harshness. Adjustable. Height 13 ins., neutral brown finish, padded base. **30/-**

THE AUDIO TRANSFORMERS

Ratio 1 to 5. High amplification of applied voltage, together with straight line amplification frequency curve. **17/6**  
Also 2nd stage, 1-3, 1-5 (Black case). 1-3 (Brown case).

MATCHED TONE HEADPHONES

The synchronised effort of both receivers discovers greater sensitivity and volume and truer tone. Light, comfortable and sturdy. **20/-**

Brandes

From any reputable Dealer

BRANDES LIMITED, 296 REGENT ST., W.1

ACOUSTICS SINCE 1908

RADIOTORIAL  
QUESTIONS AND ANSWERS

(Continued from previous page.)

month, and I particularly want my spare 'phones to behave properly. Now they sometimes go a little "wonky," and I'm never sure how long they will stay perfect. Can I do anything to them, or must I send them to be overhauled?

Try the following: Disconnect the 'phones from the set and examine the cords. If the covering is frayed bind it with thread so that the wire inside is protected. Pay special attention to the ends, where the strain is most severe. If the cords are fastened to the earpieces by nuts externally, try with your fingers to loosen the nuts. If you can do so they are too loose and should be given a little extra pressure with a pair of pliers.

Then test if the 'phones are sensitive. Put them on in the ordinary way, but instead of joining the tags at the end of the cords to the set's terminals, put one of them in your mouth. Now rub the other tag gently with a key or similar piece of metal. If there are corresponding noises in the 'phones you can be fairly sure that they are O.K.

If, however, you have found no loose nut and the 'phones do not seem as good as new, we should have them overhauled properly by a firm specialising in this class of work. (See the advertisement pages of this journal.)

"4-VALVE FAMILY" UP TO DATE.

S. J. A. (Hexthorpe, Doncaster, Yorks).— I have only just noticed that Mr. Harris has been modernising the Family Four.

What issue of "P.W." was the article in, and were the alterations drastic ones, or the sort that I could do easily in spending just week-ends at home?

The "4-Valve Family Set" was brought up to date in "P.W.," Nos. 235 and 236 (December 4th and December 11th issues).

It proved to be quite an easy task, and the new fittings were not at all too expensive, considering the very great gain in both selectivity and sensitivity.

The changes incorporated were (a) Introduction of separate grid bias for the L.F. stages.

(b) Provision of separate supply for H.F. and detector, first note-magnifying valve and second note-magnifying valve.

(c) Substitution of a coupled aerial for the direct connection, for the purpose of improving selectivity.

(d) Neutralisation of the H.F. stage so as to simultaneously improve both the sensitivity and selectivity.

(e) The substitution of jack switching so that the voltages applied to the detector and note-magnifying valves would not be altered when changing over from one combination to another.

(f) Provision of certain shunting condensers where needed.

"LEAKAGE" IN A NEW SET?

H. J. L. (Haywards Heath, Sussex).— My new four-valve set, though correct according to the instructions, is only giving poor results, and I suspect a leakage somewhere. What are the likeliest places in which to look for this?

If no fault can be found with the wiring of the set, look for any places where leakage might affect signal strength. For instance, has any damp or dirt collected on the underside of the panel? Has any soldering flux filled the space between two valve legs and subsequently collected a lot of dust?

Have any lines, drawn with a blacklead when marking out the panel, been left in? Are any two bare connections touching?

Are any components mounted on wood which has not been thoroughly dried out before using?

Failing the discovery of any wiring fault or serious leakage inside the set, make certain that all components are in good order and suitable for their work, and that batteries, etc., are correctly connected to their respective terminals.

THE LODGE "N" CIRCUIT.

The Blue Print diagrams of the Lodge "N" Circuit which we present to our readers in this issue are for the benefit of bona-fide experimenters, and it should be clearly understood that the Lodge "N" Circuit is subject to Letters Patent, and that sets embodying this principle must not be constructed without permission of the owners of the patent.

Readers desiring to build up Lodge "N" receivers must first of all obtain permission to do so, and they should address their applications to the firm which is acting on behalf of Sir Oliver Lodge—i.e. Messrs. Romer & Skan, of 4, Coptall Chambers, London, E.C.2.



Standard Wet H.T.

Leclanche Type

Batteries. 3d. a volt

Unlike other batteries permanent results are obtained with our High Tension cells. The reception is also quite free from extraneous noises. This source of H.T. is absolutely ideal, being simple to fix, cheap and silent in operation. The cells consist of Containing Jar, Zinc and Sac element, or depolarizer in a weak solution of sal ammoniac. There is no risk of creeping or corrosion.

The Zinc element will last 9 months. The Sac element much longer according to use.

No charging. No scrapping of complete battery. Simply a change of solution every 6 months. Voltage 1.4 per cell.

Sac elements can be supplied with terminals or for soldering.

Rubber rings can also be supplied, and are recommended for insulating purposes.

Two sizes of Sac elements are at present manufactured by us.

No. 1 for supplying up to 7 milli-amps, and No. 2 up to 15 milli-amps. To make the containing tray for cells is a simple matter, but if desired we can supply trays for 60 cells or 100 cells, as per list below.

Send 1d. stamp for full particulars.

	Price per dozen.
No. 1. Sac . . . . .	1/6
No. 1. Sac with terminals . . . . .	2/3
No. 2. Sac . . . . .	3/-
No. 2. Sac with terminals . . . . .	3/9
Jar (Waxed) . . . . .	1/3
Zincs . . . . .	1/-

Sample dozen cells complete with No. 1 Sacs . . . . . 3/6

Packets of 24 Rubber Rings for insulating 12 Sacs—No. 1 size, 6d.; No. 2 size, 6d.

MAHOGANY TRAYS

Var. Unvar. nished.	Var. Unvar. nished.
60 cells 9/- 7/6	Lids extra 4/6 3/6
100 cells 10/6 9/-	" " 4/6 4/-

Carriage extra.

WET H.T. BATTERY Co.

23, COLDHARBOUR LANE, CAMBERWELL GREEN, LONDON, S.E.5

Phone: Brixton 2539.

## 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.

### DYNAMIC VALVE CURVES.

The Editor, POPULAR WIRELESS.  
Dear Sir,—Mr. Taggart's article in POPULAR WIRELESS for Jan. 8th, on "What Dynamic Curves Mean" does not seem to have thrown a great deal of light on the working conditions of the average amateur's valve. If I read the article aright what the author is intending to impress upon us is that the ordinary characteristic curve supplied by the manufacturer does not mean anything. To use his own words he wants to show us "how utterly fallacious it is to judge of how a valve will operate by looking at its static characteristic curve." It is interesting to note that Mr. Taggart encloses a sheet showing not dynamic but static characteristic curve of his valves in each box.

The sheet says that they are given "to serve as some comparison with other valves. Dynamic curves are obtainable on application." If the facts are as stated, what is the use of the comparison, and why are the dynamic curves not reproduced if they are so important?

Perhaps the reason is that a dynamic curve, as shown by the writer in his article, can only be given for one particular set of circumstances which, in nine cases out of ten, will not be those under which the experimenter will work his valve. The author's explanation of "Impedance" on page 1150 immediately shows up a difficulty, for the voltage, as he explains, set up across an inductance coil, when a direct current is passed through it, is negligible if we consider that the coil has a negligible ohmic resistance. If, as he goes on to explain, we set up an alternating current through this coil, appreciable potentials will be set up across the inductance. Obviously, the voltage in such circumstances will be dependent upon the frequency and, as a loud speaker is dealing with frequencies from, say, 40 up to 3,000 or more, the voltage set up—and therefore the dynamic curve—must be different for every frequency.

Again, on page 1152 the author seems to have made a slip, because he says "the loud speaker only has a relatively small resistance compared to that of the valve." The average loud speaker, I believe, has a D.C. resistance of 2,000 ohms, and super power-valves now sold usually have a resistance of round about 3,000 to 5,000 ohms, to judge by the makers' advertisements. Personally, I should not call 2,000 "relatively small" compared with 3,000 or 5,000 ohms.

Yours faithfully,  
"PRACTICAL MAN."

Kingston.

[A copy of the above letter was sent to Mr. John Scott-Taggart in order to give him an opportunity of replying. His reply is appended.—ED.]

### MR. SCOTT-TAGGART REPLIES.

The Editor, POPULAR WIRELESS,  
Fleetway House,  
Farringdon Street, E.C.

Dear Sir,—Your correspondent, "Practical Man," raises several points.

1. He says that my article was intended to impress on the public that ordinary characteristic curves "mean nothing." There is not a word in the article suggesting anything of the kind; on the other hand, I refer to them as "valuable" (page 1152).

2. His next point is that dynamic curves represent a certain set of conditions. He is merely repeating a very definite statement to the same effect in my own article.

3. In his last point he definitely quotes me as saying that the loud-speaker resistance is small compared to the valve resistance, and disagrees. In my article I said it "may be." In any case, he is completely wrong technically and has got confused between the resistance and A.C. resistance of a valve.

My article was, I believe, the first one in POPULAR WIRELESS dealing with this subject, and I assumed that the Editor would prefer me to deal with the matter in a first article in the simplest manner possible, rather than in a school-teacherish pedantic way. From past experience, however, I have learnt to keep an eye on several classes of reader:

1. Those who know more than I do.
2. Those who think they do and read the articles as a kind of indoor sport.
3. Those who have a good technical knowledge and read with a genuine desire to learn.
4. Those who have less technical knowledge and who do not desire to be confused by too much technical detail.

(Continued on next page.)

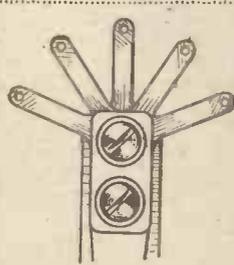
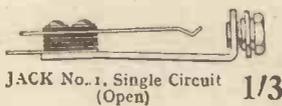
# Any Circuit Ideas!



Somebody's two-some, three or multi-valver, may have smitten you to try this—or that circuit. Deep cogitation—cost!!! Conclusion—all a catch—too darned expensive! Very probably too, with the designer's specification before you—to him Resistances, Jacks, Plugs, Anti-microphonic Valves Sockets, etc., might grow on trees; so they might, but summer's a long way off.

**Any Circuit Ideas** are capable of improvement, in operation, in economy of construction, and in appearance, by incorporating Ashley Radio Jacks, Plugs, and Resistances—the **Best British at Continental Prices.**

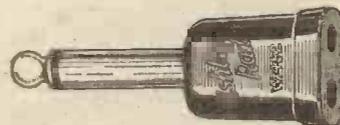
## JACKS



Jacks at the above prices, besides materially increasing the effectiveness and appearance of a circuit, reduce the amount of work involved when experimenting, aiding both construction and dismantling. The Jack itself helps towards this end, the tags being spread fanwise for ready soldering. Non-ferrous metal nickel-plated springs (recognised best by leading Wireless and Telephone Engineers) insulated throughout with genuine bakelite. Solid Silver Contacts. Single hole fixing to standard size panels.

**Positive in Action.**

## STANDARD PLUG



PRICE 1/6

Will fit all standard Radio Jacks and take any form of connection Spade or Pin tags, rigid wire or ordinary flex, with equal facility and minimum trouble. Pin tags and rigid wire leads firmly connect when pushed home. Spade tags and flex connect to simple adaptors provided for insertion similarly. Genuine bakelite neatly moulded with mirror finished metal work.

## RESISTANCE CAPACITY COUPLING



The most vital component in any circuit on this principle is the anode resistance. Many an otherwise satisfactory circuit has proved inefficient and noisy in operation due to the Resistance employed depending on some principle now proved fundamentally unsound. Freedom from disturbing noises is assured with the Ashley-Ledward Resistance, the base of which differs from all others.

Exhaustive tests by famous laboratories have produced eminently satisfactory reports, and each Resistance on completion is subjected to a 48 hour test during which it is continuously under pressure at a minimum of 230 volts.

ALL STANDARD VALUES  
PRICE (Complete with Clips) 2/6 each

ASHLEY WIRELESS TELEPHONE CO. (1925), LTD.,  
17, FINCH PLACE, LONDON ROAD, LIVERPOOL



CORRESPONDENCE

(Continued from previous page.)

I have always endeavoured to make even the simplest and most unconventionally written article accurate, although every detail and every apparent exception cannot and should not be explained. Although I am not infallible, there is no evidence at all in your correspondent's letter of any mistake on my part. Let me tackle each point separately:

He says: "If I read the article aright, what the author is intending to impress upon us is that the ordinary characteristic curve supplied by the manufacturer does not mean anything." He has not read the article aright. The title of the article is perfectly clear: "What Dynamic Curves Mean." Static characteristics are very valuable, especially if you have a lot of them. If regarded static curves as useless, why should they be given in every valve carton containing an S.T. valve?

"Practical Man" himself seems rather worried about this, whereas the simple explanation is that not only do I not regard static curves as useless, but never said in my article that they were. On the contrary, on page 1152, I say they are "valuable."

What I said was that a static characteristic curve does not represent working conditions, but only conditions which never exist in practice. This is entirely different from saying the curves "do not mean anything."

I certainly suggested that it was "utterly fallacious" to look at, say, the 100-volt static curve, and judge from it what will happen in practice. I could give any number of examples of articles in the wireless papers where it is obvious that the authors regard the static curve as representing the working conditions. I go so far as to say that to judge the anode current readings from given grid potentials from the static curve would be "useless," and that the curve is "meaningless" for that purpose. But I never said, and never shall say, that a static curve does not mean anything. It means several things, but does not represent what happens in practice.

A "family" of static characteristic curves conveys valuable information to the technical man who knows all about amplification factors, impedances, etc., especially if the family is a large one. Dynamic curves are, as was explained in my article, derivatives of the "family." The dynamic curve can be obtained by calculation or direct measurement, but, as I say, it is customary amongst many students to look up, say, the 100-volt curve and make deductions from that which are absolutely meaningless, useless and fallacious. That is why I thought a simple article on the subject might be interesting to your readers.

Having dealt with this point, I should like to mention that when I write I do so as a private individual and do not expect the introduction of trade marks, but, as he has mentioned the question of S.T. valves, he may be interested in the fact that dynamic curves of S.T. valves are given in No. 1 of the Elstree Radio News.

My anonymous critic next points out that a dynamic curve represents only a given set of working circumstances. This is quite true, but a static characteristic does not represent any working conditions at all and has been the cause of infinite misunderstandings. Although I felt it best not to elaborate my article too much, I specifically said that a dynamic curve only holds good for the particular conditions which were specified. Variations in frequency alter the dynamic curve, since the output impedance is varied, and we consequently can produce a family of dynamic curves. As a matter of fact, there are two separate articles in the Elstree Radio News which go further than my own in POPULAR WIRELESS. The new one by myself explains how very clearly dynamic curves emphasise how easy it is to get different distortion on different frequencies, and a small family of dynamic curves is given. Not only will the person ignorant of dynamic effects grossly exaggerate amplitude (bottom end) distortion, but his examination of static curves will reveal no distortion due to varying frequencies, whereas dynamic curves immediately show that bottom bend distortion may be negligible on the high notes, but serious on the very low ones.

There are numerous other reasons which make dynamic curves a necessary and fascinating study for the proper understanding of valves and valve circuits. They explain all sorts of phenomena which are not apparent from the static curves. But no extolling of the merits of dynamic curves can be fairly twisted into the suggestion that I have said static curves are "meaningless." I think and have said nothing of the kind, although I repeat that a static characteristic curve does not represent working conditions and is a regular source of all kinds of fallacies. To use the rough analogy of the non-rigid or semi-rigid airship, it is delightful to know its size and shape when still, if only to know what size of shed to put it in! If I were the designer, I should be far more interested in its shape and the stresses and strains on it while actually in flight, and I should not be less interested because these varied at different speeds of travel. The shape of the airship at rest corresponds to the static curve, while the flying conditions represent the dynamic curve.

(Continued on next page.)

CALLER'S COLUMN

NOT SENT BY POST. EBONITE GRADE A Stock sizes, 6 x 6 and 7 x 5, 1/3; 8 x 6, 1/8; 9 x 6, 1/9; 10 x 8, 2/9; 12 x 6, 2/9; 12 x 8, 3/8; 12 x 9, 4/8; 14 x 7, 4/8. ALSO CUT TO SIZE while you wait at 1d. per sq. inch 3/16th; and 3d. sq. inch for 1/4 in. Special cheap panels for Crystal Sets.

H.T. BATTERIES. All kinds of rubbish on the market, so beware where only guaranteed and reputable makes sold. Adco, Polo (highest test awards), 60-v., 6/11; 100-v., 12/11. Dr. Nesper (the name is enough) 60-v., 7/11; 100-v., 13/11. For those that want a cheaper but still reliable H.T., try the "K.R." 60-v., 5/11; 100-v., 10/11. Ever-ready, Stemen's stocked B.T.H. 1-8, 2/- Adco, 1/9. Columbia, 2/8. Helicon 2/8. Helicon 4 volts Super L.T., 10/6 (and worth it!). H.T. 66-v., 12/6; 99-v., 21/- Flash lamp, 4/5.

Adco. 4/6 doz., 6d. British 62 doz., Dr. Nesper. 4/6 doz. CABINETS. American type, solid polished birch lid and baseboard. 8 in. x 6 in. x 7 in. deep, 8/11; 10 in. x 8 in. x 8 in., 8/11; 12 in. x 8 in. x 8 in., 10/6 and 12/8; 14 in. x 8 in., 12/8; 16 in. x 16 in., 16/1. Any size made to order in a few days.

HEADPHONE CORDS. Good quality, 1/3, 1/6. Loud Speaker Cords, 2/9. Battery Leads, 1/6. 7-way, 3/8. STAINED 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 goods seeing. Fontenay, Newey G.E.C. Lotus, Polar stocked. AERIALS.—100ft. 7/22 Hard drawn, 1/11. Extra heavy, 2/2. Phosphor 49 strands, 1/-.

Electron stocked. Special 1000 R. 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; 20 yds., 1/6. Extra heavy, 2d. and 3d. yd. B. & B. Twin Flex (best), 6 yds., 10d.; 12 yds., 1/8; 30 yds., 4/-; Ins. Hooks, 2 for 14d. Egg Insulators, 2 for 14d. Ins. Staples, 4 a d. Grid Tapes—Copper, extra value, 2/3. Climax, 5/- (also at 2/6).

SWITCHES.—On porcelain DPDT, 1/3; SPDT, 10/4d. Superior articles. Nickel, Panel. SPDT, 1/6. Push and Pull, 9/4d and 1/- All Lissens stocked. TERMINALS, Etc.—Nickel W.O., Phone, Pillar, 1/- Doz.; 3 for 4d. Brass do, 10d. doz.; 1d. each. Nickel, 1/6. 2 for 1d. Stop Pins, 2 a d. Spade Tags, 6 a d. Soldering, 3d. doz. Ormond Nuts, 2d. doz. Washers, 12 a d. 2 and 4 B.A. Rod, 3d. It. Only the best sold here. Screw Valves, Pins, 2 a d.

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

RED & BLACK Waxed Plugs, 2d. and 3d. pr. Plug & Sockets, 3d. Clix Waxed Plug, 2d. Ignitic, 3d.

COIL PLUGS.—Ebonite on Base, 6/4d., 7/11. Lot 1/6. Edson-Jones, 1/9. Low Loss, 8/4d. Panel, 6/4d. Various stocked.

CALL HERE FOR LISSEN, BENJAMIN, RADIO-MICRO, COSMOS, MULLARD, EDISWAN, MARCONI, COSSOR, OSRAM, JACKSON (G. B.), DUB LITE R. McMichael, 4/9. SUCCESS, BEARD & FITCH, BOWYER-LOWE, LEWCOX, IGRANIC, EUREKA, ORMOND, UTILITY, FORMO, EDISON-BELL, FERRANTI, E.T., POLAR, LEWCOX, MAGNUM.

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

KAYRAY

S.L.F. CONDENSERS LATEST MODEL NOW READY 6/11 POST GD.

Knob and Dial Free. 6003 With 3 in. dial, 7/11.

LOW LOSS SQUARE LAW. This variable Condenser is simply marvellous value. It cannot be equalled in price or quality.

4/11 each By Post 5/11. With VERNIER, 1/- extra. From J. M. Haines, M.I.E.E., 33, Retreat Place, Hackney, E.9.

24th September, 1923. I have two of your 0005 Low Loss S.L.F. at present giving excellent results. I put them in my set in place of two condensers of a very reputable Maker, and increased the selectivity 100 per cent.

You may use this testimonial (entirely unsolicited) as you wish. (Signed) J. M. Haines. World's Most Wonderful Crystal "WYRAY" 1/6

The Crystal with the Power of a Valve. GAMBRELL CENTRE-TAPPED COILS.—B.C.G., 6/-, 5XK, 8/3. FUNWELL'S LOW-LOSS COILS (Tandem Patent). Accurately calibrated. Standardised Polarity, 25, 35, 50, 75, 1/8 each. 30, 40, 60, 100, 1/8 each. 150, 2/3. (5XK 175, 2/8.) 300, 2/9. 250, 3/3. 300, 3/9.

Post extra (5/- worth free). LISSEN.—Lissenola, 13/8. L.F. Transformer, 8/6. 35 ohm. Rheostat, 2/8. H.F. or L.F. Choke, 1/0. Fieldless Coils, 13/8. Grid Leaks, F. 1/-; Dilito, variable, 2/6. All parts available.

SPDT, 1/6. Push and Pull, 9/4d and 1/- All Lissens stocked. TERMINALS, Etc.—Nickel W.O., Phone, Pillar, 1/- Doz.; 3 for 4d. Brass do, 10d. doz.; 1d. each. Nickel, 1/6. 2 for 1d. Stop Pins, 2 a d. Spade Tags, 6 a d. Soldering, 3d. doz. Ormond Nuts, 2d. doz. Washers, 12 a d. 2 and 4 B.A. Rod, 3d. It. Only the best sold here. Screw Valves, Pins, 2 a d.

PERMANENT DETECTORS.—Liberty, 3/6. Red Diamond (a topper), 2/-.

RED & BLACK Waxed Plugs, 2d. and 3d. pr. Plug & Sockets, 3d. Clix Waxed Plug, 2d. Ignitic, 3d.

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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

27 and 28a, LISLE STREET, LEICESTER SQUARE, W.G.2. Back of Daly's Theatre. Nearest Tube, Leicester Square. Phone: Gerrard 4537.

27 and 28a, LISLE STREET, LEICESTER SQUARE, W.G.2. Back of Daly's Theatre. Nearest Tube, Leicester Square. Phone: Gerrard 4537.

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IGRANIC'S REDUCTIONS. IGRANIC TRIPLE HONEY-COMB INDUCTANCE COILS. 30, 2/9; 40, 2/9; 50, 2/9; 60, 3/-; 75, 3/3; 100, 3/8; 150, 3/9; 200, 4/-; 250, 4/6; 300, 4/8; 400, 5/6; 500, 7/6. 750, 9/6; 1,250, 14/-; 1,500, 16/-.

ALL PARTS STOCKED. FINSTON SCREENED COILS. B.B.C. Aerial Coil, 5/6. Split Primary H.F. Transformer, with reaction, 7/8. 8S. (Baseboard), 7/8. Reimartz, 7/8. 5XK, above, 5/6, 7/6. 11/- Screen and 6-pin Base, 9/- Finston Monoidal Coils, 9/- each. Base, 1/6. All British Six, 10/6 each B.B.C. 14/6 each 5XK.

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**CORRESPONDENCE.**

(Continued from previous page.)

The last paragraph of "Practical Man," while supposed to point out a false apprehension on my part, is a very gross technical error on his, and, curiously enough, arises out of a lack of appreciation of the difference between static and dynamic conditions. He quotes me as saying that "the loud-speaker resistance only has a small resistance compared to that of the valve." He says that "the average loud speaker has a D.C. resistance of 2,000 ohms and super-power valves have a resistance of about 3,000 to 5,000 ohms. Personally, I should not call 2,000 relatively small compared with 3,000 or 5,000 ohms."

This criticism is really unimportant, because the point I was making was simply that when no signals were being received we could practically regard the anode voltage as being equal to that of the H.T. battery, but that when signals were received the big fluctuations across the loud speaker would vary the anode voltage above and below that of the H.T. battery. The value of the loud speaker resistance was quite immaterial to the theory, but since it is suggested that I made a slip, I propose to deal with it. What is more, I am going to ignore his slipshod quotation of my remarks. I did not say that the loud speaker "only has" a small resistance. My words were "may have," but even if I had said what he declares I said, I would still have been right.

His criticism would have made a good crushing ending to his letter. Unfortunately he has got confused between the resistance of the valve and its impedance, two entirely different matters. This confusion has arisen probably because we often speak of the A.C. resistance of a valve, and "Practical Man" has got mixed up between the resistance of a valve and the A.C. resistance (or "mean differential A.C. resistance," which is a more technical form).

While a super-power valve may have an A.C. resistance correctly rated at 4,000 ohms, its resistance may be very much higher. In the case of a certain super-power valve I have in mind, the anode current at 24 volts on the grid is 8 milliamps, with the anode at 120 volts. This means that the resistance of the valve under quite normal operating conditions is 15,000 ohms. I would consequently be right if I said that the resistance of the loud speaker (even if taken at 2,000 ohms, although some have a resistance of only 500 ohms) was small in comparison with the resistance of the valve.

Except for this last point, I think your correspondent's remarks are helpful in having afforded me an opportunity of elaborating my article. From his letter he obviously appreciates the importance of dynamic curves while regarding static curves as valuable as a basis. I entirely agree with these sentiments, and always have done so, and this letter cannot but satisfy him.

Should "Practical Man" desire to continue the discussion—although there appears to me to be no more to say—I trust he will write above his real name. In spite of the rather peevish tone of his present anonymous letter, I have given it every consideration in the hope of helping any readers genuinely interested in the subject.

Yours faithfully,  
JOHN SCOTT-TAGGART.

**MR. SCOTT-TAGGART REPLIES TO MR. ROYDS.**  
January 27th, 1927.

The Editor, POPULAR WIRELESS.

Sir,—Your further correspondence, Mr. A. D. Royds (published in last week's "P.W."), is apparently anxious to show that my simple introduction to dynamic effects is not a complete treatise on the subject. It is rather like a superior person criticising an elementary series of articles on electricity and complaining that the section on Ohm's Law is "incorrect" because it does not take into consideration negative resistance effects or Langmuir's equation dealing with the space current in a vacuum tube.

Like all critics who have a taste for dramatic statements about inaccuracy, Mr. Royds is really declaring as inaccurate not what I wrote, but what impression he himself got from my article. Although the article was not written for (to use his own phrase) "anyone pretending to any knowledge of dynamic curves" (in which class he obviously places himself), yet there is nothing to prevent anyone with three-pence in his pocket from reading an introductory article such as mine. The least to expect, however, is, first, that the object and scope of the article will be borne in mind. A popularly written article of this kind was not intended to give Mr. Royds or myself an opportunity of exhibiting our technical knowledge. It was intended to indicate that the ordinary static curve gave entirely wrong impressions, not to Mr. Royds, of course, but to the average amateur, of what took place under actual operating conditions. I explained how the anode current fluctuations were entirely altered by the impedance of the anode circuit. To the best of my knowledge, the word dynamic had never before appeared in POPULAR WIRELESS.

The second consideration an author expects is, if his critic reads an article not meant for him at all, that the article shall be carefully read. Mr. Royds, in his haste, overlooks the little phrases and occasional

(Continued on next page.)

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You can get other anti-microphonic valve holders besides BENJAMIN—just as you can get inferior substitutes for every first-class article made. But it is a poor policy.

BENJAMIN Anti-Microphonic Valve Holders—the first and the finest on the market—have built up their enormous popularity chiefly through the following five exclusive and essential features:—

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The BENJAMIN Anti-Microphonic Valve Holder again was the first to incorporate a grid-leak or condenser and grid-leak attachment, already mounted for your convenience—and there is still no better combination to be obtained.

Price of valve holder alone:

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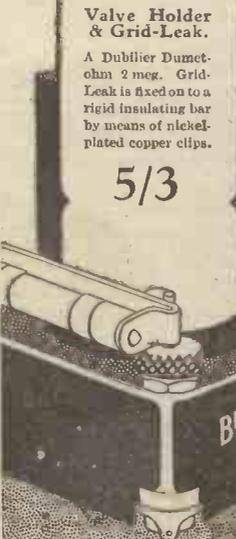
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**Valve Holder & Grid-Leak.**

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**Valve Holder Grid-Leak & Condenser.**

7/-





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## CORRESPONDENCE.

(Continued from previous page.)

words which I put in especially for his sake. His comments, on the whole, in my opinion, show a lack of sense of proportion, in that my article was really unworthy of his interest and certainly unworthy of his criticism; which should be reserved for stronger meat. Yet if he fails to appreciate the scope of an introductory article, he has nevertheless every right to expect accuracy. He must, however, be scrupulously accurate himself in searching my innocent little article for flaws which appeal to him. I use such sentences as "the negative half cycle at the maximum may only decrease the anode current to 10 milliamperes." Why do I say "may" instead of "will," although I am taking readings from an actual curve? The reason is that many years' writing and editorial experience has shown me that there is bound to be some individual in the Outer Hebrides or in Reigate who, if I said that the "anode current will decrease to 10 milliamperes" is certain to say: "Oh, no, it won't always. What about the case where the relative magnitude of the reactive and resistive components of the anode impedance are such that the decrease would be appreciatively different?"

Again, I continually refer to statements holding good for certain conditions. My cautiousness is also illustrated by my statement that the "loud speaker may have a relatively small resistance compared to that of the valve." I try my best to keep an eye on some possible meticulous critics, but I have no intention of sacrificing simple explanations by dragging in all sorts of matter which would seriously complicate an article. I doubt if the Editor would like me to sacrifice the interests of POPULAR WIRELESS readers to provide a Roman (or rather Reigate) holiday for Mr. Roys.

My critic complains that the dynamic curve should be shown in the form of an ellipse and not as the axis of an ellipse. He offers no explanation of why an elliptical curve can be obtained. Presumably he expected me to explain it. Let me say at once that the discussion of dynamic curves could be extended to a whole book. Let me supply very, very briefly what Mr. Roys would have liked to have seen in my article. Although a very simple case can be considered; yet the amplification of wireless signals can become extraordinarily complex. Differences in phase between the applied voltages on the grid and the resultant anode current have to be considered, and may produce ellipses which vary in shape and size. The minor axis and major axis may depend upon a whole set of circumstances such as the applied voltage, the inductance, resistance and capacity in the anode circuit, the capacity of the valve, the degree of reaction which may in itself vary, stray capacities, etc., etc. High and low frequency stages have individual problems. The case of an accurately tuned grid and a tuned anode circuit in an H.F. valve is naturally different from that of an L.F. transformer stage. The simple case of the dynamic curve of a valve used for resistance coupling would, no doubt, be condemned by Mr. Roys as totally inadequate. How much, of all this, is a writer to describe in an elementary article before my critic is satisfied? The subject is immense.

The statement that a dynamic curve is an ellipse might itself be characterised as slipshod. I am sure if I had referred to ellipses in my article, some person would have asked how does it become an ellipse starting from the grid bias point, what about spiral effects, is there time in practice for an ellipse to be formed, how far do broadcast signals trace out a Chinese puzzle of a dynamic curve resembling nothing on earth, what about limiting cases, what about dynamic curves where the anode circuit contains only a resistance and no reactive component, do you seriously imply that the ellipse cannot under appropriate circumstances resolve itself into a straight line? etc., etc. What good really does it do to introduce matters of this kind? Readers will judge for themselves how entirely altered the article could have been if I had complicated it.

My critic says that I regard ordinary curves as "unreliable," and that they are not. Of course they are not. I said they were "valuable." I explained that if you took a curve and judged the anode current changes in practice from the curve, then the results would be unreliable and utterly fallacious.

This was really the whole point of this simple article. Anyone reading the two letters of criticism might imagine that there was some controversy about dynamic curves. There is none whatever. If I have failed to elaborate my article to sufficient extent, I must ask Mr. Roys' indulgence, but the article was not written for him, and I was anxious to avoid burdening it with matter which would have made it extremely complex.

Mr. Roys also says that "anyone pretending to any knowledge of dynamic curves is able to picture from the ordinary static curves what the dynamic curves would be like." I admire his visualising powers, but, after all, the last person my article was written for was "anyone pretending to any knowledge of dynamic curves."

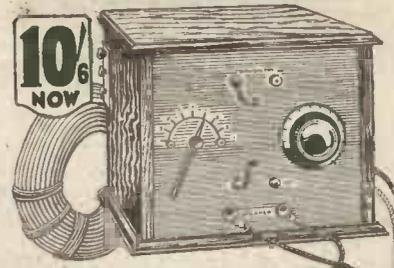
Yours faithfully,

JOHN SCOTT-TAGGART.

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THE CABINET is of beautifully polished Oak, & all components are of the highest quality. Dual Emitter Valves with patent valve holders, & 2 H.T. Battery, 2-volt accumulator and complete Aerial Outfit. LOUD SPEAKER of exclusive design with unique magnetic system and improved mica diaphragm. Price £7:17:6

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VALVES, British, 2-volt H.F. or L.F. 5/3; 2-volt Power, 8/-; 3-volt '06, H.F. or L.F. 5/3; 4-volt '06, H.F. or L.F. 5/6; 4-volt Power, 8/-; 5-volt Power (1 amp.), 8/6. We pay postage and guarantee full satisfaction or money refunded. DAWSON BROS., Milton Hall, Deansgate, Manchester.

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(Prov. Patent 25069/26)

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Do not be put off with the ORDINARY PARCEMENT CONE, having a Seam Joint. EXTRACTS FROM UNSOLICITED TESTIMONIALS: PIRBRIGHT, SURREY: "It is an excellent article and gives very good results." SPALDING, LINCS: "I am more than satisfied with the results." SHEFFIELD: "I have had one of the 2 1/2" LOUDSPEAKERS, and have no hesitation in saying that for tone your Seamless Cone is much better." BRISTOL: "The Seamless Conical Diaphragm received yesterday works fine."

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**TECHNICAL NOTES.**

(Continued from page 1358.)

ray oscillograph, upon the wave-form of the current delivered from the low-frequency side of a receiving set, when using a regular choke coil, and when using a substitute coil, for example, the primary of a bell ringing transformer. It is not possible, in these notes, to reproduce the actual figures obtained, but it is interesting to note that the superiority of the results with the audio-frequency choke was very marked.

Experiments were also made to compare the purity of crystal rectification with that of the valve rectification; in this case it was found that, under proper conditions, the valve rectification could be equal in quality, or at any rate practically equal in quality, to that given by the crystal with, of course, the added advantage that greater voltage swings could be accommodated.

**Cathode Ray Oscillograph.**

Readers may not, perhaps, all be aware of the mechanism of the cathode ray oscillograph. This is a very interesting piece of apparatus, and one which has already found many important applications in radio engineering, and in electrical engineering in general. There are many elaborated forms of the appliance, but in its simplest form it consists of a vacuum tube about 12 in. in length and 3 or 4 in. in diameter, with suitable electrodes introduced for the purpose of producing a stream of electrons. The electron stream emitted from the cathode is projected along the axis of the tube and strikes the rounded end of the tube, upon the interior surface of which is a thin layer of some fluorescent substance, such as barium platino-cyanide or Willemite. When the tube is observed in a darkened room, the point at which the electron stream strikes the fluorescent screen is easily observed owing to the luminosity. The electron stream, shortly after emission from the cathode, is caused to pass between small metal plates which are insulated and arranged so that an electric field may be set up between them.

Thus the electrons whilst shooting through the field are subject to its influence and are deflected from their original course. With a consequent shift in the position of the luminous spot on the fluorescent screen. If the metal plates referred to be connected to a source of rapidly alternating or varying potentials, the spot on the screen will execute rapid motions correspondingly. It is here that the great advantage of the cathode ray oscillograph lies, as compared with any form of mechanical oscillograph, for the mass of the moving member, which in this case is the electron stream, is so exceedingly small that the system has very little inertia and consequently is able to respond faithfully to extremely rapid variations. It is this property which has rendered it peculiarly applicable to the study of telephone speech-currents and to the operation of the wireless valve.

**Concerning Screening.**

One of the most important tendencies in "set" design of recent months has been in the direction of improved screening, in order to avoid hand capacity and other interference effects. Screened coils are now quite commonly employed both in

(Continued on next page.)

**The Only High & Low Tension Accumulator in the World.  
WITH PLATE GRIDS AND PASTE MADE OF PURE LEAD.**

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**PURE LEAD IS THE ONLY METAL THAT PERFECTLY,  
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Wood Separators in other Batteries (not used in Tungstone) create high internal resistance and excessive heat quickly destroying the life of the plates. Decaying Wood produces impurity of Acid, constantly lowering the Amp. hour efficiency necessitating repeated re-charges at unreasonably short intervals.

Low Tension 2-volt Celluloid Containers (not used in Tungstone) contain Camphor which the Acid attacks creating constant Frothing and Foaming. Also holds the heat with attendant Fire and Explosion Risks.

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Plate Grids are perfectly pasted uniformly in weight and thickness by automatic machinery. Paste cannot be forced out of Grid. Not pasted by Hand.

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Independent fixture of Plates a preventive against short-circuit or buckling. Can be continuously overcharged. Eliminates internal resistance.

Accessibility, the keynote of practical usefulness is exemplified by the fact that any single part or plate in a 2-volt cell or complete battery can be replaced by unskilled labour in a few minutes.

All component parts, including plates and 2-Volt Cells are Standardised and Interchangeable one with another.

All-metal Container, Cell Connector Bridges are acid-proof, unoxidizable and indestructible. Will outlive very many sets of plates.

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Re-wound and re-magnetised 5/- per pair. Loud Speakers repaired 5/-. Transformers re-wound 5/- each. All work guaranteed and tested before delivery. Write for Trade Prices. Phone: Clerk. 1795. MASON & CO., 44, East Rd., City Rd., N.1.

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 Watertight brass, 17/6. Weston Relays, 20/-.  
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 4 multipliers, 6/6.  
 The Rolls Royce of Radio.  
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**A.C. TESTER.** 108/B21, has 4 ranges, 120-v., 6-v., 200 m/a and 4 amps, for 40-100 cycle mains, 45/-.  
**MILLIAMMETERS.** All ranges stocked. State max. load and send 2/- for Mov. Coil. Accuracy guaranteed. Brr ditto, M.I., 10/6 each.  
**MARCONI 1-VALVE and CRYSTAL DET. SETS.** Straight from makers. Closed case. Ebonite panel, nickel fittings, detector, valve-holder, L. and S. wave switch, double spade tuning, two H.F. chokes, T.C.C. condenser, terminal and plug sockets. All new, with wiring diagram and Osram valve. List price, £7. Sale, aerial tested, 27/6.  
**D.C. MAINS, 2-VALVE TYPE.** 1 det., 1 L.F., 200/1,800 metres, with 100/250-v. D.C. H.T. 3-tap Unit in same cabinet. Reaction vernier condenser tuning. Tested B.B.C. stations on aerial. Valve and phones, £8 10s. Great Bargain.  
**CRYSTAL SETS, with H.R. phone.** 10/-, 15/-.  
**R.B. MARCONI 2-VALVE SET.** All range coils, 58/-.  
**STERLING, 1-valve.** List, £5 10s. Sale, 60/-.  
**WESTERN ELECTRIC, 2-valve.** Sale, £5 15s.  
**MAGNAVOX, 2 LO/5XX 2-v.** Sale, £5 10s.  
**R.A.F. 3-VALVE SET.** Enclosed cabinet, all range coils, and DE valves, 80/-.  
**POLAR, 4-Val.** All-Range Vert. Pol. Cab., £8 10s.  
**STERLING, 3-valve Reflex,** with Frane Aerial. Gorgeous Set, Vert. Cab. double doors, £8 10s.  
**R.A.F. 10 G.E.C. 5-V. SET,** with valves, 25.  
**MARCONI, 6-v.** Cabinet Set, new, with valves, £10.  
**MARCONI 2-VALVE AMPLIFIER,** in mahogany case, 35/-.  
 3-valve, 50/-.  
**STERLING and MAGNAVOX, 2-valve Power Amplifiers,** Vertical Cab., £3 15s.  
**SUPER-HET, 7-VALVE R.A.F. AMPLIFIER,** Mahog. Case for Super Het., 3 H.F., Det. and 3 L.F. £5 10s.  
**HIGH-FREQUENCY AMPLIFIERS.** 5,000 to 20,000 metres, complete with rheostat and potentiometer. H.F. Transformers, 4/6. Etesca, 200/2,000, 15/-.  
**IRONS.** 110-v. or 220-v. Soldering Irons. Workshop pattern. List, 35/-.  
 Sale, 7/6. 110-v. or 220-v. Electric Flat Irons. List 21/-. Sale, 10/-.  
**NEW SPEAKERS.** "T.M.C." 13/6. Western Electric, 17/6. Magnavox Sterling, 65/-.  
 Parts only, 30/-.  
 Texas Cone Speakers, 30/-.  
 Amplion AK 39, 32/6. AR 110, 42/-.  
 Violinas, with Viola Unit, 25/-.  
 B.T.H. Headphones, 12/6. Marconiphones, 11/6. London Lightweights, 9/-.  
**X-RAY VALVES, 30/-.** Battery Home Chargers, £3 10s. Lucas Switches: 3-way 1/6; 8-way, 4/6. Relays, 80d., 4/-.  
 Navy Stabilising Gyroscopes, 15/-.  
 Mains H.T. Unit, Transformers 20 m.a. 25/-.  
 50 m.a., 37/6 each.  
**H.T. GENERATORS.** 6/1,000-v. T.V.T. pattern. Contain mica condensers, vibrator, plugs, etc., output 30 m/a. Cost £12. Sale Price, 25/-; post, 1/-.  
 Rectifiers, 2-valve, for converting A.C. to D.C., any voltage, 250 to 2,000 volts. Cost £10. Sale, 20/-; post, 1/3. H.T. motor generators, all voltages.  
**SPARK COILS.** 1 in., 6/6; 2 in., 15/6; 10 in., 27/-.  
**R.A.F. 4-WAY SWITCH PLUG AND SOCKET** for L.T. and H.T., with push switch. Cheap, 4/6 pair.  
**SPECIAL POLAR BARGAINS.** Precision Variat Condensers, 0005, 4/9; 0003, list, 4/3. 3-range Triple Varia, 30/-.  
 Polar Panel 2-way Coil Holders, 2/9. Polar Varia H.F. Transformers, 300/500, 3/6. L.F. Inter-valve, 7/6. Dubilier Cond., 0005, 1/6. Polar Rheos. Knob and Dial, 1/3. Polar Variometer, scale and dial, Sale, 8/6. Polar Everset Detectors, 1/3. Chokes, L.F. 200, 1,600, 1,000 ohms, 1/6. Double 400 and 1,000 ohms, 4/6. Marconi, 3,000 ohms, 4/6. H.F. Filter, on Ebonite, 1/6 and 2/6. Hendon, one hole H.F., 1,000 ohms, 4/6.  
**PLUGS AND JACKS.** 2/8 pair. One hole, 3/- pair. Switches—Dewar's 1-way, 1/6; 3-way, 2/6; 4-pin Lucas Plug and Sockets, 4/-; Panel 2-pin Base and Plug, 8d.; Electric Switch Adapters, 5d.  
**INSULATORS.** Transmit and H.T. Buldix bell-strain, 1/6. Porcelain Ribbed Ped. brass stems, 2/-.  
 Marconi 4-ft. Rubber Cord strain Insulators, 2/-.  
 Cows for Down-lead or Lead-in, 1/-.  
 Large Porcelain, for 10,000-v., 3/6.  
**SLATE PANELS.** Polished face, 1/4 in. thick, 5/6 per sq. ft.; 1/2 in. thick, 6/6 per sq. ft. Plain Slate Bars for power Rheostats, 10d. each.  
**SUNDRIES.** Protractors, Engr. Double 0-180, in case, by Taylor Hobson. Cost £2. Price 8/-.  
 Electric Bells, 1/6. Morse Keys, with cover, 2/6. Western Electric Engr. Knobs and Dials; List, 2/6; Sale, 9d. Buzzers, for Wavemeters, 3/6 each. Small Power Buzzers, 4/8. Mica Sheets.—Best Ruby for Condensers, 002, 2 by 2 by 002 thick, 1/- per dozen. Card of Detector Parts, 6d. each.  
 The most unique Radio Catalogue in the World, 4d.  
**ELECTRADIX RADIOS.**  
 218, Upper Thames St., E.C.4

**TECHNICAL NOTES.**

(Continued from previous page.)

the construction of commercial and amateur sets, with considerable improvement not perhaps so much in efficiency as in operation. In the design of superheterodyne sets, attention was much earlier paid to the important question of shielding, and the same remark applies to neutrodynes. As a rule, the general principle of shielding in these cases is the use of sheets of tinfoil or copper foil between the various stages.

**IS THE TRANSATLANTIC RADIOPHONE A SUCCESS?**

(Continued from page 1349.)

calls than business ones, at present. When you are having a friendly chat with a relative it really doesn't matter if your conversation happens to be overheard or not or if you have to spend some time getting through—

"Or (it was my turn to interrupt) whether you hear distinctly that Aunt Aggie's got a bit of a cold!"

We laughed together.

"But, seriously," said Mr. Selfridge, before saying good-bye, "I think this radiophone is a great stunt, and that every praise ought to be given to the people who have got it going. These are early days to say too much about it one way or the other, but it marks a distinct advance on anything that has yet been done. Everything novel is bound to go slow at first, and this time next year may see all the difference."

"Provided," I said, "that the authorities concentrate on clarity, quickness, secrecy, and reduction in cost?"

"Exactly," assented my companion. "Good-bye."

Straight from Oxford Street I went along to the Central Telegraph Office to see the chief engineer and ask him what was going to be done about removing the business man's radio difficulties as detailed by Mr. Selfridge.

When I got there, and when I telephoned later, I was told that I could not be seen, and that no information could be given on the matter.

This caused me no disappointment. Rather the reverse. I knew that if the chief engineer could not see anyone he must be very busy indeed. Busy, I suspect, upon the matters of clarity, quickness, secrecy, and reduction in cost! Let's hope he will have good news for us later!

2-VALVE AMPLIFIER, 35/-  
 1-Valve Amplifier, 20/-, as new; Valves, D.E. 06, 7/-; Headphones, 8/6 pair; new 4-volt Accumulators, 13/-; new 60-Volt H.T., guaranteed, 7/-;  
 2-Valve All-Station Set, £4. Approval willingly.  
 Write for free bargain list.  
 P. Taylor, 97, Studley Rd., Stockwell, London.

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 Shield for same, 6d.

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 and learn how little it costs to get much better reception. Tested on 500 volts D.C. All capacities obtainable—1 mfd. 2/9, 2 mfd. 3/9, 4 mfd. 6/-. etc. Full particulars of Hydra Condensers from your dealer or direct from

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 2-v. 35-a. Power..... 9/- 4-v. 06-a. H.F. & L.F. 7/6  
 4-v. 35-a. Power..... 10/8 6-v. 25-a. Power..... 12/-

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**POST FREE.**  
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**COMPLETE HOME ACCUMULATOR CHARGER 7/6**

For high and low tension accumulators. State voltage of mains. Direct current only.

**H. PARKES, 10, Sandringham Av., RHYL**

**Better! Cheaper!! Why not Use them?**

The J.J.R. indicating terminal with patent non-rotating top. Made in eight colours and all markings on insulated tops.

Handy tag connector made in eight colours to match our wander plugs. Erinoid sleeve which cannot pull off when in use.

Why blow your valves? Our safety plug will save them: costs nothing to renew fuse (renewal instructions with each). Will last a lifetime. Blows at 4 Amp.

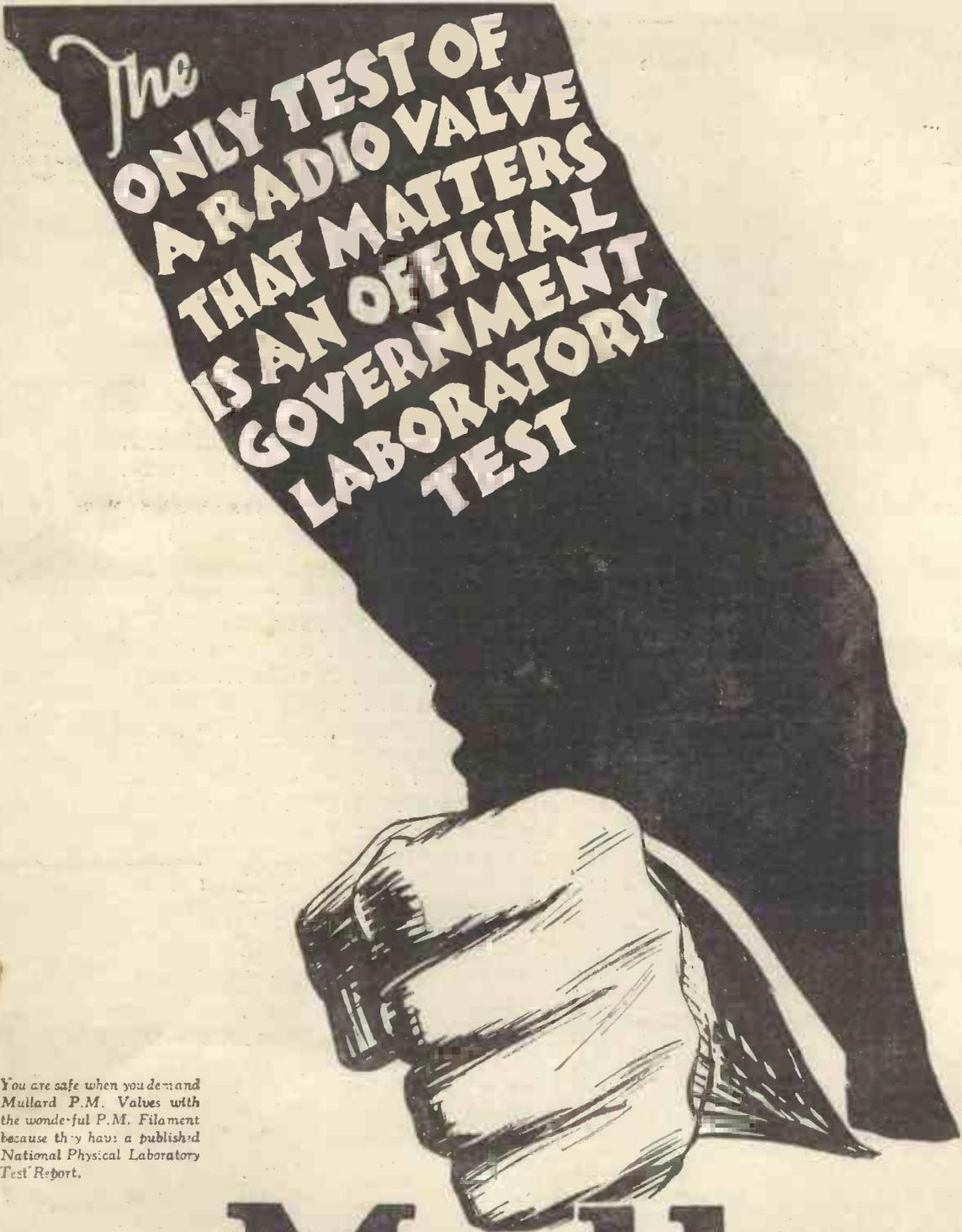
**1/-**

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 Manufacturers and Patentees,  
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We are the suppliers of the genuine U.C. and Thorpe valves, as specially tested and recommended by the "Undyne" inventors and "Popular Wireless." U.C.5 and Thorpe K.4 (both 4-electrode 5-pin valves), each, post free..... **8/11**

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 R/R



*You are safe when you demand Mullard P.M. Valves with the wonderful P.M. Filament because they have a published National Physical Laboratory Test Report.*

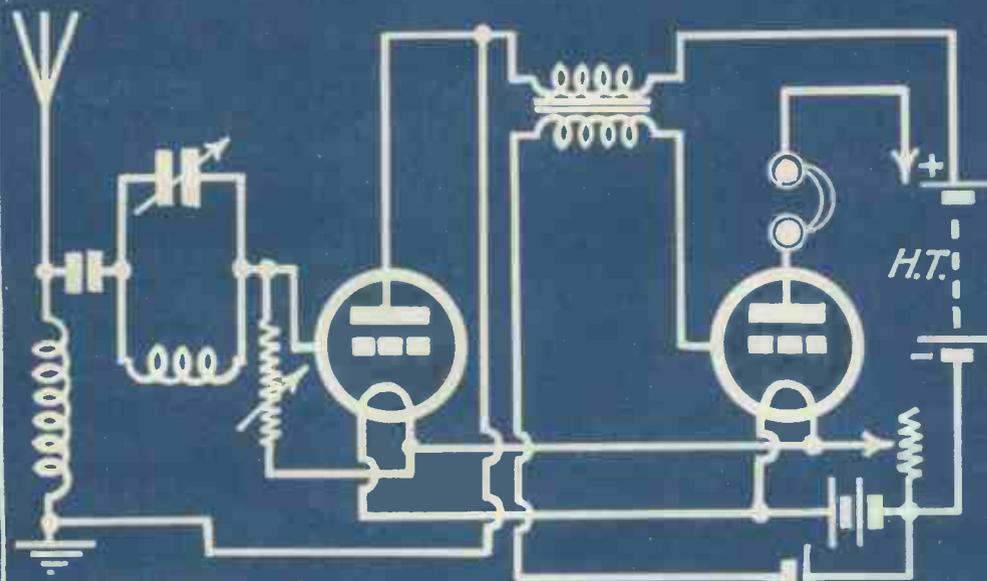
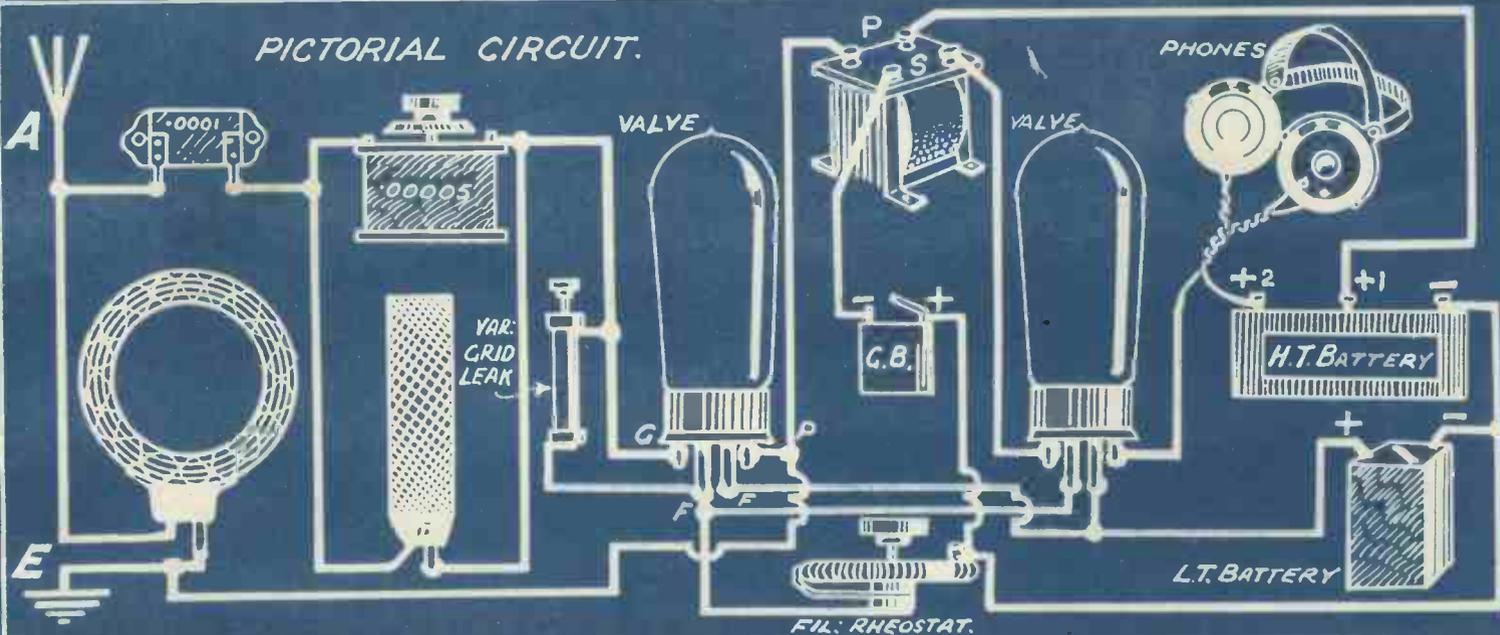
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## THE · MASTER · VALVE

ADVT. THE MULLARD WIRELESS SERVICE CO. LTD., MULLARD HOUSE, DENMARK STREET, LONDON, W.C.

# The "P.W." Blue Print Circuit, No. 21 The Two-Valve Lodge "N."

6d.



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CHECKED BY B.D.  
SER. NO. BP.105.

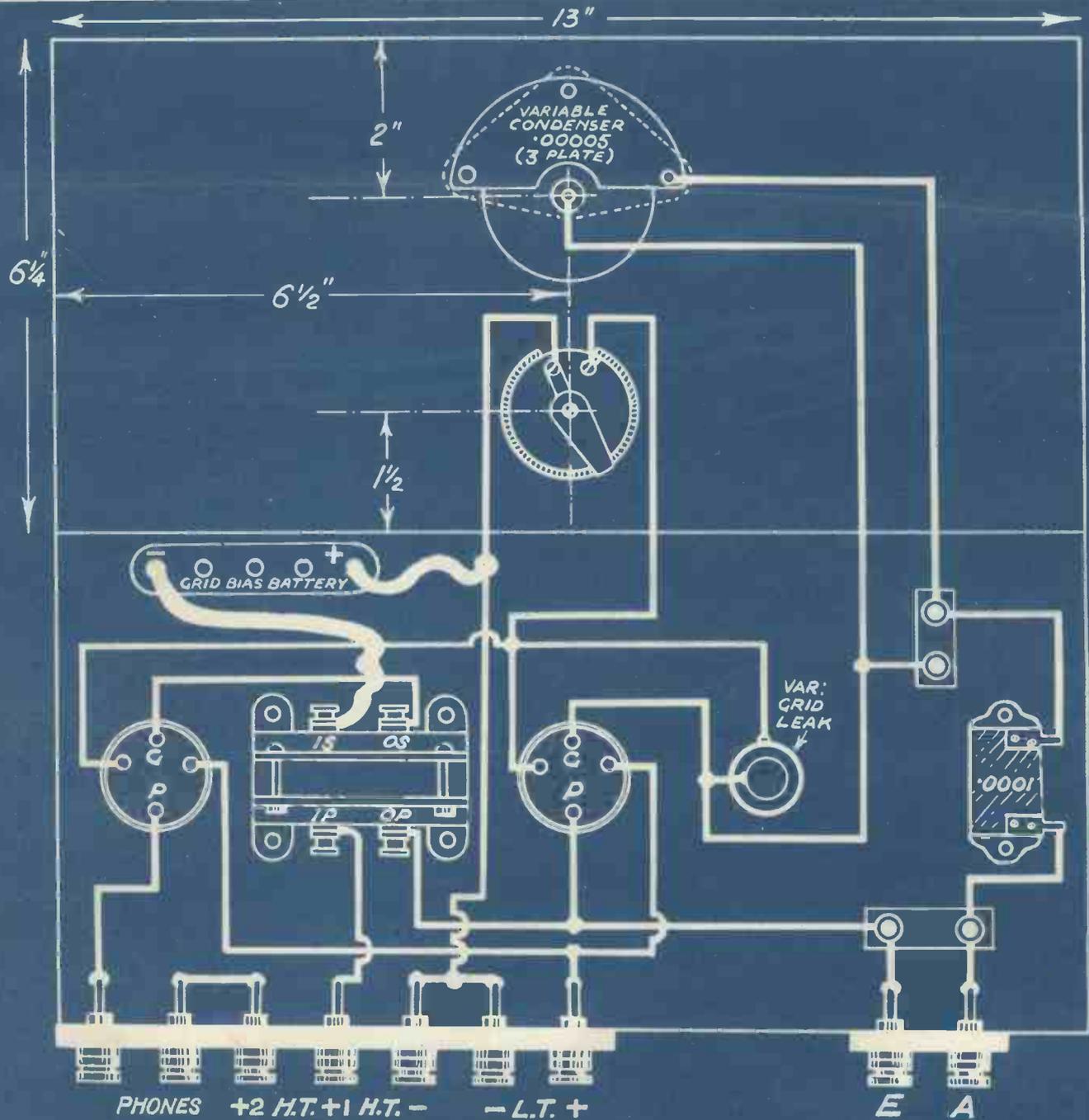
## The "P.W." Blue Print Circuit, No. 21 The Two-Valve Lodge "N."

### List of Components.

- Panel, 13 in. by 6½ in. | with Cabinet to fit.  
Baseboard, 13 in. by 6½ in. |  
1 Variable condenser (3 plate, '00005 mld.).  
1 Special L.F. transformer (as originally specified).  
9 Terminals.  
2 Single coil holders.  
2 Valve holders.  
1 Rheostat.  
1 Fixed condenser, '0001.  
1 Variable grid leak.  
Wire, screws, transfers, wander plugs, ebonite terminal strips, etc.

### Accessories.

- 2 Valves (1 detector, 1 L.F. type).  
2 Coils (150 and 45/60).  
1 H.T. battery. | To suit valves.  
1 L.T. battery. |  
1 Tapped grid bias battery.  
1 Phones or loud speaker.



DRAWN BY *W.D.*  
 CHKD BY *S.C.*  
 SER: NO B.P. 104

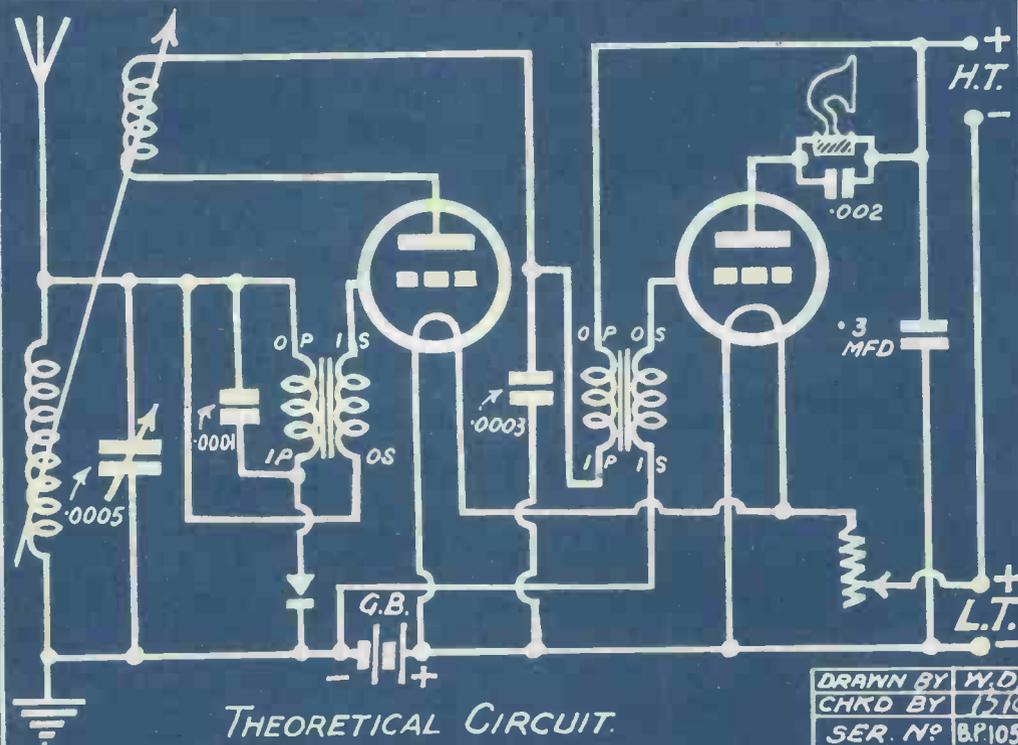
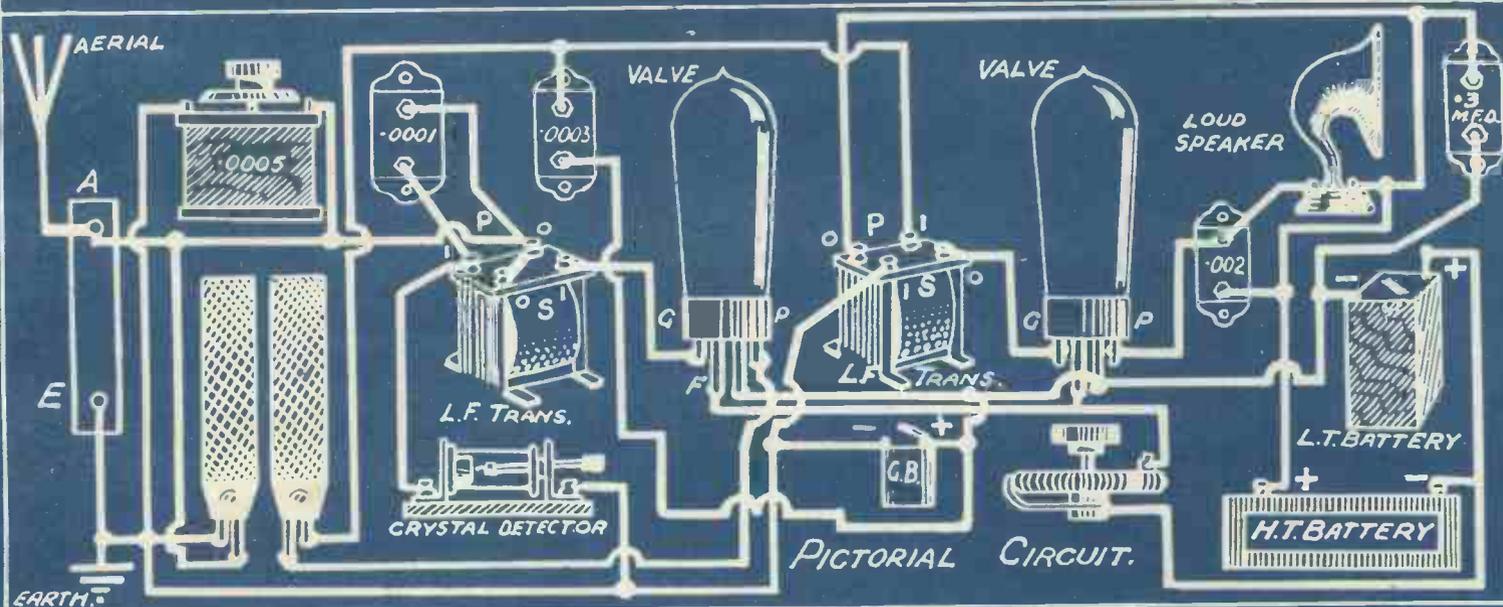
THE "P.W." BLUE PRINT CIRCUIT, No. 21. THE TWO-VALVE LODGE "N."

This, the famous non-radiating receiver evolved by Sir Oliver Lodge, F.R.S., will give clear and powerful results from the local station, and is extremely easy to operate. The grid leak employed must be one capable of smooth variation over a wide range of resistances, but once set for the particular valve in use it may be left adjusted. The grid bias battery must be tapped at every 1 1/2 volts, the maximum voltage available being not less than 4 1/2. Although phones are shown in the diagrams, the set will operate a loud speaker up to approximately 12 miles from the local station.

# The "P.W." Blue Print Circuit, No. 22

## "The Guaranteed Reflex."

# 6d.



### The "P.W." Blue Print Circuit, No. 22 "The Guaranteed Reflex."

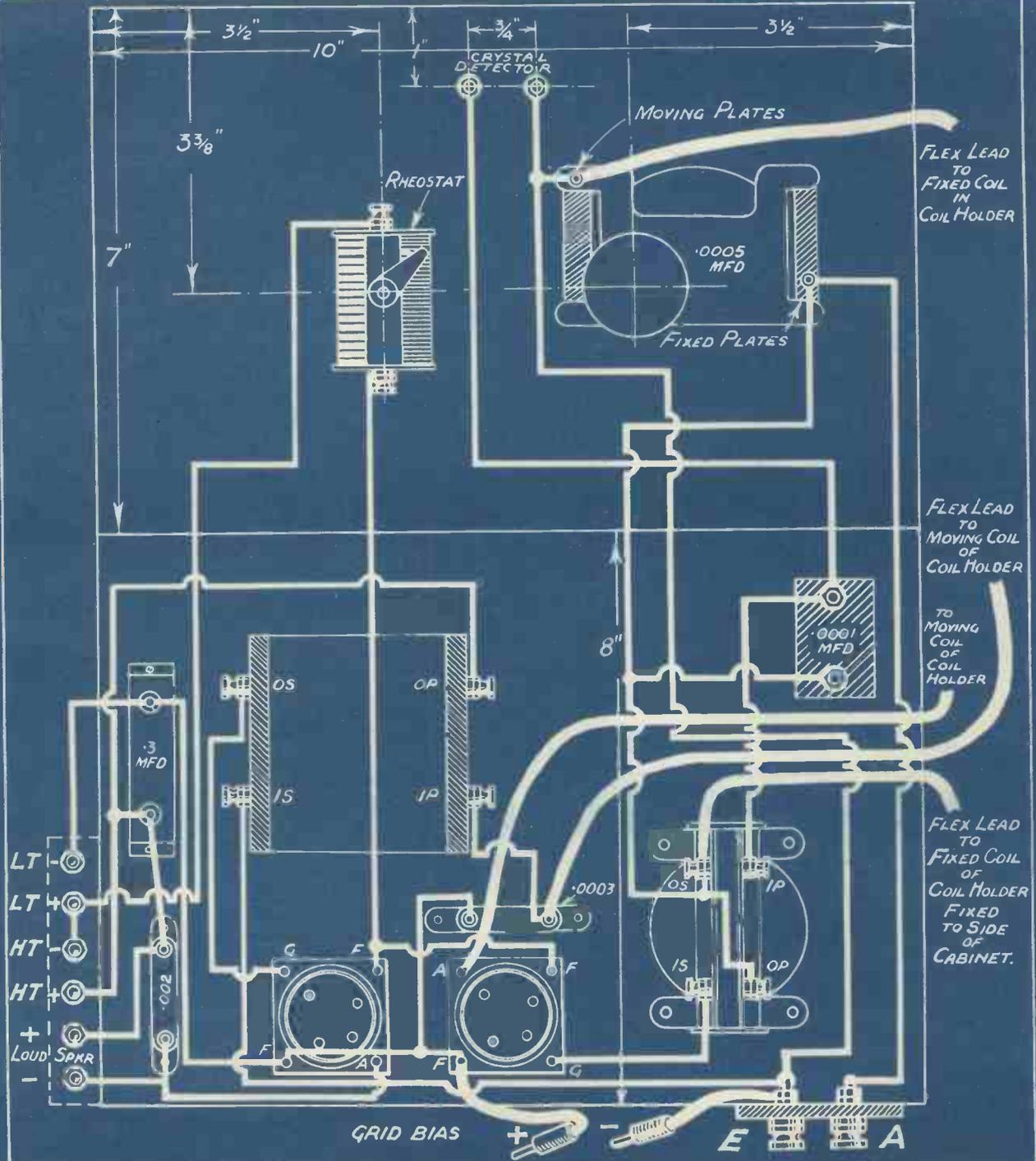
#### List of Components.

- Panel, 7 in. x 10 in. } and Cabinet  
Baseboard, 9 in. x 10 in. } to fit.
- 1 Variable Condenser, .0005 mfd.
  - 1 Rheostat.
  - 1 L.F. Transformer (First stage).
  - 1 " " (Second stage).
  - 1 2-Coil Holder.
  - 2 Valve Holders (anti-microphonic).
  - 1 Fixed Condenser, .3 mfd.
  - 1 " " .0001 "
  - 1 " " .0003 "
  - 1 " " .002 "
  - 1 Crystal detector, wander plugs, wire, screws, transfers, etc.
  - 1 Six-terminal Strip.
  - 1 Two-terminal Strip.

#### Accessories.

- 2 Valves (L.F. power type).
- 1 L.T. Battery } To suit valves.
- 1 H.T. " }
- 1 G.B. " }
- 2 Coils (A 35/50, Reaction 50/60) (for 5 XX :  
150 and 200 turns).
- 1 Loud speaker.

DRAWN BY	W.D.
CHKD BY	151K
SER. NO.	8P105



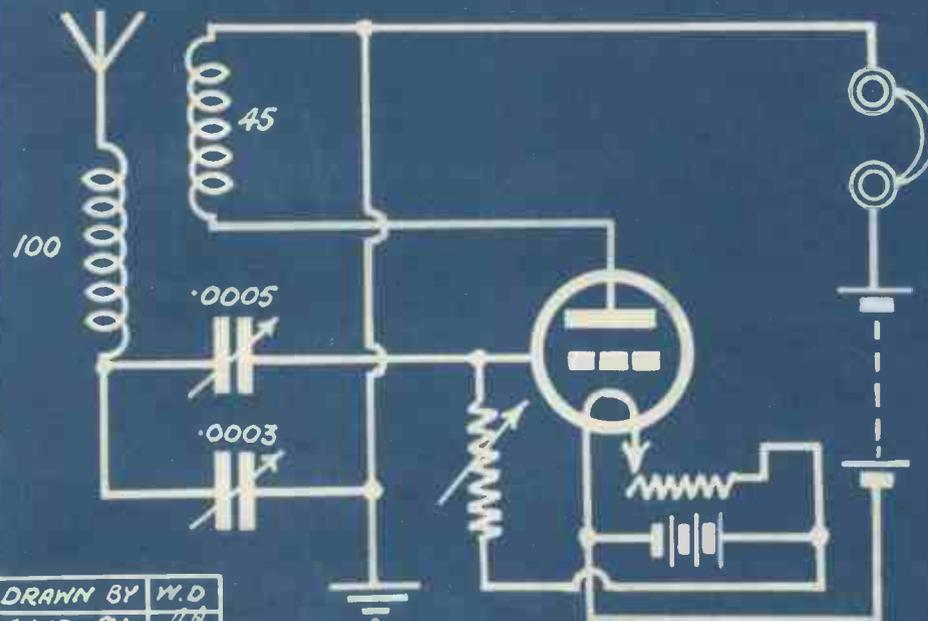
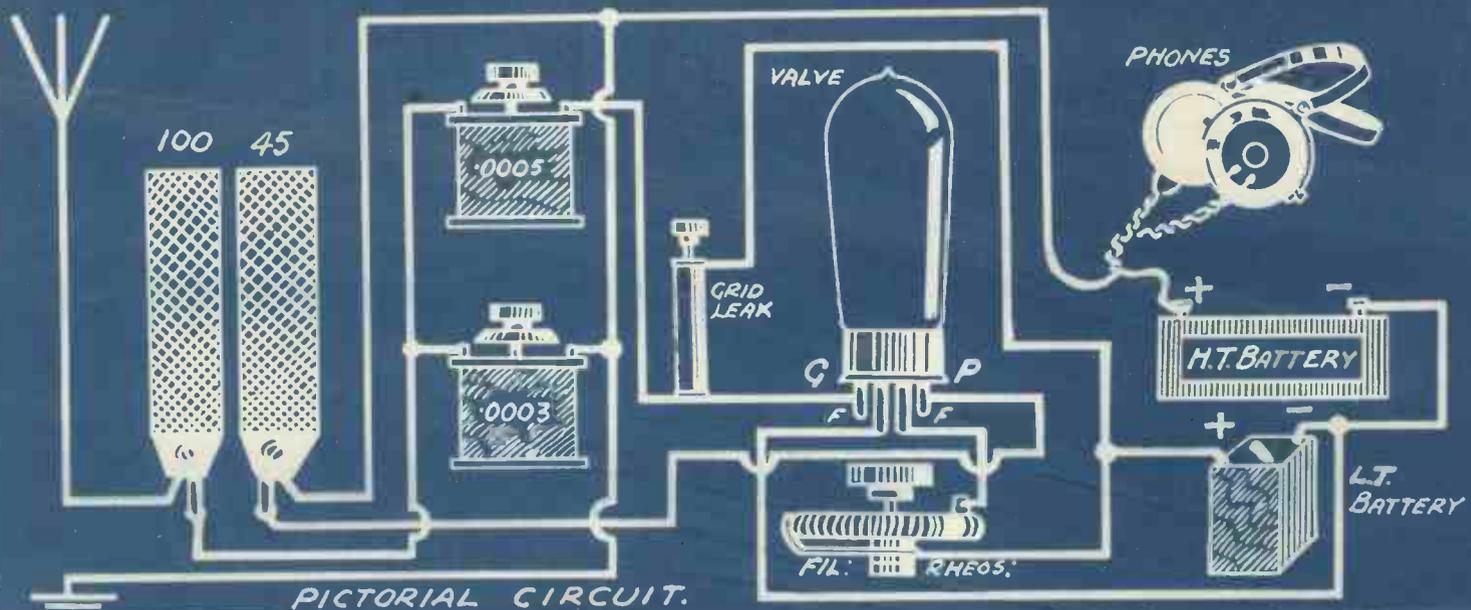
DRAWN BY *W.D.*  
 CHKD BY *BA*  
 SER. NO. BP106

The P.W." Blue Print Circuit, No. 22. "The Guaranteed Reflex."

This popular receiver is very simply controlled, capable of giving tremendous volume, with quality far above the average. As L.F. transformer design is not standard, it may be necessary to reverse O.P. and I.P. (and/or O.S. and I.S.) on one or both L.F. transformers. If the set fails to oscillate, the effect of reversing the connections to the reaction coil should be tried. Correct adjustment of grid bias is essential to the successful operation of this set

# The "P.W." Blue Print Circuit, No. 23 The One-Valve "Chitos."

6d.



DRAWN BY W.D.  
CHKD BY [Signature]  
SER: N° B.P.101

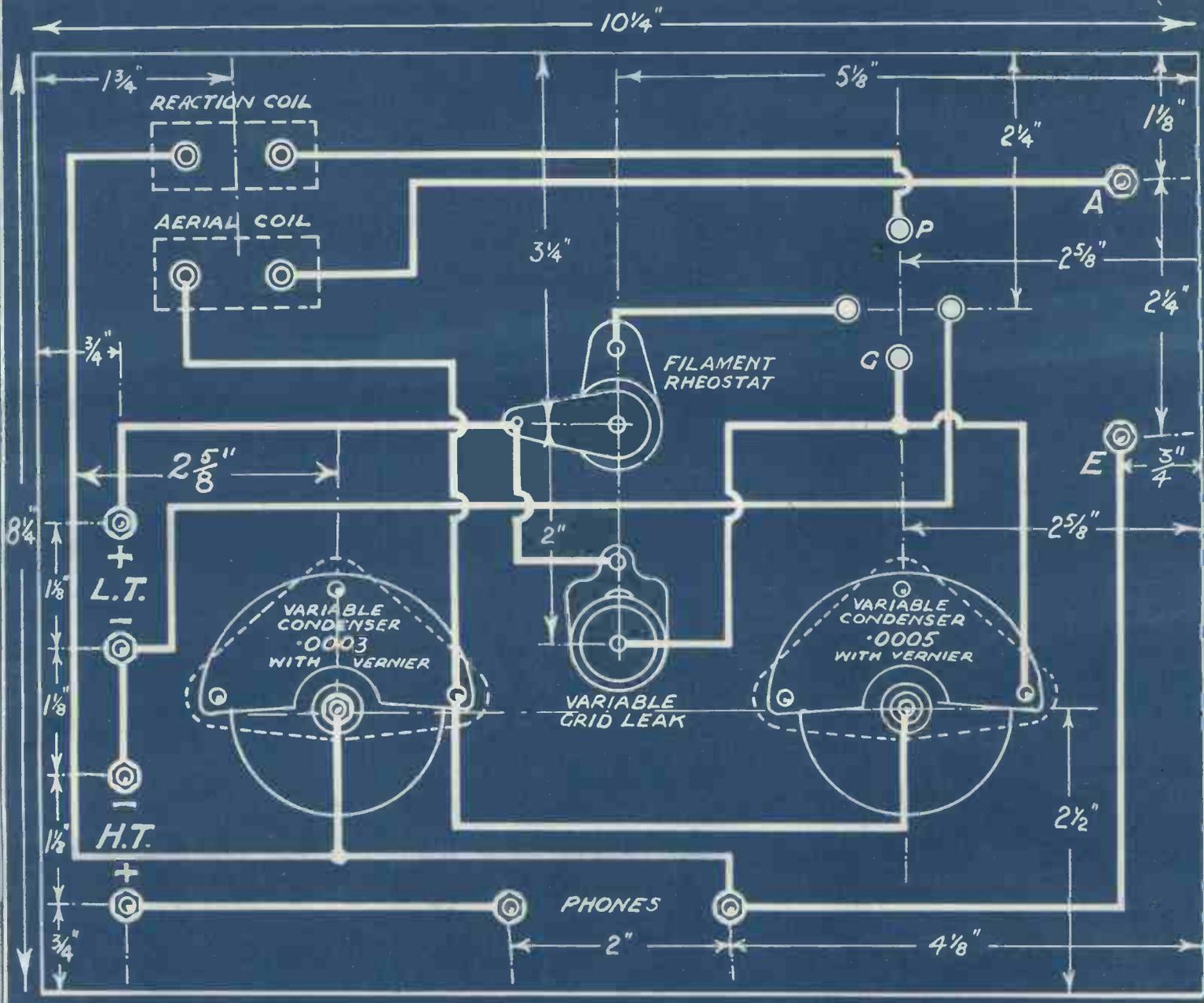
## The "P.W." Blue Print Circuit, No. 23 The One-Valve "Chitos."

### List of Components.

- 1 Panel, 10½ x 8½, with Box to fit.
- 1 .0005 Variable Condenser. | Slow motion
- 1 .0003 " " | or vernier
- 1 Rheostat.
- 1 2-way Coil Holder.
- 1 Variable Grid Leak.
- 1 Valve Holder (or 4 valve-sockets).
- 8 Terminals.
- Wires, screws, transfers, etc.

### Accessories.

- 2 Coils (A 100, Reaction 45 turns).
- 1 Valve.
- 1 L.T. Battery | To suit valves.
- 1 H.T. " |
- 1 pair 'Phones.



PANEL LAYOUT.

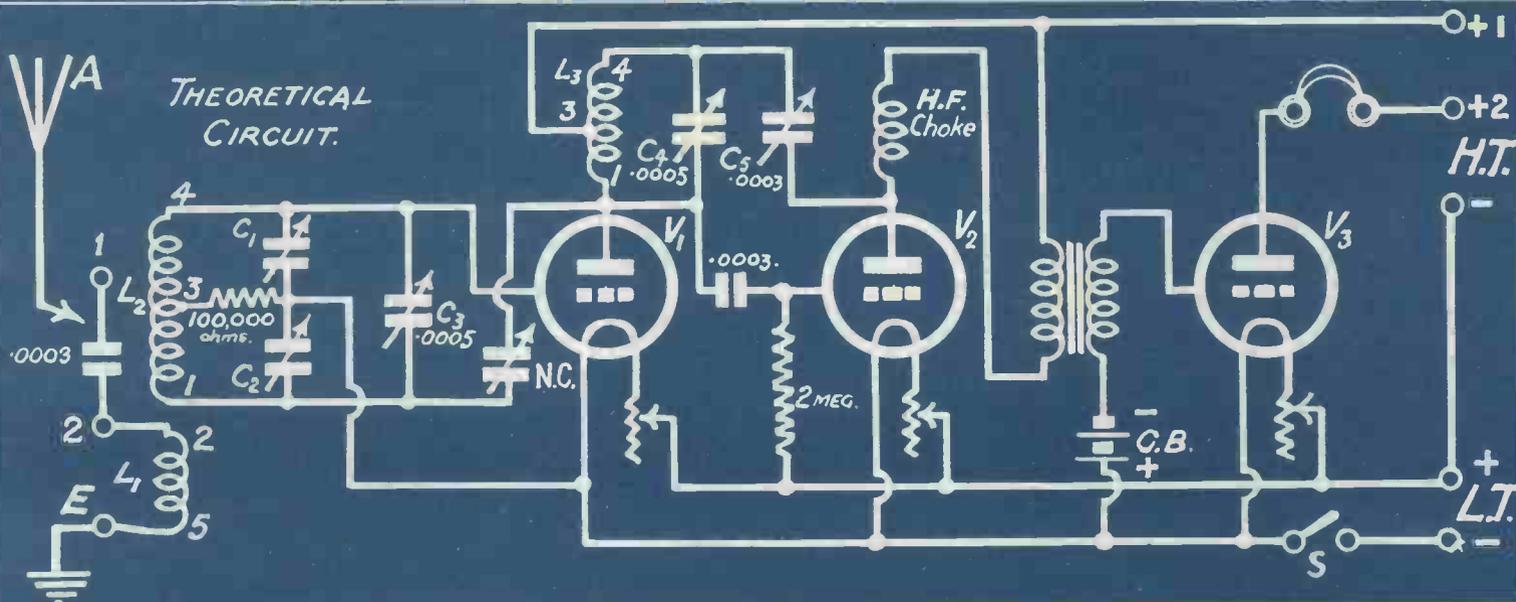
DRAWN BY	W.D
CHKD BY	BD
SER: NO	BP 102

THE "P.W." BLUE PRINT CIRCUIT No. 23. THE ONE-VALVE "CHITOS."

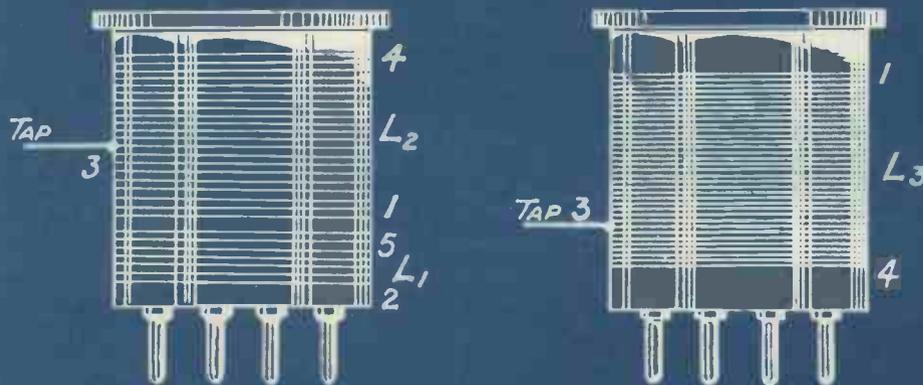
An excellent one-valve circuit for long-distance reception on 'phones. It is very selective, and capable of giving strong reproduction from the local station. (Like all circuits of this class it works best on wave-lengths below 600 metres.) If the set fails to oscillate, the effect of reversing the connections to the reaction coil should be tried.

# The "P.W." Blue Print Circuit, No. 24 "The Spanspace Three."

6d.



## DETAILS OF COIL WINDINGS.



### THE COILS.

The special coils are wound on the standard "screened coil" formers, but no screens are used. Connections should be made as indicated by the numbers, which are standardised by the various makers. The windings are in single layers of No. 34 D.S.C. copper wire. The turn numbers and connections are given below. L<sub>1</sub>—20 turns. Top end to pin 5, bottom end to pin 2. L<sub>2</sub>—90 turns, on the same former and in the same direction as L<sub>1</sub>, tapped at 45 turns. Top end to pin 4, tapping to pin 3, bottom end to pin 1. L<sub>3</sub>—90 turns, in the same direction on the other former, tapped at 30 turns. Top end to pin 1, tapping to pin 3, bottom end to pin 4.

**DRAWN BY** W.D.  
**CHKD BY** B.K.  
**SER. N<sup>o</sup>** BP.107

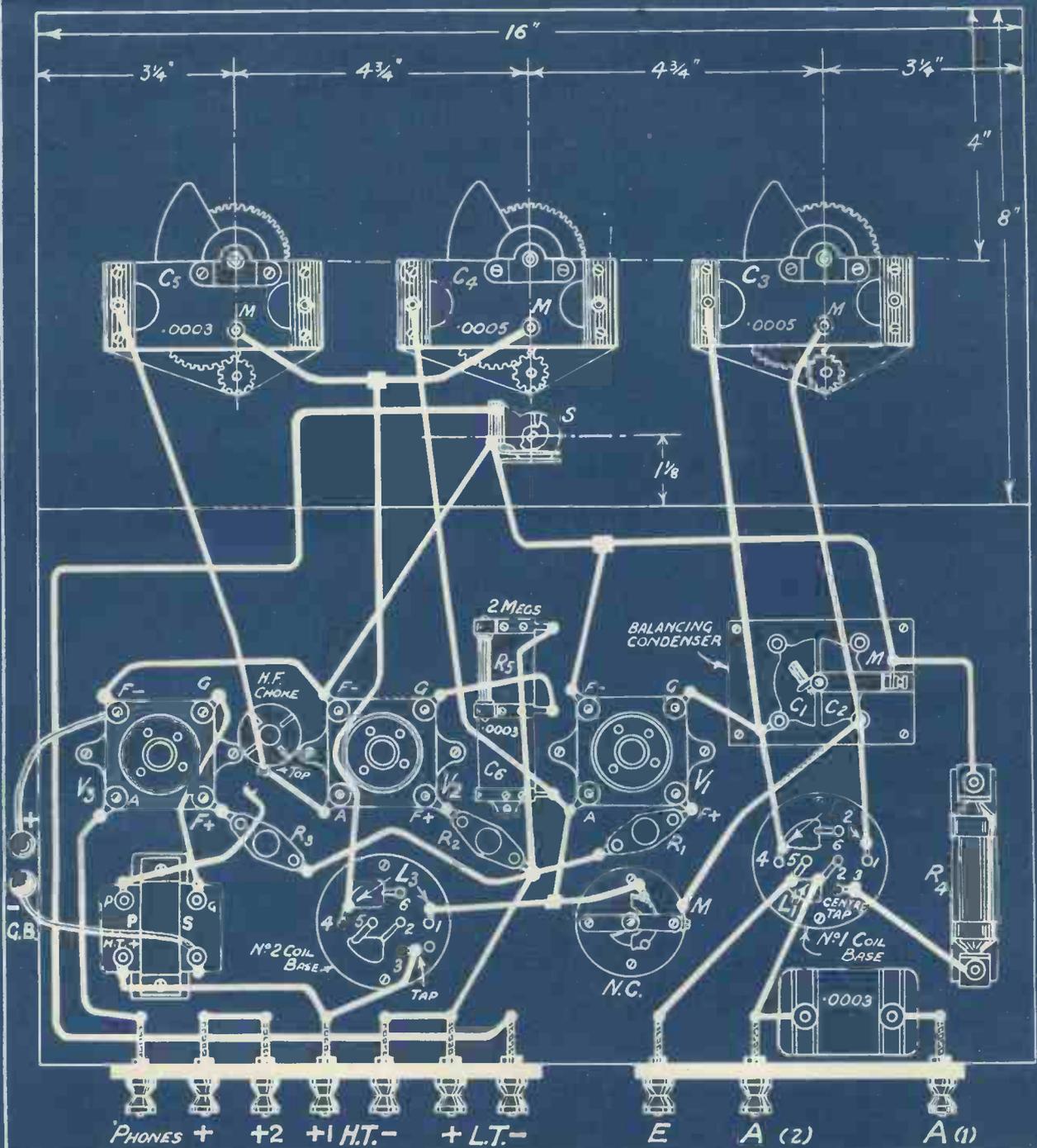
## The "P.W." Blue Print, No. 24 "The Spanspace Three."

### List of Components.

- 1 Ebonite panel, 16 in. by 8 in. by 1/4 in.
- 1 Cabinet, with baseboard, 9 in. deep.
- 2 Panel brackets.
- 2 ·0005 and 1 ·0003 geared variable condensers.
- 1 Balancing condenser.
- 1 Baseboard mounting neutralising condenser.
- 1 Fixed condenser, ·0003, type 610.
- 1 Fixed condenser, ·0003, type 600, with grid leak extension, and leak 2 megohms.
- 1 100,000 ohm anode resistance, baseboard mounting.
- 1 H.F. choke.
- 3 valve holders.
- 3 Holders and 3 suitable fixed resistors.
- 1 On-and-off switch.
- 1 L.F. transformer.
- 2 Tapped coil formers, with standardised bases.
- 1 Ebonite strip, 5 in. by 2 in., with 3 terminals.
- 1 Ebonite strip, 7 in. by 2 in., with 7 terminals.
- Glazite and a short length of flex.

### Accessories.

- 2 H.F. valves.
- 1 L.F. or power valve.
- H.T. & L.T. batteries according to valves used.
- 2 Special coils (if Daventry is required 2 more will be needed. Can be bought ready-made under the name of "Span-Space" coils).
- 1 Pair of 'phones or loud speaker.
- 1 Grid bias battery.



DRAWN BY	W.D.
CHECKED BY	BR
SER. NO.	BP.108

The "P.W." Blue Print No. 24. The "Spanspace Three."  
 Three-valve receiver employing one neutralised H.F. valve, detector with non-radiating reaction control, and one L.F. valve. Specially intended for long-distance reception on phones, and loud speaker at moderate ranges. Neutralise by setting reaction (Cs) at zero. C1-C2 at midway position, and adjusting N.C. until set does not oscillate at any position of C3 and C4; if local station available, turn out V1 and adjust N.C. until station inaudible despite re-tuning. Tune on C3 and C4, bring up strength with C5.

# R.I. K.L.1 Transformer

## for A.C. Mains



THIS transformer has been specially designed for the new G.E.C. K.L.1 Valve to operate direct from the electric light mains and is suitable for supplying the necessary power from 1 to 4 of the above valves.

This K.L.1 valve is designed to operate at a voltage of 3.5 and the fluctuation in voltage should not exceed 5 per cent.

The R.I. Power Transformer will maintain a *constant* voltage of 3.5 volts with a current of *from 2 to 8 amperes* for supplying up to 4 valves, and the watt consumption in the primary is negligible owing to the large iron core and special method of winding the coils, which are layer wound to avoid any possibility of short-circuit losses between the turns.

This transformer is absolutely safe; the insulation system between the primary and secondary is similar to that employed on large power transformers and there is no fear of injuring the K.L.1 valve through variations under load.

Ask your dealer to show you this new transformer. It is a sound engineering job throughout. It will save its cost in a few months by eliminating accumulators.

For Osram or Marconi K.L.1 valves.

## Price 30/-

Write for the R.I. Green and Gold Catalogue



### THE MARK OF BETTER RADIO

Advt. R.I. Ltd., 12, Hyde Street, New Oxford Street, W.C.1

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R/R

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How to make

AN INEXPENSIVE ONE-VALVER and  
THE "THREE-IN-HAND" CRYSTAL SET

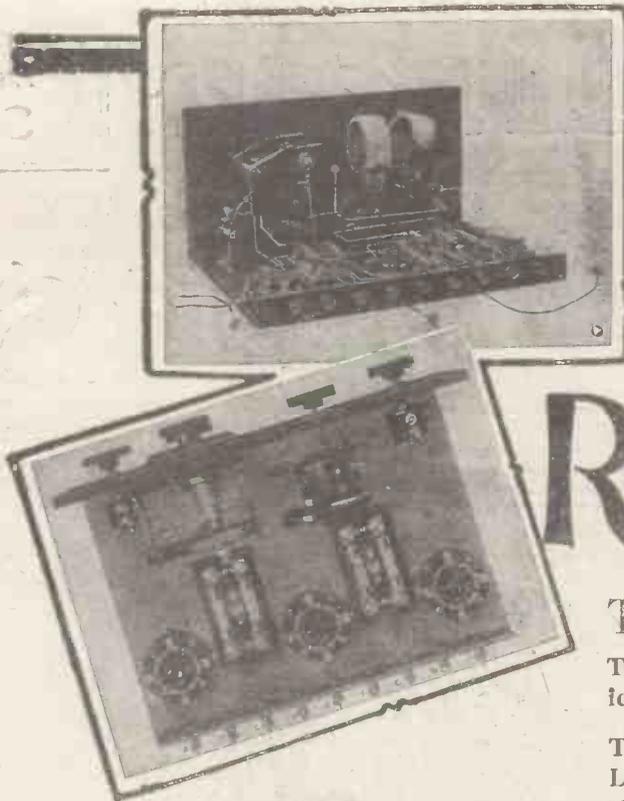
Are Dynamic Curves Misleading? By Capt. H. J. Round, M.I.E.E.

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FOUR YEARS OF SET DESIGN

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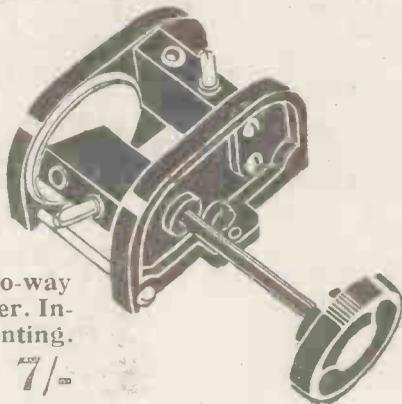
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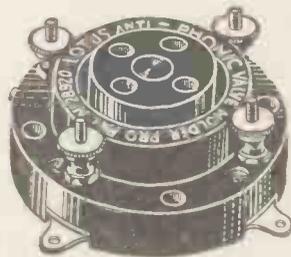
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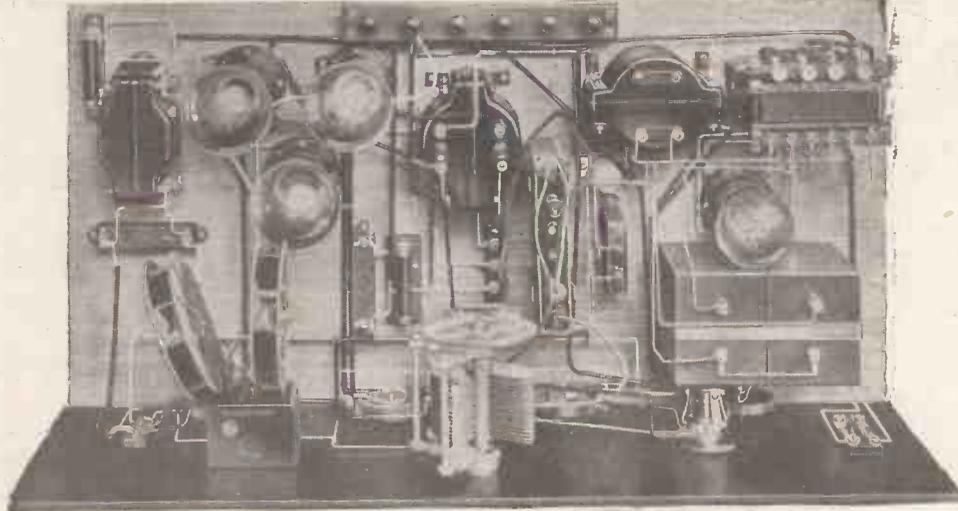
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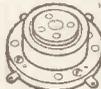
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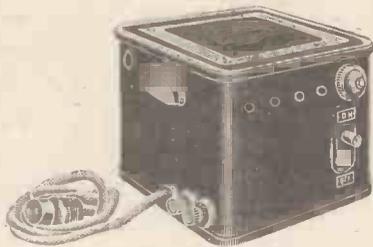
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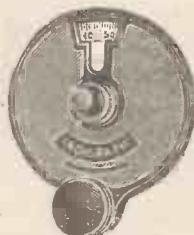


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the new system of simplified wiring



## PERCY W. HARRIS'S

**Great New Invention for Wireless Constructors**

AN entirely new system of set building called "Radiano" is introduced in the March issue of "WIRELESS CONSTRUCTOR" (out on Tuesday, February 15th).

The system is explained fully by means of full-size drawings on an elaborate blue print chart. All components are shown in position so that the veriest novice can immediately build a modern efficient receiver without the possibility of a mistake. The wiring-up has been simplified to such an extent that the beginner can obtain results equal to those of the experienced constructor. The RADIANO chart shows the exact length of wire for every lead and abolishes the laborious work of measuring and bending stiff wire until by trial the best shape is found.

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**FREE**

Large Blue Print Chart in the March

**The Wireless Constructor**

On Sale Tuesday, Feb. 15th. 6<sup>d</sup>.

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FOR USE WITH 4 VOLT.  
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**Dubilier Mansbridge Condensers**

Wherever a large capacity condenser is needed in your set, see that you make it a Dubilier Mansbridge.

No other Condenser in the world has behind it the combined experience of Dubilier and of Mansbridge.

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**SPRING-YET THERE ARE NO SPRINGS OR RUBBER SUSPENSION**

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The great feature about a gyroscope is that it will remain in a steady position, and is unaffected by external conditions. Exactly the same applies to a valve suspended in the Artic World Patent Non-Vibratory Valve Holder, it remains perfectly steady under various conditions of shock and vibration, and even when the valve is moved directly it just sags back into position. The Artic Non-Vibratory Holder does not employ springs or rubber as it is impossible to obtain ideal conditions by the use of these mediums.

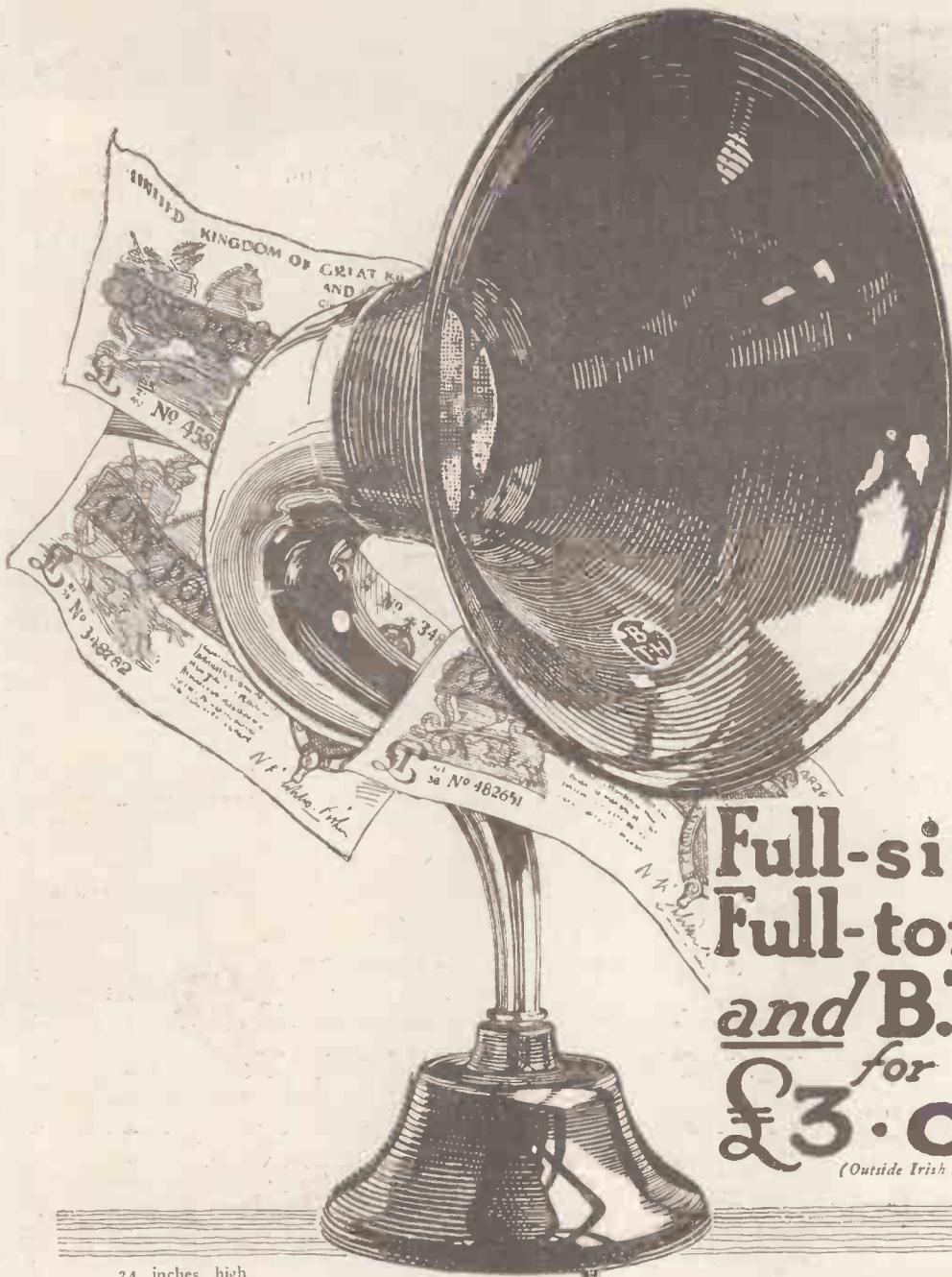
**IMPORTANT TO YOU.**

NOTE.—Owing to numerous complaints received stating Artic Non-Vibratory Holders cannot be obtained, if your local dealer cannot supply, we will send by return C.O.D. Postage Free, on receipt of P.C. (Name and address in block letters).

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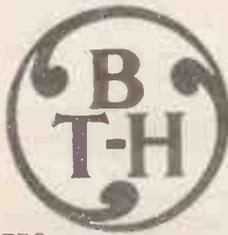
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FOR all its low price, the C2 can challenge comparison with loud speakers costing two and three times as much. In fact it is doubtful whether there is a better horn loud speaker at any price. Listen to a C2 at your dealer's and then consider the superlative quality of the reproduction given by this very inexpensive instrument—the only full-sized, full-toned loud speaker at or near £3 0 0.



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Ample Stocks Available

*The British Thomson-Houston Co., Ltd.*



*From the deep  
majestic chords  
of the organ—*

*—to the highest  
notes of the  
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The new  
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**—and every register in between—all  
reproduced with startling realism with the  
wonderful new Cossor 2-volt R.C. Valve**

The new  
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**W**IRELESS is undergoing a significant change. The latest trend is towards better tone. Quality of reproduction comes in the fore-front of every broadcast enthusiast's requirements. "Give me" he says "the voice of the living artiste—not a mechanical rendition."

Ever since Broadcasting began tonal purity has been dependent upon the use of suitable L.F. Transformers. And very few Transformers are capable of giving an equal amplification of all frequencies. Even the most expensive ones lose entirely

the very low notes. How, then, can radio approximate to the original when a considerable proportion of the lower registers are missing?

But now a big change is afoot. Transformers will soon be things of the past. Experimenters have long since known that choke or resistance coupling, besides being much cheaper, gives a perfectly equal amplification of every note in the harmonic scale.

But one thing has been lacking—a suitable valve. At last even this difficulty has been removed. The wonderful new Cossor 2-volt R.C. is the solution to this 3-year-old problem. This valve—with an impedance of only 75,000 ohms. has a record amplification factor of 40—the highest yet attained. While its consumption at 1.8 units is only 1 ampere.

Convert your Receiver at once and enjoy the living naturalness and the true beauty of every instrument—and of every voice. The cost is but little—the reward of your labour is great indeed. But be sure you use the new Cossor R.C.—no other valve has the Kalenised filament which is the real secret of its wonderful powers of reproduction.

# COSSOR

*—the valve which serves you longest*

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## RADIO NOTES AND NEWS.

The Short-and-Long Method—Grandpa Awakes—Methuselah's Mistake—A "Dead Horse"—Gilding the Pill—Safety First—DX Made Easier—"Jack Frost"—Wonders Never Cease.

### The Shove-and-Lug Method.

IN my Notes for November 27th, 1926, I commented lightly upon the fact that a certain motoring paper was toiling painfully in the rear of progress by representing "push-pull" amplification as the very latest thing in plus fours. Rash man that I was, I might with more safety have tried to teach a dug-out colonel of 1863 militia about Lewis guns. For the motoring writer who had been doing the push-tush article (in the absence of the grease-gun expert) coughed haughtily and replied in print practically to the effect that "P.W." is ignorant of the matter.

### Grandpa Awakes.

SO far, so funny! We then published Mr. G. P. Kendall's article (signed, mark you) on "Is 'push-pull' worth while?" (Jan. 15th), which all may read and judge. This brought the motorist out of his bath-chair in one movement, and he replied by calling us "mere theorists" with whom he is no longer disposed to argue, he having been contributing to technical journals for 20 years when we were still at school.

### Methuselah's Mistake.

WELL, *mes enfants*, as to our being "mere theorists," meaning, of course, theorists *only*, the complete reply is in the pages of "P.W." and the homes of thousands of our readers. As to the 20 years' hard labour of my contemporary, they are no proof that he is eligible to assume a grandfatherly attitude towards wireless specialists. Twenty-three years ago I was contributing signed articles on

commercial chemical analysis to a technical paper—to be precise, to the "Oil and Colourman's Journal" on the analysis of hydrocarbons—but I should not dream of quoting the fact in support of my views on "push-pull" amplification. Our motoring friend has gone off the white line in supposing he is dealing with "new journalists," a mistake from which his 20 years' experience should have saved him.

noise in the kitchen when Mary says good-night to her young man. The heart-current passes the normal and "blows" the main fuse.

### Crack!

A MAN just home from Rio tells me that radio goods are not selling at all well in Brazil. Naturally! It is always difficult to make Brazil (k)nuts "shell out."



Adjusting the special wireless set fitted in the dayroom of the Royal apartments on H.M.S. "Renown."

### Enterprise "Down Under."

AN Australian broadcasting company is to pay the University of Melbourne £1,500 for three years' wireless research work. I believe they want to know how to train Laughing Jackasses to broadcast chamber music.

### A "Dead Horse."

THERE has been an attempt to revive that "dead horse," "What shall we call the listener-in?" Someone now suggests "etherite." My suggestion is "never-right," because the B.B.C. always knows better than the listener. The correct definition of a listener is, of course,

"a patron of the B.B.C."

### A Suspicious Fact.

I SAY! Look here! This is almost too much of a good thing! The U.S.A. had 520 broadcasting stations jazzing on June 30th, 1926, and since then no less than 100 more have been licensed. Well, if I were a prohibition officer I'd have a good look inside the musical instruments of some of the 620 stations in the U.S.A.

### Twenty Years Ago.

I SEE that Dr. W. H. Eccles states that twenty years ago "wireless was known merely as Morse telegraphy." Oh, dear! I think not. It was far more generally known as "wireless," and left at that.

### Personal Power Stations.

DR. ECCLES also states that "every throb of the heart causes an electric current." That accounts for the

(Continued on next page.)

### NOTES AND NEWS.

(Continued from previous page.)

I suppose a well-grown saxophone could hold about a quart. Even the word "licensed" makes one suspicious. Gosh! What a country!

#### New Broadcasting Station.

**R**EACHERS-OUT might make a note to search for Posen on 270.9 metres on or about February 15th, on which date the Posenites hope to begin chiming in with the Concert of Europe.

#### Gilding the Pill.

**D**R. PUPIN, Professor of Electro-Chemistry at Columbia University, says that "atmospherics" and "fading" are only the voices of the earth and sun. Thanks very much! But it's a pity they don't combine, so that the "atmospherics" could "fade" during broadcasting hours.

#### "Gie Thyssen Ower."

**T**HE refusal of a B.B.C. station director to broadcast a play by local "talent" because of the accent of some of the players was a sad mistake, in my humble opinion. Everybody, even an "Uncle," speaks with an accent of some sort, and, after all, we are human Britishers, not dry-as-dust professors, and broad "Yorkshire" is as good as nasal Cockney or footling "Brasenose." Why, the north countree talk is more soothing than aspirin to a man that is not cockered up with self-conceit and loves the great English people.

#### "Safety First."

**T**HE new studio at 2 L O has walls padded with felt. Now the highbrows there can bang their precious heads against the walls in safety when they hear "John Henry's" terrible accent.

#### The Die Hard.

**M**R. ERNEST NEWMAN, the musical critic, says that if one's only chance of hearing Wagner and Beethoven and Strauss and Elgar were by means of wireless, he would rather go without music than hear it under such conditions. As a night-watchman said to me when I told him I didn't like pig's trotters: "Pore bloke!" I wonder whether the sets Mr. Newman has heard were quite correct in the matter of grid bias?

#### "Far from the Madding Crowd."

**T**HE Sultan of the Maldive Islands, in the Indian Ocean, has installed a five-valve set. Let's send him a B.B.C. pamphlet about "howling," preferably so as to reach him by April 1st. What I want to know is, firstly, how often does the G.P.O. inspect his set, and, secondly, what do they charge at the local garage (poetry!) for ruining his accumulators?

#### Radio on the Equator.

**T**HERE are, it is reported, less than one hundred receiving sets in use in Ecuador. The fact is, they can't keep the monkeys from swinging on the aerials while the parrots sing "The more we are together."

#### "H.U. Calling."

**T**HE radiator which has been interfering with European listeners for a month or more has been identified; and steps are being taken to stop its activities. It has a long range, and affects most ordinary receivers very powerfully. I discovered it myself. It is Influenza! "But why H U?" you say. Because—*Atchoo! Atchoo!*

#### DX Made Easier.

**I** HEAR that there is a plot on foot in Geneva to systematise the call letters of broadcasting stations so that the letters shall be indicative of each station's nationality. This is horse sense, and has been done for years past in the case of commercial wireless telegraph stations. *En passant*, what about systematising the manner of calling, so that we don't get so much "achtung" and "allo"?

#### The Australian "Beam."

**I** AM told that the "beam" station for communication with Australia will be as efficient as that for Canada. Some slight trouble with auxiliary apparatus caused the official tests to be unsatisfactory to the Marconi Company, who therefore will not ask the Post Office to accept the station until another test has been applied. Telephony by "beam" to Australia is a development which will be quite possible this year.

#### The New Valve.

**I** AM very glad to hear that the new M.O. valve, on which so much research has been spent, is at last about to make its debut, because it is badly needed. It will enable filament current to be taken from the mains and its most novel feature is the device for heating the filament without passing current through it. Slowly but surely radio is progressing towards

### SHORT WAVES.

Modern Version: "Music" covers a multitude of sins.—"Sunday Pictorial."

The new B.B.C. has started by scrapping some of the old Uncles. This seems a mistake; their attitude towards the public should be to maintain their old relations.—"Eve."

We understand that the new B.B.C. studio in London is to be a loftier room than usual. It has been suggested that this is to accommodate the highbrows.

Since the advent of Marcel and Marconi Britain has been ruled by the waves.—"Westminster Gazette."

He: "How many reception rooms have you got?"

She: "Oh, only one. You see, we've only got one crystal set."—"Sunday Pictorial."

Calling up a friend by wireless will soon be as easy as calling him up on the telephone. The only difference will be that instead of getting the wrong number we shall get the wrong wave-length.—"Eve."

"Loud speaker fine," runs a headline in the "Evening News." One of our readers writes to say his is rotten.

Scene in Year 10 A.D.:  
Two Romans are talking to each other.  
Cæsar: "Let's do something to-night."  
Antony: "I'd rather stay at home."  
Cæsar: "What'll we do at home?"  
Antony: "Listen to some radio."  
Cæsar (eloquently): "Don't be foolish, radio hasn't been invented yet!"—"Boston Beanpot."

"You press the button; we do the rest" simplicity.

#### Where Great Britain Scores.

**A** SERVICE of wireless instruction for the children of bargemen had been begun by the Hilversum station. You couldn't teach an English bargee's children anything about language, manners, or deportment. Especially language!

#### "Any Ice To-Day, Lady?"

**T**ALKING of language, I notice that the Montreal station has been broadcasting in the Esquimaux tongue. The accent would, of course, be far too atrocious for the B.B.C. to countenance, and no doubt many of the words used would be "horrible hybrids." Still, a debate between a Polar bear and a penguin on the beauties of the north and south Polar regions would be better than one between two B.B.C. "brows" on the correct way to pronounce Cirencester.

#### The Conjurers.

**I**T is said that an amateur has found out how to convert a piano into a loud speaker. That's nothing! Why, I know an hotel-keeper who can convert a billiard-table into a bed. I wonder if our friend the piano-changer can work backwards and turn a loud speaker into a piano? If he can, mine is at his service.

#### "Jack Frost."

**R**ADIO enthusiasts dwelling in Putney, Wandsworth, Fulham and Chelsea, and roundabout, and who would be glad to have cheap but expert instruction in the theory and practice of wireless, should join the class now forming at the Putney Literary Institute (Putney County School, West Hill, S.W.15), to be conducted by Capt. Jack Frost, late Uncle Jack of 2 L O. Thursdays, at 2.15 p.m. Fee, for course to Easter, two shillings.

#### The "Ordinary" Set.

**A**N esteemed reader, having read—not in "P.W."—a reference to "the ordinary type of set," asks me whether I know what such a set is. Absolutely! It is one consisting of a detector, with or without amplifiers to taste. Next please!

#### To Those Who Bind "P.W."

**M**R. G. E. HOLLOWAY, 11, Shoe Lane, E.C.4, has a number of copies of "P.W." to give to anyone who needs them. Let brotherly love continue, but don't forget the postage, please!

#### Wonders Never Cease.

**A** FAITHFUL reader writes to say that he can hear Rugby any time he is transmitting on a crystal set, "employing a different circuit," and can also hear New York answering back. He asks if the achievement is any good. Well, if he can transmit on a crystal set and hear New York answer back, he should hie him to the Patent Office so swiftly that his tail cannot be seen for dust. But hearing Rugby is nothing; the Post Office says it has been heard all over the globe, and in the Hospital for the Stone Deaf at Wigan!

# Is the Modern Tuning Coil Final?



IN the very earliest days of wireless, when the principles of tuning were just being grasped, the coils which were used were mostly of the simple type consisting of a single layer of wire upon some sort of insulating tube. Since then the ingenuity of inventors has been exercised constantly in devising new methods of winding coils, and an extraordinary profusion of "fancy" inductances have seen the light.

For a long time inventors sought chiefly to achieve compactness by using some form of multi-layer winding, and to arrange it in such a fashion that self-capacity was reduced to a minimum. Until the advent of experimental telephony and broadcasting on the present wave-lengths the coils in which we were interested were mostly large ones, and so some multi-layer arrangement seemed necessary to reduce their bulk, and unless such windings were carried out in certain special fashions their self-capacity was apt to be high. It was perhaps natural, therefore, that the idea of low self-capacity should become something of an obsession.

## H.F. Resistance.

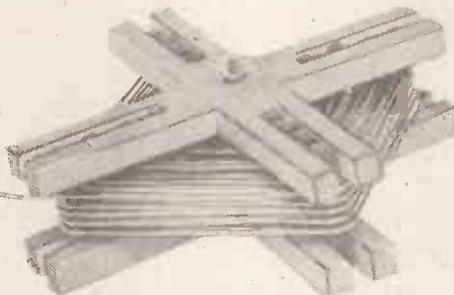
The fact is that another and an even more important characteristic of a good tuning coil, namely, low H.F. resistance, was to some extent forgotten, and the ill effects of this neglect were felt for a long time in the production of coils for the broadcast band of waves. Here the coil required is of a comparatively small number of turns, and it is quite easy to devise some fairly open method of winding giving a low self-capacity, and it was assumed that it followed that the coil was therefore an efficient one. It is true that the methods which reduce self-capacity

With the many designs in tuning inductances that have been put forward during the last year or so one is apt to wonder where it will all end. In this informative article Mr. Kendall, who is an authority on the subject, discusses the whys and wherefores of the present trend of development.

By G. P. KENDALL, B.Sc.  
(Assistant Technical Editor)

are beginning to pay far greater attention to H.F. resistance as such, regarding dielectric losses, self-capacity, and so on, merely as factors in the problem.

Closer attention and a certain amount of more scientific experimental work with



A coil with low H.F. resistance—the "Cross Coil."

actual measurements has led to the conclusion that the single-layer coil is probably the best basis for the production of an inductance which is really "low-loss" in the true sense of low H.F. resistance.

Any system of multi-layering which is at all close is very apt to increase the resistance of the coil heavily, and, indeed, such an increase may be regarded as an almost inevitable consequence of a departure from the single layer (speaking always of coils for the broadcast band of waves, of course).

The best that can be said of the ordinary types of multi-layer windings is that they may, under favourable circumstances, approach the standard of a good single-layer coil;

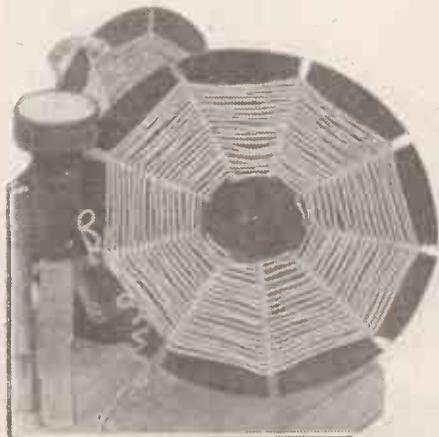
some, such as the "cross coil," usually associated with my name, and the basket or spider coil may make a fairly close approach, and therefore may appeal to a designer anxious to save space in some special circumstance, but we are driven to the conclusion that if we wish to produce an ultra low-resistance coil for the broadcast band, we should use the single-layer system of winding.

## Fine Wire Advantageous.

Over the details of the winding there is still some divergence of opinion, but a good case has been made out for a coil of relatively fine wire with a slight spacing between the turns, either obtained by using some spacing device or by using a suitable thickness of covering on the wire.

It is interesting to note in passing the reason for the use of fine wire, contrary as this is to the ideas of "low-loss" in vogue not long ago. The point is that by using a fairly fine gauge, say, No. 32, it is possible to compress the winding into a small space, and so produce a coil which is quite short in proportion to its diameter. In a coil like this the inductance per turn is greater than in one of greater length and fewer turns per inch. Hence, to produce the desired amount of inductance fewer turns are

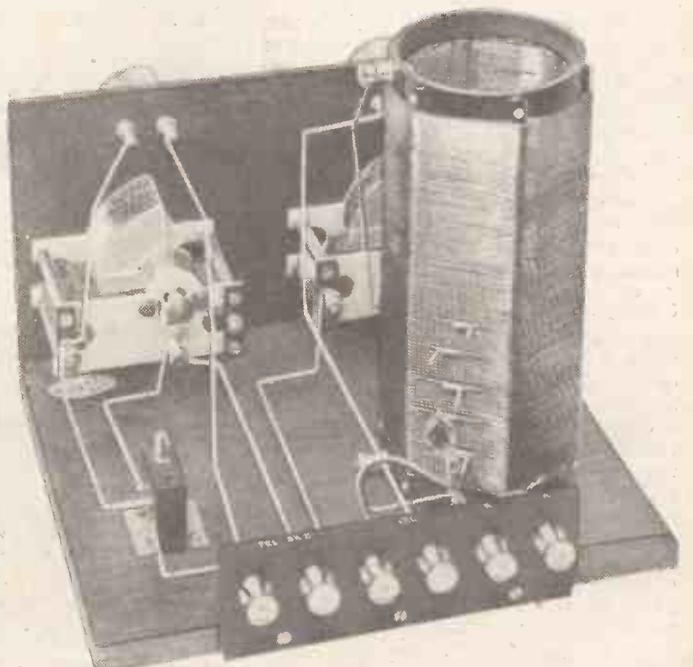
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An old favourite—the spider web coil.

are also frequently beneficial from the point of view of minimising the H.F. resistance of the coil, but something more is needed than such an accidental reduction as this.

A better perspective has been achieved in recent years, and at the present time we

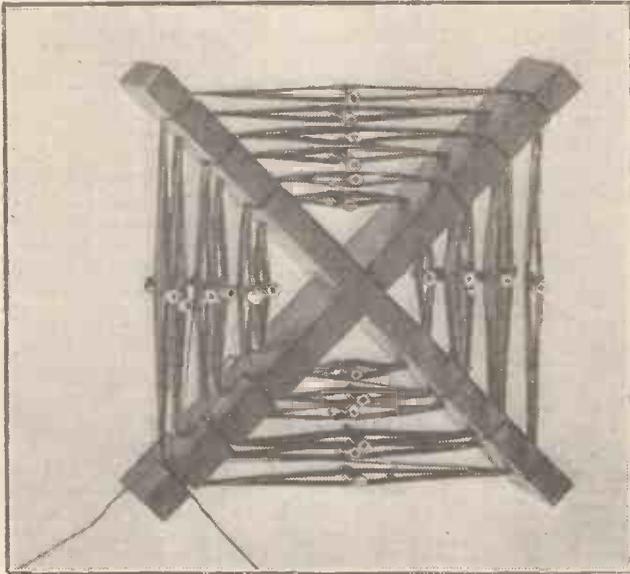


Pulky but efficient. The spaced solenoid coil is apt to assume large proportions, but it need not be carried to the limits shown above.

## IS THE MODERN TUNING COIL FINAL?

(Continued from previous page.)

needed—i.e. less wire is required, and a shorter length of wire means lower resistance. Thus, it is possible for a fine wire coil to possess the desired low H.F. resistance to comply with reasonable ideas of "low loss."



Another example of a low-loss, low-resistance coil.

We have now a fairly clear idea of what is meant by a "modern tuning coil." We see that it is almost inevitably a single-layer winding, and that quite a common method of securing a fairly low H.F. resistance is to use a short concentrated winding of fine, slightly spaced wire. A good example of an inductance of this type is found in the screened coil now used in so many sets.

In this way it is easy to produce a coil with an H.F. resistance of from 5 to 10 ohms, which, of course, is very much less than that of the average multi-layer plug-in coil of the same size (say, a No. 75). Now, it has been shown that it is not permissible to reduce the resistance of the tuning coil in a circuit intended for telephony reception below a certain figure. If a further reduction takes place it is inevitable that a certain amount of distortion of the received speech and music should take place.

### Causing Distortion.

This may perhaps surprise some of my readers who are accustomed to think of distortion as taking place only in the L.F. amplifying circuits, but it is a fact that it can be produced by over-sharp tuning in the H.F. circuits, either as a result of the use of too much reaction or a tuning coil of too low a resistance. What happens is simply this; a modulated carrier wave—i.e. a broadcast transmission, does not consist of a single frequency, but of quite a mixture of frequencies, and if the tuning of the receiving set is too sharp this bunch of waves will not be uniformly received, and some will be shut out, with consequent distortion. (This is the operation usually called "cutting off the side-bands.")

What we require is evidently a circuit which will respond to a band just wide enough to accommodate the bunch of waves produced by the desired station, and not so wide as to bring in the waves of adjacent stations. To get just this desired degree of sharpness of tuning is no easy matter, for the problem is a complex one, and causes much perplexity to the conscientious designer.

Authorities differ slightly as to the minimum resistance which can be permitted without introducing the danger of cutting off side-bands with over-sharp tuning, but it is agreed that it is within the limits which can be achieved fairly easily with a good modern coil; it is then natural to wonder whether we have reached finality in coil design, for if we must not go below a certain resistance value, and that value has been achieved, why worry about further reduction of losses?

### NOT "Good Enough."

This seems so reasonable an attitude that it has received the blessing of certain quite responsible people, who have declared that the present improved types of coil are good enough, and that no further improvement is required. Nevertheless, I feel that this attitude is based upon incomplete reasoning, and will not bear close examination. It seems to me that the exponents of the "good enough" doctrine are forgetting that their coils are *not used alone*; they are in practically every case associated with other constituents of a complete receiver which add "damping" to the circuit, and so produce an effect which is equivalent to the addition of sundry ohms to the resistance of the coil.

This damping may be that produced by the association of an aerial or the circuits of a valve, but it is present in a surprisingly large number of cases, and to my mind vitiates completely the arguments in favour of stagnation in coil design. What we should rather do is to make an estimate of the order of the added damping and then try to produce a coil which is *better* by that number of ohms than the theoretically permissible minimum. So shall we arrive at the desired degree of selectivity, and this calls for coils considerably better than those in common use. Further comment is, I feel, superfluous.

When referring to the screened coil, of course I mean the coil itself without relation to the screen. When the latter is placed in position it naturally raises the resistance of the coil considerably, and the values which I gave (5 to 10 ohms) do not necessarily apply.

## AN EXTENSION LEAD DANGER.

It is now realised by most amateurs that when telephone or loud-speaker extension leads of any considerable length are used some sort of H.T. by-pass system is essential. This generally takes the form of an L.F. choke and a 2-mfd. fixed condenser. The former is connected in place of the reproducing instrument (speaker or 'phones) on the set, and the latter is placed in series with one of the extension leads.

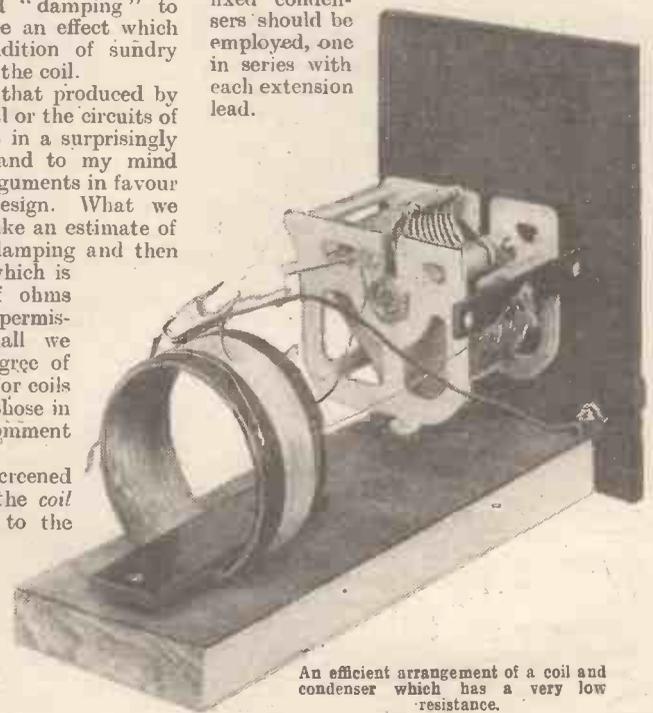
Thus the steady H.T. current does not flow right round the extension system on its journey from the plate of the last valve to the filament negative or positive—only the L.F. impulses follow this route. The steady H.T. current has been "by-passed" through the choke. On the strength of this many amateurs erect flimsy extension leads, using thin, badly insulated wire. But the H.T. has not been completely isolated from the leads. H.T. positive will be directly connected "metallically" to one of the extension leads, although it may happen that the L.F. choke is connected in series with it.

Now the negative terminal of the H.T. battery is always earthed through the L.T. battery. Therefore the H.T. can leak to earth through the extension lead if this is not very carefully insulated.

### Use Two Condensers.

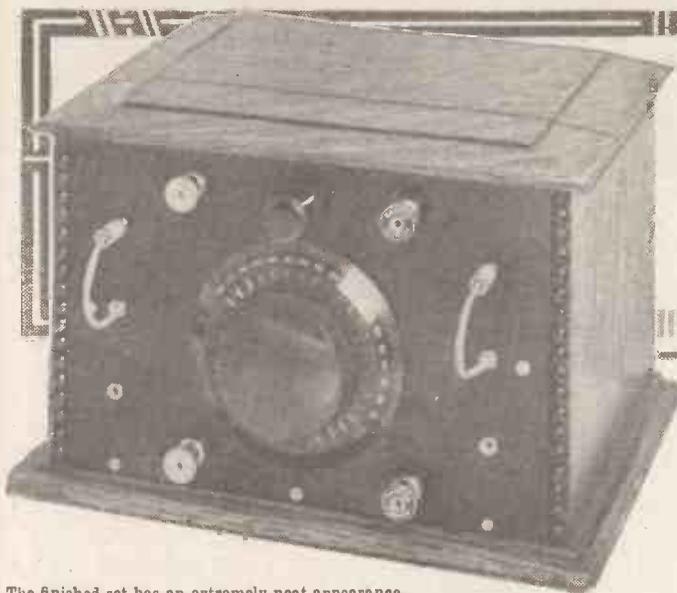
On the strength of a choke-condenser by-pass we knew of an amateur who actually ran a pair of extension leads out of one window into another over the outside of the walls of a house in places in actual contact with metal objects such as drain pipes. The wire used was double cotton-covered, and in wet weather serious leakage occurred, with the result that H.T. batteries were rapidly exhausted and loud "artificial statics" caused.

To ensure complete safety two large fixed condensers should be employed, one in series with each extension lead.



An efficient arrangement of a coil and condenser which has a very low resistance.

# THE "THREE-IN-HAND" CRYSTAL SET.



The finished set has an extremely neat appearance.

In this crystal set four different circuits are available, so that whatever system of connections is being used, the constructor has three others that can be utilised according to the conditions prevailing at any given moment. By this means maximum efficiency and signal strength are assured.

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

THE popularity of the crystal receiver continues unabated, and the reasons for this are not hard to find. In spite of the improvements in sets employing

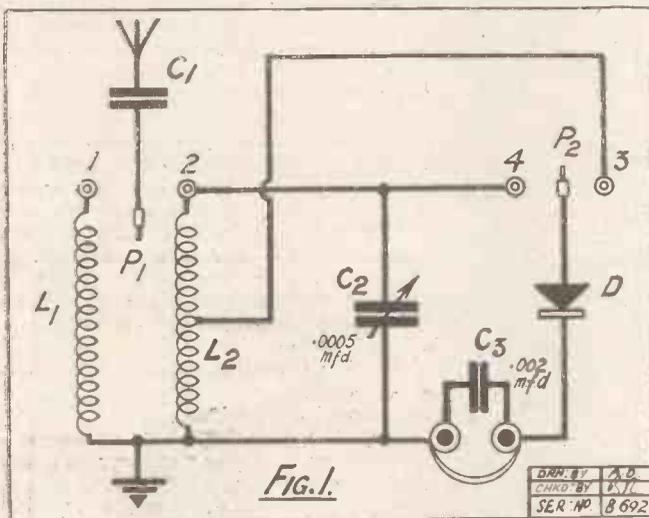
is desirable in order to overcome the effects of some interfering transmission, or in anticipation of the possibility that in the near future alternative programmes from a given station may become a regular feature.

There are many ways in which the desired measure of selectivity may be secured, and the receiver described in this article, by a simple plug-and-socket arrangement, gives a choice of one of four possible circuits, three of which will be found selective.

### The Connections Required.

Reference to Fig. 1 will indicate the scheme adopted.  $C_1$  is a clip-in condenser, and  $L_1$  a plug-in coil of the usual variety. These may be adjusted to give the best ratio of inductance to capacity in order to secure good signal reception.  $L_2$  is a Dimic coil coupled to  $L_1$ , tuning being effected through the medium of a .0005 condenser,  $C_2$ . The plug  $P_1$  can be inserted into sockets 1 or 2 to give "aperiodic" or direct aerial coupling. The plug  $P_2$ , attached to one end of the crystal detector, enables  $D$  to be tapped

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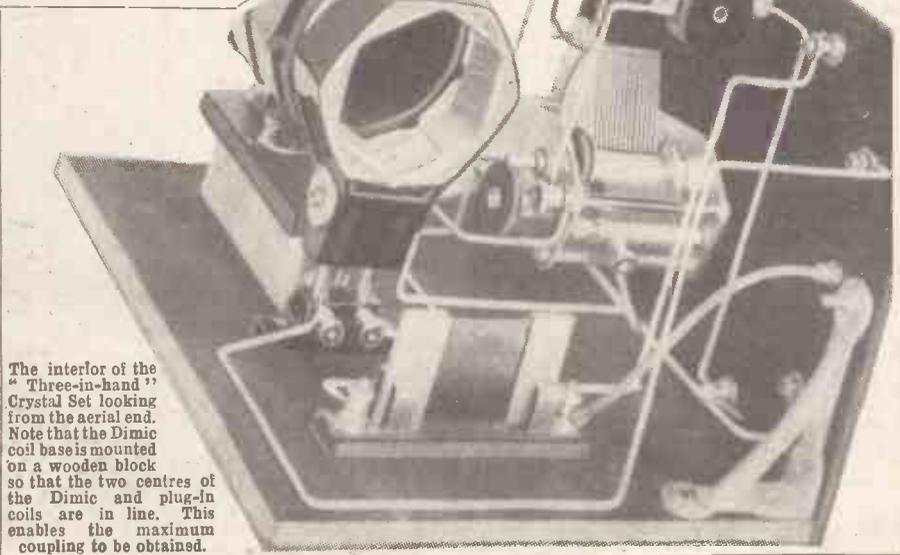


Readers will recall the interesting experimental transmissions made some time ago when two different programmes were sent out from the same centre, at the same time, but on two different wave-lengths. The wave-length difference was of the order of 100 metres, and many owners of crystal sets found difficulty in tuning in one programme to the exclusion of the other.

valves as rectifiers of the incoming signals, no one can deny that the plain crystal still holds the palm for purity of reproduction. This may be due in some measure to the fact that no crystal receiver can really be so selective as to cut out the side bands, and for local station reception many amateurs prefer to have a "home" set consisting of a crystal rectifier and two or three stages of resistance-capacity coupling to bring the volume up to full loud-speaker strength. Added to this we have the all-important factor of cheapness, as far as first cost is concerned, and the absence of renewals or battery upkeep in favour of the crystal set.

### A Variety of Circuits.

Again, there are many and varied circuits which can be experimented with; so that the crystal user, if he so desires, can obtain useful information as to the type of circuit best suited to meet the demands of local conditions. In this connection one often finds that a certain measure of selectivity



The interior of the "Three-in-Hand" Crystal Set looking from the aerial end. Note that the Dimic coil bases mounted on a wooden block so that the two centres of the Dimic and plug-in coils are in line. This enables the maximum coupling to be obtained.

**THE "THREE-IN-HAND" CRYSTAL SET.**  
(Continued from previous page.)

across half or all the coil  $L_2$ . An examination of the resulting circuits will be made later, and for the present attention must be focussed on the details of construction. Elsewhere will be found a list of the

**COMPONENTS AND MATERIALS REQUIRED.**

- One ebonite panel, 9 in. x 6 in. x by  $\frac{3}{8}$  in.
- One "Popular" oak cabinet with hinged top to take a box panel, with loose baseboard  $7\frac{1}{2}$  in. deep.
- One .0005 variable condenser.
- One permanent mineral detector for one-hole fixing.
- Two Dimic coils (No. 1 and No. 3).
- One base for above.
- One single coil holder.
- One .002 fixed condenser.
- One .0002 clip-in condenser.
- One base with clips for above.
- Four terminals marked aerial, earth and 'phones, two plugs and six sockets.
- One pair small aluminium brackets.
- Short length of rubber covered flex, Glazite for wiring up, and a few wood screws, etc.

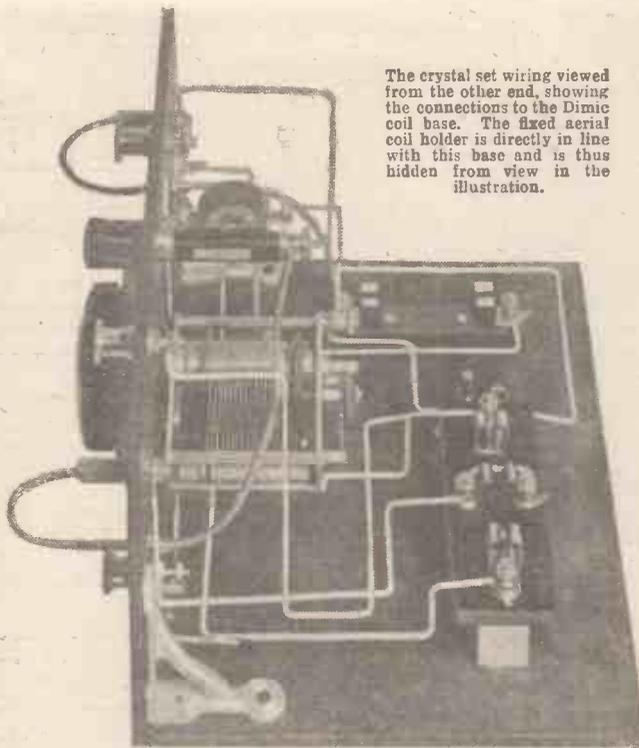
components incorporated in this neat little set and, while in some cases substitutes may be used, it is not advisable to deviate much from the arrangement adopted.

Operations can be commenced by filing up the ebonite panel so that a reasonably close fit is secured in the cabinet. The measurements for marking out the panel will be found in Fig. 2, and if the scribed lines made on the back of the panel are difficult to see, rub a little white chalk over the points of intersection where centre-punch marks are to be made.

**Mounting Components.**

After removal of any superfluous chalk, these lines will be thrown into relief, and the exact positions for the required holes can then be found. The next step, after all the drilling has been accomplished, is to screw the panel to the loose baseboard and mark off the position of the angle brackets, and this is preferably done when the panel and baseboard are in position.

The constructor can then proceed to mount all the components, the positions of those on



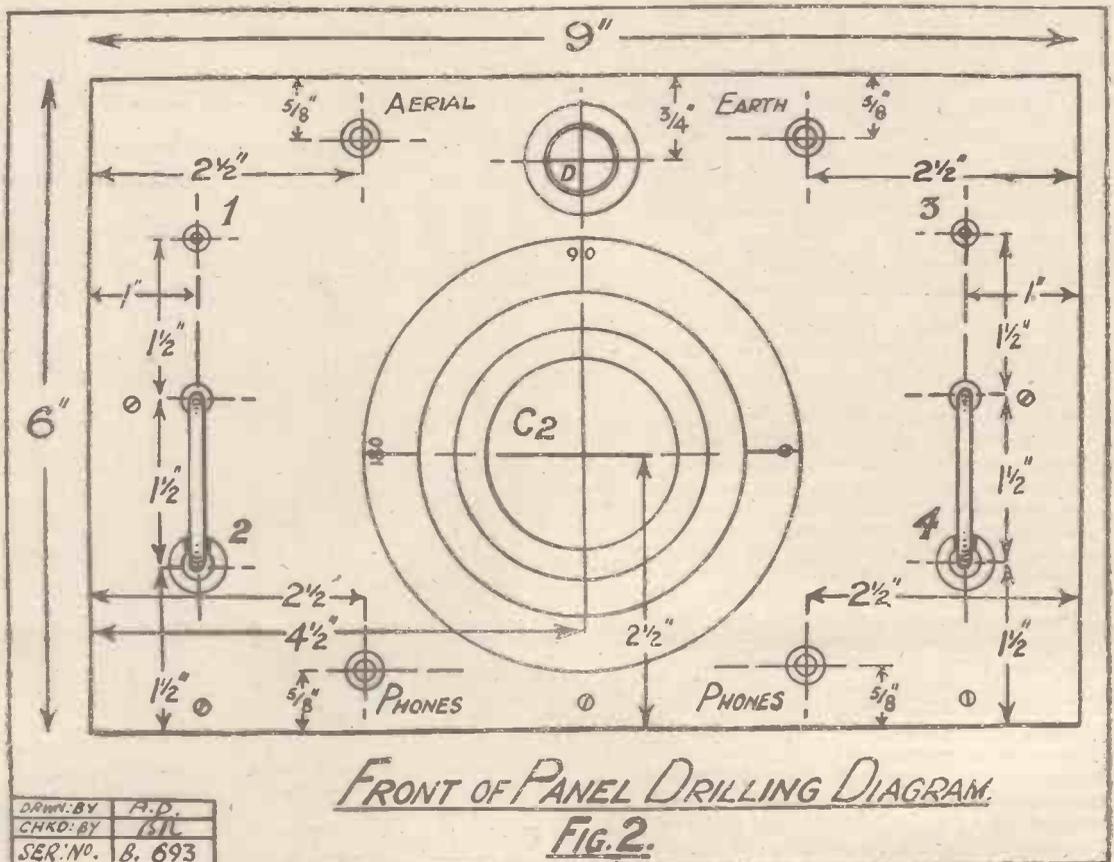
ing this block to the baseboard being sunk into the underside of the baseboard. Another mounting detail which calls for comment is the position of the Watmel condenser  $C_3$ . It is mounted in juxtaposition to the permanent detector, the terminal bracket and holding screw for the latter (see Fig. 3), being conveniently attached to the condenser through the medium of the existing hole in one of the condenser lugs. Once secured no strain will be brought to bear on this component, so that it is quite an efficient arrangement, but if preferred the condenser can be screwed to the baseboard between the telephone terminals.

**Close Coupling.**

The single coil holder should be brought as close as possible to the Dimic base so as to ensure proper coupling between the coils. Now follow the wiring instructions, little difficulty being experienced with this operation since guidance is obtained from wiring diagram Fig. 4, and the accompanying photographs. It is always advisable to check this work after completion.

the baseboard being found by reference to the wiring diagram (back of panel), Fig. 4. In order to bring into line the centres of the plug-in and Dimic coils, the Dimic base is screwed on to a small wooden block  $1\frac{1}{8}$  in. high, as can be seen from the photographs, the screws for hold-

tween the coils. Now follow the wiring instructions, little difficulty being experienced with this operation since guidance is obtained from wiring diagram Fig. 4, and the accompanying photographs. It is always advisable to check this work after completion.



# THE "THREE-IN-HAND" CRYSTAL SET.

(Continued from previous page.)

tion. Those constructors who find the soldering iron rather a clumsy tool to handle, can make use of the nuts and terminals on most of the components, making sure that they are well screwed home after the wire has been inserted underneath the terminal shank. If the joints are soldered, be quite

### POINT-TO-POINT WIRING.

Join socket 2 to socket 4, thence to one end of  $L_2$  base and fixed plates of  $C_2$ .

Join the junction between the crystal detector and  $C_3$  to one telephone terminal.

Join remaining side of  $C_3$  to moving plates of  $C_2$ , thence to remaining end of  $L_2$  base and remaining telephone terminal.

Join aerial terminal to one end of  $C_1$  base.

Join one end of a flexible lead to a plug, pass loose end of flex through bushed hole between sockets 1 and 2 and join to remaining end of  $C_1$  base.

Join socket 1 to one side of  $L_1$  single coil holder, the other side of the holder being joined to the earth terminal and junction of  $C_2$  and  $L_2$ .

Join socket 3 to both centre-tap terminals of  $L_2$  base.

Join one end of a flexible lead to a plug, pass loose end of flex through bushed hole between sockets 3 and 4 and join to vacant terminal on crystal detector.

sure to remove any superfluous flux after the operation, and use a well-tinned bit heated to the right temperature.

The constructor is now ready for an aerial test, and the composite diagram of Fig. 5 shows the four circuits to be tried out. A, of course, is quite the orthodox scheme, and is obtained by inserting  $P_1$  into socket 2 and  $P_2$  into socket 4. A No. 1 Dimic coil must be clipped into the base as  $L_2$ , while the value of  $C_1$  can be determined by experiment, the usual order being .0002. Now tune in the local station, after having attached the aerial, earth and 'phone leads to the terminals so marked.

### Improving Selectivity.

Remember that the crystal detector used in this set is of the permanent type, and the cap over the plunger must only be removed in case of emergency. If the sensitivity of the detector appears to have become reduced, due perhaps to rough handling whilst installing, the ebonite knob must be pulled out, rotated in either direction very slightly and then gently released. On no account must the plunger spring back suddenly or damage to the crystals may be the outcome.

Now, lack of selectivity in a crystal set is mainly due to the presence of resistance where it is not wanted. The aerial-earth system must be examined to remove all possible sources of losses, since the energy passed to the crystal is derived entirely from the aerial and not from any local source, such as batteries, as is the case with valve sets. Apart from this, however, we have the damping introduced by the crystal circuit shunted across the whole

coil  $L_2$ . This is reduced by inserting plug  $P_2$  into socket 3, this giving B of Fig. 5, the crystal then being tapped across half  $L_2$ . Selectivity is now improved without any marked diminution in signal strength.

Further improvements in selectivity are obtained by resorting to the so-called "aperiodic" aerial coupling, and the circuit of C may be tried by inserting  $P_1$  into socket 1 and  $P_2$  into socket 4. Coil  $L_1$  should be a No. 50 or 60, or the equivalent in lettered makes, and it will be found that although signal strength may suffer slightly the gain in selectivity, if that condition is desired, will more than compensate for the small loss. The D circuit, brought about by changing  $P_2$  from 4 to 3, is the most selective of the four possible combinations that can be tried with this receiver. When

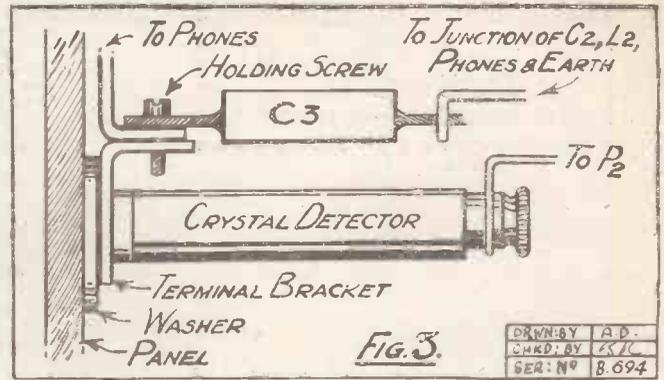


FIG. 3.

DRAWN BY	A. D.
CHECKED BY	S. J. C.
SER. NO.	8.694

tested on an aerial ten miles north-west of 2 L O, that station came in at good telephone strength with this arrangement, but a few degrees movement of  $C_2$  on either side of the optimum tuning position gave silence.

The Daventry station can be received by substituting Dimic coil No. 3 for No. 1, and a No. 200 coil for the previous one in position  $L_1$ . The value of the condenser  $C_1$

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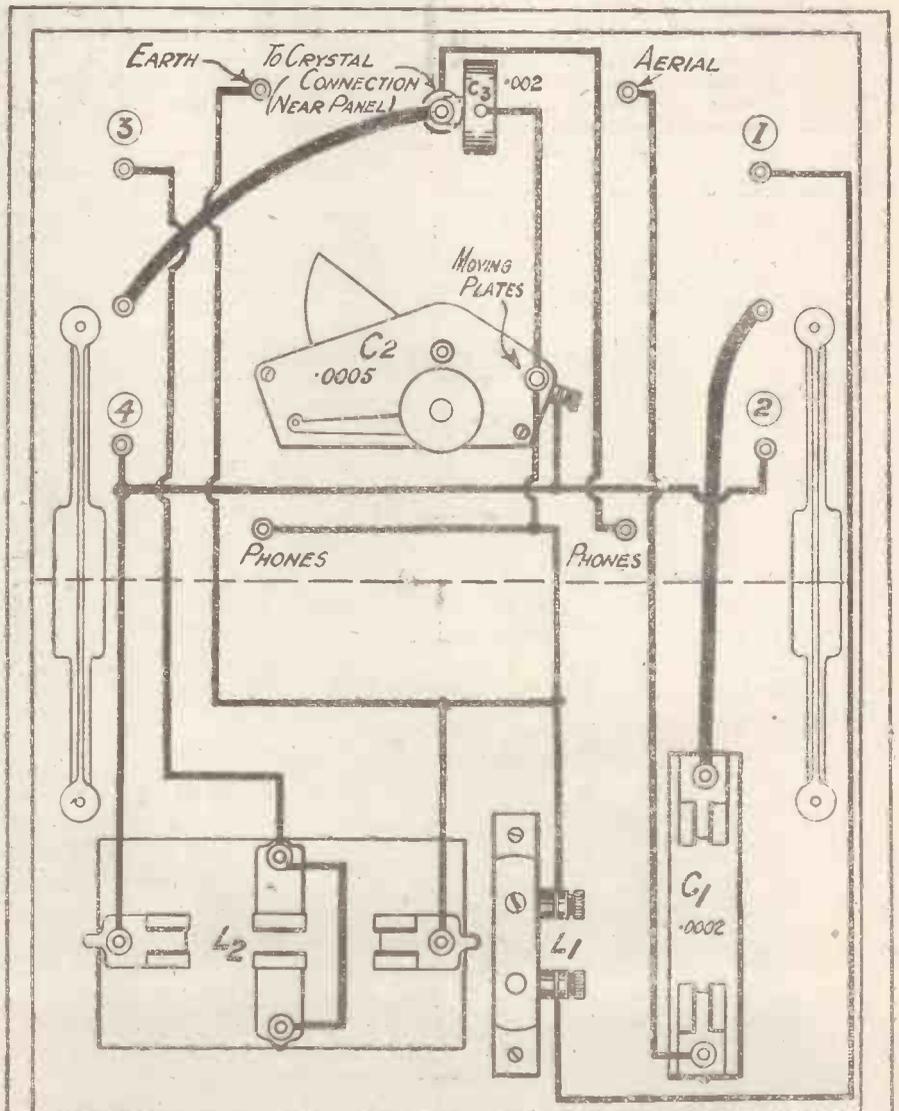


FIG. 4.

WIRING DIAGRAM

DRAWN BY	A. D.
CHECKED BY	S. J. C.
SER. NO.	8.696

# THE "THREE-IN-HAND" CRYSTAL SET.

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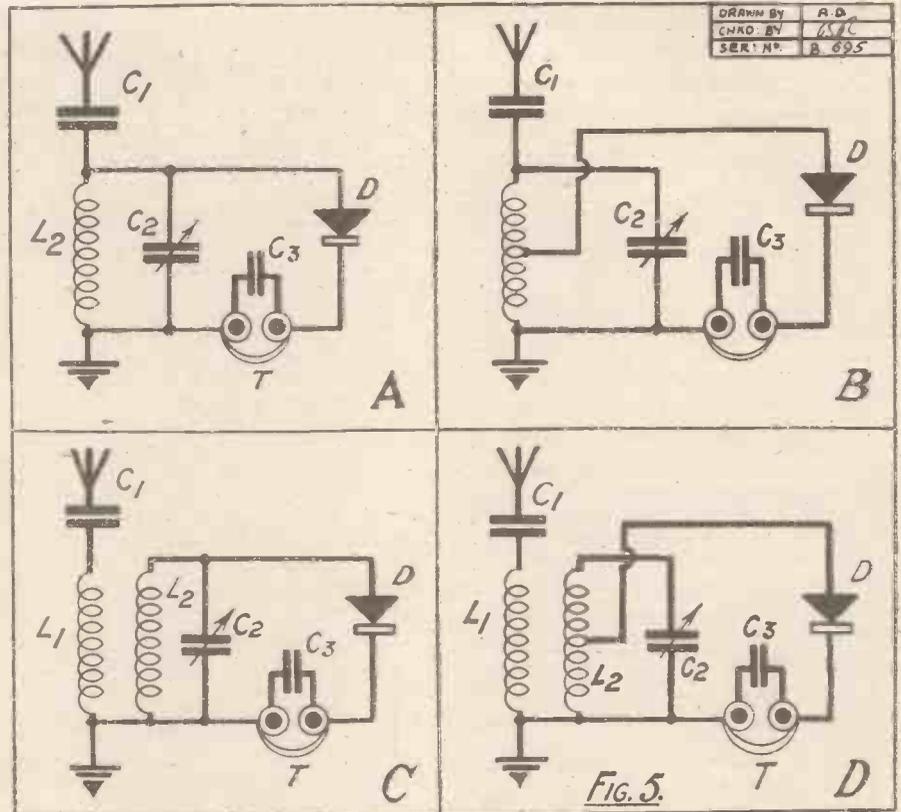
may also have to be changed, but a little trial will soon settle this point, as it depends on the aerial constants.

The potential constructor of this receiver can thus see that the arrangement adopted will meet most of the demands likely to be made on a crystal set, and in addition to performing its functions with every satisfaction the completed set, provided due care is taken in its construction, will be a neat addition to the home.

### Why Selectivity?

It may be argued by many constructors that there is no real need for selectivity where a crystal set is concerned, that such a receiver is designed for, and, indeed is limited to, the reception of the local station, and that to trouble about its "cutting out" properties is sheer waste of time and energy. To those critics I could point out that there are a great many constructors to whom the need for selectivity, even in a crystal set, is most pressing.

Listeners who live on the coast, near stations such as Bournemouth, Plymouth, Cardiff, Swansea, Liverpool, to name but a few, besides those to the east of 2 L O, often have their programmes spoiled by 300 and 600 metre Morse if their crystal sets are not selective. This receiver caters for such listeners and will remove a great deal of their troubles. Then again there are those near enough to Daventry to make



that station objectionable when 5 IT is required and vice-versa, and for those also the "Three-in-hand" will be a veritable blessing.

# TURNING OUT THE H.F. VALVE.

By HUMPHREY PURCELL.

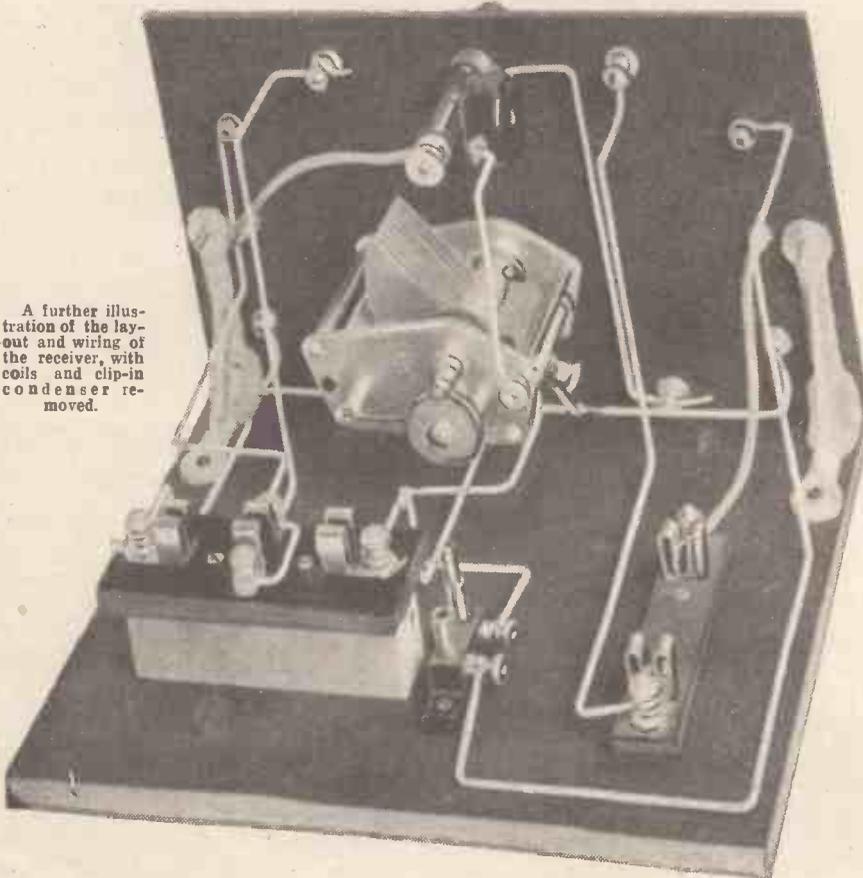
WHEN a set includes a stage of high frequency, coupled by means of a "tuned anode," it is possible to turn out the filament of the H.F. valve and still receive signals from the local station substantially as loud as when all the valves are working. The internal capacity of the first valve is in such circumstances sufficient to pass the H.F. currents on to the detector.

### De-neutralising.

If, however, the H.F. stage has been neutralised, it is obvious that this cannot be done in so simple a manner, because the whole purpose of neutralising is to balance out the inter-electrode capacity of the H.F. valve. One of the methods of adjusting a neutralised set is, of course, to tune in the local station, break the filament circuit of the first valve, and then adjust the neutralising condenser until signals are quite inaudible or very faint.

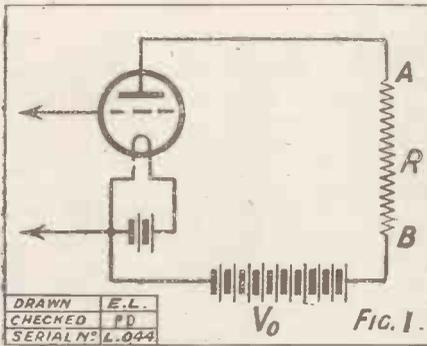
If it is desired to use the set for listening to the local station with the H.F. valve unlit, it will be necessary to reinstate the internal capacity of the valve. Provided a good neutralising condenser is used, and it is of the type which permits the user to re-set it at any desired reading—e.g. by reference to a dial—it will be found that by turning this condenser to its minimum reading the set will function as though it had not been designed on neutrodyne lines. Care must be taken, of course, to readjust the balancing condenser before the H.F. valve is again used.

A further illustration of the layout and wiring of the receiver, with coils and clip-in condenser removed.



MR. JOHN SCOTT-TAGGART'S recent article on dynamic valve characteristics appears to me to be an attempt to draw a red herring across the valve track, as surely the static characteristic of a valve is now accepted as representing very fairly the behaviour of that valve up to all but the highest frequencies. In other words, the speed of the current carrying electrons is sufficiently high to be neglected under all but extremely rapid alternations, such as those occurring on waves of the order of ten metres or under.

What I understand Mr. Scott-Taggart to mean by the "dynamic" characteristic of the valve is not the characteristic of the



valve alone, but that of the valve and circuit in combination, and whatever is the use of publishing such characteristics when every circuit used is different?

Let us take a normal valve characteristic, as in Fig. 2. It represents three variables— $V_g$  the grid volts;  $V_a$ , the plate volts; and  $I_a$  the plate current—and we can say that whatever value any two of the variables are fixed at, the third one is immutably determined by the characteristic. Thus, if the plate volts are made 100 simultaneously with the grid volts being made -6, then without any appreciable lag in time whatever, the plate current assumes a value of 5 milliamperes. If we are careless enough to put a resistance in between our supply of volts and the plate and assume that the 100 volts are really applied to the plate, we shall get a result not agreeing with the characteristic, but that will be our fault.

"All We Need—"

The static characteristic gives us all we need to know about the valve to determine its action when placed in any circuit the properties of which we know, providing, of course, the manufacturer has not played such tricks as introducing exceptionally large capacities between the leading-out wires, or given us a very soft valve which owing to the presence of slow-moving atoms, may quite easily behave different dynamically from statically. But manufacturers do not usually do these things—it would be bad for their business.

Admittedly valves vary in filament efficiencies and lives and in nicely shaped

# ARE DYNAMIC CURVES MISLEADING?

An article appeared in our issue of January 8th, in which Mr. John Scott-Taggart expressed the opinion that dynamic valve curves are far more useful from a practical point of view than static curves. In this article Capt. H. J. Round carries the discussion a step further, and gives his views on the subject.

By CAPT. H. J. ROUND, M.I.E.E.  
(Chief of the Research Dept., Marconi Co.)

characteristic curves, but this does not alter the fact that the static characteristic represents the behaviour of the valve under all usual conditions, and from the static characteristic the expert will be able to prophesy the current, voltage and power output with various grid inputs at different frequencies, with any circuit of which he knows the constants.

Using Static Curves.

One must admit the subject is difficult, particularly for a non-mathematically minded person, and one can easily quarrel with the published characteristics, because they are drawn in what I believe to be the wrong way for easy working. But no one who has thought seriously over the subject ever imagines that the characteristic lines are the *operating lines*, and if Mr. Scott-Taggart will look up his own journals ("Wireless Weekly," October 22, 1924; February 18, 1925; "Modern Wireless," March, 1925) he will find some articles by me on graphical ways of working out what he calls the "dynamic characteristic."

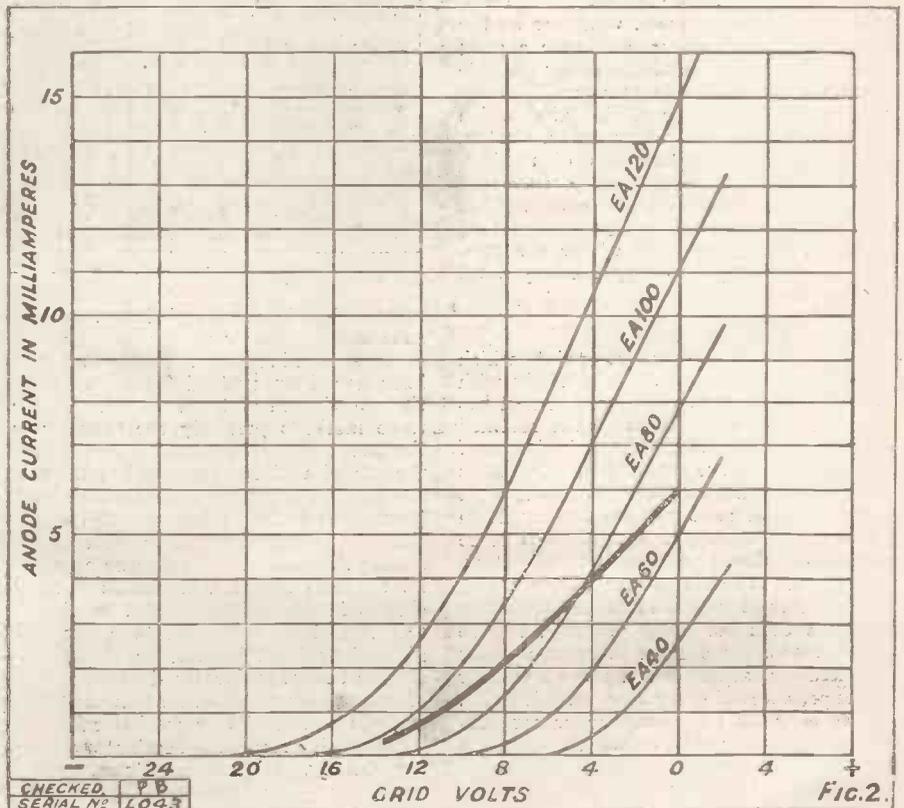
battery, and under normal happenings no voltage ever gets induced into this circuit except that given by  $V_0$ , therefore  $V_0$  is always the total voltage in the circuit.

If a current  $I$  is flowing, then the resistance absorbs  $IR$  volts and therefore  $V_0 - IR$  is the voltage left for the valve. We have thus  $V_0 - IR$  as the valve voltage (and not  $V_0$ ),  $I$  the valve current, and picking up our valve characteristic we can plot the point on it representing this condition of the valve, and incidentally read off the valve grid volts  $V_g$  which *must* be present for this condition to occur.

Dynamic Characteristic.

Do this for several points, as I have done with a D.E.P. 215 valve and 5,000 ohms resistance in Fig. 2, and from all the points we get this so-called "dynamic" characteristic.

As we know that with all normal valve working we must neither run into grid current nor into the condition of no plate current, the line as I show it represents the (Continued on page 1456.)



# TECHNICAL NOTES.

A Weekly Feature Conducted by

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

IN these days of electrolytic rectifiers and trickle chargers one is sometimes apt to forget that there are many people who are "still old-fashioned enough" (as one of them said to me recently) to prefer to stick to their 60 or 100 amp.-hour accumulators, and to charge them up at 5 to 7 amps once a fortnight. For this rate of charge the ordinary electrolytic rectifier is unsuitable, and the vibratory or rotary rectifier comes into its own. The vibratory rectifier, as most of my readers know, depends upon the motion of a reed carrying a magnetic armature, which reed vibrates in the alternating field set up by the a.c. current which it is desired to rectify. The reed vibrates synchronously (that is, "in tune" with the alternations of the current) and makes and breaks a contact in such a way that one half of the wave is allowed to pass whilst the other half is cut off, or (if the rectifier be a "full-wave" rectifier) in such a way that the two halves are directed into the same channel and in the same direction.

## Vibratory Rectifiers.

These little vibratory rectifiers are often very efficient, since there is little voltage loss, a voltage of 10 volts or even less, delivered from the low tension output side of the step-down transformer, being sufficient for the charging of a 6-volt battery. Moreover, they are often capable of delivering quite large currents, up to seven amperes of direct current. When properly adjusted, there should be no spark whatever at the make-and-break contact, and with a good type of charger it should be easily possible to attain and maintain this condition. I have myself a charger of this kind which works perfectly for hours at a stretch, delivering about ten amperes of rectified current. This particular charger is used for a car battery, to enable it to "catch up" to the heavy drain due to headlamps, etc., being on during the long winter evenings, with little charging during the day from the generator.

## One Important Point.

There is one important point which should always be looked to carefully with this kind of charger, however, and that has reference to the direction of the rectified current. An ammeter (or any indicator of the direction of the current) should always be kept in circuit, as these chargers are apt to reverse and so to run the battery down instead of charging it up. This is more particularly liable to happen at the start, and appears to be due to the reed not getting into the correct type of vibration. Once the reed has been got going properly, I have never known the charger to reverse whilst in operation, although I am open to hear the experiences of other users on this point. These chargers have another minor disadvantage, and that is that they emit a continuous "droning" hum, which is apt to be disagreeable to some people, particularly those not sympathetically inclined to

mechanical devices. Personally, I get the same sort of satisfaction from hearing a charger "humming" nicely as I do from hearing a car engine doing the same thing—a sign that all is well. But some people feel quite otherwise, and regard it as an intolerable nuisance. Here the valve or electrolytic rectifier has an important advantage.

## Wave-length Control.

With the increasing congestion of the ether it is essential not only that transmitting stations be given appropriate wave-lengths, but that they keep strictly to their allotted lengths. This matter of the keeping

natural frequency may be taken high enough for radio purposes, and the crystal, when suitably introduced into an oscillatory circuit, will control that circuit and cause it to oscillate at an extremely uniform frequency.

The use of quartz crystal oscillators for controlling wireless transmissions has been developed quite considerably in the United States during the past year or two, and station WGY is an example of a station which employs this method for the standardisation of its wave-length. The method is to use the crystal in a low-power circuit of perhaps 5 watts, subsequently amplifying in successive stages (but without disturbing the frequency) until the actual transmitter is reached.

A remarkable diaphragm for use both in headphones and in loud speakers has been developed lately by Eugen Reisz, the well-known telephone engineer, and, according to reports, gives an almost uniform amplification of notes between about 150 and 8,000 vibrations per second, with consequent purity and faithfulness of reproduction.

The system underlying the new speaker



Sir John C. W. Reith (third from left) in the control-room of the Glasgow station.

to an assigned wave-length is not so simple as it might seem, or at any rate it *was* not so simple until recently. Different methods have now been evolved for the control of the wave-length of transmission, and of all these methods probably the simplest and the most reliable is that which depends upon the use of a piece of piezo-electric quartz. No doubt every reader knows that quartz (as well as certain other crystals) exhibits the "piezo-electric effect"; that is, if an electrical potential difference be applied to its opposite surfaces, it suffers a minute change in dimensions, whilst, on the contrary, if it be subjected to a change of dimensions (that is, if it be strained), an electric charge is developed at its surfaces. If alternating potentials be applied to its surfaces it will vibrate mechanically.

Since it is a mechanical oscillatory system, it has, like all other such systems, a natural frequency of vibration. By taking a sufficiently small piece of the crystal, this

is really an old one, namely, the use of a condenser the plates of which vibrate in accordance with the incoming speech-currents. In the new Reisz reproducer a metal plate is used as background, and before this and in very close proximity with it is a rubber-sheet diaphragm.

## Particularly Novel Feature.

The particularly novel feature comes in in connection with this diaphragm, which is covered over its inner surface with carbon granules, secured to it by means of an adhesive. The metal plate is perforated all over its area in order to allow of the escape of the sound-waves produced by the alternate to-and-fro motion of the rubber diaphragm. The layer of carbon granules forms one electrode of the speaker and the metal plate the other, the speech-currents being fed to these two electrodes. The capacity of the diaphragm condenser as

(Continued on page 1455.)



## POINTS WORTH REMEMBERING.

Many of the troubles that occur in wireless receivers can be traced to the unfortunate choice of components.

By J. R. WHEATLEY.

**P**ROBABLY the most important part of a wireless installation is the aerial, as the whole efficiency of the set depends to a very great extent on this. Trouble, and even a great deal of time, spent in erecting the best possible aerial is energy well spent. Remember to keep the aerial as high as possible, well insulated, and well away from iron pipes, gutters, etc. Although the actual wire used, whether insulated or not, does not matter to any great extent, do not under any circumstances employ wire that will snap when it is subjected to the least strain.

Make sure that the pulley is intended for use with a fairly thin halyard or it is sure to jam. Quite a good idea is to employ a wire halyard of a similar kind to that of the aerial. All the connections to the lead-in should also be well soldered.

When a buried earth-plate is used, this should be of sufficient area to prevent rapid corrosion. If the water pipe is employed, do not forget to thoroughly clean the surface before attaching the earth clip.

When obtaining a variable condenser, make sure that it is suited for the particular class of work for which you intend it.

### Condenser Contacts.

Examine the connection between the moving vanes and the connecting terminal; if purely a rubbing contact, steer clear of it, or endless trouble may be the result.

If it is for use in a circuit where a short would have some disastrous effect, examine the spacing of the vanes and the insulation between the fixed and moving plates.

Never buy cheap fixed condensers; sometimes you are lucky, but ninety-nine cases out of a hundred you will be unlucky. Make sure that you are getting the value you intended.

If the salesman has not a .002 in stock, don't think that .002 or a .02 is the same. It is like buying a bath in place of a teacup. Obtain a grid leak of the same make as the grid condenser (if this is intended to be a combined unit), the grid leak will then fit firmly in the clips.

It is possible to obtain accumulators

at a very low figure, but make sure that these are intended for the number and type of valves you have in use. It is better to keep an accumulator continuously at work, instead of lying idle.

If the accumulator has to be charged outside, the better plan is to have two accumulators of a fairly low capacity than one of a high capacity. In this way not only are you always sure of having an accumulator available, but it is also far better for the accumulators.

### H.T. Batteries.

Do not, under any circumstances, buy cheap H.T. batteries, they can rarely, if ever, be relied upon to give a constant and unflinching output over a given period.



Mr. J. L. Baird in front of the transmitting portion of his apparatus.

If a multi-valve set is in use, or one or more power valves, an H.T. eliminator or H.T. accumulator is a sound investment. Always store dry batteries in a dry place, and to stand them on a sheet of glass is a good plan.

### The Treatment of Coils.

Coils should not be pulled out of their sockets by the coil itself, but by the holder.

Often curious crackling and intermittent reception can be traced to a faulty coil contact, due to such careless handling. Occasionally clean the plugs of the coils, holders and valve pins, scraping them with a penknife and slightly opening until they fit snugly, but not tightly in their sockets.

When you decide to buy an extra pair of 'phones, do not forget that money spent on a good pair is well invested. Buy a reliable make and you will never regret it.

Loud speakers, of which there are so many kinds, offer a big field for the "dud" manufacturer. Do not be misled by thinking that a big horn points to an efficient loud speaker; hear the loud speaker before you buy it. If you have a four-valve set, do not expect efficient results from a loud

speaker designed to operate and give good results from a two-valver under the same conditions.

The following general hints may be helpful. All joints should be soldered, and connections to terminals must be cleaned frequently; dust can be wiped off the plates of variable condensers by means of a pipe cleaner.

Ebonite should be kept in a cool, dry place, and if a fairly large sheet, laid flat. All leads should have a distinctive colour, or the type of wire used may be different, or otherwise one finds oneself putting the H.T. across the filaments when connecting up the set.

Above all, do not be in a hurry; before you decide on anything carefully consider the advantages and disadvantages.

## TELEVISION BY INVISIBLE RAYS.

(Continued from previous page.)

plates immersed in carbon bisulphide, and located between two polarising Nicol prisms. The fluctuating signal-voltages rotate the plane of polarisation through different angles, and thus control the intensity of the light passing through the Nicols. In this way, the transmitted picture is built up or reconstructed on a suitable viewing-screen.

In order to secure any television effect,

it will be clear from the foregoing account that the object must be in close proximity to the rotating disc or obturator system, and also to the sensitive electric "eye." Otherwise it will be impossible to obtain an adequate response from the latter. Further, the object itself must be subjected to light of considerable intensity, whether of infra-red or other rays.

### Considerable Difficulties.

It is accordingly difficult to see how such a system could be employed to give warning of an enemy approach in the darkness, by throwing them into visible relief upon a television screen, unless, indeed, the raiders were sufficiently accommodating to carry

the apparatus with them, and to pose for it from time to time.

It is equally difficult to imagine that any useful effect could be obtained from an "invisible" ray focused upon a distant aeroplane. To be of service, the ray must be able to indicate the position of the enemy craft with sufficient rapidity and accuracy to mark them out as a target for heavy gunfire.

It is inconceivable that this could be done at anything approaching the range of twenty-five miles suggested by the inventor.

It is, of course, possible to utilise infra-red or "invisible" rays to produce photographic effects upon a suitably-prepared plate.

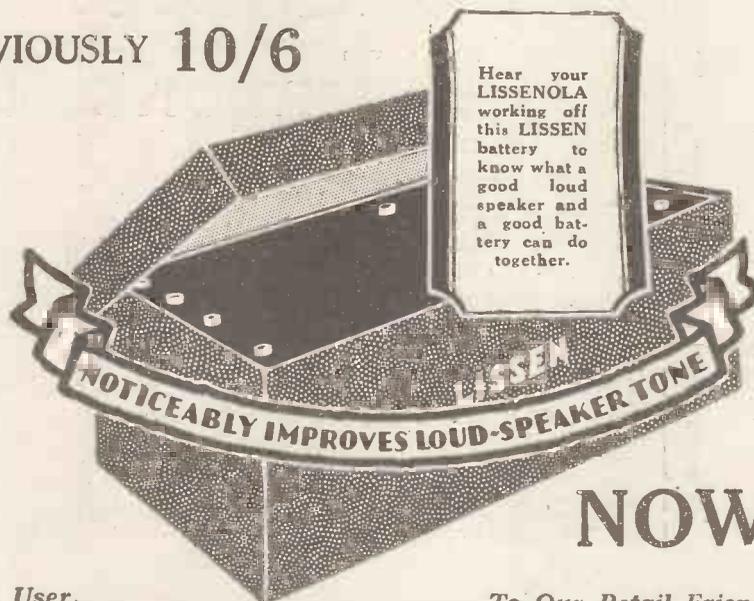
# THE RISKS THAT LISSEN RUN TO SAVE YOU THIS 5/1 ON EVERY BATTERY!

—And a day for all Battery buyers to remember—Monday, January 24th, 1927

On that day the reduced price for the Lissen New Process Battery first came into operation. Before that, however, Lissen had had to take a big risk. Prior to August 16th, 1926, Lissen had been distributing through wholesale factors, but on that day a new policy of direct-from-factory-to-dealer distribution was put into operation by Lissen which eliminated all wholesalers' profits. Intended first for sale at 13/-, it was only possible to sell the Lissen New Process Battery at 10/6 by drastically altering the previous method of distribution, and the decision to do this was fraught with serious possibilities, for Lissen at once had to do business with some thousands of retailers instead of a smaller number of wholesalers. There was a great risk that the wholesalers would use their influence with their retail customers to block the new Lissen policy; at any rate, no wholesaler could be expected to uphold it. **BUT LISSEN HAS WON THROUGH.** That step alone saves users 2/6 on every Lissen New Process Battery purchase, 1/- on many other Lissen parts, and made Lissen mean to the user the best value for money in radio operators.

**NOW LISSEN HAS TAKEN STILL ANOTHER BOLD STEP.** To make the new reduced price for the Lissen New Process Battery possible, a price actually less than many inferior foreign batteries are sold at, Lissen have had to reduce the profit previously allowed to the retail trade and have had to make a big sacrifice in profits themselves as well. No user of H.T. batteries can remain unattracted by the thought of being able to obtain a Lissen New Process Battery for 7/11—and the justification of the new step will come through largely increased sales. It is through the co-operation of our retail friends that Lissen batteries will be made available to you at thousands of shops throughout the country, and we therefore want users to know that it is due to the sacrifice of our retail distributors as well as ourselves that this new low price is made possible. With high price no longer a reason for being without the Lissen New Process Battery, your loud speaker reproduction will be better, volume bigger, and utterance clearer than ever before. The new price now places fine battery characteristics within the reach of all.

PREVIOUSLY 10/6



Hear your LISSENOLA working off this LISSEN battery to know what a good loud speaker and a good battery can do together.

NOW 7/11

**To the User.**

There is no substitute for a LISSEN New Process Battery. Ask for "LISSEN New Process" and see you get it. There is a LISSEN dealer close to you who will be glad to sell it to you. But if any difficulty send direct to factory. No postage charged, but please mention dealer's name and address. Or can be sent C.O.D. Connect two batteries in series when more than 66 volts required. Rated at 60 volts, this LISSEN New Process Battery goes considerably over. Its size is 9½ in. x 4½ in.—IT IS PACKED FULL OF NEW ENERGY.

**To Our Retail Friends.**

We were loth to lower the discount, but we think the new price is going to be justified. Full credits on existing stock have been made to stockists who obtained supplies direct from us, whose claims were in our hands by January 31st, 1927, for any LISSEN New Process Batteries in stock on January 18th which were invoiced in January. Since January 18th batteries have been invoiced to the trade at the new trade price.

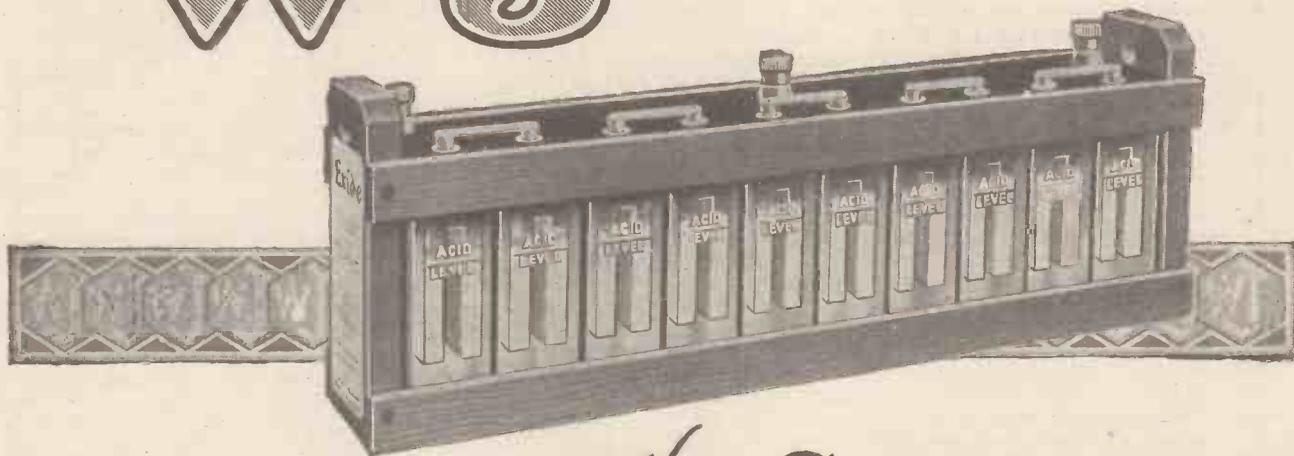
*Buy it, not merely because you prefer British, but because it is the Best Money's Worth*

**LISSEN LTD., 8-16, FRIARS LANE, RICHMOND, SURREY**

Managing Director : THOMAS N. COLE.

Ask for  
TYPE  
**W J**

**CAPACITY**  
**2500** milli-amp.  
hours



**Exide**  
**LOW TENSION**

Exide Cell, Type DBG.

**Types DTG and DFG**  
Specially designed for small discharge currents, and to hold their charge, when not in use, for long periods. Suitable for small Dull Emitter valve sets.

**CAPACITY:**

<b>DTG</b>	<b>DFG</b>
20 amp. hrs.	45 amp. hrs.
Price 4/6	Price 8/6

*The* **Supreme**  
**High Tension Battery**

This battery provides the most satisfactory source of H.T. in existence.

It will stand for six months at least, without detriment or loss of charge even when partially run down, so that its full capacity is available, though the discharge be spread over such periods. It can be recharged, and, reasonably cared for, will last for years.

The discharge is steady, free from fluctuations, and ensures pure reception against a silent background that is a revelation.

**Exide**

**THE**  
**LONG-LIFE BATTERY**



<b>TYPE</b>	<b>2500</b> milli-amp.	<b>9<sup>D</sup></b>
<b>Price</b>	<b>15/-</b> per 20-volt unit	<b>per volt</b>



# An Inexpensive One Valver

**T**HE outstanding features of this receiver are the ease with which it is made and operated, its reliability, and its low cost. It is a straight one-valve set, with no "frills" of any kind, and if a home-made cabinet is used the total cost of the component parts should not be much more than 30s.

As will be seen from the photographs, the set is of the flat-panel type, with the valve and coils arranged upon the panel face. The coil holder is a very simple affair, consisting of one ordinary fixed coil plug, mounted upon the panel, and another coil plug carried upon a moving arm, which is pivoted at one end.

In addition to its low cost, this type of moving-arm reaction control has the advantage that owing to the leverage of the arm, it is quite easy to obtain fine variations in the coupling between the two coils, such

Many people hesitate to take up wireless because they are of the opinion that elaborate and costly apparatus is essential. To be able to listen to the local programmes, and in many cases to those from many other stations, does not necessarily mean the installation of complicated gear. A set that will give you all the enjoyment you want, which should cost well under £5 complete, is described in this article.

By P. R. BIRD.

(Assistant Technical Editor.)

a given part of the wave-length scale. As an example, a 40-turn aerial coil will tune from, say, 170 metres to about 270 metres, when connected "in series."

The same coil, with the aerial condenser "in parallel," would cover the wave-lengths

### LIST OF COMPONENTS.

1 Panel, 8 x 8 x 1/2 in., with box	10	6
4 1/2 in. deep	12	6
1 .0005 variable condenser	3	0
1 Fixed and 1 moving coil holder	3	0
1 Rheostat	1	0
1 Valve holder	1	0
1 Grid condenser, .0002	1	0
1 Grid leak, 2 meg.	1	0
Terminals, wire, screws, etc.	2	6

The "on-off" control is the filament resistance, and beside it will be seen the variable condenser that controls the tuning adjustment. The terminals to the right of the panel are self-explanatory, and the three at the back of the panel are for the aerial and earth leads.

In case the reader is not familiar with the two-aerial-terminals method of switching it may be advisable to explain at this point that in order to make the set suitable for short or for long wave reception, it is necessary to arrange that the tuning

between about 300 and 500 metres. Consequently, by changing over from "series" to "parallel," the coil will cover a very much wider wave-length range than would be possible if the condenser were permanently fixed either in series or in parallel. The method of changing over is simplicity itself, and will be dealt with later.

(Continued on next page.)



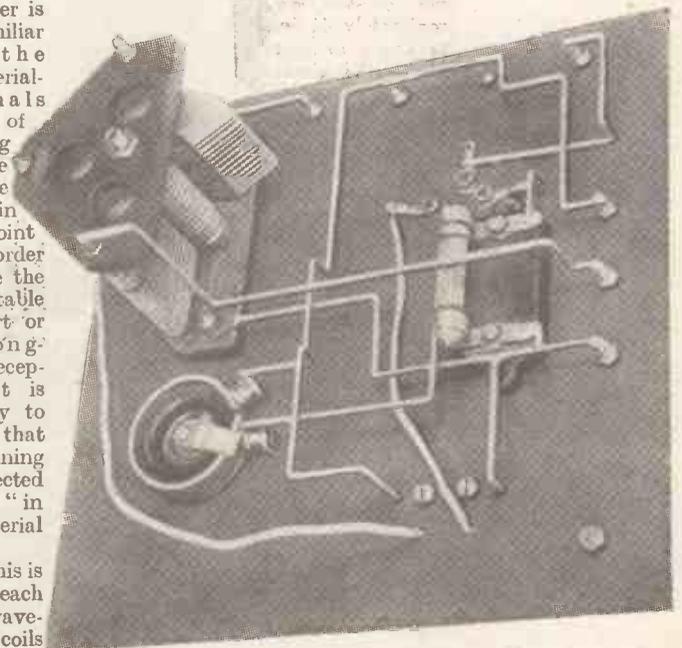
The coil holder and the tuning control—on the left and right respectively—are clearly shown in this illustration.

as is necessary when a distant station is being tuned in. The long arm has the same effect as a slow-motion device, and with it the distance between the two coils can be regulated with a very fine degree of accuracy.

As is usual with sets employing magnetic coupling of this type, the aerial coil is placed in the fixed coil holder, and the reaction coil in the moving one.

condenser can be connected either "in series" or "in parallel" with the aerial coil.

The advantage of this is that in such a circuit each tuning coil has two wave-length ranges, so fewer coils can be employed to cover



This photograph shows the simple nature of the under-panel wiring.

# AN INEXPENSIVE ONE VALVER.

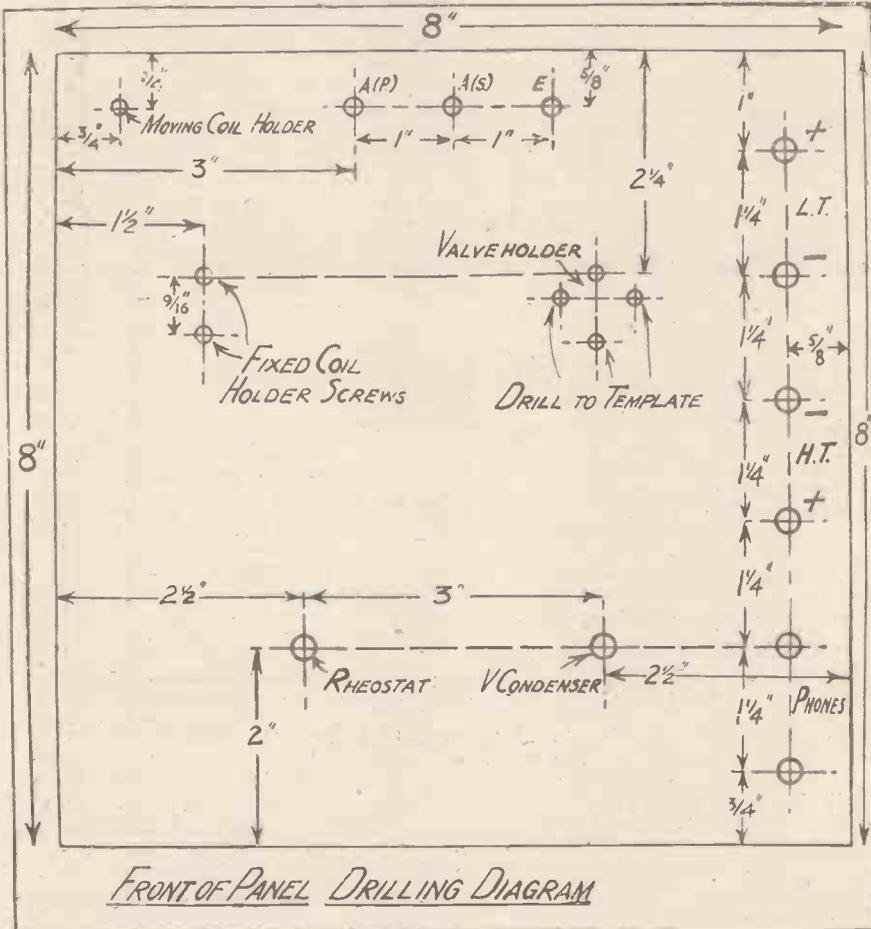
(Continued from previous page.)

In case the constructor decides to make his own cabinet, it should be noted that the

First of all, the panel and case must be made to fit together nicely, and then the former is marked ready for drilling. With the components shown in the photographs, the various dimensions may be taken straight from the front-of-panel drilling diagram. If not, any little discrepancies are easily allowed for, there being plenty of room upon the panel for all the components.

This thickens the shaft sufficiently to allow of its being held securely.

When the drilling is completed the terminals and valve sockets (or valve holder) are mounted, and prepared for soldering. The ends of the terminals should be filed off, and then tinned, the valve contacts being tinned also at this stage. During this part of the work the panel should be kept as clean as possible, as if



### POINT-TO-POINT CONNECTIONS.

Aerial parallel terminal to plug of fixed coil holder, to moving plates of variable condenser and to one side of grid condenser and leak. Other side of grid condenser and leak to grid socket of valve holder.

Aerial series terminal to fixed plates of variable condenser

Earth terminal to L.T. negative, to H.T. negative, to one side of rheostat, and to socket of fixed coil holder. Other side of rheostat to one filament socket of valve holder. Other filament socket to L.T. positive.

Plate socket to plug of moving coil holder. Socket of moving coil holder to one 'phone terminal. Other 'phone terminal to H.T. positive.

brass dust is allowed to remain upon it faults are likely to develop when the set is in use.

The next step is to mount the rheostat, coil holders, and variable condenser. The grid leak and condenser unit need not be affixed to the panel, as it will be supported by its own wiring.

### Wiring Up.

The wiring is very easily carried out, the various connections being clearly shown by the wiring diagram and the back-of-panel photographs. It will be seen that flexible connections are necessary to the reaction coil, though the fixed coil leads have been taken through holes in the panel direct to the coil holder. If desired the leads to the

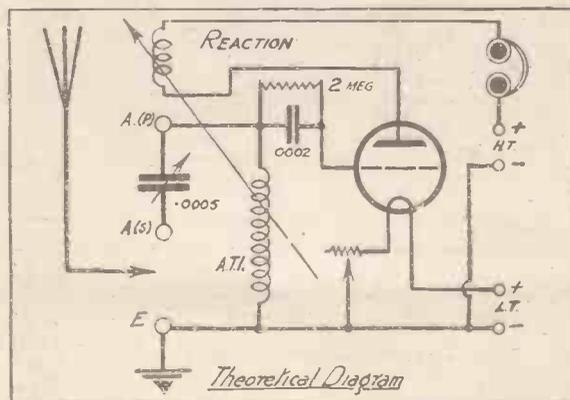
(Continued on page 1425.)

depth of this is approximately 4 1/2 in., the remaining dimensions being arranged to suit the panel, the size of which is given upon the drilling diagram.

The construction is a very easy matter, but for the sake of the novice the following

The actual drilling of the holes is best done with a small hand-drill, such as can be purchased at any wireless dealer's very cheaply.

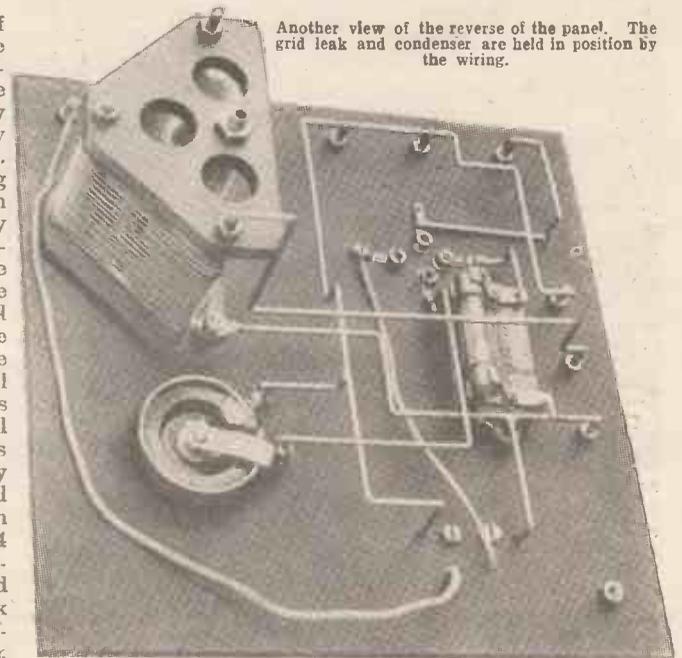
Failing this, an ordinary carpenter's brace can be adapted for use with the small wireless drills. All that is necessary is to wind a length of No. 24 (or similar



instructions are given, which in conjunction with the photographs and diagrams should enable anyone to make the set without the slightest difficulty.

gauge) wire, round and round the shank of the drill before inserting it in the brace.

Another view of the reverse of the panel. The grid leak and condenser are held in position by the wiring.



# WHEREVER RADIO PARTS ARE WANTED—USE LISSEN—

**N**O matter what may be mentioned or used in any circuit of any booklet or periodical you may be building from, remember that the best parts have not necessarily been used. There are many advertising manufacturers—all expect a share in the use and mention of their products, and they usually get it. LISSEN gets a share, too, but obviously it is not possible for the periodical to use all one maker's parts, although they may be known to be the best. Remind yourself of that when building—remember, too, that the best parts are LISSEN, and that if you build with them you will use all the energy available, and get louder, clearer signals from near and far in consequence.

## FACTS OF IMPORTANCE ABOUT LISSEN PARTS—

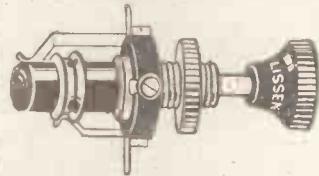
### LISSEN FIXED CONDENSERS



Fixed condensers should be leak-proof, and if they are LISSEN which DELIVER ALL THEIR STORED UP ENERGY ALL THE TIME, nothing is lost. Note the case in the LISSEN condenser, how it can easily be used upright or flat. Then the price of LISSEN FIXED CONDENSERS is half what it was a year ago. The plates are properly laid in a LISSEN—they are homogeneous with each other, and cannot move or come apart. Capacities -0001 to -001, 1/- each (much reduced). Capacities -002 to -006, 1/6 each (much reduced).

DEMAND LISSEN FIXED CONDENSERS.

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LISSEN 2-way Switch.

There is one for every switching need in radio. Designed for radio work where currents are small—they will not waste current. They fit easily—take up little room. LISSEN ONE HOLE FIXING OF COURSE.

	Previously	NOW
LISSEN 2-way	2/9	1/6
LISSEN Series-parallel	3/9	2/6
LISSEN Double Pole Double Throw	4/-	2/6
LISSEN Key Switch	2/6	1/6

### HOW TO MAKE H.T. BATTERIES LAST LONGER

Every ordinary H.T. battery can be made to yield more energy if a LISSEN 2 mfd. (or 1 mfd., but the larger capacity is the better) is put across it. It will absorb all the noises when the battery gets old. Your dealer will be pleased to show you how to connect it easily.



LISSEN (Mansbridge type) Condenser  
2 mfd. 4/8 ; 1 mfd. 3/10.

.01	2/4	1	2/6
.025	2/4	.25	3/-
.05	2/4	5	3/4

Specially moulded case makes it impossible for the condenser to short circuit on to case—a feature exclusive to LISSEN.



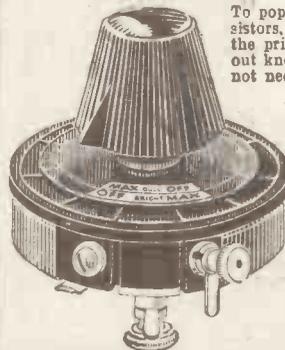
### LISSEN VALVE HOLDER

Has both low losses and also low capacity, twin virtues found in few valve holders. Sent out ready for baseboard mounting but can also be used for panel mounting by bending springs straight.

Patented, Previously 1/8, NOW 1/-

### BASEBOARD RHEOSTATS

Reduced from 1/6 to 2/6



To popularise baseboard mounting resistors, LISSEN has now just reduced the price. Baseboard type are without knob, dial and pointer, which are not needed for baseboard.

	Previously	From Jan. 24.
Prices 7 ohms	2/6	1/6
35 ohms	2/6	1/6
400 Potentiometer	2/6	1/6

QUALITY RHEOSTATS FOR PANEL MOUNTING—previously 4/- NOW 2/6

LISSEN quality—look how they are made, and note the irresistible appeal of price.

	Previously	NOW
LISSEN 7 ohms, pat.	4/-	2/6
LISSEN 35 ohms, pat.	4/-	2/6
LISSEN DUAL, pat.	6/-	4/6
LISSEN Potentiometer, pat.	4/6	2/6

LISSEN ONE HOLE FIXING, OF COURSE.

USE ANY CIRCUIT BUT ONLY LISSEN PARTS, NO MATTER WHAT ELSE MAY BE NAMED, and you will gain in volume and eliminate distortion. LISSEN PARTS—WELL THOUGHT OUT, THEN WELL MADE.

LISSEN LTD., 8-16, FRIARS LANE, RICHMOND, SURREY

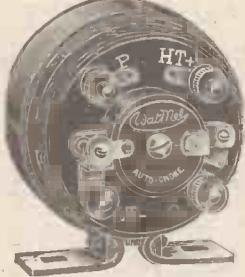
Managing Director: THOMAS N. COLE.

L. 215

# Watmel

## H.F. CHOKE

Double silk-covered wire wound in four accurately balanced sections. Ensures required constant impedance, very low capacity, small external field. Transparent case. Ebonite base. A British product well up to the "Watmel" standard. **7/6**



## AUTO-CHOKE

(Illustrated above.) A famous "Watmel" product. Coils wound in special manner with over a mile of wire. Transformer volume with Choke purity. Totally enclosed winding. Splendid finish. Complete with fixed condenser and resistance mounted. **18/6**

## TAPPED L.F. CHOKE

Same in appearance and method of winding as Auto Choke, but without Condenser and Grid Leak. Winding connected to 3 terminals, giving 3 wiring combinations. For filtered circuits, L.F. circuits, and smoothing circuits in H.T. eliminators. **15/6**



## Variable Grid Leak and Anode Resistance

Resistance continuously variable. Dust-proof case. Elements not affected by changes of temperature. Perfect electrical contact with adjusting screw. Tested before leaving factory. One-hole fixing. Variable Grid Leaks, 5 to 5 megohms, 2/6 each, as illustration. With low loss grid condenser, mounted, 3/ Variable Resistances, 3/6 each.

## FIXED CONDENSERS

Most efficient shape—round. Best ruby mica and finest Bakelite. Accurate to within 5%. In all capacities, 2/- and 2/6. As illustration. Grid Condenser with fixed grid leak incorporated (parallel or to filament) 2/6



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From your dealer or direct from—  
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 Mr. J. B. Levee, 23, Hartley Street,  
 Levenshulme, Manchester.  
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## PUBLIC NOTICE.

I am receiving quite a lot of letters from people who say they have seen our advertisements in various media in which I offer free advice. These letters frequently embody an apology for taking up my valuable time.

Now, I wish the public to clearly understand that no apology is necessary. We have expert tutors for every Department, but my special business is to give advice as to how people can better themselves either in technical trades or commercial life. There are so many people who are in the rut, or think they are in the rut, simply because they cannot see the way to further prosperity. It is my business to show them and to put them on the right path where they can achieve their ambition.

If they have no ambition I cannot help them, I can only pity them, but to anyone who has an ambition I may be able to give valuable advice, if not, I will say so honestly, but if I can help them, then I will explain exactly how, I will point the road clearly. No matter what your present position may be, if you wish to improve it write to me at this address, tell me how you are employed, what is your ambition, I shall then reply to you by return and you will not be under any obligation whatever.

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Note Address, The Bennett College, (Dept. 106), Sheffield.

*J. H. Bennett*

F.R.S.A., M.I.Mar.E., A.I.Struct.E., etc.,

Governor of

**THE BENNETT COLLEGE,  
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# VALCO MAGIC!

**WILL MAKE YOUR BROKEN VALVE AS GOOD AS NEW. ALL TYPES OF VALVES REPAIRED AT HALF LIST PRICES (minimum charge 5/-).**

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An unsolicited testimonial from one of our many satisfied users will appear each week.

BLANTYRE, 9/12/26.—I have received my valve in O.K. condition and am delighted with it. It is as good as new. You may be sure I will give you my valves to repair should occasion arise and will recommend your valuable service to my friends.—J.G.

Weco, S.P.'s and low capacity types not repairable. Minimum D.E. current 0.15 amps when repaired.

**VALCO LTD., Dept. "P.W.," TABOR GROVE, WIMBLEDON, S.W.19.**

**AN INEXPENSIVE ONE-VALVER.**

(Continued from page 1422.)

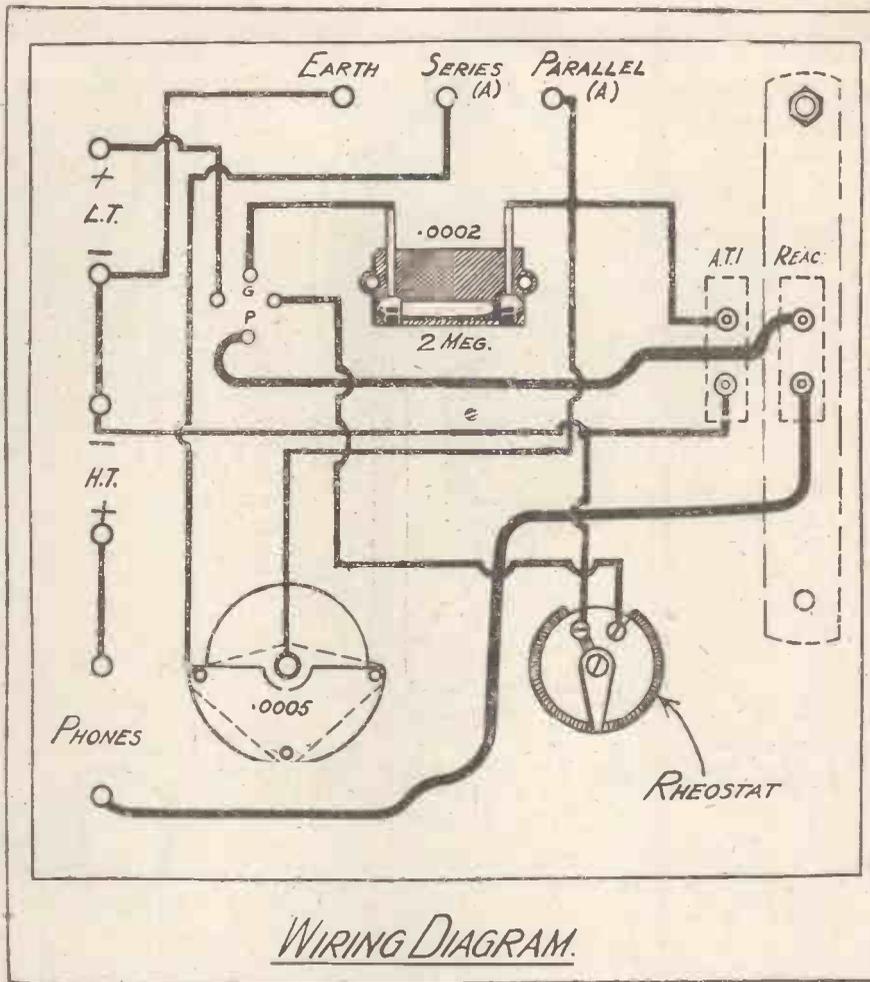
fixed coil also can be flexible ones, joining the stiff wiring at the grid condenser and rheostat wiring.

When completed, the wiring should be checked from the accompanying list of point-to-point connections. Finally, the back of panel should be brushed or dusted, to remove all traces of unnecessary metal, etc., which otherwise would cause faulty reception. (There is no need for traces of flux to make this part of the work troublesome, as it can easily be cleaned off during the soldering. As soon as a joint has been made, and whilst the metal is still hot, wipe it over with a clean duster, and all the flux comes away easily.)

**Coils Necessary.**

After this final overhaul the set is ready for connecting up. For the ordinary broadcasting wave-lengths suitable coils will be a pair having, say, 40 and 60 turns, or 50 and 75 turns. Either pair will do, for the set is capable of tuning "in series" or "in parallel," thus covering a large number of wave-lengths, according to the arrangement of the connections (150 and 200 will be required for 5 X X).

To try out the set, connect the different batteries and 'phones to their respective terminals, taking care not to mix the leads, not to touch them upon anything other than their correct terminals. Care must be taken also when inserting the valve, as if its legs touch the wrong pins it may be burnt out. Place the larger coil in the fixed coil holder, and the smaller one on the socket on the moving arm. The aerial lead can be joined to the aerial terminal marked "series," and the earth lead to the



*WIRING DIAGRAM.*

"earth" terminal, leaving the "parallel" terminal without external connection. For the longer waves "parallel" tuning should be employed. All that is necessary to change over from "series" is to place the aerial lead on the terminal marked "parallel," and connect the "series" and the "earth" terminals together by a short length of wire.

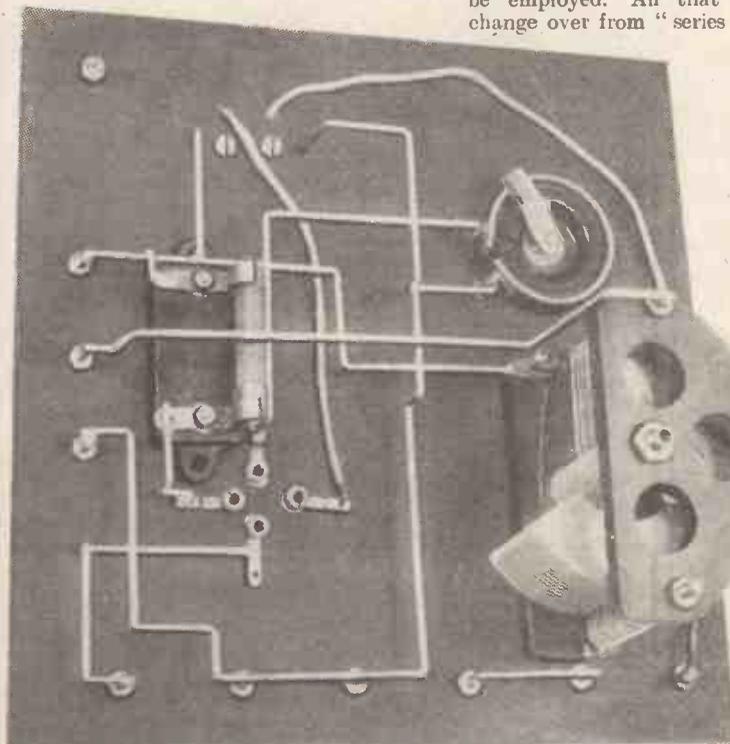
When the rheostat is turned on, a faint breathing sound in the 'phones indicates that it is now "alive," and rotation of the condenser will tune the set to the local station. At first the moving coil should be well separated from the fixed one,

but if signals are not strong enough, try the effect of bringing the two coils closer together. If this decreases, instead of increasing the signal strength, reverse the two leads going to the reaction coil (moving.)

With the coils connected correctly, the set will oscillate if they are placed too close together. As this will spoil your own reception, as well as that of your neighbours, it is essential to learn how to handle reaction properly if you are to get the best possible results. A pamphlet upon the subject is issued by the B.B.C., and can be obtained free of charge upon application to them at 2, Savoy Hill, London, W.C.2, or to the local station. A stamped addressed envelope should be enclosed.

**Many Stations Available.**

Once the knack of handling the reaction coil is gained, it will be found possible to get very good results with a set of this type. With a good aerial it will pick up many stations besides the local one, so in addition to its simplicity and low cost it is one of the most satisfactory receivers that it is possible to build.



Used in conjunction with the diagram on this page, this photograph will enable the constructor to wire up the set without the slightest trouble.

**NEXT WEEK**

How to make the 1927 Trindyne.

*Coming Shortly*

The "S.P." Crystal Set.

By Percy W. Harris, M.I.R.E.

PLACE YOUR ORDER FOR "P.W." NOW.



## H.T. Supply from the Mains

Send for this Booklet  
and learn all about it.

**H**IGH Tension supply is a question which has troubled most valve users. Constant renewals are costly. Frequent trouble is almost inseparable from the old way of H.T. supply. What is wanted is a means of obtaining an even, continuous supply—completely absent from all crackling and extraneous noises. There is a solution to this problem. It lies in current from the mains by means of a Battery Eliminator.

Anyone who has electric light should send for a little booklet upon this subject which we have prepared. It is called "How to build your own High Tension Eliminator for A.C. or D.C." and is written by Mr. Percy W. Harris, M.I.R.E., Editor of the "Wireless Constructor."

The whole question of H.T. supply from the mains is thoroughly dealt with in its twenty pages. By following the simple instructions and clear, easy-to-follow diagrams anyone can build a Battery Eliminator. Moreover, you know you are safe. No risk of using Condensers which will not stand up to the required pressure. T.C.C. 600 volt Condensers are used because they are reliable and safe. Fill in the coupon and post (with three penny stamps) to-night in order to secure your copy.

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All complete sets of components purchased; wired up free of charge. We stock a complete range of small tools suitable for wireless work.

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**H.T. ACCUMULATORS** : Ever-Ready and Exide, 20 v. dry charged, 15/-; L.T. ACCUMULATORS : 2 v. 40, 10/-; 2 v. 60, 12/6; D.F.G., 8/6; 4 v. 40, 17/6; 4 v. 60, 21/-; 6 v. 40, 26/6; 6 v. 60, 33/-; Exide D.T.G., 4/6.

**BATTERY ELIMINATORS** : Ekco D.C., 42/- and 55/-; D.C., £8 10/-; H.T.C., £8 6/-.

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The famous Croxsonia Panels : All sizes in stock, 1d. per square inch. **VAR. CONDENSERS** : G.E.C., Igranic, Sterling, Bowyer-Lowe, Jackson, Ormond, Cyldon and Ormond triple in stock. Special line Straight Line Var. Cond., '0005, 6/-; '0003, 5/9.

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**LOUD SPEAKERS** : Amplion A.R. 38, 38/-; A.R. III, 48/-; A.R. 65, 65/-; Brown H4, 30/-; H3, 60/-; Lissenola, 13/6; also Speakers by Priory, B.T.H. and G.E.C. Cabinet Speakers all in stock.

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**VOLT AND AMP. METERS** : Many types from 4/6. Sets rewired, repaired and modernised. Lowest prices.

Nickel-plated Screws, Terminals, etc., in stock. Aerial Wire, Strainers, Mast Rings, Earth Mats, Earth Tubes, etc., all in stock.

Carriage paid on all goods over 2/6, excepting Batteries, Accumulators. **Send Stamp for Catalogue.**

We also stock Baby Pathé Projectors, Accessories and Films.

THERE was a time when every real wireless enthusiast used to spend hours with pencil and paper working out elaborate and fear-some schemes for switching three H.F. valves in or out of circuit one at a time, in any order, with three or four different alternative intervalve couplings, converting them all into reflex valves at will, and so on and so forth.

Some real "hard cases" used to judge each other's sets, it almost seemed, very largely by the number of switches they carried, and the complexity of the combinations which could be achieved! Wiring-up such a set was a task to daunt a cross-word puzzle maniac, while as for the job of finding a fault in the finished product, well, the less said, the better!

Wiring was in many cases horribly complicated and full of losses, and it was not long before the experts began to tell us that all switching was little short of criminal, and quite a crusade against it was instituted, and has lasted in a slightly softened form ever since, so that many people have become so nervous of switches that I have heard a set criticised because it had a lock-switch for the L.T. supply! Just here and there one may still come across an unconverted victim of switchitis, but the general distrust of switches of all kinds is so strong that it has occurred to me that it might serve a useful purpose to try to indicate just where switches are really objectionable and where they are safe.

First of all, there is the filament circuit, and here we can say definitely that practically any switching scheme is harmless, provided that the switch itself is of a sound



To introduce switching into a receiver is always a risky undertaking if maximum efficiency is to be obtained, and especially if it is required on the H.F. side. This article is of vital interest to all constructors.

BY A CORRESPONDENT.

type making good, reliable contact. This applies to every "straight" set employing an ordinary circuit, but an exception should perhaps be made in the case of the Filadyne. Here a little discretion should be used, and all switching done between the filament chokes and the L.T. terminals of the set, and not between the chokes and the filament.

**A Dangerous Practice.**

Turning now to one of the decidedly dangerous portions of a receiver, we come to the aerial circuit. At one time it was quite a common practice to include a switch for placing the aerial tuning condenser in series or parallel, and this is unquestionably one of the most risky forms of switching ever devised. The danger of producing losses arises from the fact that in this scheme both aerial and earth are connected to contacts on the switch, and unless the latter's insulation is of the best leakages and dielectric losses may easily result.

This arrangement is now very little used,

the familiar three-terminal scheme having replaced it, and there is really little to be said in its favour. In the more recent types of sets, moreover, a fully-tuned aerial circuit is not used; instead, a tuned secondary circuit is used either auto-coupled or inductively coupled to a so-called "aperiodic" aerial circuit, and so the problem does not arise.

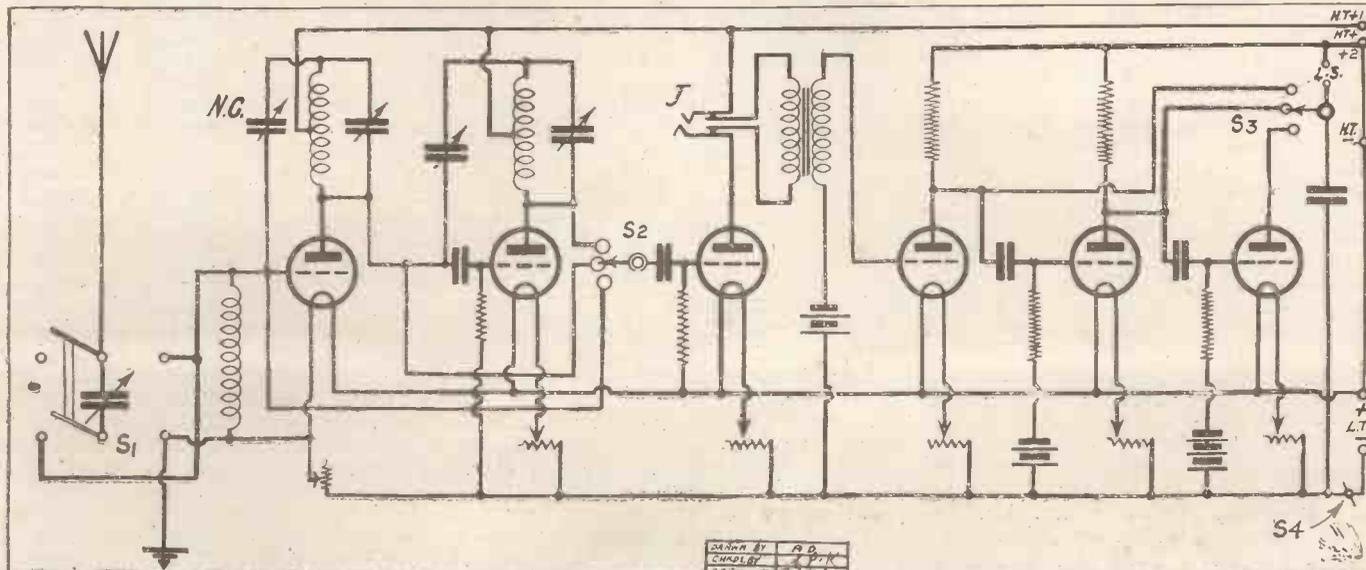
Another type of switching scheme which is often used in the aerial circuit takes the form of a device for earthing the aerial when not in use, and here again there are

chances of producing considerable losses. As in the previous case, both aerial and earth must be brought to points on the switch, and it is important that such a switch be a large one so that these points shall be well spaced out, and further that it should be mounted on really good insulating material (porcelain or high-grade ebonite), and that care be taken to avoid running the leads very close together. If these points are attended to, the earthing switch is probably justifiable.

A much safer type of switching device is that sometimes provided for reversing the connections of the reaction coil. Here a double-pole change-over switch is generally used, and, provided the wiring is not bunched together too much, there is little risk of trouble. Losses at this point do not have much effect upon the working of the set unless they are most abnormally heavy, and in a receiver of an experimental nature it is quite a handy refinement.

A switch of some sort is occasionally provided for varying the connections of the grid leak, the usual arrangement serving to permit the leak either to be placed in

(Continued on next page.)



Here are some examples of good (J), bad (S2), and doubtful (S1 and S3) switching.

# ADDING AN H.F. VALVE.

Some useful details for those who wish to add H.F. stages to their existing sets.  
BY A CORRESPONDENT.

SO much is being written on the subject of new sets that there is a likelihood of the man, who is financially unable to afford these, being forgotten, although he may own a detector with one or two L.F. amplifiers.

It is the purpose of this article to show that such a man can, at small expense, keep pace with his more fortunate friends.

A very efficient H.F. valve can be added to such a set as has been mentioned, which will give exceptionally pure loud-speaker results and, where required, selectivity, although this does not always mean purity of tone.

Attached is given a diagram of a four-valve set which is so stable that it is possible to hold the aerial terminal without affecting the signals being received in any way. The purity of tone with the set is exceptional.

## Pure Reproduction.

Full particulars of all components and values are given on the diagram, and it only remains to say that Daventry is received, in South Devon, with a purity that has not often been equalled by the best commercial sets. Bournemouth is also received extremely well in the same place at a distance of 70 miles, there being little to choose between these two stations in the matter of purity or signal strength.

The loud speaker used is a "Celestion," and this "fills the room," which is 23 feet by 18 feet, at about the right strength for music lovers.

The point to be emphasised is that the H.F. portion of the set, enclosed in dotted lines, can be added to any detector set, by enclosing it in a separate cabinet,

which may be several inches away from the detector set.

The following should be carefully noted:

(a) The H.F. Lissen choke must not be placed too near the aerial coil or interaction will take place.

(b) The small condenser "D" must be inserted to save the H.T. battery from any danger through an imperfect reaction condenser "B."

(c) The condensers "A" and "B" must be really efficient and controlled by verniers, and it is recommended that condenser "C" should also be fitted with a vernier.

Exception may be taken to the R.I. choke used to couple the detector valve to the first L.F. amplifier, but experiments have been carried out with five makes of L.F. chokes, and although some gave much louder signals, none gave even

approximately the same purity, it would therefore seem, that if the specification is departed from, careful experiments must be carried out before it is finally decided what choke to use.

The potentiometer "E," with the 1 meg. grid leak, is also of paramount importance for the purpose of applying the correct plus grid bias where the best results are wished for.

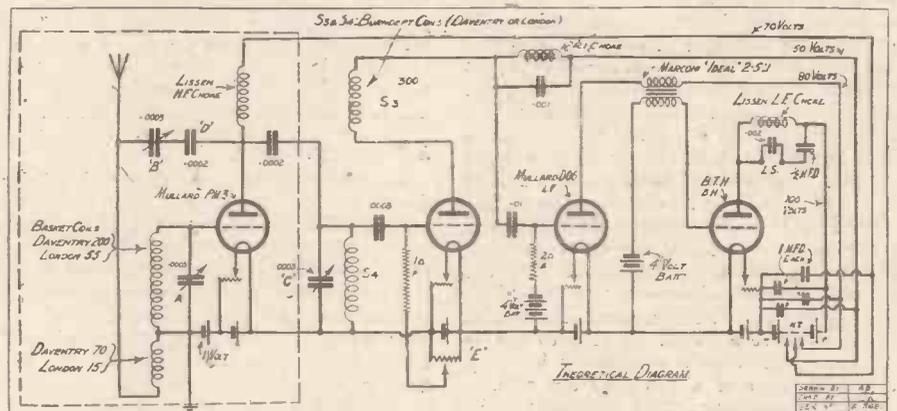
The correct grid bias is assumed to be used with the H.F. and L.F. valves employed. In both cases the object is to prevent grid current.

## Large Reaction Coil.

The largest reaction coil which can be used without causing distortion gives the clearest and loudest signals.

Condenser "B" should only be used to obtain selectivity, or where it is found that distant stations are required which cannot be obtained without the use of this condenser.

To sum up. It is possible to add an H.F. valve, in a separate cabinet, to any existing detector and L.F. sets, and as a result to get greatly improved quality of speech and music from the loud speaker. This can be done at small additional expense and is well worth the keen man's attention.



# THE SWITCHING BOGEY.

(Continued from previous page.)

parallel with the grid condenser or connected straight to L.T. positive or negative. There is really not very much point in this device, since most valves work best with the leak straight to positive, and undesirable effects are very easily produced with many switches. Probably the only safe way is to use three well-spaced sockets on the panel and a flex-lead with a wander-plug. On the whole, this is decidedly one of the forms of switching which is best left alone.

I have left until the last the consideration of one of the vexed questions of the switching problem, namely, whether it is permissible to arrange for cutting H.F. and L.F. valves in and out of circuit. Here the decision must depend largely upon the particular circumstances, but in general it is reasonably safe on the L.F. side. So long as it does not involve any great complication and bunching up of wiring, little harm can result from switching the note magnifiers.

The special point to avoid here is the use of any scheme of switching which produces "back coupling." In other words, see that you are not causing wires in the anode circuit of one valve to run very near to those in the grid circuit of a preceding valve. Similarly, see that leads from the anode circuit of one L.F. valve and the grid circuit of the same or a preceding valve are not brought to closely-adjacent contacts on a switch. If it is unavoidable, use a switch with well-spaced-out contacts—i.e. a switch of the type usually called "anti-capacity."

## Jack Switching.

Really the easiest way of satisfying these requirements is to adopt the plug and jack system of switching, which has many other advantages.

Switching among the H.F. valves is a much more difficult matter, and here the risks are really serious. The only truly safe advice is to give up the idea altogether, but there are circumstances in which such switching is extremely convenient, and it may be as well to indicate where it is least harmful.

Now, the main difficulty is that the

resulting mixing up of wiring is very apt to produce all sorts of undesirable stray couplings and make the receiver unstable, and hence it may be seen that such switching is most risky in the older types of un-neutralised sets. Where the circuit is a neutrodyne such effects can largely be balanced out, and less trouble is experienced, but even so it must not be concluded that no other losses are produced. As a matter of fact, they are produced in most cases, and it is only on the score of convenience that such switching can be justified.

So far I have only referred to receivers incorporating a single H.F. stage, and when we come to consider the case of two or more H.F. valves it will be seen that the objections to switching are enormously increased, and I do not think it can be justified in any normal set; the risks are too great.

To sum up: Switch a single H.F. stage if you think it worth while to lose a little efficiency to gain a good deal in convenience, but be very careful to use a good switch, space out your wires all you can, and preferably use a neutralised circuit. When it is a question of switching in the H.F. stages of a receiver embodying two or more H.F. amplifiers, be wise and don't do it!

# Four Years of Set Design

Mr. Harris and his "Anglo-American" Six, one of the many popular sets he has designed.



This interesting and informative article, written in retrospect, discusses the various forms of receiver lay-out and design that have appeared since broadcasting commenced. Mr. Harris is perhaps one of the best known set designers in the country.

By PERCY W. HARRIS, M.I.R.E.  
Editor of "The Wireless Constructor."

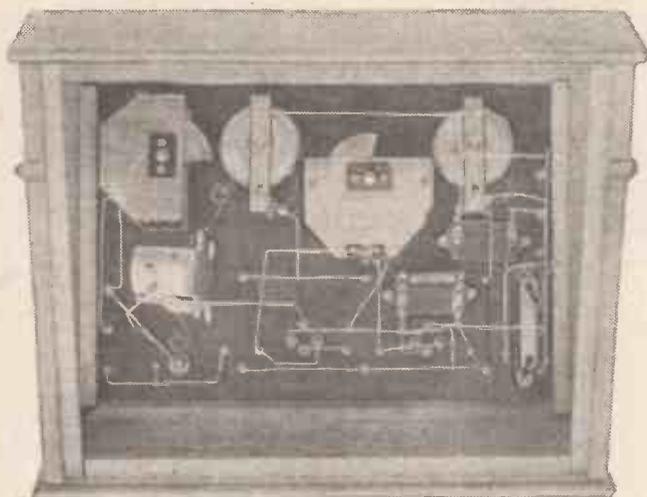
DO you realise that five years ago the home constructor as we know him to-day was non-existent? Wireless experimenters were already a numerous band, designing and building their sets

to call this "Seven Thousand Panels in Four Years," so many do I seem to have used.

A modern constructional article—and here I am dealing with the popular constructional article and not the specialised type written for the more advanced experimenter—consists in the main of a list of the component parts required, a theoretical circuit diagram, a practical wiring diagram or two, and a number of photographs of the set at different angles so that the constructor can compare his own work with that of the original as he progresses. In practically every case component parts identical with those used by the designer can be purchased through any wireless dealer (a wireless dealer in every town is also the product of the last four years). Four years ago the number of reasonably priced component parts available was extremely limited, and what were obtainable were often of indifferent quality. To take a few examples at random—valve sockets were of the crudest kind, and frequently so badly made that the valve pins would not push into the sockets, owing to wrong spacing. Baseboard mounting valve sockets were practically unknown—although a few were obtainable at 5s. or 6s. each—as baseboard mounting had not come into vogue. Most experimenters bought the separate sockets and carefully drilled

their panel at the correct spacing to take them.

And then we had the ebonite problem! Without exception the ebonite sold was unsuitable for use as purchased. There were no standard size panels available, so that whenever we made a set it was necessary to cut a new panel from a larger sheet of ebonite. The process of manufacturing

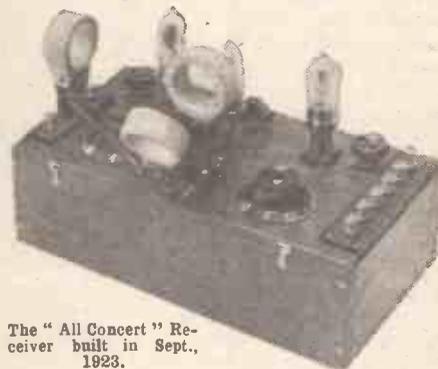


Back view of the original Transatlantic Three.

amid a host of difficulties, and with very little assistance from technical journals. But the real dyed-in-the-wool home constructor—the "ham" who arrives home with a strange shaped and rather loose parcel of components; the ham who commandeers the kitchen table for several evenings and, with soldering iron, fluxite, and a much thumbed copy of a wireless journal, proceeds rapidly to produce a cabinet wireless receiver—he simply did not exist!

### Early Difficulties.

Having had a little to do with the evolution of the home constructor, I have been asked by the Editor to tell readers of POPULAR WIRELESS something of the trend of design of my own sets during the last four years. In preparing this article I have been looking back through my records and files and examining the bulky packet of photographs of all the sets that I have built during that period. The chief draughtsman of POPULAR WIRELESS recently wrote an article entitled "Seven Thousand Diagrams in Four Years," which rather tempted me



The "All Concert" Receiver built in Sept., 1923.

the ebonite involved rolling the ebonite between sheets of tinfoil which when peeled off left a bright polished surface, pleasant to the eye, but damnable to the experimenter. The chemical action of the ebonite upon the tinfoil caused the surface

(Continued on next page.)



The set that popularised the barrel type of H.F. Transformer—the "Transatlantic Three."

## FOUR YEARS OF SET DESIGN.

(Continued from previous page.)

of the ebonite to become conducting, and unless this were removed by careful rubbing with sandpaper, insulation of parts mounted on it was impossible. The few variable condensers available at prices within reach of the average experimenter were so badly made that most amateurs built their own by laboriously assembling the separate plates and washers on the spindles and end plates. Most tuning coils were home made, although the plug-in variety were well established on the market and growing in favour. Altogether, building a wireless set was no mean achievement.

Knowing the difficulties which faced the home constructor and knowing that there were thousands of people who would joyously embark upon set building if their path could be smoothed, I set to work to see what could be done to simplify matters. Remember that at this time constructional articles generally contained a theoretical diagram and just one or two photographs of the finished instrument, and, occasionally, if some special components had to be made, a few constructional drawings for these particular components. The "practical wiring diagram" to scale and drawn in detail was virtually unknown.

After some weeks of work I succeeded in building a two-valve set with one stage of high frequency and a detector in such a way that it could be reproduced very cheaply with ordinary tools and a very small expenditure by the veriest tyro. The aerial circuit was tuned by means of a single-layer coil on which a slider ran (there were no variable condensers) and the anode circuit was similarly tuned by another coil at right angles to it. The coils were home wound on cardboard formers, and the only ebonite pieces required were one or two small strips. The article was profusely illustrated with photographs and contained what was then a novelty, a scale drawing of the actual wiring. The article was published in "Conquest," a popular science journal under my editorship.

### Surprising Success.

The success of the set was very flattering, and after a week or two I had pinned to my office wall a large map of England, with small flags indicating where readers were obtaining successful results. The map soon became studded with flags in every part of the country—England, Wales, Scotland, and even Ireland. Here obviously was the public I had expected—the public

interested in the results obtained with wireless sets but without the specialised knowledge which could only come from long study. Thus encouraged, I produced a three-valve set for all wave-lengths which I called "Universal," with one stage of high frequency, a detector and one note-magnifying valve, the whole being mounted on a wooden baseboard. Plug-in coils were used and, for the first time, the three-terminal arrangement for series or parallel connection of the aerial-tuning condenser—a method which has been widely adopted by all wireless journals since.

### The S.T. 100.

The set in question appeared in the early spring of 1923, and in addition to the series or parallel arrangement of terminals, had other terminal arrangements which enabled the constructor to use either the detector

and the ability to "chop and change about" had an extraordinarily wide appeal.

Having great faith in the future of home construction I willingly accepted Mr. Scott-Taggart's invitation to join him in his new publishing activities, and in the middle of 1923 I began what was subsequently to be a very long series of constructional articles in "Modern Wireless." The S.T. 100 circuit had just been published in theoretical form, and the first practical constructional article on this set came from my pen. The general make-up of this set (on a baseboard without ebonite panel) was very similar to my "Universal," variable condensers being used in wooden boxes and the coupling between coils being varied by the method just described.

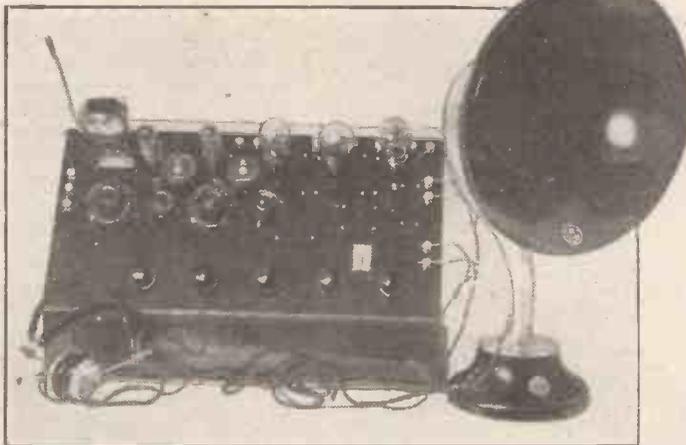
In the autumn I was fortunate enough to catch the public fancy with the "All Concert" receiver, which has probably been built in greater numbers than any other home constructor's design.

### More Efficient H.F.

Nowadays, when every set is given a name, good, bad or indifferent, it is interesting to recall that the "All Concert" was the first home constructor's set to be given a "fancy name," for prior to that date sets had been described as "a two-valve receiver," "a useful three-valve receiver," or occasionally, as in the case of the set I previously mentioned, a "Universal receiver" for all wave-lengths. The constructing public obviously liked to refer to sets by special names—if only for easy identification—so the christening of the wireless set has become the rule rather than the exception, even the commercial firms nowadays adopting the principle.

The next pressing need appeared to be for receivers with more efficient H.F. amplification, the rule at the time being to have one stage of H.F., generally of the tuned-anode variety. The successful evolution of a design using two stages of H.F., capable of being handled with the same ease as one, offered many difficulties; but after some experiment I came to the conclusion that a good set could be built using the small barrel type of H.F. transformer of which McMichael were then the sole makers. To obviate the difficulty of multiplicity of controls, I decided to use a double condenser, and so in the "Transatlantic" receiver

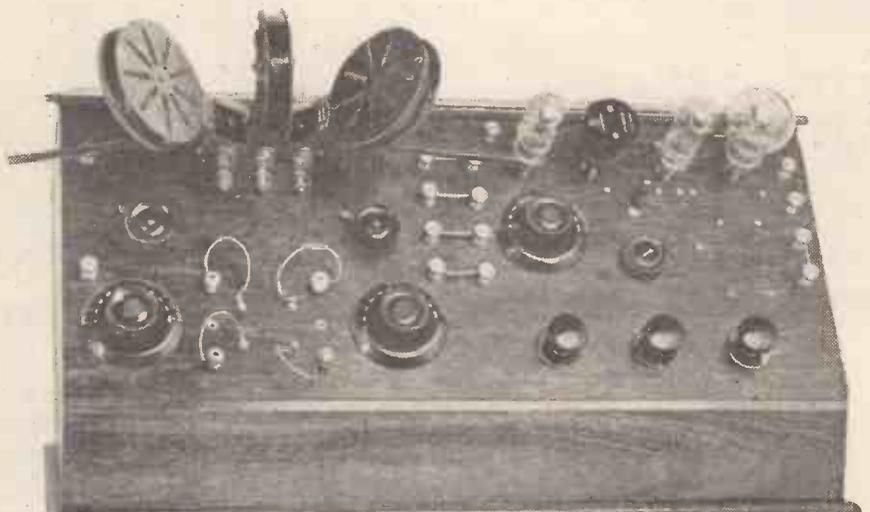
(Continued on page 1433.)



The first popular multi-valver to use resistance-coupled L.F., the "Transatlantic Five."

alone, the detector with one note magnifier, the high-frequency valve and the detector, or all three valves together. These changes were simply made with the aid of terminals, and switches were entirely unnecessary. The method of avoiding a special two-coil holder, variation of coupling between the coils being made by fixing one of the coil holders to a strip of wood, was also original.

The popularity achieved by the "Universal" suggested to me that a very wide demand existed for this type of receiver,



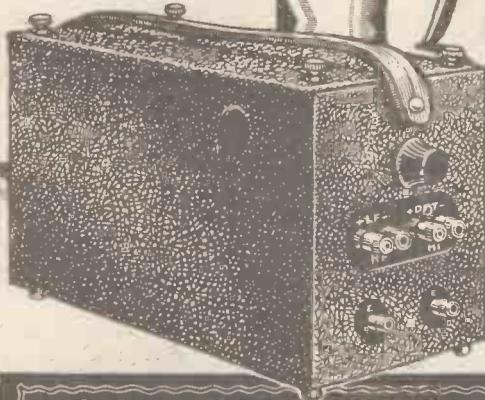
A three-valve nentrodyned set with separate tuner panels. First published in October, 1924.

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1 <sup>ST</sup> YEAR	3 AT 25/- 3·15·0	4·10·0	8·5·0
UPKEEP	—	1·1·0	5·0
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3 <sup>RD</sup>	3·15·0	1·1·0*	5·0
4 <sup>TH</sup>	3·15·0	4·10·0 1·1·0	5·0
5 <sup>TH</sup>	3·15·0	1·1·0	5·0
6 <sup>TH</sup>	3·15·0	1·1·0*	5·0
7 <sup>TH</sup>	3·15·0	4·10·0 1·1·0	5·0
8 <sup>TH</sup>	3·15·0	1·1·0	5·0
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0003 M.F.  
**10<sup>2</sup>**

WITH DIAL  
0005 M.F.  
**10<sup>6</sup>**



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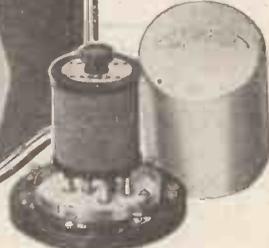
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(Signed) R. WALDO EMERSON.

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Wavy Etched Black ]

Cube design Etched

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**FOUR YEARS OF SET DESIGN.**  
(Continued from page 1430.)

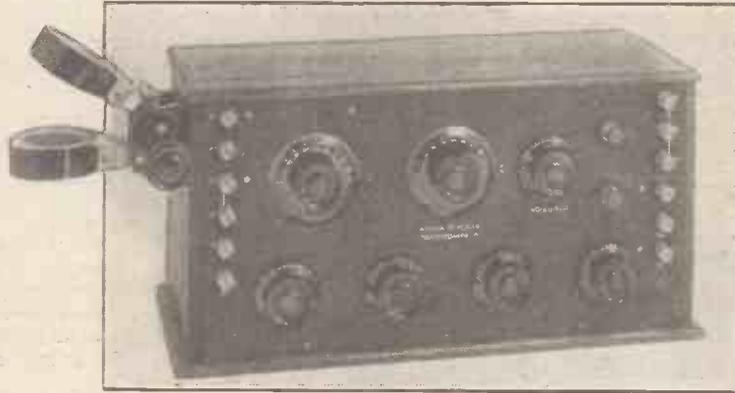
containing two stages of H.F. simultaneously tuned we have the forerunner of the modern "gang control."

Such was the success of the Transatlantic set that the original makers were quite incapable of coping with the demand for the barrel type of transformer, and consequently others took it up, and it became a regular component with a large number of manufacturers. Hundreds of readers wrote soon after the article appeared reporting the successful reception of American stations. Strangely enough for a year or two we all had remarkably good results in receiving America on the ordinary broadcast band—almost any sensitive receiver would bring in two or three American stations if we only sat up between one and three a.m. Unfortunately the last year or two has been very bad indeed for long-distance reception on the ordinary broadcast band. Three years ago, set designers in Radio Press made it a rule to sit up at night after they had finished a good receiver, for the purpose of testing it out on American signals. On a number of occasions America was heard on single-valve sets.

persuaded one or two other manufacturers to make the type, although the modern reader would find it very difficult to imagine that anyone should stand out against the change. Very slowly other manufacturers embarked upon the making of straight-line-wave-length condensers, until after a year or so the old kind passed out entirely. With the redistribution of wave-lengths on a frequency basis, the new straight-line frequency type is now quite rightly coming into vogue.

The "Transatlantic Five."

The original Transatlantic receiver was



The "Transatlantic Four"—a 2 H.F. gang-controlled receiver.

designed for telephone work and for loud-speaker use an additional amplifier had to be added. The widespread demand for a complete instrument containing the amplifier as well as the H.F. and detector resulted in the production of the "Transatlantic Five," adapted to the ordinary four-pin valve (in suitable sockets) and straight-line-wave-length condensers. The "Transatlantic Five" was the first popular multi-valve set to use resistance coupling, and a special switching system was incorporated so that the user could listen on the telephones on the three valves or on the loud speaker in the output of the fifth valve. This scheme was popular for many reasons. The purity of reproduction given by the original "Transatlantic Five" was of a very high order, as in those days, L.F. transformers had not reached the present stage of perfection, and the difference between transformer and resistance coupling was very marked. Furthermore, the comparatively few wireless stations to which one could then listen had to be sought rather carefully, and searching with a loud speaker was not by any means easy. To listen on the telephones and pick up a station and then to switch on to the loud

speaker was a far more convenient practice than standing with one's head in the loud-speaker horn in a frantic endeavour to find some very weak station by that method.

**Neutralising Introduced.**

A little later the neutrodyne circuit, invented by Prof. Hazeltine, came to attract attention. It was not made up by home constructors to any extent at first, as it required special H.F. transformers which were not then generally available.

Mr. A. D. Cowper, M.Sc., a very keen research worker and experimenter, evolved a very interesting modification, which he called the "neutrodyne tuned anode," and on studying this it occurred to me that the existing barrel type of H.F. transformer, with very little modification, could be used to obtain the neutrodyne effect, with increased efficiency. After experimenting with a number of windings, I found a suitable ratio, and a number of firms thereupon produced them for the home constructor. A neutrodyne set of this type appeared in the first issue of "The Wireless Constructor," and a month or two later the "Anglo-American Six," with three stages of H.F. amplification, was published in the same journal.

**Gang Control.**

To simplify handling two stages were tuned with a twin condenser, and the third with a separate condenser, as suitable triple condensers with the required accuracy (as well as sufficient accuracy in the neutrodyne units) were not available. I think I can claim that the "Anglo-American Six" was the first six-valve receiver with three stages of H.F., neutrodyne, to be made available for the home constructor in this or any other country.

The evolution of sets and their designs in the last twelve months or so is well within the knowledge of most readers, and space does not permit of my referring to many other modifications that have come about.

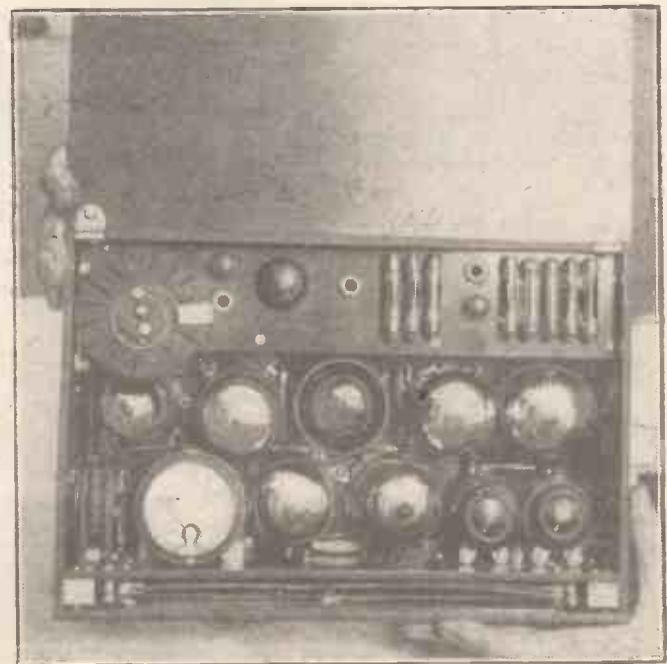
**Straight Line Condensers.**

Even in those days the difficulties inherent in H.F. amplification were painfully obvious, and a good deal of trouble with the use of two stages was avoided by the adoption of very short wiring and low-capacity valves of the tubular type. It is not generally realised that much of the trouble in the earlier H.F. receivers was due to the large capacity in the valve bases and in the solid ebonite in which the sockets were set. The tubular type of valve, with its leads brought through the sides of the glass tube, instead of through a "pinch" in the base, was very useful in this connection.

The variable condensers sold at that time were of the straight line capacity type rather than of the straight line wave-length or straight line frequency types, and my own experiments soon showed me the absurdity of using a condenser which crowded wave-lengths at the bottom of the scale rather than distributed them throughout. I thereupon decided that I would no longer use straight line capacity condensers, and that every set in future would have a condenser which would have a better distribution of wave-length.

At that time there was available only one make of straight-line-wave-length condenser—the Sterling. After much argument, I

At that time there was available only one make of straight-line-wave-length condenser—the Sterling. After much argument, I



An example of recent American design. The set is a 7-valve super het.

# CURRENT TOPICS

BY THE EDITOR.

Another Conference—High-Power Stations—Call Signs—The "Big Seven."

ANOTHER European conference of broadcasting experts was held the other day at Brussels under the auspices of the Union Internationale de Radiophonie. This time the subject of the deliberations of the members of the Conference was the long-wave situation. There has been for some time a considerable amount of uncertainty as to the wave-bands above six hundred metres, which will be set apart by the forthcoming Washington Conference for the use of broadcasting stations.

Readers of this journal who have listened to distant long-wave stations recently will probably agree that the wave-lengths above six hundred metres appear to be very over-crowded with Morse Code traffic, either by definite transmission on a specific wave-length, or by harmonics of those transmissions. The Conference hopes to make a thorough survey of the situation, and then employ what one critic has termed "intelligent anticipation" as to the future; but in any case, whatever the decision arrived at, it will have to be subject to the approval of the Washington Conference, or by the authorities of the countries concerned.

European long-wave broadcasting stations are growing more numerous, and the power and range are in many cases excessive. The Geneva Conferences have adopted a frequency separation of 10,000 beats per second as one sufficient for the avoidance of mutual interference between short-wave stations, but whether this separation can be maintained on the longer wave-lengths is uncertain. It may be that fifteen or even twenty-five thousand beats are necessary for practical purposes, and then will arise the very intriguing question: "Where can the necessary wave-lengths be found?"

## Limited Wave-bands.

A separation of fifteen kilocycles necessitates a difference of 200 metres between stations in the neighbourhood of 2,000 metres, while a separation of twenty kilocycles means at least 300 metres between stations at 2,000 metres. It will thus be seen that the number of stations which can work on the wave-band 1,000—2,000 metres, even supposing this wave-band were entirely free from broadcasting stations, is very limited.

Many of the high-power stations in Europe will shortly be increasing their power. Daventry to-day works on a power of 25 kilowatts in the aerial, while the Eiffel Tower, in Paris, with a normal power of 5 kilowatts in the aerial, has recently been experimenting with power as high as 50 kilowatts. Radio-Paris is another station which will shortly raise its power to 25 kilowatts, while in Germany Königswusterhausen, which has a nominal power of 10 kilowatts, will shortly be working at 120



Making the lions roar during the recent broadcast from the Olympia Circus.

kilowatts, or 50 kilowatts in the aerial. Hilversum, now working on 4 kilowatts, is quite likely to increase its power to 20 kilowatts in the near future, while in Poland the station at Warsaw, working on short waves, will shortly be altered to a 10 kilowatt station on 1,010 metres.

\* \* \*

The new station of Lengenbourg, in Germany, is another example of the increasing power of Continental stations, and suggests that if the new regional broadcasting system of stations in this country which is now under consideration by the B.B.C. and the Post Office is adopted, it will be necessary, in view of Continental progress, to make the British stations much more powerful than was originally anticipated.

In the opinion of many experts in this country, the new B.B.C. regional transmitting stations should have a power of at least 100 kilowatts. If not, and if Continental stations are allowed to go on increasing their power *ad lib*, then interference with British stations is bound to be worse and worse. It is only right that the British broadcasting stations should have a power at least equal to some of the larger Continental broadcasting stations.

## Call Signs.

Another question of importance which will have to be dealt with by the Union Internationale de Radiophonie is that of international call-signs. The question of these call-signs, which will enable listeners in different countries easily to recognise the origin of foreign transmissions, is most important.

These days London does not make any frequent reference to 2 L O, but we hear chiefly: "This is London calling." This is quite satisfactory for British listeners, but it is not very suitable for long-distance reception when the call is introduced so infrequently. Vienna is probably the most easily recognised Continental station, for in the intervals between the items in the programmes transmitted from that station a loud ticking noise from the studio clock is broadcast.

It is suggested that some musical tuning note should be broadcast from London as a means of identity, in the various waits in the programmes.

The question of these call-signs may not seem very important on the surface, but there is undoubtedly a good deal of clearing up in such matters to be done, and we shall await the results of the deliberations of the Union Internationale de Radiophonie with considerable interest.

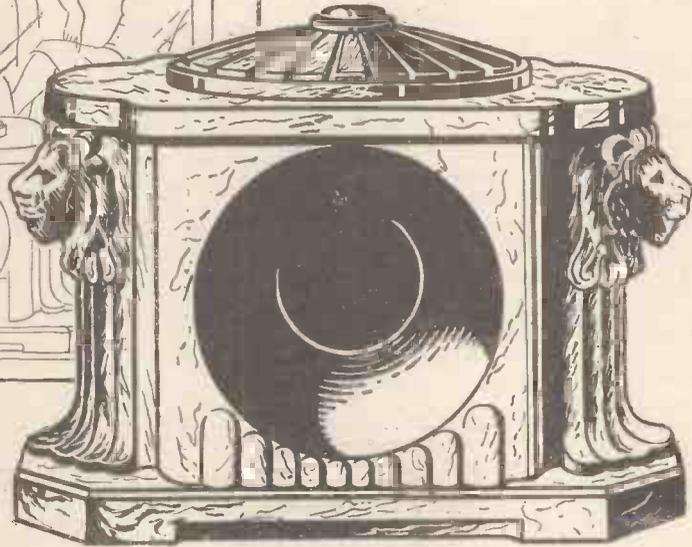
## The "Big Seven."

Listeners have lately been intrigued by the formation of what the B.B.C. describe as the "Big Seven." The Big Seven is the Programme Committee, and it is composed of: Mr. R. H. Eckersley, Mr. George Grossmith, Mr. Percy Pitt, Mr. R. E. Jeffrey, Mr. B. E. Nicholls, Mr. J. C. Stobart and Miss Hilda Matheson.

We understand that the B.B.C. intends putting a little more punch into its programmes in the immediate future, and the punch will be supplied, it is to be hoped, by the efforts of the Big Seven. It has often been asked: "How does the B.B.C. really know what the public wants?" The answer is that they rely very largely on the great number of letters received from listeners every day. Some of these letters are stupidly critical and others are stupidly eulogistic, but it does seem possible, nevertheless, for the B.B.C. to extract from their enormous correspondence a fairly clear idea of what the public thinks they want.

The Big Seven, we understand, meet every Thursday and are in conference for several hours, and it is due to their deliberations that the programmes are provisionally arranged seven weeks ahead.

The different station directors submit their draft programmes to the Big Seven, and they are discussed, altered and criticised, etc., by these Olympians of the programmes. We cannot congratulate the B.B.C. on their appointment of the individual members of this Big Seven Committee.



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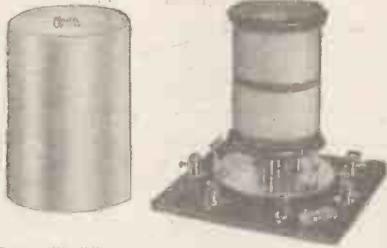
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" " " 1,000-2,000 " ..	10	0
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# BROADCAST NOTES.

FROM OUR BROADCASTING CORRESPONDENTS.

Those "Peaks"—Running Narratives—York Minster—10,000 Girls to Broadcast—Rose Macaulay—A Relaxed Censorship—A Year of Occasions—L. G. on the "Mike"—A Conrad Radio Drama—Laurence Binyon—Eva Haswell's Return—University Men—Archie de Bear v. the B.B.C.—"Eisteddfod" Broadcast.

## Those "Peaks."

There has rarely been more welcome news than the announcement that the B.B.C. is going back to its old policy of programme features and stunts. To provide consistently good programmes is not to give satisfaction. What the majority of listeners want nowadays is an occasional thrill or focus point of interest; the stuff in between is not of much consequence to them. Thus there will be a full listening house for the special Gershwin Night on March 2nd, when the London Radio Dance Band and Miss Baker, the American "wonder jazz singer," will spread themselves in syncope for the benefit of all British listeners. Then Delysia is to appear shortly in a mystery programme. A special version of "The Farmer's Wife" is also in preparation. Thus the prospects for better and better "peaks" are much brighter.

## Running Narratives.

Broadcasts of sporting events now arranged include the following:

London Cup Tie, Soccer, London:

March 5th.

Ireland v. Wales at Rugged, Belfast:

March 12th.

Oxford Torpids, Rowing: March 26th.

Other commitments include the Boat-Race, the Derby, the Oaks, and the Cup Tie Final, Cambridgeshire, Cesarewitch, and an event from the main Ascot meeting.

The narratives so far have been very well handled by the B.B.C., and it is significant that little additional staff or organisation has been required. The technique of the new programme feature is being rapidly and efficiently mastered.

## York Minster.

The important centenary celebrations at York Minster on June 25th will be made the occasion for a special broadcast which promises to be much more impressive than any so far taken from that venerable shrine.

## 10,000 Girls to Broadcast.

At the Girls' Friendly Societies' Musical Festival at the Albert Hall, on July 2nd, there will be about 10,000 voices kept in sweet harmony by the baton of Mr. Plunket Greene. Listeners will get the pick of the items.

## Rose Macaulay.

A special treat is in store for London and Daventry listeners on February 19th, when Miss Rose Macaulay will read some of her own writings and add a few characteristically pungent remarks occurring to her at the moment.

## A Relaxed Censorship.

Attentive listeners will have noticed a considerable change in the latitude of

microphone work since the middle of January. The B.B.C. are steadily but progressively taking advantage of the new freedom accorded them in the Royal Charter. Thus the debate on the "Menace of the Leisured Woman" tolerated the introduction of controversy with a vengeance. There was a big chunk of birth-control, with a generous mixture of party politics and a savage attack on the Government.

But it makes a great difference when this sort of thing is done as an Outside Broadcast, and when the protagonists are G. K. C. and G. B. S. But there have been significant developments in the studios as well. Judging from the vigour and freedom of Mr. Wilson Harris' talk on China, there



An oval cone loud speaker by which it is claimed that both high and low notes are equally reproduced.

would appear little doubt that the typescript had not run the gauntlet of the Foreign Office or the Post Office either.

These signs are welcome. It is to be hoped that the new freedom is exploited with courage and care. A bad mistake would probably throw broadcasting back two or three years. On the other hand, undue circumspection will not be tolerated by the public. So the task for the Savoy Hill people is not easy.

## A Year of Occasions.

The year 1927 is well stocked with occasions suitable for the programme peaks sought by the B.B.C. To mention only a few, there are the centenaries of Canning, Newton, and Machiavelli.

## L. G. on the "Mike."

It is only recently that Mr. Lloyd George has taken any serious interest in broadcasting. His attention was aroused by the agitation in North Wales for a separate

system. He is also watching the work of the Corporation rather closely from the political angle. It is understood that the ex-Premier was not consulted in the framing of the constitution of the Corporation, which he regards as peculiarly a product of a strangely Conservative-Socialist alliance. Therefore if the B.B.C. happens to lay itself open to attack in Parliament, there will not be lacking those willing and able to turn the situation to account. Special interest accordingly attaches to the broadcast of Mr. Lloyd George's speech on February 14th, when he is to be the guest of honour at the dinner of the Women's Advertising Club of London at the Piccadilly Hotel.

## A Conrad Radio Drama.

On February 18th a radio adaptation of Conrad's novel, "Lord Jim," by Cecil Lewis, will be broadcast S.B. at 9.15.

## Laurence Binyon.

Mr. Laurence Binyon, the well-known writer, will read some of his own poetry from London on Monday, February 14th.

## Eva Haswell's Return.

Miss Eva Haswell will describe from 2 L O on Thursday, February 17th, some of the exciting experiences she had during her recent motor caravan tour of the wild North-West of Canada.

## University Men.

Sir Ernest Benn and Mr. J. Maynard Keynes will be the antagonists in a "mike" debate at London on Wednesday, February 16th, the subject being "University Men in Business."

## Archie de Bear v. the B.B.C.

Three months is about the average interval between Mr. Archibald de Bear's quarrels with the B.B.C. The Anti-Broadcasting Company formed by Mr. de Bear with such a flourish of trumpets

after the Sitwell row fell into abeyance for some time, only to be revived again after the recent struggle between Mr. de Bear and Mr. Gerald Cock. Some interesting developments are promised, including the possibility of sensational legal proceedings.

## "Eisteddfod" Broadcast.

A recent account in POPULAR WIRELESS of the deadlock that has been reached in negotiations between the B.B.C. and the 1927 "Eisteddfod" Committee has drawn from the latter a strong denial that any such state of deadlock had been reached. They admit that there are many difficulties in the way of completing the arrangements, but they suggest that their own attitude in the matter is by no means rigid, which is another way of saying that the "Eisteddfod" Committee for 1927 has begun to realise how tremendously important Broadcasting is to the international success of their Festival.

# 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 LETTER FROM MR. HALE.

The Editor, POPULAR WIRELESS.

Sir,—Since the publication in your journal of the Hale receiver circuit, communications have reached me which prompt me to make it known that the patent in this circuit (No. 234,965) was obtained by Radio Engineering Company, Ltd., jointly with myself as the inventor and in the capacity of research engineer to that company. The position applies also in the case of the following patents:

237,025: Telephony control system (signals produced by variation of the capacity of a condenser which is connected to the grid of the generator valve or of a valve exciting the generator valve in such a manner that it partly or wholly neutralises the retro-action or back coupling between the anode and grid circuit of that valve).

237,683: Variable electrical resistances.

239,309: Telephony control system ("series-valve" control method, anode current supply being directly connected to generator valve which is substantially at high frequency earth potential, an H.F. choke coil being so employed as to prevent damping of oscillations through changes in resistance of the control valve anode-filament path).

239,319: Hale circuit modifications (plug-in detector being used for varying function of receiver or amplifier valves).

241,653: Transformers (secondary winding is divided and so connected as to produce cumulative effect, internal diameters of primary and secondaries being approximately equal).

243,794: Variable condensers (lateral motion, leading edges of fixed and moving plates being inclined to one another).

252,704: Variable amplification systems (coupling between valves is varied by means of a differential inductance or choke coil, one end being connected to the valve anode and the other to a point at zero audio-frequency potential whilst a mid-connection is taken to the grid of following valve).

From the foregoing it will be appreciated that the Hale circuit was devised with a specific object in view and as part of a radio research programme, which also included the development of the Hale-Lyle broadcasting reception system employing cordless radiophones.

The fact that I am interested in radio research in a professional capacity is, of course, quite contrary to what has been assumed by those who have been kind enough to congratulate me on "discovering" a circuit which "only the trained engineer might have devised," and I shall be obliged if you will publish this letter in order to dispose of any misunderstanding in this connection.

Yours faithfully,  
G. N. HALE.

Raynes Park, S.W.20.

## BUYING BRITISH GOODS.

The Editor, POPULAR WIRELESS.

Dear Sir,—Being a constant reader of your most interesting paper, POPULAR WIRELESS, I have noticed several letters which have been written to you re British goods. My Amphon speaker just before last Christmas broke down after three years' constant use. The unit was forwarded to Messrs. Graham for repairs, and was soon returned to me repaired and overhauled, with the remark on the bill, "With compliments. Free of charge." Surely this speaks for itself re British goods. Also I have three D.E.R. valves which have been in constant use since November, 1923, and still going strong.

Yours faithfully,  
A. MADDERS.

41, Herbert Road,  
Manor Park, E.12.

## GENEROUS TREATMENT.

To the Editor, POPULAR WIRELESS.

Dear Sir,—May I, another old reader of the above favourite, give my views on the Buy British Goods controversy. Recently I had the misfortune, on removing a D.E.4 Marconi valve from its case, to break the bulb. My dealer advised me to explain the circumstances to the firm, it being entirely my own fault, as the valve was otherwise perfect. He said, they may make some allowance. To my surprise, this generous British firm gave me a free replacement. They said, no doubt it was held a little tight in the case, but of course that was no fault or liability on their side, with which I quite agree. Now, I ask Mr. Fullelove to try a foreign valve under the same circumstances. I need say no more, leave alone the splendid results I have since obtained with the use of same.

Yours faithfully,  
A. F. BRAMET.

63, Burnfoot Avenue,  
Fulham, S.W.6.

## INFINITELY CHEAPER.

To the Editor, POPULAR WIRELESS.

Dear Sir,—My recent experiences of the business-like methods of two British manufacturers of radio accessories should prove to one and all that it not only pays to buy British goods, but in the end it is infinitely cheaper. A few months ago I had the misfortune to badly damage an '0005 Jackson Bros. geared condenser. It was a toss up as to whether I should purchase a new one or not. However, I sent it up to Messrs. Jackson Bros. (less fittings), who informed me that my condenser would be reconditioned for a nominal charge of 1s. 6d., including postage. Within a week, this was posted to me. Much to my surprise and delight, not my old condenser, but a brand new one complete, with the makers' compliments. Last week my "Harmony Four," a set designed by Mr. Percy Harris, September, 1925, suddenly began to fail. After overhauling it, I came to the conclusion that the valves had lost their powers of emission. I dispatched them back to the various makers, asking them to test them and let me have a report. One firm replied that the



Mr. C. H. Wright, who is developing an invention for the transmission in facsimile of hand-writing.

three valves submitted to them would have to be replaced, but as I had had over a year's continuous use of them, of about five hours daily, I have purchased three more valves of the same make. Messrs. Mullard, to whom the fourth valve was submitted for test, reported that the required test had been made, and that they would be pleased to supply me with a new P.M.4 valve free of charge. Therefore my motto is to "Buy British Goods." The only foreign components that I ever bought were placed in the fire long ago, for the simple reason that to obtain satisfactory results, I had to replace every one with a British-made article. Needless to remark, I have no interest in the firms mentioned, only as a very well satisfied purchaser of their products.

Yours faithfully,  
M. J. HIGGS.

Fairlie Place,  
Withdean, Sussex.

## CHARGES TOO HIGH.

To the Editor, POPULAR WIRELESS.

Dear Sir,—I am writing in answer to those readers who so strongly voice the slogan, "Buy British Goods."

It is true that most British radio firms replace defective apparatus free of charge, but do your readers realise how this is made possible? To quote

one instance. Has it ever occurred to them that the cost of production of a 14s. British-made valve is but a small fraction of this price? Do they not know that at one time a Cleartron C.T.25 b. could be sold for 15s. at a huge profit, since when the "Cleartron" Company have joined the "Valve Ring," and the price is now 18s. 6d.? Do they not realise the high cost of advertising, in not only every radio journal, but in other periodicals and dailies? However, summing up, I consider British apparatus equal to, and in some respects better than, that of the foreigner, but until prices are put down by at least 40 per cent I shall continue to search discriminately for the foreign equivalent, and should this prove unobtainable, then I shall continue to construct my own apparatus from the raw material.

Yours faithfully,  
ROBERT N. BALLARD.

4, The Vale,  
Acton, W.3.

P.S.—A better slogan would be "Buy British and Swell the Ring."

## FOREIGN COMPONENTS PREFERRED.

The Editor, POPULAR WIRELESS.

Dear Sir,—I note with interest some of the letters re "Buy British Goods." How is one to tell that even British goods are not sometimes inferior to foreign. Personally, I should welcome better facilities for obtaining foreign components, for the simple reason that most British manufacturers have entered into an agreement (association, they call it) to get rich quick. I think everyone will admit that valves, for instance, are too dear. Again, why on earth is a base with a copper cover over it priced at 15s. If this is not profiteering, what is? I notice one firm at least are producing them at 9s. now, though. Lately I had trouble with my set. I eventually found the fault was in the grid condenser. I replaced it with one of a different make, but half the price; the set now works quite all right.

Yours truly,  
W. MARTIN.

Moorleigh Cott, Mount Charles,  
St. Austell, Cornwall.

## MR. FULLELOVE REPLIES.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have read the comments on my letter to you re the prices of certain radio articles, and it all goes to prove how hard it is to win over some people. My letter was just to point out the different prices of valves and fixed condensers of English make of firms who are in and who are not in the combine, and I thought I had made it quite clear my meaning of the word "foreigner." Any town folk who have gone rambling in country villages will have heard the word "foreigner" applied to them. I am not hedging, and must thank Mr. Brown, of Glasgow, for his letter, as he is the only one that has got the gist of my letter. I have bought many valves and fixed condensers, both with small and extra large capacities; for the sets I have made which, seeing that I have taken the "P.W." since its commencement, must be a fair number (hook-ups, of course, some of them were), I have not yet had to complain. All the condensers I have used have been English, and some of them have had 230 volts D.C. across them; 1925 sets to 1927 battery eliminators is a fair step, and I hope that our Aberdeen friend will call me a constructor, bearing in mind that all amateur constructors do not have their names at the top of articles in periodicals. Of course, our friend may have helped 2 A Z and 2 L R to get their first receiving gear together, if so, then my four years of pottering about will be at a discount. I am pleased to note that he is in agreement with me as regards "some components." As regards the lock-nut on this particular English grid leak, I am afraid that I am not the only one who has found this lock-nut hard to manipulate when the flanged knob is screwed up near the panel. Still, if people will pay any price for their articles, let 'em. As John Henry would say, "Ah, well!"

Yours truly,  
D. FULLELOVE.

85, Addison Crescent,  
Old Trafford, Manchester.

[This closes the correspondence on this subject which cannot be discussed further in these columns.—ED.]

## BEAM INTERFERENCES.

The Editor, POPULAR WIRELESS.

Sir,—Being interested in your article concerning Beam Interferences in Cornwall by C. G. Philp, I am enclosing a cutting from a Cornish paper, sent me recently, on the same subject. The interference referred to is of a different nature to that mentioned in this week's issue—it was a severe cracking sound which seemed to arise every evening about the same time, and listening was unbearable. I was down in Cornwall in September last, and although the set and aerial were thoroughly overhauled it didn't improve reception. Since then my brother informs me that the trouble has been located, but what it was he could not say. Trusting this may be of interest to you,  
Your regular reader,

A. GREGAR.

The locality I mention above was North Cornwall, eleven miles S.W. of Bodmin, near Wadebridge. "The Pines," Days Lane, Sidcup, Kent.

(Continued on page 1452.)

# THE PERFECT VACUUM



## What is the greatest single development in the history of the valve?

Undoubtedly, it is the improvement of the vacuum in the bulb. In 1907 and the years that followed, valves were made which closely resembled modern types and even dull emitter filaments were known, but the research workers of those days in their wildest dreams never contemplated the extraordinarily high vacuum which has been achieved in the S.T. valve.

In 1913 the valves had such a poor vacuum that their operation was not only erratic but they often only lasted a few hours. In recent years, the proverbially short life of cheap Dutch valves (in spite of their sound construction and good filaments) is a striking proof of how vital it is to have a good vacuum.

Even the torodium filament, the able design and robust construction of S.T. valves, would be useless combined with a poor vacuum. Not only does the most perfect vacuum science has achieved contribute to the fine performance of S.T.'s but the fact that it *remains* perfect is the main reason why the S.T. is the only valve in twenty-three years whose life an insurance organisation has been ready to insure. Let your next valve be an S.T.—the valve with the perfect vacuum!

### TYPES AND PRICES.

2-VOLT.		4-VOLT.		6-VOLT.	
S.T.21 (H.F.) 0.1 amp. . . . .	14/-	S.T.41 (H.F. and Det.) 0.1 amp.	14/-	S.T.61A (Res. Cap.) 0.1 amp.	14/-
S.T.22 (L.F. and Det.) 0.1 amp.	14/-	S.T.42 (Power) 0.1 amp. . . . .	18/6	Amplification 40 . . . . .	14/-
S.T.23 (Power) 0.15 amp. . . . .	18/6	S.T.43 (Super Power) 0.25 amp.	22/6	S.T.61B (H.F. and Det.) 0.1 amp.	14/-
				S.T.62 (Power) 0.1 amp. . . . .	18/6
				S.T.63 (Super Power) 0.25 amp.	22/3

S. T. Ltd., 2, Melbourne Place, Aldwych, London, W.C.2 (Next to Australia House.)



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.

**AN INGENUOUS ADAPTOR.**  
**M**ESSRS. HARLIE BROS., 36, Wilton Road, Dalston, London, E.8, recently sent us a sample of their new anti-microphonic adaptor. It is a little device which plugs into an ordinary type of holder, thus providing four flexibly mounted sockets in place of the original ones. An excellent little scheme, but we cannot help thinking that it has come along rather late in the day. A year or two ago it would have gained tremendous popularity, but nowadays there cannot be a vast number of sets that are not already fitted with anti-microphonic holders.

However, the adaptor accomplishes its purpose admirably. We dug out an old set fitted with ordinary panel-mounted valve sockets specially to test the article. We also unearthed a valve notorious among the staff as really bad (or should it be good!) microphonically. The Harlie adaptor put a stop to this tube's activities. At 1s. 3d.

the article should sell like the proverbial "hot cakes" among possessors of sets with rigid holders who have also microphonic valves.

**"CAMCO" PANEL BRACKETS.**

The Carrington Manufacturing Co., Ltd., 18-20, Norman Buildings, Central Street, London, E.C.1, makers of the well-known "Camco" cabinets, recently sent us a pair of their new "Camco" panel brackets. They are substantial, but are light, being of cast aluminium, and are so designed that they lie snugly into the angle formed by panel and baseboard. It is a mistake not to include supporting brackets, even though but few items are mounted on the panel, for brackets not only hold the panel rigidly but also tend to prevent this from warping. Two shillings spent on a pair of Camco brackets is a wise investment.

**A NOVEL FILAMENT RHEOSTAT.**

To the Benjamin people is due a very novel and interesting design of filament rheostat. Designed for one-hole panel-mounting, it occupies no more space behind the panel than that required for its central screw and nut. All the "works" are in the dial itself. These include both its wire resistance element and moving contact. Apart from the saving of behind-panel space, this allows a fixed relation between dial and pointer to be obtained. Thus when the pointer points to the word "off" then the contact is well and truly off the resistance element and not half-way round it! The dial on which is moulded a nice large milled knob is of respectable dimensions and dignified appearance, and does not appear as a "button" against the dial of a variable condenser. We particularly

(Continued on page 1442.)



A case of Polar tuning units which are unique in their compactness and efficiency.

THE "EKCO"

COMBINED H.T.--L.T.--G.B. UNIT FOR D.C. MAINS

(British Letters Patent No. 2627567 and Patents Pending.)

THE SENSATION OF 1927!

ALL High and Low Tension troubles, mess and expense saved—by just attaching adaptor to electric light lampholder! Valves of different filament current and voltage can be used!

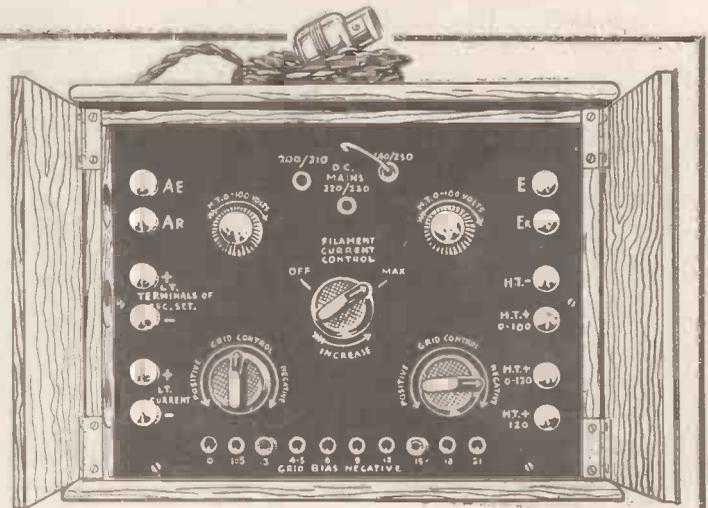
No batteries or accumulators whatsoever required!

Running costs approximately 1/4d. per hour. The "EKCO" Silent "background"!

SAFE! SILENT! SOUND!

PRICE £15:15:0 COMPLETE

UNITS FOR H.T. ONLY } From 42/6 Illustrated Folder FREE!



MODEL "C"

PROVIDES:—

- (a) H.T. 1 Variable voltage 0-100. 1 Variable voltage 0-120. 1 Fixed voltage 120.
- (b) L.T. Current for any number of valves of different type or voltage on your receiver, provided each valve does not require a filament current of more than 35 amps.
- (c) G.B. Tappings at 0, 1 1/2, 3, 4 1/2, 6, 9, 12, 15, 18, 21.

**F.K. COLE LTD**

(Dept. A), 513, LONDON ROAD, WESTCLIFF-ON-SEA.

# 70/- buys the World's Best Loud Speaker "ETHOVOX"

For 70/- you can now obtain the Standard Model of the World's Best Loud Speaker—the Ethovox.

The wonderful quality and sound construction of the Ethovox are being rigorously maintained, and now that it is available at the remarkably reasonable price of 70/- it becomes not only the finest loud speaker of its type, but also the most reasonably priced.

The large sales which the Ethovox has been recently enjoying justify the claims which we make for this speaker. The numerous devices incorporated, and which ensure its quality of perfect reproduction, are patented—it is therefore impossible for you to obtain another loud speaker which will give anything like the results given by the Ethovox. The quality of the Ethovox is unsurpassable.

ETHOVOX PRICES	
METAL HORN MODEL	£3-10-0
MAHOGANY HORN	£4-4-0
JUNIOR MODEL	£1-17-6
ALL TYPES	

The mahogany horn model has the same high-grade internal construction as the Standard Model but is fitted with a mahogany flare instead of a metal horn. This mahogany flare imparts a wonderful mellow tone to the music reproduced and which is appreciated by so many.

Go to your local Burndept Dealer and ask him to demonstrate an Ethovox. Compare it with any other speaker he may have in stock, you will be surprised at the result and be convinced that the Ethovox is "The World's Best Loud Speaker."

*The trade is invited to apply for further details regarding price.*

**BURNDIPT**

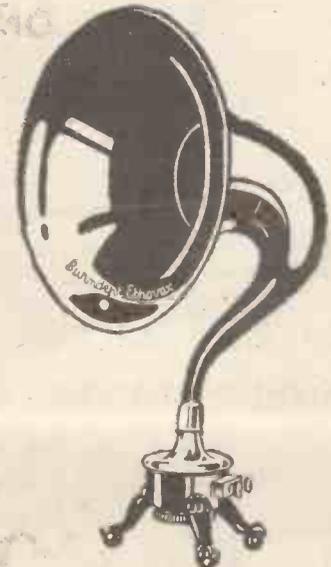
WIRELESS LIMITED

BLACKHEATH, LONDON, S.E.3

AGENTS EVERYWHERE



MAHOGANY HORN MODEL



METAL HORN MODEL

**APPARATUS TESTED.**

(Continued from page 1440.)

like the quarter of inch or more of "off" movement. This is a great improvement over some rheostats with their "hair's breadth" of on-off movement. And we mustn't forget to mention that the movement of this Benjamin rheostat is permanently adjusted and cannot be "messed up" when mounting the component on a panel.

The sample sent us has a maximum resistance of 30 ohms, and sells at 2s. 9d.

The Benjamin people also sent us one of their 'push-pull on-off switches for panel mounting. This is a neat little article, and has a nice, definite action. This, too, can be fully recommended.

**TWO IMPORTANT CORRECTIONS.**

In the R.I. advertisement which appeared on one of the cover pages in our issue for week ending January 29th the price of the double rectifying valve given in the list of components for the R.I. Rectifying Unit is £1.0.0. This should have been £1.10.0.

We gave the price of the clips and base for mounting Silvertown Tubular Fixed Condensers as 7s. 6d. in our January 22nd issue. This was an error; 1s. 6d. is the correct figure.

**THE KEW K.L.I. VALVE.**

The announcement that valves are now obtainable in this country which will operate direct from A.C. and D.C. mains and thus eliminate accumulators, mains units

or other such filament heating appliances has, naturally, aroused a great deal of interest in all radio circles. We have received several of these new valves from the Marconi Co., and have them under close observation. A very similar type of valve was brought out in America some time ago, but owing to certain reasons was not found



Mr. Mitchell-Hedges, who is well known to all radio listeners, criticises the "other end of the ether."

to be very successful. Now the only satisfactory test for such a component is a life test and several weeks may pass before we are in a position to publish our report.

Our first impressions are that the K.L.I.

does indeed incorporate a solution to the problem of trouble-free filament heating, but we must reserve our fuller comments for the time.

**A CHEAP H.F. CHOKE.**

Mr. S. M. Henry, of 33, The Pleasance, Putney, S.W.15, recently sent us a sample of an H.F. choke which he has placed on the market at 6s. 6d. post free. It is well made and quite well designed. Its self-capacity is commendably low, and on test we found it to give good results on all wavelengths up to the 1,540 which is its stated maximum. In fact, the sample submitted operated quite well in a set which was tuned to Daventry (1,600 metres), but as the maker places its maximum at the above mentioned figure, it would not be wise to rely on every one proving equally successful.

**ANOTHER "VARIABLE FIXED" RESISTOR.**

The M.A.P. Company, of 246, Gt. Lister Street, Birmingham, are marketing a very efficient form of that hybrid article the "variable-fixed" filament resistor. The device is for baseboard mounting, and has a very fine adjustment. The wire is wound in grooves on an insulating cylinder. A knob controls a contact which passes round making contact continuously with the whole length of the wire. Thus, absolutely vernier settings of resistance are available if desired, although with modern valves this is seldom necessary. The price of this M.A.P. product is 2s. 4d. We believe several values of maximum resistance are obtainable up to 36 ohms.



**BOTH CLEVER AND SIMPLE**

Everyone, clever and simple alike, can appreciate Clarke's "Atlas" Vernianob, which, in itself is both clever and simple.

Just examine it. A four-inch dial, surmounted by two "man-size" knobs—no cramping. Made throughout of bakelite, practically indestructible and an ornament to any set.

The larger knob is for coarse tuning. The smaller knob gives a gear ratio of 50 to 1. No pulling or pushing to effect the change; it is impossible to miss a carrier wave.

At once the easiest and most effective way of giving ordinary condensers the finest Vernier movement. Bushed for 3/16", 1/4" or 2BA spindles.

Price 8/- each

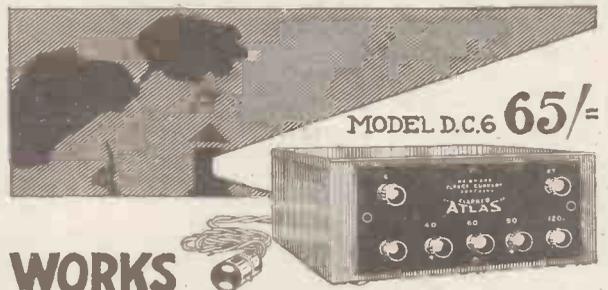
**CLARKE'S "ATLAS" RADIO SPECIALITIES.**

We have vacancies in various districts for qualified service agents. Replies should be addressed to us, stating full qualifications.

**H. CLARKE & CO. (Mc.) LTD., Radio Engineers, "Atlas" Works, Old Trafford, MANCHESTER.**

Telephone : 683 and 793 Trafford Park.

Telegrams : "Pirtoid, Manchester."



**WORKS WITHOUT NOISE OR FUSS**

Clarke's "ATLAS" H.T. Battery Eliminator is the one thing needed to make wireless all pleasure. Turns the old H.T. dry battery, with its annoying troubles and costly replacement, into an interesting museum relic. A real economy and a justifiable luxury combined. Simply plug into an electric-light socket. Models for direct or alternating current; direct current models from 65/- as illustrated.

Ask for any good dealer's opinion!

Send for descriptive folders 17 and 18 and leaflets 19 and 20. They tell the whole story of the most efficient method yet devised for the supply of H.T. current up to 150 volts.

We did not ask for this letter; it came to us as the spontaneous appreciation of a genuinely pleased customer.

"St. Muir", Leicester Road.  
NEW BARNET.  
January 3rd, 1927.

Dear Sirs,

I have pleasure in informing you that I have at last found a perfect "Slow Motion" dial in the "Ormond".

After spending a good deal of money on several well-known (and much recommended!) types of S.M. dials, and finding to my disappointment that each had a more or less serious drawback, you may well imagine how pleased I am at the moment.

I might mention that I have given the two dials now in use a very thorough test and I heartily recommend "Ormond's" to any enthusiast who is really seriously interested in such components. The silky movement of the "Vernier" is quite positive—no slipping, etc., as in some makes of dials.

Although an old Radio fan, I must admit that the dials are a revelation to me in regard to their aid to tuning—the workmanship also is above criticism in my opinion.

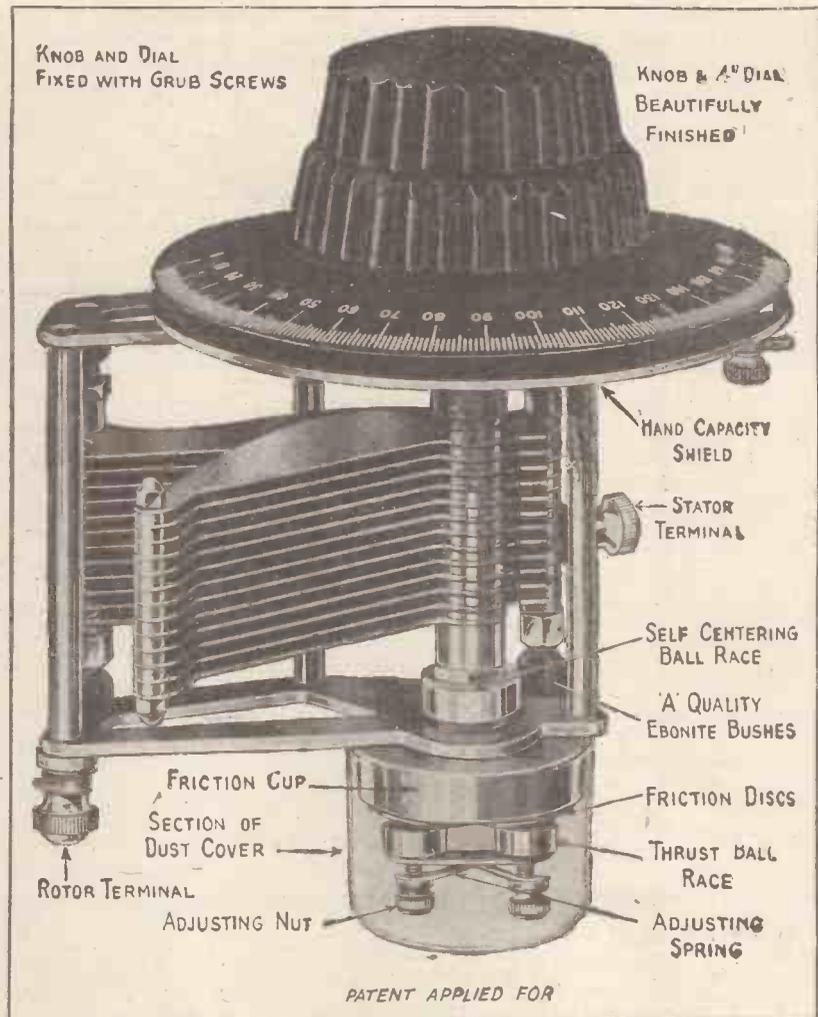
Thanking you for at last producing a really fine and much sought for Slow Motion dial that can be relied on.

Yours faithfully,

(signed) F. Appleton.

Messrs. The Ormond Eng. Co., Ltd.,  
N.1.

P.S.—You are at liberty to make what use you like of this letter if of any service to you.



THE ORMOND S.L.F. Condenser is all but essential now that the new "Geneva Plan" is in operation. The markings of the dial enable listeners to pick up any station with the minimum of trouble and without any unnecessary calculations. Precise tuning adjustments with noiseless operation are ensured by the general sound construction of this popular ORMOND Product. The famous ORMOND SLOW MOTION FRICTION DRIVE (Ratio 55—1) is incorporated, and special ball bearings give liquid-like movement to every turn of the knob. This world-famous ORMOND component is easy to mount, having one and three holes for fixing, with both terminals and soldering tags for connections.

PRICES

With 4" Bakelite Knob.		With Dual Indicator Dial.	
.0005 mfd.	20/-	.0005 mfd.	21/6
.00035 mfd.	19/6	.00035 mfd.	21/-
.00025 mfd.	19/-	.00025 mfd.	20/6
RATIO 55—1.		RATIO 55—1.	



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

Telephone: Clerkenwell 9344-5-6. Telegrams: "Ormondengi, Kingcross".

Factories:

Whiskin Street and Hardwick Street, Clerkenwell, E.C.1.

Continental Agents: Messrs. Pettigrew & Merriman, Ltd., "Phonos House", 2 & 4, Bucknall Street, New Oxford Street, W.C.1.

# RADIOTORIAL

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

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The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts and photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All inquiries 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."

### TECHNICAL QUERIES.

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

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

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

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

Details of the "P.W." BLUEPRINTS are published fortnightly in the advertisement pages of "P.W."

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If a list of point-to-point connections is required an additional fee of 1s. must be enclosed. Wiring diagrams of commercial apparatus, such as sets of any particular manufacture, etc., cannot be supplied. (Such particulars can only be obtained from the makers. Readers may submit their own diagrams, etc., for correction or for criticism. The fee is 1s. 6d. per diagram, and these should be large and as clear as possible.

No questions can be answered by 'phone. Remittances should be in the form of Postal Orders.

## Questions and Answers

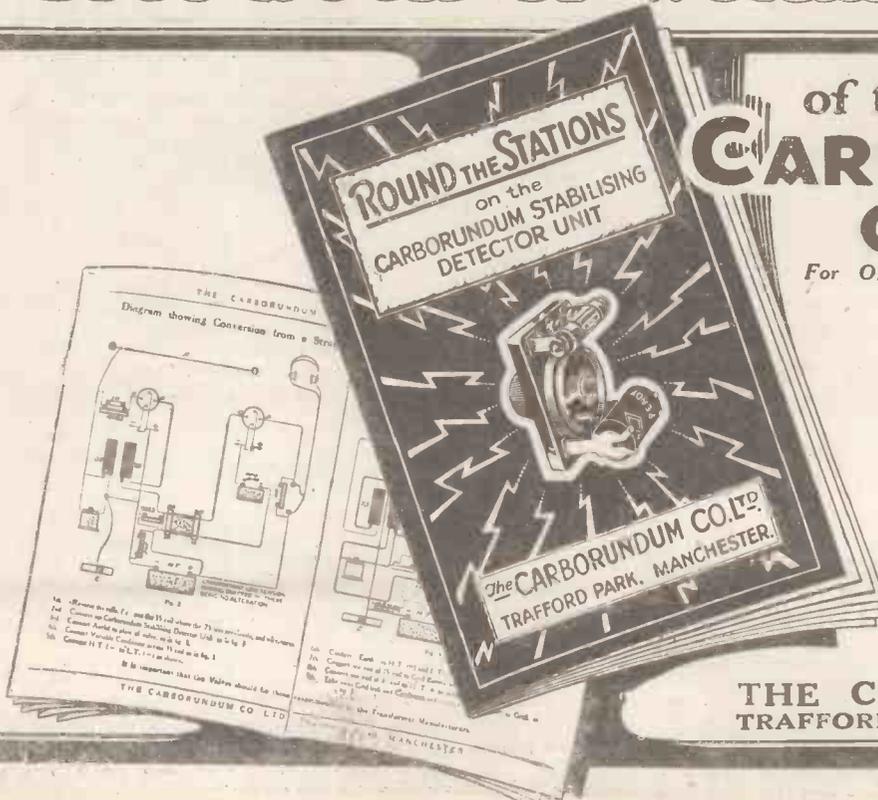
### REPRESSING THE RHEOSTAT.

L. J. G. S. (Mitcham Common)—I have read with great interest the article (in "P.W." No. 243) called "Repressing the Rheostat," by Mr. Dowding. Suppose one is using an old-fashioned or cheap set, without an on-off switch, would it not be necessary in the circumstances outlined to disconnect the accumulator lead to prevent a flow of current?

Yes. If there is no on-off switch, one of the L.T. battery leads should be removed when the set is not in action. Always remember that when disconnecting a battery lead it should be removed at the battery end, not at the set end.

(Continued on page 1446.)

# Free book of working diagrams



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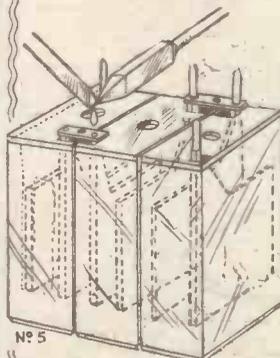
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## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1444.)

### AERIAL FAULTS.

E. A. Y. (Westcliff-on-Sea).—What are some of the chief snags that I must avoid in putting up an aerial for a one-valve set?

Don't allow any part of the aerial or lead-in to run close to a wall, hedge, or wire fence. Don't use twin flex for taking both aerial and earth leads away from the set; the aerial and earth leads should nowhere approach to within less than three or four inches of one another. Don't use lead-covered cable for either aerial or earth leads. Don't staple the aerial lead to the walls of the room. Keep the indoor portion of the lead as short as possible. Don't use two earth leads to different earths; the length of the earth wire affects the wave-length of the aerial system, and when two leads are employed, even though the resistance may be lowered, signals will be slightly muffled. Don't let the active parts of the earthing switch be exposed to the weather.

### DISTORTION IN L.F. AMPLIFIER.

G. H. (Portsmouth).—Some weeks ago I saw in "P.W." a hint for reducing distortion or howling in the L.F. stages by fitting a grid leak to the transformer. What were the connections for this?

The illustration is here-with reproduced again. It shows a 25 meg. grid leak connected across the two secondary terminals ("G." and "G.B.") of the L.F. transformer.

### TERMINALS LOOSE AFTER SOLDERING.

"EBONITE" (Whipp's Cross).—Why do terminals often loosen after being soldered, even though they have been well tightened?

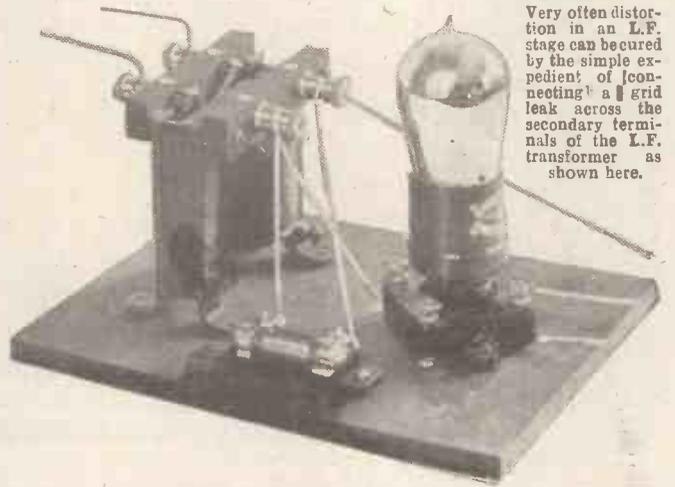
Terminals, etc., which have been tightly screwed into ebonite will loosen when soldered, because the heat softens the ebonite. After each joint is soldered the fixing-nut will need to be tightened up against the panel again.

### WHEN PANELS WARP.

S. H. (Shipley, Yorks).—I have had a super-het. panel standing by for a long time, till I had a chance to make the set, and now I find it has become bent. How can this be remedied?

The panel can be straightened by gently warming it, and then placing it between flat boards upon which a heavy weight is resting until the ebonite

(Continued on page 1448.)



Very often distortion in an L.F. stage can be cured by the simple expedient of reconnecting a grid leak across the secondary terminals of the L.F. transformer as shown here.

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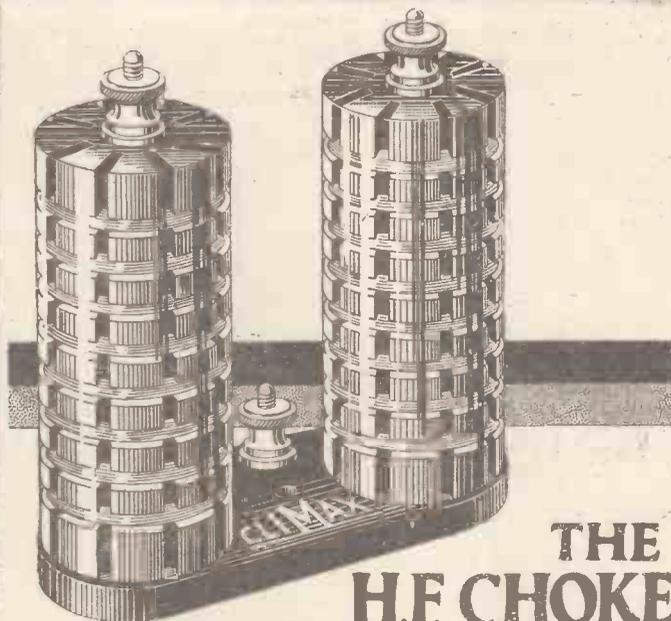
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## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1446.)

has thoroughly cooled. One good way of warming the panel is by immersion in hot water, but by storing it in a flat position the whole trouble could have been avoided.

### VALVE TEMPLATES.

"NOVICE" (Co. Galway, Ireland).—Please tell me the best way of marking the positions for valve legs.

In order that valves can be inserted and changed easily, the marking for valve legs must be accurately done, and a proper template or "jig" for this purpose only costs a few pence. Another good method of finding the correct positions is to "transfer" them to the panel from the valve itself. This can be done by placing a piece of carbon paper over the panel and firmly pressing the valve down in the desired position. Clearer marks can be obtained by coating the bottom of each valve leg with a very small spot of soap, and then pressing the valve direct upon the panel. A tap with a punch or sharp nail will then mark the exact centre of the spot.

### ACCUMULATOR SEDIMENT.

P. A. L. H. (Measham, Leicestershire).—I notice that a kind of sediment has formed at the bottom of my accumulator. Will this develop into a fault?

Owing to the constant charging and discharging, small particles become in time detached from the plates and settle at the bottom of the accumulator. They must not be allowed to touch the plates or bridge across between plates, as this would quickly ruin the accumulator.

### TESTING CHARGED CELLS.

"SERVICE" (Bournemouth).—When charging a bank of accumulators, should the charging current be cut off as soon as the cells begin to gas freely?

The fact of gassing is hardly a satisfactory criterion, though it is a useful indication. The best test of a fully charged cell is the fact that the specific gravity of the acid ceases to increase. When this happens, the charging current starts to decompose the water in the cell into its constituent hydrogen and oxygen, which causes the gassing.

In practice, charging is often continued until the fluid in the cells begins to have a rather milky appearance. The charging current is reduced to about half the normal when the cells are gassing freely at both negative and positive plates, and it is generally allowed to continue at the reduced rate until the gassing recommences, when charging is complete.

### SMOOTHING CONDENSERS FOR H.T. ELIMINATOR.

A. L. D. (London, S.W.18).—I am building an eliminator for D.C. mains, in which it is recommended that two fixed condensers should be used, each of 2 mfd. capacity. I have on hand one 2 mfd. condenser, and also two 4 mfd. condensers. Could I use one or both of these latter, or is the difference in capacity likely to affect results?

Certainly you can use the condensers already on hand. In smoothing units of the type you are constructing, the actual capacity is quite unimportant, so long as it is large. Probably the two 4 mfd. condensers would give results superior to the two 2 mfd. condensers recommended in the article. Alternatively, one of the 4 mfd. condensers could be used, in conjunction with the 2 mfd. condenser you have on hand.

### FRAME FOR FLEWELLING.

W. G. L. (Fleetwood, Lancs.).—Can I use a frame aerial with success for the Flewelling circuit? If so, what are the connections for reaction?

A frame aerial will give excellent results with the Flewelling circuit, its low damping tending to assist easy super-regeneration.

If the frame is of the centre-tapped type, one of the windings may be used as a reaction coil. A more usual method is to connect a loading coil to the frame-winding in series, and the tuning condenser across the two (winding and coil). Reaction is obtained by coupling another coil to the aerial loading coil, in the usual way.

Either a 2-ft. or 4-ft. frame may be used. The best size for coils will have to be found by experiment, but will probably be about 30 turns for loading and 75 for reaction.

(Continued on page 1450.)

## ADVERTISEMENTS

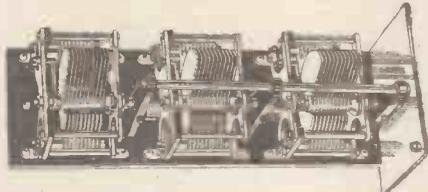
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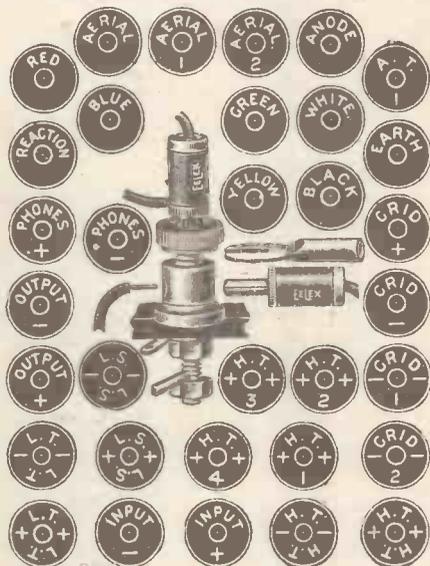
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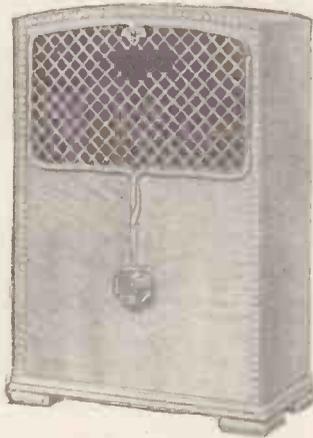
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Newcastle-on-Tyne: TANGENT House, Blackett Street.

**RADIOTORIAL QUESTIONS AND ANSWERS**

*Continued from page 1448.)*

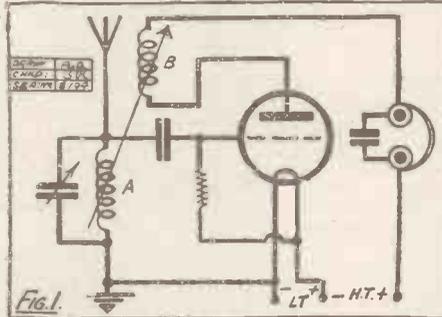
**CAUSE OF HOWLING.**

"HOWLED AT" (Belfast).—What part of the set is it that actually causes the howl when a set is oscillating?

The reason that a howl is set up is due to the fact that a valve set, properly connected for receiving, can act as a transmitting set if excessive reaction is used.

It cannot be too clearly understood that when the reaction coil (B) is brought so close to the aerial coil (A) that the set oscillates, the receiving set acts as a miniature transmitter (see Fig. 1). The aerial attached to it sends out a continuous wave like the carrier-wave of a broadcasting station.

If the set is tuned for broadcasting wave-lengths this illegal carrier-wave will have a wave-length very near to that of the wave used for broadcasting. In itself either of these waves would be inaudible



(except when modulated), but when they are present in a receiver simultaneously beats are formed at regular intervals between the two sets of waves. Even if neither wave is modulated, such beats or heterodynes can give rise to a howl in a neighbouring receiver. This is because the beats may occur at audible frequency and if so will give rise to a corresponding note in the telephones.

If the tuning condenser of the offending set is turned so as to bring the wave-lengths nearer to or farther from one another, the beats will alter in frequency and the received note will rise or fall accordingly. This will give rise to the all too-familiar chirps and whistles that are associated with oscillation.

**TINNING TERMINALS.**

N. G. S. (Boston, Lincs).—How can a set of terminals and small metal parts be "tinned"?

The ingredients required will be ½ lb. of tin, and 1 oz. of cream of tartar.

After melting in a suitable crucible, the tin should be poured into an enamelled saucepan, or a similar vessel, which should be about three parts filled with water.

(The best method of pouring is to hold the crucible at arm's-length, and pour into the saucepan from a height of 4 feet, spreading the tin evenly on the bottom of the saucepan. It should not be allowed to accumulate as a mound in the centre.)

The water in the saucepan should now be brought to the boil. When boiling, drop in the polished metal parts, sprinkling in at the same time about half of the cream of tartar.

Keep the level of the boiling water above the tin, and the parts can be removed in about an hour. If a heavier coating is desired, the time may be extended and the remainder of the cream of tartar can be added. After removal, the various parts should be rinsed thoroughly in cold water, and then dried.

If washed and dried, the tin may be used over again.

**POSITION OF REACTION COIL.**

E. C. (Oswestry, Salop).—Why is it that sometimes my coils have to be quite close to get full reaction effects, whilst at other times oscillation occurs when the coils are quite widely separated?

Several causes may tend to have this effect, but if it is as marked, as your question suggests, we think it is probably due to variations in the resistance of the aerial-earth circuit. Such variations should not be allowed to continue, so we should overhaul the whole of the aerial-earth connections. Probably it will be found that an oxidised joint is the cause of the trouble, or the contact with a buried earth-plate has become erratic.

Apart from such a fault, variation in the reaction-coil position can be caused by alterations in the

*(Continued on next page.)*

**RADIO REGISTERED PANELS**

Inches	Inches
7 × 5 1/4	6 × 6 1/2
7 × 6 1/3	8 × 5 1/2
8 × 6 1/4	9 × 6 1/7
10 × 8 2/1	11 × 8 2/3
10 × 9 2/4	12 × 8 2/6
12 × 10 3/4	12 × 9 2/10
14 × 12 4/4	14 × 10 3/5
	Post Free.

**CROXSONIA**  
TRADE MARK

Money back guarantee that each and all Panels are free from surface leakage. Messger test Infinity.

Callers cut any size. Quotations by post, or phone Clerkenwell 7853. Samples and prices post free to the Trade.

CROXSONIA CO., 10, South St., MOORGATE, E.C.2

**"HARTEL" WET H.T. BATTERIES**

Leclanché Type. As tested and recommended by "Popular Wireless" (see Aug. 7 and Jan. 22 issues).  
NON-CORROSIVE. ALL PARTS REPLACEABLE.  
30-v., in Case with lid, 13/6, carr. 1/6. 60-v., ditto, 25/-, carr. 2/-. 100-v., ditto, 42/8, carr. 5/6. Separate tappings. 7 days' trial against cash. No more trouble or expense if you install a genuine "Hartel." Don't buy cheap imitations, but get the battery recommended by the Wireless Press (see "Popular Wireless," as above). Manufactured solely by Yorkshire Ignition Co., Ltd., 1 & 3, Broomhall Street, Sheffield. Trade & Factors supplied.

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Write for Illustrated Price List of Cabinets. Let us quote you for your own designs and sizes  
F. DIGBY, 9, BANBURY ROAD, SOUTH HACKNEY, E.9.

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FOR MOUNTING ON WOOD. PERFECT INSULATION  
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Hole in Bush... 6BA, 4BA, 2BA, 1/4 5/16 3/8 7/16"  
Price each: 1d. 1d. 1d. 1d. 2d. 2d.  
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TRADE SUPPLIED

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**LOUD-SPEAKERS, HEADPHONES, H.T. ACCUMULATORS.** Anything Wireless.

Send a list of the parts you are requiring, and we will send you a quotation on monthly payments.

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The "CLEAR STONE" mineral combination  
Refills for all makes of Permanent Detectors. Sufficient for two Detectors. Wood's Metal Free. Positively the Loudest Results on Earth.  
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(Phone: City 7261.)

and NOT to the Editorial or Publishing Offices.

RADIOTORIAL
QUESTIONS AND ANSWERS

(Continued from previous page.)

filament- or H.T. voltage, or both, or by bad contact in the reaction-coil circuit.

SOFT DETECTOR VALVES.

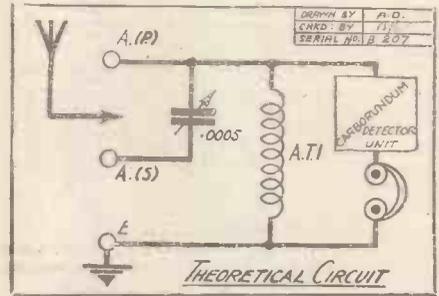
F. R. S. (Godalming, Surrey).—Is it not a fact that "soft" valves, although they make good detectors, are rather short lived, as compared with a hard detector valve?

Usually the "soft" valve had a much shorter life than that of a "hard" (high-vacuum) valve. This applies particularly to the old-fashioned "soft" valves in general use some years ago, which suffered from bombardment of the filament by the positive ions in the bulb.

Great advances have been made in the manufacture of robust filaments since then, and it is now possible that valves having the good detecting characteristics of a soft valve can be designed with long-life filaments. Such valves would have the advantage of low H.T. requirements.

CARBORUNDUM CRYSTAL CONNECTIONS.

N. M. T. (Ipswich).—I should like to try a carborundum crystal circuit, using one of the complete carborundum detector units, as



advertised recently in "P.W." Are the connections the same as for an ordinary crystal set?

Yes. The complete unit takes the place of the ordinary crystal, as shown in the accompanying diagram.

(A set using a unit of this kind was fully described in "P.W." No. 231, Nov. 6th, 1926, issue.)

L.F. TRANSFORMER LOSSES.

S. R. E. (Chesham, Bucks).—Why is the iron core of an L.F. transformer split up into "laminations" or separate sections?

The core is laminated in order to reduce losses in the transformer due to "eddy currents" (sometimes called Foucault currents). These currents flow in the core, and represent so much waste of energy. It is not possible to prevent them altogether, because the alternating current in the primary circuit acts inductively upon the iron core, in the same way that it acts upon the secondary circuit.

In order to reduce these "eddy" currents (as they are generally called), the iron core is sub-divided laterally but is continuous longitudinally. In this way the iron helps the magnetic lines of force that are inducing current into the secondary by providing a continuous longitudinal path; but it opposes the cross-currents set up in the iron by virtue of the fact that there is no easy continuous path for these eddy currents.

WHY IS RANGE GREATER AT NIGHT?

"OBSERVER" (Penzance, Cornwall).—Why do the foreign stations come over so much better after sunset?

This is largely owing to the action of the sun upon the earth's atmosphere. The effect of the sunlight is to "ionize" the atmosphere high above the ground. The result is that this upper layer of the atmosphere becomes a conductor, and during darkness it tends to assist communication upon ordinary broadcasting wave-lengths. For this reason the ranges of distant stations appear to be more than doubled and trebled soon after sunset.

COMPONENT PRICES.

In the advertisement of the Eureka Orthocyclic Condenser, which appeared in "P.W." 243 (p. 1335), the price of the 0005 mfd. capacity was erroneously stated as 14s. 6d., instead of 15s. 6d.

Similarly, the Detex 2-way coil holder, given in the "Savoy Three" list of components ("P.W." 239), should have been 8s. 6d. instead of 6s. 6d.

3-VALVE SET (D. & 2L.F.)

with Coils and Valves. Tax paid. (Carr. and packing, 7/6) .. £5 15 0

With accessories as mentioned, with 2 Valve Set. (Carr. and packing 10/-) .. £8 18 6

SET ONLY .. £4 0 0 (Carr. 5/6).

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2-v. 40, 7/11; 2-v. 60, 9/6; 2-v. 80, 12/6; 2-v. 100, 14/6; 4-v. 40, 13/11; 4-v. 60, 17/11; 4-v. 80, 22/6; 6-v. 60, 25/6; 6-v. 80, 33/6. ALSO another good make, 1/6 extra on each of above. Post 1/- each.

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

VARIABLE CONDENSERS.—Polar Standard, 10s. Junior, 5/6 each. Bowyer-Lowe Popular 10/6. Igranio, 24/-; Collinson's Low-Loss, 21/-, 20/-; Utility, 8/6, 10/6; Verrier, 2/6 extra. Utility Low-Loss, stocked -0003 and -0005. J.B. (Jackson Bros.), Square Law 7/1, 9/8; 9/05, 8/-; 9/003, 7/0 (with vernier 4/- each extra). Geard, 9/005, 15/-; 9/003, 13/-; Low-Loss, 10/8, 9/-.

CABINETS. Large stocks of really useful Cabinets kept on hand to order. Polished mahogany colour or oak. American type, hinged lid, baseboard. 8" x 6" x 7" deep..... 6/11 (By post, 8/3). 10" x 8" x 8" deep..... 8/11 (By post, 10/3). 12" x 8" x 8" deep..... 10/6 (By post, 12/-). 14" x 7"..... 12/6 (By post, 14/-). 16" x 8"..... 16/11 (By post, 17/11).

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(Mullard Receivers). FRANKLIN P.M. RODNEY P.M. NPLON P.M. GRENVILLE P.M. All parts in Stock. Set of 4 Blue Prints, with Book of Instructions free to customer. NELSON components exact to author's specification, £6 10s. (includes all coils) Post. 2/-.

EDISWAN R.C. THREESOME

Set of Parts: 2 Units, 7/- each; Pr. 2 Valve, 18/6; 2 R.C.E. at 14/-; Lotus V.H. at 2/6; 2 Fil. Rheostats at 3/6; 2-v. Grid Bias, 2/-; Lotus 2-way L.H., 7/-; 0005 Tuning Condenser, 6/11. The lot, post free, £3 19s. 6d. With cheaper (but good) rheostats, valve holder and 2-way. The above lot, 72/6.

RADIO MICRO

(Guaranteed genuine) 3.5-v. 006-a, G.P. .. 5/11 1.9-v. 2-a, G.P. .. 5/11 3.5-v. 3-a, Power .. 8/6 1.9-v. 2-a, .. 10/6 Post 1/- each.

WATES' MICROSTAT ... 2/9 each

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

S. T. VALVES

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PARTS FOR LODGE "N" (2-Valve) "P.W." 21

(Customers must obtain permission to make same). ALL PARTS (as specified), including SILVERTOWN Transformer (essential), 35/- Post 1/-.

Panel and Cabinets stocked.

GUARANTEED REFLEX "P.W." 22.

1.0005 Variable; 1 Rheostat; 1 L.F. Transformer (1st stage); 1 L.F. Transformer (2nd stage); 2 2-way Coil Holders; 1 Fixed 3rd.; 1 Fixed.0001; 1 Fixed.0003; 1 Fixed.0002; 1 Crystal Detector; 2 Coils A.30/50, Reaction 50/80, and for 3XX, 130 and 200. Components as specified, £2 17s. 6d. Post 6d.

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NOT SENT BY POST. EBONITE GRADE A. Stock sizes, 6 x 6 and 7 x 5, 1/3; 8 x 6, 1/8; 9 x 6, 1/9; 10 x 8, 2/9; 12 x 6, 2/9; 12 x 8, 3/6; 12 x 9, 3/6; 14 x 7, 4/6. 1/20 CUT TO SIZE while you wait at 1d. per sq. inch 3/16th; and 2d. sq. inch for 1 in. Special cheap panels for Crystal Sets.

BATTERIES. All kinds of rubbish on the market, so buy where only guaranteed and reputable makes sold. Adco, Polo (highest test awards), 60-v., 6/11; 100-v., 12/11. Dr. Nesper (the name is crucial), 60-v., 7/11; 100-v., 13/11.

For those that want a cheaper but still reliable, H.T., try the "K.R." 60-v., 5/11; 100-v., 10/11. Beware of cheaply stocked B.T.H. E.S. 2/9. Adco, 1/9. Columbia, 2/3. Hellesen 2/8. Hellesen 4/1 volts Super L.T., 10/6 (and worth it!). H.T. 60-v., 12/8; 90-v., 21/-; Adco, 4/1 doz., 6d. British 5/- doz.; Dr. Nesper, 4/6 doz. CABINETS.—American type, solid polished hinged lid and baseboard. 8 in. x 6 in. x 7 in. deep, 9/11; 10 in. x 8 in. x 9 in., 9/11; 12 in. x 8 in. x 8 in., 10/8 and 12/6; 14 in. x 8 in., 13/6; 16 in. x 8 in., 16/11. Any size made to order in a few days.

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DPDT, 1/3; SPDT, 10/4. Superior articles. Nickel, Panel, Ebomite handle. DPDT, 1/8; SPDT, 1/8. 100 Amp. Plug, 1/8. 24 Spade Pins, 1/-; All Lenses stocked. THERMALS, Etc.—Nickel W.O., 'Phone, Pillar, 1/- doz.; 3d for 4d. Brass doz., 10d. doz.; 1d. each. Nickel Valve Legs, 2 for 1ld. 100 Amp. Plug, 1/8. Spade Pins, 6 a 1d. Holder, 3d. doz. 6d. Ormond Nuts, 2d. doz. Washers, 12 a 1d. 2 and 4 B.A. Rod, 3d. 1d. the best sold here. Screw Spacers, 2 for 1ld. Pins doz. Valve Pins, 2 a 1d.

PERMANENT DETECTORS.—

Liberty, 3/8. Red Diamond (a copper), 2/-; Lion Micro, latest cannot be equalled, 2/6. Brownie, 3/-; Detached Kay 2/6. 1/3. Service Micro-meter, with crystal, 2/9. Burmet 4/-; Mic Met, 4/6. RED & BLACK Winder Plugs, 2d. and 3d. per Spades, 3d. pr. Pins, 2d. pr. Pins, 3d. Socket, 3d. Clix Winder Plug, 2d. Igranio, 3d.

COIL PLUGS.—Ebomite on

base, 6/4, 7/4. Lotus 8d. Burn-Jones 1/9, Low Loss, 8/6. Panel, 6/4. Various stocked.

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SWAN, MARCONI, COSSOR, OSBAMA JACSON'S (I. B.), POLYBLIE, McMICHAEL, SUCCESS, BEARD & FITCH, BOWYER - LOWE, LEWCOS, IGRANIO, EUREKA, ORMOND, UTILITY, FOREM, EDISON-BELL, FEERANT, R. J., POLAR, NEWAY, P. & J., 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

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**CORRESPONDENCE**

(Continued from page 1438.)

The following is an extract from the cutting sent to us by Mr. Gregar:

Since the opening of the new Imperial Beam wireless stations at Bodmin and Bridgwater last month numerous complaints of interference have been made by Westcountry radio enthusiasts whose contact with the various broadcasting stations is practically cut off when the great "Beam" aeriels are in operation (says a London representative of the "Western Morning News").

The interference is stated to be particularly bad in Cornwall, and Mr. G. Pilcher, M.P., has been bombarded with letters from Cornish "victims of the beam" since he raised the matter in the House of Commons a few days ago.

Mr. Pilcher asked the Postmaster-General whether he had any information regarding the interference with ordinary wireless receiving in Cornwall by the new beam system of communication with Canada, and if he would approach the Marconi Company with a view to protecting the interests of the owners of receiving sets.

Sir Wm. Mitchell-Thomson replied that the operation of the Post Office "beam" station at Bodmin did not interfere with broadcast reception in Cornwall provided that suitable receiving apparatus was used.

He agreed that some interference had been experienced by persons in Cornwall using short wave-lengths for experimental purposes, but he thought that was unavoidable.

The Postmaster-General's reply has been strongly criticised by many Cornish listeners, who have written to Mr. Pilcher, describing the official defence as "absolutely incorrect and misleading."

One complainant, writing from St. Austell, states that he has a first-class set, and declares that interference takes place "practically all day long on any wave-length."

**RESISTANCE COUPLING BEST.**

The Editor, POPULAR WIRELESS.

Sir,—In your issue of January 29th a correspondent, Mr. J. Baggs, comments on the poor results obtainable from commercial resistance coupling units, and he states that much better results may be obtained with a certain make of L.F. transformer. While agreeing with Mr. Baggs' remarks regarding the commercial resistance coupling units, I beg to differ entirely with his suggestion that transformer coupling (using the make of transformer he mentioned) is superior to the resistance-capacity method.

I have made actual measurements and curves of various transformers, choke and resistance coupled circuits with all sorts and conditions of makes and values of components, and have proved to my satisfaction that there is no form of L.F. coupling that approaches the common or garden resistance capacity circuit as given in most wireless journals. In the complete commercial R—C units the value of the coupling condenser is usually far too small in relation to the values of the other components and the valves in circuit. The poorest results were obtained with choke coupling, excepting with two or three rather expensive chokes. Several transformers actually gave better results than the make mentioned by Mr. Baggs, but there were less than a dozen transformers which could be seriously considered as suitable for a quality wireless receiver. Two or three transformers were really excellent, and one—an American make—very closely approached the straight line given by resistance coupling. All the results were confirmed by ear on a moving coil-driven cone loud speaker.

Of course, if one delivers really good bass notes to most of the horn type loud speakers, a kind of "burbling" sound is the result. I don't believe there are more than two loud speakers on the market that adequately reproduce any note below 200 cycles. And not a single one reproduces a pure fundamental 50 cycle note. What type of loud speaker did Mr. Baggs use for his experiments? Has Mr. Baggs heard 50 cycles?

Yours, etc.,  
"MALTESE CROSS."

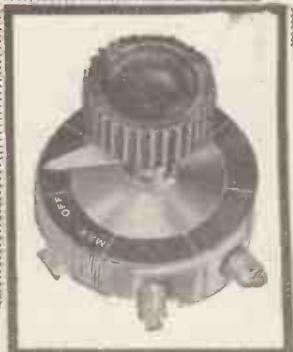
**MR. ROYDS REPLIES TO MR. SCOTT-TAGGART.**  
The Editor, POPULAR WIRELESS.

Dear Sir—I have read with considerable amusement Mr. Scott-Taggart's reply to my letter published in your issue dated January 29th. In particular, those portions which confuse curves with the hills of "Rome" and "Reigate." The reading of your contributor's comments took me back some years into my youthful geographical studies. Doubtless in those days I should have welcomed with open arms some gentle diversion—perhaps a few bars on the piano from an adjoining class-room—maybe the strains from a Blue Hungarian Band in the street, struggling through Mendelssohn's "Overture to the Hebrides." Flights of fancy are youth's prerogative—

But now, looking through a glass darkly, gentle diversions are ruled out of order on the count of frivolity. Curves, co-ordinates and such graphical terms are serious matters to the readers of POPULAR WIRELESS, who have, no doubt, drawn their own conclusions from your contributor's employment of a "smoke barrage."

From beginning to end your contributor has confused the issue—not even mathematically but very frivolously. In pointing out some of the inaccuracies in Mr. Scott-Taggart's article on "What Dynamic

(Continued on page 1454.)



The 'PEERLESS'  
Junior  
RHEOSTAT

Sales  
now over  
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MILLION

Study the life of your valves and fit only the components that will function properly. In the "Peerless" Junior Rheostat are found features which make it exceedingly popular—its sales figures are now well over the half million. This Rheostat has an OFF position provided, while definite stops make short circuit impossible. The resistance element is immune from damage. Will safely carry current of two valves.

Complete with nickel dial and one hole fixing. Three types. Size, 1 1/2" dia. x 1" high, 6, 15 or 30 ohms.

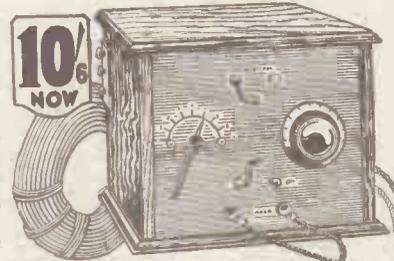
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**GRAVES**  
2-VALVE  
LOUD SPEAKER BARGAIN.



This highly efficient 2-Valve Loud-Speaker Set is the finest wireless value ever offered.

It gives a volume and quality of tone unattained by any instrument of a similar price and is the essence of simplicity. Fitted with coils covering all the British wave-lengths, including Daventry.

THE CABINET is of beautifully polished Oak, & all components are of the highest quality. Dull Emitter Valves with patent valve holders, &c.; H.T. Battery, 2-volt accumulator and complete Aerial Outfit. LOUD SPEAKER of exclusive design with unique magnetic system and improved mica diaphragm. Price £7:17:6

TERMS: Our Bargain Price is for deferred payments. Send 10/6 now, & complete purchase in 14 monthly payments of 10/6. If you wish to pay cash, 5 per cent discount is allowed. Catalogue Post Free. Up-to-date Crystal & Valve sets at keenest prices.

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**WIRELESS.**—Capable, trustworthy men with spare time who wish to substantially increase income, required where we are not fully represented. Applicants must have practical knowledge of installation of Set and Aerial, be a householder or live with parents, and be able to give references: state age and experience. Address: Dept. 10, General Radio Company, Limited, Radio House, Regent Street, London, W.1.

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A. H. JENKINS, 176, Ombersley Road, BIRMINGHAM. Trade inquiries invited.

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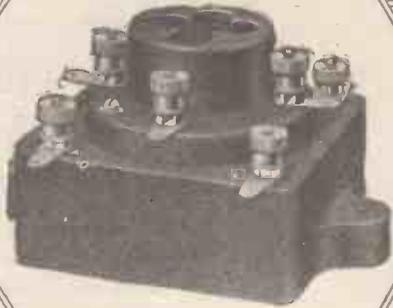
Change the programme RIGHT INTO your room

The L. G. Russell Laboratories  
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**1/9 DONT PAY MORE**

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Anti-capacity. Anti-phonio.  
If hard to get, drop us a line.  
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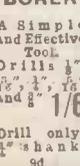
**DEWAR SWITCH**



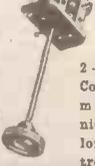
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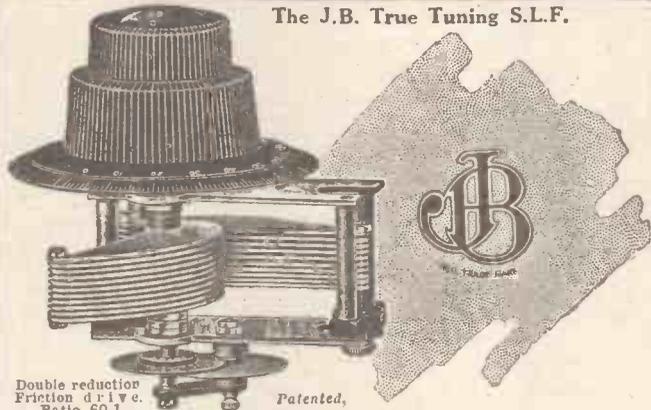


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**CORRESPONDENCE.**

(Continued from page 1452)

Curves Mean." I was hopeful that some useful discussion for the readers of POPULAR WIRELESS would ensue. One good result has evolved however: Mr. Scott-Taggart and myself have now agreed that ordinary static characteristics are both reliable and useful.

As some of the points I raised have not been satisfactorily met, I will, Mr. Editor, with your permission, elaborate them. My first point was:

"That the dynamic curve of Fig. 3 is incorrect."

The conditions yielding this curve were as follows:

(a) The static characteristics are as in your contributor's Fig. 2.

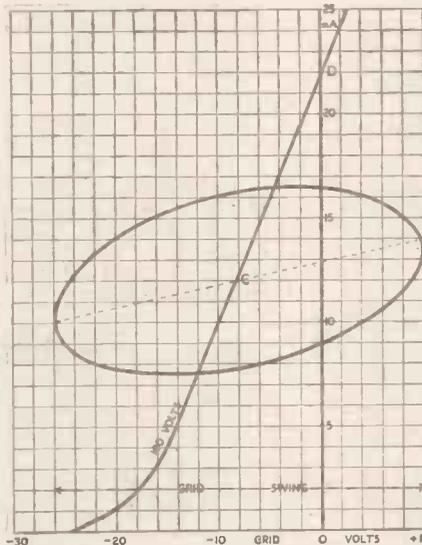
(b) An impedance of 20,000 ohms is in the anode circuit.

(c) A grid bias of -8 volts is used.

(d) A grid swing of from -26 volts to presumably positive 10 volts is applied.

Now with these conditions an anode current change of approx. 4½ m.a. per ½ cycle is obtained, and an anode voltage change of about 90 volts per ½ cycle, so that the static characteristics fulfil the conditions well as regards anode current, and just satisfy them as regards the voltage change. The ellipse then will cut the static characteristic at the points where the anode current is 16½ m.a. and 7½ milliamperes, and the ellipse will be of the form shown in the figure reproduced. This is a dynamic curve under certain definite conditions.

There is not one dynamic curve for a given valve and loud speaker, but an infinite number. The manufacturer of radio valves who foolishly attempted to



This graph represents the appearance of the dynamic curve arrived at from the data quoted by your contributor in his article.

supply his customers with dynamic curve data might be faced with employing many ten-ton lorry-loads of literature to satisfy a single inquirer.

With every different note uttered a different dynamic curve is obtainable, and if the grid swing be considered of fixed amplitude, then the ellipses vary in width for different frequencies.

If, as is the case in practice, both grid swing and frequency vary, then both the widths and the lengths of the ellipses vary. Now Mr. Scott-Taggart's dynamic curve, which gives "the true conditions," has no width and is apparently of indefinite length, and certainly does not represent what is happening under the conditions given.

His curve is not a dynamic curve due to ohmic resistance in the anode circuit, for such a curve as he shows is entirely below the ordinary characteristic curve; if it is not meant for the axis of some particular ellipse, Heaven only knows what it is meant for!

Mr. Scott-Taggart admits that ellipses MAY be produced. I assert that in the case he considered, and except where only a pure ohmic resistance exists in the anode circuit, they are produced.

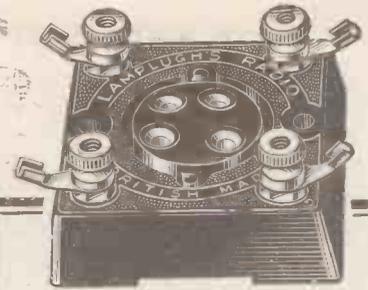
Mr. Scott-Taggart has written an article to show "what dynamic curves mean," and makes the astounding statement—that one has to see "that the dynamic characteristic curve is DEAD straight so as to give perfectly pure-reproduction."

Readers of POPULAR WIRELESS will now be able to judge for themselves just to what degree perfectly pure reproduction depends upon a straight line.

I have criticised this article not because of its simplicity, but because of its inaccuracies, and because I feel that neither simple inaccuracy nor inaccurate simplicity will elucidate a difficult subject.

G. D. ROYDS.

Reigate, Surrey.



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**TECHNICAL NOTES.**

(Continued from page 1416.)

used for a loud speaker may amount to as much as 0.0145 mfd.

It is claimed also that there is a more even distribution of the reproduced sound, which proceeds directly from the outer surface of the rubber diaphragm, and indirectly (through the perforations in the metal plate) from the inner surface of the rubber diaphragm.

**Power Valves.**

My recent remarks on the subject of power valves have brought me many letters from readers dealing with various points, one or two of which I should like to touch upon. Some readers disagree with the statement that a power valve does not necessarily produce more power, but only enables more power to be handled without distortion. It is curious how a name or designation appears to hypnotise. The term "power" is purely relative, and means nothing except in relation to valves commonly used prior to the advent of "power" valves. A power valve (used in the last stage) merely handles the power supplied to it, and its undoubted superiority in many cases is due to the fact that it is better adapted to handle the power than an ordinary valve.

It should be noted in connection with the proper operation of the power valve that the grid should not be allowed to become positive in potential, and therefore there should be sufficient grid bias applied to the grid to ensure that the swing does not at any time make the grid positive. If the extent of the swing is known, the minimum grid bias is known, for it is equal to the maximum grid swing. More grid bias than this may usefully be applied, but if less be applied, not only will there be liability to distortion, but the H.T. battery current will be unduly large, with consequent shortening of the life of the H.T. battery. It is essential, also, for undistorted reproduction that the curve of the valve shall have a reasonably straight portion over the range represented by the maximum grid swing.

Users of power valves often do not realise the magnitude of the grid swings obtained in some cases with some modern receivers. A 9-volt grid-bias battery seems large enough for most purposes, but not with some of the super "power valves" used for receiving purposes. In many cases even 15 or 18 volts is not too much.

**Valve Design.**

Readers who take a serious interest in valve characteristics should consult a paper in the current issue of the "Proceedings of the Institute of Radio Engineers," entitled "The Output Characteristics of Amplifier Tubes," by two members of the Research Laboratory of the General Electric Company, Schenectady, N.Y.

The authors commence by pointing out that, although it has been common practice for a considerable time past to define the capabilities of an amplifier valve in terms of certain constants or characteristics such as mutual conductance, amplification factor, input impedance, and so on, this method, whilst it gives the necessary information for determining the performance of the valve when the only consideration is the amplification, is quite inadequate when the valve is called upon to supply an appreciable amount of power to the load circuit.

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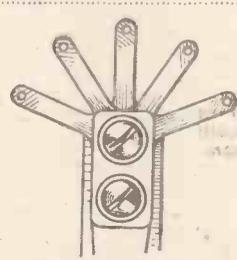
### JACKS



JACK No. 1. Single Circuit (Open) 1/3



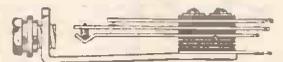
JACK No. 2. Single Circuit (Closed) 1/6



Showing Convenient Formation of Tags.



Jack No. 3. Double Circuit 1/9



Jack No. 4. Filament Single Control 1/9



Jack No. 5. Filament Double Control 2/3

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## ELECTRADIX RADIOS

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# ARE DYNAMIC CURVES MISLEADING ?

(Continued from page 1415.)

limit through which we must work, and obviously if we are dealing with symmetrical alternating current, about the centre of the straight part of the line gives us from the characteristic our grid bias setting for practical working.

From this so-called "dynamic" characteristic we can read our voltage amplification or power output for any grid volts input, but if we alter the value of R or Vo the line will be quite different.

If R is replaced by any network of capacities, inductances and resistances, just in the same way, except that the calculation is a great deal more complicated, we can determine the operating lines on the characteristic. The engineer who wants refinements will, of course, take into account valve capacities, etc., but these minor issues I need not consider here.

### "No Change" Required.

There is no mystery about good and bad valve characteristics; the subject is only a little complicated, and every circuit has to be worked out on its merits and the particular valve determined.

However, one can state definitely that the type of valve which has the lowest resistance when measured between the grid and plate strapped together and the filament, whatever its grid mesh is likely to be, is the best valve; but the choice of grid mesh after this "basic" resistance has been obtained is a matter depending on the circuit used. A simple way to reason out that this lower resistance is of advantage, is to think of two similar valves in parallel. They will have half the resistance of one and will obviously give us twice the power output of one valve. This basic resistance is very nearly the same as the inverse of

the mutual conductance or the  $\frac{m}{p}$  of the valve.

The greater the  $\frac{m}{p}$  of a valve is, providing a suitable p is chosen, the better the valve will be on any circuit, and the  $\frac{m}{p}$  of any two valves can be at once compared by putting two characteristics over one another and noting which is the steeper set of lines of the two (taking care that Vg, Ia scales are the same).

I hope I have put the case clearly for "no change." The so-called "dynamic" characteristic of a valve does not effectively differ from the static characteristic, providing one does not muddle the circuit into the question.

Mr. Scott-Taggart's examples of valve grid swings can, of course, be worked out with any given valve characteristic and any given circuit, and a good number of these cases I have written about previously.

I have pointed out before that if the characteristics are drawn between Ia and Va the graph is much easier to work out circuits with, and I believe it would be better if all characteristics were published between these two co-ordinates rather than as at present between Ia and Vg, but for those who have to do much work with curves the transformation is, of course, easy.



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There is no risk of creeping or corrosion. Rubber Rings can be supplied and are recommended for insulating purposes.

Two sizes of Sac Elements are at present manufactured by us—  
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No. 1 Sac	1/6
No. 1 Sac, with terminal	2/3
No. 2 Sac	3/-
No. 2 Sac, with terminal	3/9
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Zincs	1/-
Sample dozen cells complete with No. 1 Sacs	3/6
Packets of 24 Rubber Rings for insulating 12 Sacs—No. 1 size, 6d.; No. 2 size, 6d.	

Carriage Extra.

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**VALVES** at Wholesale Prices to all. Leading British make. 2-volt H. or L.F. 5/3; 2-v. Power, 8/-; 3-v. .06, H. or L.F. 5/3; 4. .06, H. or L.F. 5/6; 4-v. Power, 8/-; 5-v. 1-amp. Power, 8/6. All worth double. We pay post, and guarantee full satisfaction or money refunded.  
**Dawson Bros., Milton Hall, Deansgate, Manchester.**

## BUILD A LOUDSPEAKER

### THE SEAMLESS CONE

(Prov. Patent 25069/26)

and a Brown A Earpiece, or Lissnola with Reed, will enable you to construct a **CONE LOUDSPEAKER**, which will give you unsurpassable results. These Cones are unequalled for purity of reproduction, the high and lower registers being equally rendered.

Do not be put off with the ORDINARY PARCEMENT CONE, having a Seam Join. EXTRACTS from UNSOUGHT TESTIMONIALS: **FIREBRIGHT, SURREY:** "It is an excellent article and gives very good results." **SPALDING, LINCS:** "I am more than satisfied with the results." **SHEFFIELD:** "I have had one of the 27/10 Loudspeakers, and have no hesitation in saying that far more your Seamless Cone is much better." **BRISTOL:** "The Seamless Conical Diaphragm received yesterday works fine."

Illustrated Lists and particulars for Stamp.  
**GOODMANS, 27, FARRINGTON STREET, E.C.4.**  
 Also obtainable from Spence's Stores, 45, Mason's Av., E.C.3.

# To check the UNKNOWN factors



The Unknown Factors in a wireless circuit are mainly the aerial and earth. These can only be approximately standardised, as they vary according to the geographical and local conditions of every user. Batteries, Valves, Coils, Condensers, and all the other accessories used in a circuit, can be accurately standardised.

The R.I. Tuner compensates for this lack of standardisation.

How is this done?—By giving every user a choice of two or three values of inductance and capacity, for different stations, as the best position on the tuner, suitable for a particular aerial and earth, can be found in a few seconds.

Herein lies the great reason for the popularity of this component, and users of the various circuits now being recommended by Valve manufacturers and others, are writing to them, asking how the "R.I." Tuner can be adapted.

Unless you have one of these components in your set, you cannot be sure that you are getting the best from your receiver, as you might be using fixed coils which are not giving the most efficient results on your own particular aerial and earth.

You will only realise the advantages to be obtained by fitting this tuner to your set.

Price 39/6

Write for the R.I. Green and Gold Catalogue.

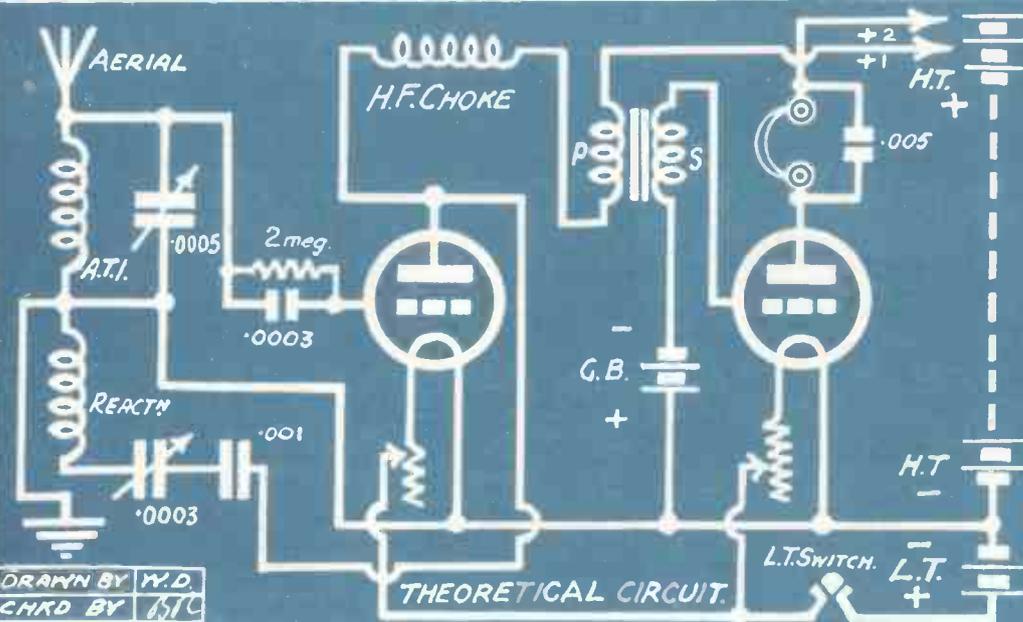
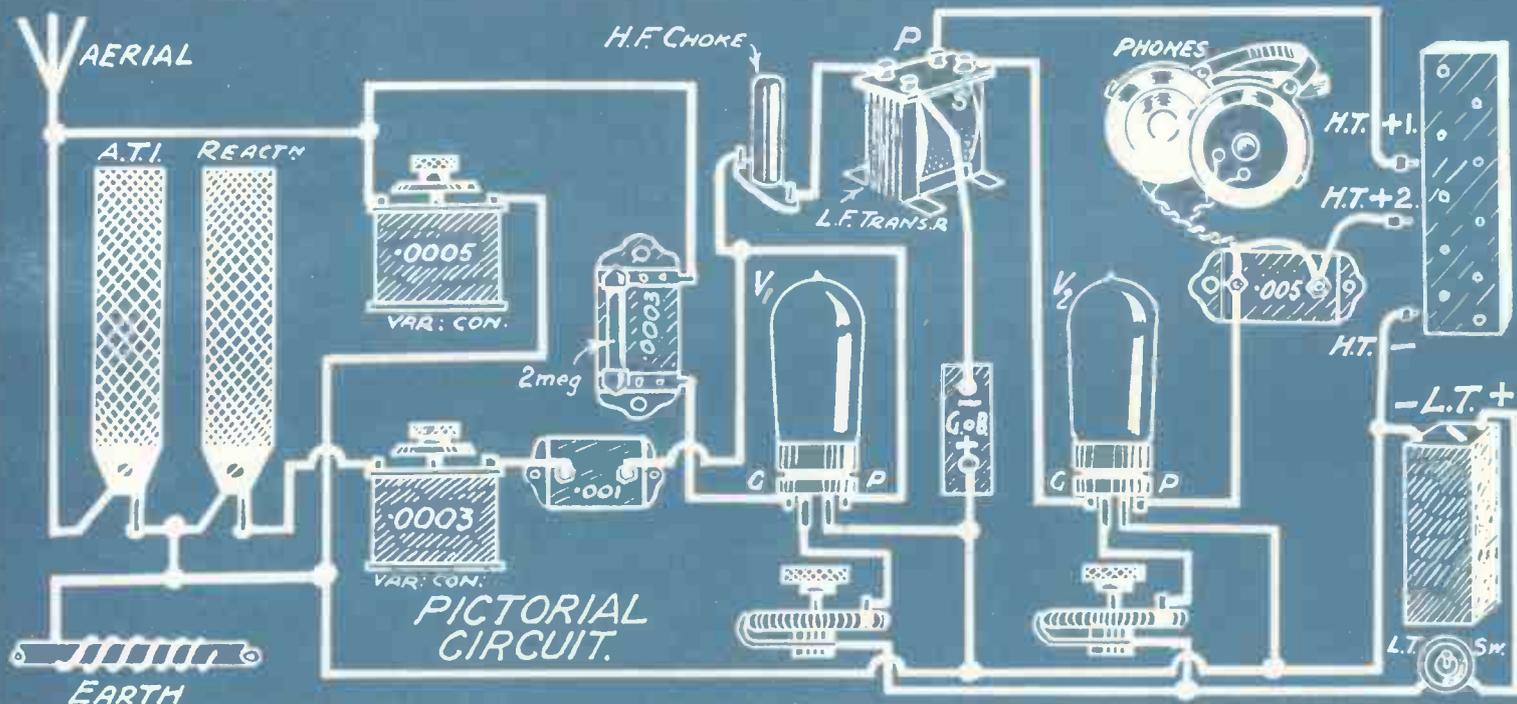


THE MARK OF  
BETTER RADIO

# The "P.W." Blue Print Circuits, No. 25

Two-Valve Reinartz (Det. and L.F.).

6d.



DRAWN BY W.D.  
CHKD BY B.T.C.  
SER. N° BP.114

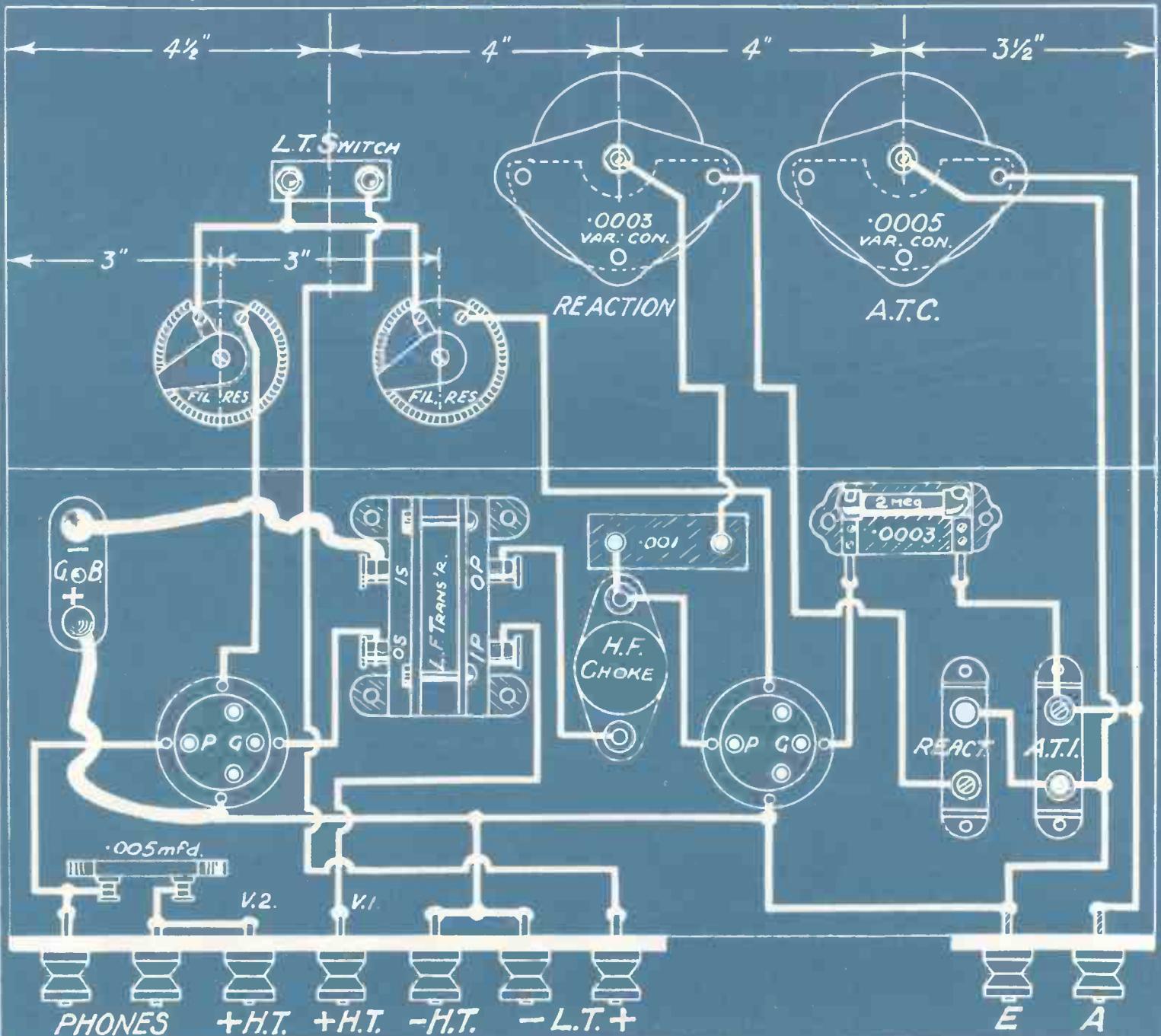
The "P.W." Blue Print, No. 25  
Two-Valve Reinartz (Det. and L.F.).

### List of Components.

- 2 Baseboard-mounting coil holders.
- 1 .0003 grid condenser and 2 meg. leak.
- 2 Valve holders.
- 1 H.F. choke (to cover up to 4,000 metres).
- 1 L.F. transformer (1st stage).
- 1 .005 mfd. fixed condenser.
- 9 Terminals and 2 strips.
- 2 Rheostats.
- 1 L.T. "on-off" switch.
- 1 .0005 variable condenser.
- 1 .0003 variable condenser.
- 1 .001 fixed condenser.
- 1 Baseboard, 16 in. x 8 in. } With cabinet.
- 1 Panel, 16 in. x 8 in. }
- 1 Pair angle brackets.
- Wire, screws, transfers, etc.

### Accessories.

- L.T. and H.T. batteries } To suit
- Grid-bias battery } valves.
- 1 Detector valve.
- 1 L.F. valve (or power valve).
- Phones or loud speaker.
- Two coils, A 35-50. Reac. 50-75.
- (For 5 X X, 150 and 200).



DRAWN BY W.D.  
 CKD BY *W.D.*  
 SER: NO B.P.113

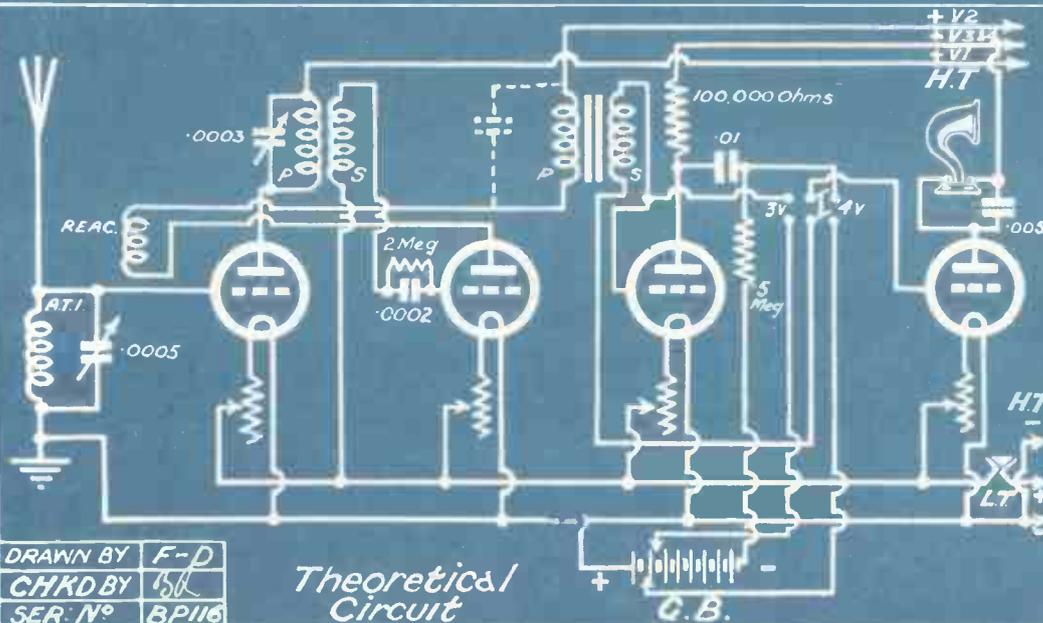
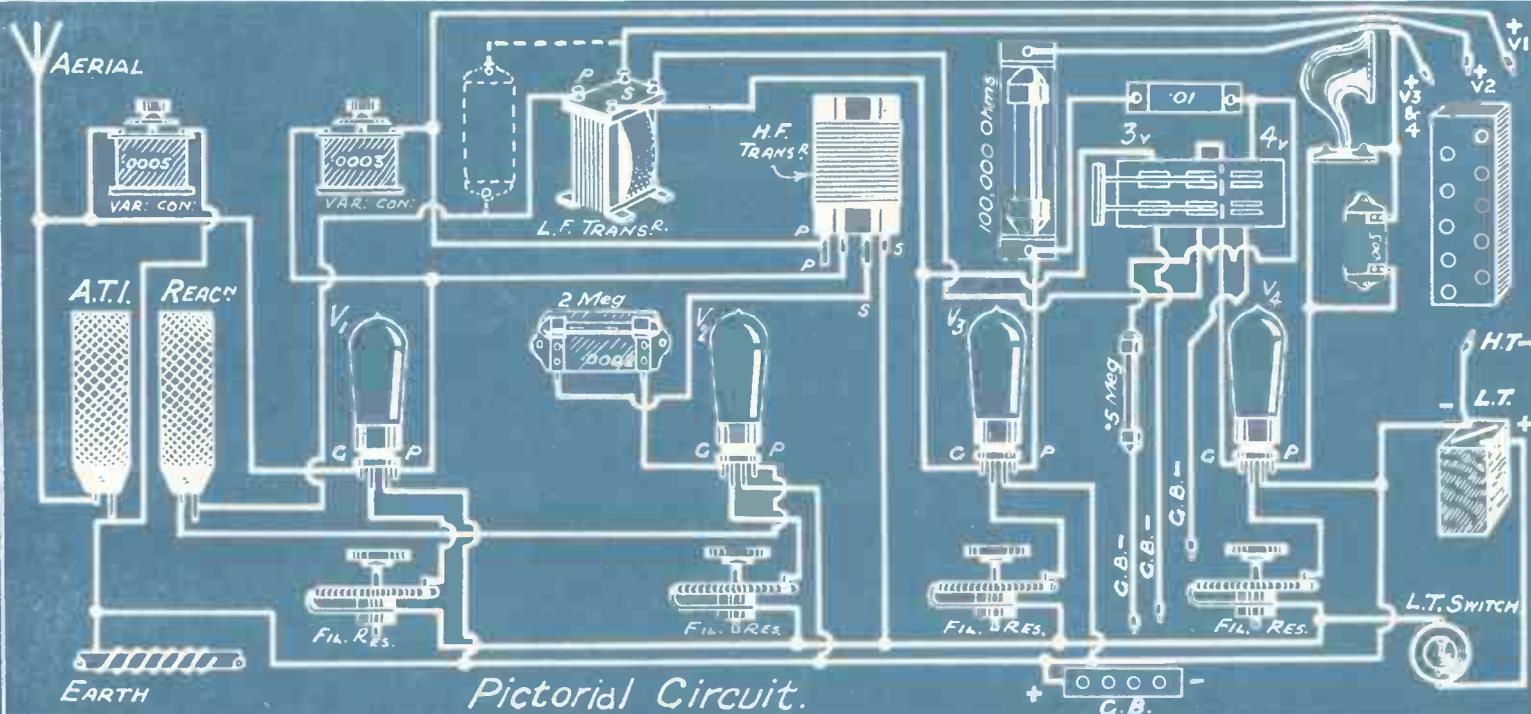
The "P.W." Blue Print, No. 25. Two-Valve Reinartz (Det. and L.F.)

Specially suited for long-distance reception, owing to the remarkable ease and accuracy with which reaction can be controlled. Capable of working a loud speaker at moderate distances. Should the set fail to oscillate, try the effect of reversing the leads to the reaction coil. As L.F. transformer design is not standard, the effect of reversing the leads to O/P and I/P (and/or to O.S. and I.S.) should be tried, if the correct method of connecting is not specified by the maker.

# The "P.W." Blue Print Circuits, No. 26

A Straight Four-Valver (H.F., Det., and 2 L.F.) with Switching.

6d.



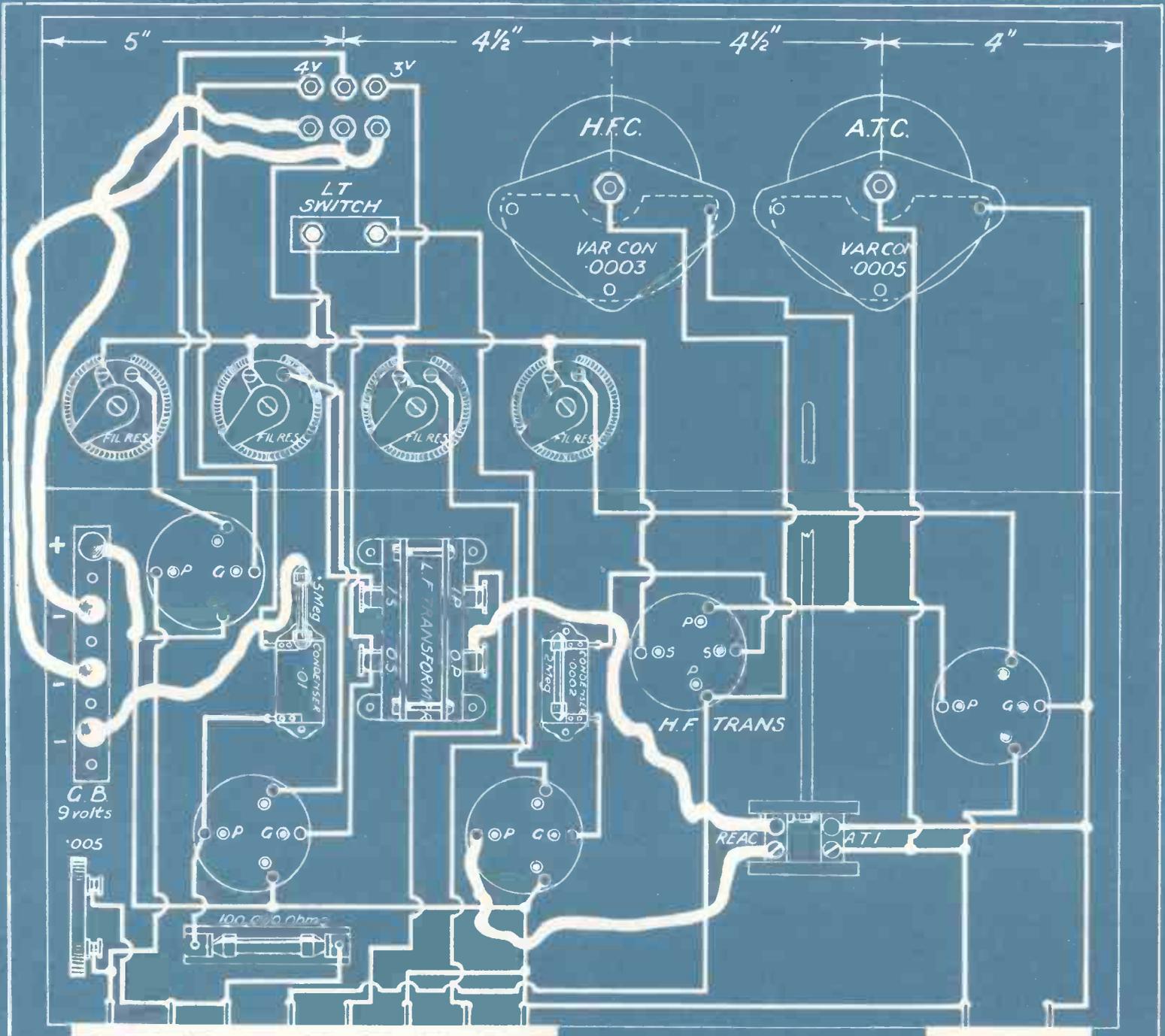
DRAWN BY	F-D
CHKD BY	SK
SER. N°	BP116

### List of Components.

- 1 Panel, 18 in. x 8 in. x 1/4 in. } And cabinet
- 1 Baseboard, 18 in. x 8 in. } to fit.
- 1 Pair angle brackets for above.
- 1 Variable condenser, .0005.
- 1 " " " .0003.
- 4 Rheostats. " "
- 1 L.T. "on-off" switch.
- 1 2-pole 2-way switch.
- 1 2-way coil holder (long-handle type).
- 5 Valve holders.
- 1 L.F. transformer (1st stage).
- 1 Terminal strip with 8 terminals.
- 1 " " " 2
- 1 Grid leak and condenser (2 meg. and .0002 mfd.)
- 1 Fixed condenser, .01 mfd.
- 1 " " .005 mfd.
- 1 Fixed resistance, 100,000 ohms.
- 1 .5 grid leak.
- Wire, screws, plugs, transfers, etc.

### Accessories.

- 4 Valves (1 H.F., 1 Det., 1 L.F., of moderate impedance, and 1 power valve).
- H.T. battery. L.T. battery. Grid-bias battery.
- 2 Coils, 35-40 and 50-75 (5 X X, 150, 200).
- 1 H.F. transformer of appropriate wave-length.
- 1 Loud speaker.



V.3 & 4 V.1 V.2  
**L.S. +HT+HT+HT-HT+LT-LT**

This "all-purpose" receiver is suitable for loud-speaker reproduction at moderate distances, using three valves. Continental and other stations can be received on the loud speaker when the fourth valve is switched in. If the set does not oscillate, reverse the leads to the reaction coil.

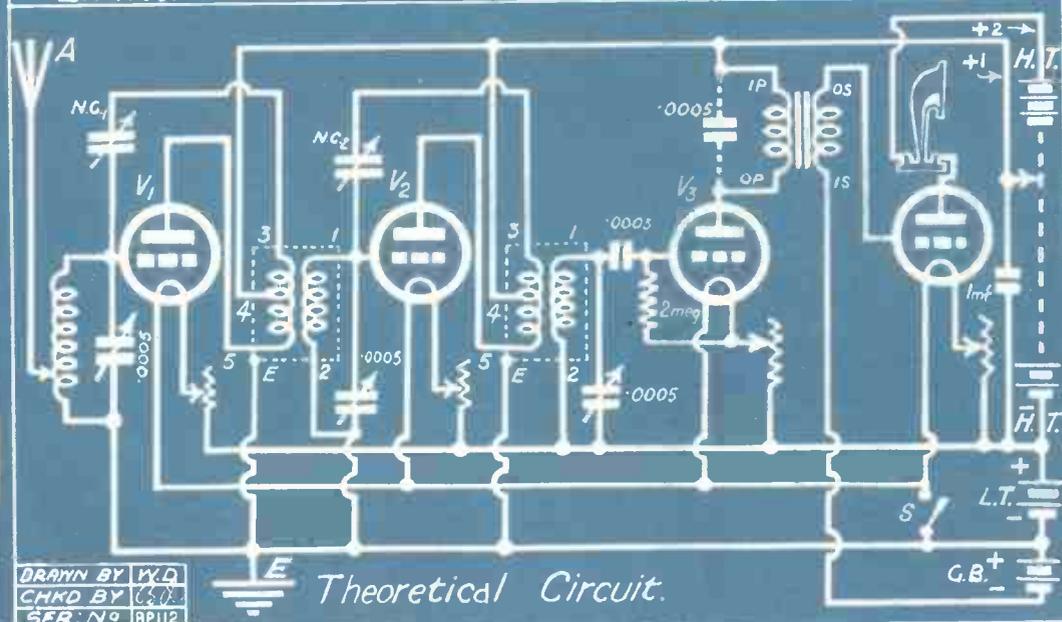
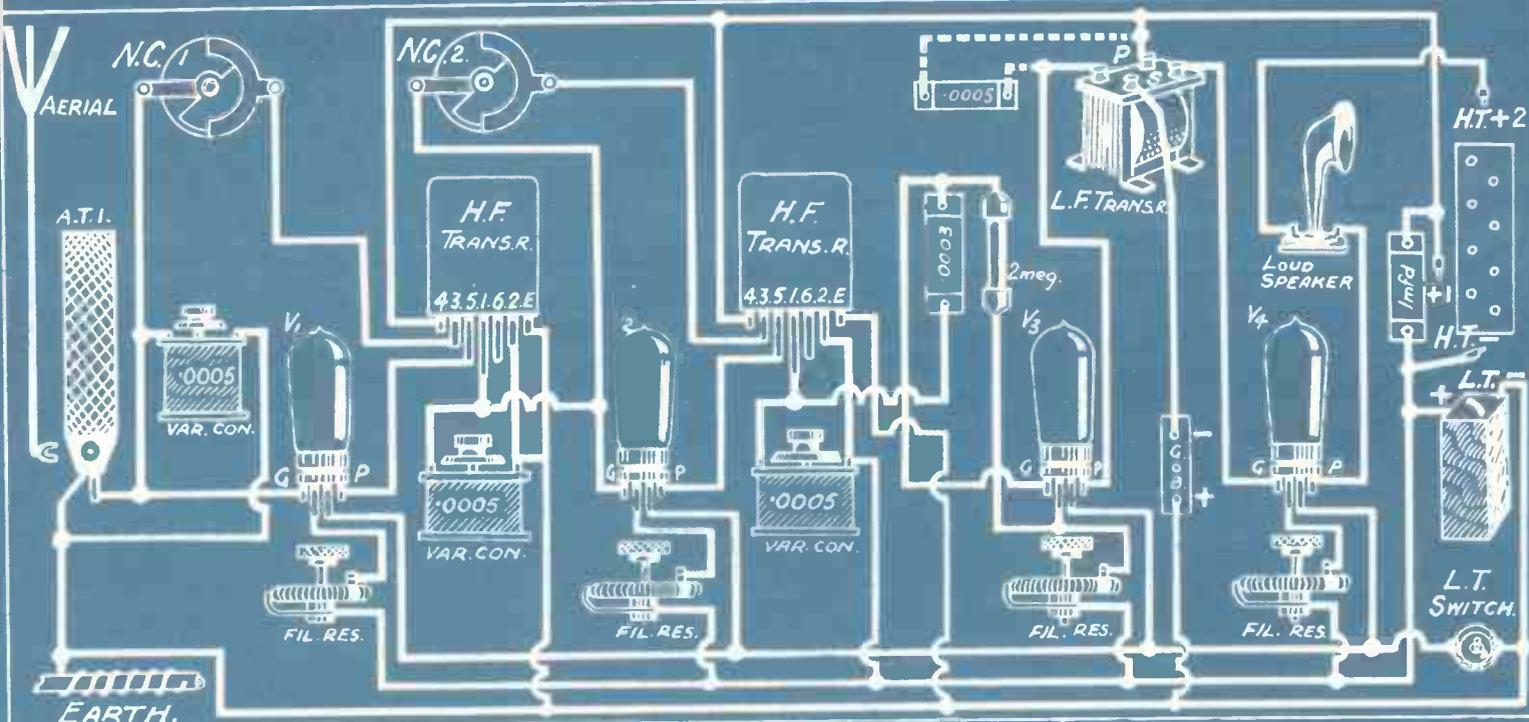
E A

DRAWN BY	F-D
CHKD BY	BR
SER. NO	BR115

# The "P.W." Blue Print Circuits, No. 27

A "Modern Wireless" Four-Valver (2 H.F., Det., and L.F.)

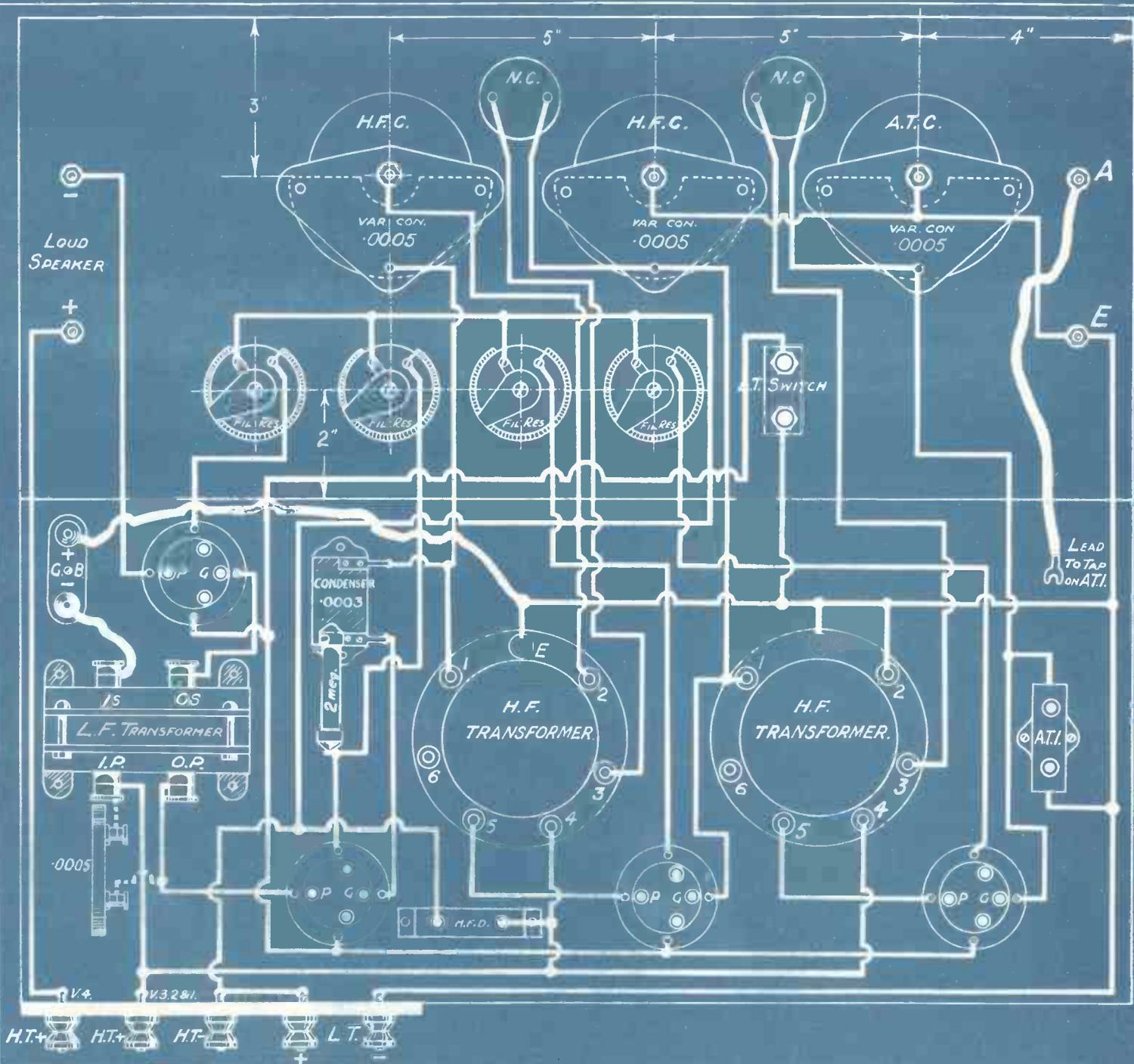
# 6d.



- List of Components.**
- 1 Panel, 21 in. x 8 in. x 1/4 in.
  - 1 Baseboard, 21 in. x 10 in.
  - 1 Cabinet to fit above.
  - 1 Pair of angle brackets.
  - 3 Variable capacitors (.0005).
  - 2 Neutralising capacitors.
  - 4 Rheostats.
  - 1 "On-off" L.T. switch.
  - 4 Terminals.
  - 1 Terminal strip with 5 terminals.
  - 4 Valve holders.
  - 1 Single coil holder.
  - 2 Standard six-pin coil-bases, with screens.
  - 1 .0005 fixed condenser, with 2 meg. grid leak.
  - 1 .0005 fixed condenser (optional).
  - 1 1 mfd. fixed condenser.
  - 1 L.F. transformer (1st stage).
  - Wire, screws, transfers, etc.
- Accessories.**
- 4 Valves (2 H.F., 1 Det., and 1 L.F. or power valve).
  - 1 X Coil, 2 H.F. transformers, standard 6-pin split-primary type. H.T. battery. L.T. battery. Grid-bias battery. Loud speaker.

DRAWN BY W.D.  
CHKD BY C.S.  
SER. NO 8P112

*Theoretical Circuit.*



DRAWN BY W.D.  
 CHKD BY *W.D.*  
 SER. NO BP.111

The "P.W." Blue Print, No. 27.

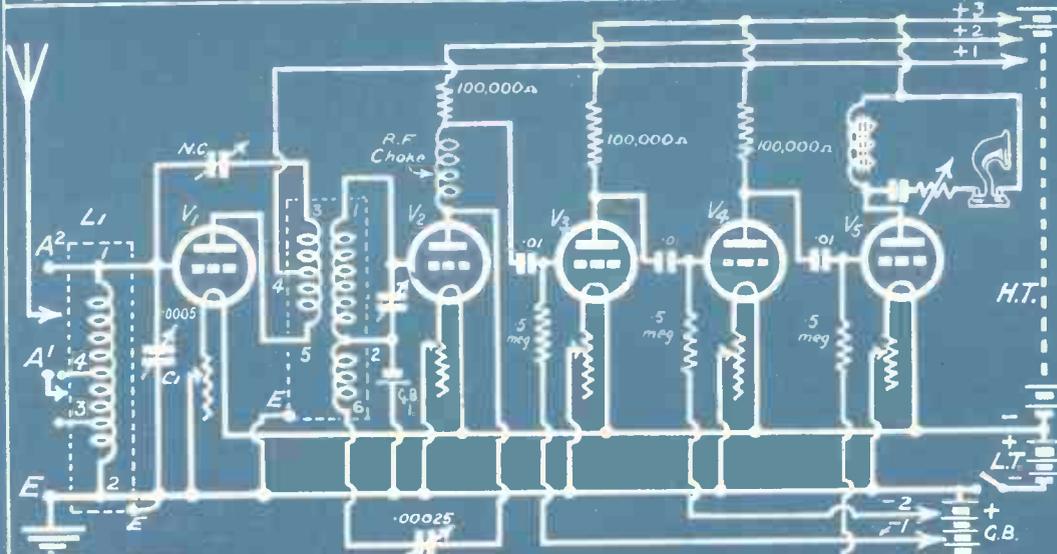
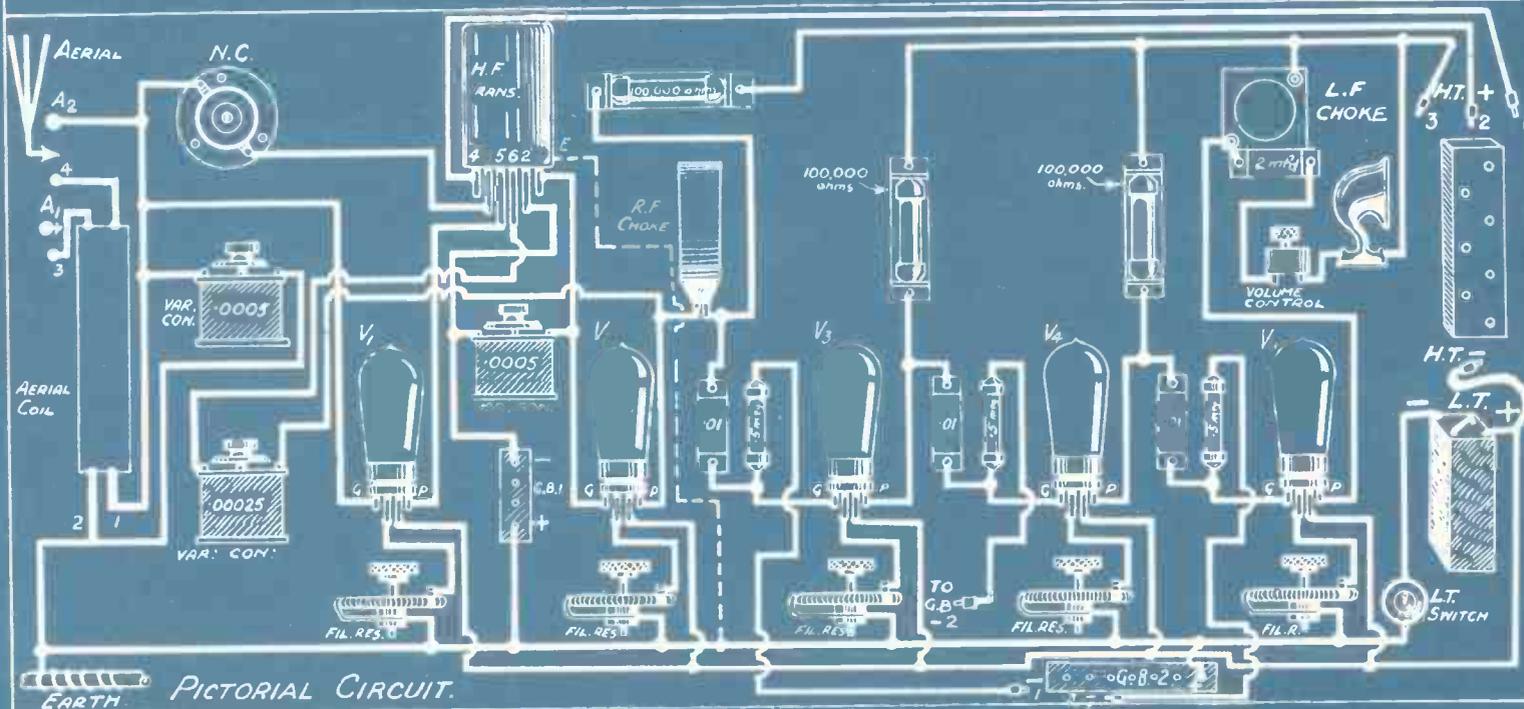
A "Modern Wireless" Four-Valver (2 H.F., Det. and L.F.)

This up-to-date circuit is specially designed to give loud-speaker results on a large number of stations. A high degree of selectivity has been secured, so that the cutting out of the local station is an easy matter. Very fine variation in the degree of reaction is obtainable by means of one or both neutralising condensers. As L.F. transformer design is not standard, the connections to I.P. and O.P. (and/or to I.S. and O.S.) may need reversal, unless explicit directions have been given by the makers.

# The "P.W." Blue Print Circuits, No. 28

A "Modern Wireless" Five-Valver (H.F., Det., and 3 L.F.).

6d.



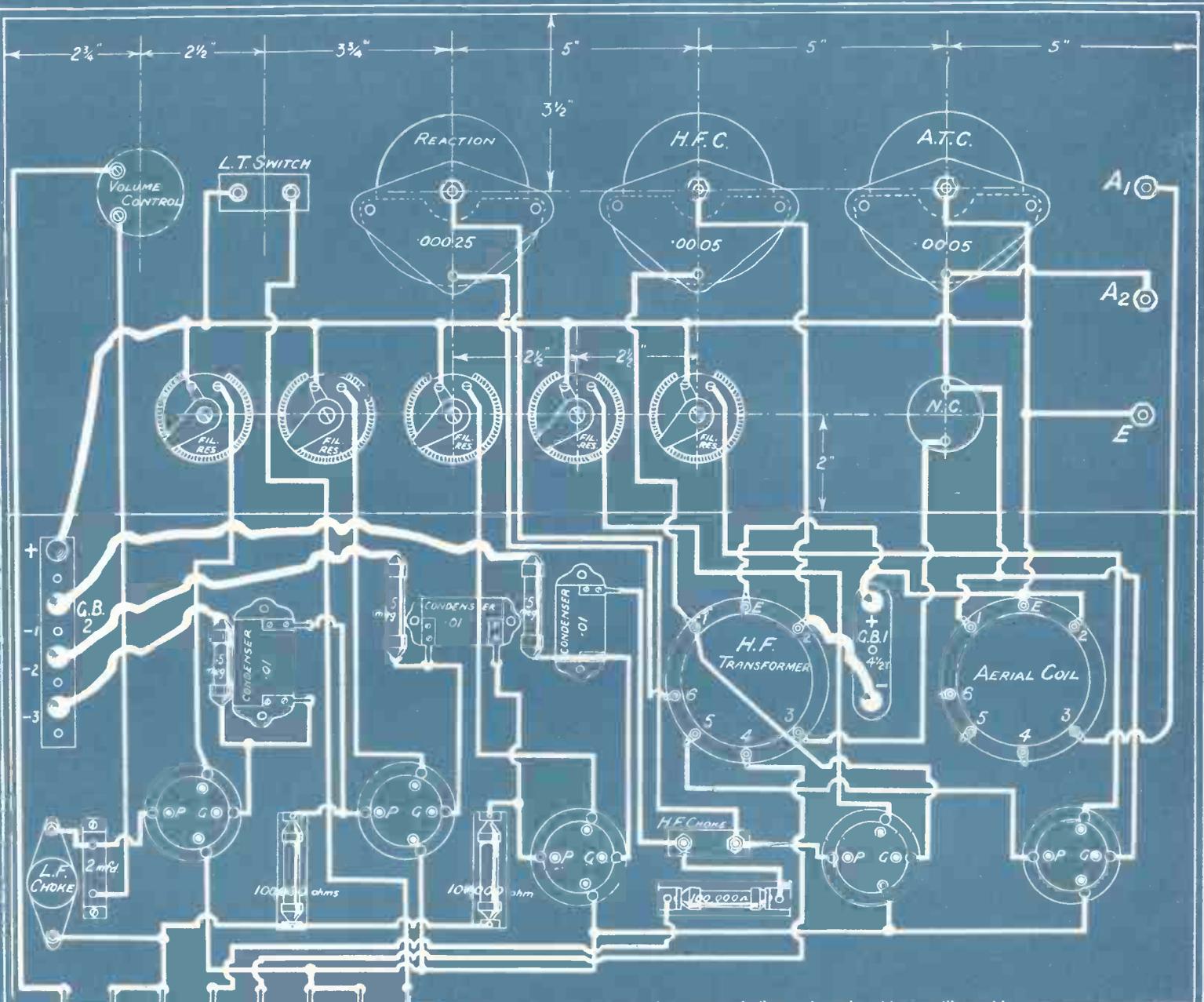
### List of Components.

- 1 Panel, 24 in. x 8 in. x 1/4 in. (With cabinet)
- 1 Baseboard, 24 in. x 13 1/2 in. (1 to fit)
- 1 Pair angle brackets, for above.
- 2 Variable condensers (.0005 mfd.).
- 1 Variable condenser (.00025 mfd.).
- 1 Neutralising condenser.
- 5 Rheostats.
- 1 "On-off" filament switch.
- 1 Variable resistance for tone control.
- 3 Terminals, 1 Terminal strip with 8 terminals.
- 5 Valve holders.
- 2 Standard six-pin split-primary coil bases.
- 1 H.F. choke. 1 L.F. choke.
- 3 Fixed resistances (100,000 ohms).
- 3 Fixed resistances (.5 megohms).
- 3 Fixed condensers (.01 mfd.).
- 1 Fixed condenser (2 mfd.).
- Wire, screws, plugs, transfers, etc.

### Accessories

- 5 Valves (1 H.F., 1 Det. for anode bend rectification, 2 L.F. for resistance coupling, and 1 super power valve).
- H.T. battery, L.T. battery. 2 Grid-bias batteries (1 4v., 1 9v.).
- 1 Loud speaker.
- 1 Aerial coil (standard six-pin type).
- 1 H.F. transformer (with split-primary type).

DRAWN BY M.D.  
 CHKD BY R.R.  
 SER: NO 8P110.



Designed with the object of giving good all-round results, this set will provide excellent reproduction from the local station and a number of British and foreign stations. Reinartz reaction, anode-bend rectification and screened coils are employed.

DRAWN BY	W.D.
CHECK BY	W.D.
SER. N°	BPI09

L.S. V3 & B5 +3 V2 +2 V1 +1 H.T. - + L.T. -

Presented free with "Popular Wireless," week ending February 12th, 1927.

# There's more than strength in the wonderful P.M. Filament there's proved lasting merit and good music



*For 2-volt accumulator*

THE P.M.1 H.F. 0.1 amp. 14/-  
 THE P.M.1 L.F. 0.1 amp. 14/-  
 THE P.M.2 (Power) 0.15 amp. 18/6

*For 4-volt accumulator or 3 dry cells*

THE P.M.3 (General Purpose) 0.1 amp. 14/-  
 THE P.M.4 (Power) 0.1 amp. 18/6

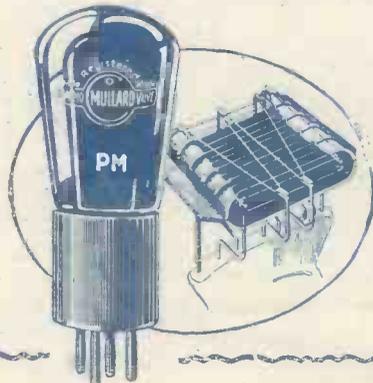
*For 6-volt accumulator or 4 dry cells*

THE P.M.5x (General Purpose) 0.1 amp. 14/-  
 THE P.M.5B (Resist. Capacity) 0.1 amp. 14/-  
 THE P.M.6 (Power) 0.1 amp. 18/6

*Super power valves for last L.F. stage*

THE P.M.254 (4 volts, 0.25 amp) 22/6  
 THE P.M.256 (6 volts, 0.25 amp) 22/6

Sectional view of P.M.5x showing generous proportions of P.M. Filament



**T**HE strength of the wonderful P.M. Filament is unrivalled.

More than a year ago it was demonstrated that after a 1000 hours' life this amazing filament could be tied in knots and support four Mullard P.M. Valves without breaking.

Then the test report of the National Physical Laboratory established conclusively the consistent high service, generous value and long life to be secured from valves with the Mullard P.M. Filament.

This published report of an official Government Laboratory test was distributed to the radio public for the first time in valve history.

The superior qualities of the Mullard P.M. Filament are many. They claim the attention of every man who owns a radio receiver.

From the moment Mullard P.M. Valves are inserted into your receiver, they bring renewed pleasure to your radio. Music in all its natural beauty is reproduced with life-like truth. Call in at your nearest radio dealer to-day and obtain full particulars of Mullard P.M. Valves with the wonderful P.M. Filament.

## Mullard

**THE MASTER VALVE**

ADVT. THE MULLARD WIRELESS SERVICE CO., LTD., MULLARD HOUSE, DENMARK STREET, LONDON, W.C.2.

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R/R

MY FIVE-VALVER--By a B.B.C. Research Engineer

# Popular Wireless

Every Thursday  
PRICE  
3d.

No. 246. Vol. X.

INCORPORATING "WIRELESS"

February 19th, 1927.



*Special Features In This Issue*

Radio Helps the Music Hall    What Listeners Want    Capacity Controlled Reaction  
 A Wavelength "No Man's Land"    My Radio Van    Rugby, the "Radio Parasite"

**How To Make The 1927 Trinaryne**

Our cover photograph this week shows Miss Edna Best, surrounded by members of the company of the "Constant Nymph," telephoning to New York via the new Transatlantic Radiophone service. Mr. Basil Dean, the famous producer, is seated on the extreme right.

# MARCONI

## 6 VOLT ECONOMY VALVES

### FOR BETTER RECEPTION & GREATER ECONOMY

These new 6-volt General Purpose Marconi Valves are remarkable for their low filament consumption—only 12 amperes. This trebles the life of your accumulator charge and ensures better results at lower cost.

*Ask your radio dealer for full particulars, or send a postcard (mentioning "POPULAR WIRELESS") for Marconi Valve Publication No. 443B to:—*

The MARCONIPHONE COMPANY, Ltd.

*Head Office:*  
210-212, Tottenham Court Rd.,  
London, W.1.

*Registered Office:*  
Marconi House, Strand,  
London, W.C.2.

#### MARCONI TYPE D.E.H.612

A highly efficient detector valve suitable for resistance or choke-capacity coupling, and all forms of high-frequency amplification.

*Fil. volts* - - - 5.6-6  
*Fil. amps.* - - - 12  
*Anode volts* - - - 40-150  
*Amp. factor* - - - 20  
*Impedance (ohms)* 33,000

14'



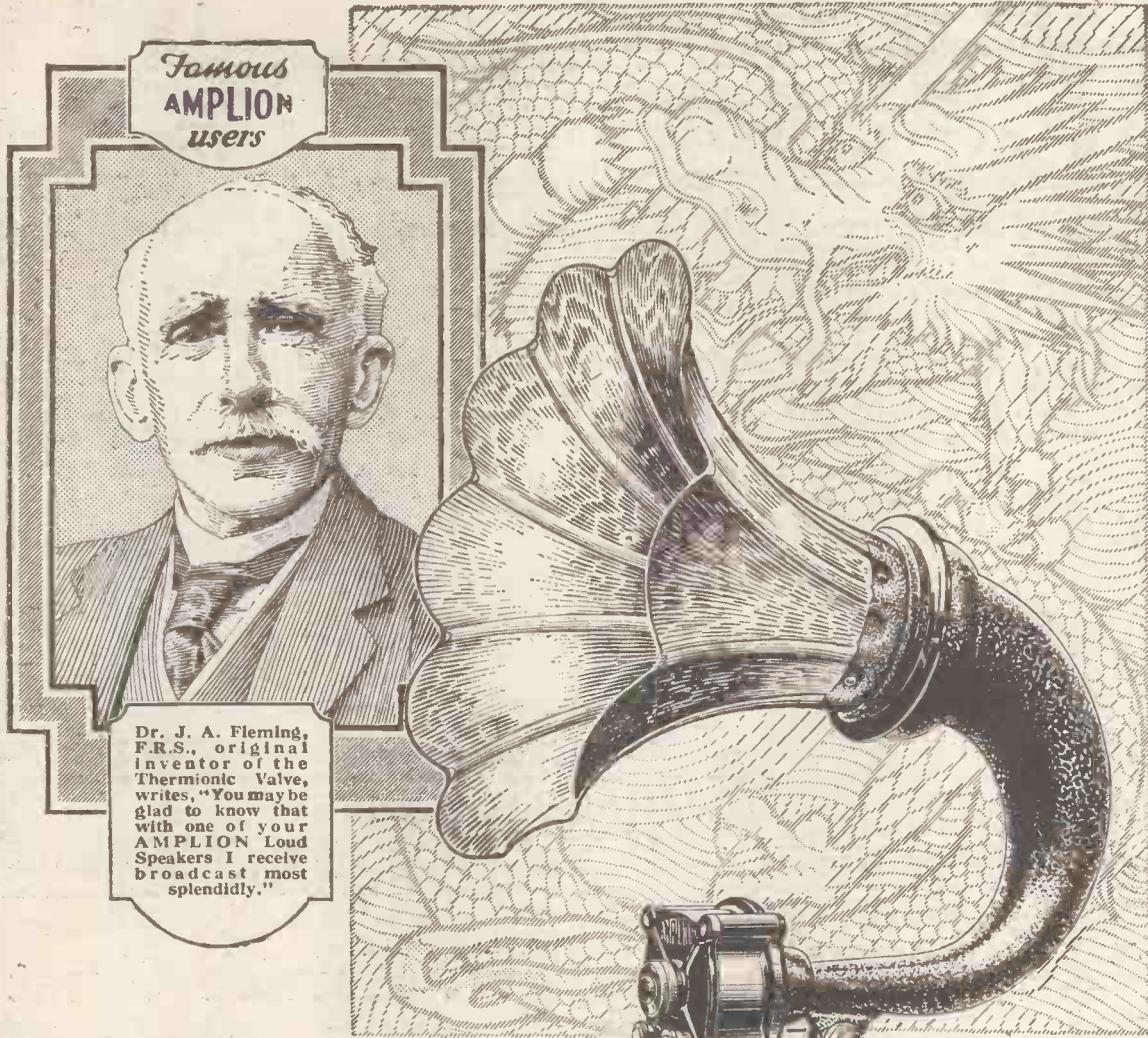
#### MARCONI TYPE D.E.L.612

Designed for transformer-coupled sets, and an excellent valve in the second stage.

*Fil. volts* - - - 5.6-6  
*Fil. amps.* - - - 12  
*Anode volts* - - - 80 max.  
*Amp. factor* - - - 7  
*Impedance (ohms)* 9,000

14'

# D.E.H.612 AND D.E.L.612



*Famous  
AMPLION  
users*

Dr. J. A. Fleming,  
F.R.S., original  
inventor of the  
Thermionic Valve,  
writes, "You may be  
glad to know that  
with one of your  
AMPLION Loud  
Speakers I receive  
broadcast most  
splendidly."

*The New*  
**SENIOR  
 DRAGON**  
 with Oak Flare, Type AR.65·0

The popular "Dragon" shape—at once graceful and efficient—with wooden flare of Jacobean oak finish. Improved appearance—pleasing mellow tone.

A full size, well designed, well balanced and exceedingly efficient Loud Speaker, with the Amplion Hall-mark, for three pounds, eighteen shillings and sixpence.

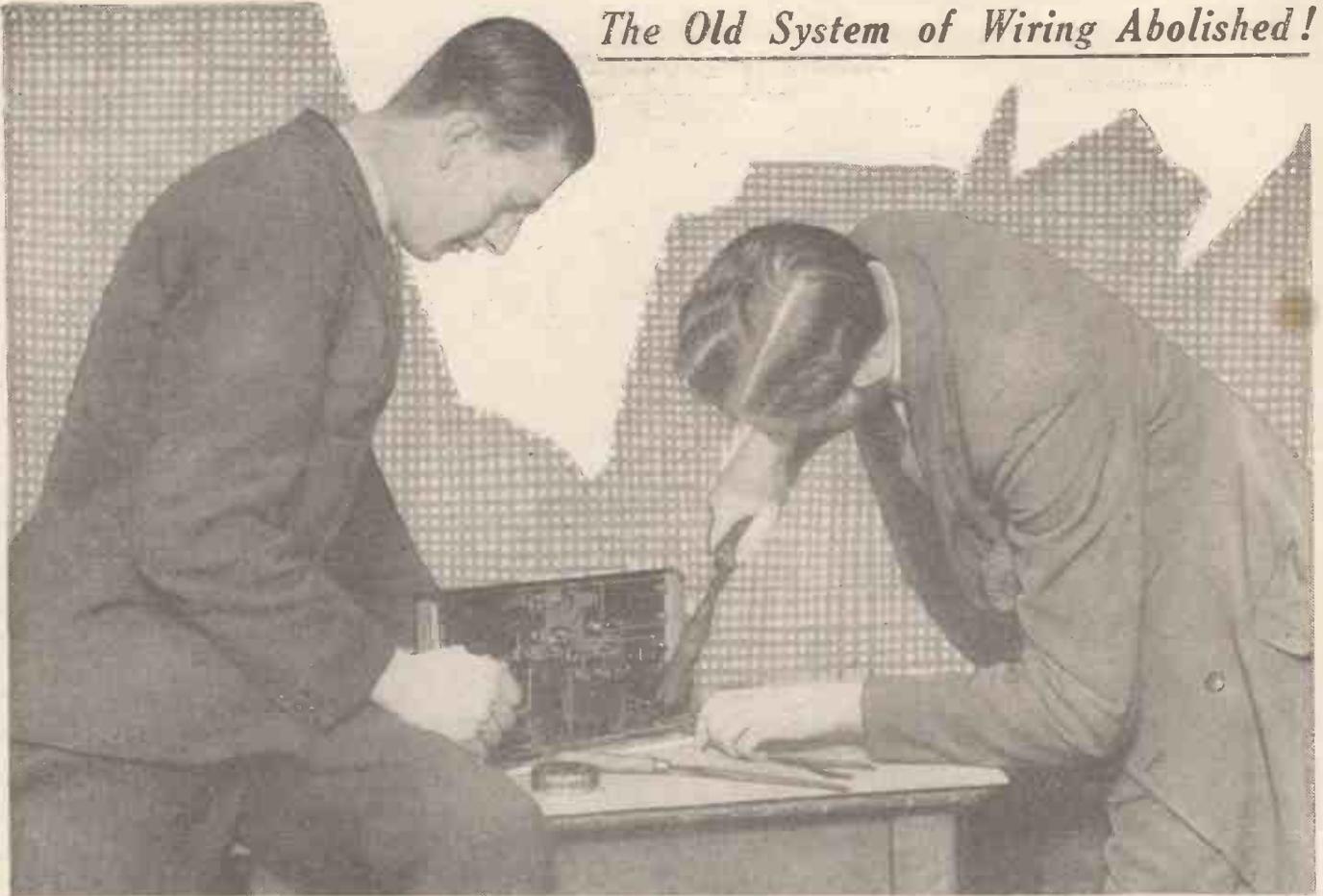
**£3·18·6** **AMPLION**

Other Models from 38/- to £13·13·0

*The World's Standard Wireless Loud Speakers*

Announcement of Graham Amplion Limited, 25 Savile Row, London W.1

## The Old System of Wiring Abolished!



### **“RADIANO”—Percy W. Harris’s Great New System for Wireless Constructors**

An entirely new system of set building called “Radiano” is introduced by the “WIRELESS CONSTRUCTOR” to-day. The system is explained fully by means of full-size drawings on an elaborate blue-print chart. All components are shown in position so that the veriest novice can immediately build a modern efficient receiver without the possibility of a mistake. The wiring up has been simplified to such an extent that the beginner can obtain results equal to those of the most experienced constructor. The RADIANO

chart shows the exact length of wire for every lead and abolishes the laborious work of measuring and bending stiff wire until by trial the best shape is found.

The RADIANO system marks a new milestone in home wireless construction, for with one blow it has demolished all the difficulties connected with the wiring up of a set and gives the beginner an equal chance with the expert. Get the FREE CHART to-day and have your “Radiano Three” WORKING THIS WEEK-END. Dozens of other fine features also appear in this issue.

*Large Blue-Print Chart FREE in to-day’s*

# **WIRELESS CONSTRUCTOR**

*For March*

**6<sup>D.</sup>**

*Buy Your Copy NOW*

# 3,600 HOURS

47, Milton Road,  
Cambridge.  
Nov. 15th, 1926

Dear Sirs,

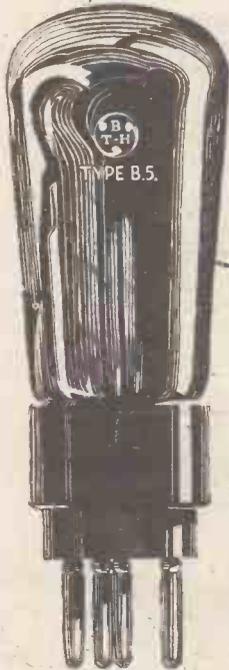
You will no doubt be interested to hear of my experience with three of your B.T.H. B5 .06 valves. Two of these, up to the present time have been used for 3,600 hrs. and the third for nearly this period.

When I bought them (Jan. 4th 24) it was after careful comparison with the best valves then on the market and in the meantime I have frequently tested them alongside other makes and have failed to note any falling off in the efficiency of these valves.

On two occasions I have accidentally flashed H.T. current through the filaments, temporarily causing them not to function, but, by applying the current as per your instructions, the valves have come back to life and are an amazing testimony to your splendid production. They are used on a loud speaker set and have therefore had to work at good pressure.

Wishing you all success,  
Yours faithfully,

*Les J. Stanley*



## B.5. VALVES

### The Ideal 4 Volt Combination

#### High Frequency

**B.5.H.** ..... 14/-  
Filament Volts ..... 2.8  
Filament Current 0.06 amp  
Anode Volts ..... 40 to 120  
Amplification Factor 17.5  
Impedance ..... 55,000 ohms

#### Detector

**B.5.** ..... 14/-  
Filament Volts ..... 2.8  
Filament Current 0.06 amp  
Anode Volts ..... 20 to 80  
Amplification Factor ..... 7  
Impedance ..... 17,000 ohms

#### Power Amplification

**B.6.** ..... 18/6  
Filament Volts ..... 2.8  
Filament Current 0.12 amp  
Anode Volts ..... 40 to 120  
Amplification Factor ..... 8  
Impedance ..... 12,000 ohms

The above prices are applicable in Great Britain & Northern Ireland only

The British Thomson-Houston Co. Ltd.

PLAYER'S MEDIUM NAVY CUT CIGARETTES, WITH OR WITHOUT CORK TIPS.



for Cool Smoking



REGD. NO. 10701A

# PLAYER'S

Navy Cut

# CIGARETTES

10 for 6d. 20 for 11½d.

50 for 2/5 100 for 4/8



N.C.C.40

# LOTUS *and*

## RADIO FOR THE MILLION

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.

These circuits are designed to get the best results from Mullard Valves. Lotus Valve Holders are, therefore, an obvious choice.

They absorb shock, protect the valves and eliminate all microphonic noises. Rigorous tests at the factory ensure that they will give satisfaction under any conditions. That is why they are best for any set.

Valve sockets and springs locked together by a mechanical process, making a definite and permanent connection. Bakelite mouldings, nickel silver springs and phosphor bronze valve sockets, nickel plated.

**PRICES:**

Valve Holder without terminals ... 2/3

Valve Holder with terminals ... 2/6

Combination Grid Leak and Terminal Valve Holder... 3/9



# LOTUS

BUOYANCY

## VALVE HOLDER

ANTI-MICROPHONIC

Made by the makers of the famous Lotus Vernier Coil Holder

GARNETT, WHITELEY AND COMPANY, LIMITED  
LOTUS WORKS, BROADGREEN RD.  
LIVERPOOL



## No more "lost" Chords

*Cossor Valves — with the wonderful new Kalenised Filament—bring you the superb technique of the living Artiste*

**Y**EAR by year the barriers to perfect Radio reproduction are being broken down. No longer can it be said that Broadcasting suffers from mechanical limitations. With the vast improvement in the design of Loud Speakers and the development of choke or resistance capacity amplification, Radio enters upon a new phase. Every note in the harmonic scale can now be reproduced with the living naturalness of the concert hall or the studio. There are no more 'lost' chords.

But this method of amplification demands a valve specially designed for the purpose—the wonderful new Cossor 2-volt R.C.

This new valve has an exceptionally high amplification factor of 40—higher than any other valve of similar type. Due to the prolific emission from its Kalenised filament it will give a richness of tone such as you have never heard before. From the deep fascinating rhythm of the lower octaves of the organ to the surprisingly sweet high notes of the violin. Every note is there, none is missing.

If your Receiving Set utilises the choke or resistance coupling method, use this superb new Cossor R.C. Valve at once—and hear Radio with a charming freshness and vitality which must amaze you.

# Cossor

— the valve which serves you longest

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



**The new Cossor 2-volt R.C.**  
Consuming 1 amp at 1.8 volts Impedence 14/  
70,000 ohms. Amplification factor 40

### Other Cossor Valves

#### For 2-volt Accumulators

210H.F. (Red Band) H.F. use	14/-
210D (Black Band) Detector	14/-
215P (Stentor Two) Power Valve	18/6

#### For 4-volt Accumulators

410HD (Red Band) for H.F. or Detector	14/-
410RC (Blue Band) For Resistance or Choke Coupling	14/-
410P (Stentor Four) Power Valve	18/6

#### For 6-volt Accumulators

610P (Stentor Six) Power Valve	22/6
--------------------------------	------

N.B. All above valves consume 1 amp. except the 215P which consumes 1.5 amp.

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## RADIO NOTES AND NEWS.

Truth Will Out—The "Ideal" Receiver—Cruelty to a Valve—The Penitent—Two New Stations—Transatlantic Telephony—One-Valve Reports—Loud Speaker "Tests."

### Truth Will Out.

IT is almost stupefying to learn that at the first meeting of the board of the B.B. Corporation its members unananimously agreed that alternative programmes are really necessary. Hundreds of thousands of us have been saying the same for several years. Looks almost like telepathy, don't you think?

### That "Ideal" Receiver.

MY specification of the "Ideal" receiver has, I am sorry to say, raised false hopes in the bosom of an attentive reader, one J. S., of Upper Holloway. This gentleman wants the diagram, because, although he has a six-valve neutrodyne, he cannot get Prague. Well, if a six-valve neutrodyne won't get Prague nothing will. But I am sorry he is disappointed though he should read what the dictionary says about "real" and "ideal."

### Cruelty to a Valve.

OH, shocking! Here's a gent of Dorset Square writing to say that because his set wouldn't work he tore a Mullard P.M.3 valve out by its roots, bit its ear, and hurled it to the ground. The thing merely bounced in disdain, so our friend, being of a calm, equable temperament, tore the bulb out of its socket, returned the bits heavily to the floor, and retired without waiting for the crash.

### The Penitent.

NIGHT brought counsel. Arising in the morn with a cool brow, the overnight destroyer went to view the corpse, but the dashed thing was perkier than ever. So he put the bulb back into its socket, repaired certain wires, and lo! all was well, except the scars. A pretty good testimonial

to the valve's ruggedness, yet I hope the valve makers will continue to pay their usual amount of attention to the more delicate and more important "characteristics" of their goods.

### Why?

ON looking through a recent week's programmes of Radio-Barcelona, I was rather annoyed to find no British composer represented. Chance, perhaps! But, then, p'raps not. I think

the B.B.C.'s thunder and broadcast popular and entertaining matter when 2 Z Y is not working. The audacity of this idea will probably increase mortality at the G.P.O. and Savoy Hill, but I'll wager the development of it will be vastly amusing. So look out for 2 H D on about 230 metres. How I hope Capt. Eckersley asks for an "audition."

### Two New Stations.

THE new Fritz-casting station, Stuttgart-Degerloch (Wurtemberg) is now wagnerising on 379.7 metres. It is supposed to be readable on valve sets all over Europe. "P.W." circuits will no doubt try this out. Likewise, the new auxiliary station at Freiburg (Baden) is working on 577 metres. No lack of material nowadays! And to think that not so long ago an amateur station with a honking gramophone was a thing to sit up and search for!

### Transatlantic Telephony.

THE long-distance fees have now been extended to nine of the United States. It is not correct that Mr. J. D. Rockefeller has refused to avail himself of the service on the grounds that when he speaks for three minutes it's worth 150,000 dollars.

### To Collectors of Rare Editions.

MR. E. A. DEDMAN, of "Rossmoyne," 65, Kingston Road, New Malden, Surrey, has a large number of copies of "P.W.," "Modern Wireless," "Wireless," and "Wireless Weekly," and will be pleased to send a bundle free to anyone sending sixpence for postage. Mr. Dedman, whose radio monomark is G 2 N H, is

(Continued on next page.)



A recent photograph of Jack Hylton, the famous dance band conductor, who has broadcast several times.

the sooner we arrange to relay some of our stuff to Continental stations the better for the fame of British music. This John Bull modesty is no good in these days. Let's put some of Elgar's "Cockaigne" over and make the señores sit up.

### Writtle the Second?

I LEARN that the Manchester Radio Scientific Society, having hooked up a transmitter, proposes to steal some of

## NOTES AND NEWS.

(Continued from previous page.)

a reader of "P.W." from No. 1, and I hope to hear more from him.

## An Introduction.

IF this should catch the eye of G 5 F G he may know that Mr. Alois Weirauch, Mestec Kralove, C.S.R., has sent me a DX card full of thrilling hieroglyphics about him. I gather that he heard G 5 F G on January 15th, at 19.00 M.E.Z., and will burst if G 5 F G does not QSL by card. For goodness' sake, do something about it, G 5 F G. N.B.—Mestec Kralove is 60 kms. from Prague.

## Change of Call Signal.

TO all whom it may concern! Mr. W. G. Fudger's call signal has been changed from 6 I X to 2 A Z D. Got that? If you hear 2 A Z D it's Mr. Fudger calling, and if you hear 6 I X it's not Fudger, but forger.

## One-Valve Reports.

MR. T. H. Parkman (London, W.6) sends in a hefty list of stations heard on a one-valve "Chitos" set; pretty nearly every European station, from the look of it. Ah, but the one-valve "Chitos" incorporates reaction, and so your performance, though really first-class, is not admissible, because it is not a fair comparison with the work of a crystal set. Sorry, and all that.

## Another Disqualification.

MR. T. FOLEY (Dudley) who also sends a list, including some hot-stuff distances, is similarly scratched. He used a "P.W." one-valve set which also has reaction. No! I am waiting for results on a single-valve detector set, no reaction, no nothing, except rectification. Doesn't anybody do it nowadays?

## Valve Sets "All Out."

THIS honours list is going to be as crowded as the other is with knights of the cat's-whisker—good men all. Also, I see that I shall have to get my atlas down, dust it, and learn how to measure distances on the Great Circle. Mr. E. Tarplee, of Gloucester, is a very barty Bart. Pulls in American stations so frequently that his loud speaker has developed a nasal twang. Like the first Bart. (See "P.W." Feb. 5th), he gets Miami, Florida. Tophole, sir! But they broadcast in Australia, you know.

## Highly Commended.

E. H. (Edinburgh) is a runner-up whose form we shall watch. He confesses to KDKA on three valves. You just want to kind of—er—stretch out a bit, Mr. E. H.—say; to Florida. Then Auld Reekie will have another glory added unto it. I can tell by your letter you know your wireless way about. Mr. S. A. C. (Birmingham) produces Warsaw. This is worth an "O.B.E." All the valve Barts talk about America, so far. Let it not be overlooked that the credit is awarded for distance, not for long distance on a minimum valve power. Use as many valves as you please—only get me Australia.

## Loud-speaker "Tests."

I WAS interested to notice that the Bradford Wireless Society recently organised a test of fourteen "commercial" loud speakers. The first two places were secured by a well-known make; an equally well-known and approved type romped home last. But mark, men of Bradford! You used one set only, presumably with no means of tone control, and impedance was a quantity ye recked not of. Surely, the test was like putting fourteen different breeds of horse to one and the same fence, so that the steeple-chaser wins the prize and the draught-horse cuts his legs.

## Note for K's of the C.W.

WOR (Newark, N.J.) is going to increase its power output by ten times. Get this (495.2 metres) and turn the valve Barts. sour with jealousy and establish a crystal record.

## Daylight Robbery.

I TAKE this from the Australian "Radio." Courtship—He broadcasts. She listens-in. Honey-moon—She broadcasts. He listens-in. Now—They broadcast. The neighbours listen-in.

## A Nice Station.

IT is reported that a 5 kw. broadcasting station is to be built at Nice this year. That will make Nice nicer. We may yet hear the croupiers crouping and the bank breaking, without losing a bean.

## SHORT WAVES.

"Wireless sets pawned in colliery districts." Haven't wireless Uncles been abolished?—"Star."

We understand that policemen in a New Jersey town are to be provided with a miniature receiving set, complete with earphones, aerial, valves, and battery. We hope this will not increase the tendency for assault on the police—and battery.

"Please send me a copy of the Wireless Act. I have a wireless installed, and should like all inflammation."—Letter from a listener, "Daily Chronicle." Thus enabling him to increase the size of his re-Act-ion.

"Everything," says a writer, "will soon be done by wireless." Cats are now eagerly awaiting the advent of the wireless canary cage.—"Sunday Pictorial."

"I hear you're leaving the village, McTavish. Moving nearer London. I understand?"

"Ay."

"And why are you going?"

"Ma crystal set's not loud enough."

One of our readers has written to ask our advice. He says he is of the opinion that his wireless licence should be supplied to him at half the usual fee, as he has become deaf in one ear.

At 2 L O we have encountered a most unusual incident. The walls of the studios, to be soundproof, have to be felt. This, the B.B.C. insists, makes the artistes sing with much more feeling.

Low Group of Nine Stations broken up—"Evening News."

By the highbrows?

A Sunday paper prints sermons which are delivered in London churches the same morning. With the evening service also available on the wireless, it only needs the porting of their threepenny bits by people and there will be no need for churches at all.—"Star."

## Britain Leads.

IN one respect at least Britain appears to be ahead of her Continental neighbours, namely, in the number of licensed radio listeners. In December, according to "World Radio," the number of listeners in various countries were: Great Britain, 2,130,000; Germany, 1,337,122; Sweden, 238,000; Denmark, 114,492; Hungary, 53,070; Switzerland, 51,759. But these figures fade into insignificance compared with some from the United States. A recent survey in the U.S.A. revealed the fact that there were 6,500,000 radio sets in use, and that the invisible audience was estimated at 26,000,000.

## Those "Talks."

I SHOULD think the B.B.C. must be feeling a trifle washed out, considering the amount of hot water it has enjoyed during the past few weeks. The row still rages merrily around the subject of "talks," on which much might well be said; but surely the matter would be vastly improved if the B.B.C. would select better "talkers."

## Personality, the Master Secret.

HOWEVER thrilling or interesting the subject, however well-written the "talk," the speaker must have that mysterious quality called personality. Sir Oliver Lodge would keep an audience quite happy, even though his subject were bone dry. So could Sir Walford Davies and Mr. A. J. Alan, and many others. Therefore, the B.B.C. should study the art of selection and pick out men and women who can broadcast human personality, and leave the pronunciation business to the cranks.

## Radio Sleuthing.

THE Post Office's Black Maria radio van for tracking oscillators to their lairs is a very posh bit of work and from all I hear is getting most accurate results. Yet I fancy that some of the stories about this wireless bloodhound are too steep to be honest Injun. For instance, though it is possible that the P.O. people can find the very street and say whether the offending set lives in "York Towers," or "Kia Ora," I will not believe they can tell whether the owner has ginger whiskers.

## "Erin Go Bragh."

MR. W. BRYAN BATES, "Baltrasna," Ashbourne, Co. Meath, Ireland, has blandathered the Irish Free State into granting him a transmitting licence, and he hopes to begin operations about the end of the month. Call sign, G W 45 C.

## News from Moscow.

DEAR me, how "P.W." travels! It soothes the savage printer's breast and lifts the gloom from "Black Monday" to read these appreciative letters from distant countries. Here's Mr. A. P. Shoriguin, of Moscow, taking in "P.W." regularly and writing in excellent English to say that on his 3-valve he hears Daventry very well. A nice, friendly fellow, I should say, and a pity they are not all like him. If only everybody were radio mad and read "P.W.," and there were room in the ether for us all to exchange signals—why, radio as a war-preventer would put the League of Nations out of business!

# Radio Helps the Music Hall



An interesting account of a recent invention where the thermionic valve is employed in an entirely new rôle—that of supplying “artificial” songs for revue scenes.

BY OUR SPECIAL CORRESPONDENT.

**A** COMBINATION of radio and the gramophone has solved one of the greatest problems of the music-hall stage—that of getting good singing without good singers. The originator of this remarkable advance in stage and chorus work, which has relieved the chorus girl of the necessity of singing at all, is Florenz Ziegfeld, famous for his “Follies” in New York.

It has been found that most chorus girls who are of the better class of dancers are almost totally without singing voices. Consequently, either a manager must chose a good dancer and lose vocal ability, or vice versa, and Mr. Ziegfeld, having heard of the remarkable results of a new gramophone, investigated it to see if he could not develop “song” in which the girls would not have to join, and thus solve his problem.

### The “Super-Panatrope.”

The instrument he has adopted is called in America the “super-panatrope.” It consists of a needle passing over a gramophone disc as usual, but instead of this needle vibrating against a mica diaphragm, it is connected directly with an electromagnetic circuit which will translate these sound vibrations of the needle into variations in a regular telephonic circuit. Radio comes to the aid of these other instruments with the special power amplification valve unit such as is used on giant loud speakers.

In fact, it is through a giant diffuser that the sound finally does reach the audience.

The gramophone records are made by the finest singers, in duplicate (or even more) to avoid any loss by wearing out. The apparatus is set up in duplicate all the way through, in the wings, so that should there be a break of any kind in the mechanical parts of one set, the other can be switched on without any loss of time, or without throwing the dance completely out.

The vibrations are passed through three stages of amplification, the final stage containing a 250 watt power valve. The amplification is, in fact, so great, with so little distortion of the original sounds, that it is

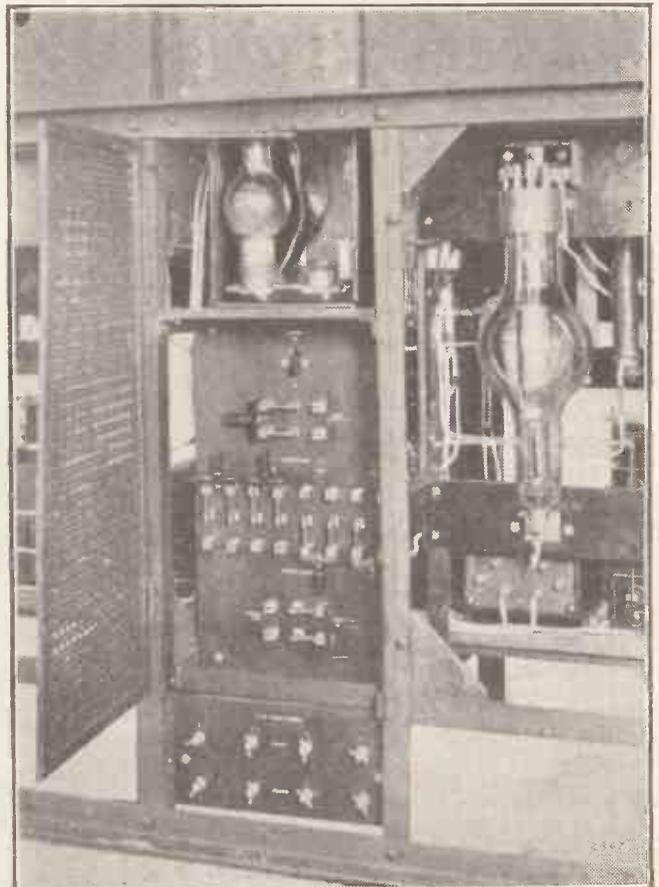
claimed this singing can be heard nearly 10 kilometres away if really “let loose.” By a system of synchronised motors, together with a release relay, the two gramophone discs are made to revolve in exact unison, so that by a shift-over relay the tune can be taken up on one record just where the other left off, in case of a breakdown without showing any break in the sound sequence. This entire apparatus can be controlled from the orchestra or from the wings of the stage if desired.

By merely pressing a button the discs are set in motion simultaneously, the needle-arms lowered automatically to the records, and the music begins. The orchestra leader generally controls this, and the time as well as the volume. By means of a microphone he can communicate with the control operator in case of necessity.

Mr. Ziegfeld expresses himself as thoroughly satisfied with his “mechanical” voice” for the chorus. The girls have only to pretend to sing, or merely to sing in low tones in unison with the instrument, and an immense improvement is thus rendered possible, for the true singing comes from the trained throat of some opera or concert singer, via the gramophone disc.

At the gramophone end the reproducer is very carefully arranged so that the needle, which is connected to the moving coil arrangement, is properly “damped” to avoid any resonance

effects and to prevent “blasting” on the loud passages. Special controls are also provided so that the usual background caused by the needle making contact with the revolving record is cut out, and does not make itself audible through the loud speakers or diffusers employed in the auditorium. The arrangement is, of course, very similar to that employed on some of the recently developed electric gramophones now placed on the British market, where several stages of specially designed L.F. amplification are incorporated in the gramophone, and the reproduction is carried out by means of a loud speaker usually of the Rice-Kellogg type.



Part of the apparatus used in the production of the “mechanical voice” employed by Florenz Ziegfeld.

# CAPACITY - CONTROLLED REACTION.

The benefits of regeneration in any receiver can be almost totally lost if the circuit is not properly arranged. If reaction is difficult to control the functioning of the set is completely spoiled. In this article our contributor discusses the well-known Reinartz or Hartley form of reaction, and shows how it may be adapted for use on standard receivers which already employ some form of magnetic reaction.

BY A CORRESPONDENT.

**A** FACT that is at once apparent to any operator of a valve receiver is the great increase of volume and range obtainable by the use of reaction. Reaction consists of feeding energy from the plate of the detector valve into the grid circuit of the same or preceding valves.

This was accomplished by mounting two coils in a 2-way coil holder, one being in the plate circuit (reaction coil) and the other in the grid circuit, and transfer of energy from one to the other was magnetic, and variable by adjustment of the distance between them.

### A Superior Method.

This method was quite effective, but the adjustment was in most cases very coarse, complicated the tuning (because each variation of the coil holder necessitated an

a good make of L.F. transformer is employed the fierceness of the reaction is removed.

In this case a smaller condenser, or even none at all, across the L.F. transformer may be required if the set will not oscillate well.

The arrangement shown in Fig. 2 will be found to possess practically all the advantages of capacity reaction, does not require the use of a choke, and preserves the quality of loudspeaker reproduction.

To obtain the best results, the following procedure should be observed :

Use a reaction coil of about 60 per cent the number of turns of the aerial coil, and adjust the angle between this and the aerial coil to about 10 degrees.

Set the aerial tuning condenser and reaction condenser to read about 170 degrees, apply the rated voltage to the filament and the maximum H.T. value for correct working of the detector valve.

If the set oscillates, revolve the reaction

condenser backwards and forwards and oscillation should be stopped or started at will, but if not, try a smaller coil until this object is achieved.

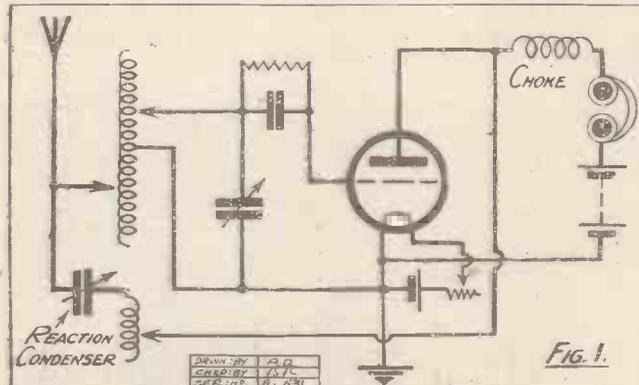
Should the set refuse to oscillate, a larger reaction coil is required, but the angle of separation should remain unaltered.

It will then be found that the H.T. current will be reduced as the reaction is revolved toward zero to preserve the balance.

### Better DX Results.

This method of reaction control, properly adjusted, will be found to be delightfully smooth, and has the advantage of dispensing with a choke.

All that is necessary to convert existing



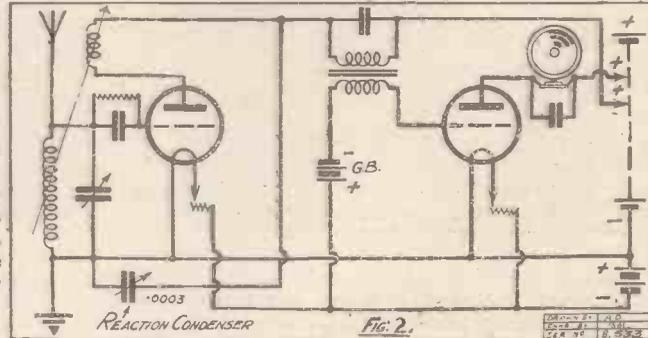
adjustment of the tuning condenser), and working the receiver in its most sensitive condition was a matter of difficulty with a constant danger of the set bursting into oscillation.

A much superior method is that adopted in the famous Reinartz circuit. It is known as capacity reaction, and is achieved by diverting the H.F. current from the plate circuit by means of an H.F. choke through a variable condenser to the earth end of the grid coil (with or without a coil in series). (Fig. 1.)

### Smooth Operation.

This method is very smooth in operation, involves little or no change in the tuning condenser setting, and is capable of very fine adjustment, but is liable to be the cause of a falling off in the quality of reproduction when one or more stages of transformer amplification are in use, if reaction is inclined to be fierce due to an unsuitable H.F. choke being employed.

When, however, the H.F. choke is omitted, as it can be in many cases where



magnetic reaction is a variable condenser of .0003 capacity in series with the reaction coil and the earth end of A.T.I. (Fig. 2.)

A precaution against damage to the transformer that might be caused if the vanes of the reaction condenser were to short can be taken in the form of a .001 fixed condenser placed in series between the variable and its connection to the reaction-transformer lead. The high resistance of the transformer would save the filaments of the valves in such a case, but it is quite possible that the transformer windings might be damaged in such a case.

With the use of capacity-controlled reaction it will be found that distant stations will be far more easily brought in than with the ordinary magnetic "flip-flop" type in use.



The transmitting gear used at Bodmin for the Canadian beam service, 1925-1926.



# A WAVELENGTH "NO MAN'S LAND"

IF, as in America, the European broadcast wave-band ended at about 600 metres and did not roam up into the thousands of metres, no doubt many more amateurs would employ carefully arranged and more selective aerial tuners. As it is, the straightforward plug-in coil scheme with series-parallel condenser tuning is still very popular. And where but a moderate degree of selectivity is required, this is just as efficient a method as anything else.

An informative article which should prove of the utmost interest to every home constructor.  
 By G. V. DOWDING, Grad.I.E.E.  
 (Technical Editor.)

capacity of the aerial that the variable condenser is placed in the series position, but of course we cannot vary the inductance of the aerial without varying the antenna's length. But the inductance of the average amateur's aerial is not great and could it be varied it would not provide a means of covering a band of more than a few metres. But the capacity, which may

But does that mean that by means of the series-parallel variation obtained with a switch or the popular three terminals, one coil will suffice for all wave-lengths between 270 and 1,000 metres? Certainly we can go down to 270 in the series position and up to 1,000 when the variable condenser is in parallel, but unfortunately about midway lies a "no man's" area which neither arrangement will cover.

### Badly Neglected Point.

In this particular instance it is situated between 500 and 570 metres and, it will be agreed, some fairly important broadcasting stations fall in this patch of wave-lengths.

This is by no means a new discovery, but it is a point that has been badly neglected, and probably thousands of constructors do not realise that the variation between "minimum series" and maximum parallel" is seldom, if ever, adequately covered by one coil. Take a No. 50 coil of well-known make. Used with a .0005 mfd. variable condenser for tuning an average aerial, it covers (series) 180 to 370 metres and (parallel) 415 to 700 metres. Here the gap is narrower in metres, but in kilocycles,

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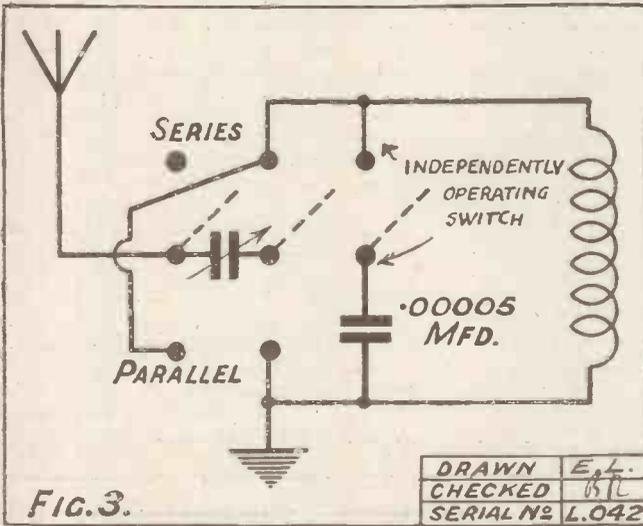


FIG. 3.—A method of covering the wave-length gap when a D.P.D.T. switch is used for "series-parallel" switching.

And by arranging so that the variable condenser can be placed either in series or in parallel, quite wide ranges of wave-length can be covered on single coils. Between 200 and 600 metres it is seldom necessary to change a reaction coil, but if the condenser were permanently connected either in series or in parallel, at least two aerial coils would be needed.

### An Aerial's Capacity.

A paralleled variable condenser and a coil alone will cover a much wider wave-band than when they are connected to an aerial and earth, for the simple reason that in the latter case there are factors over which no direct control can be obtained. If the capacity and inductance of an aerial were no greater than that of the connections to an anode tuning circuit the whole business would be much simpler.

be of the order of .0003 mfd., plays quite a part in the tuning of the system.

Take a coil consisting of 75 turns—a coil of the ordinary plug-in type. With a .0005 mfd. variable condenser in parallel this coil, connected directly in series with the aerial and earth, will provide wave-length tuning between about 570 and 1,000 metres. Connect the variable condenser in series with the coil and the aerial and earth, and it will be possible to tune down to about 270 metres.

It is in order to reduce the effective



A straightforward set employing the popular "three-terminal" system with an extra terminal (marked X) corresponding with the additional terminal shown in Fig. 3.

## A WAVE-LENGTH "NO MAN'S LAND."

(Continued from previous page.)

the basis upon which the grouping of broadcasting stations is now effected, is just about as wide as in the case of the 75-turn coil.

And that hiatus between 370 and 415 metres embraces some very important stations indeed.

In order to cover this gap in tuning, the Dubilier people some time ago introduced a special variable condenser known as the Duwatcon. The instrument forms a very ingenious solution to the problem, but as it was placed on the market at 30s. it never achieved the popularity it deserved.

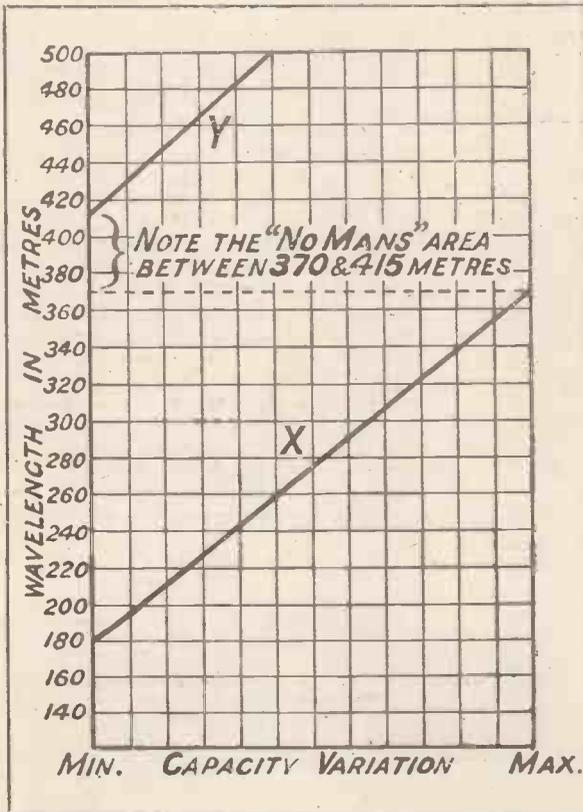


Fig. 2. Showing the wave-length "No Man's Land" in graphical form.

But if the No. 50 coil could be made completely to cover the whole band of wave-lengths between about 180 and 700 metres in some cheap and simple manner, merely by straightforward panel or terminal switching, no doubt the ether would be much quieter. We are convinced that much of the really bad "oscillating" is occasioned by the hefty readjustments which invariably follow the changing of coils. It is here that the lusty flopping about of the reaction-coil takes place accompanied by two or three swings of the variable.

### Increasing Wave-length.

Well, let us take that same previously mentioned No. 50 coil and see what happens when we use it in a straightforward one-valve circuit such as is shown in Fig. 4. When the aerial is connected to the centre

terminal aerial (s) the variable is in series, and we can tune between 180 and 370 metres. This is shown by the line X in Fig. 2.

In order to increase the wave-length range we disconnect the aerial lead from the aerial (s) terminal and join it to aerial (p), and then connect the aerial (s) to the earth terminal with a short piece of wire or a brass strap. Now the variable condenser is in parallel, and we can tune from 415 to 700 metres, as is shown by line Y in Fig. 2.

### A Nasty Gap.

That leaves the nasty 370-415 metre gap. This could be covered by plugging in another suitably sized aerial coil. In cases it is possible to swap over the aerial coil and reaction coil and to use the latter, but frequently it is not possible to do so, for one reason or another, and a third coil must be requisitioned for the purpose.

But any coil changing at all can be avoided in quite a simple manner. Let us examine Fig. 2. With the variable condenser in series the maximum wave-length, 370 metres, is reached when maximum available capacity is in circuit, and to this the variable contributes its full quota of .0005 mfd. Obviously any further increase of capacity would mean an increase in wave-length, for increasing the capacity always means increasing the wave-length whether the condenser be in series or parallel.

Actually, if we were to connect a fixed condenser of only .00005 mfd. capacity across the coil the wave-length tuning would jump right over the gap and into the parallel range. A fixed condenser so connected, is shown in Fig. 3. The intermediate tuning can easily be accomplished by taking the variable back towards its minimum and then working up again in the usual manner.

But the fixed condenser must not

be permanently connected across the coil, or the result will merely be to move all the tuning up with still an uncovered break between the series and parallel ranges. This fixed condenser must only be brought in to cover the gap. That is, it should be

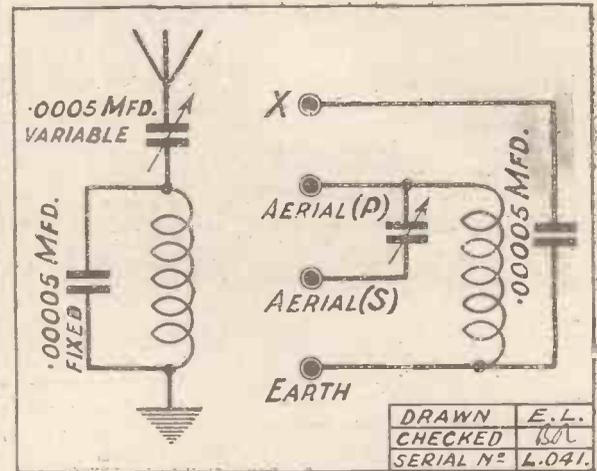


Fig. 3. A simple arrangement for covering the tuning gap.

connected up after reaching the series maximum point and should be disconnected when changing over to parallel tuning.

A convenient method of arranging for the switching of the condenser in the case of the three terminal system which is incorporated in so many sets, is to mount a fourth terminal above aerial (p), as shown at X in Fig. 3. The fixed condenser should then be connected between this terminal and the earth terminal. Then, when the earth to aerial (s) strip or wire is removed when changing over to series tuning, it can be used to join aerial (p) to terminal X and bring the fixed condenser in circuit at the moment it is required.

### When a D.P.D.T. Switch is Used.

Of course, it can be left in circuit throughout the series tuning if the lower wave-lengths are not desired.

When a double-pole double switch is used, instead of the three terminals, it is necessary (Continued on page 1506.)

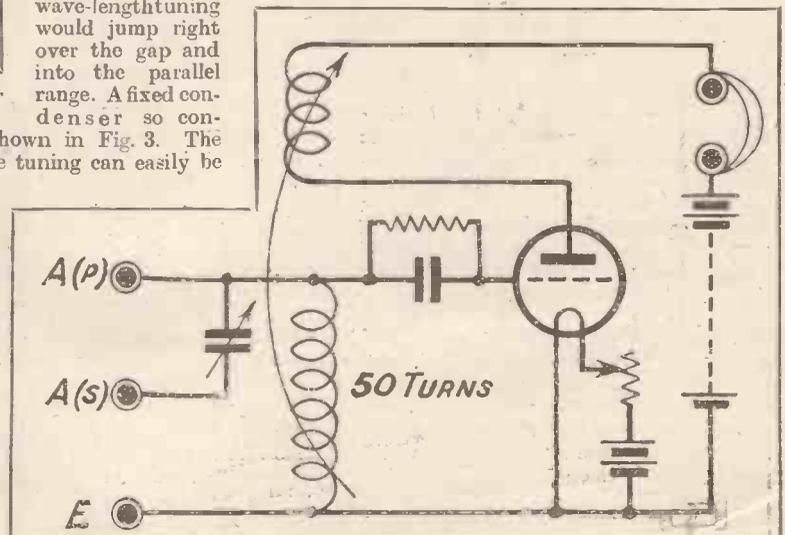


Fig. 4. The type of tuning circuit employed in thousands of sets, of which the one shown in the photo on the previous page is an example.



**FIVE!** A mystic number! At the tender age of five a misfortune overtook me, in the shape, or rather mis-shape, of a broken nose. At school I was regularly caned for "cutting" a cross-country run known as "The Five." I have been fined five pounds for motoring too fast. I suppose that if I had lived a hundred years ago I would have written "five-bottle man" on R.S.V.P.'s and had gouty descendants. And now I have been asked to describe a five-valve set which does, or would, satisfy my personal requirements in the reception of broadcasting, or, I suppose, anything else. Curious to relate, the "anything else" part of it is quite important in my particular scheme of things.

**"Unfavourable" Conditions.**

With a blush at the number of "I's" I've written, I hastily take up my story in the third person. Imagine a young fellow full of beans and all that, slightly gingering at the temples, married a year, fond of home life, learning the Charleston—(breath)—who wants to install a really

\* \* \* \* \*

Some details of the receiver used for the reception of broadcasting by one of the leading authorities on L.F. amplification.

By a  
**B.B.C. RESEARCH ENGINEER.**

\* \* \* \* \*

first-class wireless set. A good one (you-know-what-I-mean), with a loud speaker on which organ pedal notes will rattle the neighbours' false teeth. So far, so good.

Unfortunately, the happy home is in the centre of a veritable inferno of man-made atmospheric, electric railways, X-rays, neon-tube signs and high-frequency treatments. Distant reception is out of the question, it being an even worse egg than usual. The local station comes in very strongly, so strongly that all the above-mentioned "nuisances" fail to make their mark on it. This fellow, you may think, has no alternative but to listen all the time to the local station. Not so! It is here that a new "alternative" to the local

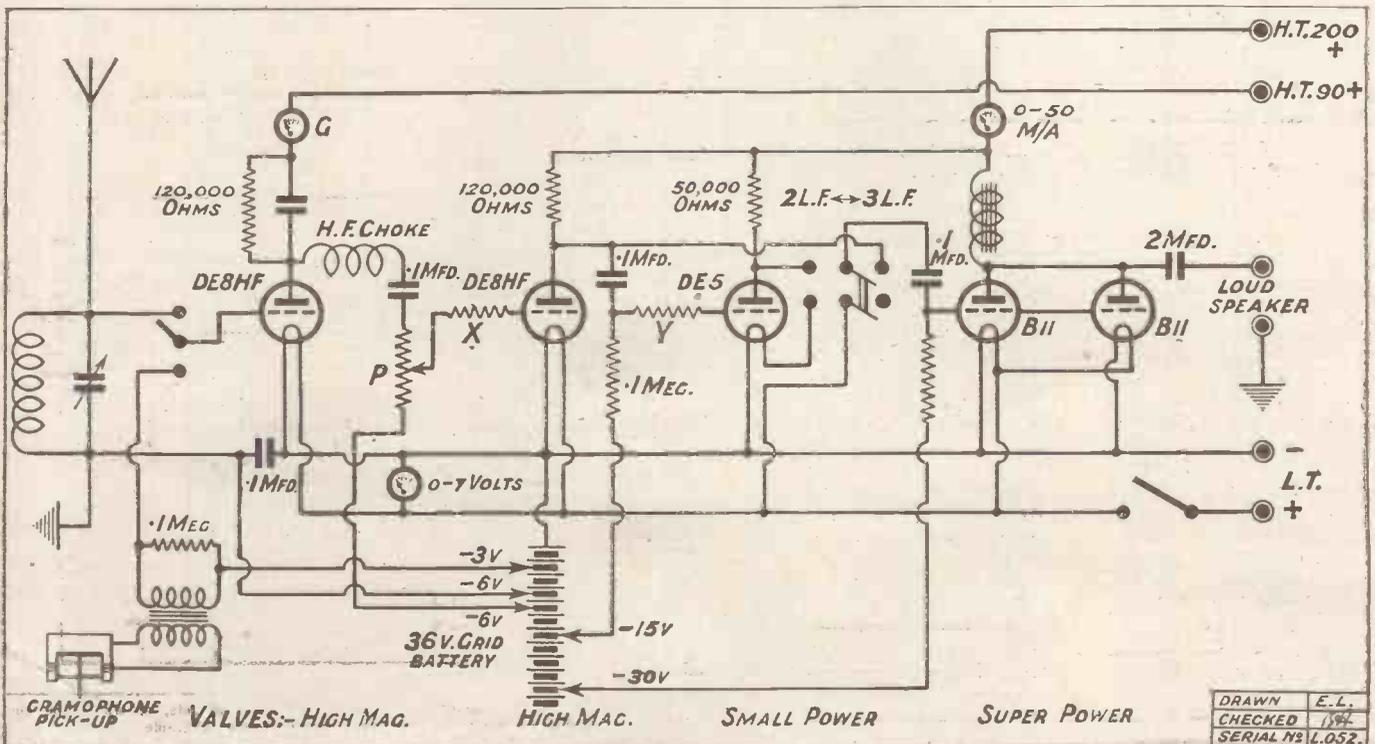
station makes its bow—the electric gramophone.

**The Electric Gramophone.**

When the local station is transmitting a whispering bass or a froth-blowers' quartette, "our hero" has no longer to stuff an antimacassar into the loud speaker—he merely switches his amplifier over to his electric gramophone and reproduces electric records of Bach, Berlioz or Brahms symphonies on his loud speaker. Of course, if he were inclined t'other way about, he would put jazz records on his gramophone when Stravinsky was taking the air. In any case it is an excellent alternative, and if the amplifier of his set is well designed and the loud speaker a good one, he will be able to obtain far better reproduction of records than is possible with any of the ordinary acoustic-type gramophones.

Most of us have heard about the miniature revolution that has been taking place in the actual methods of making gramophone records. Until about a year ago an

*(Continued on next page.)*



DRAWN	E.L.
CHECKED	1927
SERIAL NO.	L.052.

# MY FIVE-VALVER.

(Continued from previous page.)

apparatus not unlike an ordinary gramophone was used for making the original wax "master" record. Artists and orchestras had to crowd around the mouth of a large trumpet and put as much "vim" into their performance as possible. Violins had little trumpets on them to direct the sound towards the recording horn, and string bass instruments were not used at all. Apart from the discomfort of this method of recording, the recording machine could not cope with low notes, and distorted the human voice almost beyond recognition. Then somebody had a bright idea. A microphone replaced the recording horn, and the impulses from this microphone were amplified until they were sufficiently strong to operate an electro-magnetic wax "cutter." Records made by this process are so good that no ordinary gramophone can adequately reproduce the wide range of recorded sounds. On an electrical record reproducer, however, the improvement is positively staggering!

### Perfect Reproduction

The correct and only way to hear the new electric process records at their best is on an electrical record reproducer. It is possible, for instance, to pick out individual instruments in an orchestra, the pedal notes of an organ, the high harmonics of the violin—if the loud speaker normally used for broadcast reception can do justice to these sounds.

The funny part about it all is that our friend needs to spend very little additional money to make any receiver reproduce

gramophone records. He does, of course, need a gramophone mechanism, but it is not necessary for it to be jewelled in every hole. In place of the ordinary sound-box, an electro-magnetic pick-up is used. This is a simple piece of apparatus something like the inside of a headphone.

The movement of the gramophone needle causes a piece of iron to oscillate in a magnetic circuit, varying the flux at audio-frequencies and setting up voltages on its coils. Good pick-up devices can be made with ordinary diaphragm or reed type telephones. The gramophone needle holder and bar of an ordinary sound-box should be soldered on to the reed of the telephone receiver and "damped" with rubber bands or pads. Specially designed gramophone pick-ups are made by Marconi, Amplion and others.

I said before that the local station came in at great strength. This made high-frequency amplification unnecessary, even though anode-bend rectification was used for the detector valve. The remaining four valves were used as low-frequency amplifiers, with two of them working in parallel in the last stage. Resistance capacity inter-valve coupling was used, and the

loud speaker (a coil-driven cone) was choke-fed from the last L.F. stage, as in Fig. 1. The full circuit of the complete outfit, including a smoothing system for working off D.C. house mains, is shown in

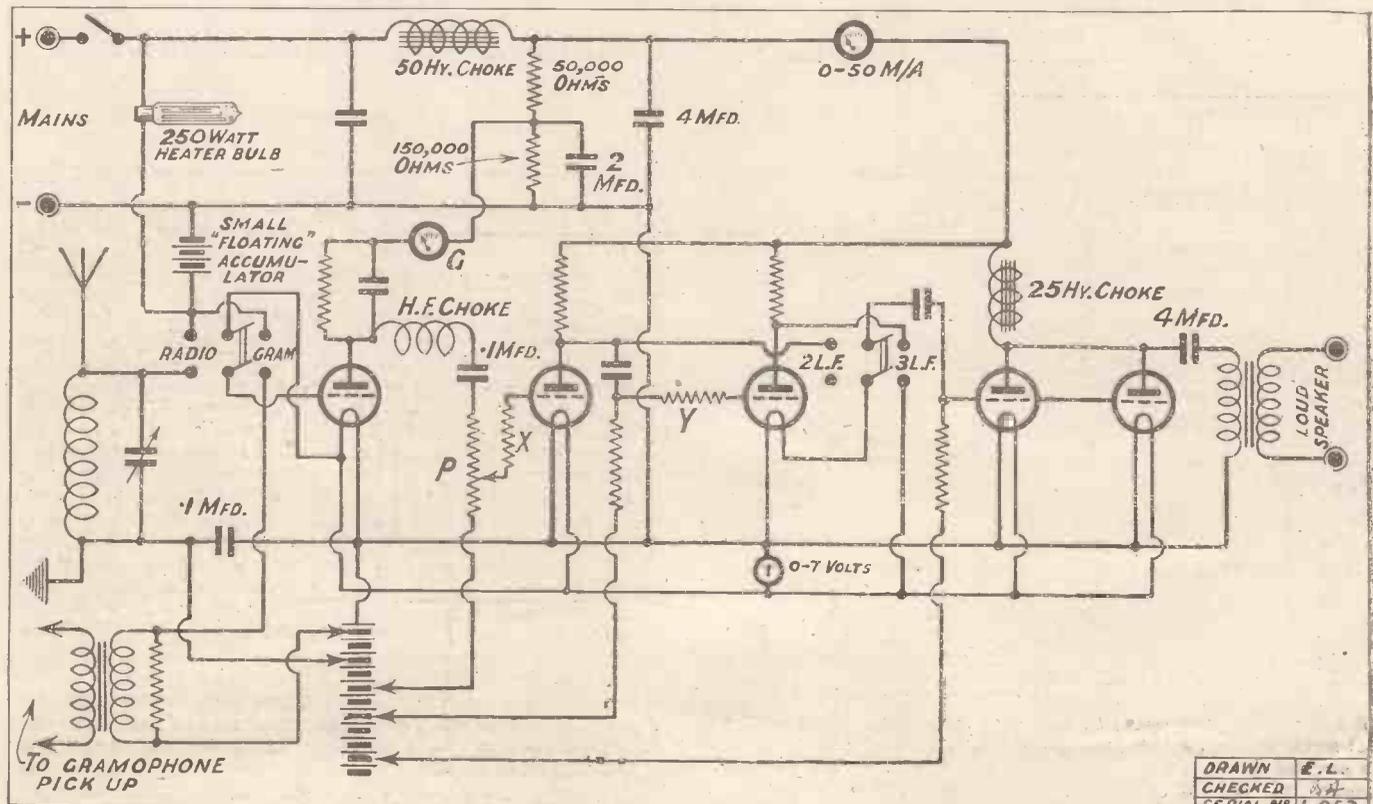


Not a Five-Valver. Mr. Harry Randall, the well-known "Panto" star, listens in on his new set.

Fig. 2. Protective 1 mfd. condensers were placed in the actual aerial and earth leads so that mains could not be earthed.

The galvanometer in the H.T. lead to the detector valve gives a reading of the H.F. current, the local station when tuned-in giving a reading of about eight divisions. This is quite a luxurious refinement which

(Continued on next page.)



DRAWN	E.L.
CHECKED	AS
SERIAL NO.	L.053.

# TWO NOVEL IDEAS.

A Useful and Serviceable Crystal Mounting—and an Ingenious Rheostat Lock.  
BY A CORRESPONDENT.

**Q**UITE a novel and, incidentally, often an extremely serviceable form of crystal mounting may be made by the simple means illustrated in the sketch below.

Very few of us do not possess at least one or two old and burnt-out flash-lamp bulbs. It is from such articles that the present form of crystal mount is made.

Remove the glass from the old flash-lamp bulb by breaking it, and, after this, scrape away the porcelain or plaster filling from the interior of the bulb. Now wrap up a small fragment of crystal in a shred of tin-foil or silver paper, and insert it into the bulb, pressing it well down so as to make firm contact with the metallic sides.

Next, mount on the detector one of the small screw-in flash-lamp bulb sockets, which are easily procurable nowadays. The broken bulb containing the fragment of crystal is then screwed into position in the socket, after which the detector is ready for use.

This form of crystal mounting has two decided advantages. In the first place, a very rapid change of crystals can be made,

The knob and spindle form the key, and can be inserted in the hole provided for fixing, to turn the low-tension supply on and off. When the rheostat is in the "off" position and the key removed, the set cannot be interfered with.

A word on the correct value of rheostat. For one valve of the '06 type, one of 30 ohms should be used; for two or three valves of this type, one of 20 ohms; for four, one of 10 ohms, and for five or more, one of six ohms. The six ohm type will be found most suitable for all multi-valve sets, and when the 2-volt valves are used the resistance should never exceed this value. Even if the resistance of a 30-ohm rheostat is all out, there will be a sufficient drop of voltage across one turn of the wire to lower the efficiency of the valves. In addition, there is a danger of overheating if a high-resistance rheostat is called upon to pass anything like a heavy current.

## MY FIVE-VALVER.

(Continued from previous page.)

gives an indication of the strength of the local transmission. The resistances  $x$  and  $y$  (1 meg. each) in the grid leads of the first and second valves act as stabilisers in the prevention of low-frequency reaction effects and oscillation.

### Volume Control.

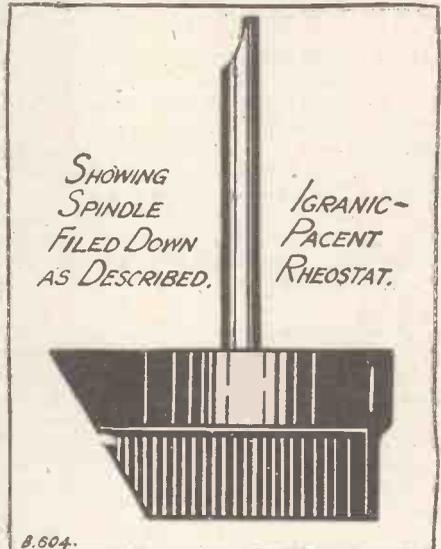
The potentiometer P is a volume control, giving a continuously variable adjustment of loud-speaker strength; it has a resistance of 500,000 ohms. The coil of the loud speaker had a very low impedance, and a transformer had to be used to couple it to the last valves of the amplifier. The output choke was nevertheless retained in order to prevent the D.C. for the last valves from saturating the transformer primary.

A switch is arranged so that the first valve (detector) is connected to the secondary of the gramophone input transformer, the grid bias being changed at the same time so that the valve operates as an amplifier instead of as a detector. No difficulty was found in working the set off the house mains, which were 200 volts D.C., with the negative side "earthed." It is sometimes quite difficult to get rid of generator hum from

the power station when the positive main is earthed. The complete outfit worked—and still works—excellently, with none of the usual troubles of battery maintenance and expense.

Yes, it undoubtedly is a great advantage to have the set arranged so that electrical reproduction of the gramophone can be carried out, for during uninteresting items broadcasting is often switched off and one can choose one's items on the gramophone. The reproduction—and here's the whole point—being as good as that obtained when broadcasting is being received.

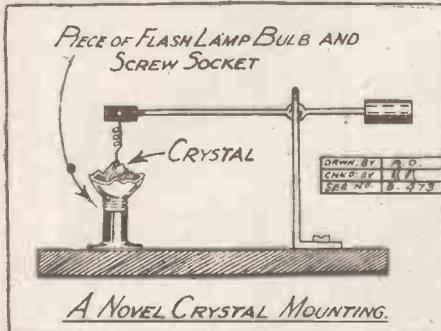
It has been found that this refinement is exceedingly popular at home, especially when talks are being broadcast. You must



have a good loud speaker, however, or the gramophone will only be made more "gramophoney" than it is in its natural state.

The loud speaker is mounted in an old oak fire screen baffle and is, I think, the only antique loud speaker which is up to date.

Even as I write now it is reproducing the Savoy bands. Ah! What's that? A Charleston! I must leave you.



for, by having a number of these broken bulbs each containing a crystal, it is very easy quickly to screw one bulb out of its socket, and to screw another in.

Advantage number two is that by these means very small fragments of crystals may be utilised with perfect success over long periods. Here, therefore, is an excellent means for effecting crystal economy.

### A RHEOSTAT LOCK.

**M**ANY ingenious lock switches have been illustrated and described in these columns before, but none combining the attractive features of utility and simplicity of the gadget shown on this page.

An Igranic-Pacent rheostat is mounted on the panel and connected in series with one of the low-tension leads. In this position it serves as a master control for the filaments of all the valves. But, instead of mounting the knob and spindle (both of which are in one piece) by means of the set screw on the contact arm, the set screw is screwed down as far as it will go, and a portion of the end of the spindle is filed down to form a decided flat as shown.



The Rev. G. H. McNeal, of City Road, London, receiving a message from one of his colleagues in New York by means of the Rugby radio service.

# TECHNICAL NOTES.

A Weekly Feature Conducted by

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

(Staff Consultant.)

THE insulating material known as bakelite, which had its origin in the United States and which is there finding increasing uses for wireless and electrical purposes, has also been on the English market now a year or two and has found considerable favour here, although there are many manufacturers and constructors who, for various reasons, prefer other types of insulating compound.

Bakelite is manufactured in a variety of types—the laminated type is used for panels and insulating strips owing to its high insulation constants and its mechanical strength. Another variety is the moulded bakelite which, in addition to the characteristic electrical properties, takes on a permanently lustrous finish and can be coloured in a variety of colours.

Another type of bakelite, which is not so commonly known, is the transparent material which is quite clear (or, at any rate, as clear as good celluloid) and is not brittle. This material also may be tinted in various colours and is sometimes used in wireless receiving sets (more particularly in the States) for the ruby window behind which is the pilot light which shows when the valves are switched on.

## A New "Tester."

The advent of receiving valves and wireless receiving sets has given birth to many new types of electrical instruments. Enterprising valve manufacturers now supply dealers with valve testers by means of which valves may be readily tested, for their main characteristics, in the presence of the customer. Some of these valve-testers and similar appliances are quite elaborate instruments and it says much for the critical attitude of the present-day radio buyer that appliances of this kind should prove to be a good investment on the part of the dealer.

One of the latest additions to the list of such instruments is the "B-eliminator" tester which has lately been put on the market by the Jewell Electrical Instrument Company, of 1650, Walnut Street, Chicago, U.S.A. This instrument has been developed owing to the very great increase in popularity in the United States of H.T. battery eliminators. In the announcement of this new appliance the Jewell Company claim to have produced the first valve tester, to have given radio the first high-resistance voltmeter, to have furnished the first radio service set, and now to have produced the first "B-eliminator" tester.

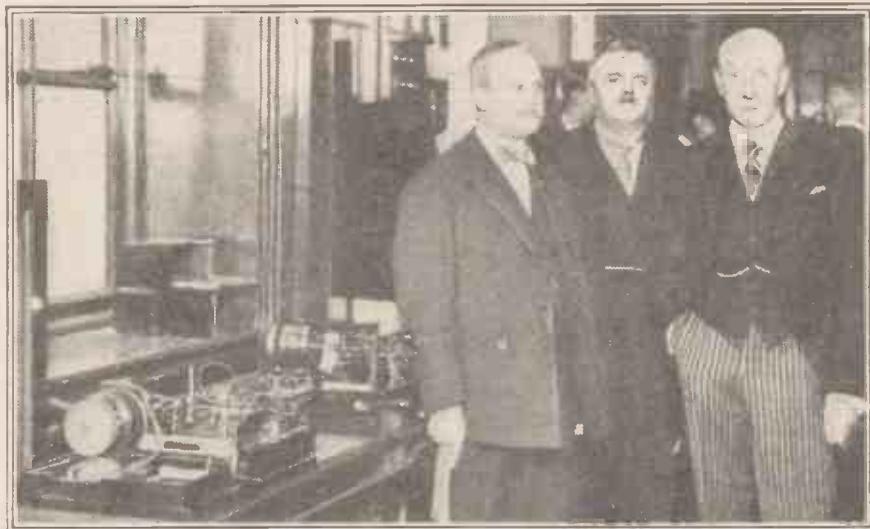
## Voltage Under Operating Conditions.

The tester has been developed for the use of manufacturers and dealers in adjusting H.T. eliminators to the requirements of the particular receiving set with which they are intended to be used. The appliance consists essentially of a suitable milliammeter connected in series with an adjustable load, and a voltmeter so arranged that it shows

the voltage at the eliminator terminals under actual operating conditions.

## Headphone Diaphragms.

Listeners who use headphones will no doubt have noticed that, after wearing these for any length of time, moisture is apt to be deposited within the cap of the telephone receiver and upon the surface of the diaphragm. The presence of moisture within the receiver is liable to cause the diaphragm to rust at any spots where the enamel (or other protective coating) may be weak. It is, therefore, a good plan to clean the diaphragm thoroughly (taking great care not to press it unduly in the process) and then to smear it over with an exceedingly thin film of oil such as lubricating oil.



One of the sensitive relays now used in the carrying out of long-distance communication where long lengths of land-line have to be used.

Care must be taken that the amount of oil is not more than the merest film, as otherwise the vibrations of the diaphragm may be damped.

If you have a new pair of 'phones and you do not wish to unscrew the cap (and it is always as well to avoid unscrewing the caps of the 'phones if possible) you may protect the diaphragm at the outset by introducing a small quantity of oil between the cap and the diaphragm. In order to do this the receiver should be placed in a horizontal position, on its back, that is with the cap and diaphragm upwards, and a very small quantity of oil (about as much as will hang from the end of a match stalk) should be deposited on the diaphragm through the hole in the centre of the cap. If the earpiece is then left in that position for a few hours the oil will spread itself out into a uniform film over the whole of the surface of the diaphragm.

## Valve Fitting.

Valve users will have noticed that many of the present types of valves are now fitted

with a new kind of valve leg which takes the form of a hollow tube with four equally spaced longitudinal slots in order to give lateral resiliency.

These new valve legs are very much superior to the old-fashioned split-pin type. In the first place they make much better contact and, owing to the fact that the cylindrical wall of the tube which constitutes the valve leg is quite thin, a better spring effect is obtained and there is much less liability for the springiness to be destroyed by frequent insertion and removal of the valve into and from the holder. The old-fashioned type of valve leg was very liable to become jammed owing to the bad fit between the valve and the holder, and it was, as everyone knows, frequently necessary to prise open the prongs with a penknife in order to obtain proper contact. These troubles have practically disappeared since the introduction of the new type of valve leg.

## Leakage on the Base.

Another advantage of this new type of valve leg or valve pin, which concerns not only the user but also the manufacturer, is that the leading-out wire from the valve

may be passed along the hollow pin and soldered at the tip. In this way the operation of soldering is greatly simplified and a much better soldered joint may be obtained. In the old type of pin, in which the leading-out wire was given a couple of turns around the pin close up against the valve base, it was difficult to make a proper soldered joint owing to the fact that great care had to be taken not to over-heat the pin with the soldering iron and so soften the surrounding composition.

The flux which was used for the soldering was, as a rule, freely sputtered upon the valve base and unless great care was taken (by a subsequent operation) to remove all traces of flux, it remained there as a fruitful source of inter-electrode leakage. With the new type of pin, as the soldered joint is at the tip there is no need to be at all squeamish about applying a hot soldering iron and making a perfect soldered joint, and furthermore the sputtering of the flux is much less likely to cause any deposit on the valve base.

(Continued on page 1507.)

# RUGBY—THE RADIO PARASITE

THE general public in this country are under the impression that Rugby is the last word in wireless stations. Perhaps it will surprise them to know that in the opinion of experts, Rugby is already out-of-date, and that the hundreds of thousands of pounds which were spent on this station—in spite of the advice of those experts who foresaw the development of the Beam system—Rugby is nothing more or less than a white elephant these days.

Added to this, broadcast listeners have the suspicion—and a very shrewd suspicion it is, too—that the thousands of pounds of excess licence money withheld by the Postmaster-General from the old B.B.C. has been spent on Rugby, for Rugby, it is suspected, is not paying its way.

Beam stations are much cheaper to erect than stations like Rugby, and Beam stations are proving to-day their immense superiority over high-power stations built and managed like Rugby.

A good deal of boosting has been given in the Press to Rugby and the general public are inclined to pat themselves on the back and express satisfaction at the knowledge that Britain now has the most powerful wireless station in the world. But Rugby, despite its hundreds of kilowatts, and despite its towering masts and general air of impressiveness, is, nevertheless, a very unsatisfactory station.

## “Appalling Mismanagement.”

For some time past POPULAR WIRELESS has been collecting data concerning Rugby, and we have received from a competent wireless operator at present serving on a ship abroad some very significant facts regarding this station. It will come as a bit of a shock to the general public to hear that this ‘super station, this marvellous Rugby, is described as a “disgrace to the British Empire” by people abroad.

Such, however, is the description given to it by a large number of wireless operators at sea. They know Rugby, not as Britain’s finest wireless station, but rather as the laughing-stock of wireless operators of all countries.

By far the most important work of Rugby is the transmission of private and press messages to ships at sea. The “disgrace” referred to is in the manner in which these transmissions are conducted. They are a veritable nightmare to operators who have to read the Morse signals. Not only is each transmission full of slips and mistakes, but also an amazingly large number of perfectly avoidable mistakes of an absurd nature are made.

Such mistakes as: “Sending a press message backwards for ten minutes before it was discovered,” or “Repeating a press message which has already been sent,” can only point to appalling mismanagement.

Schedule at Rugby is a myth. So long as one transmission commences before the next one is due, the authorities concerned would appear to be perfectly satisfied. No other station in the world of any importance is ever more than a few seconds off its



automatically it should not be expected to find a single error. Even two errors and consequent corrections will cause an operator considerable bother and waste of time. Fifteen or twenty (such as Rugby frequently makes) will in many cases make it necessary to completely re-copy messages.

Prior to December 1st, 1926, Rugby transmitted private messages

to ships at sea at 00.48 and 12.48 G.M.T. After that date, however, for no apparent reason whatever, the times were changed to 00.48 and 11.00. The fact that a large percentage of ships are not maintaining a watch at 11.00 would seem to be of no consequence at all! No wireless station, other than a badly managed one, could overlook such an obvious “howler.”

## “Something Radically Wrong.”

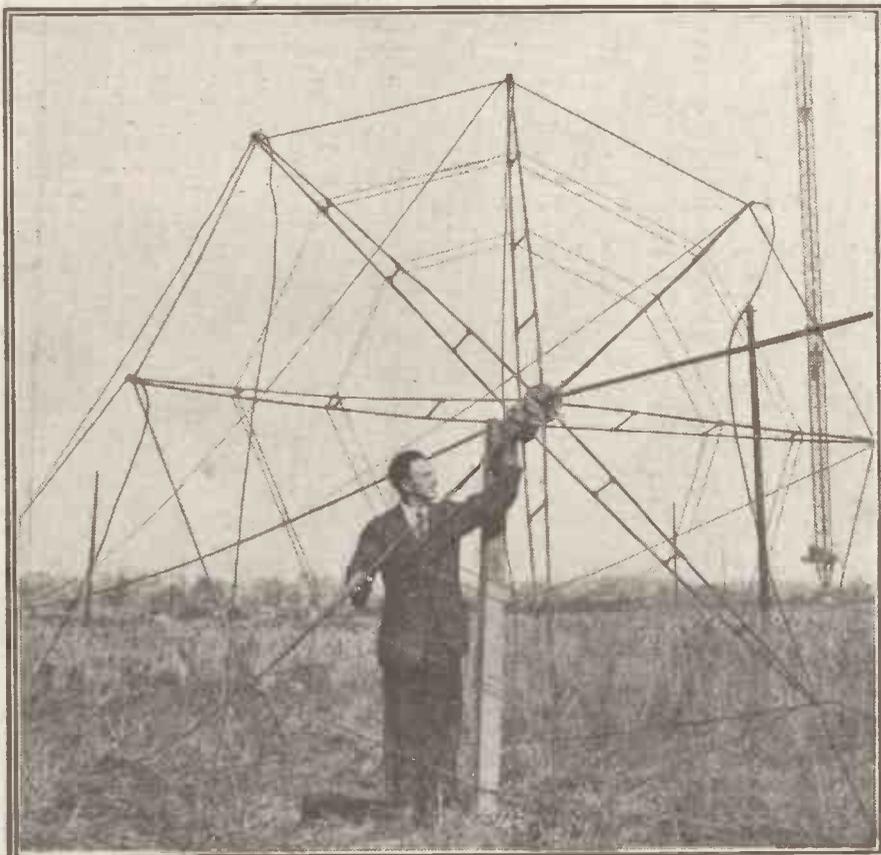
With regard to the actual reception of Rugby in various parts of the world, it would appear that here again there is something radically wrong. There are many parts of the globe where Rugby’s signals are unreadable owing to their weakness and the amount of interference on the wave-length which is chosen for the transmission to take place.

Even as close as the Mediterranean, press messages are frequently missed. In  
(Continued on next page.)

Is the new Rugby high-power station the tremendous success it is popularly believed to be? In spite of a good deal of publicity, it would seem very doubtful if this station is anything more than a white elephant.

scheduled time. It is no exaggeration to state that on an average at least half an hour daily is wasted by the Rugby wireless station in the making and rectifying of errors.

At times a press message is received in such a mutilated condition that only the operator’s ingenuity can enable him to make a readable copy of it. If the transmissions were made by hand a few errors would be reasonable; since they are sent



One of Rugby’s aerial “spreaders” down for a cleaning and a careful examination.

## 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.

### BEAM INTERFERENCE.

The Editor, POPULAR WIRELESS.

Dear Sir,—As a regular reader I was naturally interested in Mr. Philp's article which appeared in a recent issue. More particularly as the interference referred to has bothered me quite a lot, although up till now I had not connected it with Beam Transmission. It seems likely that this sort of trouble is

not confined to Cornwall, as I have experienced the same sort of thing here for some time past.

Using a Marconi five-valver, 2 H.F., D. and 2 L.F., I locate this interference round about 1,300 metres, at its greatest intensity, but when in operation I feel the effect right through Hilversum to Radio-Paris—in fact, practically right round the dial.

Tuning in Berlin (Königswusterhausen 1,300) I

My aerial is a twin, well-spaced 50 feet span, 30 feet high, with direction N.N.W.—S.S.E.

More often than not the reception I get now is very indifferent no matter what station or wavelength. Very occasionally first-rate, but never, I notice, when our friend on 1,300 is working or fading about. His activity seems to upset the quality of all the transmissions, leaving us the noise, but taking all the music out of it.

Formerly, bad reception here was the exception, and not, as now, the rule.

I've experienced, too, the "dynamo effect" Mr. Philp comments on, for some time past on and off. This has troubled me, especially on London and Daventry, although I've not associated it with the other bother.

At times during the same evening it has proved unbearable.

I've likened it to the noise one would expect to get if there was a pumping station next door to 2 L.O., and with the windows of the studio open letting in the roar of traffic from the street. I never used to get this sort of thing with any set, whereas now I get it with all, including a simple crystal.

With the latter a few Sundays ago from 11 p.m. to 11.30 I received Leipzig quite comfortably and remarkably clear—for a crystal. So as I do not believe there can be anything radically wrong with my aerial-earth circuit, I propose leaving it alone until I have seen your readers' opinions and comments on Mr. Philp's theory.

Personally I think he may be right in a lot he says, but in my case, knowing very little technically myself, I should not feel competent to challenge his "earth skin" idea.

I feel convinced, however, that the question now raised has been exercising the minds of many listeners, and I am very pleased to think that POPULAR WIRELESS intends to interest itself in solving the problem of this most unpleasant and discouraging type of interference.

I shall be looking forward to getting your next week's issue and, meanwhile, wish you every success.

Yours faithfully,

WILF. ROBBINS.

57 Bexhill Road, Crofton Park, London, S.E.4.

### WAVE-TRAP SUCCESS.

The Editor, POPULAR WIRELESS.

Dear Sir,—It is with great pleasure that I write to let you know how grateful I am to "P.W." for publishing "A Wave-Trap that Works." I made up the circuit out of some scrap accessories I had by me. To tell you the truth, I was rather dubious over making it at all, as I have tried many other wave-traps without success.

However, to my great surprise on fixing it as per instructions, I was amazed at the way it cut London dead out, and, what is more, how it brought in Bournemouth, Hamburg and other foreign stations, all on the loud speaker, clear as a bell. To prove that it is not a freak, I can get the same results every night. I consider this an achievement as I live three miles under 2 L.O. It is indeed a "Wave-Trap that Works" in every sense. Wishing "P.W." every success, and hoping to see some of the features of "Wireless" in "P.W."—I am,

Yours faithfully,

A. W. TIPPET.

36, Hampton Street, London, S.E.17.

(Continued on page 1505.)



Some of the dynamos in one of the huge generator rooms at the Rugby station.

## RUGBY, THE RADIO PARASITE

(Continued from previous page.)

the East African regions and the Western Atlantic, unless the ship is fitted with an exceptionally good receiver, signals are often not heard at all. Attempts have been made to explain this poor reception as being due to "blind spots." These spots undoubtedly exist, but in this case they would have to be remarkably large "spots."

The French high-powered station at Bordeaux is readable at any time and anywhere with very little difficulty. In fact, in the greater part of the world Bordeaux seriously interferes with Rugby. Why should not Rugby do the interfering? Rugby, the super station of the Imperial Wireless Chain! Surely if the station was worth erecting at all, it is worth a little care in its management.

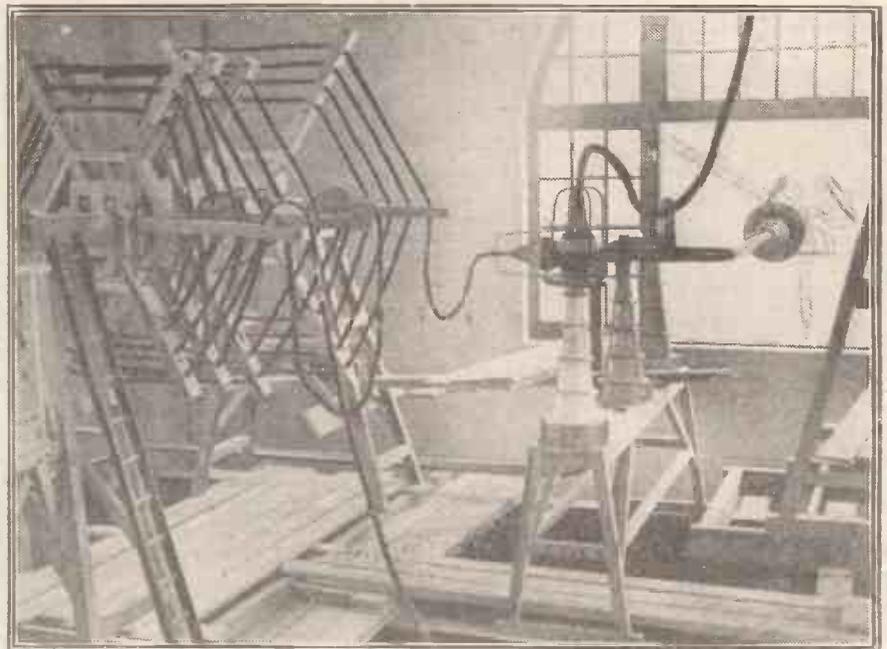
The following extract from a reader's letter throws some light upon the "secrecy" of the new radiophone system:

"Dear Sir,—Can anything be done to eliminate interference from Rugby high-power station? Snatches of conversation are received at all times on all wavelengths up to 2,000 metres, making reception impossible."

Rugby, the so-called super station, is out of date.

get the phenomena so aptly described by your contributor in his reference to "choppy effect," and "mincing machine."

At times reception perfect—then suddenly w-w-wipp—cut off as if with a knife—a period of "staccato," followed by clear reception, and so on repeated indefinitely.



The aerial lead-in at the Rugby station. Note the massive insulators.

EXPERTS IN RADIO ACOUSTICS SINCE 1908



*'Not on your life, old man!*

**I**T'S not an atom of use getting on your hind legs to tell me of the thrills of an eight valve "super-het." Nice little row of fairy lights—what! That's all they mean to me.

Besides, I want peace in life. I get just as much fun out of two or three valves and much less trouble and expense.

I want ease of operation, marvellous compactness, ingenious design and guaranteed efficiency, and I'll bet a Brandes means all that.'

# Brandes

*From any reputable Dealer.*



## THE BRANDESET II.

The new Brandes 2-valve set features simplicity of control and ingenious compactness. Condenser dial, filament rheostat, reaction dial and "throw-over" switch for long or short wave tuning complete the panel controls. Straight line frequency condenser tuning and grid-bias is employed. The standard coil is suitable for Daventry and no "plug-in" coils need be purchased. The L.T., H.T., and grid-bias leads are plaited into one cable from rear of set.

£6-10-0

*(Exclusive of Marconi Royalty and Accessories.)*



## THE BRANDESET III.

The new Brandes 3-valve receiver employs the same ingenious characteristics as the Brandeset II, except that an extra stage of Audio Frequency is employed. It has straight line frequency condenser tuning, grid-bias and is adapted to long and short wave tuning. Both receivers give most excellent loudspeaker reproduction on a number of stations, and are specially designed for this purpose.

£8-10-0

*(Exclusive of Marconi Royalty and Accessories.)*



# No other wireless firm gives this service!

## A Unique Offer

### Features of the Set

The receiver is contained in a handsome polished walnut case and the control panel and Loud Speaker are finished black background with gold sprayed relief.

The set tunes from 250 to 2,400 metres, thus being capable of receiving all Broadcast wave-lengths *without the use of additional coils.*

The Dull-Emitter valves are mounted in patented vibration and shock-proof holders *inside the case.*

The full-size Hearthsides Loud Speaker has a new patented cast-in diaphragm, the secret of its wonderful purity of tone.

The wonderful General Radio Two-valve set with Loud Speaker and Headphones will be *installed free* by our engineers in your own home—anywhere in the British Isles—for 20/- down and 20/- a month for twelve months only. Cash price £12.

There is nothing else to buy—the set is sold *complete* with accumulator, battery, dull-emitter valves, aerial equipment, all cords and plugs, and the Royalty is paid.

Our engineers will fix the set just as you want it and leave it playing *perfectly* for you. You are also entitled to *free service* calls after the set is working. *No other firm gives this service.*

The whole set is designed, built and fully guaranteed by the General Radio Company. *It is unsurpassed for purity of tone and volume of reception.*

When our engineers have installed the set, you need only push *one plug* into its socket to secure perfect and powerful Loud Speaker reception.

Send a postcard to-day for Catalogue No. 10W which gives full details of this unique offer.

**20/-  
DOWN**



**General Radio**★

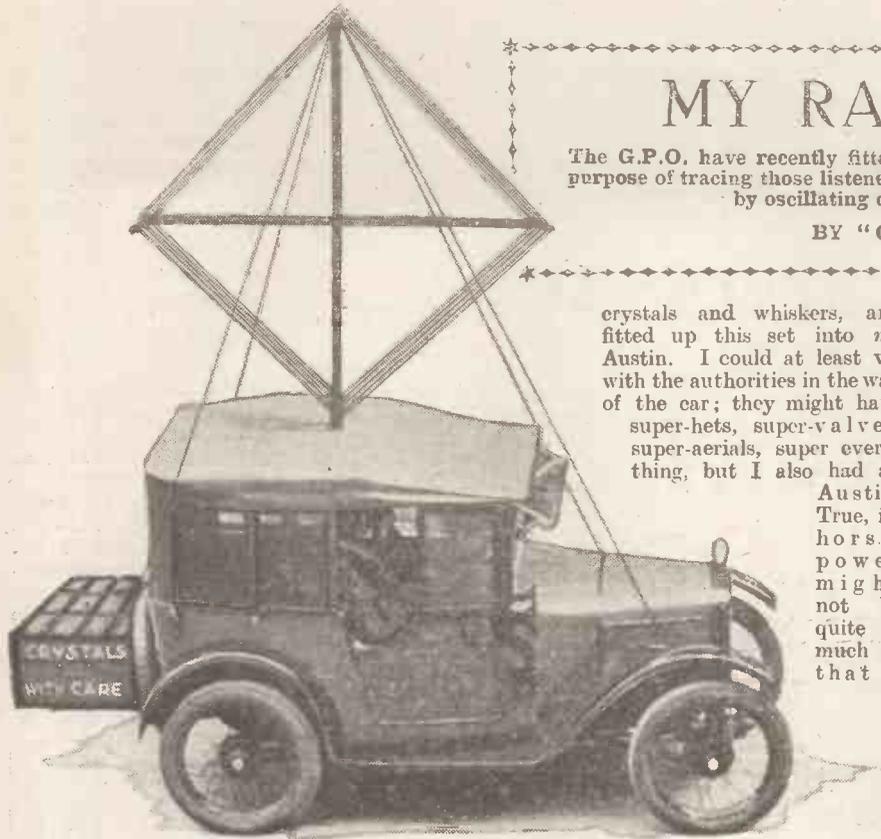
GENERAL RADIO COMPANY, LTD.,  
RADIO HOUSE, 235 REGENT ST., W.1

*The unique General Radio service can only be obtained by purchasing the Sets direct from the Head Office of the Company or from its accredited Representatives and Engineers*

# MY RADIO VAN.

The G.P.O. have recently fitted up a special "detective" van for the purpose of tracing those listeners who spoil their neighbours' enjoyment by oscillating during broadcast hours.

BY "OSCILLATOR."



The Austin "7" used by our contributor.

crystals and whiskers, and fitted up this set into my Austin. I could at least vie with the authorities in the way of the car; they might have super-hets, super-valves, super-aerials, super everything, but I also had an Austin. True, its horse-power might not be quite so much as that of

car completely top-heavy and tipping it up; but I *did* fix it, as the photograph shows, and with all my gear on board and aerial swaying gracefully in the wind I sallied forth to do battle with the enemy.

I had a little difficulty in negotiating draughty corners with that aerial, but I managed it, listening as I went along for that neighbour of mine who nightly breaks into my enjoyment between the hours of 7 and 10 p.m. As I expected, I heard his peculiar burble as soon as I started, so speeding down the road, I hurried on the scent.

### On the Track.

Rounding the corner at the bottom of the road, I accelerated and, facing the car south, was immediately rewarded by an increased intensity of the interference. Elated at my success, I fairly stamped on the throttle. The noise ceased. The set had gone dead.

Pulling up, I examined everything. Earth to the chassis was O.K., aerial all right, crystal—no, the crystal was not all right. I found the cat's-whisker, due no doubt to the vibration of the car, had bored its way right through the crystal.

After extricating it, I replaced the crystal with another from the case I carried on the luggage grid, and continued my way. Yes,

(Continued on next page.)

I RECENTLY received, via the Editor of "P.W.", an invitation to have a look at the wireless detective van used by the Post Office authorities at Dollis Hill for tracing oscillators. This van has been specially designed for its purpose, and consists of a complicated arrangement of sets and controls, together with a frame aerial mounted on the roof and controlled by means of a large steering-wheel similar to that used for steering a car. The whole is mounted on an Austin chassis of considerable horse-power; at least, so I gather from the photographs that have appeared from time to time, for I have not yet seen the van, nor, as far as I know, has it ploughed its way through the mud of my garden suburb in search of those fiends that disturb 2 L O's dulcet tones in my vicinity.

It is, however, a very hardworked van. I can say that with certainty, for was I not going to see it one fine Saturday, only to be politely informed that that day was its bath day, its day of rest and recuperation, when it had its face washed, its tyres overhauled, its valves replaced in readiness for another week's hunting? What a busy van it must be! And how sorry I felt for it and its crew when I realised how hardworked they were.

### Up-to-Date Equipment.

I was so sorry, in fact, that I decided it ought not to be left to do its work all alone lest it develop a nervous breakdown. So I decided to help; myself to go in search of those evildoers that were causing the P.O. so much trouble with their howls and squeals.

After much thought I gathered together all the wireless gear I had (a well-worn but trustworthy crystal set and a push-pull amplifier), purchased a vast quantity of new

their 90-90 super-charged model, for mine was an Austin Seven, but I certainly made up for it with the aerial.

What a marvellous frame that was! I just managed to fix it without making the



The Post Office van referred to by our contributor in the accompanying article.

## MY RADIO VAN.

(Continued from previous page.)

there was the noise again! I was on the right track evidently.

Louder and louder grew the noise as round and round the place I went, though the frame aerial certainly did not seem to be too efficient from a directional point of view. However, I felt I was getting on all right, and no doubt the aerial was not acting well because the oscillator must be very near now.

I had done about six miles when I came to a long road with overhanging trees on one side and a couple of lonely houses on the other. Down the road I went, listening as I went along, when suddenly the car was thrown up on two wheels. It rocked dangerously for a moment or two, and then came to a standstill just as I let the clutch out and dragged the gear lever into neutral. The engine raced, exhaust fumes rose in a cloud all round, and there was a crash from above. The frame aerial had collapsed through the hood of the car, having been dragged from its exalted position by an overhanging branch.

### The Finale.

As I surveyed the damage an enraged youth came out of one of the houses and rushed up to me. "What on earth do you think you're doing?" he asked unkindly. "This is a private road, and I can't hear anything on my set for the row the magneto of your miserable perambulator is making!"

I bowed my head sadly. It was all clear now. The fault was not in the frame aerial, after all. How could it have been directional? I shall leave it to the G.P.O. in future.

[From the above details, and without knowing the exact circuit employed by our correspondent, we would imagine that the results obtained were not up to those that should have been achieved in the circumstances. We understand, however, that an up-to-date model (with specially strengthened chassis) of a pull-push crystal detector and 3-valve push-pull amplifier was used, the first valve being controlled by a simple push-pull switch.

We are unable to give further details at present, except that our correspondent assures us that the apparatus had previously been in perfect working order, and was in the habit of pushing out signals of enormous volume from the various stations it pulled in.—MOTORING EDITOR.]

## ACCUMULATOR HINTS.

By J. W.

**A**CCUMULATORS are often a source of trouble to the average listener.

This does not mean to infer that the batteries are entirely to blame. All scientific components require attention at some time or other, and wireless components are certainly not an exception to the rule, especially accumulators.

Be careful to see that all connections are correct when charging; current wrongly flowing through a battery, if only for a short period, may result in a permanent injury.

Never apply a higher voltage or allow the charging rate to go above that stated

by the makers. Charging at a greater rate may, and usually does, ruin the cells for ever. Always use a hydrometer for testing and test the specific gravity of the acid not only before but also after the charge. Do not allow the battery to discharge below 1.8 volts per cell.

Standing discharged, overcharging, and insufficient charging, are the main causes which result in sulphating. Even if your battery is not in use to any great extent, charge it up every fortnight or so. You will find that it will amply repay you in the long run.

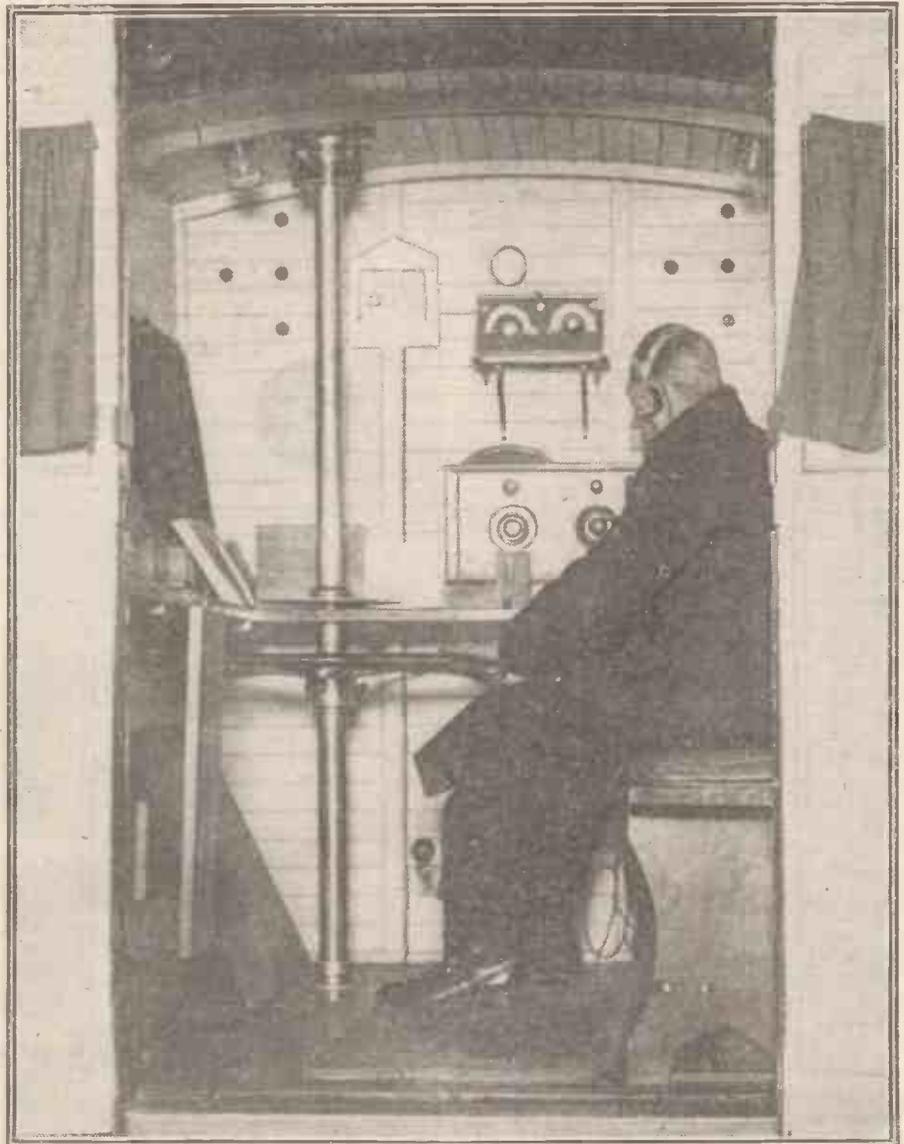
### Removing Sulphate.

When the plates are only sulphated slightly a slow charge, not exceeding half the normal rate, will often cure the trouble. Under no circumstances be tempted to use battery revivers, which usually consist of strong solution of sulphuric acid. The sulphating may disappear, but the plates will soon begin to fall to pieces. If the battery is a new one, it should be given a long first charge of fifty hours or so at a low rate; most makers state the first charging rate of their accumulators, but in cases where this is not given  $\frac{1}{10}$  to  $\frac{1}{15}$  the

normal charging rate should be quite in order.

Until the full charge has been given, it is not advisable to begin discharging. After constant use for some time it will be noticed that a small amount of sediment has collected in the bottom of the cells. This is due to the filling of the plates becoming slightly disintegrated, and unless a fair amount has collected no undue precautions need be taken. If a good deal has accumulated, it should be removed. Before recharging, pour out the acid and half fill with distilled water, and shake vigorously, taking care not to splash clothes, etc.; repeat this until all the sediment is removed. Carefully drain out all the water, and pour back the old acid, adding fresh diluted acid until the correct specific gravity (1.190-1.184) is reached; or fill the cells with entirely new acid. At all times see that the plates are covered.

If the acid should drop below the normal level when on charge, it should be brought up to this point by means of distilled water. When it is necessary to charge accumulators in the house, they should be placed on an enamelled tray, or, better still, in the scullery sink.



The operator in the detective van controls the frame aerial by means of a large wheel.

# TESTED AGAINST A 6-GUINEA LOUD SPEAKER

—the Lissenola best

The result of an actual test—the Lissenola against a very well-known loud speaker.

The user writes:—

Ref. 7870. 26. 1. 27.  
Rochester.

“ A Lissenola unit I purchased at Xmas gave such good results on the cardboard horn that I made it a curved three-ply horn, which has still further improved reproduction, and last evening I tested this speaker against a 6-guinea \* \* \* \*” (giving a very well-known make) “both instruments being on a two-way switch to enable instantaneous comparison to be obtained. Even the owner of the \* \* \* \* had to admit, with a somewhat rueful air, that the Lissenola was infinitely the superior as regards quality whilst volume was very slightly less than that of the \* \* \* \* which is admittedly sensitive.”

Now you can get a complete Lissenola Loud Speaker as illustrated for

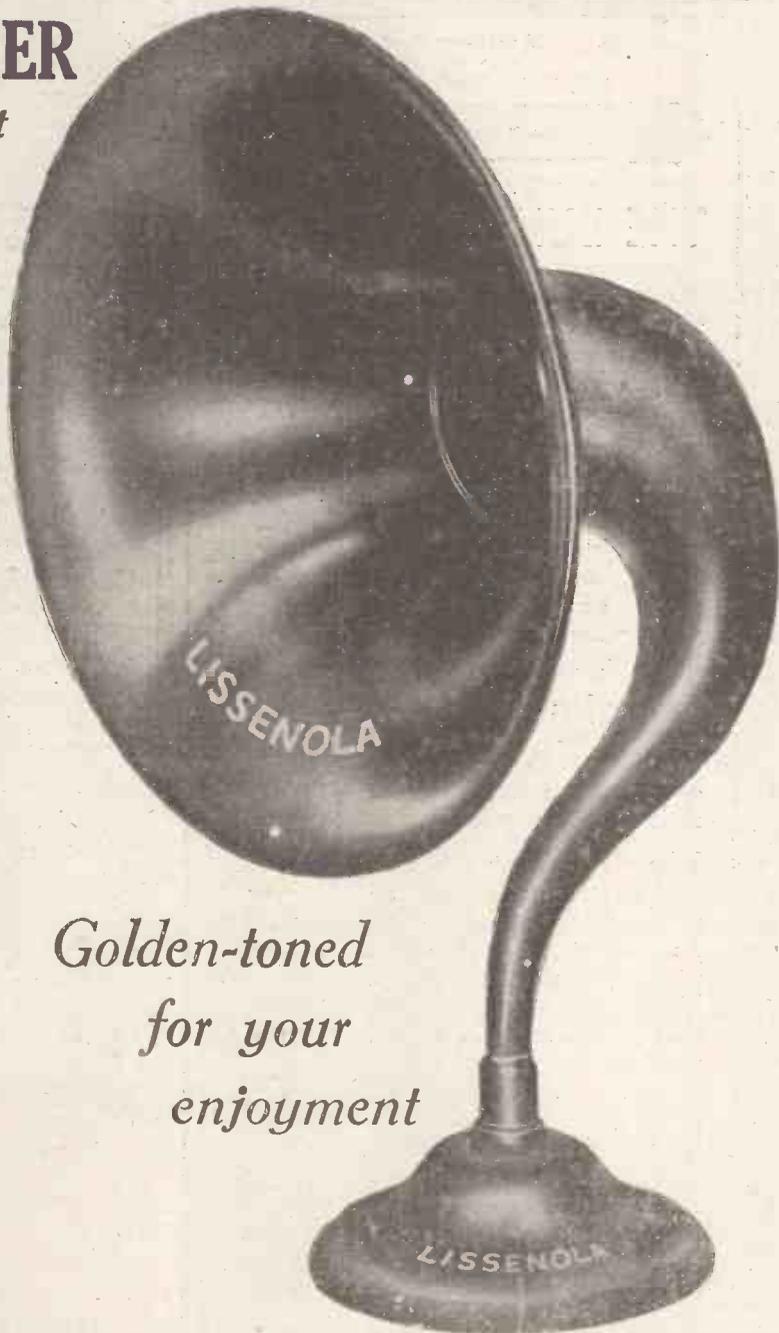
## 34/-

The only full tone, full size loud speaker of high grade British manufacture selling to-day complete for this price.

### 7 DAYS' TEST.

Test the LISSENOLA against the most expensive loud speaker you can find—anything up to £20. If you do not definitely prefer the LISSENOLA for tone, purity, and power, to any Loud Speaker you test it against, irrespective of price, send it back and your money will be willingly refunded in full.

**LISSEN LIMITED,**  
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Golden-toned  
for your  
enjoyment

These parts can be purchased separately —

LISSENOLA LOUDSPEAKING UNIT. The essential sound-reproducing base which can be built into ANY kind of loud speaker. Golden-toned . . . . . 13/6

LISSENOLA UPRIGHT HORN. Big and powerful, with 14 in. flare. Exactly the same as the horn of the LISSENOLA Loud Speaker illustrated above . . . . . 17/6

LISSENOLA STAND. The base of the LISSENOLA Loud Speaker illustrated above. For those who have the LISSENOLA Loudspeaking Unit and a LISSEN home-built Horn or LISSENOLA Horn . . . . . 3/-



## THE DUMETOHM

The Dumetohm Grid Leak, whose resistance element is of a metallic nature, possesses numerous advantages over Grid Leaks of the impregnated type formerly available.

The resistance value of the Dumetohm remains absolutely constant under various applied voltages up to 100-v. D.C.

Even when the current passed through a Dumetohm is sufficient to heat up the element, the variation in resistance is very small.

Like all Dubilier Products the Dumetohm carries an unequivocal guarantee, and its constancy and silent working properties make it highly necessary in all Radio Receivers where good reproduction is expected.

Made in resistances of 0.25, 0.5, 1, 1.5, 2, 3, 4 and 5 megohms.

Price 2/6 each.

Grid Leak Clips are also supplied separately for 3d. per pair.

# DUBILIER

REGISTERED  TRADE MARK

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

M. C. 261



a  
new and better  
valve holder!

WHEN we introduced the C.E. PRECISION RHEOSTAT, we thought that in quality, in efficiency and in price, this Component could not be beaten. Now that we have added the C.E. PRECISION FLOATING VALVE HOLDER we find it even exceeds the former in these respects to such an extent that the demand has been amazing, and we are working to maximum capacity to keep pace with the orders.

Before purchasing other makes, just ask your dealer to show you ours. We are confident that after comparison they will have the preference.

C.E. PRECISION FLOATING VALVE HOLDERS; anti-capacity, non-microphonic, 2/3 each.

C.E. PRECISION RHEOSTATS, efficient and velvety, 50 and 30 ohms, 3/- each. 7 and 15 ohms, 2/9 each.

Dual Rheostats and Potentiometers, 3/9 each.

C.E. PRECISION GRID-LEAK, an entirely original and accurate component, 2/- each.

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THE Czardas or Hungarian folk dance is inseparable from the Tzgame music of the nomad gypsies. When broadcasted this music loses none of its beautiful rhythm and wild abandon characteristic of the dance, provided that it is correctly interpreted, and above all, reproduced with the aid of the Claritone.

Senior Model  
£5 : 0 : 0

Junior Model  
£2 : 15 : 0

# CLARITONE

LOUD SPEAKERS & HEAD PHONES

Advt. of Ashley Wireless Telephone Co. (1925) Ltd., Liverpool.



As a direct result of the growing dissatisfaction of listeners with the B.B.C. programmes, the "Daily Mail" has organised a ballot whereby listeners who care to may vote for the type of programme

which they prefer most. It is hoped that this ballot will reveal, in some considerable measure, the needs of the majority of listeners with regard to programmes.

Since last week's comments on the subject of the deterioration of the B.B.C.'s programmes, from the point of view of the general listener, the B.B.C. have replied to one of their critics through Mr. George Grossmith, who is a Programme Adviser and a member of the "Big Seven." Mr. C. B. Cochran, the famous theatrical manager, had raised some very interesting points concerning the B.B.C. programmes, the chief of which are these:

An editor-in-chief and experts in every branch of entertainment should assist the programmes as compilers. All the wearying talks and lectures should be cut out, as well as book reviews and cinema chats. Mr. Cochran also suggested that only one News Bulletin should be broadcast, at ten o'clock of an evening, and it should be confined to news of a universal interest. Saturday night, in his opinion, should be one for big variety programmes. The programmes should be full of light, humorous and popular items of entertainment. Mr. Cochran further suggested that if there is a demand for Spanish and French courses by wireless, they should be broadcast in hours other than those of the evening, when listeners look forward to relaxation and general entertainment, and not education.

#### Mr. Grossmith Replies.

It is the opinion of Mr. Cochran wireless is not a satisfactory vehicle for dramatic sketches and plays, and in conclusion he said that when one suggests the best to the B.B.C., the inevitable reply is: "We cannot afford it."

In reply to these points Mr. Grossmith said that the committee set up to deal with programmes consists of "certain experts." Mr. Percy Pitt (who is one) is a former musical director at Covent Garden, while Mr. Grossmith himself advises on the lighter musical side. Sir John Reith is the editor-in-chief.

According to Mr. Grossmith, it is impossible to cut out wearying talks: "As judged by the letters of appreciation, wearying talks are exceedingly popular." This reads rather ambiguously, but readers will probably note that it is a matter of opinion between Mr. Grossmith and Mr. Cochran as to what constitutes a "wearying" talk.

Mr. Grossmith says the B.B.C. are also convinced that book reviews, cinema chats, and dramatic criticisms are wanted by listeners, and that the double News Bulletin is issued to suit all classes, as many Londoners and dwellers in cities are conversant with most of the seven o'clock News Bulletin: but thousands who listen-in from distant parts are not, and therefore at ten o'clock the News Bulletin is fresh to many listeners. He claims that Saturday evening programmes are as light as possible, considering the cosmopolitan taste of the

## WHAT LISTENERS WANT.

By THE EDITOR.

### THE "DAILY MAIL" BALLOT—THE VIEWS OF MR. COCHRAN AND MR. GROSSMITH.

thousands who listen-in on these evenings; and, further, that there is a demand for foreign language lessons, and that they are broadcast at the present times because many listeners who want them could not listen-in during their working hours.

Mr. Grossmith also maintains that wireless is a satisfactory vehicle for dramatic sketches and plays, and that this opinion is borne out by listeners themselves in their letters to the B.B.C.

In conclusion, Mr. Grossmith says that the B.B.C. always endeavour to give their best to listeners, and that the B.B.C.'s fees are just as high in proportion to the time given as those of any theatrical, music-hall, or concert fees.

It seems that the B.B.C. does not grudge paying big artists big fees (according to

suggest that he reveals the weak spot in the B.B.C.'s attempts to please listeners. As we have pointed out, they may receive thousands and thousands of letters a week, but they cannot receive a fraction of the opinions of listeners through the medium of letters—for there are, as our readers know, more than two million listeners in the country. If the B.B.C. received about a million letters a week and each letter gave a brief and succinct opinion as to the programmes, then perhaps written opinions from listeners would be of value in the matter of selecting programmes; but to judge programmes for two million people from the letters sent in by a few thousands is a very bad way, and a very unsatisfactory way, of gauging the taste of a large public.

#### Big Fees.

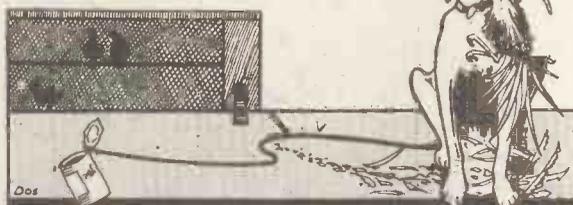
We agree with Mr. Grossmith that the News Bulletin is best as it is, and we also agree that the Saturday evening programmes, although not wonderful, do attempt at aiming at the light and humorous general entertainment touch. But the number of people who want Spanish and French courses must be comparatively few compared to the number of people who, after working hours, want general entertainment; and here would seem a clear case that the B.B.C. are catering for a minority and, worse still, encroaching upon the hours which should be devoted to the entertainment of the majority.

On the question of fees we do not feel competent to criticise the B.B.C. Their expenditure must be enormous, and it is impossible, of course, that they should continue day after day to spend £500 here and £300 there, and perhaps £1,000 on another item in an attempt to secure the biggest artists in the entertainment and concert world. The result would be that the B.B.C. would soon be lacking funds wherewith to continue the broadcasting of even mediocre programmes. But we think that once a month they should introduce a big surprise into their programmes by engaging some really international artist at, possibly, a big figure. If they could afford to do this it would certainly give listeners a pleasant sense of excitement when a "big evening" was announced.

However, to sum up, Mr. Grossmith has stated that the B.B.C. are not deaf to the protestations of the large section of listeners who have complained about the programmes.

Mr. Grossmith admits that many of these may agree with Mr. Cochran's criticisms, and he himself agrees that amusement should be the keynote of all programmes.

## "The Wanderer"



"The Wanderer" is the name given to a specially designed five valver which is fully described in the current issue of "Popular Wireless."

Mr. Grossmith), but here it is interesting to note that for £500 the B.B.C. have been offered the right to broadcast the Royal Command variety performance to be held this year at the Victoria Palace on February 24th. It has been reported that the B.B.C. have only offered £200, although it is a matter of opinion whether the Royal variety show is worth £500 as an outside broadcast or £200.

#### The Weak Spot.

Mr. Cochran is right when he says that an editor-in-chief and experts in every branch of entertainment should assist the programme compilers. The Big Seven, as we have pointed out before, seem to be inadequate to deal with this very important matter; and although Mr. Percy Pitt combines a very remarkable knowledge of music with that essential human touch which enables him to include in the programmes music which, although he may not like it, he knows other people will, and although Mr. Grossmith himself must give invaluable aid to this committee, the committee as a whole is not a strong one.

We have already pointed out that the appointment of Miss Hilda Matheson as chief arbiter of the talks is a most singular one, and one which has led to a series of

# BROADCAST NOTES.

FROM OUR BROADCASTING CORRESPONDENTS.

"My Programme," by a Frothblower—The First Transatlantic S.B.—Manx Music for 2 L O—Military Band Broadcasts—Prince Arthur of Connaught to Broadcast—G.B.S. a Possibility—Bands at Newcastle—Scotland First with Peaks—Sir Hamilton Harty at Glasgow—Belfast Gains Ground—Children's Hour : "As You Were"—Chunks versus Snippets.

"My Programme," by a Frothblower.

It is understood that the B.B.C. have decided to arrange a "My Programme" by a Frothblower. This will be received with universal interest, and is likely to be closer to the ideas of the elusive "man-in-the-street" than any other of the series of "My Programmes" so far transmitted from London.

The First Transatlantic S.B.

The B.B.C. are trying to arrange a special broadcast in connection with the farewell dinner to be given to Major Segrave at the Piccadilly Hotel towards the end of February. Major Segrave is going to the States with a mystery thousand horse-power British racing car, and hopes to show America what speed on the floor really is. There is good ground for believing that this mystery machine will do in the neighbourhood of 200 m.p.h. If this comes off according to plan, it will mean a tremendous boost and triumph for British motor manufacture. It is appropriate, therefore, that Major Segrave should be given a special send-off. Sir Arthur Stanley, as head of the R.A.C., will preside. During the evening, Sir Arthur will hold a brief telephone conversation with his opposite number in the United States.

The intention is to broadcast this conversation throughout Britain and America simultaneously. The B.B.C. and the Radio Corporation are co-operating in this enterprise, which will be really the first transatlantic S.B.

Manx Music for 2 L O.

The Manx Society in London has now arranged with the B.B.C. for the production in April of a special programme of Manx music, which is understood to be particularly attractive and quite distinctive.

Military Band Broadcasts.

Military band music has always been a firm favourite with listeners. Every competition organised on programme items has placed military bands in the first two or three. But perhaps the B.B.C. has not been over-anxious to recognise the full popularity of this kind of entertainment. Anyway, whatever was the case previously, the matter is now being put right. Lieutenant B. Walton O'Donnell, M.V.O., F.R.A.M., R.M., whose name has been appearing in the programmes with increasing frequency of late, is to be taken on the establishment at Savoy Hill. He will be the regular broadcasting conductor of military band programmes.

Prince Arthur of Connaught to Broadcast.

Up to now Prince Arthur of Connaught has not been heard on the wireless. It is understood, however, that he has given his

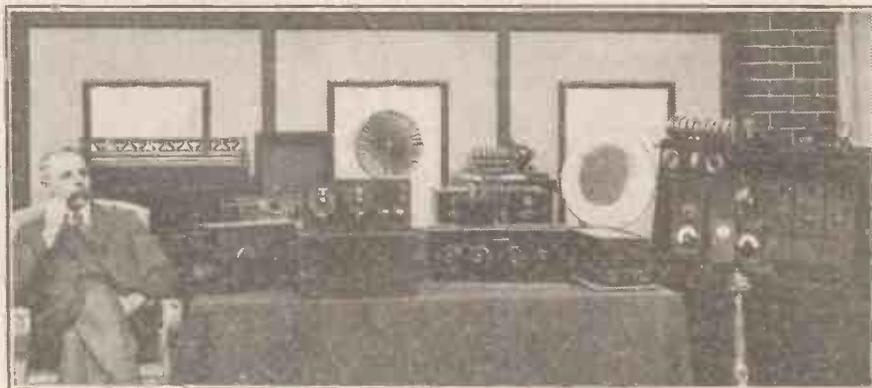
consent to being broadcast when he addresses the great Boys' Brigade Rally at the Royal Albert Hall on May 4th.

G. B. S. a Possibility.

The B.B.C. is trying to induce Mr. George Bernard Shaw to read the introduction to one of his plays in the London studio. There is a chance that this will be arranged in March.

Bands at Newcastle.

Newcastle has become conspicuous for its encouragement of brass bands. The station awards trophies for annual competitions in which many local aggregations of the North Country compete. Band programmes are put on in the studio with considerable success. One of these is to take place on February 26th, when a special



Some of the home constructed receivers and components shown at a recent wireless exhibition organised by a London radio society.

programme will be given by the Band of the Tyne Division of the R.N.V.R., supported by Mr. F. Kemp Gordon, baritone.

Scotland First with Peaks.

On February 24th, Roy Henderson, the eminent Scottish baritone, will sing for listeners north of the Tweed through all B.B.C. stations from Aberdeen. With him will be Miss May Fettes, violin, and Mr. Wilson Ronald, the well-known cosmopolitan humorist. Scotland seems to have got to the new "peak policy" of the B.B.C. before the other stations or even London. Really outstanding programmes at reasonable intervals instead of a high average is the idea.

Sir Hamilton Harty at Glasgow.

When Sir Hamilton Harty visits Glasgow on February 20th he will conduct the Station Symphony Orchestra in a special programme, including the symphonic poem, "With the Wild Geese." The soloist for the occasion will be Mr. George Parker, baritone. The Glasgow Station Orchestra has been earning golden opinions of late

under the very able and enterprising directorship of Mr. Herbert Carruthers.

Belfast Gains Ground.

The Belfast station of the B.B.C., after a long period of obscurity, has come to the front with a rush. This is due chiefly to the impetus given its work by the new station director, Mr. Beadle, who came from South Africa some months ago. Programmes have been brightened up and there is a general revival of interest in local broadcasting throughout Ulster. Mr. Beadle's contact with life in South Africa and his experience as director of the "late" Durban station have made him very keen on the development of Empire broadcasting. It is characteristic, therefore, that he should be organising a special programme for February 22nd, the day on which the Duke and Duchess of York reach New Zealand. Sir James Parr, the High Commissioner for New Zealand in London, will introduce this programme, other features of which will be a Maori concert and vivid word pictures of life and conditions in New Zealand.

Children's Hour : "As You Were."

"As you were" describes the present position of the Children's Hour feature of the B.B.C. The Provincial stations made no change at the New Year. The changes which attracted so much discontent were introduced only at London and Daventry.

Now, however, all is lovely in the garden again. The old intimate touch is restored and Uncle Peter is again Uncle Peter in name and reality. This was a wise yielding to a legitimate grievance.

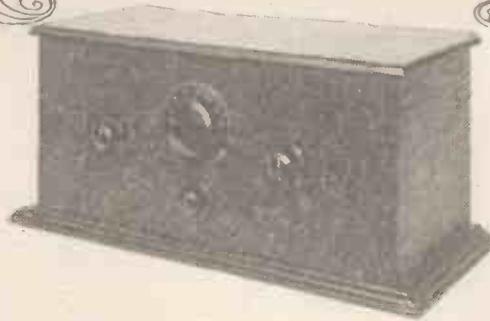
Chunks versus Snippets.

The latest controversy about programme building is concerned with the problem of whether it is better, on the present system of distribution, to follow a policy of chunks or a policy of snippets. The chunks enthusiasts complain that a hotch-potch of items of many kinds satisfies no one, and that what is wanted is a distinctive character for a whole evening and a programme made up of comparatively solid slabs of material. The snippets people, on the other hand, are quite satisfied with the average Saturday evening programme from London now. They contend that with the existing limitation of distribution, it is up to the B.B.C. to crowd as many different kinds of items as possible into every programme. The B.B.C., however, appear to be moving away from snippets to chunks.

# The 1927 Trinadyne

The Trinadyne circuits, introduced by Mr. English two years ago, have proved to be some of the most popular of dual amplification systems. This latest development will be of interest to all constructors, and is capable of giving exceedingly good results.

By J. ENGLISH.



speaker volume for comfortable audition when receiving the London station, six miles away, purity of reproduction being all that could be desired.

You will be able to imagine the very high magnification obtainable with this new

MANY of my readers will doubtless remember the first description of the Trinadyne circuit which I gave in POPULAR WIRELESS about two years ago.

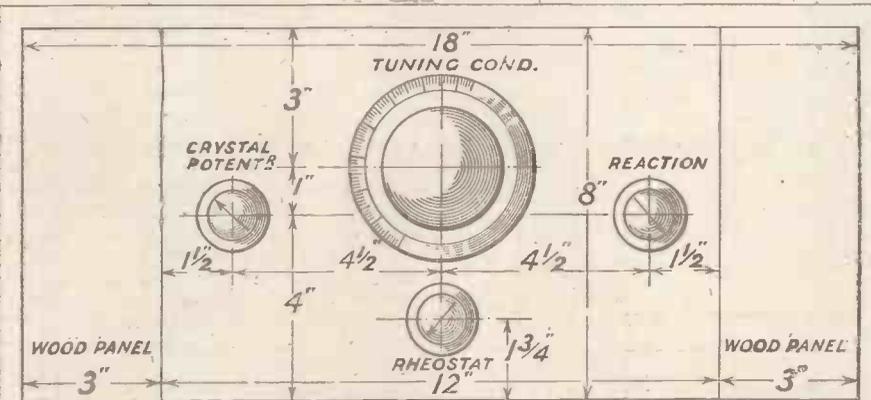


FIG. 1.

PANEL LAYOUT

DRAWN	E. L.
CHECKED	10
SERIAL NO.	L. 054.

This circuit and its modifications achieved considerable popularity, chiefly on its merits as an economical and powerful broadcast receiver.

Those of you who constructed the Trinadyne receiver will recall the "punch" that it had on the local station and the exceptionally pure loud-speaker reproduction. Long distance results were also surprisingly good, I myself having received American broadcasting on several occasions, using a two-valve set.

### Full Loud-Speaker Strength.

Although the original Trinadyne receivers were capable of such good performances, the components available at that time were not capable of giving the full amplification, quality and stability that was theoretically possible. Since then, however, components and valves have changed so much for the better that recently I decided to make up a new two-valve receiver, using the more efficient and suitable components now available.

When this receiver was put into operation the results exceeded my expectations, the new receiver being in every way a great improvement upon the older sets. Even the one-valve Trinadyne gave ample loud

receiver for a full-sized power valve had to be used in the second stage to prevent

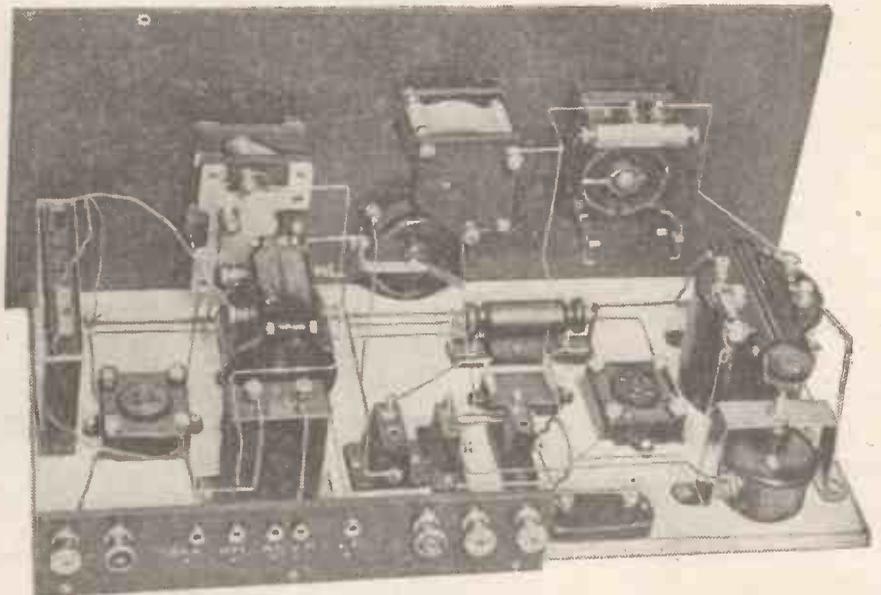
### LIST OF COMPONENTS.

- 1 .0005 variable condenser.
- 1 .0003 ditto.
- 1 .0002 fixed condenser.
- 1 .001 ditto.
- 1 2 mfd. ditto.
- 1 Micro-condenser.
- 1 Inter-valve transformer (ratio 3 1/2/1.)
- 1 ditto (ratio 6/1.)
- 1 Carborundum Crystal unit.
- 2 Valve holders.
- 1 Anode Resistance 500,000 ohms.
- 1 Rheostat.
- 1 .5 Meg. grid leak.
- 3 Coil holders, baseboard mounting.
- 5 Terminals.
- 5 Sockets.
- 8 Plugs.
- Ebonite, 10 in. by 2 in.
- Ditto, 12 in. by 8 in.
- Baseboard.
- Sundries.

overloading and distortion. On several occasions when dance music has been broadcast from 2 L O, the loud speaker could be heard three rooms away with all the doors shut! Naturally it requires a good power valve and a good loud speaker to handle this power without introducing distortion through overloading.

As for DX results, several British and foreign stations have been received quite well on the loud speaker, some of the German stations being very strong. What struck me most when listening to these transmissions was the absence of distortion, so that the

(Continued on next page.)



A photograph of the back of the set showing the disposition of the terminals and sockets on the terminal strip.

# THE 1927 TRINADYNE

(Continued from previous page.)

stronger stations, were as clear as the local. On the higher wave lengths Daventry comes in at strong loud-speaker strength, and other stations, such as Radio-Paris and Hilversum, at good loud-speaker strength.

Although good DX results are thus possible, I would like to emphasise the fact that this receiver has been designed primarily for good quality reception of the local station, although provision has been made for occasional long-distance reception.

The receiver shown in the photograph is constructed on the usual lines, except that the front panel is actually a small centre

Trinadyne is a one-valve combination. First comes a crystal receiver from which the rectified signals are stepped up in voltage and fed to the valve by a transformer. This valve being essentially an L.F. amplifier, then amplifies the signals. At the same time it acts as an H.F. amplifier, amplifying the incoming H.F. voltages, which reach the grid from the aerial circuit via the small condenser  $C_3$ . The magnified H.F. current is fed back to the aerial circuit by means of  $L_3$  coupled to  $L_2$ , the amount of the feed back being controlled by  $C_2$ .

In other words, any desired degree of H.F. reaction can be obtained from the L.F. valve, and in this way reaction can be used to obtain louder signals and better selectivity. The high resistance R is inserted to prevent the H.F. currents from shorting to earth through the transformer secondary.

If the first valve is adjusted for distort

reflex or valve detector (leaky grid) receiver. The new Trinadyne one-valve combination is certainly capable of a remarkable degree of amplification.

So much for theory. I must now get back to practical matters and tell you more about the actual receiver.

The crystal detector, upon which a great deal of the success of the receiver depends, is the Carborundum Co.'s stabilised unit. As this has a high resistance it can be connected across the whole of the tuning coil  $L_2$  without causing such serious damping as the lower resistance galena crystal used in the original Trinadyne. This fixed detector appears to be quite stable, and on the local station it is quite effective without the potentiometer adjustment.

### Constructional Details

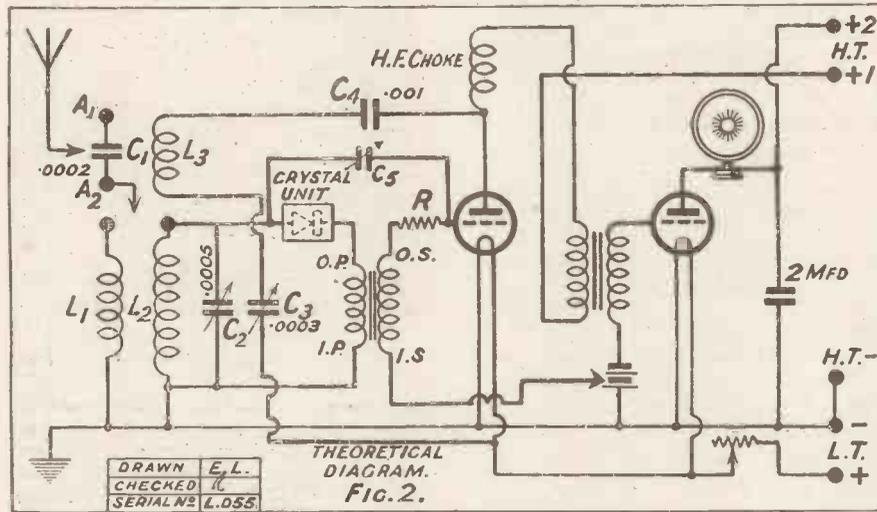
Two new features of this receiver are the H.F. by-pass grid condenser and the H.F. choking device. I found that, with the particular combination of components used, the capacity of  $C_3$  could be reduced to a very small value, which is all to the good. In this receiver  $C_3$  is an Igranite micro-condenser mounted in front of the first transformer. This small variable condenser has a maximum capacity of 35 microfarads, which is quite large enough for its purpose, and a good neodyne condenser could be substituted if desired.

The H.F. choking device is not an H.F. choke as used in the original circuit, but a resistance of 500,000 ohms. This resistance in practice works much better than a choke coil. The rest of the circuit is quite straightforward, consisting of a simple transformer coupled L.F. stage.

Coming now to constructional details, there are no components needing special construction, so that you can commence right away with the set when the necessary materials have been assembled. A list is provided of components used in the receiver described herein, but alternative components can be used, if they do not differ appreciably in size or electrical constants.

The ebonite panel is squared up and drilled in accordance with Fig. 1. and then

(Continued on page 1487.)



panel of ebonite with a wooden panel on each side of it. Since all the controls can be mounted on an ebonite panel 12 in. by 8 in. it is wasteful to use a full length of ebonite. Also the appearance of the set is enhanced by the use of these wooden side panels, although this is not shown to full advantage in the reproduced photographs.

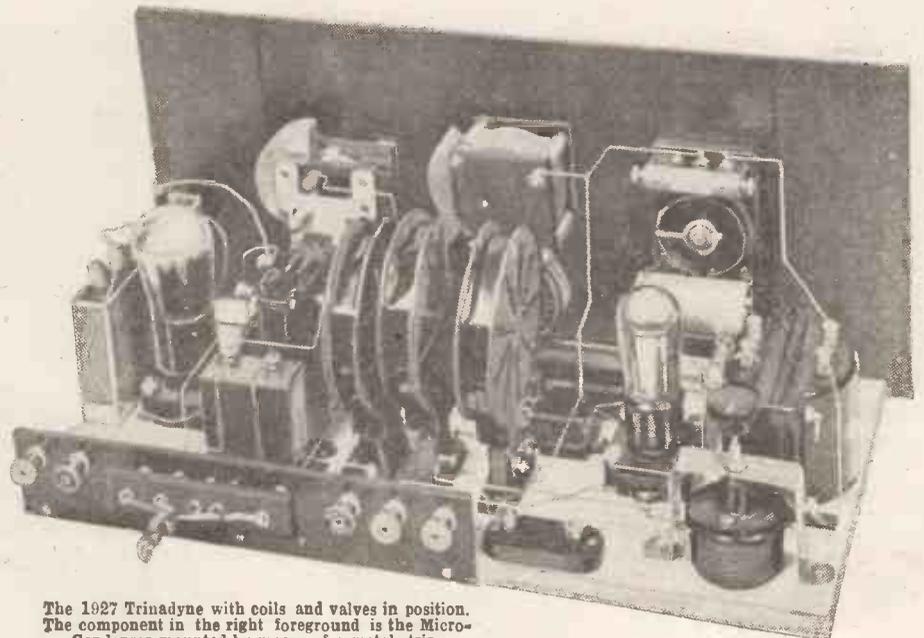
The panel lay-out is quite symmetrical, and all controls are sufficiently close together to ensure easy operation. The large centre dial is the main tuning condenser, the reaction control knob being on its right. Beneath the centre dial is the rheostat, and on the left the crystal potentiometer knob. The rheostat and reaction condenser are fitted with knobs to match that of the crystal potentiometer. This was done to give a more symmetrical appearance. These two extra knobs are readily obtainable from dealers in wireless sundries.

### Operation of the Circuit

The theoretical circuit is reproduced in Fig. 2. You will notice that two aerial terminals are provided, so that a series aerial condenser  $C_1$  can be used. A flexible connection from  $C_1$  can be connected directly to the top of the grid coil  $L_2$  for local reception, or to the top of another coil  $L_1$ . This coil is coupled to  $L_2$ , and constitutes a loose coupled aerial circuit, giving greater selectivity for long distance work.

At this juncture readers who have not previously met the Trinadyne may perhaps want to know how it works. Actually the

tionless amplification, which is quite easy the quality of signals is almost perfect simply because the crystal, as a distortionless rectifier, is the nearest approach to the ideal. The constants of the circuit are such that in my opinion the purity of loud-speaker reproduction exceeds that of any



The 1927 Trinadyne with coils and valves in position. The component in the right foreground is the Micro-Condenser mounted by means of a metal strip.

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**F**ROM quite a small thing, up and up you can build it with this new LISSEN Transformer—the sustained volume kept crystal-clear all the time, and words coming through without a slur on the syllables. There is no noise in the background—and sound emerges pure and powerful.

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URNS RATIO 3 to 1. RESISTANCE RATIO 4 to 1.

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**LISSEN LTD., 8-16, FRIARS LANE, RICHMOND, SURREY**

Managing Director: THOMAS N. COLE.

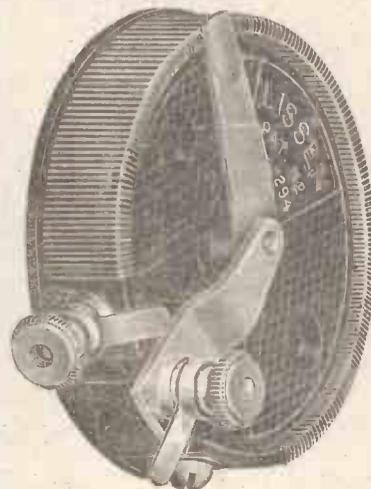
L. 252

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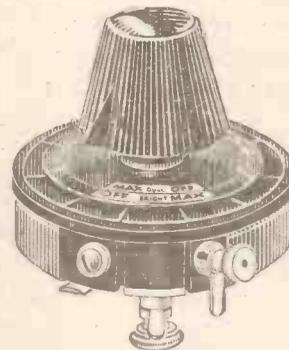
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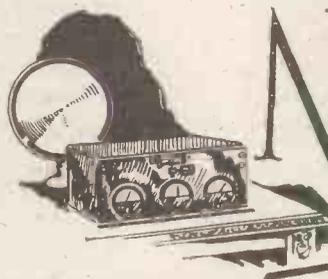
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An unsolicited testimonial from one of our many satisfied users will appear ere week.

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NO PUZZLING CHARTS — COPY THE ORMSBY CONSTRUCTIONAL MODEL.

It is a full-size replica of the Ormsby 4-valve set. Every detail shown as clear as daylight. If you already possess a few necessary parts, you can construct it for £3 15s. 0d. It'll be a revelation to you.

Send now for this Model, price 3/- post free.

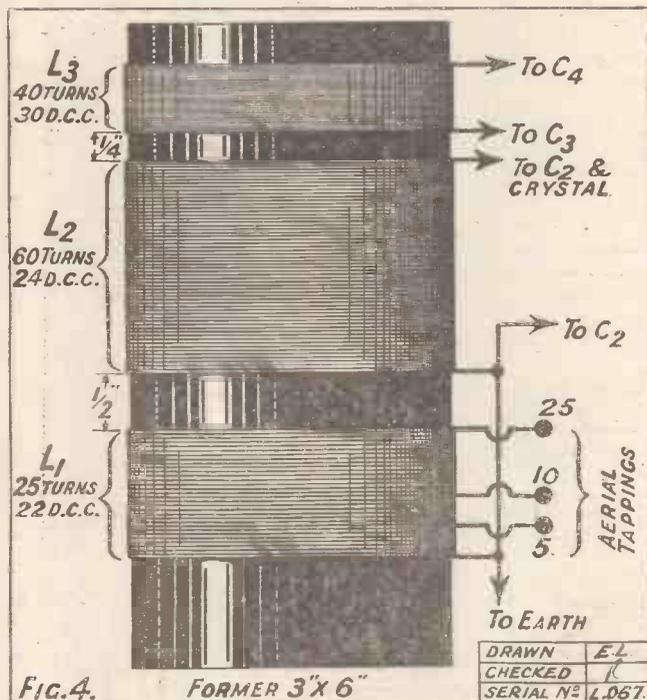
ORMSBY & CO., LTD.,  
Ormsby Works, Lower Richmond Road,  
Richmond, Surrey.

## THE 1927 TRINADYNE.

(Continued from page 1484.)

screwed to the centre of the front edge of the baseboard. On each side of the panel is secured a piece of  $\frac{1}{4}$  in. wood 3 in. by 8 in. These pieces may be stained and polished to match the cabinet in which the set is to be housed.

The three sections forming the front panel will remain in line and at right angles



with the baseboard if properly screwed to the latter without the use of angle brackets. The spacing of the holes for terminals and sockets in the terminal panels (10 in. by 2 in.) is shown in the wiring diagram, Fig. 3.

When mounting the components on the baseboard I would advise you to follow as closely as possible the original lay-out, and particularly is this necessary with the first valve portion of the set. The panel and baseboard lay-outs are shown in the photographs of the receiver removed from its cabinet.

### The Battery Connector.

When wiring up it is a good idea to do as much soldering up as possible before mounting the two transformers. You will then be able to get at parts of the receiver more easily with these components out of the way. If the wiring diagram (Fig. 3) is followed carefully, no "snags" should occur in this part of the construction. A little extra care is necessary in connecting up the micro-condenser to ensure well-spaced wiring.

The mounting of the resistance R needs a little explanation. This resistance, a Dumet-ohm grid leak, is held in position by the two clips removed from the fixed condenser C<sub>1</sub> (Dubilier type 610). One of these clips is screwed down under the Q.S. terminal of the first transformer and the grid connection

soldered to the other. This method of mounting is secure, and gives short connections.

The final stage of construction is the making of the battery plug. This is a useful accessory obviating any tedious fiddling with terminals at the back of the cabinet. The batteries are automatically connected or disconnected when the plug is inserted or withdrawn, the irregular spacing of the holes preventing incorrect insertion. The plug and socket system of battery connections makes a sound and neat job, and constructors who take a pride in the appearance of their receivers will appreciate

that the extra expense of a shilling or so is well worth while.

The plug is constructed from a piece of  $\frac{1}{4}$  in. ebonite 4 in. by 1 in., along the centre line of which are drilled five quarter-inch holes, spaced as the five socket holes in the terminal panel. In each hole is inserted a wander plug, to which is secured a length of single flex long enough to reach the batteries when the set is in position.

If you use red and black flex, two lengths of red can be used for the H.T. + leads, with different coloured plugs at the battery ends. The two

black lengths can be used for H.T. and L.T. negatives, and a length of ordinary brown flex for the L.T. positive lead. The five leads can be plaited or bound together, except for a distance of a foot or so at the battery end.

The next step is to run over the wiring to see that all connections have been correctly and soundly made. The usual tests for mistakes in filament and H.T. wiring can then be carried out, and, all being well, the receiver is ready for testing.

First of all, insert only one coil, a Gambrell B.1, or an equivalent size, such as a No. 35, in the middle holder. Then connect the aerial lead-in to terminal A<sub>1</sub>, or, if it is a small aerial, to A<sub>2</sub>. The flex lead from the condenser C<sub>1</sub> is connected to the aerial terminal (x) on the middle coil holder. Having inserted the valves and connected up the batteries, tune in the local station on the centre dial,

You should now try the effect of reversing the crystal detector, as one way round often works better than the other. The potentiometer adjustment is not essential when receiving the local station, but at distances greater than 15 miles or so it will be found useful in obtaining clearer and stronger signals. Information regarding the mounting of the small  $1\frac{1}{2}$  volt cell and the working of the detector unit in general is supplied with the unit when purchased.

If the local station is now received well, a Gambrell A or B.1 can be inserted in the reaction coil holder and the set tested for reaction effects.

### Operating the Set.

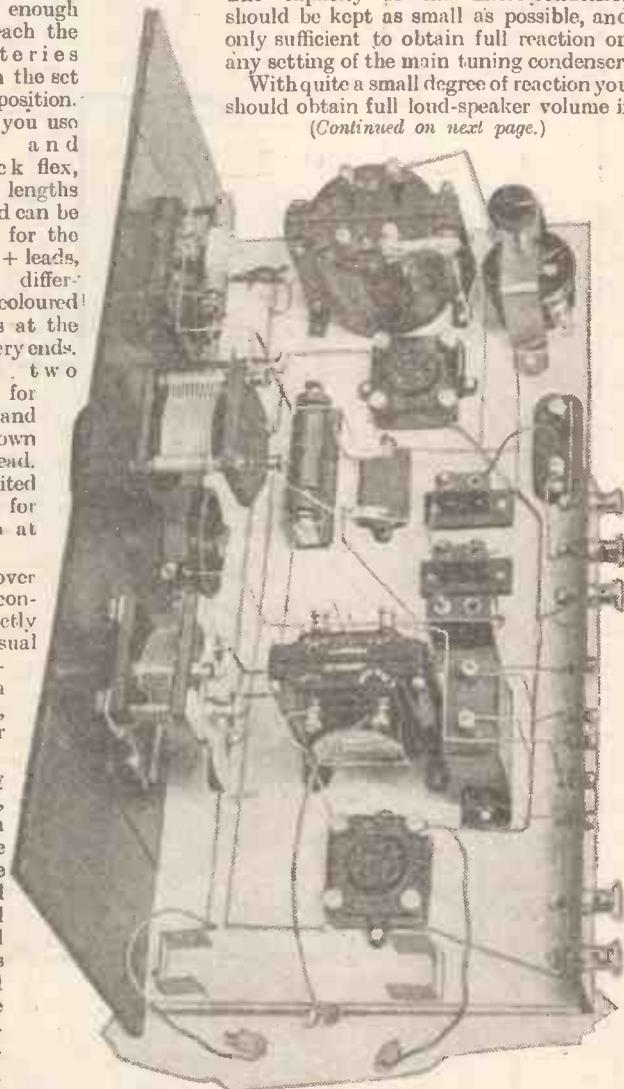
First set both C<sub>2</sub> and C<sub>3</sub> at maximum, and then adjust the micro-condenser until oscillation commences. If the set refuses to oscillate with this condenser at maximum, the aerial damping may be too high or the values of filament and anode voltages too low for the first valve. Try connecting the aerial to A<sub>1</sub> or increasing H.T.<sub>1</sub>. In extreme cases try inserting a Gambrell A or No. 25 in the first coil holder and connecting flex lead from C<sub>1</sub> to terminal Y on the first holder.

It will now be necessary to use a bigger coil in the middle holder, since the aerial has been removed to the coupled coil L<sub>1</sub>.

The capacity of the micro-condenser should be kept as small as possible, and only sufficient to obtain full reaction on any setting of the main tuning condenser.

With quite a small degree of reaction you should obtain full loud-speaker volume if

(Continued on next page.)



An unusual view of the interior of the set, which clearly shows the lay-out of the components and their connections.

**THE 1927 TRINADYNE.**

(Continued from previous page.)

you are fairly near the local station. In any case do not use too much reaction, as this sharpens tuning and is prone to cause distortion.

Since the two valves of this receiver are essentially low-frequency amplifiers they must be specially chosen for their job, and so adjusted that they can handle some considerable volume.

**The Valves Required.**

When receiving the local station the output of the first stage is of such a value that it is really necessary to use a good power valve—if you want crystal clear loud-speaker reproduction in full volume. This valve should have an impedance not greater than 7-8,000 ohms, with a small magnification factor. There are several types of valves in either 2, 4 or 6-volt ranges having this

specification, so that it is not necessary for me to mention actual valves.

The first valve, which handles rather more power than the usual first stage magnifier, should have an impedance between 15,000 and 20,000 ohms, with a magnification factor of 7 or 8. A small power valve is ideal for local reception, but is not absolutely necessary for distance work.

The value of anode voltage is not critical for either valve, and you cannot do better than follow the manufacturers' instructions. With the types of valves described above not less than 60 volts for the first and up to 120 for the second, with the correct grid bias, will give you all the volume you want, with exceptional quality.

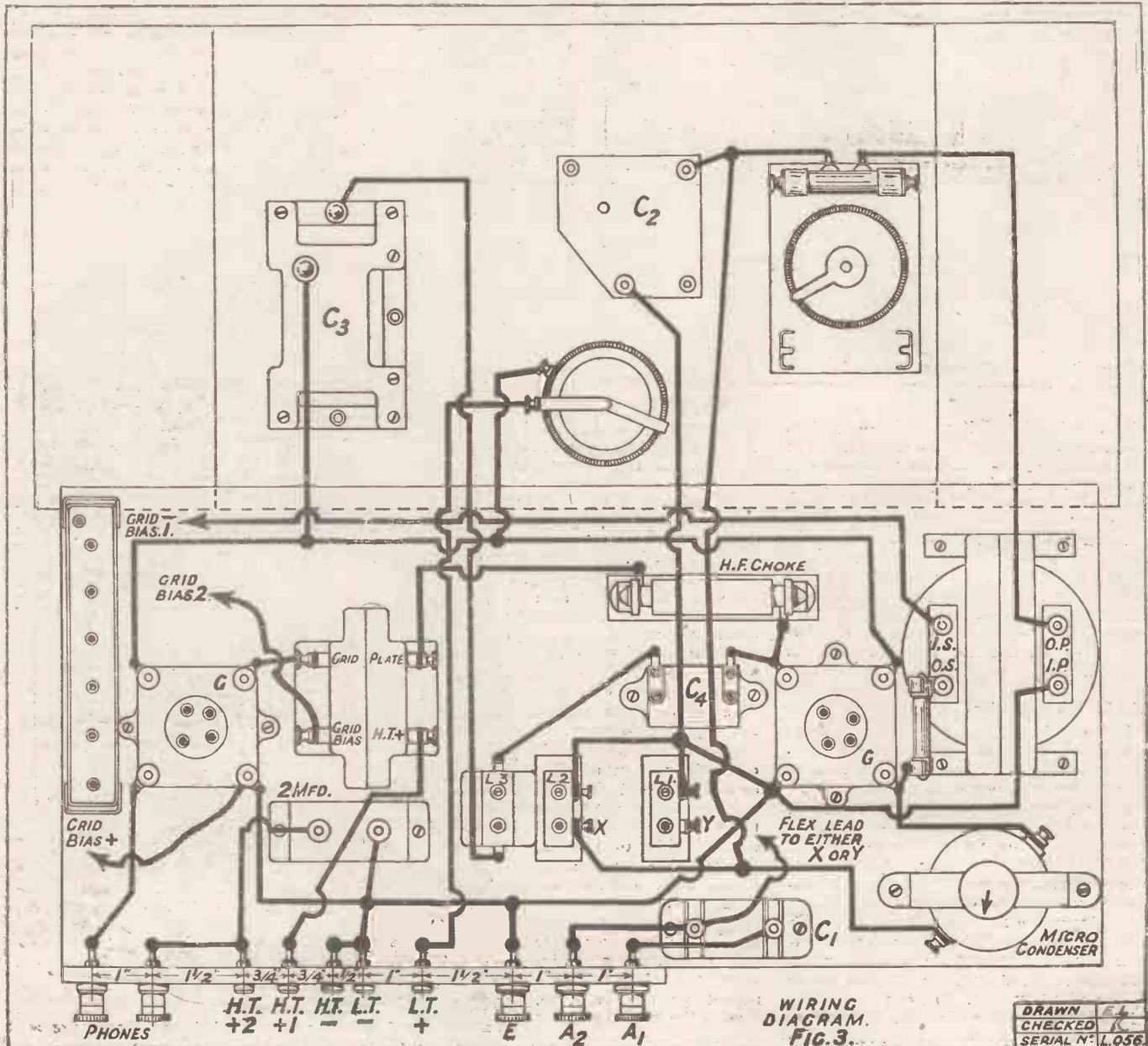
The grid bias of the first valve needs to be adjusted with some care. First tune in the nearest station without reaction, remove the crystal detector and adjust the first grid-bias plug until little or nothing is heard. If signals do not weaken appreciably increase the H.T. voltage and filament brilliancy, and readjust grid bias. On replacing the detector, signals should

come in with a roar, the crystal and the valves working together efficiently and without distortion.

For the reception of the local station, only the two coils  $L_2$  and  $L_3$  need be purchased, the third coil being required for selective long-distance work. Should you desire to make up your own coils for this receiver, the three windings can conveniently be accommodated on one former. This can be mounted on the baseboard where the coil holders are situated in the present receiver, no coil holders being necessary if you use a specially wound coil.

**Home-made Coils.**

Dimensions and winding data for a tuning range of roughly 200 to 500 metres are indicated in Fig. 4, all windings being wound in the same direction. To facilitate wiring up the ends of the three windings are lettered in Fig. 4, and corresponding letters in Fig. 3 indicate the existing leads, as shown in that diagram to be soldered to these six points on the coil former.





**A FEW EXAMPLES**  
of their manifold uses

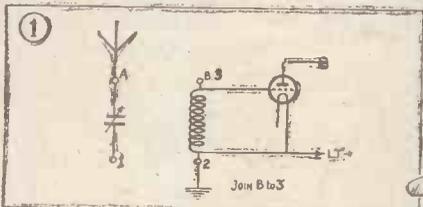


Fig. 1.—Enables the Tuning Condenser to be used in series or parallel with Aerial Tuning Inductance.

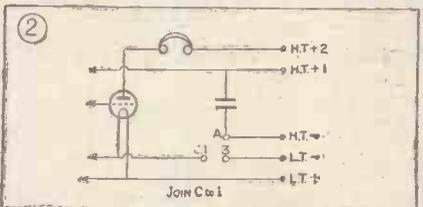


Fig. 2.—L.T. and H.T. "on" and "off" gives the additional safeguard obtained by switching off H.T. and also avoiding leakage.

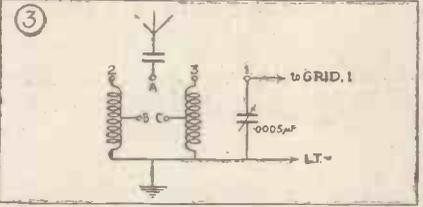


Fig. 3.—Gives alternative use of two Aerial Tuning Coils, permitting quick change over from normal Broadcast range to Daventry range, for example.

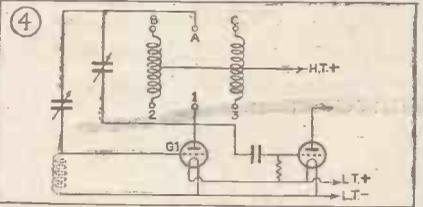


Fig. 4.—As for Fig. 3, but applied to two "tuned anode" Coils ("balanced capacity" Dimic Coils).

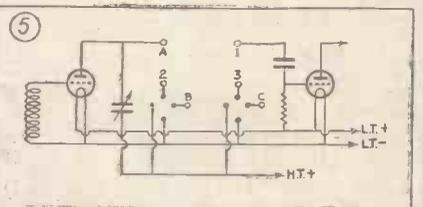
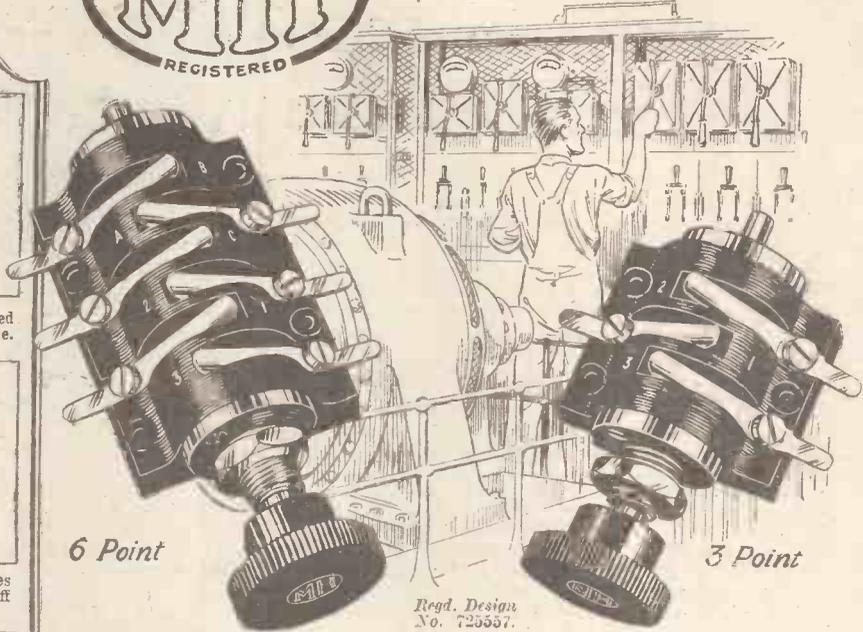


Fig. 5.—Change over from one range to another, using **MH** barrel-type H.F. transformers.

**NOTE.**—When the Knob is "pushed" contact is made A-B and 1-2.  
When the Knob is "pulled" contact is made A-C and 1-3.



# Switch Efficiency

Hitherto experimenters have (not without good reason, perhaps) been reluctant to include more switches than are absolutely necessary in their receivers.

The Advent of  
**THE NEW **MH** MULTIPLE SWITCH**  
(SELF-CLEANING CONTACTS)

has brought about a great change. There need be no hesitation now. Special constructional features make it possible for the spring contacts to be much stronger than is usual, thus exerting a great pressure on the contact surfaces, and ensuring a good connection. When in normal use the switch keeps itself clean.

It has a large variety of uses, five of which are shown on this page. Others will follow in subsequent announcements.

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Mr. S. W. Whateley, "Trevetler," Bude, North Cornwall.

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THE "POPULAR WIRELESS" VALVE GUIDE—continued.

4-VOLT L.F. VALVES—continued.

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SIX-SIXTY— Electron Co., 189, Regent St., W.1.	S.S.1	3.7	0.06	50-100	0-0	28,000	8.5	8 0	General purpose	TBLA-RADIO— Monowatt Lamp Co.	G.P.	3.5-4	0.06	—	—	—	—	s. d.	General purpose	
	S.S.3	3.0	0.06	50-125	0-4.5	60,000	17	14 0	Res. coupling		D.E.3	3.0	0.06	—	—	—	—	—	—	General purpose
	S.S.3	3.0	0.06	30-100	0-0	15,500	7	14 0	L.F. valve	TRIOTRON— Electric Lamp Service Co., 6, Red Lion Yd., W.C.1.	T.P.3	2.5-3	0.06	—	—	—	—	—	—	General purpose
	S.S.7	3.7	0.1	30-100	0-6	9,000	20	18 6	Power valve	"TWO GRID"— Ameloy Products Ltd., East Dulwich, S.E.22.	B.E.	3.5	0.55	50-100	+20	—	—	—	—	Four-electrode G.P.
S.T.— S.T. Ltd., 2, Melbourne Place, W.C.2.	S.T.42	3.8	0.1	60-120	3-12	6,000	6	18 6	Power	VITA— Peter Curtis Ltd.	D.E.06	4.0	0.06	—	(inner grid)	—	—	—	—	4- or 5-pin Unidyne valves
	S.T.43	3.8	0.25	120	16-24	4,000	3.8	22 6	Super power	VOLTRON— Voltron Co., 75, City Rd., E.C.1.	D.E.	4.0	0.34	—	(inner grid)	—	—	—	—	—
STANDARD— Standard Cables & Telephones, Connaught Hse., Aldwych, W.C.2.	P.A.4	4.0	0.9	100-160	5-15	4,500-6,000	5.5-6	35 0	Super power valve		T.P.3	2.5-3	0.06	40-100	0-6	17,000	—	—	—	General purpose
	P.425	4.0	0.25	120-160	2-8	6,000	6	18 6	Super power valve (4-pin base)		L.C.1	3.5-4	0.06	30-100	0-6	13,500	—	—	—	Power valve
	P.425A	4.0	0.25	120-160	2-8	6,000	6	18 6	Super power valve (bayonet fittings)		L.C.4	3.5-4	0.06	30-100	0-6	7,500	—	—	—	General purpose

6-VOLT H.F. VALVES.

Make of Valve	Type	Fil. Volts	Fil. Amp.	Anode Volts	Grid Bias	Impedance	Amp. Fac.	Price	Remarks	Make of Valve	Type	Fil. Volts	Fil. Amp.	Anode Volts	Grid Bias	Impedance	Amp. Fac.	Price	Remarks		
AMPLION— Alfred Graham & Co., 25, Savile Row, W.1.	A.M.G. 6/9	5.5	0.09	Max. 120	—	18,000	9	18 6	General purpose	EDISWAN— Edison-Swan Electric Ltd., Queen Victoria St., E.C.1.	—	—	—	—	—	—	—	—	—	A.R. H.F., could be used with 15-ohm rheostat	
ARA— Stephens & Wall, 55, Gt. Eastern St., E.C.2.	A.M.R. 9/9	5.5	0.09	120	—	55,000	35	18 6	High amp. H.F.	ELKA— L. Kremer, 49a, Shudehill, Manchester.	—	—	—	—	—	—	—	—	—	—	
BEAM— Lester & Marquis, 15-16, Thavies Inn, E.C.1.	—	—	—	—	—	—	—	—	—	FRELAT— L. Kremer, 49a, Shudehill, Manchester.	—	—	—	—	—	—	—	—	—	—	—
BENJAMIN— Benjamin Co., Brantwood Works, Tottenham, N.17.	D.F.55 S.P.55B S.P.55B	5.5	0.09	Max. 120	—	18,000	9	18 6	General purpose	LOEVE-AUDION— Audion Radio Co., 52, Dorset St., W.1.	—	—	—	—	—	—	—	—	—	—	—
B.S.A.— B.S.A. Ltd., Small Heath, Birmingham.	—	—	—	—	—	—	—	—	—	LOUDEN— Fellows Magneto Co., Gumberland Avenue, Park Royal, W.	F.2	5.5	0.4	40-100	—	40,000	11	4 6	Also res. coupling	—	—
British Thomson-Houston, Crown Hse., Aldwych, W.C.2.	B.2 B.4 H.	5.0	0.7	40-120	—	37,000	10	8 0	General purpose H.F. and det. and initial L.F.	LUSTROLUX— Lustrolux Ltd., Bollington, Macclesfield.	5.25B.	5-6	0.25	40-150	—	28,000	21	15 0	H.F. and res.	—	—
BURNBY— Burnby Ltd., Barnet, Herts.	—	—	—	—	—	—	—	—	—	MARCONI— Marconi Hse., Strand, W.C.2.	R.5V. D.E.5B. D.E.8	5.0 5-6 5-6	0.25 0.25 0.12	30-120 30-120 20-120	—	30,000 8,000 30,000 25,000	9 7 20 16	8 0 18 6 18 6 18 6	General purpose Power, but OK for Good H.F. [H.F.]	—	—
C.A.C.— C.A.C. Valve Distrib. Co., 10, Ransom St., E.C.3.	—	—	—	—	—	—	—	—	—	METAL— J. Rae, Ltd., 60, Blackfriars Rd., S.E.1.	H.F. V.21	5.0	0.75	20-60	—	20,000	6	20 0	Special low capacity H.F. valve	—	—
CLEARTRON— Cleartron Radio Ltd., Crossing Cross, W.C.2.	C.T.25 C.T.25B	5.0	0.25	30-70	—	10,000	9	18 6	General purpose	MULLARD— Mullard Wireless Service Co., Denmark St., W.C.2.	P.M.5 P.M.5B P.M.5A	5-6 5-6 5-6	0.1 0.1 0.1	50-125 50-150 50-125	—	18,000 74,000 20,000	17.5 37 26	18 6 18 6 18 6	H.F., Det., & Res. L.F. H.F. & Res. L.F. Det., H.F. & Res. L.F.	—	—
COSMOS— Cosmos Valve Supplies, Ltd., 156, Charing Cross Rd., W.2.	A.45 D.E.50 S.P.55B	4.5	0.05	30-120	—	20,000	9	8 0	General purpose	NELSON— Nelson Electric Co., 138, Kingston Rd., S.W.10.	S.5	5	0.75	20-100	—	30,000	25	16 6	General purpose	—	—
	S.P.55B	5.5	0.09	60-120	—	55,000	35	19 6	Res. coupl. H.F. tuned anode & neutralised H.F. and reflex (spec. H.F.)	NEUTRON— Neutron Ltd., Hse., Southampton Row, W.C.1.	S.5	5	0.75	20-100	—	30,000	25	16 6	General purpose	—	—
COSSOR— A.C. Cosor Ltd., Aberdeen Works, Highbury Grove, N.	W.R.2	1.6-6	0.3	30-120	(to be issued shortly)	30,000	10	10 0	General purpose	OCTRON— H.S. Electric Ltd., 32, Charlotte St., Birmingham.	—	—	—	—	—	—	—	—	—	—	—
CUNNINGHAM U.S.A.— Rohrhamel Corp. Ltd., 26, Maddox St., W.	610H 610L.C.	5.5	0.1	120	—	—	—	14 0	Res. coupling	—	—	—	—	—	—	—	—	—	—	—	—
DEAN— Dean Radio Co., 10, Ransom St., E.C.3.	C.X.301 A	5.0	0.25	—	—	—	—	10 0	General purpose	—	—	—	—	—	—	—	—	—	—	—	—
E.E.C.— E.E.C. Ltd., Fitzroy Sq.	440	4.5	0.30	60-120	—	30,000	—	6 6	General purpose	—	—	—	—	—	—	—	—	—	—	—	—

(To be continued.)



# Apparatus Tested

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.

### "DECKOREM CABLE PLUG."

**M**ESSRS. BULGIN, of Cursitor Street, produce novel and useful radio gadgets with a most surprising regularity. A month passing without something new to hand from this firm is a distinct exception—quite frequently the rate of arrival of "Deckorem" products is as much as four per month. This week a "Deckorem" cable plug was received.

In design it is similar to a valve base and is provided with four similarly disposed pins. Thus it can be used in conjunction with any ordinary type of valve holder. A removable cover provides access to neat terminals, to which connections from the four- or five-way cable (which is provided separately) can be made.

This cable plug is a very useful article, providing as it does a means of tidily grouping L.T. and H.T. leads in such a way that they can all be connected and dis-

connected in one single operation. The plug is very well made and is within the reach of all amateurs at its price of 2s. 6d.

### THE LORIOSTAT.

There is a great deal to be said for the "variable resistor," although it might be fairer to the true resistor to call it a base-board-mounting filament rheostat. Anyway, to this ever-growing class is now added the "Loriotat," a production of Messrs. A. W. Stapleton, of 19a, Lorrimore Buildings, Lorrimore Street, London, S.E.17.

The Loriotat is designed on a multiple basis. It consists of a number of variable resistors built together into one unit. Six types are available—from a "One Way" at 2s. up to a "Six Way" at 10s. 9d. And additionally, these are all obtainable in 6, 15 and 30 ohm maximum resistances. The device is very well made and is as compact as anything of its nature we have seen. The

model submitted was found to operate quite successfully.

It is a component which should appeal to many constructors of multi-valve receivers.

### THE N.M.C. DETECTOR.

It may be remembered by readers that it was reported some time ago that the N.M.C. Detector people were experiencing a difficulty in obtaining supplies of suitable iron pyrites crystals for their detectors. This, we now learn, has been overcome and a good stock has now been accumulated.

We were sent a sample of this new stock of "Goldite" and find it excellent. It is undoubtedly the best piece of iron pyrites we have ever examined.

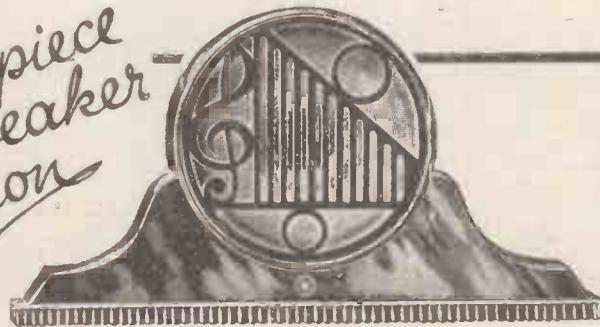
The price of the N.M.C. Detector has been reduced to 1s., at which figure it undoubtedly represents excellent value, more especially as it is guaranteed for five years.

### NEW H.F. CHOKE.

It wasn't so very long ago that an H.F. choke was merely a quantity of wire "cotton-reel" wound on an insulating former—just that and nothing more. But nowadays super-efficiency is demanded of every radio component and accessory, large and small. And the new Climax H.F. choke is a good example of the modern trend of development. It incorporates two windings arranged in a "binocular" manner. And although this method undoubtedly does reduce "external fields" we question the maker's claim that the result is a choke "without an external field." "Considerably restricted" would have been happier.

(Continued on page 1494)

*The Masterpiece of Loud-Speakers of Construction*



## The "Blue-Spot" Supertone III CONCERT SPEAKER

A Masterpiece indeed!

No other loud speaker constitutes such an elegant and valuable instrument at so modest a price. Built in accordance with principles laid down after long years of study devoted to the problem of tone and conductivity, the "BLUE-SPOT" SUPERTONE III embodies an achievement of supreme importance in the realm of sound technique. In its design, materials and construction, nothing has been missed in obtaining the most handsome appearance and perfect tone production.

That the "BLUE-SPOT" SUPERTONE III is indeed a masterpiece is amply evidenced in the extraordinary popularity it enjoys.

Prices of "Blue-Spot" Concert Speakers:—

**SUPERTONE III**, bent horn and mahogany front 50/-

**The SENIOR**, all Mahogany, Concert Speaker 132/-

**The JUNIOR**, all Mahogany, Concert Speaker 100/-

Ask your Dealer, or write to one of the following addresses for LIST "F. 4" of "Blue Spot" Specialities.

Wholesale only:  
**F. A. HUGHES & CO., LIMITED.**  
Head Office: 204/6, Gt. Portland St. London, W. 1.  
Telephone: Museum 8630.  
Telegrams: "Distancing", Wesdo, London.

**SUB-AGENTS:**  
Yorkshire: E. Harper & Co., 10, Manchester Road, Bradford.  
Lancashire & Cheshire: F. A. Hughes & Co., Ltd., 6, Booth Street, East, C. on M., Manchester.  
South Wales: Watson Bros., 48, Dock Street, Newport.  
Midlands: Foster - Boynton Co., Ltd., 70, Lombard St., Birmingham.  
Northumberland, Durham, Westmorland, and Cumberland: David Bloom, 68, Northumberland Street, Newcastle-on-Tyne.



## "A FOOL-PROOF & EVER-READY SET"

The "Threesome" is the simplest three-valver to make and to operate that it is possible to imagine . . . . So far as cost goes the claim that the set, apart from valves and the necessary accessories, can be made for less than £3 is a modest estimate. Using parts which I knew to be good, regardless of their cost, the figure in my own case was £2:17:0 . . . . As to performance, the set gives ample volume and excellent purity . . . . The set is, as an additional advantage, practically foolproof; is ever-ready at the turn of the switch, and is very economical of both high and low tension current. (Daily Sketch, 21-12-26.)

### A LOCAL RECEIVER Misapprehensions regarding the "Threesome"

So many people have written to me concerning the Ediswan "Threesome" resistance-capacity set that I think a general reply is justified.

One correspondent finds the set will not work properly with the R.C.2 valves in the first and second sockets; he has to use a P.V.2 as a detector.

This shows that there is some error in wiring—though exactly what, it is impossible to say without examining the set.

Other readers ask me whether, instead of the stipulated make and type of valve, various others may be used. The reply is emphatically in the negative, unless other valves of precisely similar characteristics as to impedance, etc., are used.

Speaking generally, however, the Ediswan "Threesome" should not be regarded as a distance-getter, first because in the interests of purity no reaction is used, so that the detector valve is little better than a crystal

Secondly (also in the interests of purity) anode rectification is employed in place of the more usual and more sensitive grid leak and condenser.

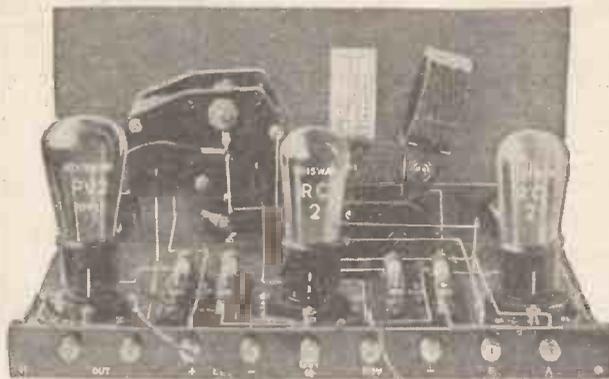
All these things can be easily altered, but then the set ceases to be the "Threesome." If it is regarded—as its designers regard it—simply as an ultra-pure-toned loud speaker receiver for the local station only, it will give satisfaction.

(Daily Sketch, 1-1-27.)

### EDISWAN SERVICE DEPARTMENT

If you have any wireless problem, let Ediswan solve it for you. No charge is made. Queries should be addressed to Service Department, The Ediswan Electric Co., Ltd., 123/5 Queen Victoria Street, London, E.C.4.

## R.C. THREESOME SUCCESSFUL TEST BY A GREAT NATIONAL NEWSPAPER



THE tonal purity, volume, and entire absence of "mush" of this remarkable set has already converted tens of thousands of listeners. It is acclaimed the finest loud-speaker receiver of its kind ever designed, yet it is so easy to make . . . and cheap, too.

The two new EDISWAN valves used with the R.C. Threesome are R.C.2. and P.V.2. Undoubtedly these two new valves—both from the new EDISWAN Quarter-watt POINT ONE ECONOMY Range—are the secret of the phenomenal success of the R.C. Threesome. Ask your dealer about them.

### FREE BLUE PRINT & INSTRUCTION BOOK

YOU can build the R.C. Threesome easily in an evening. £3, or less, will cover the cost. The easy-to-follow Blue Print and non-technical Instruction Book are FREE.

**FILL IN COUPON - NOW!**

# EDISWAN

To THE EDISON SWAN ELECTRIC CO., Ltd.  
(Publicity) 123/5-QUEEN VICTORIA STREET, LONDON, E.C.4.

Name .....

P.W. 19/2/27.

Address .....

Please send, post free, presentation copies of the "R.C. Threesome" Instruction Book and Blue-print.

PLEASE USE  
BLOCK LETTERS

## APPARATUS TESTED.

(Continued from page 1492.)

Also, the claim that it enables "high inductance" to be obtained is rather putting the matter round the wrong way. Nevertheless, this new choke has an exceptionally large inductance (100,000 m.h. approx.) and, owing mostly to its well-spaced 16 sections, it has a very low self-capacity. Thus it is efficient over a very wide band of frequencies.

The Climax people have been responsible for some very excellent gear of late, their components for battery eliminators must be known to every amateur interested in these, and their new H.F. choke is as good as anything they have produced. It is suitable for either panel or baseboard mounting and is compact and very well made. It is a component we have no hesitation whatever in recommending to our readers for use in either straightforward or special sets. One of its most attractive features is its price—8s. 6d.

### A USEFUL ARTICLE.

Mr. A. H. Jenkins, of 176, Ombersley Road, Balsall Heath, Birmingham, recently sent us one of his Multi-Borers. It is a simple yet highly efficient little tool which will appeal strongly to the home constructor. It borer clean holes of any of the following five sizes,  $\frac{3}{8}$  in.,  $\frac{3}{16}$  in.,  $\frac{1}{4}$  in.,  $\frac{5}{16}$  in. and  $\frac{3}{8}$  in., through ebonite or hard woods.

It is very easy to handle and does its work almost as well as a high-class drill. The

Multi-Borer costs but 1s. 6d. and should last a very long time indeed, as the steel of which its cutting element is formed appears to be of a good quality.

### AN INTERESTING DEVICE.

To Automobile Accessories (Bristol) Ltd., is due an interesting device. It is styled The P.D. Wave-length Balancer, and consists of a very small variable condenser designed for attachment to an aerial lead-in tube. Thus it takes its position in series in the aerial circuit. Although it is small in size its maximum capacity is approximately .001 mfd.

It should prove a popular little component at the reasonable price of 5s., for many amateurs will welcome a device which enables series aerial capacity to be added so neatly and expeditiously externally to a set. Needless to say, considerable increases in selectivity and flexibility of tuning can be obtained by this means even in the case of a set already provided with series-parallel aerial condenser tuning.

The device is quite well made.

### LOEWE MULTIPLE VALVES

The agency for Loewe Multiple Valves has been secured in this country by Mr. J. Dorn 4, Great Russell Street, London, W.C.1.

### MARCONIPHONE CIRCUIT BOOKLET

We recently received a copy of "Circuits for Building Radio Receivers." It is a well produced little handbook and its twelve circuits have been well chosen and are very representative. Much useful information is given concerning each circuit.



Major Segrave, the famous motorist, telephoning to New York via the new transatlantic radiophone service from the offices of Pass & Joyce, Ltd., in the Euston Road.

# The First Essential to Perfect Reception

**B**BROADCASTING brings into your home all that is best in music, drama and education. But to enjoy these to the full, you must use "HART" Batteries on your set for both Low and High Tension Supply. "HART" Batteries alone provide that steady power to your valves which enables them to reproduce with maximum power and purity. That is why many eminent musicians personally use and recommend them.

## HART BATTERIES FOR ALL WIRELESS CIRCUITS

"Ray" Model High Tension Accumulator, 20-volt, 14/8 ;  
30-volt, 22/-

"Enduro" Low Tension Accumulator, 2-volt, 10 Ampere-  
Hour Actual, 6/-

Write Dept. P.W.12 for full particulars of all "HART" models and FREE  
Booklet "The Right Way to Use Your Wireless Batteries." Post Free.

HART ACCUMULATOR CO. LTD. STRATFORD, LONDON. E. 15

# IT'S THE VACUUM THAT'S VITAL!



### Why is it impossible to make your own Valves?

The glass work could be done by a boy in his school laboratory, while the electrodes can be made with a pair of scissors and pliers. The great stumbling-block is the vacuum. So important is it to get a good vacuum in the bulb, that every process in the manufacture of a valve is, or should be, carried out with a view to the ultimate vacuum. But for the vacuum, valves would sell at quarter the price. Valves with an inferior vacuum are sold at cheaper prices because vital costly processes are omitted. The result is a short life and not even a gay one, because although the valve is often nicely constructed the poor vacuum affects the emission and passage of electrons, and also the life of the filament.

A valve is as good as its vacuum and its life is the life of its vacuum. The cheap Dutch valve had such a short life because its vacuum was "soft" (i.e. poor). Recent measurements carried out on even the leading makes of valves show amazing variations in vacuum. The perfect vacuum of the S.T. Valve stands out by contrast in extraordinary fashion and not only helps to explain why POPULAR WIRELESS stated that "every S.T. has proved to be highly efficient," but why the S.T. is the only valve whose long life is so certain that Lloyds have insured it in the case of every valve sold by us.

### BUY S.T.'s—THE VALVES WITH THE PERFECT VACUUM!

2-VOLT.	4-VOLT.	6-VOLT.
S.T.21 (H.F.) 0.1 amp. ... 14/-	S.T.41 - (H.F. and Det.) 0.1 amp. ... 14/-	S.T.61A (Res. Cap.) 0.1 amp. amplification 40 ... 14/-
S.T.22 (L.F. and Det.) 0.1 amp. ... 14/-	S.T.42 (Power) 0.1 amp. ... 18/6	S.T.61B (H.F. and Det.) 0.1 amp. ... 14/-
S.T.23 (Power) 0.15 amp. ... 18/6	S.T.43 (Super Power) 0.25 amp. ... 22/6	S.T.62 (Power) 0.1 amp. ... 18/6
		S.T.63 (Super Power) 0.25 amp. ... 22/6

S.T. Ltd., 2, Melbourne Place, Aldwych, London, W.C.2

(Next to Australia House.)

Send us your name and address and the test certificate cut from an S.T. valve box and you will receive a year's free subscription to the great new journal, the "ELSTREE RADIO NEWS."



**THIS MAGNIFICENT 2-VALVE SET**  
(D. and L.F.) as shown, in Handsome American Type Cabinet, 12 by 3 Panel.  
**ALL PARTS ENCLOSED.**  
Complete with 2 Dual Emitter Valves, Tandoo latest Coils, L.T. and H.T. Batteries, Aerial Equipment, 4-way Leads, 4,000 ohm Phones, O.R. Lissencu, G.E. Loud Speaker  
**£4 19 6**  
Marconi Tax Paid.  
Carriage and Packing, 5/-

**3-VALVE SET (D. & 2L.F.)**  
with Coils and Valves. Tax paid. (Carr. and packing, 7/6) .. **£5 15 0**  
With accessories as mentioned, with 2 Valve Set. (Carr. and packing 12/-) .. **£3 18 6**  
**SET ONLY .. £4 0 0** (Carr. 5/6)

**ACCUMULATORS.**  
2-v. 40, 7/11; 2-v. 60, 9/6; 2-v. 80, 12/6; 2-v. 100, 14/6; 4-v. 40, 13/11; 4-v. 60, 17/11; 4-v. 80, 23/6; 6-v. 50, 28/6; 6-v. 80, 35/6. ALSO another good make, 1/6 extra on each of above. Post 1/- each.

**LOTUS. - V. Holders, 2/3;** with Terminals, 2/6. 3-way Coil Stand, 7/-, 8/-, 3-way, 10/6, 12/-.

**RADIO FOR THE MILLION**  
(Mullard Receivers).  
**FRANKLIN P.M.**  
**RODNEY P.M.**  
**NELSON P.M.**  
**GREENVILLE P.M.**  
All parts in Stock.  
Set of 4 Blue Prints, with Book of Instructions, Free to customers.

**PARTS FOR NELSON P.M.**  
Terminals, 4 Anti-m. Valve holders, 2 Coil Holders, 2 S.L.F. 0005, 1-0003, with 4 in. dials, Neutroverner (Mullard), 100,000 ohms, and clips, 0005 G.L.R. 002, 01-1 met. G.L.R. R.V. Choke, Everest 100,000 ohms and stand, B.T.H. L.F., Push and Pull Switch, 1 Fil. Rhco., 8-pin Base, S.P.H. Transformer, short and long wave, 2 Aerial Coils, and Secondary Gambrell Tapped B. and C.  
**TYPE L.O. 25/10/0.**  
Carriage 2/-.  
**ALL THE PARTS AS SPECIFIED BY AUTHOR.**  
World's Most Wonderful Crystal

**"WRAY" .. 1/6**  
The Crystal with the Power of a Valve.  
**GAMBRELL GATE-TAPPED COILS.**-B.C. 6/-; 5XX, 8/3  
**"TUNEWELL" LOW-LOSS COILS** (Tandoo Patent). Accurately calibrated. Standardised. Poplity, 25, 35, 50, 75, 1/8 each. 30, 40, 60, 100, 1/8 each. 150, 20, 40, (5XX 175, 2/8) 200, 2/8, 250, 3/3, 300, 3/9.  
Post extra (5/- worth free).  
**LISSEN.**-Lissencu, 13/6, L.F. Transformer, 8/6. 35 ohm. Rheostat, 2/6. H.F. or L.F. Choke, 10/-, Fieldless Coils, 13/8, Grid Leaks, F. 1/-, Ditto, variable, 2/6. All parts available.

**NEUTRALISING CONDENSERS.**  
-Foto-Scott, 5/-, 6/3, 7/6  
Osmond, 4/-, Bowyer-Lowe, 7/-; Magnum, 5/-; Service, 2/6, 3/6; McMichael, 4/8.

**RADIO MICRO (Guaranteed genuine)**  
3.5-v. 08-a, G.P. .. 5/11  
1.8-v. 2-a, G.P. .. 5/11  
3.5-v. 3-a, Power .. 8/8  
3.5-v. 1-a, .. 9/8  
1.8-v. 2-a, .. 10/8  
Post 1/- each.

**WEST END DEPOT FOR "MAGNUM"** (Burne-Jones)  
SEE K. RAYMOND'S NAME ON PREMISES. THIS WILL ASSURE YOU GETTING THE GOODS I ADVERTISE.  
PLEASE ASK "IS THIS RAYMOND'S?"

Complete sets of parts for "P.W." Blueprints, Feb. 5th.  
**SPANSACE THREE 24 COMPONENTS.**

**PARTS WITH GEARED CONDENSERS.**  
**TOTAL COST NETT, £5 19s. 6d.** Post 1/-  
Polished Oak Cabinets with bearded, hinged lid, American type, with drilled panel, 24/-, Post 2/-  
**GUARANTEED REFLEX "P.W." 22.**

1.0005 Variable; 1 Rheostat; 1 L.F. Transformer (1st stage); 1 L.F. Transformer (2nd stage); 1 2-way Coil Holder; 1 Fixed 3 md.; 1 Fixed 0001; 1 Fixed 0003; 1 Fixed 002; 1 Crystal Detector; 2 Coils for Local Station or 2 for 5XX Components as specified, 35/- post, 1/-  
Pansels and Cabinets stocked.

**SOLODYNE COMPONENTS AS SPECIFIED £10 15 6**  
Less Panel, Cabinet, Valves.  
**CABINETS.** Large stocks of really useful Cabinets kept, or made to order. Solid oak. Glass finish. American type, hinged lid, baseboard.  
8" x 6" x 7" deep, .. 8/11 (By post, 8/3).  
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12" x 8" x 8" deep, .. 10/6 (By post, 12/-).  
14" x 7" .. 12/6 (By post, 14/-).  
16" x 7" .. 16/11 (By post, 17/11).

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With handsome **TRIOLETTE 7/6** dial and knob ..  
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This variable Condenser is simply marvellous value. It cannot be equalled in price or quality.  
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All Mullard, Ediswan, Oram, Marconi, Cossor, Bright D.E. and Power, 8/-, 14/-, 18/8, 22/8, 24/8, 30/-, 22/-  
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**SQ. LAW LOW-LOSS.**  
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Potentiometer, 400 ohms, 2/8. L.F. Shrouded, latest model, 15/-.

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ORMOND, with dial .. 22/-  
CYLON, no dial .. 50/-  
Triple .0005.  
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CYLON, no dial .. 70/-  
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Adico, 4/6 doz, 6d. British 5/- doz; Dr. Nesper, 4/6 doz. 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 10 days.

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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."

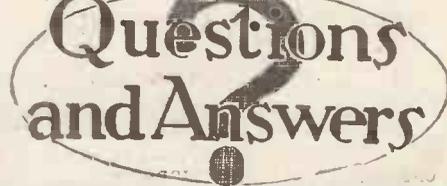
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Letters should be addressed to: Technical Query Dept., "Popular Wireless," The Fleetway House, Farringdon Street, London, E.C.4.  
They should be written on one side of the paper only, and MUST be accompanied by a stamped addressed envelope.

Queries should be asked in the form of the numbered questions. (1), (2), (3), etc., but may be accompanied by a short letter giving any necessary additional particulars as briefly as possible.  
For every question asked a fee of 6d. should be enclosed. A copy of the numbered questions should be kept, so that the replies may be given under the numbers. (It is not possible to reproduce the question in the answer.)

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**FINDING THE POLARITY OF MAINS.**  
G. B. A. (Stafford).—How can I tell which is the positive main, and which the negative?  
(Continued on page 1498.)

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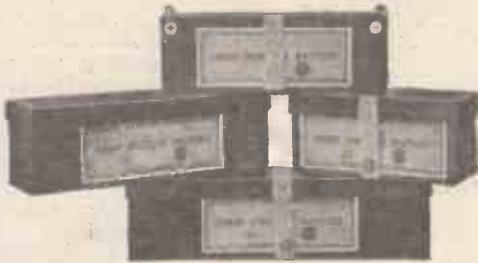
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Price 2/9 each



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(Dry Cells)

No. 1720	.. .. .	15 volt,	9½" × ¾" × 2½" high,	3/6
No. 1721	.. .. .	30 "	6½" × 2½" × 3½" "	7/6
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No. 1724	.. .. .	100 "	10½" × 5" × 3½" "	21/-

The 15-volt Battery forms one unit, but the larger batteries can be tapped every 4½ volts, and are provided with two "wander" plugs to each.

#### AN AID TO ENTHUSIASTS.

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

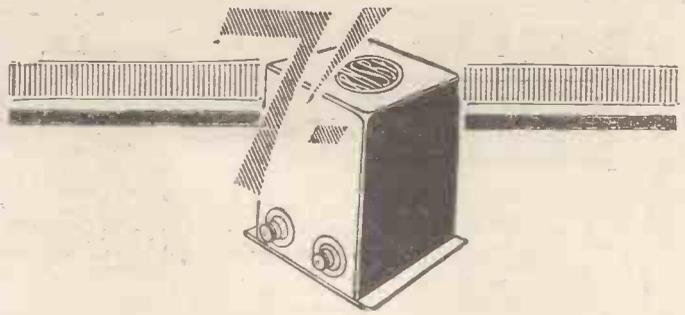
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## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1496.)

(I wish to use the mains for charging my accumulator.)

A very easy and simple method is to use a tumbler of water, to which a small pinch of salt has been added. Then dip the two leads into the water, at opposite sides of the glass. It will be found that bubbles will be given off by the wires, and that one wire will give off more bubbles than the other. This one with the excess of bubbles is the *negative* wire.

Another simple test for polarity is to push the ends of the wires into the surface of a freshly-cut potato. In this case a greenish-blue mark will be made by the *positive* lead.

### TESTING DRY BATTERIES.

B. J. R. (Aberdeen).—Could the hints on the testing of dry batteries—which were given in "Radiatorial," some months ago—be repeated for the benefit of those who like myself have mislaid the copy?

Considerable misapprehension appears to exist regarding the correct method of testing an H.T. dry battery. To be of any value such a test should only be made with a high resistance moving coil voltmeter having a resistance of *at least* 100 ohms per volt scale. The internal resistance of the battery increases with use and age, but its internal resistance is relatively not of much importance in view of the high internal resistance of a thermionic valve.

A battery having a high internal resistance may still be capable of supplying the maximum current required to operate the receiving apparatus, providing its overall voltage is sufficiently high. Even a high-grade moving coil voltmeter having a resistance of 100 ohms per volt of scale will take a current of 10 milliamperes at its full scale reading, and it can be assumed, therefore, that if a battery shows a good voltage on such an instrument it will give at least the same voltage when delivering current to the receiving apparatus.

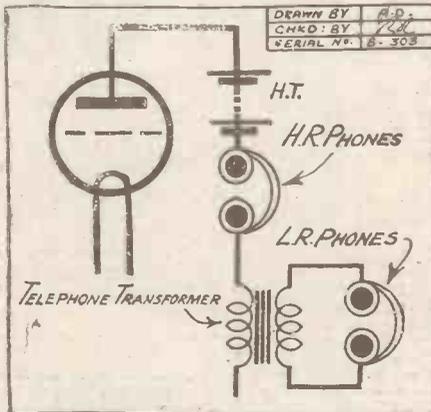
Testing sections of an H.T. battery by means of a flash-light bulb is not recommended. It will certainly indicate the ability or otherwise of a battery to light such a lamp, but is an extremely unreliable method of determining whether the battery is still capable of being used for H.T. purposes. The usual flash-light bulb takes a current of from 200 to 300 milliamperes, and although a battery which has seen considerable service may not be able to give this discharge, it may still be perfectly capable of supplying the very much smaller current required for H.T. purposes.

Incidentally, the practice of connecting a wire across an apparently "dead" section is usually a certain method of damaging the entire battery, and is strongly deprecated.

### HIGH AND LOW RESISTANCE 'PHONES.

H. A. D. (Merton Park, London, S.W.19).—What is the method of using high and low resistance 'phones in the same circuit?

A step-down transformer is used as shown in the accompanying diagram.



### A SIMPLE WAVE-TRAP.

W. V. W. (Chadwell Heath).—What is the simplest form of wave-trap I can employ to cut out unwanted stations which interfere during long-range work?

A basket coil and a variable condenser should give quite satisfactory results in this respect. The connections are as follows: Aerial to one end

(Continued on page 1501.)

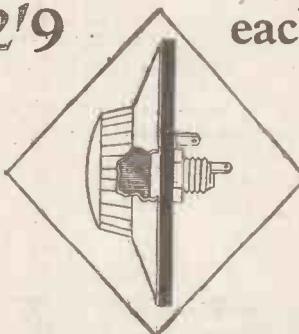
# BENJAMIN



## Self-contained Rheostat

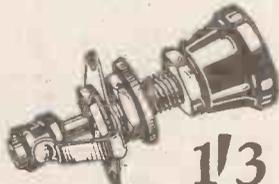
THIS DIAL—only 2 3/4" in diameter—encloses the resistance windings and moving parts. All that appears behind the panel is the lock-nut and soldering tags. This means space saved, neater panel layout and easier wiring. The dial, made of genuine Bakelite, is marked 0 to 100. A nickel-plated pointer checks adjustment. One hole fixing. Three resistances: 6, 15, and 30 ohms.

2/9 each



The windings inside the dial.

## Battery switch



Neat and efficient. Nickel-plated parts and Bakelite knob. Can't get out of order.

It's off when it's in.

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(Leclanché Type)  
**3d. a Volt.**

Size:  
2 1/2" high, 1 1/4" sq.

Our cells are fundamentally ideal for H.T. supply owing to their natural capacity for giving a small current for a long period. It can be stated with accuracy that the reception from the use of these cells is absolutely free from extraneous noises. They are also cheaper than H.T. Accumulator Eliminators or Dry Batteries. The cells consist of Sac Element Zinc and Jar. No skill is necessary for assembling with the simple instructions provided with each order. Rubber rings for insulating the Sacs.

Send 1d. Stamp for full particulars.

	Price per dozen.
No. 1 Sac for up to 7 milli-amperes	1/6
No. 1 Sac, with terminal	2/3
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Jar (waxed)	1/3
Zincs	1/-
Sample dozen cells complete with No. 1 Sacs	3/8
Packets of 24 Rubber Rings for insulating 12 Sacs—No. 1 size, 6d.; No. 2 size, 6d.	

Mahogany Trays.			
Var-nished.	Unvar-nished.	Var-nished.	Unvar-nished.
60 cells 9/-	7 6 lids extra 4/6	4/6	3/6
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FLUXITE  
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THE OLD SET  
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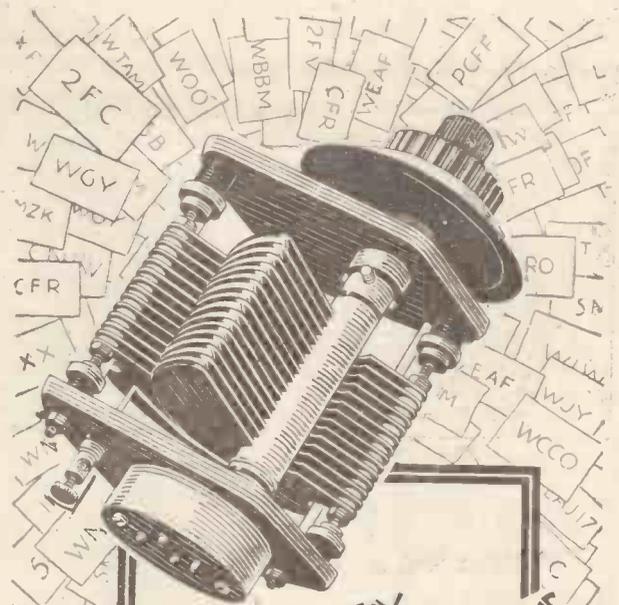


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## TWICE AS MANY STATIONS WITH THIS GEARED CONDENSER

For cutting out the local station, picking up amateur stations, and getting foreign stations you will find this PYE Geared Condenser better than any you have ever tried before. Its design has been worked out on the soundest scientific lines to eliminate dielectric losses, and its wonderful 200 to 1 geared vernier drive gives a precision in tuning that you will not find in any other condenser.

Porcelain insulation is provided for the stator and ebonite for the rotor. The rotor vanes are of special decrement shape connected electrically to the terminal by means of a soldered pig-tail from the spindle. Vernier action is very smooth and has no backlash whatever. The end-plates are strongly stamped brass and being thoroughly insulated, make hand-capacity negligible. Definite stops are provided and fixing is by the one-hole method.

Capacities.	Prices.
.0001, .0002.	
.0003, .0005 mfd. . . . .	£1 2 6
.00075 mfd. . . . .	£1 7 6

Get a PYE Condenser this week.

All good Radio shops sell them, or they can be obtained direct:—

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Granta Works, Montague Road,  
Cambridge.





**ONLY FORMO USERS KNOW**  
Quality and Efficiency with Economy

- Single Condensers 7/6
- Twin Gang ... 24/6
- Triple Gang ... 33/6
- Vernier Dials... 6/-

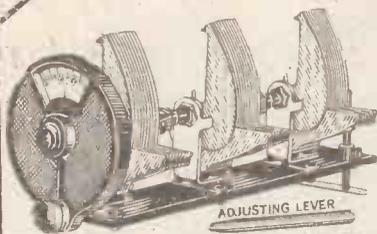
Crown Works,  
Cricklewood Lane,  
N.W.2  
Telephone: 1787 HAMP.



10/6  
"FORMO"  
Shrouded Transformer

- Screens complete with 6 pin base . . . . . 9/-
- Split Primary Aerial Coil 250/550 . . . . . 5/6
- H.F. Transformer . . . . . 7/6
- Reinartz Coil 250/550 . . . . . 7/6
- Mullard Rodney 250/550 9/-
- Mullard Nelson 250/550 9/-
- All types of coils in stock.

Manchester :  
**J. B. LEVEE,**  
23, Hartley Street,  
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475 Heaton Moor.



**The name does not rotate**

The head does not come off:

The slot and nut eliminate soldering.

The finish is perfect throughout.

Complete patent No. 248,921, 4th March, 1925, and registered designs.

Standard Large Insulated Model (polished black bakelite), Type B, 9d. each. Popular Model (non-insulated), Type M, 6d. each.

28 different engravings stocked. Catalogue free on request.

**BELLING-LEE TERMINALS**

Advt. of BELLING & LEE, Ltd., Queensway Works, Ponders End, Middlesex. M.C.14.

**"RADIO FOR THE MILLION" SETS**

We supply all the parts for these Sets and guarantee you good results

THOUSANDS of amateur set builders owe their success to the help they received from the famous Pilot Service. Under this scheme we supply you with whatever parts you may require to build your receiver, and our Technical and

Captain Tingey, M.I.R.E., will advise and help you entirely free, of charge should you encounter any small difficulties. This service has now been extended to cover the popular "Radio for the Million" sets described in the Mullard Service Department, under the control of

Send **NO** money—pay the **POSTMAN**

We will pay all postal and C.O.D. charges.

Here are the prices of the Kits of components:  
**GRENVILLE P.M. £2:6:10 FRANKLIN P.M. £3: 7:0**  
**RODNEY P.M. £8:8: 0 NELSON P.M. £8:19:6**

The above prices do not include panels, cabinets or baseboards.

**IMPORTANT NOTE.** If you have some components already by you, or a set which you are going to dismantle, let us know exactly what parts you have, and we will advise you if they will be suitable. Detailed list for any of the above sets will be sent on application.

Standard Panels and Baseboards for above Sets.

The panels are cut from "Red Triangle" guaranteed ebonite and drilled to specification and engraved.

	Panel	Base-board
	s. d.	s. d.
<b>GRENVILLE P.M.</b> ..	4 0	1 0
<b>FRANKLIN P.M.</b> ..	7 6	1 6
<b>RODNEY P.M.</b> ..	11 6	3 0
<b>NELSON P.M.</b> ..	11 6	3 0

Send three 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.

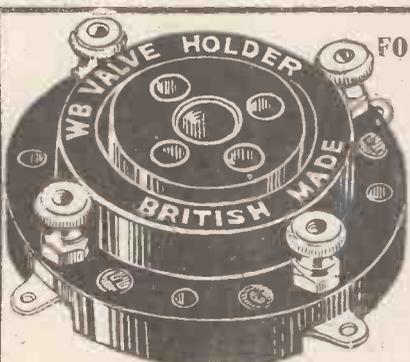


**THE PILOT MANUAL**

**PETO-SCOTT CO., LTD.,**

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P.S. 7960



FOR BEST RESULTS

USE **W.B. ANTI-PHONIC LOW LOSS VALVE HOLDERS**

PRICE With Terminals **2/3**

With Tinned Soldering Tags **2/-**

If unable to obtain from your dealer write direct.

Manufactured by **WHITELEY, BONEHAM & CO., LTD.,** Duke Street, MANSFIELD, NOTTS.

**DULIVAC VALVES**

7/-  
GENERAL PURPOSE

13/-  
POWER



**ARE THE BEST IN THE WORLD**

They give greater power, purer tone and more economical consumption at a lower cost.

1.8 volt, general purpose, 0.2 amps. 7/-; 1.8 Volt, Power, 0.3 amps. 13/-.  
4 volt, general purpose, .06 amps. 7/-; 4 Volt, Power, .25 amps. 13/-.

From your dealer or direct from **M. & A. Wolff** 9-15, Whitecross Street - E.C.1

## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1498.)

of coil and variable condenser to the other end. The A. and E. terminals of the complete receiver go to the usual aerial and earth leads, and, in addition, the remaining side of the variable condenser is connected to the earth terminal.

The trap is tuned to the interfering station's wavelength, and will be found to side-track most—if not all—of the unwanted signals.

### TAPPINGS FROM H.T. RESISTANCE.

D. C. (Cross Street, Manchester).—I have made a resistance to go across direct current mains for H.T. The mains are about 200 volts, so shall I get 100 volts if I plug in half way along, 50 volts at three-quarters of the way along, etc. ?

Yes. Apart from slight losses which can be ignored, the ends of the resistance can be regarded as having the full voltage of the mains, with proportional voltages at all intermediate points.

### INDUCTANCE OF A COIL.

N. C. L. (Grimsby).—Now that solenoid coils are the fashion again, can you give me the formula for calculating the inductance of a coil wound upon a cylindrical former ?

The formula is :

$L$  (in centimetres) =  $\pi^2 D^2 n^2 l K$ ,

where  $\pi = 3.1416$

- $D$  = the diameter of the coil in centimetres.
- $n$  = the number of turns of wire per centimetre.
- $l$  = the length of the coil, in centimetres.
- $K$  = a factor (called Nagaoka's factor) which depends upon the ratio of the diameter of the coil to its length.

For instance, to find the inductance of a coil having a winding 6 centimetres long and a diameter of 12 centimetres this is very roughly 2½ in. long and 4½ in diameter, with 10 turns per centimetre, proceed as follows :

Inductance in centimetres  
=  $3.1416 \times 12^2 \times 10^2 \times 6 \times K$ .

When the diameter is twice as great as the length of winding, reference to the standard table for Nagaoka's factor shows that factor  $K$ , in this instance, is equal to .5255.

We therefore get

Inductance in centimetres  
=  $9.8702 \times 144 \times 100 \times 6 \times .5255$

The approximate total inductance in centimetres comes out at about 439,403, and as 1 microhenry = 10<sup>9</sup> centimetres the coil's inductance in microhenries is found to be approximately 439.

### ADDRESSES WANTED.

The following readers have submitted queries bearing either no address or an insufficient address. Will they please communicate with the Query Dept., so that their replies may be sent ?

- |                |                |
|----------------|----------------|
| J. Priest.     | F. Bailiss.    |
| A. Wheatcroft. | H. M. Girling. |
| W. Wyatt.      | D. Young.      |
| S. C. Stevens. | C. V. Preece.  |
| A. Moore.      | W. C. Cowell.  |

### DAVENTRY GOES DUMB.

R. S. B. (Sandown, Isle of Wight).—Using a perfectly straight 2-valver (Det. and L.F., magnetic reaction), I used to get good results from 5 X X. About a fortnight ago, when changing over to my big coils (after I had been using a 75 and 50 for about a week), I found Daventry was dumb! Also Radio-Paris, though I could get both stations at good strength before. Changing back to short-wave coils again, the set was normal, and it now functions on low waves, but not on the high. I have tried other coils with the same result. Where is the fault likely to be ?

We note that you used a 75 and a 50 for short waves, so apparently you were then tuning "in series." If, as appears probable, you use "parallel" tuning for 5 X X, you will almost certainly find that your series-parallel switching arrangement is the cause of the trouble. We should have suspected one of the long-wave coils if you had not tried others, but this latter fact makes it almost certain that the fault lies in the change-over from the "series" to "parallel" connections, so these should be overhauled very carefully for good contact, etc.

(Continued on next page.)

# 100,000 OHM RESISTANCES

for "P.W." Circuits—get them  
guaranteed accurate within  
10%

## ASHLEY-LEDWARD RESISTANCES



The most vital component in these circuits is the anode resistance. Many an apparently satisfactory circuit has proved inefficient and noisy in operation due to the Resistance employed depending on some principle now proved fundamentally unsound. Freedom from disturbing noises is assured with the Ashley-Ledward Resistance, the base of which differs from all others.

Exhaustive tests by famous laboratories have produced eminently satisfactory reports, and each Resistance on completion is subjected to a 48-hour test during which it is continuously under pressure at a minimum of 230 volts.

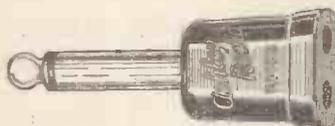
Price:

2/6 each

ANY RESISTANCE  
(with Clips)

Superior to wire-wound at half the price.

### STANDARD PLUG



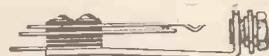
PRICE - - - 1/6

Will fit all standard Radio Jacks and take any form of connection Spade or Pin tags, rigid wire or ordinary flex, with equal facility and minimum trouble. Pin tags and rigid wire leads firmly connect when pushed home. Spade tags and flex connect to simple adaptors provided for insertion similarly. Genuine bakelite neatly moulded with mirror finished metal work.

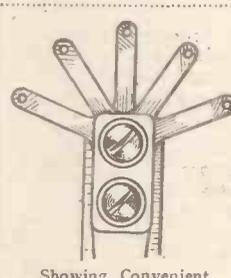
## JACKS



JACK No. 1. Single Circuit (Open) 1/3



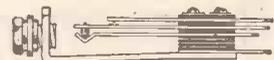
JACK No. 2. Single Circuit (Closed) 1/6



Showing Convenient Formation of Tags.



Jack No. 3. Double Circuit 1/9



Jack No. 4. Filament Single Control 1/9



Jack No. 5. Filament Double Control 2/3

Jacks at the above prices, besides materially increasing the effectiveness and appearance of any circuit, reduce the amount of work involved when experimenting, aiding both construction and dismantling. The Jack itself helps towards this end, the tags being spread fanwise for ready soldering. Non-ferrous metal nickel-plated springs (recognised best by leading Wireless and Telephone Engineers) insulated throughout with genuine bakelite. Solid Silver Contacts. Single hole fixing to standard size panels.

Positive in Action.

ASHLEY WIRELESS TELEPHONE CO. (1925) LTD.,  
17, FINCH PLACE, LONDON ROAD, LIVERPOOL





Panel Talks: No. 5.

## Here is a Panel that will not split or break or crack

DO you know how it feels to split your panel just when you have almost completed your drilling? No, you don't—if your choice fell on Resiston.

For Resiston Panels (like Radion) are made throughout from nothing but pure rubber. Because of this they are tough yet not brittle. They are strong. They will not break. Or split. Or crack. They can be sawn with ease and with safety. They can be drilled without difficulty and, when tapped, will take a good thread.

Thus, when the home constructor buys a Radion or Resiston Panel, in one of its 17 sizes, he knows that even though he is not quite an expert with the drill or the saw, he is in very little danger of ruining his panel. Its very constitution facilitates easy working.

If, in the past, your experience of ebonite has been discouraging you'll appreciate the worth of Resiston. Its perfect insulation. Its superfine surface (which no hand has touched since it left the factory). Its colour permanence and its strength.

For the sake, perhaps, of a few pence, will you court failure and disappointment by choosing an unnamed panel in preference to one bearing such a name as Radion or Resiston—names which give you positive assurance of lasting satisfaction?

## Send for the Radion Book

In its twenty-four fully illustrated pages are details for building four unique Receivers together with many useful wireless hints

Please send me, free, the 'Radion Book,' together with the booklet, 'The Gentle Art of choosing one's Panel.' "P.W." Feb. 19th.

Name.....  
Address.....



American Hard Rubber Co., Ltd., 13a, Fore St., E.C.2

G.A. 7968.

## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

### CALCULATING THE CAPACITY OF A VARIABLE CONDENSER.

B. G. E. (Royston, Cambs).—Is there a simple formula for calculating the capacity of the ordinary semi-circular plate variable condenser? If so, please give an example.

An easily worked-out method is to use the formula

$$\text{Capacity in micro-microfarads} = \frac{0.353 (N-1) (R^2-r^2)}{t}$$

where N = total number of plates in the condenser.  
R = the radius of the moving plates (in inches).

r = the radius of the centre hole in the fixed plates.

t = the distance between the sets of fixed and moving vanes (i.e. the air space separating one moving plate from the adjacent fixed plate).

To find the maximum capacity (in microfarads) of a condenser with 45 moving plates, these having a radius of 2 inches and a dielectric thickness (distance between fixed and moving plates) of, approximately, .044 inches, proceed as follows:

One microfarad = 1,000,000 micro-microfarads, so the formula for microfarads would be

$$\text{Capacity in mfd.} = \frac{0.353 \times (N-1) (R^2-r^2)}{t \times 1,000,000}$$

It is quite usual to simplify the calculation by omitting the quantity t, because sufficient accuracy is obtainable without including this factor. Thus, the formula becomes

$$\text{Capacity in mfd.} = \frac{0.353 \times (N-1) \times R^2}{t \times 1,000,000}$$

In the example, N = 45, so N - 1 = 44;

R = 2", so R<sup>2</sup> = 4,

and t = .044;

so the formula becomes:

$$\text{Capacity in mfd.} = \frac{0.353 \times 44 \times 4}{.044 \times 1,000,000} = .0014 \text{ mfd.}$$

### WAVE-LENGTHS.

["CURIOUS" (Southall, Middlesex).—Is it a fact that some wireless stations use wave-lengths of only a few yards, whilst others use wave-lengths of nearly twenty miles?

Wave-length can vary within the limits named, though the ultra-short waves of a metre or so are used more in the laboratory than by stations conducting telegraphic or other services.

At the present time, however, there are stations working daily over very long distances on about 25 metres, and at least one station is regularly working on about 30,000 metres. (Expressed in English units, the former wave-length is equivalent to about 27½ yards, and the wave-length of the latter is equivalent to approximately 18 miles.)

### VALVE FOR FLEWELLING.

"JASON" (Reigate, Surrey).—I am thinking of turning my straight one-valve set into a modified Flewelling by adding a .006 mfd. fixed condenser and switch. Will the ordinary detector valve do in the new circuit, or shall I need more H.T. and a special type of valve?

The Flewelling circuit is not at all "difficult" with valves, and any of the ordinary valves in general use as rectifiers will be found to give excellent results. Generally, a 60-volt H.T. battery is quite sufficient.

### ACCUMULATOR FROTHING.

H. M. F. (Sawbridgeworth, Essex).—What is the cause of a froth appearing on the accumulator acid?

In most cases frothing is caused by some impurity in the accumulator's celluloid container, although, apart from the use of inferior celluloid, it sometimes happens that frothing is due to the liquid in the cell.

In the latter case the trouble may sometimes be cured by emptying the acid and washing the plates and container with distilled water, afterwards filling with new acid of the right specific gravity. If the frothing is caused by faulty celluloid, it can only be cured by the use of a new container.

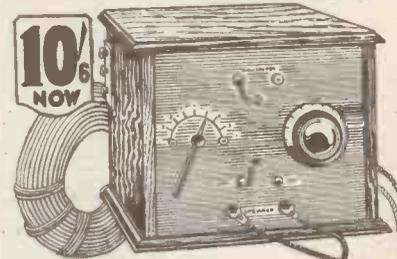
### OHMIC COUPLING.

H. E. C. (Chatteris).—I recently saw it stated that the forms of coupling used in wireless receivers were magnetic, capacitive, and ohmic. What is ohmic coupling?

Ohmic coupling is simply the form which employs a resistance. The coupling effect depends upon the potential difference at the ends of this resistance when traversed by a current, so it is called ohmic, or resistance, coupling.

## GRAVES

### 2-VALVE LOUD SPEAKER BARGAIN.



This highly efficient 2-Valve Loud-Speaker Set is the finest wireless value ever offered.

It gives a volume and quality of tone unattainable by any instrument of a similar price and is the essence of simplicity. Fitted with coils covering all the British wave-lengths, including Daventry.

THE CABINET is of beautifully polished Oak, & all components are of the highest quality. Dull Emitter Valves with patent valve holders, &c.; H.T. Battery, 2-volt accumulator and complete Aerial outfit. LOUD SPEAKER of exclusive design with unique magnetic system and improved mica diaphragm. Price £7:17:6

TERMS: Our Bargain Price is for deferred payments. Send 10% now, & complete purchase in 14 monthly payments of 10/6. If you wish to pay cash, 5 per cent discount is allowed. Catalogue Post Free. Up-to-date Crystal & Valve sets at keenest prices.

J. G. Graves Ltd. Sheffield

Fullest Approval



2-VALVE AMPLIFIER. 35/-  
1-Valve Amplifier, 20/-, as new; Valves, D.E. .06, 7/-; Headphones, 2/6 pair; new 4-volt Accumulator, 13/-; new 60-volt H.T., guaranteed, 7/-;  
2-Valve All-Station Set, £4. Approval willingly.  
Write for free bargain list.  
P. Taylor, 57, Studley Rd., Stockwell, London.

WIRELESS.—Capable, trustworthy men with spare time who wish to substantially increase income, required where we are not fully represented. Applicants must have practical knowledge of installation of Set and Aerial, be a householder or live with parents, and be able to give references: state age and experience. Address: Dept. 10, General Radio Company, Limited, Radio House, Regent Street, London, W.1.

## WIRELESS WAREHOUSE

Buy your Wireless parts direct from the Warehouse at Warehouse prices. Every known component in stock. Write NOW for list.

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THE SEAMLESS CONE (Prov. Patent 25069/26) and a Brown A Earpiece, or Lissensola with Reed, will enable you to construct a CONE LOUDSPEAKER, which will give you unsurpassable results. These Cones are unequalled for purity of reproduction, the high and lower registers being equally rendered.

Do not be put off with the ORDINARY PARCHMENT CONE, having a Seam Join. EXTRACTS FROM UNSOLICITED TESTIMONIALS: PIRBRIGHT, SURREY: "It is an excellent article and gives very good results." SPALDING, LINGO: "I am more than satisfied with the results." SHEFFIELD: "I have had one of the £7/10 Loudspeakers, and have no hesitation in saying that for lone your Seamless Cone is much better." BRISTOL: "The Seamless Conical Diaphragm received yesterday works fine."  
Illustrated Lists and particulars for Stamp. GOODMANS, 27, Farringdon Street, E.C.4. Also obtainable from Spencer's Stores, 45, Mason's Av., E.C.8.

# for every modern circuit

☐ 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 standard screened coils. Threaded or plain ribs; standard size (R.P. type, height 2½" x 2½" diameter); Featherweight (height 3", diameter 2½", thickness of Dielectric ½").

☐ 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 radio efficiency than any other similar type of coil.

☐ Universally approved by the expert set designers on the press and with leading manufacturers.

## COLVERN COILS

Approved for use in the following receivers:

- Split Primary Type**  
 The Magic Five  
 The Elstree Solodyne  
 A Four for Range and Selectivity  
 The Screened Coil Three  
 A Three-Valve Trap Receiver  
 The Nelson P.M.  
 The European Five  
 A Simple Three-Valver  
 Etc., etc.

- Split Secondary Type**  
 The Elstree Six  
 The All-British Six  
 The Distaflex Two  
 The Mewflex  
 The Elstreeflex  
 Etc., etc.

- Tapped Secondary Type**  
 The Monodial  
 The Puramusic Receiver  
 Etc., etc.

- Special Types**  
 Reinartz One-Valver  
 The Spanspace Three  
 The Rodney P.M.  
 Etc., etc.

**COLVERN R.P. TYPE FORMER**

- Diameter 2½" Height 2½"  
 Broadcast with Base .. 5/-  
 Long Wave with Base .. 5/6  
 6-Pin Base .. 1/6  
 Former only Plain Ribs .. 4/-  
 Do. Threaded Ribs .. 4/-  
 Long Wave Threaded .. 4/6

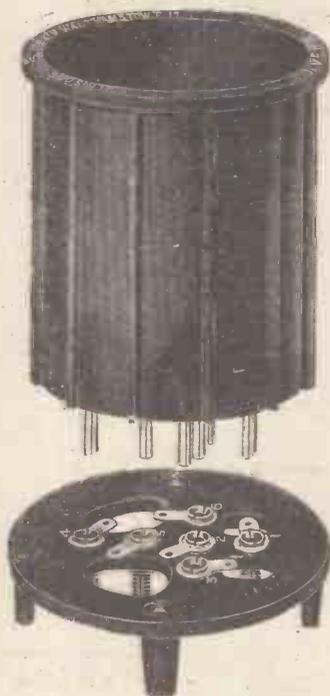
**COLVERN FEATHERWEIGHT FORMER**

- Diameter 2½" Height 3"  
 Former with Base .. 8/-  
 6-Pin Base .. 1/6  
 Former only .. 4/6

**PRICES OF WOUND H.F. TRANSFORMERS**

- B.B.C. Waveband .. 9/6  
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 Screens and Base .. 8/6  
 Aerial Coil .. 5/6  
 Reinartz Coil .. 9/6

☐ Prices for winding special coils upon application. When making enquiry or sending order, please be certain to state the circuit for which the coil or coils are required.



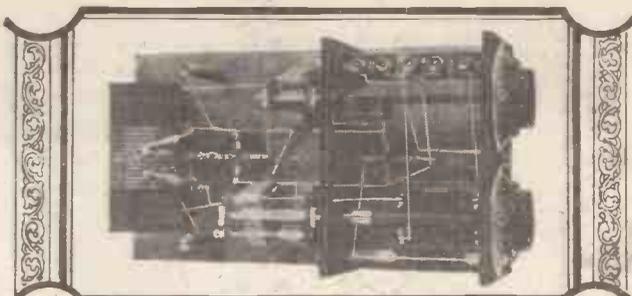
THE COLVERN FEATHERWEIGHT FORMER with the COLVERN INTER-CHANGEABLE PRIMARY enables you to use coils suited to your valves.  
 Send postcard for full particulars.

Colvern H.F. Transformers are approved by the leading technical experts, including the following:—

Mr. J. H. Reyner, B.Sc. (Hons.), A.M.I.E.E.; C. P. Allinson, A.M.I.R.E.; A. Johnson-Randall, A.V.D. Hort, M.A.; S. G. Rättee, and The Mullard Research Engineers.

**COLLINSON PRECISION SCREW CO., LTD.,**

Provost Works, Maedonald Road, Walthamstow, London, E.17.  
 Telephone 0532.



### So that you may KNOW—

we publish the following extract from one of the many authentic comments on the performance of the Short Wave Receiver.

"We have built up a model for demonstration, and must confess that it is the best Short Wave Set we have handled. It is as simple to use on an ordinary aerial as a set which has been designed for receiving broadcast. We wish you every success."

Appearances cannot tell you what is the best range of components. The Bowyer-Lowe standardised series of components—built together in a set—make reception as perfect as possible. The Bowyer-Lowe Short Wave Receiver is a direct result of the use of Bowyer-Lowe Components—the best obtainable. Each component is made to rigid specifications for lasting and perfect service for its particular function.

The Bowyer-Lowe Short Wave Receiver is a remarkably efficient set. Send 1/- NOW for the Booklet giving the whole interesting story of its uses and capabilities.



Announcement by the Bowyer-Lowe Co.,

Ltd., Letchworth, Herts.

## Don't forget to use GLAZITE

BRITISH MADE REGD.

### COLOURED CONNECTING WIRE

[ RED · YELLOW · BLUE · BLACK · WHITE and GREEN ]

Write for descriptive leaflet to The LONDON ELECTRIC WIRE CO. & SMITHS LTD., Playhouse Yard, Golden Lane, London, E.C.1.

Makers of Electric Wire for over 40 years

J.U.D.D.

## CUT THIS OUT FOR CABINETS

and post to us for FREE list illustrating Cabinets as shown in "Popular Wireless," etc., etc., and for our additional Bulletin No. 1

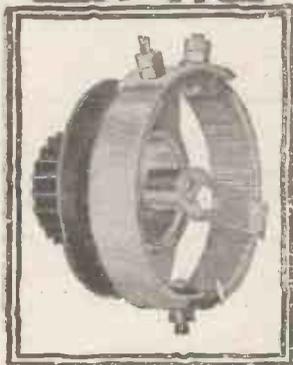
NAME .....

ADDRESS .....

(Write in block letters, please.)



**CARRINGTON Mfg. Co., Ltd.**  
 18-20, Normans Buildings,  
 Mitchell St., Central St., London, E.C.1.  
 Telephone: Clerkenwell 6903.  
 Trade enquiries especially invited.



## bright & dull emitter valves

There are two windings on this one Rheostat—one of a 6 ohms resistance with a continuation on to a 30 ohm strip winding. This has been specially made to meet the demand for a thoroughly reliable Rheostat covering needs of both bright and dull emitter valves. The resistance wire is wound on hard fibre strip under great tension and is immune from damage. The popular one-hole fixing method is provided and the terminals are conveniently placed. Contact arm has a smooth silky action. All metal parts nickel plated. Complete with ebonite combined knob and dial.

### The 'PEERLESS' DUAL RHEOSTAT

PRICE 3/9 EACH

From all dealers or direct from—

*The Bedford Electrical & Radio Co Ltd*  
22, Campbell Road, Bedford.



## FOUNDER OF HOSPITAL RADIO DEAD.

READERS of POPULAR WIRELESS will learn with regret of the death of Mr. J. Hugh Jones, a Director of the "Daily News," and founder of Hospital Radio.

Mr. Jones passed away at three o'clock at his home in Dulwich on February 1st, after a week's illness. Death was due to pneumonia following upon influenza. He was forty-three years of age, and was a native of Manchester.

It is to Hugh Jones more than anybody else that the hospitals of London, the Borstal institutions, and the lightships and lighthouses around our coast owe the great boon of wireless installations. I remember in the spring of 1925, Mr. Hugh Jones, while lunching with me one day and talking about wireless, suddenly had the idea of starting a scheme for providing hospitals with wireless sets and, with characteristic energy, he immediately set about the great task which was crowned with so much success only three months ago, when donations were announced to total more than £34,000, being sufficient to enable 15,781 beds in 122 London hospitals to have wireless sets installed.

### A Boon to the Sick.

Hugh Jones had no technical knowledge of wireless, but his knowledge of its application to the needs of the sick and those unfortunate people whose lives are drab and dull, and devoid of any form of entertainment was incomparably greater than that of any other man living.

He saw in radio a method of lightening and brightening the lives of thousands of patients in hospitals, and he saw the beneficial effect radio could have upon the inmates of the Borstal institutions and, finally, the boon it would convey to the lonely officials who man our lightships and lighthouses.

### Success Achieved.

I remember attending the first meeting of the Radio Hospital Committee at the Savoy Hotel, when Sir Arthur Stanley agreed to act as chairman. Captain Eckersley, Dr. Eccles and others were present, but throughout the meeting I was impressed by the determined and enthusiastic attitude of Mr. Hugh Jones, who, in face of the difficulties which were pointed out to him by various members of the committee, eventually aroused in them such an enthusiasm that from that day all difficulties were brushed aside with ultimate and triumphant success.

Readers of POPULAR WIRELESS will, I feel sure, join in paying a tribute to the man who did so much in such a short space of time in helping to make broadcasting a valuable ally in public service, and who devoted himself with such untiring energy and sympathy to the amelioration of the sufferings of those to whom radio has already proved a consolation and a boon.

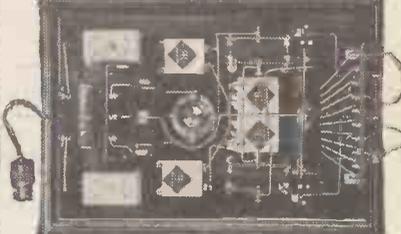
N. F. E.

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**CORRESPONDENCE**

(Continued from page 1474.)

**PURE REPRODUCTION.**

The Editor, POPULAR WIRELESS.

Dear Sir,—I have read with interest Mr. Baggs's letter casting doubt upon the alleged superiority of resistance-coupling for pure reproduction, and would like to know if the continued advocacy of this device in technical journals is based purely upon its graph? In actual practice, the use of reaction and a horn-type loud speaker both tend to accentuate the lower frequencies, and in my experience the transformer, while able to cope with much greater voltage swings, gives vastly greater amplification and definitely superior tone. It is doubtless a matter of individual taste and opinion, but I have done with resistance-coupling for good and all.

Further, why the emphasis upon the necessity for a "power valve" in the last stage? Good for the wireless industry, of course, but the G.P. valve can handle as much volume as can ever be required in a private house. I recently tried two Cosmos blue-spot valves in a two-stage power amplifier following a crystal set—transformers: C.A.V. Ferranti A.F.3, and "phone." With 200 volts H.T., and no grid bias they gave excellent tone at terrific volume, equal to three transformer stages with ordinary valves. I think the chief cause of distortion is insufficient H.T. Some friends of mine have a 3-valve dual receiver three years old, with bright valves, and transformers none too efficient. Tone was poor at 60 volts H.T., but with 100 volts H.T. and 4½-volt grid bias the tone beats any commercial resistance-coupled set I've ever heard!

W. H. SPOOR.

The Hydro, Bristol.

The Editor, POPULAR WIRELESS.

Dear Sir,—I think the answer to your correspondent Mr. Baggs, is in the science museum in the B.B.C.'s demonstration set, which uses resistance coupling on both high and low frequency sides. As to the transformer mentioned by Mr. Baggs, I haven't had the pleasure of hearing its performance, but its "static" curve has not impressed me. Under operating conditions these transformer curves are often considerably modified, and it is very possible that in this instrument the curve is modified less than in other cases. I have used other equally expensive and well-known makes, also commercial resistance-coupling units, and so far as my experience goes the transformer has one and only one advantage—it makes more noise—and even this is strictly limited by what the valve will stand without overloading. The only amateur-built set which I have ever heard reproduce a kettle-drum clearly and unmistakably out of the welter of an orchestra used commercial resistance-coupling units, and I know very well what is going to happen to my transformer when I feel rich enough to undertake a re-fit.

Yours faithfully,

G. M. PART.

Sunnyside, Frant,  
Tunbridge Wells.

**COLLOIDAL DETECTORS.**

The Editor, POPULAR WIRELESS.

Dear Sir—I should like to point out what is, I think, an error which occurred in the article entitled "Some Colloidal Detector Experiments," by J. F. Corrigan, M.Sc., A.I.G., which appeared in "P.W." No. 242, dated January 22nd. In this article he states that the causes of the Brownian movement are "electrical in nature. Each particle carries a negative or positive charge, and the motion is usually understood to be the result of the mutual repulsion of these charges." Surely this is incorrect? A particle in a colloidal suspension certainly carries an electrical charge, which is made evident by the phenomenon known as electrophoresis (the attraction of the particles towards one of the electrodes of a powerful battery if both electrodes be immersed in the system). But the rapidity of the Brownian movement increases the higher the temperature, the smaller the particles and the more mobile the liquid, and thus it is practically certain that it is due to the actual bombardment of the particles by the rapidly moving molecules of the liquid itself. The Brownian movement, in fact, constitutes one of the strongest proofs in support of the Kinetic theory.

Trusting that you will forgive my temerity (I am only seventeen years old) in advancing such an expert as Mr. Corrigan, and thanking you for your priceless periodical.

Yours faithfully,

ERNEST B. LEE.

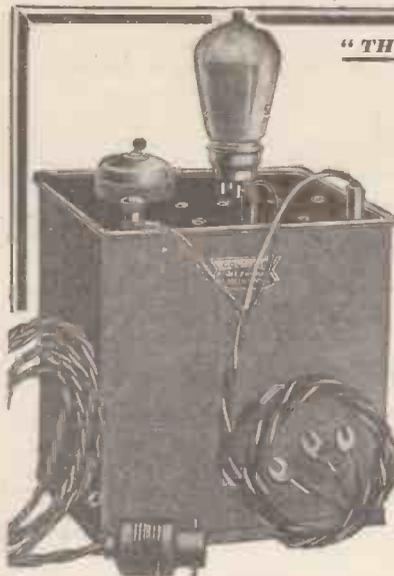
Cranley House,  
Cranleigh, Surrey.

[Below we give Mr. Corrigan's answer to the above letter.—ED.]

Mr. Lee raises a very interesting question indeed. He quotes the "classical" text-book theory of Brownian motion, a theory which is largely due to Ramsay, and thus, if he wishes to do so, he is perfectly justified in assuming my remarks on the cause of Brownian motion to be incorrect.

Recent research in the subject of colloid phenomena, however, has almost invariably pointed in the direction of, there being other forces behind the

(Continued on next page.)



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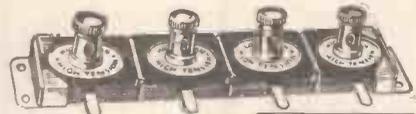
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WIRELESS WIZARDS,  
NORTHAMPTON.

## CORRESPONDENCE.

(Continued from previous page.)

Brownian movement than a mere mechanical bombardment of the suspended particles by the molecules of the liquid. In fact, Brownian motion may be due to many causes. Without a doubt, the motions of the molecules of the liquid in which the fine particles are suspended do influence the movements of the latter, but my contention is that Brownian motion is still more fundamentally of electrical origin, a theory which is finding more and more favour as research into the electrical properties of colloids progresses.

J. F. CORRIGAN.

### COASTAL CRYSTAL SET.

The Editor, POPULAR WIRELESS.

Sir,—Having constructed the "Coastal Crystal set," devised by C. A. J. Meadows and published in No. 242 of POPULAR WIRELESS, I thought you might like to know results obtained.

It works a Sterling Baby L.S. quite comfortably in an average size room from local station about three miles.

I find the set is also a good DX receiver and very selective. On Sunday evening, between 7 and 8, Langenberg, Eiffel Tower and Königswusterhausen came in at weak 'phone strength, but quite distinguishable. With the addition of one stage of L.F. these signals were brought up to comfortable 'phone strength. I might add that the crystal used was a "Mighty Atom."

Wishing POPULAR WIRELESS every success and many thanks to C. A. J. Meadows for devising such a set.

Yours truly,

F. C. PIRE.

"Bentley," Barton Road,  
Bournemouth, W.

### THE CHILDREN'S HOUR.

The Editor, POPULAR WIRELESS.

Dear Sir,—I appeal to you—can you use your influence in some way or other with the B.B.C. to put the Children's Hour back to what it was when the thousands of kiddies really enjoyed it, when they were real uncles and aunts. I am afraid there must be thousands of sad faces now, with Mr. and Mrs. also Misses, in existence. However many new people have to be brought in they could always be Uncles and Aunts. Perhaps an appeal to readers through your valuable journal—of which I am a regular reader—to write to the B.B.C. might cause them to do something.

We all think it a shame that this bit of the children's pleasure had to be tampered with.

Yours truly,

F. W. WHITE.

123, Lewis Flats,  
Dalston Lane, Hackney, E.8.

## A WAVE-LENGTH "NO MAN'S LAND."

(Continued from page 1468.)

to employ an additional single-way switch to bring the fixed condenser into circuit. Fig. 1 shows how it should be connected. Of course, the condenser can be used for extending the range of the parallel tuning, although it should be remembered that it will not increase this in a like proportion. Here it is merely the addition of .00005 mfd. to something well above .00075 mfd. or more as to the capacity of the variable condenser must be added that of the aerial. In the series position the maximum effective capacity will be nearer one quarter of that.

We trust it will be realised that as aerial capacities vary and as coils too are by no means standard in respect of inductance values ("turns" are but approximations) the figures given should be regarded as typical of an average set of circumstances. But allowance has been made for this and slight variations one way or another will in no way upset the practical application of the scheme.

In conclusion, we recommend those readers who adopt this useful method of covering an annoying tuning gap to purchase a fixed condenser of a very reliable make. The best ones on the market cost less than does one good coil.

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**TECHNICAL NOTES.**

(Continued from page 1472.)

The new valve pins are immeasurably superior to the old-fashioned type and constitute an excellent example of the advantage of giving thought to every detail of a product, even though at first glance the detail might seem to be unworthy of serious attention.

**Winding Coils.**

When winding coils it is often rather a difficult matter to arrange for the reel of wire to be suitably held so that the wire can be drawn off, to the coil which is being wound, under suitable tension. Generally, the reel has an annoying habit of rolling on the floor and the wire of becoming entangled with every available object.

All this can be overcome by making what may be called a "winding board" which carries the reel and at the same time allows the wire to be paid out under slight tension. The board need only consist of a strip of wood, say 4 in. in breadth, 6 in. long and 1/2 in. thick, in which near one end a long nail is driven in a vertical position to act as a spindle upon which to place the reel of wire. At other positions on the board a number of "screw-eyes" are placed (these go by various names, but what is meant is the little screws terminating in a circular loop about 1/2 in. in diameter such as are used for various domestic purposes).

These "eyes" are placed in such positions that the wire from the reel, when threaded through the successive "eyes," takes up a zig-zag formation. It will now be found that a certain amount of tension is necessary to pull the wire through the loops owing to the friction. The amount of tension will depend upon the sharpness of the angles at the zig-zags, upon the gauge of metal wire used in the making of the loops or "eyes," and also upon the number of "eyes" which are used. If the tension is found to be too great, the wire may be unthreaded from one or two of the "eyes," leaving a smaller number in operation.

**Removing Kinks.**

This little device will be found very convenient and it has the further advantage that it tends to remove kinks from the wire, particularly if the wire itself is not of very heavy gauge.

**Increased Load.**

Since improvements in loud-speaker design have, generally speaking, increased the demand on the last or output valve, it has been necessary to increase the output of the valve, or decrease the distortion caused by the valve, or both; and it has therefore become important to have an accurate knowledge of the maximum undistorted output which a valve can supply.

The paper goes on to discuss characteristic curves and a great many other interesting matters, and includes an important discussion of valve design. As the paper is of considerable length, it is impossible in a few words to give any proper résumé of its contents. It embodies, however, the results of much investigation on an interesting and important aspect of valve design and performance.

(Continued on next page.)

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All High Tension Makers prominently state Voltage, Voltage Test is absolutely unreliable. The majority, if the Ampere Hour capacity is stated, do not guarantee the Ampere Hour to be "actual."

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Any High Tension 1 1/2 a.h. is very difficult to fully re-charge, and seldom gets a full re-charge (not the fault of the Charging Garage) as it requires a Special Plant for a very long and low rate charging period. A grave risk with wood Separators in cells. Certainly highly speculative in results.

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**LATEST MODEL W.D. 2-V. RECEIVERS.** No. 32. All B.B.C. and Daventry, Aerial-tested, in enclosure mahogany case with D.E. Valves, 24 10s.

**3-VALVE R.A.F. ENGLCO.** All range Type No. 118A, in enclosure portable case, 3 D.E. Valves. Ready for use, 24 15s.

**4-VALVE RADIO C.** Polar Receiver, in vert. encl. pol. mahog. Cabinet with all B.B.C. and Daventry coils. All aerial-tested, 26 10s.

**5-VALVE R.A.F. PORTABLE RECEIVER.** Encl. case, 2 H.F.; 1 Det., 2 L.F., Coupler, Varia. Cond., Rheo., Patent, 5 Osram Valves. Bargain 25.

**AMPLIFIERS.** Marconi 3-valve L.F. Transformer, coupled, Selector for one, two or three valves. Tested and guaranteed, 22 10s. Cost £18. Res. Cap., coupled with switch, 23; 2-valve, 35/-.

**CABINETS.** Pol. Teak, fitted ebonite panels, 13 1/2 in. x 13 in. x 5 in., 9/-; Marconi slope type ditto, 12 in. x 12 in. x 8 in. base, 17/6. Portable 1/2 in. mahogany cases, 7 in. x 8 in. x 5 in. lid and lock, 5/6. For Portable Sets with hinged lid, handle, ebonite panel, 12 in. x 8 in. x 6 in., 10/6.

**3-Cell padded Valve Cases, lid, 1/6.**

**VARIA CONDENSER SALE, S.L.F. LoLoss.** Latest Type, 15/-; New Polar, 0005, 4/9; 0003, 4/6.

**CONDENSERS** fixed, 0001, 2, 3, etc., 6d.; 001 Mica, 6d.; Mansbridge, 03, 1/-; 25, 2/10; 5 3/-; 2 mf., 4/3; 4 mf., 6/6; 10 mf., 15/-; Ex. W.D., 2 mf., 2/6. High voltage, 00025 Mica wood, 2/6; 16 B. Mica ebon., 02, 03, 05, 2/6; 16 H.W., 30,000 volts, 10/-; 2,000 volts, 3/1 mf., 7 taps to 12, 40/-; Air space, 007, 7/6; 2,000 volts, 1 mf., 17/6; 2 mf., 22/6; 4 mf., 40/-.

**TOWNSEND BUZZERS.** For Wavemeter tuning, 3/8 each; larger model, 2/-; Small Power Buzzers, 4/6. W.D. Tuners, Loose Coupled, 10-way tap switches on Prim. and Sec., Rack ebon. mounted, 200/1,000 metres, 15/-; Small R.A.F. Loose Couplers, 5/-.

**POTENTIOMETERS.** 400 ohms, under panel type, 2/8, bargain. 600 ohms, 4/9 each. 1,000 ohms, 6/6. 3,500 ohms, 9/6.

**DYNAMOS.** Government stock of 6- and 12-volt new ball-bearing enclosed Dynamos. Bargain at 50/-.

**CHARGERS.** 220 v. A.C. to 7 v. d.c., £3 10s. 20 v. 12 a., D.C., £13; 30 v. 13 a., D.C., £16.

**H.T. FROM THE MAINS. D.C. UNITS,** with 200/220 volt supply, 3 taps, any ranges, 50 to 120 volt contain special filter, 30/-; Supersede batteries.

**PARTS FOR A.C. Six-tap Rectifying 20 m/a. Transformer, 25/-; 50 m/a., 37/6. Condensers, 4 mfd., 6/6; 10 mfd., 15/-; Power Chokes, 1,000, 1,400, 3,000 ohms, 4/6; 2 Electrode Rectif. Valves, 15 m/a, 7/6; 30 m/a, 10/6. Complete Kit, in Cabinet, 23 10s.**

**DIXON DISTANT CONTROL FOR FILAMENT.** Auto switch on and off, oak pol. case, 15/-; Brass Case, 17/6. "W.W." tested.

**R.B. 10 MARCONI CRYSTAL DET. VALVE AMPLIF. SETS.** R.B. 10 Sets in enclosed case with lid. Cap. Valve Holder, plug terminal, L. and S. Wave Switch, Range Block, Double Spade tuning. T.C.C. Cond., two 250/4,000 m. H.F. chokes, L.F. Trans. All with diagram and Osram Valve. List price, £7, 27/6.

**DRAWING-ROOM LOUDSPEAKERS.** Hornless Mahog. Cabinet. With 2,000 ohm reed viola. Brand new, 27/6. Magnavox, 75/-; Bases only, 30/-.

**WIRES** at half prices. Heavy Twin Flex, 2/6 doz. yds., post 3d. Light Twin Flex, 2/- doz. yds., post 3d. 4-way Flex, 3/- doz. yds., post 4d. 7/23 Enamelled Aerial Wire, finest Navy Bronze, 3/- per 100 ft., Rubber Vult. Lead-in wire, 2/6 per doz. yds. post 3d. 5/36 Single Flex silk braid covered for frame aerial wiring, 1/6 doz. yds., post 3d. Pos. and Neg. col. Flex, 2/6 doz. yds. Frame Aerials, Bakelite frame, Litz wound, Midtap, 10/-.

**45-METRE TWO-UNIT SETS,** with 2-valve Siemens S.W. Telephony Transmitter, Weston Meter, Microphone and 6-valve Receiver with 3 H.F., Det. and 2 L.F. Last few £5 18s. each.

**HEAREASY 'PHONE PADS, SOFT RUBBER.** Light and comfy. Are a boon to crystal users and DX workers. List 2s. Sale 6d. per pair. Free to Blind. Hospitals one free pair for each pair bought. Trade supplied.

1,000 "BARGAIN" CATALOGUE, 4d. Stamp

**ELECTRADIX RADIOS**

218, UPPER THAMES ST., E.C.4

St. Paul's and Blackfriars Stns. 'Phone: City 0191.

# TECHNICAL NOTES.

(Continued from previous page.)

## Commercial Quartz Crystals.

I mentioned a week or two back the use of piezo-electric quartz crystals for use as oscillators for controlling and maintaining constant the output wave-length of a transmitter. It is interesting to note, as showing the great development which has been made in this direction, that piezo-electric quartz crystals for use in this way are now a commercial product and are actually for sale by the Scientific Radio Service (Box 86), Mount Rainier, Maryland, U.S.A.

The above-mentioned firm undertakes to supply quartz crystals ground to a guaranteed accuracy of less than 1/10th of 1 per cent of the specified frequency. Crystals (it is claimed) are so ground as to produce their maximum vibrations, thereby rendering them suitable for use in power circuits as well as excellent for frequency standards. The crystals may be ground to any frequency between 40 and 10,000 kilocycles, and the price is 50 dollars.

## An Interesting Component.

An interesting little component which I see mentioned in one of the foreign journals, but which I have never seen in this country, is a "polariser," which consists, in fact, of a wire-wound resistance with a centre-tap; that is, a terminal at each end and one at the middle. This little resistance is intended to be used in conjunction with a bell-transformer (one of the little transformers which works from the electric lighting mains and provides low-tension A.C. current for ringing house-door bells and so on) when the transformer is providing current for illuminating the set or for any such-like auxiliary purpose.

It is designed for the purpose of reducing or removing the 50-cycle hum, by adjusting the middle point of the resistance, the polariser being connected across the terminals of the transformer. As a matter of fact, the centre-point of the polariser is not adjustable, but the adjustment is obtained by connecting an ordinary rheostat in series with the polariser, so rendering the resistances on the two sides of the centre-tap unequal, when the equivalent position of the tap can be adjusted by means of the series rheostat.

Please note that communications concerning advertising in POPULAR WIRELESS MODERN WIRELESS WIRELESS CONSTRUCTOR must be made to JOHN H. LILE, LIMITED, 4, Ludgate Circus, LONDON, E.C.4. (Phone: City 7261.)



**BECOL** Low Loss FORMER

Registered Trade Mark.

Ebonite Rods, Tubes and Sheets. Panels guaranteed free from surface leakage.

**THE BRITISH EBONITE Co., Ltd., Hanwell, London, W.7.**

# H.T. ACCUMULATORS 27/6

60 volts—Price

## ARE YOU WISE—

to the fact that light weight and low cost may be linked up to high efficiency?

The inexpensive 60-volt 3-amp. hour ELITE High Tension Accumulator, which actually costs under a 1d. to recharge, will do all that other and more expensive makes will do.

Moreover, the unique SEMI-OIL-SUBMERGED feature of the ELITE absolutely PREVENTS SURFACE LEAKAGE LOSSES.

Our leaflets are yours for the asking. They are a mine of Accumulator information, and will save you money.



Type '02 Semi Oil Submerged. 60 volts, complete as illustrated, 27/6, or 4/2 per 10 volt unit.

## ACCUMULATORS ELITE

32, King's Cross Street, Halifax

Tele. 1304. Trade supplied. Telegrams: Elite, Halifax. London Distributor: Cecil Pohlman, 77, Great Portland Street, London, W.1.

## CATWHISKERS & CRYSTALS ABOLISHED



Fixed Permanent Detector and Stabilising Unit. No Batteries required with Crystal Circuits. Indispensable for Reflex Circuits. From all dealers, or post free from Patentes, 2/2.

A. W. GRIFFIN & CO, Manufacturers, REDDITCH

## JARS ZINGS SACS

Waxed, 1/6 DOZ. Special, 1/- DOZ. High Capacity, 1/6 DOZ.

Sacs supplied with terminal tops, 19d. doz. extra. Special large, double-size sac, 3/- doz. For Wet H.T. Batteries, Post Free on 3 doz. and over. Packed in special carton with division for each cell. This can be used as a container for battery when made up. Send 6d. for sample complete unit, particulars and instructions.

All parts stocked for building the latest type loud-speaker with the Seamless Moulded Cone.

SPENCER'S STORES, LTD. 4-5, Mason's Avenue, Coleman St., London, E.C.2. 'Phone: London Wall 2292. (Nt. Bank.)

## 4 - ELECTRODE VALVES

We are the suppliers of the genuine U.G. and Thorpe valves, as specially tested and recommended by the "Undyne" inventors and "Popular Wireless" U.G.5 and Thorpe K.4 (both 4-electrode 5-pin valves), each, post free..... 8/11

Order direct from LUDGATE RADIO CO., with Cash on Order

56, LUDGATE HILL, LONDON, E.C.4

## Makers of the ORIGINAL world-famous BECOL LOW LOSS FORMER

As used in sets that took the first four prizes at the 1926 "Manchester Evening Chronicle" Wireless Exhibition and the set that won the Gold Medal at the 1926 Amsterdam Exhibition.

Size: 3 inches diameter to outside of wings. Prices: 6 inch lengths, 3/- (Postage 9d.); 4 inch lengths, 2/- (Postage 6d.); 3 inch lengths, 1/6 (Postage 6d.); Up to 36 in. lengths.

NOTICE:—Do not be put off with an imitation. Ask for BECOL and use the Former with a reputation.

Write for List "C."

# THE H.F. CHOKE

## AS USED IN THE P.M. CIRCUITS

The remarkable R.I. H.F. Choke employed in the P.M. circuits is designed for use in all tuned grid circuits.

It has a low impedance value, and is wound in well-spaced sections on a low-loss skeleton former, thus eliminating high-frequency resistance and self-capacity, and maintaining selectivity and efficiency.

For wave-lengths of from 50 to 4,000 metres it is quite suitable, and no observable increase in the H.F. resistance of the parallel-tuned circuit will result.

It is a precision instrument well in keeping with the sound engineering tradition of R.I., Ltd. Perfect in design and workmanship, it is an outstanding example of the dominating influence of this progressive company in the wireless field.

**Price 12s. 6d.**

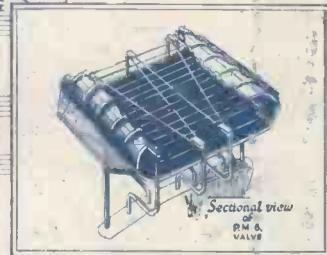
Write for the R.I. Green and Gold Catalogue.



**THE MARK OF  
BETTER RADIO**

# A Perfect Music Filament

that secures response to every note in the broadcasting range



You may do more than possess valves with strong filaments . . .

You may have valves with a filament that has been proved by National Physical Laboratory Test Report to have enormous life . . .

A filament that is so rich in electronic power and so well married to the design of its grid and anode that both the weakest and strongest incoming signals are responded to with a truth that is indistinguishable from the original.

A wonderful filament—a master filament; a filament that opens the treasure chest of the world's best music to every owner of a valve receiver.

All these advantages are made possible by the wonderful P.M. Filament. Be safe and satisfied by demanding Mullard P.M. Valves that have a published official Government Laboratory Test Report.

# Mullard

**THE · MASTER · VALVE**

*For 2-volt accumulator*

THE P.M.1 H.F. 0.1 amp. 14/-  
THE P.M.1 L.F. 0.1 amp. 14/-  
THE P.M.2 (Power) 0.15 amp. 18/6

*For 4-volt accumulator or 3 dry cells*

THE P.M.3 (General Purpose) 0.1 amp. 14/-  
THE P.M.4 (Power) 0.1 amp. 18/6

*For 6-volt accumulator or 4 dry cells*

THE P.M.5x (General Purpose) 0.1 amp. 14/-  
THE P.M.5B (Resist. Capacity) 0.1 amp. 14/-  
THE P.M.6 (Power) 0.1 amp. 18/6

*Super power valves for last L.F. stage*

THE P.M.254 (4 volts, 0.25 amp) 22/6  
THE P.M.256 (6 volts, 0.25 amp) 22/6

ADVT. THE MULLARD WIRELESS SERVICE CO. LTD., MULLARD HOUSE, DENMARK STREET, W. C. 2

HOW TO MAKE THE "S.P." CRYSTAL SET.

*albermarle*

# Popular Wireless

Every Thursday  
PRICE  
3d.

No. 247. Vol. X.

INCORPORATING "WIRELESS"

February 26th, 1927.



*Special Features :*

The "Terra Firma" Three—2 HD's Bright Idea  
Some Radio Brain Waves  
Utilising Burnt Out Valves  
Loudspeakers and Reproduction  
High Angle Radiation

Our cover photograph shows some students receiving instruction  
at the Marconi Wireless College at Chelmsford.

# Distinctly a component to be recommended

—The DAILY SKETCH

## Solution of the Grid Leak Problem

Here is what the "Daily Sketch" of Dec. 6, 1926, said about the Lotus Combination Grid Leak and Valve Holder as the solution of the problem of Grid Leak connections:—

"If there is any doubt in the matter, it is safe to adopt the habit of always taking the grid leak direct to L.T. positive. In fact, a valve holder, the Lotus, is now marketed, which incorporates a grid leak permanently connected between the grid and one of the filament terminals.

All the constructor has to do is to see that the correct side of the accumulator is connected to this particular terminal.

Since the Lotus valve holder is thoroughly sound from the anti-microphonic and every other point of view, it is distinctly a component to be recommended."

*Take the advice of independent experts—fit the Lotus Combination Grid Leak and Valve Holder and avoid difficulties*

FROM ALL RADIO DEALERS

# LOTUS

COMBINATION

## GRID LEAK

AND

## VALVE HOLDER

(ANTI-MICROPHONIC)



Made by the makers of the famous Lotus Vernier Coil Holders—

**GARNETT, WHITELEY & CO., LTD.**  
Lotus Works, Broadgreen Road, Liverpool

Valve Holder (without terminals) 2/3  
" " (with terminals) 2/6  
Combined Grid Leak and Valve Holder (with terminals) 3/9

# MARCONIPHONE

## IDEAL TRANSFORMERS

The remarkable amount of highest grade material in this Transformer makes it the most solidly constructed on the market. A scientifically built instrument of precision—10 per cent. of the cost of production being devoted to special test during each stage of manufacture. Every "Ideal" Transformer carries a year's unconditional guarantee of reliability and performance.

Four ratios: 2.7-1, 4-1, 6-1, 8-1

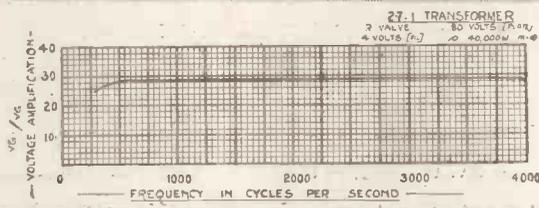
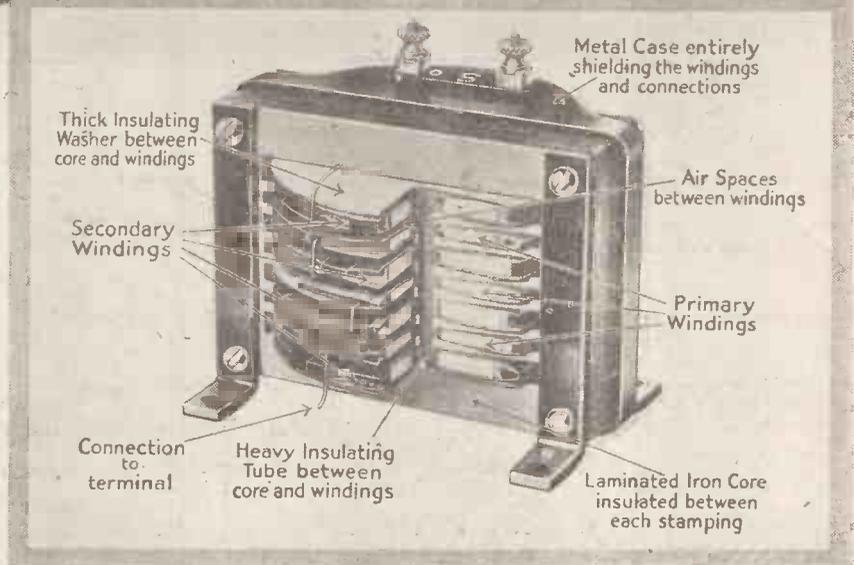
Price **25/-** each

**THE MARCONIPHONE COMPANY LIMITED**

Head Office:

210-212, Tottenham Court Road, London, W.1

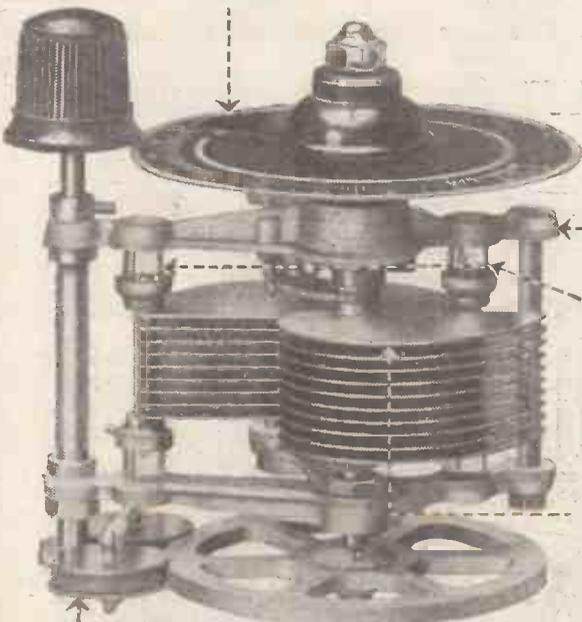
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Curve of Marconiphone "Ideal" (Type A.) Ratio 2.7 to 1.

Control Knob can be put in a variety of positions in regard to scale to unit design of set, hand-capacity effects minimized; hand does not obstruct view of moving pointer during manipulation.

Fixed Calibrated Dial and movable Pointer ensures ease of adjustment.



Low Loss End Plates of rib-like construction.

Pyrex Insulators do not attract or absorb moisture.

Moving Vanes attached to framework. Additional flexible connection ensuring perfect contact. Square Law formation. Simple to assemble in set. No side play.

Geared control situated away from calibrated dial. Velvet-like micrometer movement with total absence of Backlash. Geared 7-1. Silent in operation and undamageable through overturning.

# STERLING

SUPER QUALITY

## CONDENSERS

"MINILOSS" SQUARE LAW TYPE

The Sterling "Miniloss" Square Law Condenser is highly recommended for multi-stage, straight, and super heterodyne receivers. The same high standard of efficiency is noticeable throughout the complete range of Sterling Condensers.

In three capacities:

'00025 mfd. 14/-; '0005 mfd. 15/-; '001 mfd. 16/-

**THE MARCONIPHONE CO., LTD.**

Head Office: 210-212, Tottenham Court Road, W.1

Write for Publication No. 3649 for full particulars of all Marconiphone and Sterling instruments.



**STERLING FIXED CONDENSERS**  
'001 to '00025 mfd. 1/6



**STERLING MANSBRIDGE CONDENSERS**  
'01 to 10 mfd. 2/6 to 20/-

The most satisfactory  
source of H.T.  
in existence -

Exide H.T. Batteries retain their charge over long periods (even if partially run down) without injury or detriment.

They give a steady, even discharge, giving purity of reception against a dead silent background.

Exide H.T. Batteries are standardised by The Marconi-Phone Company.

Exide

TYPE

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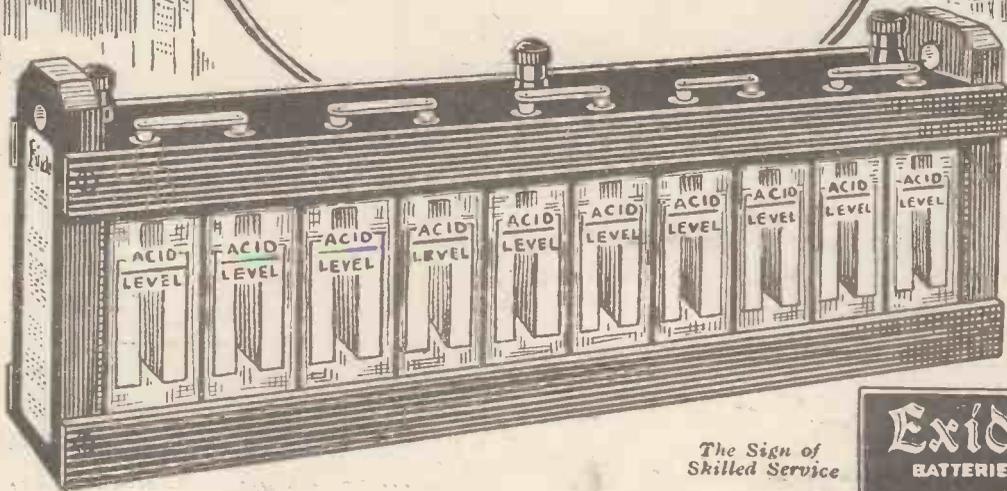
2500  
milli-amp. hrs.

15/-

per 20 volt  
unit.

Exide

THE LONG LIFE BATTERY



The Sign of  
Skilled Service

Exide

BATTERIES

SERVICE STATION



**PULLING TOGETHER**

ARE your valves pulling together? Individually, they may be excellent; but what of their collective efficiency? Co-operation is just as important in the functioning of a wireless set as in the winning of a boat race. If you are using valves which, however good in themselves, were not designed for group operation, then you are not getting the best out of your set. The two series of B.T.H. valves listed below have been designed expressly for group operation; the B5 group for 4 volt accumulators and the B4 group for 6 volt accumulators. The B5 and B4 valves are, of course, well known to be the most economical and efficient valves in their respective classes and for the specific purposes for which they were designed. But by themselves they were incomplete and did not fully satisfy the needs of the multi-valve user. Now that the B5H and B6 have been added to the B5, and the B4H to the B4, there are available two complete groups of valves which will meet every requirement of the 4 volt and 6 volt user. Either group, according to the voltage of your battery, will give you better results than any other similar combination of valves.

Valve	Purpose	Fil. Vts.	Fil. Amps.	Anode Vts.	Amplifn. Fact.	Impedance	Price
for 4v (B5H)	H.F.	2.8	0.06	40-120	17.5	55000 ohms	14 0
(B5)	Det.	2.8	0.06	20-80	7	17000 ohms	14 0
(B6)	Power L.F.	2.8	0.12	40-120	8	12000 ohms	18 6
for 6v (B4H)	H.F. & Det.	6	0.25	60-150	20	28000 ohms	14 0
(B4)	Power L.F.	6	0.25	40-120	6.5	6000 ohms	18 6



# RADIO VALVES

*Use B.T.H. Valves for efficient team work*

The above prices are applicable in Great Britain and Northern Ireland only.

THE BRITISH THOMSON-HOUSTON CO., LTD.



## THE DUMETOHM

A metallic Grid leak.

Superior to any other type.

The resistance remains constant.

It is silent in operation.

Used by the leading set makers of the world.

Fully guaranteed.

Made in resistances of 0.25, 0.5, 1, 1.5, 2, 3, 4 and 5 megohms.

Price 2/6 each.

Grid Leak Clips are also supplied separately for 3d. per pair.

Send to-day for our 28 pp. catalogue.

**DUBILIER**  
REGISTERED  TRADE MARK

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

M.C. 261

# Invaluable to EVERY Amateur and Constructor.

The "POPULAR WIRELESS"

## BLUE PRINTS of TESTED CIRCUITS

The following is a complete list of the "P.W." 6d. Blue Prints for Constructors, showing the different circuits available.

P.W. BLUE PRINT  
Number

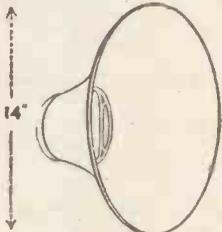
1. DETECTOR VALVE WITH REACTION.
2. UNIDYNE DETECTOR VALVE WITH REACTION.
3. 1-VALVE L.F. AMPLIFIER.
4. CRYSTAL DETECTOR WITH L.F. AMPLIFIER.
5. H.F. (Tuned Anode) AND CRYSTAL, WITH REACTION.
6. H.F. AND CRYSTAL. (Transformer Coupled, without Reaction).
7. 1-VALVE REFLEX WITH CRYSTAL DETECTOR (Tuned Anode).
8. 1-VALVE REFLEX AND CRYSTAL DETECTOR (Employing H.F. Transformer, without Reaction).
9. H.F. AND DETECTOR (Tuned Anode Coupling, with Reaction on Anode).
10. H.F. AND DETECTOR (Transformer Coupled, with Reaction).
11. DETECTOR AND L.F. (with Switch to Cut Out L.F. Valve).
12. DETECTOR AND L.F. UNIDYNE (with Switch to Cut Out L.F. Valve).
13. 2-VALVE REFLEX (Employing Valve Detector).
14. 2-VALVE L.F. AMPLIFIER (Transformer Coupled, with Switch to Cut Out Last Valve).
15. 2-VALVE L.F. AMPLIFIER (Transformer-Resistance Coupled, with Switch for Cutting Out Last Valve).
16. H.F. (Tuned Anode), CRYSTAL DETECTOR AND L.F. (with Switch for Last Valve).
17. CRYSTAL DETECTOR WITH TWO L.F. AMPLIFIERS (with Switching).
18. 1-VALVE REFLEX AND CRYSTAL DETECTOR, with 1-VALVE L.F. AMPLIFIER, Controlled by Switch.
19. H.F. DETECTOR AND L.F. (with Switch to Cut Out the Last Valve).
20. DETECTOR AND 2 L.F. AMPLIFIERS (with Switches for 1, 2, or 3 Valves).
21. THE 2-VALVE LODGE "N."
22. "THE GUARANTEED REFLEX."
23. THE 1-VALVE "CHITOS."
24. THE "SPANSACE THREE." Three-Valve Receiver employing 1 Neutralised H.F. Valve, Detector with Non-Radiating Reaction Control, and 1-L.F. Valve.
25. 2-VALVE REINARTZ (Det. and L.F.).
26. A "STRAIGHT" 4-VALVER (H.F., Det., and 2 L.F. with Switching).
27. A "MODERN WIRELESS" 4-VALVER (2 H.F., Det., and L.F.).
28. A "MODERN WIRELESS" 5-VALVER (H.F., Det., and 3 L.F.).

ALL "POPULAR WIRELESS"  
BLUE PRINTS—6d. EACH

All orders for these Blue Prints should be sent direct to the "Popular Wireless" Queries Department, Fleetway House, Farringdon Street, London, E.C.4, enclosing a stamped addressed envelope and a postal order for 6d. for each Blue Print Ordered.



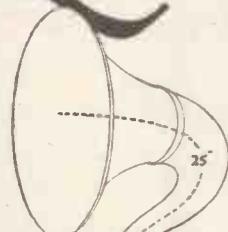
**The only full-sized, full-toned Loud-Speaker for £3**



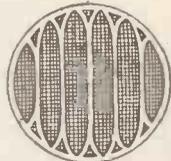
*The 14" flare gives a full, round tone.*

**T**HE B.T.H. C.2. Loud Speaker is an instrument which gives results unsurpassed by any other make. It will give faithful reproduction and a volume which will be a revelation to many listeners. Make a comparative test yourself by asking your dealer to let you listen to the C.2. and other instruments—whatever their price. The extraordinary performance of the C.2. is due to the care exercised in design and manufacture. Alongside are indicated a few of the points which make the C.2. the finest loud speaker of its kind—the only full-sized, full-toned instrument for £3.

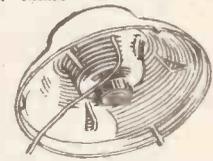
*The above price is applicable in Great Britain and Northern Ireland only*



*The length and special contour of the neck ensure maximum volume without distortion*



*The decorative grill considerably enhances the appearance without affecting volume or tone.*



*The base is made of Fabrolite, a special non-resonant material.*



**LOUD SPEAKERS**

**TYPE C2**

*Ample stocks available*

*The British Thomson-Houston Co. Ltd.*

# The new Cossor R.C. Valve brings you the realism of the Living Artiste



RADIO is now entering upon a new phase. Quality of reproduction is rightly being given pride of place. The chief responsibility for this has been the growing popularity of Choke or Resistance capacity amplification. Experts agree that Radio can now give a more truthful rendering of every note in the harmonic scale—from the deep fascinating rhythm of the lower octaves to the surprisingly sweet high notes. Until recently Choke or Resistance capacity coupling has been handicapped by the lack of suitable valves. But Cossor—by the introduction of wonderful new R.C. valves for 2 or 4 volt accumulators—is now supplying this vital need. The Cossor R.C. with an impedance of only 70,000 ohms., has the amazing amplification factor of 40—considerably higher than any other valve of similiar type. This remarkable efficiency is due to its Kalenised filament and its patented method of Co-axial mounting. Although only on the market a few weeks we have received many letters from users expressing astonishment at the rare beauty and mellowness of their reproduction. They say that they are now hearing instruments in the orchestra which they have never heard before. That from end to end of the scale the chords peal forth with a grandeur which is a revelation. Why not try out these new valves without delay—at one stroke you can abolish distortion and microphonic noises.

Without equal for richness of tone



**Next Week :**

Look out for our announcement of a remarkable series of Cossor 6-volt Valves. A type for every purpose. Every one fitted with a Kalenised filament & embodying Co-axial Mounting.

**Cossor Six-volt Valves**

Cossor Two Volt Valves		Cossor Four Volt Valves	
210H (Red Band) For H.F. use	- 14/-	410HF or Det. (Red Band). For H.F. or Detector use	- 14/-
210D (Black Band) Detector Valve	- 14/-	410RC (Blue Band) For Resistance or Choke Coupling	- 14/-
210RC (Blue Band) Resistance or Choke Coupling	- 14/-	410LF (Black Band) First 1st L.F. Stage	- 14/-
215P (Stentor Two) Power Valve	- 18/6	410P (Stentor Four) Super Power Valve	- 18/6

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## RADIO NOTES AND NEWS.

The "Wanderer"—A Futile Threat—Everything Changes—Another Station Closed—More "Talk"—Nothing is Perfect—"Pray be Seated"—The Lazy Listener—Sluggards, Awake!

### "The Wanderer."

SEVERAL of my friends seem to be getting good results from the 5-valver of the above name described in the February issue of "Modern Wireless," and it is certainly fully living up to its title. By the way, the little reminder underneath that amusing cartoon concerning "The Wanderer," in last week's "P.W.," should have referred to "Modern Wireless" instead of to our popular threepenny.

### A Futile Threat.

AN old "P.W." reader at Bath, in the last agonies of broadcast boredom, writes to inform me that if the programmes do not mend soon he will begin a "community howling" movement. Don't trouble. The B.B.C. will simply relay it as a stunt entitled, "Dawn in a Tropical Forest."

### Everything Changes.

SOMEONE has written an article in a scholastic magazine on "A Lay-out for a School." These experts can't let anything bide. There was only one lay-out for schools in my time—well over the desk, ankles together, hands clutching the next desk ahead.

### Another Station Closed.

LIKE Jo'burg, Antwerp has failed to grasp and apply the economic principles necessary for the successful running of broadcasting stations. "Radio-Zoologie"—queer name, eh?—shut down early this month. Probably they tried to feed the bassos on buns and the jazz-players on bananas and nuts, or perhaps a hyena concealed itself in the Chamber Musicians' cage. We shall never know.

### More "Talk."

A MISERABLE little man on the nine-fifteen "up" told us the other day that the advent of the "talking film" marks the destruction of his peace. It

A recent model of a "Standard" saloon has been specially fitted with a complete super-het outfit. The photographs show (left) the loud speaker fixed in the roof of the car, where it acts not only in its usual capacity, but also as a lamp-shade; and (below) the frame aerial and the receiver, fitted into the dashboard of the car.

appears that he goes to the "movies" as an escape from wireless "talks," he having taken up wireless as an escape from the noise of a parakeet which he bought to drown the din of his family discussing the "movies."

### Nothing Is Perfect.

ONE of the huge army of experts who write "wonderful wireless wrinkles" for the unsuspecting readers of provincial papers of the type of "The Mugworth and Piggery Parva Gazette and Gashuttle Weekly Recorder," states that "most trouble can be traced by means of a pair of headphones and an ordinary flash-lamp battery." This universal diagnoser, which I recommend specially in cases of "stolen aerial" and "valve-leg rickets," falls short at one important point. It is useless for *cherchez la femme*.

### "Pray be Seated."

IT is reported that the Passaic (U.S.A.) police are to be equipped personally with valve sets. The aerial is said to be woven in the sleeves of the tunic. I suppose the hip flask could act as a "capacity" earth. The valves are, I presume, to have rubber bulbs, thus enabling the officers to sit "safety first."

### The Lazy Listener.

SINCE that day when, for my sins and also for some bread-and-scrape, I became associated with radio, I have

(Continued on next page.)



## NOTES AND NEWS.

(Continued from previous page.)

been called many a breezy and joyous thing, but never before now have I been accused of laziness, though it would have been perfectly just, goodness knoweth. But now some heavyweight thinker says that broadcasting is "a stratagem for producing a monstrous national inactivity."

## Sluggards, Awake!

AS you will remark, to chew this chap up seriously is about as useful as putting on five stages of H.F., in order to get 2 L O in Haggerston. Yet I should like our friend, who evidently understands as much of wireless as of the meaning of words, to put up mast, stays, and aerial in a March wind; carry a 20 lb. accumulator a mile; bore a panel for an 8-valve set complete with gadgets-de-luxe; solder its connections; explain to his aunt all about amperes, and finally to consider how active was Newton while evolving the Law of Gravitation and the Laws of Motion.

## Constructive Criticism.

MY recent note about the first broadcast Rugby match has elicited from one of our staunchest supporters, W. C. (Homerton), the one, winged word, "Piffle." Constructive criticism like that makes the world go round. I am happy, however, to find that about this particular matter I did not piffle alone. Ah, well, W. C., we've broad backs in the Fleet, and you are within your rights.

## Why "Highbrow"?

THE very frequent use of the word "highbrow" is, in my opinion, giving a lot of people an estimate of their own intellectual powers much in excess of that to which they are entitled. In the mass they are no brainier than any other miscellaneous collection of people, probably less brainy.

## "Pose" and Perverted Taste.

A GREAT deal of their attitude towards music and literature is "pose," conscious or otherwise, and the rest is abnormality of the sort which is best kept out of jury-boxes—and advisory committees. The general public has not a very "advanced" taste in music and literature, but what it has is healthy and natural and I vote for it every time.

## The "Diggers" Score.

A PRETTY tale comes to me from New Zealand by courtesy of a reader. It seems that New Zealand listeners rely a lot on Australian stations, and so one evening 2 B L (Sydney, N.S.W.) announced that London would be "on the air" in a few minutes. Sure enough, the delighted All Blacks were then regaled with all kinds of glorious stuff from London, after which—bless their patriotic hearts, I say!—they hurled themselves in large numbers upon writing materials and told the Press about it.

## "All Blacks" Done Down.

IT is hardly credible that Sydney got away with this so magnificently, when one considers that the broadcast included the Lord Mayor's Show, a nightingale and donkey warbling at Shepherd's Bush, an

excerpt from the military tattoo at Wembley, and a news bulletin stating that it had stopped raining in Manchester for twenty three and a half minutes! The whole item was, in fact, a gramophone record, a burlesque of 2 L O broadcasting. I dread to think of New Zealand's revenge for this.

## Crystal DX.

"REGULAR reception of almost every main station within 1,000 miles." That is claimed for Mr. R. Burrell, of Willesden Green, by the use of the methods described by our Mr. J. F. Corrigan in his article in "P.W." No. 241. Oslo and Brussels are specified. These results are attributed in large measure to the "earth" used, which consists of eight copper plates, each a yard square, joined with half-inch copper rods, the lower edges of the plates being 8 ft. deep. The aerial has twenty-six insulators, and the "earth" runs the whole length of it. This is scientific work and I have my ear to the ground for further news.

## One-Way Electrons.

I READ in a well-known Sunday paper that, "Some people have a natural difficulty in accounting for the fact that electrons will readily enter a rubber-covered aerial and yet do not escape from it." I confess I am one of those persons, but I don't worry, because air and a motor-tyre behave just the same. *There's a reason.* The valve, of course. But what has the alleged one-way rubber-boring property of electrons got to do with aerials? Nothing whatever!

## SHORT WAVES.

A talk on "Bacon and Eggs" has been broadcast. Is the B.B.C. becoming rasher? —"Star."

B.B.C.'s New Studio. Height instead of floor space.—"East Anglian Daily Times." Isn't this rather a tall storey?

"Primroses now appearing," asserts a Nature writer. And soon, no doubt, we shall hear of the cuckoos running up and down the scale prior to their Spring broadcasting engagements.—"London Opinion."

"Wireless links," reads a headline in the "South Wales News." Many Froth-Blowers use other adjectives.

An increase of about a third of the nation's piano-playing is said to be due to broadcasting. It is only fair to admit that some people were against wireless from the start. —"Passing Show."

Flowers, fruit by wireless to all parts of the world in a few hours.—(Press Small Ad.)

What does it mean? Perhaps television will enable us to see a banana that has been wireless from America. Which makes me wonder how a banana will feel after such an experience. —"Daily Herald."

"Clockwork actors for broadcasting," says a heading. Haven't we enough already?

A military expert predicts that the next war will be fought by wireless. From what we heard the other night we had the impression that it had started.—"Punch."

Don't count your stations before they are caught. There's many a guy who's heard less than he thought.

Don't choke the man who sold you a dud set. Just ask him inside, and turn on the jet. Don't swallow the juice of a honeycomb coil. It will make you feel ill, and you'll have to take oil.

Don't live like a pirate without paying your fee. Pay up, look pleasant, and happy you'll be. —"S. African Wireless Weekly."

## The B.B.C. Pays Up.

THE Editor asks me to point out that the reference to the broadcasting of the Royal Command variety performance, on page 1481 of our February 19th issue, was written while the matter was still "sub judice." The B.B.C. have since stumped up the required fee, as has been widely reported in the daily Press.

## Here We Are Again!

THE same old error once more! The Minister of Posts and Telegraphs for the Union of South Africa, in what looks like the coroner's summing-up over the corpse of the Johannesburg station, is reported to have said of broadcasting, "A private profit-making control would be a retrogressive step." He is speaking of principles, not of the South African case in particular, and I venture to remark that he is simply playing parrot to the Home Government.

## State Control an Excuse.

TO suggest that state control of broadcasting in these islands is either necessary or desirable is to run counter to the general body of public opinion. The expansion of its importance by waiting to see if a thing is good and then grabbing it from private enterprise, is a favourite game of the Post Office—almost a departmental game—"state control" being merely an excuse for babes. This time next year we shall be able to see what state control has done which is good and which was not within the power of the B.B.C.

## Splendid Record.

WORKED out to two places of decimals the breakdowns of the 21 B.B.C. stations during 1926 seem even less appreciable than the actual times did to listeners. The average breakdown per station for a total annual transmission of 65,869 hours, was 0.07 per cent. Daventry, the busiest station, shows 0.09 per cent for 4,295 hours; London, 0.22 per cent for 3,471 hours. Cardiff was lowest with 0.001 per cent. Luckily for "state control" the Corporation is taking over the technical staff. I should like to see the German "breakdown" figures—the real ones.

## Get Rich by Radio.

YOU never know! Some wandering vein of gold may pass beneath your back garden. Mr. W. A. Sharpe's radio goldfinder would give you news of it. Mr. Sharpe hails from Denver, Colorado, and when he works his gadget over an unknown gold-mine it (the gadget) has fits. Scottish readers will doubtless acknowledge my self-restraint in ending this note here.

## We Live and Learn.

A SURVEY of the whole U.S.A. radio receiver distribution reveals the surprising fact that radio is more popular in large cities than in isolated districts. Communities of less than 1,000 population had sets installed in only 18.7 per cent of the homes, whereas towns of between 50,000 and 100,000 souls boasted radio in 26.6 per cent of their homes. Evidently whittling wood and scratching the old hog's back are still favourite pastimes in the back blocks of America. But the Ford car gets there; why not radio? (No prizes!)

ARIEL.

# HIGH-ANGLE RADIATION.

A new phase in the development of short-wave transmission.

By J. C. JEVONS.

IN spite of the extraordinary ranges that have been attained from time to time with non-directional low-powered sets working on short wave-lengths, it is well known that such signals are peculiarly liable to uncontrollable fluctuations in signal strength, due to fading. This, of course, makes it impossible to maintain reliable communication except during limited periods of the day or night.

For instance, transatlantic transmission on 100 metres has been found to give remarkably good results at night-time, but during the daylight hours the signals tend to become indistinguishable and at times cannot be heard at all.

By dropping the wave-length below 50 metres a better service can be maintained during a portion of the day, though the night signals fall short of reliability. On wave-lengths between 15 and 20 metres the fluctuation in signal strength becomes still more marked and uncertain.

layer, where they are reflected downwards to meet the earthbound waves.

Owing to the greater distance travelled by the space-waves, as compared with the earthbound waves, a phase difference may exist when the two combine. If the "skip" distance of the space waves is sufficient to introduce 180° phase difference, then one signal component will cancel the other, and total fading will occur at that particular locality.

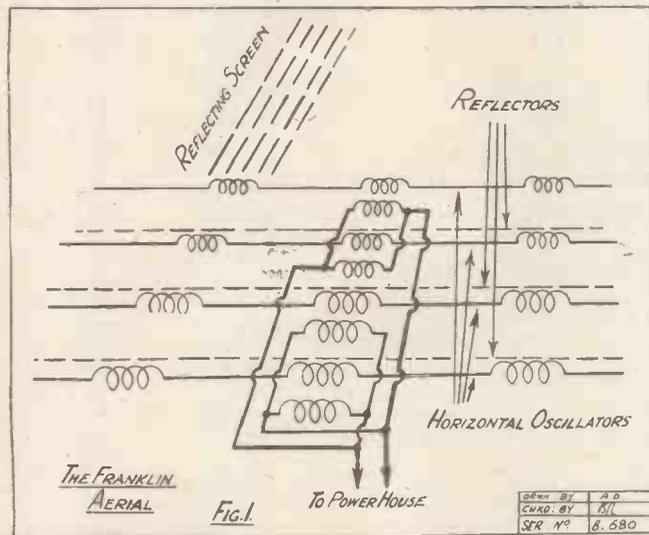
At other points the interference will be more or less pronounced, and may in certain instances give rise to a local increase in signal strength. In all cases, however, the combination of an earthbound

practically the whole of the radiated energy is projected upwards at a high angle to the horizon.

Another method consists in utilising a horizontal aerial having an overall dimension of half the radiated wave-length, the aerial being energised by a transmission line coupled to its centre.

## The Franklin Aerial.

A half-wave "doublet" of this form has the peculiar property of projecting two different types of radiation. At right angles to the direction of its length it radiates a horizontally polarised wave—as distinct from the vertically polarised wave



Within the last year or so, the technique of short-wave transmission has entered a new phase of development—the object of which is to produce a type of radiation which shall be free from fading irregularities.

The new methods are based partly upon the peculiar properties of polarised radiation, and partly upon the use of specially designed aerials which project the transmitted waves at a high angle to the horizon.

## Cause of Fading.

Extensive researches have led to the conclusion that fading is due, in part, to absorption losses suffered by the transmitted wave during reflection from the Heaviside layer. It is also due, in part, to interference between the earthbound waves—i.e. those which travel outwards from the aerial along the surface of the earth—and the "free" or space waves.

The latter are projected from the transmitting aerial at an angle to the horizon, and travel upwards and outwards in a straight line until they meet the Heaviside

wave and a reflected "space" wave is liable to result in interference and undesirable fluctuations of signal strength.

The ordinary type of aerial normally radiates both free and earthbound waves, the proportion of the former increasing as the transmitted wave-length is shortened. As regards the earthbound component of short-wave radiation, this is known to suffer a high degree of attenuation. It is therefore of comparatively little use for long-range work.

Attention has accordingly been concentrated on the problem of increasing the proportion of "space" waves and of decreasing or eliminating the earthbound radiation.

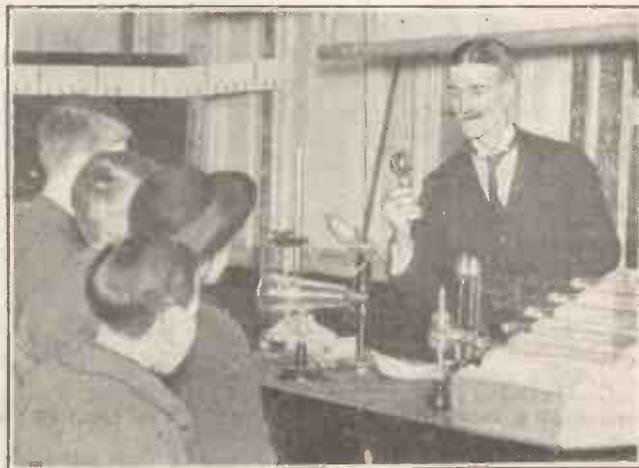
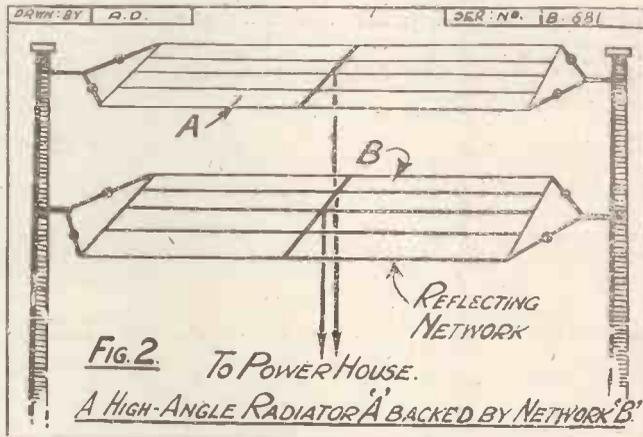
One method of securing this result is to energise a straight, vertical aerial so that it oscillates at a harmonic of its fundamental frequency. In other words, instead of causing it to emit waves approximately four and a half times its effective height, it is made to radiate waves of one-third, one-fifth, or one-seventh this size. Under these conditions it is found that

radiated from the ordinary upright aerial—whilst in the direction of its length it sends out a vertically polarised wave projected upwards at a high angle to the horizon.

A horizontal bank of high-angle radiators, due to Mr. C. S. Franklin, is shown in Fig. 1. Each of the separate aerials is energised centrally by a system of feeder cables from the power house. The main radiation from such a system is a vertically directed beam.

A reflecting network of "idle" wires may be located below the aerial proper, as indicated in dotted lines, in order to strengthen the vertical beam. Or the radiation can be diverted to any desired vertical angle, or even converted into a horizontal beam by means of similar reflecting networks placed at a suitable angle above.

(Continued on next page.)



Professor Charles Darling demonstrating the operation of the wireless valve at a recent lecture for children.

# “ VARIABLE ”

The story of an amusing experience that recently befell one of our readers.  
By D. S. LYNDON.

OF late there has been so much written in praise of the efficiency of the modern girl in business that my experience of a day or two ago was certainly amusing, to say the least.

I wanted a 100,000 ohm variable resistance. I said so to the lady shop assistant, simultaneously fumbling in my pocket for half-a-crown. My home-bus was due in four minutes.

“A hundred thousand homes?” she repeated.

“Please,” said I crisply.

“Yes—ah, here we are.”

She turned from the shelf and produced a box of—fixed grid-leaks!

“One and three,” quoth she. “Anything else, please?”

“I want a variable resistance, please,” I said firmly, with one eye on the door, “of a lower value than these.”

She readjusted her hair-slide.

“You mean cheaper?” she queried. “I’m afraid these are the cheapest we—”

Perspiration broke out on my forehead. “These are two million ohms,” I said with desperate calmness. “The ones I

mean are exactly one-twentieth of that amount, and variable. Variable.”

“Oh, I know,” she said, “with knobs.” I stared. She was perfectly serious, however.

“Yes, please,” I agreed patiently, “with knobs.”

While she was waiting for her colleague to finish with the step-ladder, my bus passed the shop with a derisive toot and a snort, homeward bound. Half an hour to wait now.

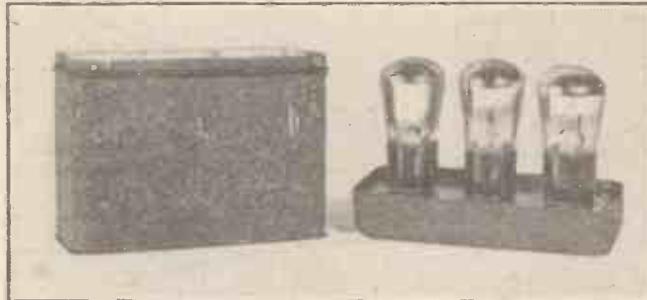
## Further Surprises.

My saleswoman lugged the ladder to the far end of the shop, took down a box containing smaller boxes, opened one of the smaller boxes, and submitted for my inspection—a microstat!

“These are two-and-nine,” she remarked brightly.

“It doesn’t matter now, thanks,” I gasped. “I’ll leave it till some other time. A yard of twin flex, please.”

She gave me a withering glare as she wrapped up a yard of *systoflex*.



A recently developed German 3-valve amplifier which is completely sealed up and contained in a metal case.

## HIGH-ANGLE RADIATION.

(Continued from previous page.)

Another type of aerial for producing high-angle radiation is shown in Fig. 2. Here the oscillating network A is supported by masts at a considerable distance above

moment, so that there is no effective radiation from this part of the system.

In the upper network a double stationary-wave system is set up, one component of which extends from A to B, whilst the other is propagated from the front to the back of the network. The resultant “free” radiation is projected upwards, in the form of a pencil inclined at an angle to the vertical, as indicated by the shaded area.

Another innovation is the so-called series-tuned horizontal loop, as used by Pickard and Alexanderson in their recent experiments on horizontally polarised waves.

As shown diagrammatically in Fig. 4, four antennæ are arranged to form a horizontal loop, which is energised by a pair of vertical non-radi-

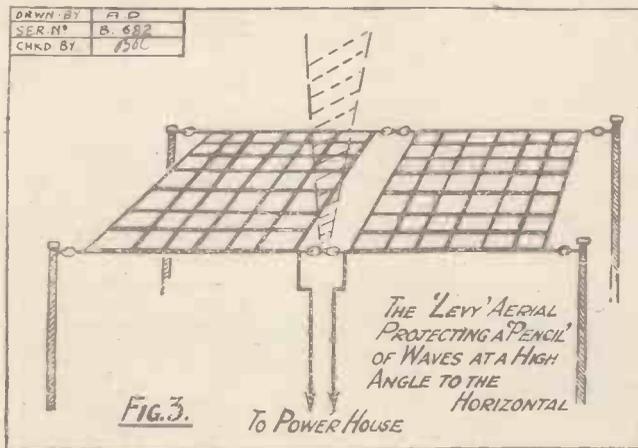
ating station, the corresponding magnetic field being mainly confined to the tuning coils. In the aerial shown in Fig. 4 the converse is the case. A spreading magnetic field is set up around the extended loop, whilst the static field is stored up in tuning condensers inserted at regular intervals around the loop.

The main field of the horizontally polarised radiation from such a system is projected broadside to the length of the loop.

## Future Possibilities.

Whilst the precise reason is still a matter of some controversy, practical tests have shown that a horizontally polarised wave suffers less loss during reflection from the Heaviside layer than the ordinary vertically polarised type of wave, and for this reason is better adapted to ensure reliable long-range communication.

It may, therefore, be quite within the bounds of possibility that before very long really reliable communication on the short waves will be practicable, irrespective of time or atmospheric conditions.



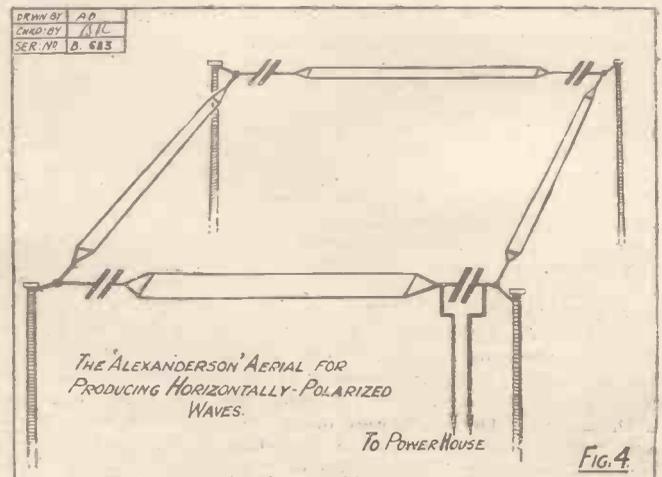
ground, and is backed by counterpoise or reflector wires B, so that the radiated waves are concentrated in the vertical direction.

## Recent Developments.

A somewhat similar form of high-angle aerial, designed by the well-known French inventor, M. Lucien Levy, is shown in Fig. 3. It consists of a horizontal network mounted at a considerable height above the ground and energised by two central leads. The currents in the vertical leads flow in opposite directions at any given

ating feeders, as in Fig. 3. This type of aerial emits a horizontally polarised wave—i.e. one in which the electric vector is in the horizontal plane whilst the magnetic vector is vertical.

The ordinary vertical aerial creates an electrostatic field around the transmit-





# The 'Terra Firma' Three

In this article Mr. Dowding deals with a logical development of coil screening which commenced to develop before coil-screening became popular! We are not quite sure how seriously the author wishes us to take him in this instance, but no doubt individual readers will form their own conclusions.

By G. V. DOWDING, Grad.I.E.E.  
(Technical Editor.)

It is a strange fact that, although generally speaking I am not too much in favour of screened coils, I was probably first in the radio field with a totally screened coil! Not that I reckon that much honour attaches to this, because, after all, sticking a coil in a metal box is an obvious sort of thing to do and a thing that someone is

Perhaps some of my readers will remember that article, but for the benefit of those who do not, and for those who did not read it, I will briefly describe the device which formed the object of the experiments and how it was used. A coil was enclosed in a metal—well, it was a screened coil, and the popularity recently achieved by screened coils has familiarised most amateurs with their construction.

In the most interesting experiment this screened coil was buried just below the surface of the ground. Thus its casing acted both as a screen and as the main earth connection. I argued that to take the principle of the screen to its logical limit this was the ideal way to use it. Fig. 1 shows how the coil was connected when used for aerial tuning. The aerial down-lead was taken straight down to the coil in the ground. A "lateral" connection was taken from the aerial lead to one side of a variable condenser, the other terminal of this being connected either to another direct earth or to the casing of the coil.

### A Novel Scheme.

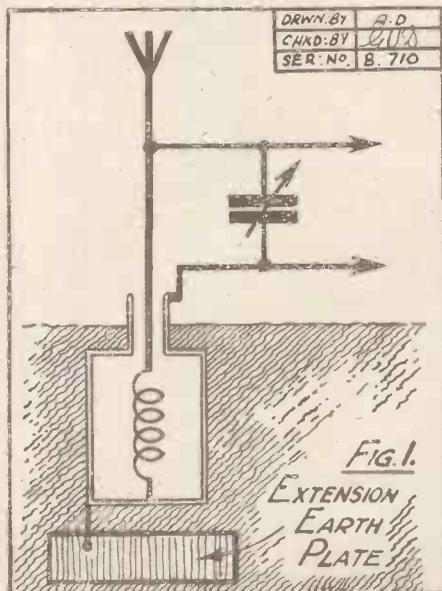
Of course, the set did not have to be outside and on the ground. This was quite unnecessary. As was pointed out at the time, the set could be in an upper room in the house if desired, one wire being joined to the aerial down lead at a convenient point and another being taken to a handy water pipe if one such should happen to be available (Fig. 1A).

With all due modesty I claim that this was a rather novel scheme, and I can add that very good results were obtained. Obviously it would have been difficult to have improved on the screening; and, in the case of a valve set, the only possible coupling that could have existed between the grid circuit of the first valve and its anode circuit or other anode or grid circuits was a capacitive one if the apparatus had been carefully arranged. And the capacitive coupling introduced by the electrodes of the valves could have been neutralised!

But most of the experiments were carried out with a crystal detector, and some very strange effects were observed. As far as I remember, the outstanding feature was a reduction of static interference during quite considerable atmospheric storms. Also signals were decidedly stronger. At the

time I tentatively advanced the suggestion that it was possible that a considerable amount of energy was picked up from the earth itself, and in view of the undoubted efficiency of Dr. Rogers' underground aerial system this appeared to be quite feasible. For this reason I gave the name of "Inductive Earth" to the scheme.

Before we leave the subject of this early screened coil, I would like to add that subsequent to the publication of the previously mentioned article I tried the effect of an extension earth plate as shown in Fig. 1. A large plate of metal was buried very deeply, and this was connected by a thick wire to the bottom of the screened coil. The object of this extension plate was to

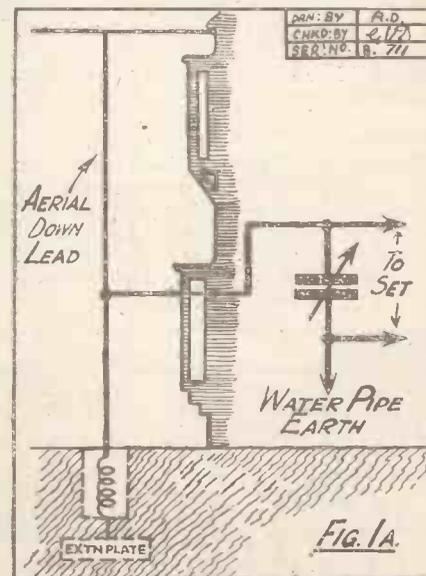


A very well-and-truly "grounded" screened tuning coil.

bound to do sooner or later. However, don't imagine that I desire to belittle the value of the research work of those technicians who have devoted themselves to the study of screened coils. I am merely referring to the bare principle of the scheme and not its scientific development.

### Early Screened Coil Experiments.

Some years ago I spent a great deal of time experimenting with screened coils, and, taking the idea to its extremes, I went as far as burying the coil and its screening case in the ground. The results were interesting, and were in part described in an article which appeared in "P.W." two or three years ago.



Semi-pictorially illustrating how the novel scheme indicated in Fig. 1 can actually be brought into practice.

obtain a really efficient earth connection, yet without leaving the coil with more than an inch or two of earth above it. The connecting wire (one only was needed, as the other coil connection was joined to the metal casing) then merely had to pass

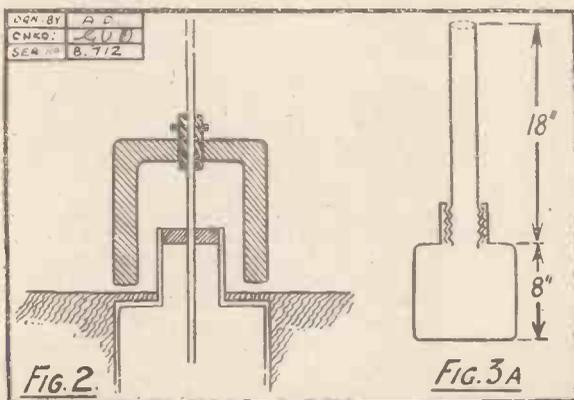
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# THE "TERRA FIRMA" THREE.

(Continued from previous page.)

through the centre of but a few inches of wide metal tubing.

I really forget what sort of weather protection I adopted, but some form of double cowl which could be slipped up the wire to allow access to the top of the tube for cleaning purposes would have been O.K. (See Fig. 2). I do remember, though, that I built a wooden box around the top of the coil, for I recollect laughingly pointing to this and saying to a friend, "Here lies buried an immortal coil!" And in a sense I suppose there was just a tiny bit of truth in that jesting remark. And, by the way, I believe there is still one of those original screened coils (75 turns on a 2-in. former enclosed within a large, round cocoa tin)



Details of the screening cases used in the "Terra Firma" Three.

buried in my garden. I must dig around and see if I can find it. It should form an interesting relic!

### A "Well-Earthed" Set.

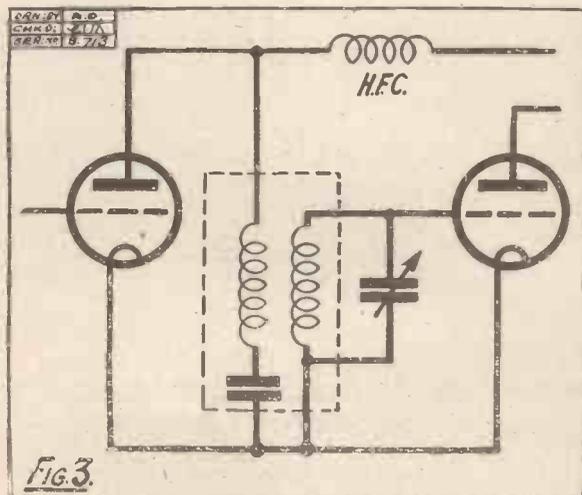
Now, quite recently, I had my garage flooring repaired. My garage is quite a large affair, and as it has a number of windows and contains several benches I carry out a fair amount of radio work in it during the summer. Anyhow, while watch-

ing these repairs being made, memories of my earthed screened coils flashed across my mind. Probably the train of thought was set in motion by seeing a number of tins (oil) and earth (brown) in close proximity! And just as an interesting experiment I thought I would assemble a multivalve receiver on the garage floor, using buried screened coils. A wild sort of idea you might say, and perhaps add, one of no great practical value. And perhaps you would be quite right. But there, you need not fear that I am going to advocate the universal construction of sets on the floor—and ground floors at that! I am merely going to relate how

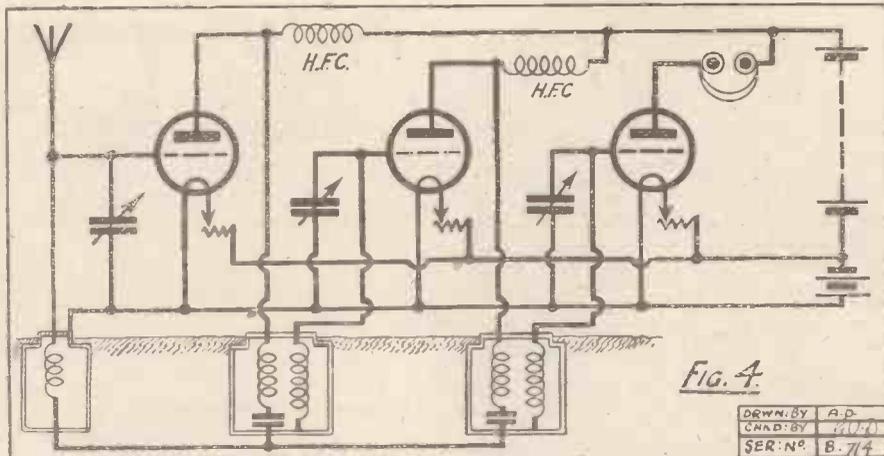
I passed away a rainy Saturday afternoon. It was certainly quite an entertaining experiment.

The method of coupling the H.F. stages of my "Terra Firma" Three was as shown in Fig. 3. The H.T. was by-passed or shunted and the "parallel-feed" system introduced.

Each of the two screened H.F. transformers consisted of two windings wound on a common cylindrical former, a small fixed condenser being included in each casing and connected as indicated in the diagrams (Figs. 3 and 4). The screened aerial coil was similar in design to the original screened



The method of H.F. interstage coupling adopted.

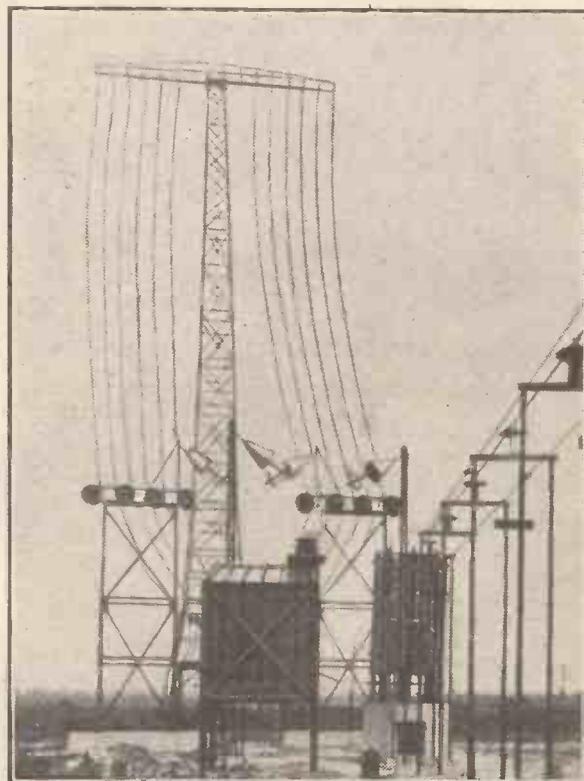


This diagram shows the full circuit of the "Terra Firma" Three.

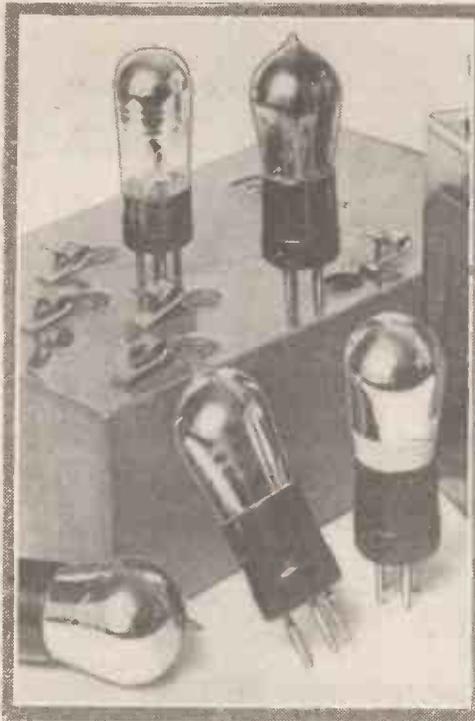
single coil. The leads passed through holes drilled through large waxed wood stoppers. The screens were tins requisitioned from the domestic quarters. The final "hook up" (or should it be "hook down"?) was as shown in Fig. 4. An extension earth plate was not used, as time did not permit of digging a deep hole.

### A Temporary Aerial.

The set worked very well indeed, and without neutrodyning was remarkably stable, even with the grid circuits connected to L.T. minus. But the aerial was not a good one—it was a temporary affair only 10 ft. long and 15 ft. or so high. A better aerial is usually available, but at the time this was hors-de-combat, a new pole being in the course of erection. Therefore, I was, and am still, quite unable to gauge the true sensitivity of the arrangement.



The transmitting aerial at Rocky Point, Maine, U.S.A., used for the transatlantic telephone service with Rugby.



# UTILISING BURNT-OUT VALVES

By O. J. RANKIN.

a selection of ideas which may be helpful. Owing to the liberal use of photographs, details of the various devices are somewhat brief.

The idea, of course, is to make some useful component utilising all four pins, and mount same on the valve base so that it can be plugged into a standard valve holder. The first thing which suggests itself is an H.F. plug-in transformer; this may be wound on a grooved ebonite disc, on a slotted card, or arranged as two small basket coils, the method of mounting, in either case, being as indicated in Fig. 1, where a piece of a bone knitting needle is threaded at both ends (with an adjustable die, taking at least six

of course, brought down over the outside of the cup. Use No. 36 D.C.C. Eureka wire, and cover the winding with Empire tape.

THE base of a broken valve—a mere cap with four accurately spaced pins—is well worth saving, for at some time or other it may prove to be a very useful gadget. It may be, to some, a painful reminder of a certain hectic moment, but the live experimenter does not regard it as a monument to his folly; he finds some practical use for it, and thus the tragic past is soon forgotten. There is something almost inhuman about the base of a broken valve; bury it amongst other debris in the scrap-box, and it will always come to the top, imploring you to make some further use of it. That new gadget of yours, and the problem of mounting it. Glance in the direction of the valve base and you can almost see the four legs struggling in an effort to help you.

### Many Different Uses.

I have discovered, from time to time, many different uses for these idle legs, and for the benefit of all experimenters I present

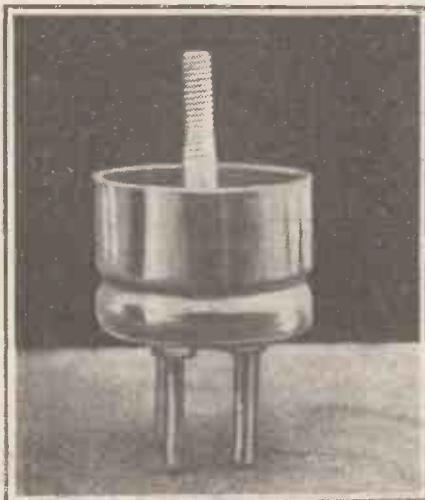


Fig. 1. Preparing the holder.

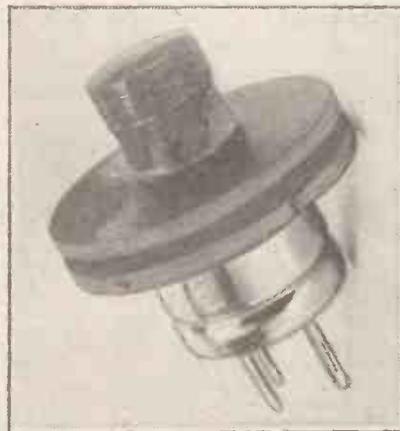


Fig. 2. The complete H.F. transformer.

cuts) and screwed into the exact centre of the ebonite base to form a stud. The transformer is then clamped to the top of the cup by means of an ebonite knob (see Fig. 2), the ends of the windings being taken down inside the cup, passed through small holes in the base, and clamped firmly under the shoulders of the pins.

### Aperiodic Coupling.

The method of bringing out the wires is shown in Fig. 3, where the cup is fitted with two tightly coupled card inductances. Fig. 4 shows an aperiodic H.F. transformer, the resistance wire (one turn per metre of wave-length for both primary and secondary) being wound on a round wooden former, about 4 in. long, which is attached to the inside of the cup by means of wood screws. In this case the connections to the pins (A1 in Fig. 9) are,

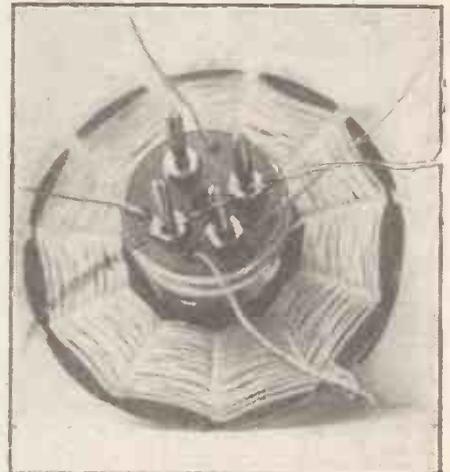


Fig. 3. Showing how the leads are arranged.

A tapped H.F. choke coil (A2 in Fig. 9) may be arranged in the same manner. Use No. 40 D.C.C. copper wire, and insulate each layer with thin waxed paper. Tap off at the 200th, 250th, and 300th turns, and

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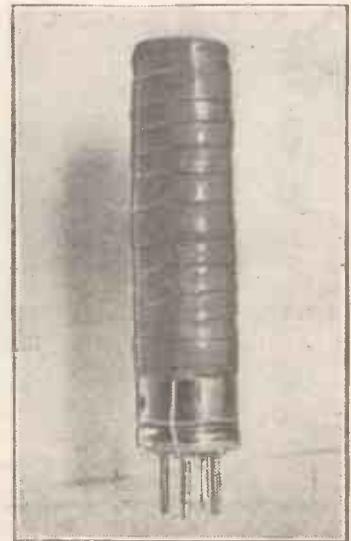


Fig. 4. An aperiodic H.F. transformer.

## UTILISING BURNT-OUT VALVES.

(Continued from previous page)

use a length of flex, with spade, for selecting the points on the valve holder. (Filament or grid terminals.)

Switching arrangements are somewhat limited, owing to the fact that the pins can only be placed in one definite position. The examples shown may be found worth while. Connect the two filament pins together, also the plate and grid pins (B1, Fig. 5), and wire

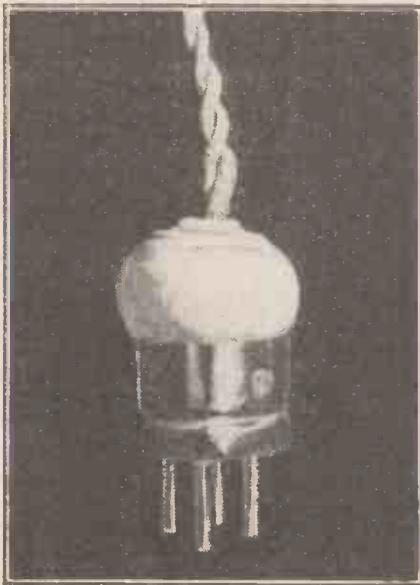


Fig. 5. A combined 'phone and L.T. plug.

the holder as at B2. The result is a simple plug switch for controlling the L.T. and H.T. battery current. Connect the plate and grid pins together, join a length of twin flex to the filament pins (C1), and connect the 'phones to the other end of the flex. Wire the holder as at C2, and we get a combined 'phone plug and battery switch, the battery current being switched on simultaneously

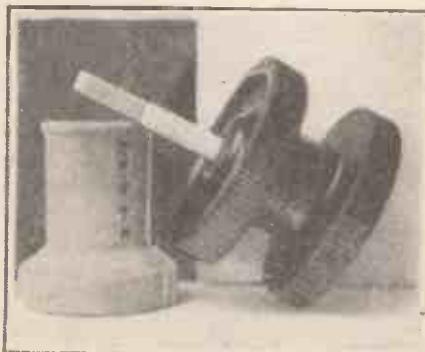


Fig. 6. Commencing another form of aperiodic H.F. transformer.

with the plugging in of the 'phones. Connect the holder, as at D, to the existing battery terminals of the set; connect the grid and plate pins to the accumulator via two lengths of single flex, and similarly connect the H.T. battery to the filament pins. We may now

switch on both batteries by simply inserting the plug. Take great care in making the connections, and use indicating tags as shown. To make a neat job pass a length

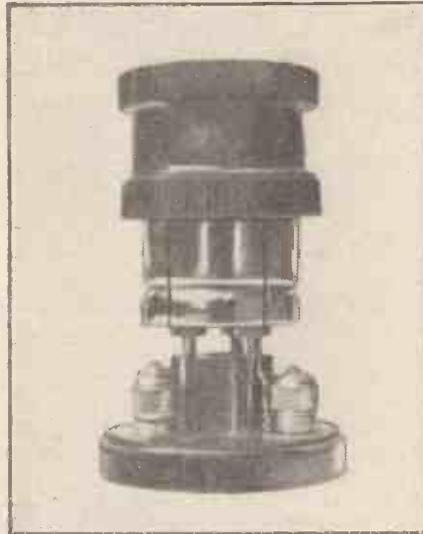


Fig. 7. The finished transformer.

of rubber tubing over the four leads. Fig. 5 shows the plug wired for the C1-C2 arrangement. The top portion is an ordinary hard-wood lamp-plug, minus pins and body, the threaded part being cut off and screwed to a wooden disc fitting the cup.

### Another H.F. Transformer.

Fig. 6 shows the two formers required for making (A) a more compact form of aperiodic H.F. transformer (Fig. 7), and (B) a tapped fixed resistor (Fig. 8). The first-mentioned consists of two large ebonite

knobs, and a length of screwed bone rod, one knob being drilled through the centre and driven on to the rod, and the other screwed firmly to one end of the rod so that both lugs meet. The other end of the rod is then screwed well into the base of the cup, and the ends of the windings connected as shown in Fig. 4. Should it be desired to pass the connecting wires down inside the cup, the two knobs must be otherwise attached, and the rod arranged as an independent stud, as in Fig. 1.

### A Useful Resistor.

The former for the tapped resistor (Fig. 8) consists of a wooden cotton reel which is cut to the form shown on the left of Fig. 6,

(Continued on next page.)

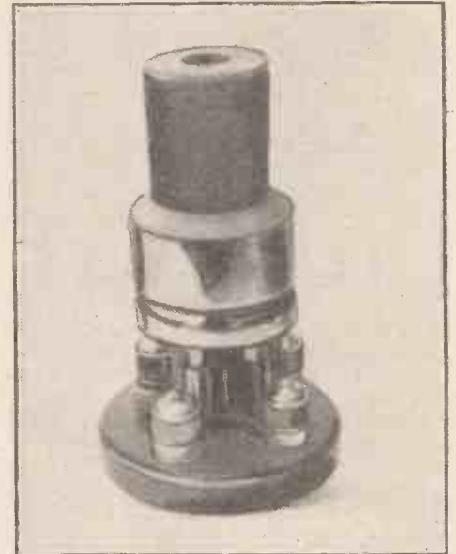


Fig. 8. A useful tapped fixed resistor.

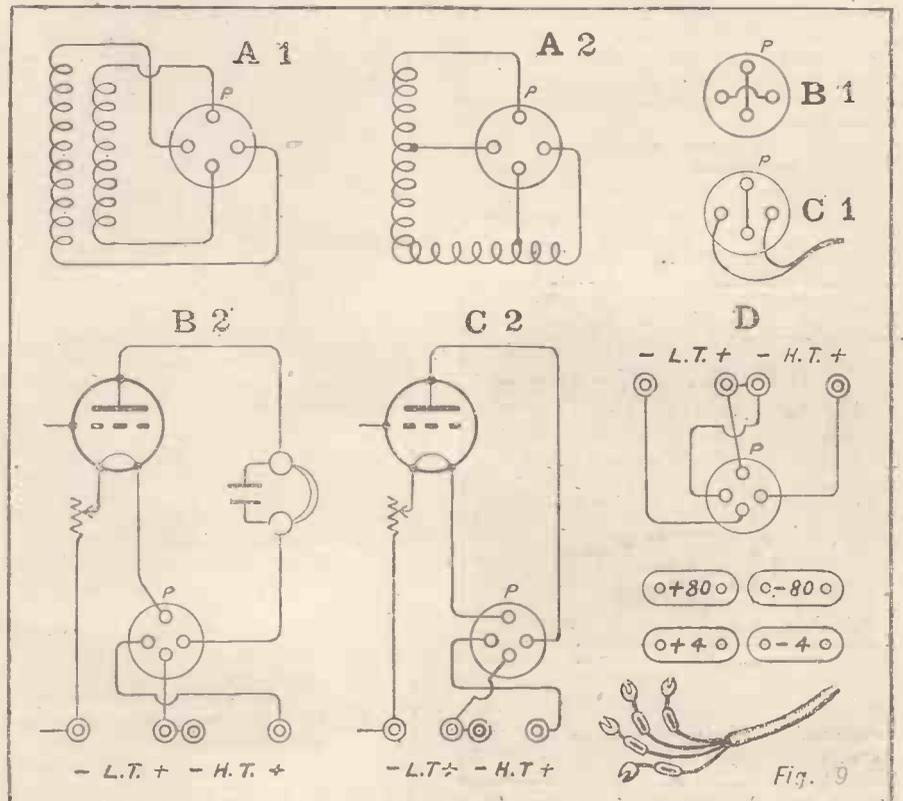


Fig. 9

## UTILISING BURNT-OUT VALVES.

(Continued from previous page.)

one flange being almost completely sawn off, so as to form a small ridge, and the other rasped and filed to fit into the top of

flexible lead and a spade. The same type of former may be used for winding a multi-resistor for a two-valve set; simply connect the pins as at B1. If then both resistances are connected to L.T. negative, connect the holder as at B2, but if one resistance is connected to L.T. positive, join the plate terminal to negative and the left-hand filament terminal to positive, or vice versa, to conform with requirements. In any case make a rough diagram of the pin connections, and keep same as a wiring guide.

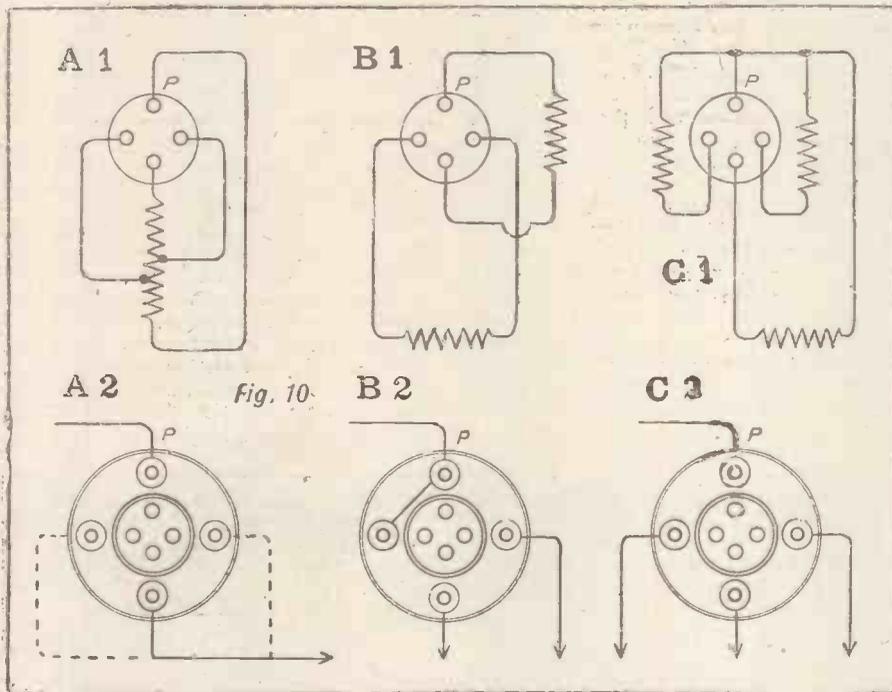


Fig. 10.

the cup. Small holes are then drilled in the body, so that the tappings and ends may be passed through same, down the centre of the reel, and joined to the pins. The lower flange is then screwed to the cup, and the winding covered with American cloth. The pin connections are shown at A1 in Fig. 10, the beginning of the winding being

Figs. 11 and 12 show top and side views of a multi-resistor for a three-valve set requiring all three resistances in the same L.T. lead, the wiring of the pins and holder

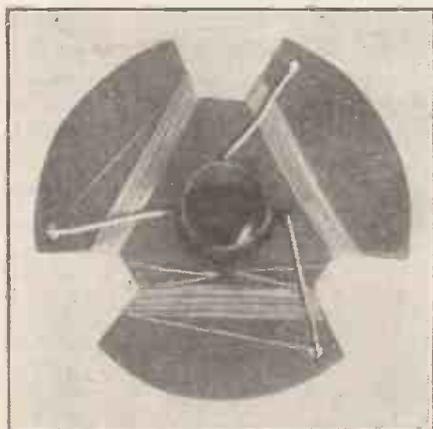


Fig. 11. The filament resistor from above, showing the way the wire is wound.

connected to the plate pin, as in further examples. Connect the holder as at A2 (Fig. 10) so that the different resistance values may be selected by means of a



Fig. 12. Side view of the resistor.

being shown at C1 and C2 in Fig. 10. Cut out a sheet fibre disc, about 2½ in. in diameter by ¼ in. in thickness, and form three recesses, each about ½ in. deep, as shown in Fig. 11. Drill a hole through the centre to clear the bone stud; drill four small holes round same, and drill a small hole in one corner of each wing and wind as shown in photos and D1 of Fig. 13.

For a four-valve set we may use a four-slot former in conjunction with a four-pin holder (Fig. 13). In the example given at D in Fig. 13, only the beginnings of the resistance windings go to the pins, the ends being connected to small terminals mounted on the former. Each wing is wound as shown at D1, so that if all resistances are placed in the same L.T. lead, the holder is simply connected as at D2, or if one resistance is required in the positive lead, as at D3, the valves being always connected to the terminals on the former.

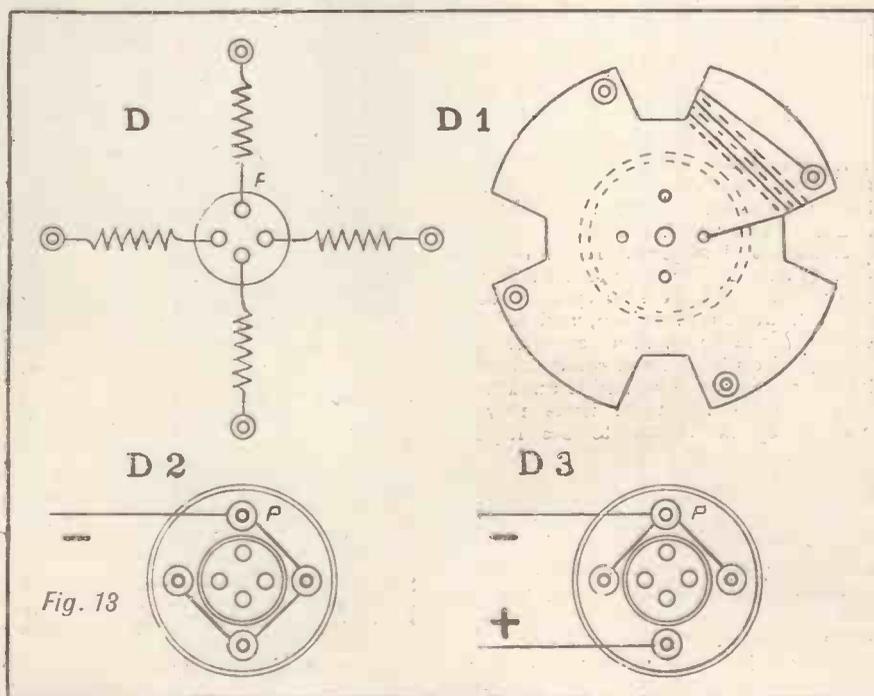


Fig. 13

# TECHNICAL NOTES.

A Weekly Feature Conducted by

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

## H.F. Components.

**D**URING the last year or two quite a number of valves have been patented, some of which have found their way on to the market, in which an attempt has been made to introduce some H.F. components inside the glass bulb and in very close proximity with the electrodes. There are certain important advantages to be gained placing the H.F. coils (for example) in very close juxtaposition with the H.F. valve electrodes, one of which is that external connections are largely avoided, and consequently a reduction is effected in the distortion which is sometimes due to the impedance and capacity of such leads. An incidental advantage is that this form of construction permits of a much greater compactness in the lay-out of the components.

One of the most interesting of such valves is that recently invented by Mr. F. S. McCullough, the well-known U.S. radio engineer. In his apparatus the H.F. coils are supported upon two wire pillars, these being, in fact, prolongations of the supports of the anode. One coil has one end connected to the anode, and the other end to an additional leading-out wire from the valve. The other coil has one end connected to the filament and the other end to another leading-out wire. There is no leading-out wire connecting directly to the anode, the connection to the anode passing through one of the H.F. coils in the usual way. Readers interested in this valve will find it described in American Patent No. 1,528,735.

## Volume Control.

There are various ways of controlling the quality and volume of the output from the loud speaker, one very simple method, and one which is now quite largely used, being to shunt a damping resistance across the secondary of one of the L.F. transformers. This resistance should be variable and should be of such a value that there is no loss of volume when the resistance is adjusted to the maximum. A general all-round maximum value will be in the region of  $\frac{1}{2}$  megohm to 1 megohm. It will be found that by reducing the value of this resistance the volume from the loud speaker will be reduced, without distortion, and in some cases this will be found a very convenient method of control. Loud orchestral items, for example, may be reduced to comfortable volume, while individual items may be brought up in volume to the required strength.

If two L.F. transformers are used, it will generally be found preferable to connect the resistance across the secondary of the second transformer, but it may, if desired, be connected across the secondary of the first transformer.

## Panel Shields.

I notice that metal panels are coming very strongly into favour in the United

States, some of the manufacturers of complete sets now standardising on metal panels instead of ebonite or bakelite. I saw in one of the American journals recently an advertisement for etched metal panels of beautiful appearance. According to the claims of the manufacturers these metal panels, when used with proper insulating bushes (the panels are already drilled, and the bushes are supplied with them) are found to be quite as efficient as ebonite panels whilst, of course, having the great additional advantage that they help to shield the set from interference and at the same time minimise "body capacity" effects. They have the incidental manipulative advantages that they do not break, split, or warp, and from the point of view of appearance they can undoubtedly be produced in most beautiful designs and finishes to harmonise with any style of cabinet work.



Some of the crew of the "Royal Sovereign" lightship enjoying a few items from 5 X X before "turning-in."

## A Useful Connector.

I recently had a little connector sent to me which, although only one of a great variety of such devices, struck me as being cheap and effective; it was for the purpose of enabling a number of pairs of telephones to be connected simultaneously to a set. The connector is a small piece of brass sheet, about the size of a half-crown, with a slot in it, similar to the slot of a spade terminal, by means of which it could be introduced under the head of the terminal of the set. One of these connectors is, of course, required for each of the output terminals of

the receiver. On one surface of the connector are secured a number of valve sockets (that is, the individual sockets, four of which are used in an ordinary valve holder). Valve pins are soldered to the tags of the telephone cords and it is then a simple matter to insert the valve pins into the sockets on the connectors. In the particular sample sent to me there were five sockets on each connector, so that five pairs of 'phones could be connected in simultaneously.

## S.L.F. Mathematics.

As you know, the straight-line frequency and straight-line-wave-length characteristics of the modern radio variable condenser are usually obtained by giving the vanes a special contour and, of course, the contour of the moving vanes depends upon that of the fixed ones. During the past year or two a number of ingenious shapes have been evolved and particular advantages are claimed for the various details.

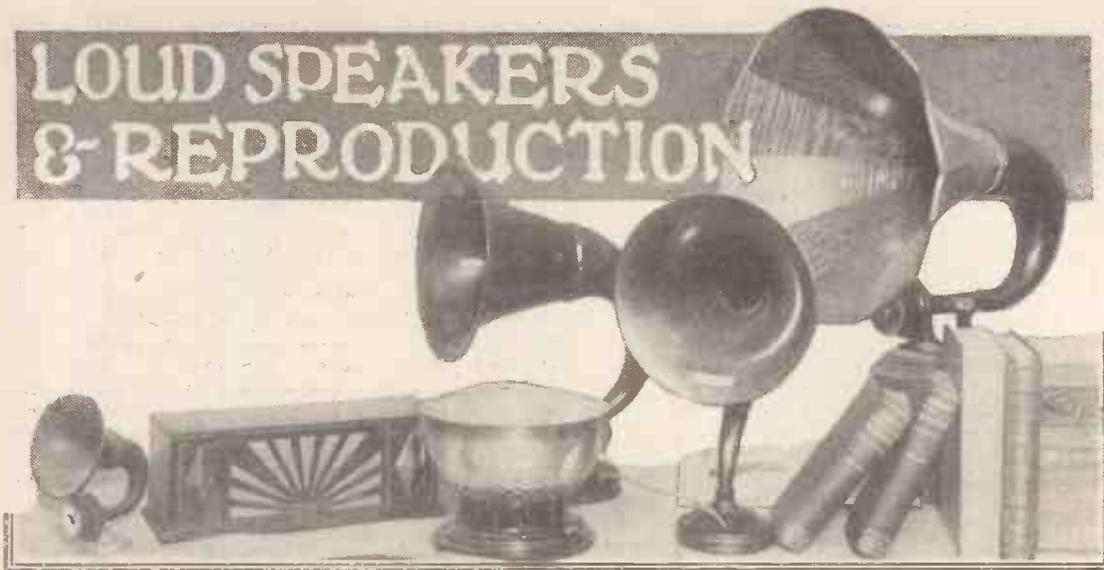
The calculation of the shape of the vanes for S.L.F. and S.L.W. readings is a matter involving an amount of mathematics which is rather beyond the average reader of a popular journal. Those readers who take a serious interest in this particular subject, however, will find an interesting paper on simplified S.L.F. and S.L.W. design in the current issue of the "Journal of the Institute of Radio Engineers."

## An Adjustable Transformer.

Owing to the different impedances of different types of valves, and to the desirability of having the L.F. transformer impedance of a valve suited to the valve with which the transformer is being used, there is a tendency lately to use transformers with tapped primary and secondary, or transformers in which some provision is made for the inductance to be varied. A transformer with an adjustable magnetic circuit was described by the writer in this Journal some time ago. An interesting type

(Continued on page 1559.)

# LOUD SPEAKERS & REPRODUCTION



the best, to resonate badly at one particular set of frequencies, or, if he is very lucky, he may obtain an output that is relatively free from distortion. If he does this, however, the mere fact of the great volume he is obtaining will cause many a listener to declare that his set, or loud speaker, is distorting badly. Surely it stands to reason that if, in a fairly small closed room, the announcer's voice is brought up to about three times "life size," it cannot possibly sound natural. It is not often possible to

**A**LTHOUGH we are safely past the benighted days in which it was common to regard a good loud speaker as on a par with a bad gramophone, one hears, only too often, the owner of a powerful receiver and loud speaker turning out "music" which would cause any real musician's hair to stand on end.

Very often this is due to a desire to "show off" by pushing a set to its limit, simply in a thirst for sheer volume. On quite a number of occasions, however, it is due to the ignorance of the owner of the set, and could probably be remedied in half an hour by an expert:

### A "Satisfactory Receiver."

It is the purpose of this article to outline very briefly a few steps which may be taken to improve the reproduction given by a "satisfactory" receiver, and to describe the results of some experiments carried out recently by the writer, chiefly in connection with loud speakers:

By a "satisfactory" receiver quite a variety of things may be meant. The term is used above, however, to indicate the usual type of two- or three-valve broadcast set which is, normally speaking, giving just an average performance, although the quality of reproduction given by it might be improved somewhat if the owner were a little more particular. There must be many such receivers in use throughout the country at the present time! It is assumed, however, that the receiver is capable of giving a practically distortionless output.

### Respectable Input Essential.

Almost any loud speaker on the market is, fortunately, capable of giving really excellent results when treated properly, and when used in conjunction with the right type of receiver and valves. This should be clearly borne in mind—and there is not a loud speaker to be bought which will turn out respectable music unless it is supplied with a respectable input. This probably seems rather obvious, yet how many users of loud speakers are there who feed their instrument with distorted signals and expect them to behave like filters, reproducing the good parts and suppressing the bad?

Some useful hints as to how the reproduction of the average set can be improved.

By L. H. THOMAS (6 Q B).

However, it is only the simple and minor cures and improvements with which we are at present concerned, and the whole theory of distortion and pure amplification does not enter into the question.

First of all, the writer believes the chief cause of bad quality is nearly always *overloading*. The man within a few miles of a main station who works his detector almost at the oscillation point, follows it with two note magnifiers, and then, as often as not, expects to obtain good results with a *small* loud speaker is simply asking for trouble, and nearly always gets it.

This arises in two distinct ways. Either he may be hopelessly overloading the loud speaker and causing it to "chatter" or, at

bring an orchestral piece up to a greater strength than would be given by an actual orchestra within the room—this accounts for the fact that a set is often giving reasonably pure reproduction of music but comes down very badly in its hearers' estimation when speech is heard. Even in this connection, however, the size of the loud speaker has a great amount to do with the apparent distortion. If the set were to be detuned to a fairly great degree, even the small loud speaker would most probably sound quite well; with a larger speaker in use it would not be found necessary to detune the set nearly as much.

### Diaphragm and Horn Sizes.

By the "size" of a loud speaker we may mean either the diameter of the diaphragm or the length of the horn, or both. The term is used here, for the purpose of convenience, to indicate both—for a loud speaker with a very large diaphragm will generally have a horn of generous proportions.

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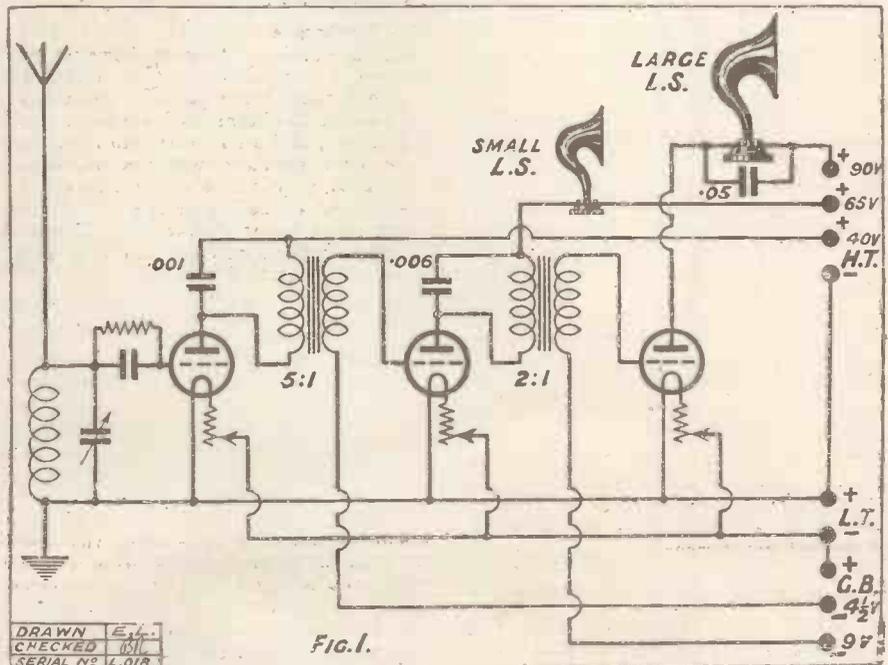


FIG. 1.

DRAWN BY E.L. CHECKED BY L.S. SERIAL NO. L.018

## LOUD SPEAKERS AND REPRODUCTION.

(Continued from previous page.)

A little test often carried out by the writer would probably surprise many users of small loud speakers. A two-valve receiver without reaction is used on a fairly good aerial at about 6 miles from 2 L. O. The volume normally obtained is rather more than comfortable in a small room, and the announcer's voice can always be understood at the far end of the garden. If the receiver is tuned in perfectly and left



A loud speaker with a medium-sized horn and diaphragm capable of handling medium inputs and of reproducing frequencies above two or three hundred fairly faithfully.

alone, with a change-over switch permitting one of two loud speakers to be used at will, the results are distinctly interesting. In the room with the set, the small loud speaker seems to be, and probably is, somewhat overloaded. Although no serious distortion is present, it is hardly pleasant to listen to at such close quarters.

If now the large speaker is switched on, the volume is apparently reduced by about 33 per cent. and the tone is greatly improved. There is no doubt whatever that the volume seems to have suffered. If now the test is repeated with the listener at the bottom of the garden, the report is invariably that the large loud speaker gives much greater volume than the smaller one. It should be understood that the shapes of the horns of these two instruments are similar, and that they are, in fact, identical in every respect but size. The disparity of these results lies in the fact that, even in the room, the larger speaker is giving the greater volume, but so undistorted and free from "overloading" is it that it seems distinctly weaker.

### A Misleading Effect.

A similar effect may be produced by using a "super-power valve" in the last stage of the set, when the ordinary power valve is slightly overloaded. At close quarters the volume quite often seems to have been reduced, whereas it has in reality been definitely increased.

The moral of this is obvious, but may as well be stated again—do not overload any part of your receiver. Of course, the point about the foolishness of overdoing the volume of the announcer's voice only applies to loud-speaker work in confined spaces. Public address systems, of course, set out to amplify voices, but they do not use small loud speakers! Actually, however, one cannot say that they ever sound natural—unless one thinks of the speaker as bawling through a megaphone!

### The Missing Quality.

Another frequent cause of apparent distortion, chiefly troublesome to persons with a good musical ear, is simply that the performance of an orchestra of, say, thirty performers, which is originally spread out over an area of some hundreds of square feet, is being reproduced through one small aperture. This being the case, say they, an orchestra is bound to sound as though one were in the concert hall with a large sound-proof curtain between one and the orchestra, all the sound having to come through a small hole in this curtain. There is, of course, a certain amount of truth in this, but even if one were to attend a concert given under these conditions, would one be able to claim that the orchestra did not sound like an orchestra, or that it was "unnatural," "wooden," or any of the other adjectives commonly applied to loud speakers?

All that would be missing would surely be the personal or individual touch? One would still hear the oboe quite apart from the flute or clarinet, although one would not be able to watch the performer as he took the solo for a moment.

A well-known radio engineer once carried out the experiment of fitting up a separate microphone and transmitter for each instrument of an orchestra, and, of course, using a separate receiver for each at the other end, each instrument therefore being reproduced on its own particular loud speaker. The result was extremely interesting and pleasing, but it was hardly a vast improvement upon the reproduction to be obtained from a really good receiver and loud speaker.

### Using Two Speakers.

For quite a different reason, however, two separate loud speakers may often be used to give a much more pleasant effect than it is possible to obtain with one only. It is well known, and an unfortunate fact, that many loud speakers will not reproduce frequencies very much below 200 to the same extent as the higher tones. In other words, notes below middle "C" begin to fall off in volume as compared with those above. Admittedly, there are many transformers—or there used to be—which would not give a respectable degree of amplification below about 200 cycles; but we must imagine that the transformers in use are rather better than this, and will give even amplification down as low as 80 cycles or so. It is now possible to use two loud speakers in such a way that one will substitute the weakness of the other. In other words, one may be arranged to give the best obtainable results over the band of frequencies extending over the three octaves above middle "C." This may be a fairly small loud speaker, but should not, of course, be overloaded.

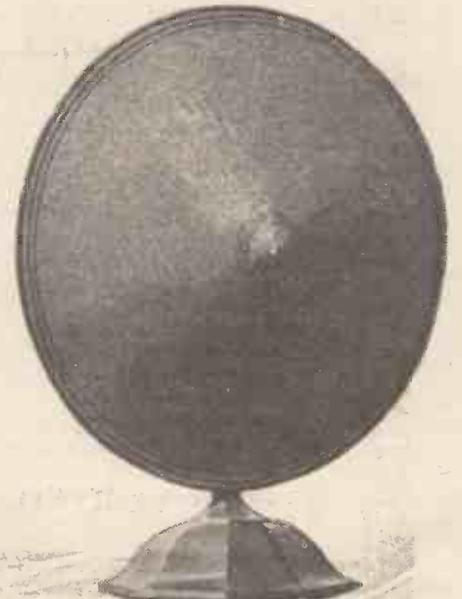
A larger speaker may now be brought into action—preferably one which rather

tends to give "throaty" reproduction—in such a way that the lower frequencies are exaggerated considerably. This may be achieved by suitable choice of L.F. transformers, with fairly large by-pass condensers, and, in addition, a large condenser across the loud speaker. If now these two instruments are used simultaneously, it will be found that the whole scale of frequencies is reproduced fairly evenly, or may be made so by judicious adjustments. The large speaker, on its own, will seem to be exaggerating the lower tones, and the smaller one alone will seem to render them conspicuous by their absence. Using the two together, however, a very pleasing effect is obtained. A friend of the writer's recently had two loud speakers, both of which were apparently "duds"; one was unpleasantly "throaty" and made the announcer suffer from a perpetual cold, and the other was quite offensively "tinny." Now, however, he has been fortunate enough to obtain an almost ideal combination of the two, and the reproduction of music leaves nothing to be desired. Until one is used to it, it seems peculiar to listen to speech coming from two distinct apertures, especially if the two loud speakers are not very close together. On the whole, however, it is an excellent combination.

### Isolating the Double Bass.

The writer has succeeded, with two loud speakers used in this way, in almost completely isolating the double bass in an orchestral selection, and also the pedal notes of an organ solo. It seems quite possible to separate them so completely that the pedal notes would be coming entirely from one loud speaker and the rest of the scale from the other!

The arrangement at present in use is shown diagrammatically in Fig. 1, from which it will be seen that the small loud speaker is used after the first note magnifier, and a separate amplifier has been used for the large "bass" speaker. At first a separate note magnifier was used for each loud speaker, but the present arrangement seems to give better results.



The original "Kone," which can handle frequencies down to about 60.

# PEOPLE PREVIOUSLY PAID TOO MUCH FOR THEIR TRANSFORMERS



**YOU** know it is much more difficult to make a transformer good and at the same time low in price than it is to make it good and high in price.

When the new LISSEN Transformer was first put on the market the people said: "It is too low in price—it can't be as good as they say it is". BUT THERE MUST BE MANY PEOPLE NOW WHO PAID A HIGH PRICE FOR THEIR TRANSFORMERS AND WHO HAVE SINCE REGRETTED IT.

## REGRET AT PAYING 30/-

Here is a user of the new LISSEN Transformer who writes:—

Ref. 4150. 5/10/26.  
Bognor.

"Last week my . . . (naming a well-known transformer) broke down after 3 months. I happened to see your announcement of the new LISSEN, so I decided to get one, and, luckily, a trader in Bognor had some in stock. The results are really astonishing: volume and purity are perfect, and, furthermore, it seems to pick out each instrument in an orchestra so distinctly. In addition I am now able to get numerous foreign stations more clearly than before. In conclusion I can only say how sorry I am that I spent 30/- when I now have something better for 8/6."

LISSEN knew they had produced a remarkable transformer in the new one—and they immediately withdrew all

the previous expensive LISSEN Transformers in favour of the new LISSEN. By putting into operation a new direct to dealer policy of distribution, too, which eliminated big wholesale profits, LISSEN were able to offer the new transformer at a price which brought it within the reach of everybody. SINCE THEN IT HAS SWEEPED THE MARKET.

### 7 DAYS' TEST.

Test this new LISSEN as a transformer against the most expensive transformer, or as a choke against the most expensive choke you can find. If you do not definitely prefer the new LISSEN for tone, purity and power to any other transformer and choke you test it against, irrespective of price, return it within seven days of purchase and your money will be willingly refunded.

*NOT ONLY A GREAT TRANSFORMER BUT A GREAT CHOKE ALSO—USED EITHER WAY IT FULLY AMPLIFIES EVERY TONE, EVERY NOTE, EVERY HARMONIC, EVERY OVERTONE.*

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URNS RATIO . . . . . 3 to 1  
RESISTANCE RATIO . . . . . 4 to 1  
Use it for 1, 2 or 3 stages L.F. It is suitable for all circuits and all valves you will want to use.

There are many advertising manufacturers and all expect a share of the use and mention of their products in the sets published by the papers they advertise in. The best transformer is, therefore, not necessarily always used. **NO MATTER WHAT TRANSFORMER MAY BE SPECIFIED IN ANY CIRCUIT, IT CAN BE REPLACED BY THE NEW LISSEN WITH AN IMPROVEMENT IN TONE AND VOLUME. REMEMBER THE 7 DAYS' TEST OFFER.**

**LISSEN LIMITED, 8-16, FRIARS LANE, RICHMOND, SURREY**

Managing Director: **THOMAS N. COLE.**

L 252

## Details which count



# Everything for the Perfect Reception of Radio

**T**HE EDISWAN COMPACTUM 2-valve Receiver is designed for those who desire a highly efficient receiver at a low price. Imagine how fittingly the COMPACTUM would fill that tiny nook in your room. It is so unobtrusive . . . so pleasing in appearance that it harmonizes with any scheme of furnishing.

Up to a distance of 25 miles from the Broadcasting Station the COMPACTUM gives loud speaker results of wonderful purity, with an abundance of volume, at the touch of a knob. The price is only 55/-, plus 25/- Royalties. Ask to see it at your dealers.

**THE DULCIVOX**  
Loud Speaker is ideal for the average living room and gives better results than many other Speakers at twice the price.

In five different finishes. Prices range from 37/6 each to 47/6 each.

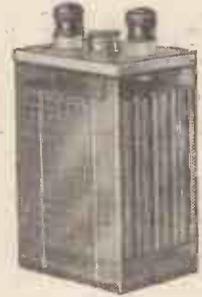


**EDISWAN H.T. Batteries** are made to give lasting silent power to your set. They are exceptionally economical in the long run . . . Ediswan valves and accumulators too are reliable allies to pure, satisfactory wireless reception. Ask your dealer for literature.

# EDISWAN

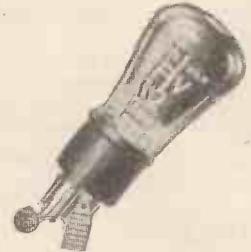


THE EDISON SWAN ELECTRIC CO., LTD.  
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Ediswan Accumulators are noted for their high efficiency and are supplied in either glass or celluloid cases. The plates are designed to withstand the heavy jolting usually experienced with portable accumulators.

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Any two Ediswan Power Valves can be employed but two P.V.2. (2-volt) Power Valves are particularly suitable.

Price 18/6 each.



Use Ediswan High Tension Batteries for your wireless.

Like all other Ediswan products they are British made at our works at Ponders End, Middlesex.



By J. F. CORRIGAN, M.Sc., A.I.C. (Staff Consultant).

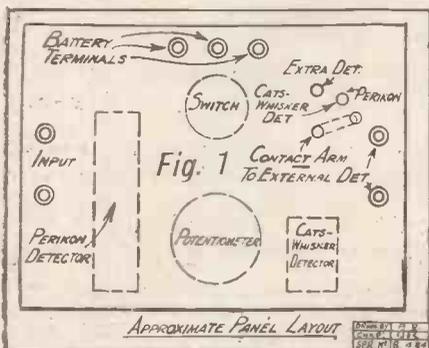
THE many varieties of crystal and other mineral rectifiers which are in ordinary use nowadays are mainly the ones which, by careful experiment in the past, have been proved to exercise their rectifying

with an extra pair of terminals for the purpose of connecting up to it any detector or other rectifying device of a novel and purely experimental character.

Thus the unit to be described is comprehensive in its usefulness. It may be used for the above-mentioned purpose, for the plotting of characteristic curves of various crystal contacts and combinations, and also for the purely experimental study of the effect which the direction of flow of the locally applied current has upon the resulting degree of rectification.

**How the Unit is Used.**

The nature of the experimental unit here described and the manner of its use will be obvious to the crystal experimenter after he has glanced for a moment at the diagram, Fig. 2, which indicates the theoretical circuit



action satisfactorily without the employment of any locally applied potential. Hence it is that the average crystal detector of the present day is such a simple device to use.

**The Lesser-Known Contacts.**

Despite this fact, however, there are many combinations of crystals and other minerals which necessitate the use of a locally applied potential. Carborundum steel is one well-known rectifying contact which works at its best with a local potential; zincite-molybdenum is another contact which requires the use of a local battery and potentiometer, and there are literally scores of other lesser known rectifying contacts which do not provide their most efficient results until the necessary degree of locally applied potential has been brought into use.

The unit to be described in this article will prove of great service to the serious crystal amateur and experimenter who wishes to undertake the investigation of the effect of supplying a local potential across a rectifying crystal contact. By its use, many different contacts may be experimented with in this manner. The unit provides for the use of "cat's-whisker" contacts, as well as those of the "perikon" or combination type; and the instrument is also provided

of a simple crystal set, together with that of the unit attached to it. In a word, the present instrument forms a unit for connecting up between the crystal and contact of any ordinary crystal set. This connection made, the unit is then brought into operation for the abovementioned purposes.

Fig. 3 illustrates the general appearance of the completed unit, whilst Fig. 4 depicts the back-of-panel appearance of the instrument.

For the benefit of the constructor, the approximate panel lay-out of the instrument is given at Fig. 1, whilst Fig. 5 affords a working diagram of connections.

**The Potentiometer.**

It will be noted that the unit contains two detectors. The first of these is a detector of the ordinary loose contact "cat's-whisker" variety, the second being of the "perikon" or combination type. These detectors are brought into circuit as required by means of a contact arm moving over a

**LIST OF COMPONENTS REQUIRED.**

- Potentiometer. (Panel type).
- Contact arm. Three studs. And stops.
- "Cat's-whisker" detector.
- "Perikon" detector.
- Panel switch.
- Seven Terminals.
- Ebonite Panel. (About 5 in. by 7 in.)

series of studs. Three contact studs are provided on the panel, one for bringing into operation the cat's-whisker detector, the second for use with the perikon detector, and the third stud being so arranged that when contact is made with it by means of the contact arm any third detector placed outside the unit is brought into circuit.

It is necessary to use three single cells with the present instrument. Three battery terminals are provided on the panel, the

(Continued on next page.)

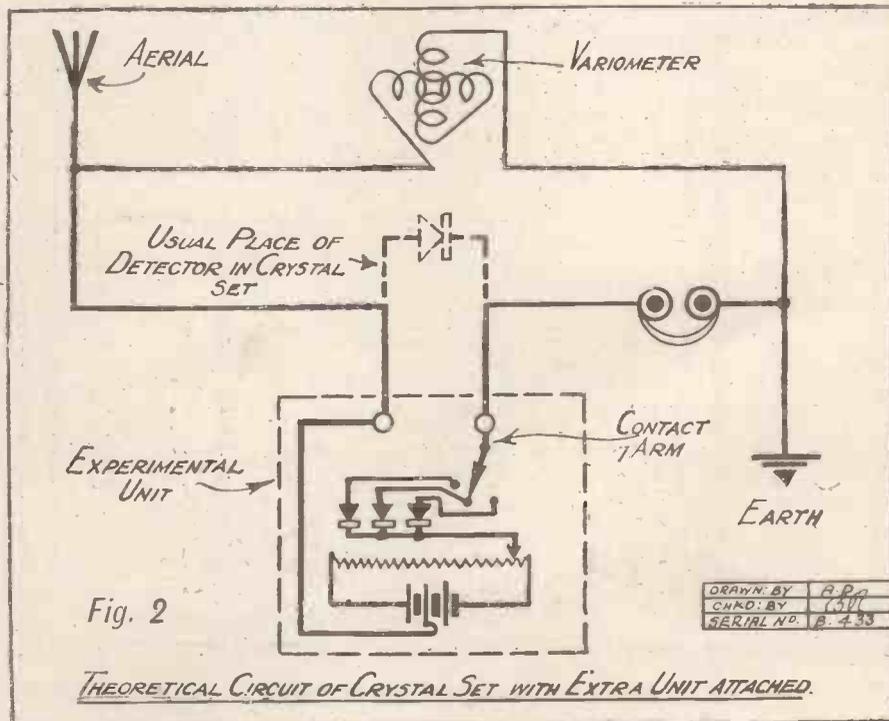


Fig. 2  
DRAWN BY R.P.  
CHKD. BY C.S.  
SERIAL NO. B. 433

*THEORETICAL CIRCUIT OF CRYSTAL SET WITH EXTRA UNIT ATTACHED.*

## FOR THE CRYSTAL EXPERIMENTER

(Continued from previous page.)

middle one being for the purpose of attaching a lead from the central point of the battery. In this way, and with the aid of the potentiometer, the direction of flow of the current across any of the crystal contacts under experimental observation may be reversed at will.

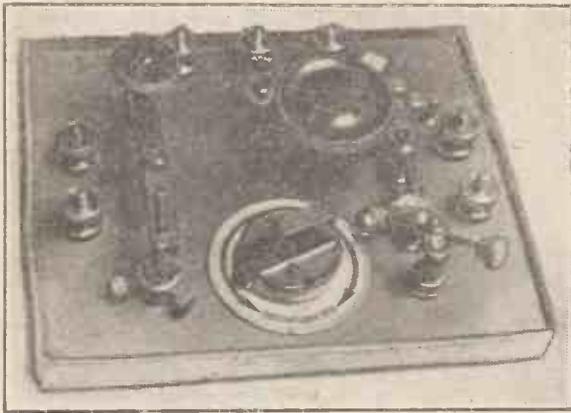


Fig. 3. A top-of-panel view of the unit.

For convenience, also, a switch is included in the battery circuit. This switch need only be a very small article, and it is there for the purpose of breaking the circuit supplying current from the cells to the potentiometer. By the judicious employment of this switch, therefore, the life of the batteries will be considerably prolonged.

### Using a Voltmeter.

In order to obtain a reading of the current voltage flowing into the instrument a voltmeter must be employed. This, of course, may be built into the set, but, generally, the amateur will find it more convenient to place the voltmeter in some

external position, so that it may be readily disconnected and used for other purposes as required.

In making the necessary connection from the contact arm spindle to one of the input terminals on the panel it is advisable to employ flex. Under these conditions the frequent small movements of the contact arm spindle will not tend to break the connection.

At a later date I will give some notes on the further use of this instrument for the benefit of the crystal enthusiast who has not had experience of this branch of work. In the meantime, however, I have only space

to add that for the really serious crystal experimenter, the above experimental unit will prove to be a most useful addition to his stock of radio apparatus. It is readily constructed and, naturally, small variations and modifications may be made on the above design without interfering with the

usefulness of the instrument in the least.

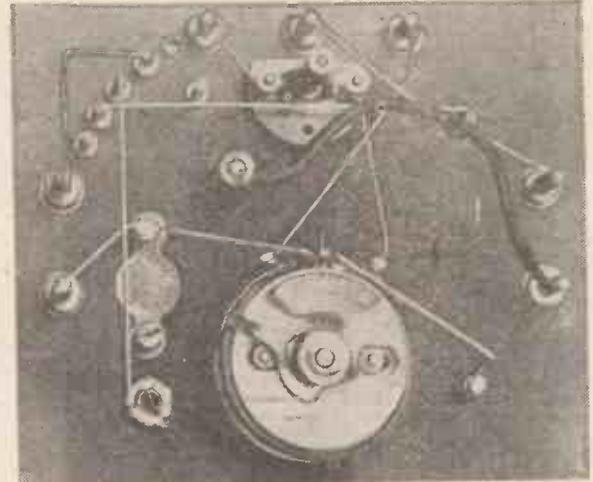


Fig. 4. Showing the wiring beneath the panel of the crystal unit.

## VOLUME CONTROL

Too great a volume can be just as much a nuisance as insufficiency in the form of "weak signals." Especially in the case of a multi-valver, de-tuning may bring in interfering stations, while to dim the filaments of any one or more of the valves may cause very serious distortion. Reduc-

not appear to have any snags, and that is to employ a choke-condenser bypass system in the anode circuit of the last valve, and then to place a variable resistance across the loud speaker itself. Anyway, this is what the writer does, and the method appears to be perfectly satisfactory, providing as it does a volume control which does not introduce the slightest distortion.

## A QUESTION OF SIZES

It appears to be commonly believed that a small receiver necessitates a small loud speaker, and that a moderate output will not operate a large instrument. This is quite wrong.

Sensitivity is not proportional to size, and invariably a really large loud speaker will capably deal with both small and large inputs, although, on the other hand, few small speakers will handle large inputs with credit.

The same idea does not apply to valves in all cases. A large power valve, speaking in terms of watts, designed to handle big L.F. fluctuations, does not necessarily amplify weak signals better than a small power valve. In many instances "super-power" valves are less sensitive to moderate inputs than ordinary power valves.

Similarly a large piece of crystal in a crystal detector is seldom more sensitive than a piece of crystal of microscopical size.

Again, a large aerial may in cases be less efficient than a small aerial. For instance, for normal broadcast reception an aerial should not exceed about 70 feet in length.

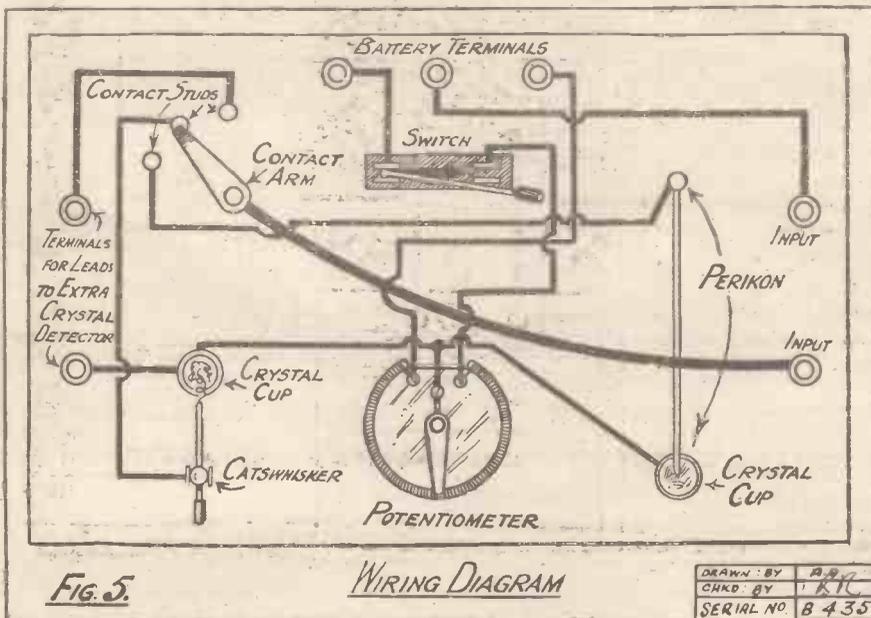


Fig. 5.

WIRING DIAGRAM

DRAWN BY	R.R.
CHKD. BY	K.T.C.
SERIAL NO.	8435

# WHEREVER RADIO PARTS ARE WANTED—USE LISSEN

**N**O matter what may be mentioned or used in any circuit of any booklet or periodical you may be building from, remember that the best parts have not necessarily been used. There are many advertising manufacturers—all expect a share in the use and mention of their products, and they usually get it. LISSEN gets a share, too, but obviously it is not possible for the periodical to use all one maker's parts, although they may be known to be the best. Remind yourself of that when building—remember, too, that the best parts are LISSEN, and that if you build with them you will use all the energy available, and get louder, clearer signals from near and far in consequence.

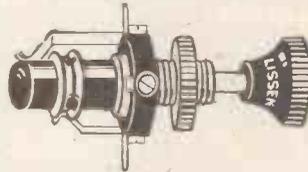
## FACTS OF IMPORTANCE ABOUT LISSEN PARTS—

### LISSEN FIXED CONDENSERS



Fixed condensers should be leak-proof, and if they are LISSEN which DELIVER ALL THEIR STORED UP ENERGY ALL THE TIME, nothing is lost. Note the case in the LISSEN condenser, how it can easily be used upright or flat. Then the price of LISSEN FIXED CONDENSERS is half what it was a year ago. The plates are properly laid in a LISSEN—they are homogeneous with each other, and cannot move or come apart. Capacities: .001 to .001, 1/- each (much reduced). Capacities: .002 to .006, 1/6 each (much reduced). DEMAND LISSEN FIXED CONDENSERS.

### LISSEN SWITCHES



LISSEN 2-way Switch.

There is one for every switching need in radio. Designed for radio work where currents are small—they will not waste current. They fit easily—take up little room. LISSEN ONE HOLE FIXING OF COURSE.

	Previously	NOW
LISSEN 2-way	2/9	1/6
LISSEN Series-parallel	3/9	2/6
LISSEN Double Pole Double Throw	4/-	2/6
LISSEN Key Switch	2/6	1/6

### HOW TO MAKE H.T. BATTERIES LAST LONGER

Every ordinary H.T. battery can be made to yield more energy if a LISSEN 2 mfd. (or 1 mfd., but the larger capacity is the better) is put across it. It will absorb all the noises when the battery gets old. Your dealer will be pleased to show you how to connect it easily.



LISSEN (Mansbridge type) Condenser  
2 mfd. 4/8 ; 1 mfd. 3/10.

.01	2/4	1	2/6
.025	2/4	25	3/-
.05	2/4	5	3/4

Specially moulded case makes it impossible for the condenser to short circuit on to case—a feature exclusive to LISSEN.



### LISSEN VALVE HOLDER

Has both low losses and also low capacity, twin virtues found in few valve holders. Sent out ready for baseboard mounting but can also be used for panel mounting by bending springs straight.

Patented, Previously 1/8, NOW 1/-



### LISSEN FIXED GRID LEAKS

They do not alter—they are perfectly silent. You can put a LISSEN half-megohm leak in circuit direct on to a 220 volt supply and leave it on indefinitely—it will not alter. It can then be put straight into a critical radio circuit—it will be absolutely silent. LISSEN grid leaks have been further tested by exposure to rain and sun on the roof of the LISSEN factory. They never altered, never varied. Patented.

All resistances—Previously 1/8, NOW 1/- each.

### BASEBOARD RHEOSTATS

Reduced from 2/6 to— 1/6



To popularise baseboard mounting resistors, LISSEN has now just reduced the price. Baseboard type are without knob, dial and pointer, which are not needed for baseboard.

	From Jan.	Jan.
Prices 7 ohms	2/6	1/6
35 ohms	2/6	1/6
400 Potentiometer	2/6	1/6

QUALITY RHEOSTATS FOR PANEL MOUNTING—previously 4/- NOW 2/6

LISSEN quality—look how they are made, and note the irresistible appeal of price.

	Previously	NOW
LISSEN 7 ohms, pat.	4/-	2/6
LISSEN 35 ohms, pat.	4/-	2/6
LISSEN DUAL Pat.	6/-	4/6
LISSEN Potentiometer, pat.	4/6	2/6

LISSEN ONE HOLE FIXING, OF COURSE.

USE ANY CIRCUIT BUT ONLY LISSEN PARTS, NO MATTER WHAT ELSE MAY BE NAMED, and you will gain in volume and eliminate distortion. LISSEN PARTS—WELL THOUGHT OUT, THEN WELL MADE.

LISSEN LTD., 8-16, FRIARS LANE, RICHMOND, SURREY

Managing Director: THOMAS N. COLE.

L. 215.



# BROADCAST NOTES.

FROM OUR BROADCASTING CORRESPONDENTS.

Old Empire Memories—Debates: Outside or Inside—The Mussolini Broadcast—The Frothblowers' Programme—B.N.O.C. Again—A Rising Conductor—St. David and St. Patrick—Eisteddfod "On"—Gaelic Service at Aberdeen—Daventry Junior—Bela Badock—Good Friday Programmes—Jazz Pianists.

## Old Empire Memories.

IT is appropriate that the B.B.C. should take some note of the passing of the Empire, in Leicester Square. On March 14th London and Daventry, and some provincial stations, will transmit a special programme, entitled "Empire Memories." Mr. Cuthbert Clarke is to conduct and the whole performance will be under the close supervision of Mr. George Grossmith. So a first-class popular show is guaranteed for that evening.

## Debates: Outside or Inside.

The controversial debates introduced into the programmes this year are already popular with listeners. Most of these debates, so far, have been organised to take place in a studio without an audience being present. It is felt that it would be better to stage them in small outside halls, suitable acoustically, where an audience would be available. It is difficult for debaters to become really keen in the absence of an audience visibly reacting. This change will be made effective in March.

## The Mussolini Broadcast.

In his broadcast account of his interview with Mussolini, Mr. Francis Hackett, the American novelist, gave listeners a pleasant surprise in the freedom and breeziness of his matter and manner. His talk was a model in balance, pungency, fairness, and interest. Observant listeners would be under no misapprehension that the speaker had been "sold" to Mussolini's personality but hardly to his political system. Talks of this description are perhaps dangerously near the line of controversy; but it is certainly the duty of the new B.B.C. to take risks, and to run as close to the wind as possible. The Mussolini affair was entirely successful.

## The Frothblowers' Programme.

The intention of the B.B.C. to put on a special programme "By a Frothblower," first announced in POPULAR WIRELESS, is now confirmed. The Arch Frothblower himself, Sir Alfred Fripp, will take charge of this programme from 7.45 to 9 on March 15th.

## B.N.O.C. Again.

The first broadcast in connection with the new British National Opera Company's Season will be on Wednesday, March 2nd, when excerpts from "I Pagliacci" will be relayed S.B. from Manchester. Those music-lovers whose recollections of last season's transmissions of the B.N.O.C. are not altogether happy, can be reassured this year. Not only is the B.N.O.C. itself greatly improved, but the land-lines are much better for relaying.

## A Rising Conductor.

The work of Mr. Herbert A. Carruthers, Music Director of the Glasgow Station, has

been attracting the attention of music-lovers in the south as well as in the north. His special series of Beethoven Concerts in Glasgow this winter has put him in the front rank of the younger successful conductors. Special interest, therefore, attaches to the symphony concert which Mr. Carruthers will conduct in the London studio on Monday evening, March 7th, between 9.30 and 11. This concert is to include the first performance in England of two movements from a work by G. Sandow, who was, before the Revolution in Russia, a well-known professor in the Conservatoire of St. Petersburg.

## St. David and St. Patrick.

Sir Walford Davies is arranging the special St. David's Day programme at London, on Wednesday, March 2nd. This will consist of a concert of traditional and

the open air without the aid of organs and choirs. This service has been held annually for three hundred years.

## Daventry Junior.

Several conflicting statements are going the rounds on the subject of the probable opening date of Daventry Junior with the first instalment of alternative programmes. It is quite impossible to forecast this date until the preliminary trials are completed; it might be any time between the middle of July and the middle of November. Meanwhile, there is some interesting speculation about using the Marconi House Stand-by Station to provide an alternative to London immediately. It is understood that the Air Ministry are dead against this proposal, which, therefore, cannot be pursued. Captain Round of the Marconi Company, who was closely associated with Captain Eckersley of the B.B.C. in working out the high-power regional scheme of distribution, is now credited with a new idea, or rather a variation of the original scheme. This is that instead of five regional stations each with two waves, there should be four super-stations of 100 kw. each, providing four simultaneous programmes capable of reception everywhere.

## Bela Badock.

Daventry will give Bela Badock Chamber Music from 9.35 to 10.30 on March 15th.

## Good Friday Programmes.

The arrangements for Good Friday include the following

from London and Daventry:

5-6.—Evensong from Christ Church, Oxford.

8.15-9.—"Dream of Gerontius," Part I., with Elgar conducting.

9.15-10.30.—"Dream of Gerontius," Part II., with Elgar conducting.

From 6 to 7.30 the B.B.C. stations will be silent.

## Jazz Pianists.

The 7.15 recitals are to include some jazz exponents such as Gershwin. This is a further move to bring these recitals more into line with popular requirements. The abandonment of the 8.45 recital has been widely acclaimed.



A "spoo" radio station seen during the recent Hospital Day "rag" at Exeter.

modern Welsh music and will include penillion singing by R. E. Jones. Harp solos and a Welsh Play will also figure in this programme. The St. Patrick's Day programme on March 16th will be conducted by Mr. Plunket Greene and will contain a number of attractive features.

## Eisteddfod "On."

As a result of the publicity in POPULAR WIRELESS, the Eisteddfod broadcast is now arranged, the organisers having withdrawn their unreasonable demands.

## Gaelic Service at Aberdeen.

On Sunday, February 27th, the Aberdeen Station will broadcast the Annual University Gaelic Service, which takes place in

# SOME RADIO BRAIN-WAVES.

Many weird and wonderful ideas have been patented during the comparatively few years that the science of radio has been under investigation, and below we publish details of a few of these "brain-waves."

FROM A CORRESPONDENT.

THE idea of utilizing the ether as a medium for the distribution of electric power, capable of driving vehicles or heavy machinery from a distant source, is held by many to be a reasonable development of the near future.

In this connection, it is interesting to recall a scheme for providing a world-wide distribution of radiated power which was first proposed some twenty years ago by Nikola Tesla, known in those days as the wizard of high-frequency electricity.

The earth, although possessing apparently unlimited conducting properties, does not at first sight appear to behave like an ordinary conductor of limited dimensions. On the contrary, it resembles a vast reservoir or ocean, which although subject to local disturbances or currents, remains unresponsive or quiescent when considered as a whole.

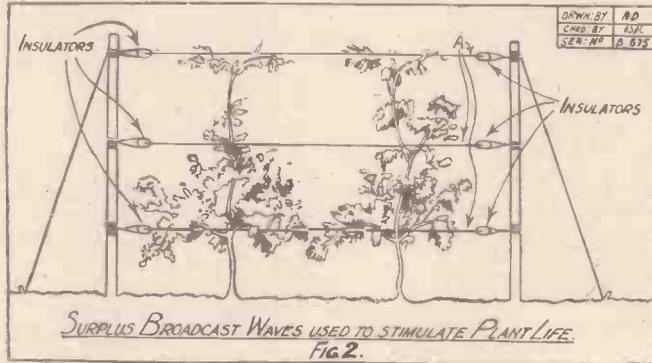
### A Gigantic Power Scheme.

According to Tesla, the earth, in spite of its vast dimensions, can be made to oscillate as a single unit, provided it is energised at the right frequency and with sufficient power. Moreover, just as it is possible to produce "stationary" waves by reflection from the ends of a Lecher wire, so Tesla claimed that he could set up a stationary wave system over the entire surface of the earth.

This he proposed to do by erecting a super-power transmitting aerial at some suitable point. The oscillations from the transmitter travelling outwards along the surface of the earth in all directions will meet at the antipodes. If a suitable frequency is chosen, the outgoing and incoming

twenty thousand vibrations per second, a resultant semi-stationary wave is formed which will travel slowly over the surface of the globe.

Any receiving aerial erected in the path of this wave will obviously absorb power



from it, and the energy so received can then be applied locally to serve any useful purpose. Apart from the initial energy required to set up the stationary wave system, Tesla argued that no appreciable energy loss would take place.

One may consider the stationary-wave system as forming a reservoir of energy similar to the power line of an overhead tramway. The receiving aerials then take the place of the trolley poles, which only absorb power so long as the motor circuit is closed.

Unfortunately, the inventor does not appear to have taken into consideration the fact that his network of waves would induce currents in every available conductor lying in its path, whether intended to act as an aerial or not. Otherwise it is entitled to rank as one of the most gigantic power schemes ever conceived.

### Giving the Beans Beans.

On the other hand, it is well known that plant life can be stimulated by the action of high-frequency currents. In fact, intensive methods of horticulture based on electrical treatment have already been successfully tried out in practice.

This being so, an inventor has been inspired to use the surplus broadcast programme energy for the purpose of cheering and invigorating the growth of French beans, peas, and similar plants.

He sets up a series of parallel wires, A (as shown in Fig. 2), carefully insulated at both ends to intercept the radiated energy. The growing plants are then trained along the wires, thus serving as earth leads for the high-frequency currents induced in the insulated wires. It is claimed that the currents passing through the plants on their way to earth stimulate them, and generally exert a beneficial effect upon their growth and fruition.

It is often a difficult matter, especially when flying at night, for the pilot of an

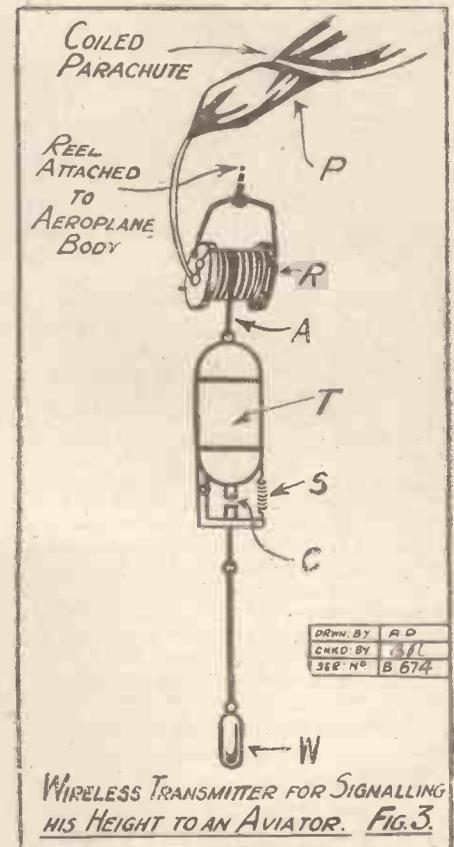
aeroplane to ascertain his precise height above the ground. Many ingenious forms of height-indicator have been invented for solving this problem, but the particular one about to be described deserves inclusion in our record of brain-waves.

Briefly, the idea is to drop a bomb-shaped vessel containing a small wireless transmitting set, so adjusted that it is energised immediately upon reaching solid ground. By noting the interval between the time of dropping the vessel and receiving the first signal back from the transmitter, the pilot is able to calculate his effective flying height.

As soon as the portable transmitter T (Fig. 3) is dropped overboard, a plummet weight W pulls on a spring S, and so keeps the contacts C open. During the first part of the descent an aerial wire A is unwound from a bobbin R. At the end of the wire is a parachute P, which then serves to keep the wire A extended above the transmitter.

As soon as the plummet W strikes the ground, the contacts C are closed, and a spark transmitter inside the casing T is energised. This radiates a signal wave from the extended aerial A which is received by the pilot of the aircraft.

The average rate of descent of the casing and parachute is, presumably, determined by previous tests.



waves then combine to form a "stationary" wave system, the crests and hollows of which will be located in parallel circles extending outwards from the main transmitter.

By impressing upon the earth as a whole two or more oscillations of different frequency, within the limits of from ten to

# The "S.P." Crystal Receiver



A receiver of novel design which provides a rapid and easy change of wave-length range—from the local station to Daventry—without the need for coil changing.

By PERCY W. HARRIS, M.I.R.E.  
(Editor of "The Wireless Constructor.")

HERE is rather an unusual crystal receiver which, I think, will appeal to many readers of POPULAR WIRELESS. It has been designed in response to a number of inquiries for an inexpensive crystal receiver with which a rapid change from the local station to Daventry can be made, while allowing the opportunity of trying different kinds of coils. Sets with rapid change-overs are by no means unique—many have already been described in these columns—but in the main they have been of one of the following types:

(a) With interchangeable coils, a larger coil being substituted when the Daventry range is required.

(b) Both short and long-wave coils incorporated in the set, the change from one to the other being made by means of a change-over switch.

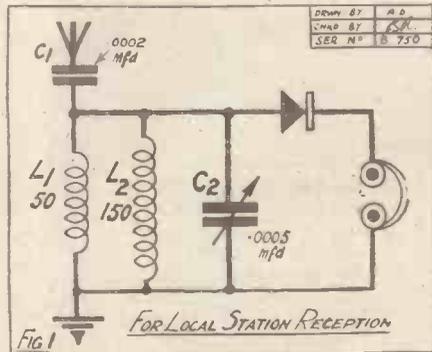
the total inductance of two inductances in parallel is less than the inductance of the smaller of them, while the H.F. resistance—which we require, of course, to keep as low as possible—is theoretically reduced by placing the two in parallel. Actually I have measured the H.F. resistance of the combination and find that the value with a particular pair of coils of a well-known commercial make is not appreciably different when they are in parallel or in series.

### Constructional Details.

The series connection, of course, is quite simple to understand, although the inductance of a 50 coil in series with a No. 150 coil does not give the same inductance as a 200, as the two coils are not wound together. In practice, the 50 in series with a 150 on an average aerial gives a tuning range of about 1,400 metres to about 2,300 metres, so that Daventry comes well within the readings of the .0005 mfd. condenser used in the set.

being small, does not need bracket supports.

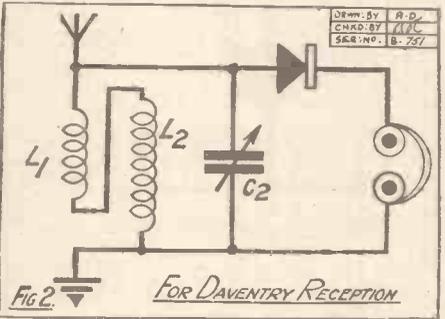
Constructional work is begun by drilling a  $\frac{3}{8}$ -in. hole for the variable condenser (which is of the one-hole-fixing variety),



In the "S.P." receiver both coils are kept in the set, but both coils are used all the time! Fig. 1 shows the theoretical circuit of the arrangement for the shorter wave-lengths. Here the two coils  $L_1$  (a 50-turn plug-in) and  $L_2$  (a 150-turn plug-in) are placed in parallel with .0005 variable condenser across them, and are placed in parallel with a .0002 mfd. fixed condenser in series with the aerial, the crystal detector and telephones being placed across both coils. Fig. 2 shows the arrangement for Daventry, when  $L_1$  and  $L_2$  are placed in series, the variable condenser being across both coils as before. The fixed condenser in the aerial is automatically cut out on this adjustment.

### Parallel Coils.

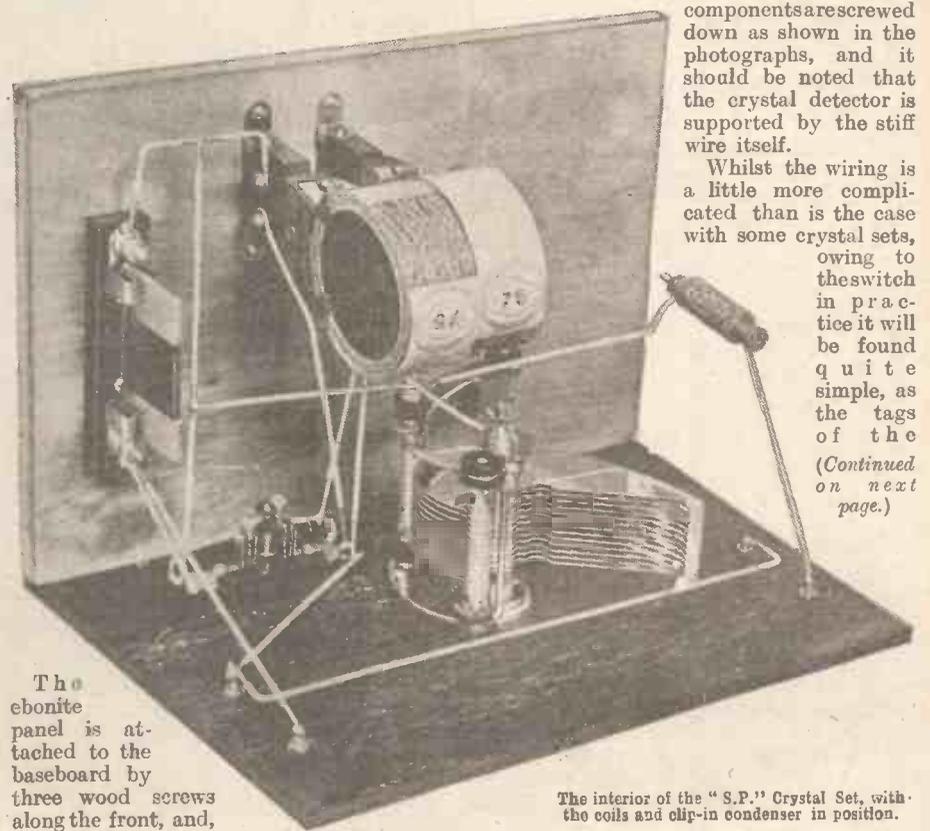
Returning to Fig. 1, some readers may be puzzled as to the possible effect of two different sizes of inductance in parallel, but their difficulties will be cleared up when they remember that inductances in parallel are similar to resistances in parallel—i.e.



a similar size hole for the Lotus push-pull switch, and four smaller holes for the terminals, together with three for securing the panel to the baseboard. The other components are screwed

down as shown in the photographs, and it should be noted that the crystal detector is supported by the stiff wire itself.

Whilst the wiring is a little more complicated than is the case with some crystal sets, owing to the switch in practice it will be found quite simple, as the tags of the (Continued on next page.)



The ebonite panel is attached to the baseboard by three wood screws along the front, and,

The interior of the "S.P." Crystal Set, with the coils and clip-in condenser in position.

# THE "S.P." CRYSTAL RECEIVER.

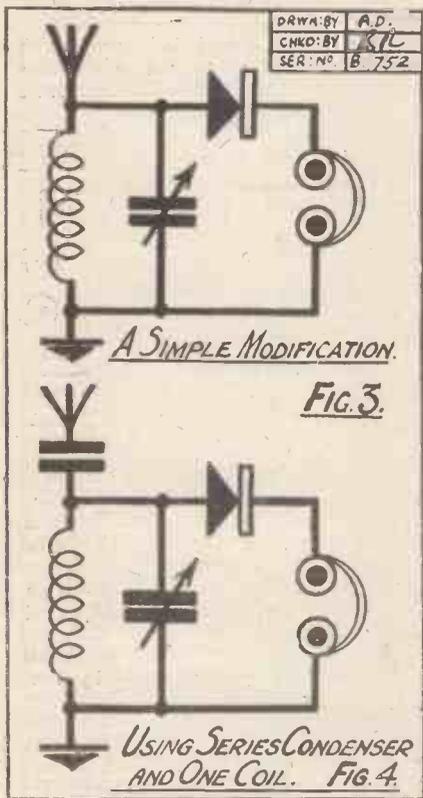
(Continued from previous page.)

switch are widely separated and clearly indicated in the diagram.

A very important point relates to the wiring up of the baseboard mounting coil sockets. Special care should be taken to see that the leads go to the terminals indicated.

### Suitable Coils.

While normally the coils required will be a No. 50 and a No. 150, as these two either in series or parallel enable any one of the British main stations to be tuned, in the

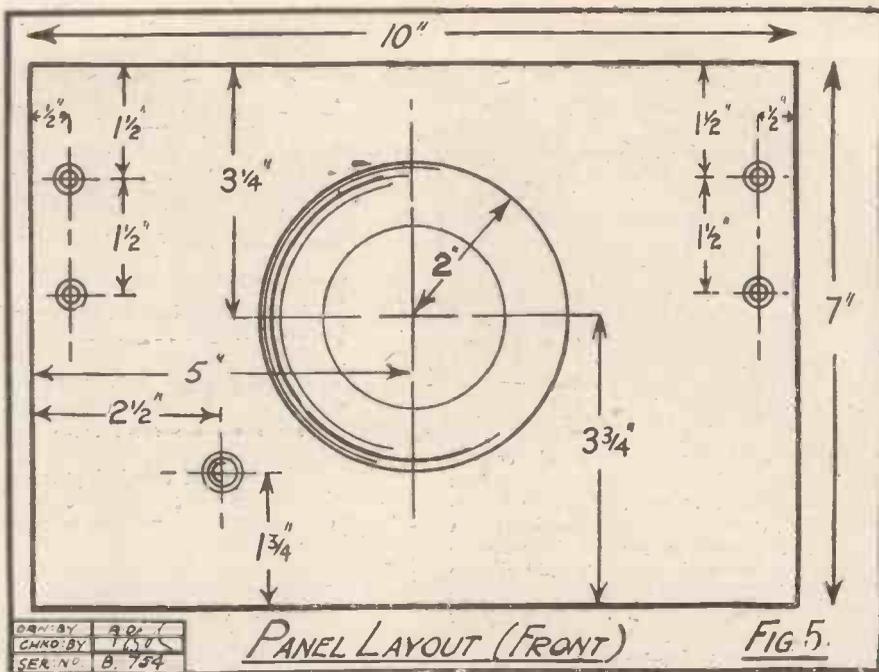


case of readers who live by one of the relays working on wave-lengths below 300 metres, then the first coil should be a No. 35. This will not affect the Daventry range.

The operation of the set is simplicity itself. The change-over from the local station to Daventry being simply made by pushing-in the switch, which automatically places the two coils in series and at the same time short circuits the fixed condenser in the aerial.

### Interesting Variations.

By now the reader will realise that the initials "S.P." refer to "Series-Parallel." The arrangements of the receiver are such that many very interesting comparisons and experiments may be made. For example, by short-circuiting the second socket (right hand, looking from the front) and placing the ordinary size coil suitable for the local station in the first socket (left), and by pushing the switch in as if for Daventry, the set will operate in the con-

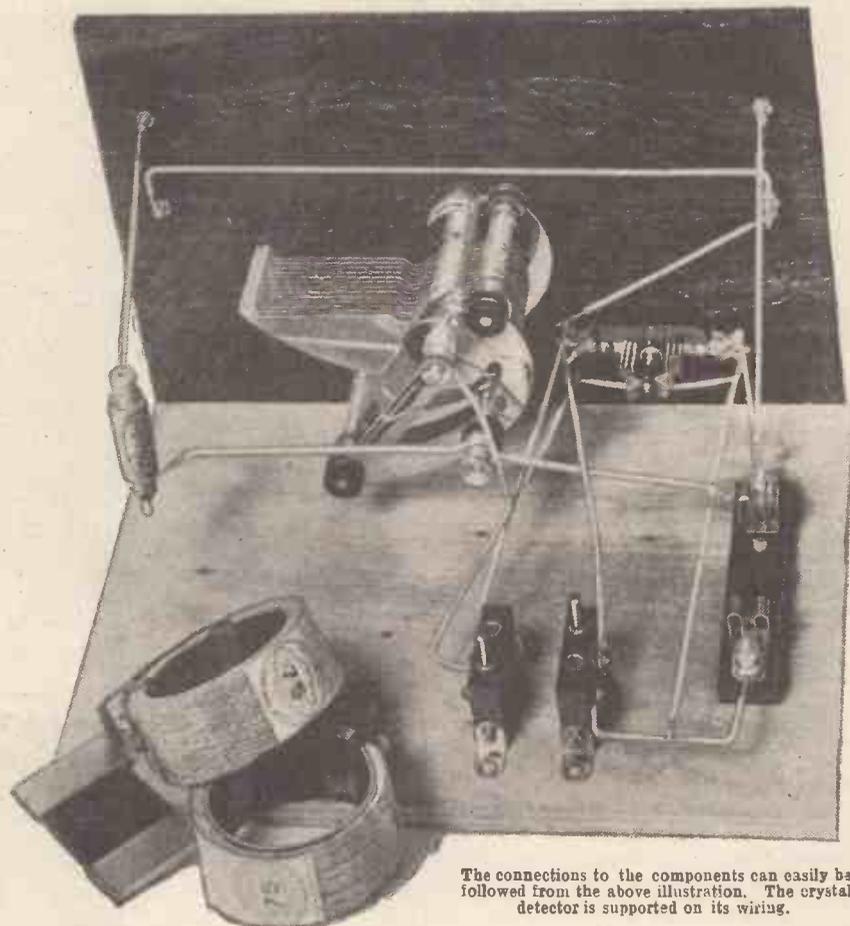


ventional way without the series condenser. This arrangement is shown in Fig. 3. Should it be desired to carry out experiments with and without the fixed condenser in the aerial, then the switch should be pulled out and the coil used in the first (left hand) socket, leaving the right-hand socket open. The arrangement will then be as in Fig. 4, and as the condensers are of the clip-in

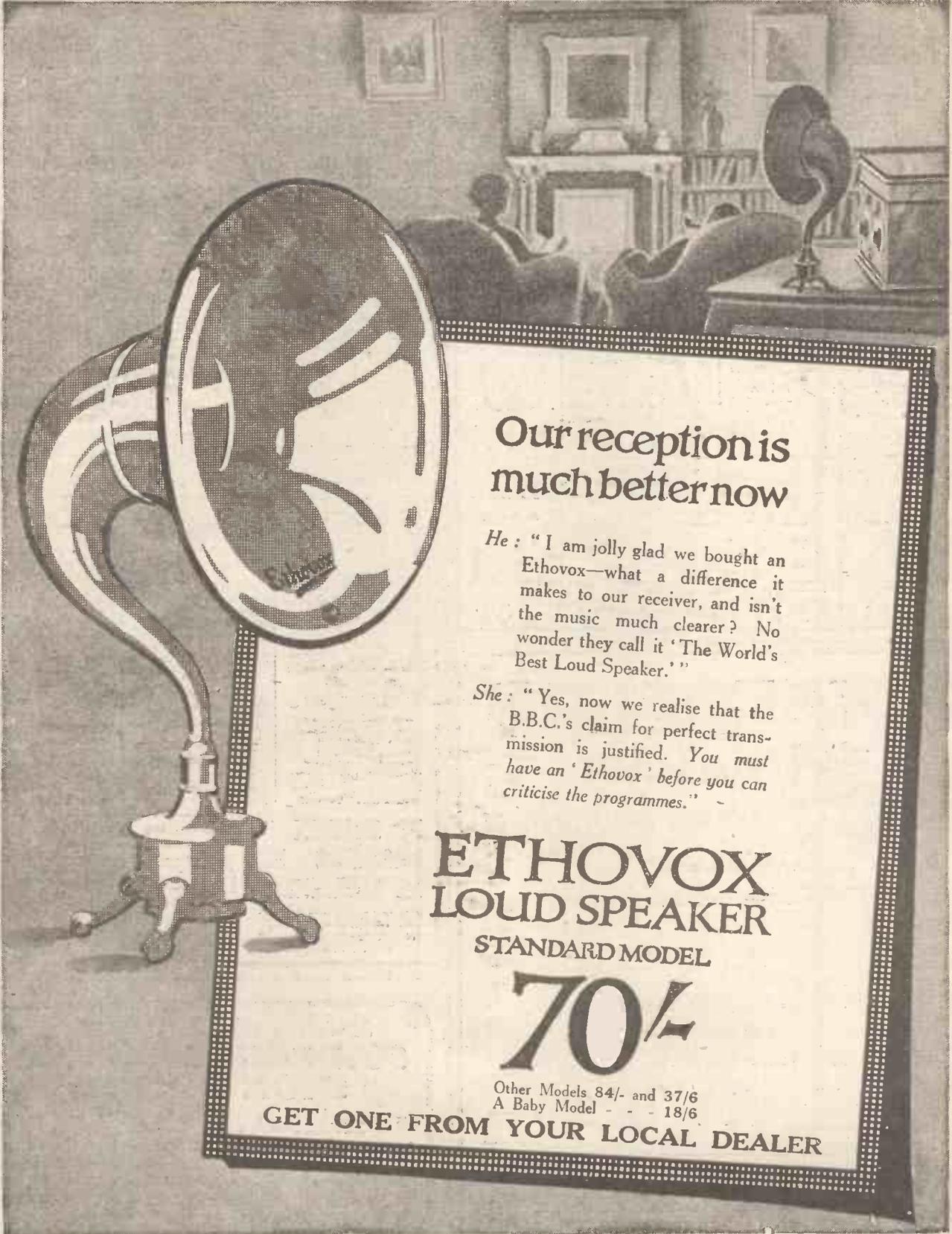
type, changes in value can be made as desired by substitution.

Another very interesting experiment is to try various coils in parallel. For example, for stations on the London wavelength and above, it will be found possible to use two Igranic coils in parallel for the short waves, and in series for Daventry

(Continued on page 1539.)



The connections to the components can easily be followed from the above illustration. The crystal detector is supported on its wiring.



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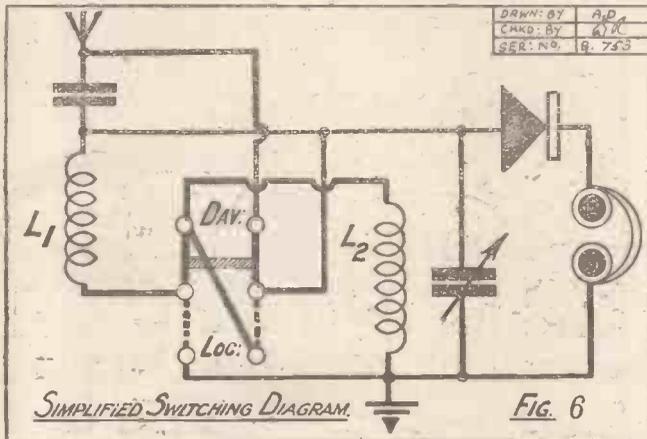
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## THE "S.P." CRYSTAL RECEIVER

(Continued from page 1536.)

Comparisons of signal strength can be made with this and the ordinary arrangement as given in Fig. 4. Unfortunately, 75 is rather an arbitrary indication of coil size with makers and instead of representing an agreed inductance value, it has no standard value, although, generally, the 75 coils of the various makes are fairly alike. There is, however, a considerable difference in wave-



obtainable and have reached a high degree of efficiency, there is, of course, nothing to prevent the reader winding his own coils to suit the receiver, particularly as for general use there is no need for the coils to be interchangeable. A 50-turn and a 150-turn basket or even two single-layer solenoid side by side, can be used. In the latter case the Daventry coil should be wound with fairly fine wire (double-cotton or double silk covered) in order that the physical dimensions of the coil shall be such as to bring the needed inductance within a reasonable length, such as 3 in. or 4 in. on, say, a 3 in. diameter former.

While the components shown in the photos are those used in the actual set described, there is, of course, no reason why other equally good makes should not be substituted, and many readers might like to try the arrangement with their existing parts.

It will be seen that all the components required for this set can be duplicated without any difficulty, or, in other words, the constructor can use any makes of components provided they will do the job and do only one in which a

length range between the Igranic 75 and some other makes of coils. Therefore, I have particularly mentioned the Igranic type as one which in the parallel arrangement gives the wave-length indicated.

While actual provision is not made in the set for use of a series condenser in the aerial with the Daventry range, it is quite a simple matter for the experimenter to try the effect by attaching his aerial to one side of a clip-in condenser and the

it efficiently. The slight "snag" might double-pole switch which appears on the market in various forms. That used in the original set was a Lotus, and as this is made differently from many others, perhaps the constructor had better keep to this make unless he is sure he will not get the connections mixed up if he employs one of different manufacture.

As a broadcast receiver it will be difficult to find another crystal set that will give equal results with the same simplicity of control and wave-length variation, but it must be borne in mind that the "S.P." crystal set was designed primarily as a household receiver, hence the permanent crystal detector, and it must not be supposed that it will have the same sensitivity for DX work as would a set employing a specially selected crystal of the galena and cat's-whisker type.

## CONCERNING TRANSFERS.

WHEN dealing with sets whose panel lay-outs have undergone a process of rearrangement, it is sometimes very desirable to be able to remove neatly old transferred letterings which, if they were allowed to remain on the panel, would become misleading and unsightly.

Some amateurs attempt to remove such letterings by the simple processes of scraping them away from the surface of the panel by means of a blunt instrument. However, in carrying out this operation it is very difficult to avoid defacing the panel.

### A Simple Method.

A preparation which will readily remove transfers from the surfaces of panels can be made by taking a lump of caustic soda (be sure it is caustic soda, not ordinary washing soda), and by dissolving it in the least possible quantity of hot water. Then dip the end of a soft rag in this liquid and rub it over the transfer.

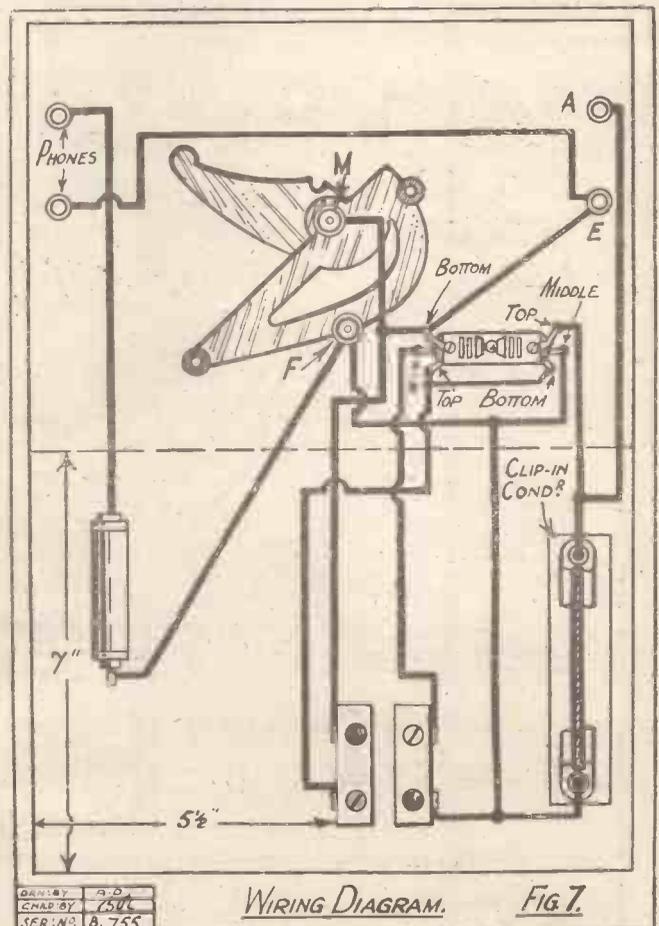
The latter will almost immediately come away from the panel, after which the area of the panel to which the transfer has been attached should be carefully wiped over with a rag moistened with a little clean water, dried, and finally rubbed over with a soft duster upon which a few drops of sweet oil have been sprinkled.

### COMPONENTS REQUIRED.

- One ebonite panel, 10 in. by 7 in. by 1/4 in.
- Four terminals.
- One double-pole double-throw push-pull switch.
- One clip-in condenser base.
- Clip-in condenser for same, .0002 mfd.
- Two board mounting coil sockets.
- One .0005 mfd. variable condenser
- One permanent crystal detector.
- Panel transfers if desired.
- Suitable cabinet.
- Wire for wiring up.

aerial terminal of the set to the other side. A couple of paper clips will hold the wires against the metal ends of the condensers, and the actual condenser out of the set can be tried, as it is not in use on the Daventry position of the switch. In general, however, an appreciable reduction in signal strength will be found by using as small a fixed condenser as .0002 mfd. on the Daventry wave-length, and if the aerial is such as to require a fixed condenser in series with it it is better to use a larger value, such as .001 mfd.

While commercial plug-in coils have been used with this set, as they are readily



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WORMS WEAR  
REARLIGHTS?"

I'M SPEAKING  
ON - "DO  
GOLDFISH  
TARNISH?"

I AM TO PLAY  
THE 299  
FUGUES  
OF  
DUSTIKOF-  
-SKI

I'M PUTTING  
IN A PLEA  
FOR "SAFETY  
PINS FOR  
WINKLES"

SPLENDID!  
I AM TO  
READ  
SOME OF  
MY  
POEMS.

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Back view of Coil showing arrangement of windings through the transparent cover. (Note the projection of the adjustment lever beyond the case, to obviate Hand Capacity effects.)

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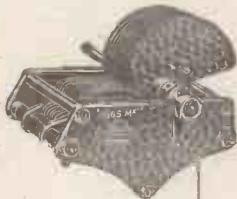
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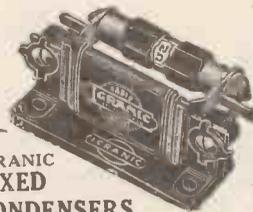
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# 2 H D's BRIGHT IDEA.

Langenberg and "Daventry Junior"—Listeners' Reports—Double Programmes and the Big Seven.  
By THE EDITOR.

THE Radio Scientific Society of Manchester—probably one of the most go-ahead radio societies in the country—has attracted a good deal of attention lately in connection with the activities of its new experimental transmitting station. 2 H D—the call sign of the new station—has, indeed, made its debut in a very provocative, but nevertheless interesting, and even amusing manner.

2 H D, in fact, has been showing the B.B.C. how to broadcast a good concert—not from the technical transmission point of view (although 2 H D's transmissions appear to be excellent), but from the programme point of view.

Mr. J. E. Kemp, chairman of the Manchester branch of the Wireless League, and one of the chief members of the Radio Scientific Society, has explained that 2 H D gives experimental transmissions on 440 metres on Sunday afternoons, using a power of 10 watts. Instead of counting from one to a hundred, or reading passages from a newspaper, 2 H D's operators recently arranged a concert, thus combining pleasure with business.

### Good Concert.

The concert was a good one: so good, in fact, that amateurs in the Manchester district seem to have awakened to the fact that 2 H D can broadcast a better programme than the Manchester B.B.C. station—or any other B.B.C. station for that matter.

Which is not very surprising. The result has been an interesting query as to the legal position of 2 H D. Is it infringing the B.B.C. monopoly, or, in the pursuit of its scientific investigations, is it allowed to transmit matter which can be classed as entertainment. We see no reason to suppose that 2 H D is in the wrong. The P.M.G.'s rules have been observed as to hours of working, wave-length, power, etc., and the reasons for the transmissions are technically *bona fide*. 2 H D, in fact, has done good work, and we can only hope that other amateur transmitting stations will broadcast something worth listening to when next they indulge in the legitimate pursuit of experimental transmission. If one is conducting a perfectly legitimate broadcasting experiment there is no reason why the services of good entertainers should not be employed, instead of half a dozen cracked gramophone records and the overworked larynx of the amateur working the set.

### The German High-power Station.

Reports from amateurs concerning the reception of signals from the new German high-power station at Langenberg seem to be rather conflicting. Many of our readers have written to us stating that, for an H.P. station, Langenberg is not received at anything like the expected strength, even with a three-valve set, while others

write to the effect that the station can be heard on a crystal set at very good strength indeed.

### "Daventry Junior."

It was expected, when Langenberg first "came on the air," that its signals would be considerably louder than those of other German stations, but judging from the experience of the majority of our correspondents, the signal strength does not seem to be much louder than that of Leipzig, Stuttgart, and Hamburg. This may be due to the fact that Langenberg is not—at the time of writing—using its full 25 kw., but these preliminary reports from readers are interesting because the advent of the "Daventry Junior" station is not far off.

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Experimental transmission from Daventry Junior will shortly commence on 400 metres. High power will be used, and it is anticipated that these transmissions will cover even a greater area than the present Daventry station.

But if Langenberg fails to live up to expectations on 25 kw., the prospects of Daventry Junior may not be so rosy. Daventry Junior; by the way, has important work to do when all is ready for the first transmissions, for this station will have to collect important data in connection with the new high-power regional broadcasting scheme.

Captain Eckersley has been appointed to take charge of experiments concerning the use of long wave-lengths, throughout Europe.

He will carry out the work in co-operation with M. Brillard, of Belgium, president of the Technical Committee of the Union of Broadcasting Organisations.

Under the Geneva scheme of wave-length allocations, a workable system has now been adopted for the distribution of medium waves, but the broadcasting nations are still more or less in the dark as far as long waves are concerned.

New stations are being operated without any knowledge of the wave-band that will eventually be allotted to broadcasting. Consequently important stations such as Leningrad, Hilversum, and Warsaw continue to work on 1,100 or so metres.

### New Distribution Scheme.

Moscow-Sokolniki and West-Ustchuck are on 1,010 metres, and several others on 1,000 metres, while several stations which are working on wave-lengths between 700 and 950 metres are too near each other to ensure freedom from interference.

The range of a long-wave station using the same wave-length as another station is limited to the area where it is strong enough to dominate the interfering station.

The chief problems for investigation, after ordinary broadcasting hours, will be the effect of distance, frequency separation, and the effect of power and geographical situation.

The committee of investigators will then meet in Brussels and discuss the framing of a new scheme of distribution.

Captain Eckersley's association with this very important work will, we feel sure, result in a considerable improvement in the allocation and use of long wave-lengths—especially those used by European broadcasting stations.

Readers will recollect that when two programmes were broadcast at the same time on different wave-lengths from 2 L O at Marconi House and Oxford Street some time ago, the reception from both places was quite good.

### Two Programmes for London?

Quite apart from the Daventry experiments, there seems no serious reason why London should not be served with the double programme as soon as the Postmaster-General's sanction is given.

At 2 L O, at any rate, it could be put in force at very short notice.

And should 2 L O be able to offer listeners two programmes the problem arises for the programme committee, "What kind of entertainers shall be provided for each?"

This is a problem the "Big Seven" would have to tackle: it would be a severe test of their capabilities as arbiters of broadcasting programmes.

Perhaps by the time two programmes are broadcast from London the influence of the one or two more tolerant and unlightened members of the programme committee will have been felt, and the "uplift" element will have learnt to control itself.

THE "POPULAR WIRELESS" VALVE GUIDE—continued.

6-VOLT H.F. VALVES—continued.

Make of Valve	Type	Fil. Volts	Fil. Amp.	Anode Volts	Grid Bias	Impedance	Amp. Fac.	Price	Remarks	Make of Valve	Type	Fil. Volts	Fil. Amp.	Anode Volts	Grid Bias	Impedance	Amp. Fac.	Price	Remarks
OSRAM— G.E.C. Ltd., Magnet House, Kingsway W.C.C.	R.5V D.H.H. 6L2 D.E.5 D.P.5B D.F.5 H.F.	5-0 5-6-6 5-6 5-6 5-6-6 5-0-6	0.7 0.12 0.25 0.25 0.12 0.12	30-120 40-150 20-120 40-150 20-120	— — — — — —	30,000 33,000 8,000 30,000 25,000 20,000	9 20 7 20 16 6	8 d. 8 0 14 0 18 6 18 6 20 0	General purpose Good H.F. and Det. Also Res. L.F. (H.F. Power, but OK for neutrodyne stages Special low capacity H.F. valve General purpose	SIX-SLXTY— Electron Co., 189, Regent St., W.1. S.T. Ltd., 2, Melbourne Place, W.C.2. STANDARD— Cables and Telephones, Con- naught Hse., Aldwych, W.C.2. TELE-RADIO— Monowatt Lamp Co.	S.S.9 S.T.61A S.T.61B	5-6 5-6 5-6	0.1 0.1 0.1	50-100 150 max. 50-120	— — —	20,000 70,000 20,000	20 40 20	19 6 14 0 14 0	General purpose, high imped. valve High mu valve, res. coupling H.F. and Det.
OSIKKO— J. W. Pickavant, Quikko Works, Lombard St., Birmingham.	V.24 P.6	5-0 5-6	0.75 0.25	20-80 20-120	— —	20,000 6,500	6 5.5	20 0 11 6	Special low capacity H.F. valve General purpose	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —
RADION— Radion Ltd., Bollington, nr. Macclesfield.	V.25B P.6	5-0 5-6	0.25 0.25	20-120 20-120	— —	8,000 8,000	7.2 7.2	10 6 10 6	Neutrodyne stages where coeff. coupl. is low. English base Same, with American base	TRITRON— Electric Lamp Service Co., 6, Red Lion Yd., W.C.1.	S.20 1A	5-6	0.2	20-200	—	8,500	4 6	—	General purpose
RADIO-MICRO— H. D. Zealander, 124, Aldrores, E.1.	V.25C H.B.	5-0 5-0	0.25 0.25	20-120 60-150	— —	27,000 27,000	20 20	10 6 10 6	Neutrodyne with high ratio coupl. English base Same, with American base	"TWO GRID"— Aneloy Products Ltd., Eton Works, East Dulwich, S.E.22. VITA— Peter Curtis Ltd.	B.E.	6-0	0.5	—	—	—	—	—	Four-electrode, 4 or 5-pin for undi- ne
RADVACO— Blitz Bros., 3, Lynton Rd., Acton, W.3.	V.25 H.C.	5-0 —	0.25 —	60-150 —	— —	27,000 —	20 —	10 6 —	— —	VOLTRON— Voltron Co., 70, City Rd., E.C.1.	—	—	—	—	—	—	—	—	—

6-VOLT DETECTOR VALVES—(Most Power Valves operate well as Detectors—see L.F. Valves)

Make of Valve	Type	Fil. Volts	Fil. Amp.	Anode Volts	Grid Bias	Impedance	Amp. Fac.	Price	Remarks	Make of Valve	Type	Fil. Volts	Fil. Amp.	Anode Volts	Grid Bias	Impedance	Amp. Fac.	Price	Remarks	
AMPLION— Alfred Graham & Co., 25, Saville Row, W.1.	A.M.G. 6/9 A.M.R. 6/9	5-5 5-5	0.09 0.09	Max. 120 Max. 120	— —	18,000 40,000	9 35	18 6 18 6	General purpose Anode lead, or leak fol. by res. coup.	CUNNINGHAM U.S.A.— Rothermel Corp. Ltd., 24/26, Maddox St., W. DEXTRAUDION— E. E. Co., Ltd., Fitzroy Square, W. EDISWAN— Edison-Swan Ltd., Queen Victoria Street, E.C.1. ELKA— L. Krenner & Co., 49a, L. Shudehill, Manchester. FIBELAT— L. Stuedgen, Manchester. LOHWAUDION— Audion Radio Co., 52, Dorset St., W.1. LODDEN— Fellows Magneto. Co., Compton Road Avenue, Bank Royal, W. LUSTROUX— Lustroux Ltd., Bolling- ton, Macclesfield. MARCONI— Marconi Phone Co., Mar- coni House, Strand, W.C.2.	C.X.301A C.X.300 440	5-0 5-0 4-5	0.25 0.40	— — 30-80	— — —	— — 30,000	— — —	6 d. 10 0 10 0 6 6	General purpose Spec. det. (gas filled) General purpose A.R. L.F. could be used with 15-ohm rheostat	
ARA— Stephens & Well, 55 Gt. Eastern St., E.C.2.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
BEAM— Lester & Marquis, 15-16, Thames Inn, E.C.1.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
BENJAMIN— Benjamin Electric Co., Bramwood Works, N.17.	D.E.50 P.55B	5-5 5-5	0.09 0.09	Max. 120 60-120	— —	20,000 55,000	9 35	18 6 18 6	General purpose Det. leak or anode rect.	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	
B.S.A.— B.S.A. Ltd., Small Heath, Birmingham.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
B.T.H.— British-Thomson-Hous- ton, Crown House, Aldwych, W.C.2.	B.2 B.4H	5-0 6-0	0.7 0.25	40-100 60-80	— —	37,000 25,000	10 20	8 0 18 6	General purpose Det. and H.F.	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	
BURDEPT— Aldwych, W.C.2.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
BURNETT— Burnett Wireless Ltd., Bedford St., W.C.2.	H.L.512	5-0	0.12	40-45	—	10,000	7.5	18 6	General purpose	—	—	—	—	—	—	—	—	—	—	
C.A.C.— C.A.C. Valve Distrib. Co., 10, Rangoon St., E.C.3.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
CLEARTRON— Cleartron Radio Ltd., 1, Charing Cross, W.C.2.	C.T.6 C.T.25 T.25B	5-6 5-0 5-0	0.1 0.25 0.25	30-50 30-40 30-90	— — —	10,000 20,000 20,000	9 20 9	18 6 18 6 18 6	Special gas filled Det. General purpose High imped. det.	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	
COSMOS— Metro-Vick Supplies Ltd., 155, Charing Cross Rd., W.2.	A.45 D.E.50 P.55B	4-5 5-5 5-5	0.65 0.09 0.09	30-60 30-60 60-120	— — —	20,000 20,000 55,000	9 9 35	8 0 18 6 18 6	General purpose General purpose Det. fol. by res. coup.	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	
CROSSOR— A. C. Crossor Ltd., Aber- deen Works, High- bury Grove, N.	W.R.1 610 H. 610 R.C.	1-6-6 5-5 5-5	0.3 0.1 0.1	30-120 120 120	— — —	16,000 20,000 80,000	6-6 20 50	16 0 14 0 14 0	Det. and L.F. H.F. and Det. Det. fol. by res. coup.	METAL— J. Rae Ltd., 60, Black- friars Rd., S.E.1.	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —

(70 to be continued)

# VACUUM MEANS LIFE!



## THREE VALVES FOR THE PRICE OF ONE!

FIT S.T.'s IN PLACE OF YOUR PRESENT VALVES AND NOTE HOW YOUR SET SPRINGS INTO NEW LIFE. EXPERIENCE THE THRILL OF YOUR ROOM FLOODED WITH WARM, LIVING MUSIC COMING FROM FAR-FLUNG CITIES OF EUROPE.

These joys are lasting and they cost so little. The perfect vacuum in the S.T. bulb ensures not only a much greater electron emission, but a longer life from the torodium filament. That is why an S.T. will outlast three other valves, and why it is the only one whose long and faithful service an insurance company has been prepared to guarantee. Seize the opportunity to-day of owning a valve whose throbbing vitality will continue to give you, month in and month out, a new zest for rich and brilliant music.

2-volt.		4-volt.		6-volt.	
S.T. 21 (H.F.)	0.1 amp. - 14/-	S.T. 41 (H.F. and Det.)	0.1 amp. - 14/-	S.T. 61A (Res. Cap.)	0.1 amp. amplification 40 - 14/-
S.T. 22 (L.F. and Det.)	0.1 amp. - 14/-	S.T. 42 (Power)	0.1 amp. - 18/6	S.T. 61B (H.F. and Det.)	0.1 amp. - 14/-
S.T. 23 (Power)	0.15 amp. - 18/6	S.T. 43 (Super Power)	0.25 amp. - 22/6	S.T. 62 (Power)	0.1 amp. - 18/6
				S.T. 63 (Super Power)	0.25 amp. - 22/6

Send us your name and address and the test certificate cut from an S.T. Valve box, and you will receive a year's free subscription to the great new journal, the "ELSTREE RADIO NEWS."

**S.T. LTD., 2, Melbourne Place, Aldwych, London, W.C.2**  
(next to Australia House).





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.

**TWO CHEAP VALVES.**

WE have received two new C.A.C. valves for test. Following are their characteristics, etc.:

Type, D.E.H.F.; fil. volts, 3-8; fil. amps., 0-2; amplification factor, 14; impedance, 45,000 ohms; price 6s. Type, D.E.3 L.F., fil. volts, 3-8; fil. amps., 0-2; amplification factor, 5; impedance, 14,000 ohms; price 6s.

We understand these valves take the place of the D.E. 006's. As will be noticed, they are very low-priced, and in this connection we must point out that the prices given in our last report concerning C.A.C. valves have since been considerably reduced.

The C.A.C. D.E.H.F. detailed above is much better than its cost might lead many who judge by such standards to believe. It operates very well in H.F. and detector stages and runs at current slightly beneath that specified. And the D.E.L.F. also

makes a good detector. It also handles fair inputs in L.F. stages and can be recommended as a "first stager."

**ANOTHER NEW COSSOR VALVE.**

Messrs. Cossor are evidently determined to come well into line with other leading valve makers. Hitherto their range has been a rather restricted one, but it is now rapidly becoming really comprehensive—doubtless much to the gratification of thousands of Cossor enthusiasts.

The latest Cossor valve to hand is a two volter for resistance coupling, etc., having a high "mu" and a moderate impedance. Following are its characteristics:

Cossor Point One, Type R.C., fil. volts, 1-8-2-0; fil. amps., 0-1; anode volts (max.), 120; impedance, 70,000 ohms; amplification factor, 35; price 14/-.

As will be seen, for a two-volter its characteristics are exceptionally interesting.

Its filament consumption is very low and its "mu and I" are such that it should lend itself to really efficient resistance coupling amplification work. And on test we found that considerable amplification (approaching that obtainable with the best transformer) could be carried out with a very high degree of tonal purity. The type R.C. makes a very excellent little detector, and can be used with success in certain H.F. stages. All round, its performances are very creditable, more especially in view of its economical nature.

**RADIODOMES.**

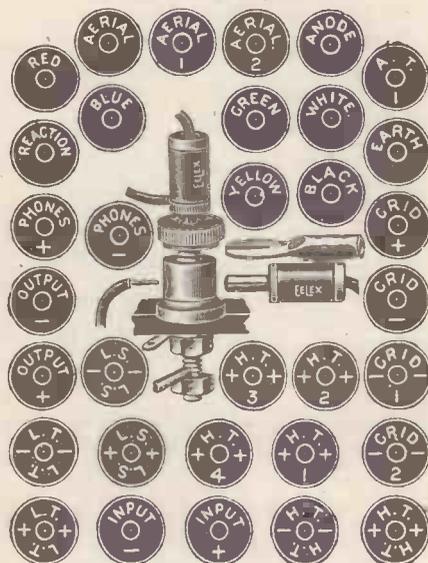
These are terminal indicating labels due to Messrs. Money Hicks & Mills, of York Road, London, S.W.19. They are designed for fixing under terminals on panels, but are not merely flat washers. They are 1/4" thick, are circular in shape, and are slightly coned. Around these coned sides are engraved the indicating letterings, which are repeated once in each case, so that they can be read at any angle. Radiodomets look very neat and attractive, more especially when used with nickel terminals. They cost 2d. each and can be obtained in either black or red colours. The lettering is white in each case. The range of lettering available is very comprehensive, and includes such items as: "Aerial 2," "G.B.—1," "G.B.—2," "High Tension + 4," etc.

**CHASLYN VENT TYPE HYDROMETER.**

Every owner of an accumulator should possess a hydrometer. Voltmeter readings give clear enough indications of voltages, (Continued on page 1548.)

**THE MOST EFFICIENT PLUG & SOCKET SYSTEM YET DEvised.**

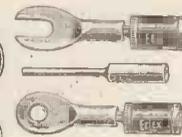
**TREBLE DUTY TERMINAL**  
Nickel Finish, 4 1/2d. each



**T14 PLUG and SOCKET.**

Plug .. 3d.  
Socket .. 1d.  
Indicating Discs .. 1d.

**T14 ADAPTORS**  
Spade, Pin, Eye.  
1d. each.



Obtainable at your dealer, if any difficulty, write to us.

INVESTIGATE for yourself by writing for LIST P.W.15  
This System is used and advised by all the Leading Wireless Journals



**J J EASTICK & SONS**  
EEXLEX HOUSE  
118, Bunhill Row, E.C.

Phone: Clerkenwell 9282

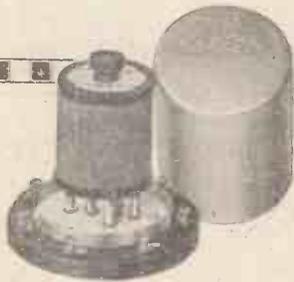
**IMPORTANT.**

*Injunction and Damages.*

On the 13th January, 1927, in the High Court of Justice (Chancery Division), in the action of Marconi's Wireless Telegraph Company, Limited, against J. P. Pembroke, the Defendant consented to an Order restraining him from infringing the Plaintiff's Letters Patent 252 of 1914, 147147, 147148, 8821 of 1913, and 135177 and directing him to pay damages and costs.

The Super Heterodyne Receiver to which these proceedings relate was built by the Defendant with Bowyer-Lowe units.

It is  
not necessary  
to use a .0005  
mfd. condenser!



The new range of Lewcos Screened Coils and Transformers will tune from 350 to 600 metres with a .00025 Variable Condenser. This should prove a great advantage to constructors wishing to use existing condensers having a smaller capacity than the .0005 condenser usually specified with this type of coil.

**FULL WAVELENGTH RANGE  
WITH .0005 CONDENSER  
—350 TO 800 METRES**

*Complete Wavelength Table*

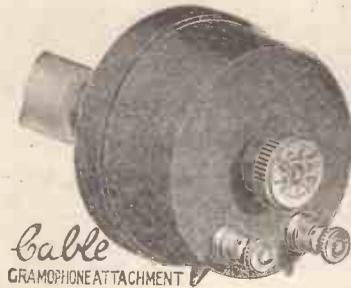
No.	Type	Zero	Condenser	
			.00025	.0005
S.P.5	Split Primary Aerial Coils & Transformers	220	400	550
S.P.8		350	600	800
S.P.20		800	1,400	2,000
S.S.5	Split Secondary Transformers	220	400	550*
S.S.20		800	1,400	2,000*

\*Note—SS type tuned with dual condensers.

THE  
**LONDON ELECTRIC WIRE  
COMPANY & SMITHS, LTD.**  
Playhouse Yard, Golden Lane, London, E.C.1.

**LEWCOSS**  
*Screened Coils*

JUDD



*Cable*  
GRAMOPHONE ATTACHMENT

**CONVERT YOUR GRAMOPHONE  
INTO A LOUDSPEAKER**

with the Cable gramophone attachment which will give you pure, round tone free from extraneous noise. May be fitted to any existing make of gramophone and is

BRITISH MADE THROUGHOUT **PRICE 12/6**

**CABLE O.V.  
INDOOR AERIALS**

Built on the lines of the big service aerials for efficiency. May be suspended in any room in a few seconds. Eliminate the bother of fixing an outside aerial and the clumsiness of a frame.

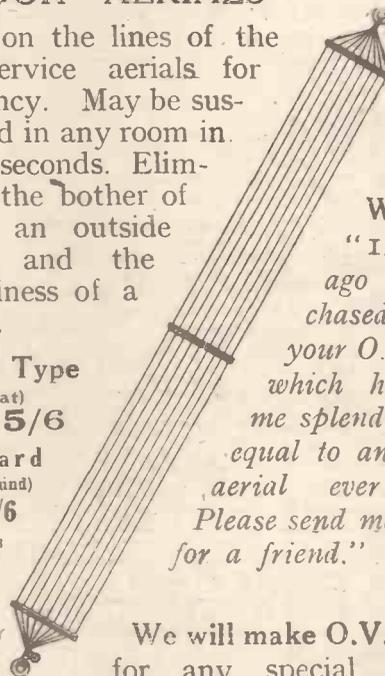
**Super Type**  
(Flat)

**Price 5/6**

**Standard Type**  
(Round)

**Price 2/6**

Both types are 12 ft. long.



**ONE  
USER  
WRITES:**

*"12 months ago I purchased one of your O.V. aerials which has given me splendid results equal to an outdoor aerial ever since. Please send me another for a friend."*

We will make O.V. Aerials for any special purpose. Send details of length required and we will quote by return.

**CABLES & ELECTRICAL SUPPLIES,  
CABLE HOUSE,  
234, PENTONVILLE RD., LONDON, N.W.1**

Telephone Nos.: NORTH 3109-4072.

**APPARATUS TESTED.**

(Continued from page 1546.)

but a hydrometer allows one to keep a watch on the state of the acid, which, besides giving one an indication of the state of exhaustion or otherwise of the battery, is a closer supervision on that type of charging station which will go on "topping up" accumulators with water "ad infinitum" even when quantities of electrolyte are accidentally spilt! Messrs. J. H. Collie & Co., of 10, Canning Place, Liverpool, are making an excellent little hydrometer which can, if desired, be left permanently in the vent hole of the stopper of the accumulator during discharge.

It is a neat little instrument and operates quite as satisfactorily as the large one we have in constant use. It is of the "three bead" type, which, after all, is the most suitable for amateur use.

**NEW "M.H." SWITCHES.**

It is not so long ago that the "knife" type of switch was practically the only type used in radio sets. These diminutive models of standard power station switches were very satisfactory—up to a point—but the constructor of a modern "multi" demands something a trifle less *gauche*. The new switches retailed by L. McMichael should appeal to such amateurs very strongly. They embody practically everything demanded by the up-to-date enthusiast. They are of the push-pull; single-

hole mounting type, and are very substantially constructed. Several types are available, and the one that is in front of us as we write is the equivalent to a "double-pole double-throw" switch. Its contacts are positive and are well spaced. The whole assembly is rigid, with, of course, the exception of the moving member, which operates smoothly, definitely, and without the slightest trace of "play." The knob is of a comfortable dimension, and the fixing nut is large and nicely fitted. The M.H. switch is not a "jack" switch, and all contacts are "self-cleaning." We can thoroughly recommend these M.H. switches to our readers as really sound, modern propositions.

**A USEFUL BOOK.**

We recently received a copy of the "Practical Electrician's Pocket Book" from S. Rentall & Co., Ltd., London, who are its publishers. Containing 602 pages of text and tables, in addition to 144 pages of advertisements and diary ruling, it is one of the most comprehensive works of its nature ever produced. Although it does not include many direct references to radio, it covers many branches of electrical science intimately concerned in the art. At 2s. 6d. we

fancy many amateurs will find it an excellent investment.

**THE NEW K.L.I. VALVE.**

We hope to be able to publish a report concerning this interesting new valve. So far the several on test are giving satisfactory results.



Crowds of people watched this interesting process in the making of Ediswan valves which was displayed in the window of the London offices of this firm.

**BECOL**

Makers of the ORIGINAL world-famous BECOL LOW LOSS FORMER

Registered Trade Mark.



As used in sets that took the first four prizes at the 1926 "Manchester Evening Chronicle" Wireless Exhibition and the set that won the Gold Medal at the 1926 Amsterdam Exhibition.

Size: 3 inches diameter to outside of wings. Prices:  
6 inch lengths, 3/- (Postage 9d.);  
4 inch lengths, 2/- (Postage 6d.);  
3 inch lengths, 1/6 (Postage 6d.);  
Up to 36 in. lengths.

NOTICE:—Do not be put off with an imitation. Ask for BECOL and use the Former with a reputation.

Write for List "C."

Ebonite Rods, Tubes and Sheets. Panels guaranteed free from surface leakage.

THE BRITISH EBONITE Co., Ltd., Hanwell, London, W.7.

**SAXON GUIDE TO WIRELESS**

If you wish to make wireless instruments which are unbeatable in price, quality, or efficiency, this is the book you must have. Everything about wireless is so clearly explained that any beginner can make the most efficient sets obtainable.

**FULL INSTRUCTIONS WITH CLEAR WIRING DIAGRAMS**

are given for making Complete Crystal Sets, Single Valve Sets, One and Two-Valve Amplifiers, Dual Amplification Sets, Two, Three and Four-Valve Tuned Anode All-Wave Receivers; also the very latest Five-Valve Resistance Capacity Receiver. The exact cost of each set is clearly stated.

**NO SOLDERING. NO DRILLING. 176 PAGES NO KNOWLEDGE REQUIRED.**

The chapter on testing wireless components is PRICE 1/3 POST FREE alone worth the price of the book.

**SATISFACTION GUARANTEED.**

If book is not approved of, return same post paid within seven days and your money will be refunded.

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**NECESSARY FOR EFFICIENT RECEPTION**



**ELECTRICAL MEASURING INSTRUMENTS**



PRICE 25/-

SIFAM Instruments are recommended by the Radio Press for all radio measurements. Our Moving Coil Milliammeter illustrated is particularly suitable for measuring plate current and tracing distortion.

Use the SIFAM Pocket Voltmeter for Voltage Checking.

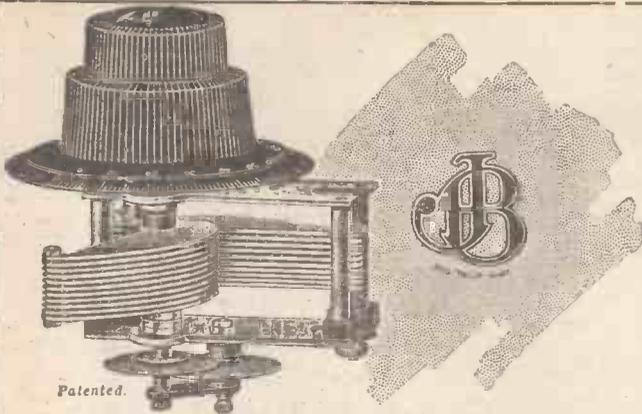
Send for FREE SIFAM Book giving useful diagrams. SIFAM Instruments can be obtained from all bona fide WIRELESS DEALERS. If any difficulty write to

SIFAM Electrical Instrument Co., Dept. P.W., 10a, PAGE STREET, WESTMINSTER, S.W.1



Leather covered cases 9d. extra.

PRICE 11/9



Patented.

### PERFECT TUNING WITH THIS FINAL CONDENSER.

Rids you of all tuning difficulties. Is fitted with a double reduction friction drive ratio 60-1, which makes remarkably close tuning possible. Precision in design and construction of friction surfaces results in an absolutely positive drive. Ball bearings ensure wonderfully smooth control. Vane design eliminates any tendency to crowd. Altogether the perfect instrument of its type.

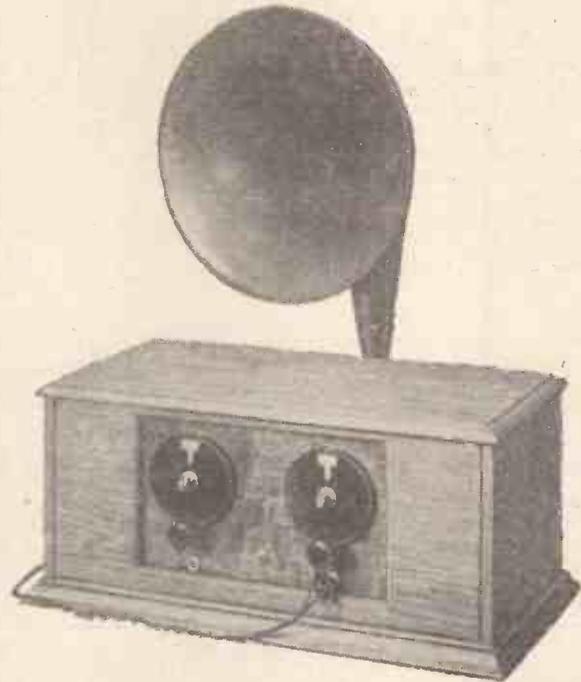
PRICES, complete with 4-inch Bakelite Dial.

THE J.B. TRUE TUNING S.L.F. .0005 mfd. 16/6, .00035 mfd. 15/6, .00025 mfd. 15/-. For Short Wave Receivers .00015 mfd. 15/-.

THE J.B. S.L.F. .0005 mfd. 11/6, .00035 mfd. 10/6, .00025 mfd. 10/-. For Short Wave Receivers, .00015 mfd. 10/-.

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

# 47 Stations on loudspeaker!!



## Personal Letter to Mr. C. P. Allinson, A.M.I.R.E.

My dear Sir,

Nearly two years ago we put together your "Round the Continent with Two Valves" set, as per "WIRELESS." It was eminently satisfactory and we have used nothing else since, except that we have used in conjunction with it a 2-valve amplifier. We have been delighted up to a few weeks ago.

We then saw your advertisement re the "MONOTUNE 3" in the "Evening Chronicle," and fortified by our past experience—we knew that your name was guarantee for a good thing—we sent for the circuit to the "Monotune" Constructone Co. and set to work gathering together components as stated by you. We determined to follow your directions and advice to the letter. After some delay everything was to hand and the set wired up. Our hopes ran high, but the results exceeded everything we had hoped, imagined or dreamed. The instrument romped away right off and pulled in stations, the names of which we had only read in print.

Last night (Jan. 13th) we heard 47 stations on the loudspeaker using only the two coils you mentioned.

We have listened to and possessed many kinds of sets—one, two, three and four valves—but have never experienced such selectivity, purity and power before. The clarity is really startling, and this is obtained when using the highest or lowest power.

My son, who is an experienced first-class P.M.C. certified wireless operator, said that I ought to write to thank you for the pleasure and intense satisfaction obtained from the "MONOTUNE 3." For selectivity, distant reception, clarity power and absolute simplicity of control, we know of no equal.

I am quite sure that the results on the preceding counts obtained by this 3-valver cannot be surpassed, if equalled by any 4-valve set.

Gratefully yours,

(Signed) G. T. V.

SOUTHPORT, January 14th, 1927.

(The original of this letter may be examined at our office)

You can duplicate this Receiver and get these amazing results by following the simple yet comprehensive instructions given in the No. 1 CONSTRUCTONE. 15 photos, diagrams and illustrations leave no detail unexplained.

**2/6**  
Post Free

THE CONSTRUCTONE PUBLISHING CO.  
(Dept. H.) 37, Drury Lane, London, W.C.2

The Modern Valve Holder



In the light of developments in the majority of modern Valves it is no longer necessary to purchase specially constructed, but doubtful, non-vibratory holding devices, the stage has been reached analogous to that which led to the vetoing of similar gadgets in the development of the filament lamp.

The new Ashley Valve Holder possesses every required refinement. Constructed throughout of genuine bakelite and non-oxidising metal, the valve sockets are surrounded by air throughout 90% of their length. Sockets and connections are stamped complete out of one piece of non-oxidising metal, provision being made for wiring to terminals or soldering to tags. Moreover, a special safety groove is provided to ensure the valve legs engaging with the corresponding sockets.



**Ashley Radio**

Use in every stage (except detector) and save 1/6 per Valve

Ashley Wireless Telephone Co. (1925) Ltd.  
Finch Place, London Road, Liverpool

# RADIOTORIAL

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

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The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts and photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All inquiries 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."

### TECHNICAL QUERIES.

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

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

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

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

Details of the "P.W." BLUE PRINTS are published fortnightly in the advertisement pages of "P.W."

BACK OF PANEL DIAGRAMS can be specially drawn up to suit the requirements of individual readers at the following rates: Crystal Sets, 6d.; One-Valve Sets, 6d.; One-Valve and Crystal (Reflex), 1s.; Two-Valve and Crystal (Reflex), 1s.; Two-Valve Sets, 1s.; Three-Valve Sets, 1s.; Three-Valve and Crystal (Reflex), 1s. 6d.; Four Valve Sets, 1s. 6d.; Multi-Valve Sets (straight Circuits), 1s. 6d. Except SUPER-HETERODYNE DIAGRAMS, all of which, irrespective of number of Valves, used, are 2s. 6d.

If a list of point-to-point connections is required an additional fee of 1s. must be enclosed. Wiring diagrams of commercial apparatus, such as sets of any particular manufacture, etc., cannot be supplied. (Such particulars can only be obtained from the makers.) Readers may submit their own diagrams, etc., for correction or for criticism. The fee is 1s. 6d. per diagram, and these should be large and as clear as possible.

No questions can be answered by 'phone. Remittances should be in the form of Postal Orders.

## Questions and Answers

### GRID-FILAMENT CAPACITY.

J. E. J. (Clapton, London, N.E.).—Approximately, what is the value in figures of the grid-filament capacity, of which we hear so much nowadays?

It varies greatly, according to the relative positions and shapes of grid and filament, but is generally of the order of 10 to 15 micro-microfarads.

### USE OF BARE WIRE FOR COILS.

W. N. D. L. (Lee-on-Solent).—Why is it that bare wire is better for coils than, say, cotton-covered wire? I know that the latter is easier to handle, and so forth, but where does

(Continued on page 1552.)

**The Master Non-Vibratory Valve Holder**



**ANTI-MICROPHONIC - VIBRATION - SHOCK - CAPACITY WORLD PATENTS.**

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"A particular point I should have mentioned in this letter which is of great importance, i.e. in the case of your set, the entire absence of a noisy background, so common to many super sets, is conspicuous by its absence, there being not the slightest trace; this I consider a great accomplishment, and the tone and quality of reception is excellent."

Letters of congratulation come in every post from enthusiasts everywhere. Not only in connection with the Super Het. Set, but in connection with all the components bear the Bowyer-Lowe nameplate. Investigate—and you will find that the reason for their popularity is traceable to careful design, perfect production, and a thorough knowledge of Radio.



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G.A. 8094

# Watmel

## H.F. CHOKE

(Illustrated on left)

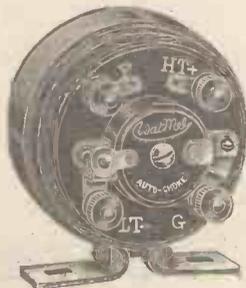
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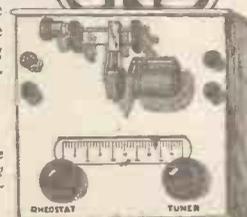


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## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1550.)

it lose in efficiency as compared with wire having no insulation ?

The chief possibility of trouble lies in the danger of the insulation of the wire—cotton, for instance—becoming damp. For this reason many manufactured coils having a covering of cotton or silk are lightly coated with shellac, etc., to prevent the absorption of moisture.

### “HOW LONG SHOULD MY ACCUMULATOR LAST WITHOUT RE-CHARGING?”

J. G. (Brightlingsea, Essex).—How often should I have to get my accumulator re-charged? I use two valves for about four hours per day, Sundays included, the valves each being marked 1 amp. filament current, and the accumulator being a 2-volt marked “Intermittent, 40; Continuous, 20.”?

You can easily calculate this as follows: The two valves, each taking 1 amp., will take a total current of 2 amps.

This figure (total current consumption) must be divided into the actual ampere-hour capacity of the accumulator. (This latter is equivalent to the number of hours for continuous discharge—in your case 20.)

Thus, to find how long (approximately) the accumulator should “run” the two valves, we have only to divide 20 by 2. The answer is 10 hours, so if used for four hours per day, theoretically, the accumulator should run for 25 days. You could, therefore, in practice, safely reckon it would need re-charging about every three weeks.

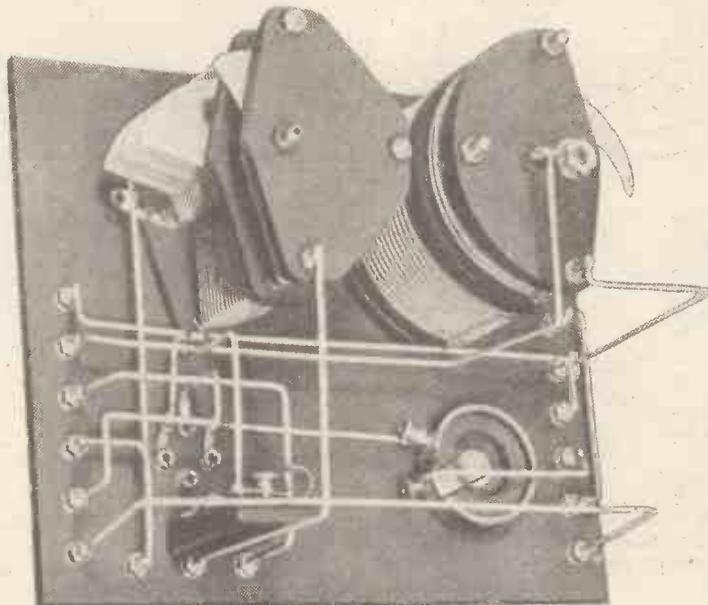
### WAVE-LENGTH OF AN AERIAL

L. R. (Wellingborough, Northants).—Is there an easy way of reckoning what is the wave-length of an aerial, apart from any coils or condensers connected to it?

Yes; the natural wave-length of an aerial can be reckoned by multiplying the over-all length in feet by 1.44. This gives a very good approximation of the wave-length in metres.

### RECEIVING GERMAN STATIONS ON A ONE-VALVE SET.

G. H. A. (Beckenham, Kent).—Why is it I can pick up two German stations on my one-valve set, but I can never hear any British stations besides 2 L O ?



If variable condensers are mounted back to back there is no risk of the adjustment of one affecting the other.

Your aerial may be rather screened except towards the east, but undoubtedly the chief reason is that the German stations are using far more power than is being employed by the B.B.C. stations. (We presume you mean when tuning on short wave-lengths, and you do not include Daventry in the British stations that which your set is incapable of receiving.)

### MOUNTING VARIABLE CONDENSERS.

A. M. R. (St. Leonard's on Sea, Sussex).—When two variable condensers have to be mounted rather close together on a panel, is it better to arrange them “back-to-back” (with the fixed plates of each towards its neighbour) or so that the fixed plates are as far from each other as possible, and the respective sets of moving plates only near to one another when the vanes are “all out”?

Generally speaking, it is better to have the fixed vanes mounted towards one another, and the condensers fixed back-to-back, as shown in the accompanying photograph.

In this way there is no alteration in the tuning of one circuit, due to the moving of vanes in the adjacent circuit affecting capacity.

If care is taken during wiring it can nearly always be arranged that the two sets of fixed vanes are at earth potential simultaneously, so that any slight capacity that may exist between the two is unimportant.

### THE 1927 TRINADYNE.

S. F. (Bruce Grove,

Tottenham, N.17) AND OTHERS.—What are the point-to-point connections for the “1927 Trinadyne,” which was described in POPULAR WIRELESS, No. 246 (February 19th, 1927)?

(Continued on page 1554.)

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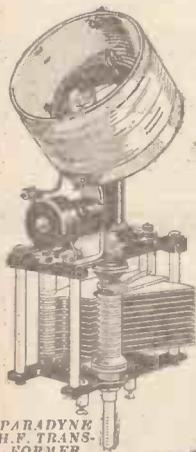
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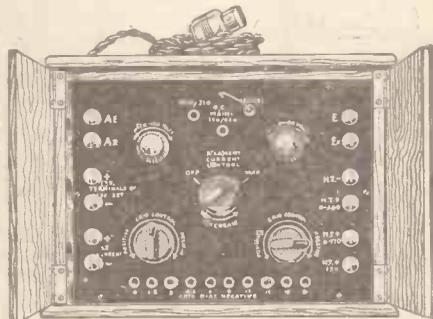
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- (b) L.T. Current for any number of valves of different type or voltage on your receiver, provided each valve does not require a filament current of more than '35 amps.
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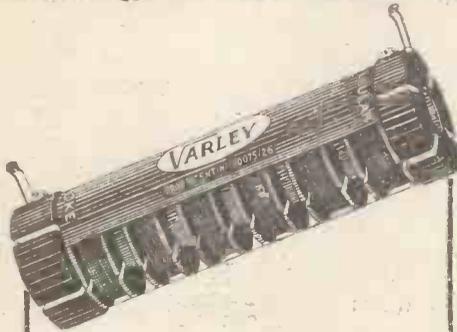
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v.18

## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 1552.)

The fixed condenser C1 is connected between the terminals A1 and A2; the A2 side of the condenser is also fitted with a flex lead, that is connected to X or Y (L2 and L1).

The nearest panel sides of L1 and L2 are joined together, and to one filament pin of each valve holder, to H.T. neg., L.T. neg., and earth terminals, to the 2 mfd. fixed condenser, to grid bias plus (by a flexible lead), to I.P. of the first L.F. transformer, and to one side of C2.

The remaining filament sockets on the valve holders are joined together, and to one side of the rheostat, and to one side of the .0003 variable condenser (C3).

The remaining side of the rheostat is connected to the L.T. plus terminal.

The terminal X (L2) is connected to the remaining side of C2, to one side of the crystal detector unit, and to the variable micro-condenser C5.

The remaining side of the micro-condenser is connected to the half-megohm fixed resistance, and to the grid socket of the first valve holder.

O.S. of the first L.F. transformer is joined to the remaining side of the .5 meg. fixed resistance. O.P. to the remaining side of the crystal.

A flexible lead joins I.S. of the first L.F. transformer to a negative tapping upon the grid bias battery.

The plate socket of the first valve holder is connected to the H.F. choke, and to one side of the .001 fixed condenser (C4).

The remaining side of C4 is connected to one side of L3.

The vacant terminal on C3 is connected to the remaining terminal upon L3.

The "plate" terminal of the second L.F. transformer is connected to the remaining terminal of the H.F. choke.

"H.T. plus" terminal of this transformer is joined to the H.T. plus 1 terminal.

"Grid" and "grid-bias" terminals of the second L.F. transformer are respectively connected to the grid socket of the second valve holder, and (by a flexible lead) to the negative end of the grid-bias battery.

Plate terminal of the second valve holder is connected to one of the loud-speaker terminals.

The remaining loud-speaker terminal is joined to the terminal marked H.T. plus 2, and to the remaining side of the 2 mfd. condenser. This completes the wiring.

### "P.W." BLUE PRINT No. 22.

A. F. (Barking Road, Plaistow, E.13) AND OTHERS.—Although correctly marked "G" and "A" respectively, are not the valve sockets in the second valve holder drawn incorrectly?

Yes. It is regretted that the position of the grid and anode sockets of this valve holder were reversed upon the Blue Print. The lettering, however, is correct—i.e. O.S. to grid; the plate socket (A) of the valve holder is joined to one loud-speaker terminal, and to one side of the .002 fixed condenser.

### CURE FOR A KNOCKING NOISE.

N. E. (Colwyn Bay, N. Wales)—I have built the "Q. and A. Set" recently published in "P.W.," but it makes a steady thumping noise all the time, about twenty to the minute! What is wrong?

Your grid leak is the cause of this trouble, and when replaced by one of the correct resistance the knocking noise will disappear.

### WHY VALVE CHARACTERISTICS VARY.

C. J. C. (Thornton Heath, Surrey).—Is it the size of the various parts inside a valve, the shape, the degree of vacuum, or the position of the grid, etc., that makes one valve so different in amplification factor, etc., from another valve?

The amplification factor and impedance of any valve depend chiefly upon the relative spacing of the valve's grid and filament, and upon whether the grid has a "fine" or an "open" mesh.

### VALVES FOR A.C. RECTIFIER.

J. S. B. (Leicester).—Can ordinary receiving valves be used in an H.T. battery eliminator for use with A.C. mains, or should special rectifying valves be employed?

Ordinary receiving valves are quite suitable, but, of course, the current obtainable from the H.T. battery eliminator will be limited by the filament emission of the valves used as rectifiers.

If a really large output is desired the special rectifying valves will be better, but for an ordinary

(Continued on next page.)

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## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

broadcast receiver two receiving valves, with a fairly liberal filament, emission, will be found to pass sufficient current for the H.T. battery eliminator.

### GOOD ONE-VALVE CIRCUIT.

C. S. H. (Tunbridge Wells).—I have had the following components given me to make a one-valve set:

One valve holder, one variable grid leak, one coil holder (for two coils), three coils (40, 50, and 100), one filament resistance, one variable condenser (.0003), one variable condenser (.0005).

I have used a set before and can make a case, but do not want to buy more parts if it can be avoided. What circuit do you recommend as an interesting change from the ordinary one-valve set?

We recommend you to try the "Chitos" circuit, which is an exceptionally interesting one-valve, capable of excellent long-distance work and giving very good volume on the nearer stations.

You have practically everything required for this set in your list, and full details for construction were given with "P.W." No. 244 (February 5th issue), or can be obtained in 6d. Blue Print form from the Technical Queries Dept. (The Blue Print in question is No. 23, and a stamped, addressed envelope should be enclosed with the 6d. when application is made.)

### TRANSFORMER AS L.F. CHOKE.

"IMPECUNIOUS" (Mansfield, Notts).—Can I use a telephone transformer as an L.F. choke to protect the loud speaker. If so, what are the connections?

Yes, the primary winding will probably make a satisfactory L.F. choke. It should be connected across the loud-speaker terminals of the set, and each of these terminals should then be connected to a separate large fixed condenser (5 mfd., or 1 mfd., will do, or one of each of these values.)

Finally, the remaining side of each fixed condenser is joined to its respective terminal on the loud speaker. No direct current from the battery can then flow through the L.S. windings, so there is no danger of a burn-out, or of demagnetisation.

## 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.

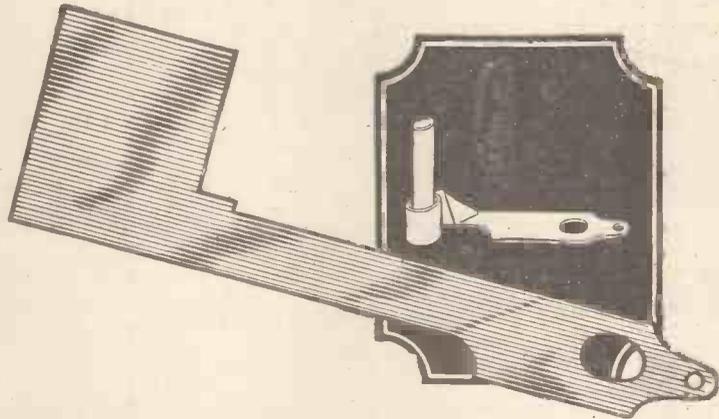
### "YOUR AERIAL."

The Editor, POPULAR WIRELESS.

Dear Sir,—Appropos your article in a recent issue of "P.W." (I refer to "Your Aerial"), some of your readers may be interested in my own observations on a number of types of aerials spread over about eighteen months. I have found that, in my position, the directive properties of amateur aerials is scarcely worth considering (except, of course, in cases of A.C. hum and other interference). In common with your contributor, I find that with a direct-coupled aerial circuit an aerial having a fairly low capacity to earth is better than an elaborate multi-wire arrangement. There are, of course, exceptions, especially where a circuit employed is straightforward but "lively." In my opinion, the fundamental reasons for so many poor aerials are (1) locality; (2) position; (3) not possessing proper appreciation of the essentials of a reasonably efficient aerial; and (4) expense. Where a crystal set is employed, I am of the opinion that it is imperative to keep the aerial capacity as low as possible, owing to the damping already introduced into the tuning circuit by the crystal. Regarding indoor aerials, I find that the best, from the point of view of strength of signals, is one continuous length of wire (about 100 ft.) in the form of treble loop—i.e. starting from one corner of, say, a bedroom, just below the ceiling, carry the wire round the four walls three times, and then down to the set. Of course, I only use this in case of a failure of the outdoor aerial. Naturally enough, an aerial such as I have described is not ultra-selective. The outdoor arrangement I have been using for some four or five months consists of two 7/22 enamelled wires 4 ft. apart with 9 1/18-in between, equally spaced. How I arrived at this combination is rather interesting. I was

(Continued on next page.)

# This one piece of metal is valve socket and spring

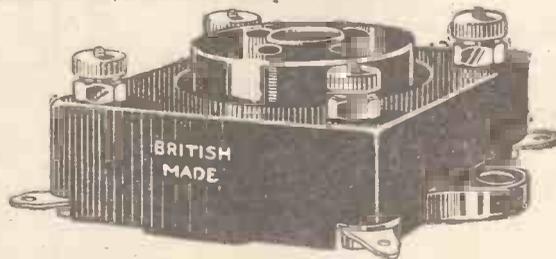


YOU WOULD never imagine that it was this innocent little piece of metal that made BENJAMIN Valve Holders so conspicuously "silent". Yet it is one of the most vital of the five exclusive BENJAMIN features. It explains why BENJAMIN Valve Holders really do eliminate all microphonic noises—for from this one strip of metal (there are four in each Valve Holder) are stamped valve pin socket, resilient spring and tag. Not a single soldered joint anywhere to loosen and create noise. It also explains the delightful buoyancy of the BENJAMIN Valve Holder, for it is made of most carefully tempered and plated phosphor bronze.

The other four exclusive Benjamin features are:—

- [1] Valves can move in any direction.
- [2] Valves can be inserted and removed easily and safely.
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Results: better reception, purer tonal quality, and entire elimination of all microphonic noises, faults and subsequent trouble.



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From all good dealers or direct.

**BEDFORD ELECTRICAL & RADIO CO. LTD**  
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## CORRESPONDENCE.

(Continued from previous page.)

rather anxious to try the effect of two separate (electrically) aeriads, one leading direct to the tuning circuit and the other to a series tuning condenser. This, I found, gave a remarkable increase in strength on distant stations, three valves working Hamburg, Stuttgart, Frankfort, etc., fine (L.S.). The only disadvantage was that, owing to the comparatively high inductive coupling between the two, windy weather upset tuning altogether. I then connected all wires in parallel, and found that volume from local (5 X X) increased and the DX qualities were better than any other arrangement I had tried, except that just described. In concluding, I would advise all amateurs to use wire halyards and keep them tight, and then some! Also to keep twin and multi-wire aeriads level. I pass a twin on my way to work every morning, and at a certain distance one can look up the whole length of aerial. The spreaders are, without exaggerating, like this X.

Wishing "P.W." all the best,  
Yours faithfully,  
**ERNEST W. JONES.**

Westergate Street,  
Aldingbourne, Sussex.

### THE B.B.C. ANNOUNCERS.

The Editor, POPULAR WIRELESS.

Dear Sir,—Broadcasting is such an international thing that it is surely amazing to hear this announcement from 2 L O: "London calling the British Isles." Why only the British Isles? Whether they wish it or not, the British stations are heard all over Europe. Why, then, do the B.B.C. announce in such a manner as to ignore all foreign listeners? Why this remarkable lack of international spirit? No Continental station calls only its own country. They want to be heard as far away as possible, and some announce in two languages for the benefit of foreign listeners. Radio-Berne, when closing down, wishes its listeners good-night in German, French, English, and Italian. That is the spirit with which broadcasting can make for friendliness between nations, not by each station calling its own particular country.

In POPULAR WIRELESS No. 242, in a letter maintaining that British goods are best, Mr. Wm. R. Cumming says that, taken as a whole, foreign components are not dependable. From my personal experience I am able to affirm the contrary. I have built a 7-valve super-heterodyne in which there is not a single British component, and the results could not be better.

It is ridiculous to compare expensive British components with cheap foreign ones. (I think this is what Mr. Cumming did from what he writes about foreign 'phones.) If one compares cheap British components with expensive foreign ones, the difference is just as great.

Speaking of foreign 'phones and loud speakers, which, says Mr. Cumming, "should be treated with a certain amount of suspicion," may I state that I have a pair of French 'phones which have given excellent results since 1923, during which time they have not developed the smallest defect?

I have also a French loud speaker which I have compared to the two very best British makes. The French article is slightly superior to both of these, and its cost is considerably less. No, British goods are no better than any others.

Yours faithfully,  
**C. O. B. MAUGHAM.**

14, Avenue de l'Eglise Anglaise,  
Lausanne, Switzerland.

### BROADCAST AND THE AVERAGE LISTENER.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have for some time studied the programme of the B.B.C. by the aid of the old school-day method of pencilling against each item heard the letters V.G., G., F., B., these indicating the varied degrees of satisfaction derived. Lately I have added a more recent three-letter abbreviation as the plain B. hardly meets some exceptional cases. This I find gives me a clear and general view of the fare that is meted out, and also affords some degree of pleasure.

Those possessed of multi-valve sets are fortunately able to vary their programmes at will by switching over to another station or the Continent. The latter will always afford an abundance of musical items, from heavy opera to jazz.

There are, however, the thousands of listeners with crystal sets who are bound to their local station, and these deserve consideration. They comprise every class of the community—the hard-working toilers of the land, many situated in remote countryside; the factory workers in their prim homes in congested centres; the workers in shops and behind counters; clerks, office workers, and last, but not least, the business man. What do all these multitudes want? They want to get away from work, worry, care, and everything else that damps their spirits and fags their brain, and lose thought of business worries and cares in light pleasure, be that the theatre, the music-hall, the pictures, or wireless. The latter could be the most popular, seeing it is at their own fireside.

(Continued on next page.)



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Send 1d. Stamp for full particulars.

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Jars (waxed) .. .. .	1/3
Zincs .. .. .	1/-
No. 1 Sacs up to 7 milli-amps.	1/6
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No. 2 Sacs up to 15 milli-amps.	3/-
" with terminals .. .. .	3/6
Sample dozen .. .. .	3/6
New Electrolyte in packets sufficient for 20 cells 9d.	
24 Rubber Insulating Rings sufficient for 12 No. 1 Sacs 6d., ditto for 12 No. 2 Sacs 9d.	
Mahogany Trays.	
Tray Var-nished .. .. .	Lid Var-nished.
60 cells 9/- .. .. .	4/6 .. 3/6
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**GOODMANS,**  
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**CORRESPONDENCE**

(Continued from previous page.)

I would not say the B.B.C. programmes are, in the main, bad. I would rather say they are too good. They break in suddenly on our musical items with talks brimful of brain protoids, culture, and good advice; all good in its way and in the proper place, but that place is not the evening programme. And, if we must have talks, let them be at least by chosen speakers who can articulate clearly and correctly, a virtue not universal with broadcast speakers. Some talks are made enjoyable by the speaker, and we may miss much good to mind, body, or soul by having to switch off unintelligible talk.

Here a digression. Concerning our spiritual fathers who are wont to address us on Sunday evenings, much could be said. Sufficient is this. There is a want of short, clear, simple, concise addresses as man to man without the chanted drawl; and there are some of our intoning clergy who can no more get away from that doleful drawl than our girls can get away from the Charleston.

Now, any simple idiot can find fault—that doesn't require brain effort; but while it is impossible to please everyone, there is a means of knowing what is wanted generally. A doctor may be confronted with a difficult case, but by feeling the patient's pulse some indication is given of a line of treatment which may possibly lead to success. Let the B.B.C. take a postcard census from listeners, giving three heads—Music, Talks, News—and under these heads itemise the classes, grades, or types of each, and let the listeners voting place these in numbered positions as they appeal to each individual. This would be feeling the listeners' mental pulse.

The B.B.C. as a wireless physician may be good; the B.B.C. as an amusement caterer would be better.

Yours faithfully,

276, Marischal Street, H. MCKENZIE.  
Aberdeen.

**THOSE PROGRAMMES.**

The Editor, POPULAR WIRELESS.  
Dear Sir.—As a reader of your paper since No. 1, and holder of four licences, I do not think you can class me as a grouser, as this is my first complaint. Up to the end of last year, to my mind, I think the B.B.C. had attained their "ideal programme," and I should have thought it would have suited everyone's taste. But no; the "Director of Programmes" (or whatever he calls himself) says we must have more "night school touch" about it. If the listener won't have it, we will make him; for we will put all the stations on one programme, and no alternative, so he will have to have it.

Now, sir, do you think that principle is going to make wireless popular? Should it be a stunt they have to frighten the "pirates," I might warn them that they are frightening the golden egg, too.

There is one item I should like to emphasise. Frank Westfield's orchestra—the way we get it dished up now—is appalling. This item was awaited for eagerly, but now it has lost all interest, as the music is broken by the news bulletin. If the B.B.C. cannot give one uninterrupted hour of music, why not cut it out and give one of their "famous talks," and not spoil good music? If it was a prelude or fugue, I think it would hold the sway.

Wishing your paper the best of luck.  
Yours respectfully,  
CHARLES BEECH.

Riverside Bungalow  
Yalding, Kent.

**THE GUARANTEED REFLEX.**

The Editor, POPULAR WIRELESS.  
Dear Sir,—I see you welcome unusual experiences in your Correspondence columns, and I think perhaps mine might interest you. I hooked the "Guaranteed Reflex" up with the addition of a filter circuit. On connecting up I was amazed with the volume it provided; in fact, it was much too loud for our small room. While I was tinkering about, with the set at full blast, the L.S. leads became detached, and, to my astonishment, I heard the music proceeding from the set itself. Upon further examination I found that the valves were the source of this; in fact, by placing my ear about a foot from either of the valves the broadcasting could be heard and followed with ease.

Yours truly,  
Edgbaston, Birmingham. H. J.

The Editor, POPULAR WIRELESS.  
Dear Sir,—During the day I wired up the Hale Guaranteed Reflex ("P.W." November 13th). The results it is giving to-night are, to use your own words, astounding. I have constructed many sets, but this is easily best of all. It is quite as powerful as any three-valve straight circuit, and the quality is far above the average. This is certainly one step nearer the "ideal." Many thanks. I have used Radio Instrument transformers. It works an Amplion speaker, £5 5s. model, with ease, and would satisfy anyone for volume. Indeed, it will overload it.

Yours truly,  
J. J. WAITE.

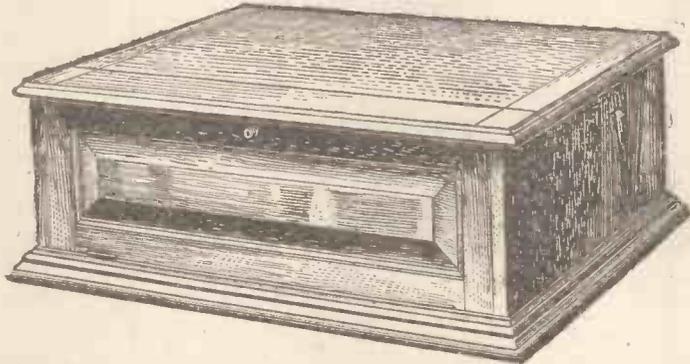
"Rosario," 4, Jackson's Road,  
Bromley Common.  
(Continued on next page.)

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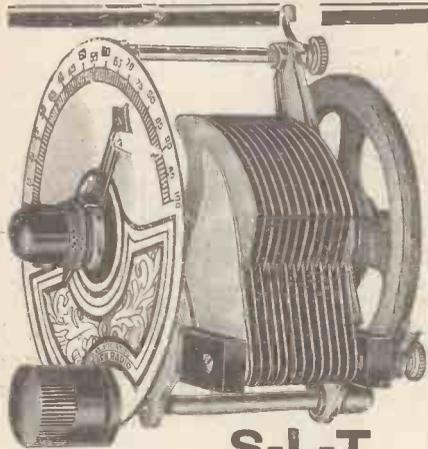
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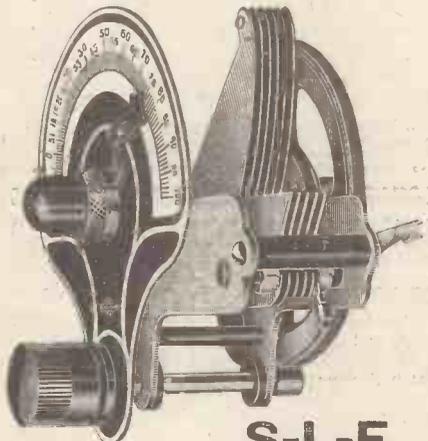
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separate stations on all wave-lengths. Lowest minimum capacity.  
 Prices: .0005, 13/- .0003, 12/6 .0002, 12/-  
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 2-Valve All-Station Set, £4. Approval willingly.  
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**A. W. GRIFFIN & CO., Manufacturers, REDDITCH**

## CORRESPONDENCE.

(Continued from previous page.)

### "MR. COCHRAN AND THE B.B.C."

The Editor, POPULAR WIRELESS.  
 Dear Sir,—I cannot say that I am amazed, but I am at any rate amused by the paragraph on Page 934 of POPULAR WIRELESS headed "Mr. Cochran and the B.B.C." All the alleged facts are entirely inaccurate. Had I, as stated, offered to allow the B.B.C. to broadcast for the sum mentioned, or any sum, I should not have been "amazed" at being turned down. I know the B.B.C.  
 Yours faithfully,

CHARLES B. COCHRAN,  
 49, Old Bond Street, London, W.1.

### "HOW I WOULD RUN THE B.B.C."

The Editor, POPULAR WIRELESS.  
 Dear Sir,—As a Cardiff listener I have read with great interest the articles in reference to H. Corbett Smith.

Firstly, I cannot understand your criticism. I must confess I have not read "Our Radio Programmes—What is Wrong and Why." Though as your criticism savours so unfavourably, and, I might suggest, a little overdone, I felt prompted to give an opinion a voice as you suggest. I feel that I am not alone when I think of the old days, when we were privileged to have "Corbett Smith" at the Cardiff station, with great pleasure. The personal note which he introduced gave one the additional pleasure of becoming intimate with the staff at the studio, and Mr. Price, the leader of the orchestra, seemed one of our most intimate friends. The contrast to-day is most striking. Programmes are carried through methodically, and lack that human note which was at once friendly and intimate.

He had always a ready wit with which an interval might be made agreeable, and, from my experience, was an exceptionally versatile, clever, and entertaining character. I should like to take this opportunity of offering my sincere thanks to Corbett Smith for those pleasant past occasions.

Yours sincerely,  
 R. RICHARDS,  
 63, Trym Side, Sea Mills, Shirehampton, Bristol.

### RE "SPANSACE THREE."

The Editor, POPULAR WIRELESS.  
 Dear Sir,—I am writing to congratulate you on publishing "Blue-print" of above. I have had one in use since the design was first published, and have logged 36 stations (including all the British main stations) as under:

- |             |                                |
|-------------|--------------------------------|
| London      | Newcastle                      |
| Aberdeen    | Dublin                         |
| Belfast     | Prague                         |
| Birmingham  | Copenhagen                     |
| Bournemouth | Radio-Toulouse                 |
| Cardiff     | Paris P.T.T.                   |
| Glasgow     | Berlin                         |
| Manchester  | Frankfort                      |
| Hamburg     | Oslo                           |
| Munich      | Madrid                         |
| Muenster    | Barcelona                      |
| Stuttgart   | San Sebastian                  |
| Breslau     | Seville                        |
| Langenburg  | Berne                          |
| Leipzig     | G 5 X N (Eng.: Amateur, Hord.) |

Also New York and Boundbrook, U.S.A., and on long waves; Daventry, Hilversum, Radio-Paris, and Königswusterhausen.

The above were all identified by call signs, and there are others not definitely identified.

With the addition of a resistance-coupled note magnifier, many of the stations are plainly receivable on loud speaker.

The valves I am using are D.E.3B. In first and second stages, and P.M.4 in last. Lissen 8s. Gd. transformer.

I am now listening to service from Newcastle on loud speaker 10 feet away, every word plainly audible. The only difficulty I found was in "spreading" the stations over the dial as they all came in on the first ninety degrees. A fixed condenser in series with the first two variables, however, has made all the difference.

Yours faithfully,  
 H. B. EVERSHERD.

"Florizel," Kingsway, Woking.

### THE "Q AND A" SET.

The Editor, POPULAR WIRELESS.  
 Dear Sir,—I wish to express my appreciation for the set described in POPULAR WIRELESS dated January 15th, and called the "Q and A" set.

I built the set the following week, and it was such a success that I was called upon to build another one for a friend of mine, with the same results.

The set is working about four miles from Dublin (2 R N) and the volume is too great, unless cut down considerably, and I am using a Brown H.2 loud speaker. Daventry is also received on speaker, but not so strong.

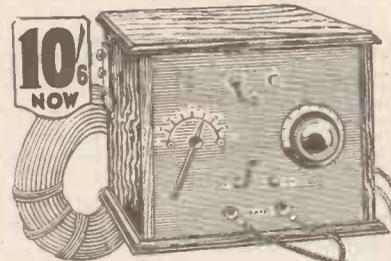
I also got Manchester, Berlin, Stuttgart, Paris, Oslo, and several German and French stations which I have not identified yet. I can bring in seven stations, using 35-and-75 coils.

Again thanking you for so simple and efficient a set,  
 Yours sincerely,

PATRICK J. BYRNE,  
 38, Lower Buckingham Street, Dublin.

# GRAVES

## 2-VALVE LOUD SPEAKER BARGAIN.



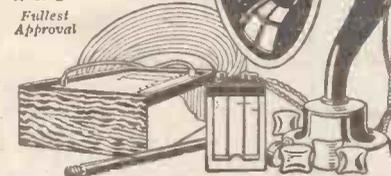
**10/6 NOW**

This highly efficient 2-Valve Loud-Speaker Set is the finest wireless value ever offered.

It gives a volume and quality of tone unattained by any instrument of a similar price and is the essence of simplicity. Fitted with coils covering all the British wave-lengths, including Daventry.

THE CABINET is of beautifully polished Oak, & all components are of the highest quality. Dull Emitter Valves with patent valve holders, &c.; H.T. Battery, 2-volt accumulator and complete Aerial Outfit. **LOUD SPEAKER** of exclusive design with unique magnetic system and improved mica diaphragm. Price **£7:17:6**

TERMS: Our Bargain Price is for deferred payments. Send 10/6 now, & complete purchase in 14 monthly payments of 10/6. If you wish to pay cash, 5 per cent discount is allowed. Catalogue Post Free. Up-to-date Crystal & Valve sets at keener prices. J. G. Graves Ltd. Sheffield



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 35ft. Masts (B), 33, Elms Rd., Aldershot, 27/6

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are DUSTPROOF and house the whole apparatus, leaving no parts to be interfered with. All you do is **UNLOCK & TUNE IN**. Made on mass production lines, hence the low price. Provision is made to take panels from 16x7 up to 30x13 in.

From £4 15 0. Write to-day for descriptive pamphlet and suggestions for adapting your receiver or panel in our Standard Cabinets. Immediate Delivery.

Carriage paid and packed free England and Wales. Thousands supplied with full satisfaction. **MAKERIMPORT Co.** Dept. 6, Melville Chambers, 60a, Lord St., LIVERPOOL.

## Glass Tubes for Wet H.T. Batteries

Standard Size, No. 2, 1 1/2" x 2 1/2", 15/- in gross quantities, or 1/6 per dozen. Carriage and packing free. Special quotation to the trade. Other sizes in stock. Write for pricelist.

It PAYS to Use the BEST. Complete Cells with Sac (screw terminals) and Zinc (wire attached), as illustration, 7/- per dozen, with instructions for filling. **RADIO DEPT., I. ISAACS & CO.,** North London Glass Works, 108, Midland Road, N.W.1. Established 100 years. Phone: Museum 4209.



TECHNICAL NOTES.

(Continued from page 1524.)

of transformer, with a somewhat similar object, has lately been invented by Monsieur L. Bonnet, a well-known French radio engineer, and depends upon the use of sliding metal tubes which act as shields or absorbers, in a manner which has long been familiar in connection with small induction coils. The inductance of a winding is varied by sliding the metal tube so that it covers a greater or a lesser portion of the winding. In the case of a transformer, a metal tube slides outside the iron core and between the core and the first winding. Another tube surrounds the first winding and slides between it and the second winding, whilst a third tube surrounds the second winding. It is claimed also that this system may be used for tuning the aerial coil and for filtering out undesired signals.

A Novel Meter.

A new and very convenient little meter is put on the market in the States called the Cel-O-Meter. It is for the purpose of indicating the current which is flowing into the battery when charging or flowing out of the battery when discharging, or of indicating the condition of the battery by its voltage. The dial is divided into two parts, the part to the left of the centre reading charge and discharge amperes, whilst the part to the right reads voltages, but is actually marked with the words "low," "medium" and "full," for the condition of the battery. In order to use the right-hand half of the dial it is necessary to depress a plunger provided at the front of the instrument. When the plunger is released the instrument reads on the left-hand side of the centre and this part of the scale again is provided with a zero at its mid-point, the part to one side of the zero reading "charge" and the other "discharge." This is an accessory that gives the user of the set an immediate indication of the condition of the storage battery or, alternatively, tells him what current he is taking or what current the battery is receiving when on charge.

Covered Condensers.

Although we are frequently advised to take all possible precautions to keep out dust from between the plates of our variable condensers and are instructed in the method of cleaning the condenser by deftly manipulating a pipe-cleaner between the plates, very few manufacturers seem to adopt the obvious precaution of enclosing the condenser vanes by means of dustproof covering which, on the theory that prevention is better than cure, would seem to be a very desirable step. There are, of course, condensers on sale in which the whole system of vanes is covered by a curved celluloid window, but this type of condenser seems to be more popular on the foreign than on the English market. It would seem to me to be a very simple matter in condenser design and one which, whilst bringing many advantages, would bring scarcely any drawbacks.

A Large Condenser.

In a recent issue of the "Radio News" some interesting statistics were given with regard to the size of a variable condenser (Continued on next page.)

Advertisement for K. Raymond, 27 & 28a, Lisle Street, Leicester Square, W.C.2. The ad lists various electronic components and services, including: Complete sets of parts for 'P.W.' Blueprints, Feb. 5th; GUARANTEED REFLEX 'P.W.' 22; 1.0005 Variable; 1 Rheostat; 1 L.F. Transformer (1st stage); 1 L.P. Transformer (2nd stage); 1.2-way Coil Holder; 1 Fixed 3 mid.; 1 Fixed .0001; 1 Fixed .0005; 1 Fixed .002; 1 Crystal Detector; 2 Coils for Local Station or 2 for 5XX. Components as specified, Post 1/- 47/6. TWO VALVE LODGE 'N.N.'; 1 variable Con., 3-plate, .00005 mid.; 1 Special L.F. Transformer; 2 Single Coil Holders; 1 Rheostat; 1 Fixed Condenser, .0001; 1 variable Grid Leak; 2 Coils, 150-45/60. Components, including Silver-tinned L.F., as specified, 35/-, post 1/-. Pare's and Cabinets stocked. 'A.W. BALLOT THREE'; By J. H. Reyner, A.M.I.E.E. Supplement, Feb. 19, '27. LIST OF COMPONENTS. 1.0005 S.L.F. Variable Condenser (Ormond); 1 Slow Motion Dial; 1 Vernier Condenser, metal mounting (Ormond); 1 Filament Rheostat, 15 ohms (Igranite); 1 Two-pole Change-over Switch, lever pattern (Wilkins & Wright); 1 On-and-Off Switch (Benjamin); 2 L.F. Intervale Transformers (C.A.V. All Purpose); 2 Valve Holders (Benjamin or Lotus); 1 Valve Holder, with .0003 grid condenser and 2-meg. leak (Benjamin); 2 Fixed Resistors to suit valves (Euro. or Lotus); .0001 Fixed Condenser (Dubilier); 1 H.F. Choke (R.I.); 4 Terminals, marked Aerial, earth, L.S.; 1 Terminal Strip, carrying seven terminals; Wires, Screws, etc. THE ABOVE AS SPECIFIED SENT POST FREE FOR £4 6.6. CAN ALSO SUPPLY WITH SLIGHTLY LESS EXPENSIVE COMPONENTS (including CAV Transformer) for the sum of 75/- CABINETS. Large stocks of really useful cabinet types, or made to order. Solid oak. Glass finish. American type, hinged lid, baseboard. 8" x 6" x 7" deep, 6/11 (By post, 3/3). 10" x 8" x 8" deep, 8/11 (By post, 10/3). 12" x 5" x 8" deep, 10/6 (By post, 12/-). 14" x 7" x 8" deep, 12/6 (By post, 14/-). 16" x 8" x 8" deep, 16/11 (By post, 17/11). SPECIAL 21" x 7" x 9" baseboard for 4-valve sets, 25/- (By post, 27/-). PARTS IN STOCK FOR THE ELSTREE SIX, SOLODYNE, MEWFLX, ELSTREFLEX, 1927 FIVE AND ALL THE CHIEF CIRCUITS. S.T. VALVES. RESISTOR PANELS. LEWCO'S, BOWYER - LOWE, MAGNUM SCREENED COILS. BNC 250/550 metres. Tapped Primary Aerial Coils, 6/1. H.F. Transformers, Split Primary and Reaction), 10/-. Split Secondary H.F. Transformers, 10/-. Reinforced Transformers, 10/-. 5XX same prices with exception of Reinartz and S. Secondary; these are 14/- each. 6-pin base, with standard spacing and cross-formation, with Screen, 15/-. FINSTON SCREENED COILS. B.B.C. Aerial Coil, 5/6. Split Primary H.F. Transformer, with reaction, 7/6. S.S. H.F.T. 7/6. Reinartz 7/6. 5XX, above, 5/6. 7/6, 11/-. Screen and 6-pin Base, 9/-. Finston Konoidal Coils, 9/ each. Base 1/6. All British Six 10/6 each B.B.C., 14/6 each 5XX. Rodney P.M. Magnetic Reaction Coil, B.B.C., 9/8. EDISWAN R.C. THREESOME. Set of Parts: 2 Units, 7/- ea.; Pr. 2 Valve, 18/6; R.C.2, Pr. 14/-; 3 Lotus V.H. at 2/6; 2 Fil. Rheostats at 2/6; 9-v. Grid Bias, 2/-; Lotus 2-way L.N., 7/-; .0005 Tuning Condenser, 6/6; T.M. coil, post free, 23/9s. 6d. All with cheaper (but good) rheostats, valve-holder and 2-way. The above lot, 72/6.

Advertisement for KAY-RAY S.L.F. CONDENSERS. With handsome TRIOLITE dial and knob 7/6. By Post 7/11. LOW LOSS SQUARE LAW. This variable Condenser is simply marvellous value. It cannot be equalled in price or quality. .0003 4/11 each. .0005 5/11. With VERNIER 1/- extra. CRYSTAL AND ONE VALVE AMPLIFIER (L.P.). 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 2-Valve AMPLIFIER in L.F. amplifier in or COMPLETE handsome with valves, polished box. H.T. and L.T. 1 Valve, 16/11. Units, 44/6. Carriage 1/6. Carriage 2/6. 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. Telephonics, adjustable genting, (20/- model), 15/11. Brunat, 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 (Real), 30/- B.T.H., 15/- Sterlings, 20/-. VALVES. Cosmos S.P. 18, Red or Green, 14/- New Blue Spot, 14/- All Mullard, Ediswan, Osram, Marconi, Cossor, Bright D.E. and Power, 8/-, 14/-, 18/6, 22/6, 24/6, 30/-, 22. Mullard EM 1, 2, 3, 4, 5, 6. ORMOND SQUARE LAW LOW-LOSS. .0005, 9/6; .0005, 5/6; 4/6 each less no vernier; Friction Gear, .0005, 15/-; .0003, 14/6; .00025, 13/6. Straight Line Frequency Friction Gear, .0005, 20/-; .00035, 18/6. S.L.F., .0005, 20/-; .00025, 18/6. SQ. LAW LOW-LOSS. DUAL, .0005, for Elstree Six, 16/- each. Ormond Friction Dial, 10/-; Filament Rheostats, Dual, 2/6; 6 ohms or 30 ohms, 2/-; Potentiometer, 400 ohms, 3/6. L.F. Shrouded, latest model, 15/-. GANG DUAL .0005. ORMOND, with dial 32/- CYLON, no dial 60/- Triple .0005. ORMOND, with dial 40/- CYLON, no dial 70/- IGRANIC, no dial 75/- BOWYER-LOWE, no dial 70/- SPECIALS. .00005 Vernier for Lodge N.. Circuit, 3/11; Formo Twin Gang, with 4" Dial, 24/6; D.J. Triple Gang, 33/6; Formo Plugs, 1/6. All Jacks stocked. All Mullard components. McMichael new H.F. Choke 9/; 3-way Guard Coil Stands, 6/6. R.I. Choke (H.F.), 12/6; Cosmos H.F. Choke, 6/6; B.T.H. L.F. Transformers, 2/1 or 4/1, 17/6; Igranite Preset Resistor, 6, 10, 30 ohms. 1/6. IGRANIC TRIPLE-HONEY-COMB INDUCTANCE COILS. 30, 2/9; 40, 2/9; 50, 2/9; 60, 3/-; 75, 3/6; 100, 3/6; 150, 3/9; 200, 4/-; 250, 4/6; 300, 4/6; 400, 5/6; 500, 7/-; 750, 9/6; 1,250, 14/-; 1,500, 18/-. ALL PARTS STOCKED.

Advertisement for CALLER'S COLUMN NOT SENT BY POST. EBONITE GRADE A. Stock sizes, 6 x 6 and 7 x 5, 7/5; 8 x 6, 1/6; 9 x 6, 1/8; 10 x 6, 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 1d. sq. inch for 1/2 in. Special cheap panels for Crystal Sets. H.T. BATTERIES. All kinds of rubbish on the market, so buy here where only guaranteed and reputable makes obtain. Polo (highest test award), 60-v., 6/11; 100-v., 12/11. Dr. Nesper (the name is enough), 60-v., 7/11; 100-v., 13/11. For those that want a cheaper but still reliable, H.T., try the "K.R." 60-v., 5/11; 100-v., 10/11. Ever-ready, Siemens's stocked B.T.H. 5, 2/-; Adico, 1/8. Columbia, 2/3. Hellesen 2/6. Hellesen 4 volts Super L.T., 10/6 (and worth 1/1). H.T. 66-v., 12/6; 99-v., 21/-; Flasho, lamp, 4/5. Alisco, 4/6 doz., 6d. British 50 Dr. Nesper 1/6 doz. 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., 9/11; 13 in. x 8 in. x 8 in., 10/6 and 12/6. 15 in. x 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, 1/8. 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 ones seeing. Penton, Newey G.E.C. Lotus, Polar stocked. AERIALS. - 100 ft. 7/22 Hard drawn, 1/11. Rytra, 2/6. 2.2. Phosphor 49 strands, 1/1. Electron stocked. Special INDOOR Aerials, phosphor, with ebonite separators and rubber ring (12 ft. x 8 strands), total 100 ft., 4/1. V.V. Super Rubber Lead-in, highest quality, 10 yds., 1/8; 10 yds., 1/3; 10 yds., 1/6. Extra heavy, 2d. and 3d. rd. R. & B. Twin Flex (beat), 6 yds., 10/-; 12 yds., 1/8; 36 yds., 4/4. Ins. Hooks, 2 for 1d. Egg Insulators, 2 for 1d. 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, 10/1d. Superior articles. Nickel, Patent Ebonite handle. DPDT, 1/6; SPDT, 1/-; Push and pull, 3d and 4d. All Lissac, 2/6. TERMINALS, Etc. - Nickel W.O., Phone, Pillar, 1/- doz.; 3 for 4d. Brass doz., 10d. doz.; 1d. each. Nickel Valve Legs, 2 for 1d. Stop Valve, 2 1/2. Spade Tag, 6 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 Spades, 2 for 11d. Pins do. Valve Pins, 2 a 1d. PERMANENT DETECTORS. - Liberty, 3/8. Red Diamond (a topper), 2/-; Lion Micro, latest cannot be equalled, 2/6; Browne, 3/-; Enclosed Key, Ray, 1/-; 3/8. Service Micrometer, with crystal, 2/9. Burn-dept 4/-; Mite Metal, 4/6. RED & BLACK Wander Plugs, 2d. and 3d. pr. Spades, 3d. pr. Pin, 2d. pr. Plug & Socket 3d. Clix Wander Plug, 2d. Igranite, 3d. COIL PLUGS. - Ebonite on Base, 6/4; 7/6. Low Loss, 8/1d. Panel, 6/1d. Various stocked. CALL HERE FOR LISSEN, BENJAMIN, RADIO-MICRO, COSMOS, MULLARD, EDISWAN, MARCONI, COSSOR, OSRAM, JACKSONS (J. B.), DUBILIER, NEMICHAEL, SUCCES, BEARD & FITZEL, BOWYER - LOWE, LEWCO'S, IGRANIC, BURKE, ORMOND, ULLITZ, FORMO, ERICSSON, BELM, FERRANTI, R.I., POLAR, NEWNEY, 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 PLEASE MAKE UP YOUR LIST FOR ORDERS OVER £2 IF REQUIRING COMPONENT PARTS FOR ANY SET AND WE WILL GIVE YOU A FIXED INCLUSIVE PRICE.

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**3-VALVE No. 138a R.A.F. RECEIVERS.** Very compact. Cost £18. 1 H.F., 1 Det., 1 L.F.; 3-valve holders, antipong mounted. Fine portable Set, fitted 2-coil Holder, covered case, with lid, 3 new '06 valves, 4-volt Accumulator, 60-volt H.T. Battery, H.R. Headphones, etc., complete outfit as above, £5 5s. Packing and carriage 3/-. Sterling 3-flex set in pol. Walnut Cabinet, with 3 D.E. Valves, £5 5s.

**4-VALVE RADIO COM. SET.** Listed £28. 1 H.F., 1 Det. and 2 L.F. with Polar Coil Holder and Coils for B.B.C. and 5XX. In Vert. Pol. Mahog. Cabinet. Brand new, £6 10s. Carriage 4/-.  
**5-VALVE R.A.F. RECEIVERS.** 2 H.F., 1 Det., 2 L.F. in portable case. Condenser and valves. H.T. and L.T. Batteries and headphones. Cost £52. Sale price £25. With D.E. valves, £5 10s.

**SUPERSONIC HETERODYNE SETS.** The cheapest is the R.A.F. 7-valve 600/6,000 metre H.F. Trans. and 3 L.F. Plug switching, beautiful mahogany cabinet. Gets Daventry with no aerial. Your existing 2-valve set coupled to this makes a £35 Het. These R.A.F. Sets cost £40, and are a snap, £5 10s. Carriage, 4/6.  
**Last of famous A.F. Marconi R.B.10 Crystal Detector and 1-valve L.F. Amplifier.** Each tested on our Aerial. Closed cabinet engraved ebonite panel, nickel fittings, spade variable Tuning, I.C.C. and M.S.I. fixed cond., Detector, Valve-holder, Terminals and plug sockets. L. and S. wave switch, wiring diagram, etc. All new and complete. With Osram valve. Guaranteed exactly as above. Worth treble the money. Bargain, 27/6. Post 1/3.  
**MARCONI Crystal Cabinets** with 'phones, 15/6. Fortevox set, one 'phone, 10/-.

**VALVES.** New stock of Low Loss "C" at 4/- for Short Wave Work; Microsix Famous French '06 valves, 9/-; Rectifying 2-Electrode Power Valves, 8/6 each. American Transmitting, 17/6; 30-watt Short Wave, 25/-; 10 watt, 12/6; AT40 Cossor 1,000-volt, 30m/3, 15/-.

**VALVE TRANSMITTERS.** French type in case. Trans. coil plug tapping. Anode 6,000 ohms wire leak. Dub. Condensers. Remote control switch, ammeter, etc., £2 10s. Packing and carriage, 2/6.  
**R.A.F. TRANSMITTERS,** with high-class 1 in. Sterling Coil wound 3 lb. fine wire, Oscil. adj. Spark Gap on ebonite. Morse Key. "H.T. Mica Condenser. Terminals and attachments on ebonite, enclosed case. These Sets cost £15, and are given away at 14/- each. Type No. 1 with Tuning Helix, 15/6. These sets give good results on Wireless models.

**R.A.F. MASTS.** 2 ft. 8 in. Steel Tube, 1 1/2 in. socket sections, 15 ft., 7/6; 20 ft., 10/-; and 30 ft., 14/-; Heavy 4 ft. 3 in. Sections, 2 1/2 in. steel tube, 5/- each.  
**DIXON DISTANT CONTROL** for Valves. On and off any distance. Uses no current. Polished Oak Case, 15/-; Bronze Watertight, 17/6.  
**MAINS UNITS.** The DIX D.C. gives any voltage from D.C. mains; 3 taps, 80/-; A.C. Rectifying H.T. Unit with Control and 3 taps, £5 10s.  
**GYROSCOPES.** Navy Torpedo in mahogany cases, beautiful work. Cost £25. Price 15/-.

**HIGH VOLTAGE CONDENSERS.** All guaranteed, on rated voltage. 500 volt. 4 mfd., 8/6, No. 20H; 1,000 volt .05 mfd., 2/6, No. 16B; 2,000 volt 2 mfd. 22/8, No. 20C; 3,000 volt 2 mfd. (oil), 45/-, No. 20FO; 10,000 volt .0025 mfd., 3/6, No. 16AI; 20,000 volt .002 mfd., 35/-, No. 20DH; 30,000 volt .0025 mfd., 10/-, No. 16HW. Switch type up to 50 m.f.d. in stock.

**WAVEMETERS.** Reduced prices. S.W. "Forward" cost £10, 40/100 metres, 85/-; B. 1,000/2,000 Townsend, 35/-; B.B.C. "Townsend," 280/1,600 metres, 50/-; LR Townsend, 120/4,000 metres, £4; Ondia Wavemeter (for 60/4,000 metres), £3 10s. Get the best out of your set by using a Dix-Onemeter and a Wavemeter.

**SPARK SETS.** 10" Marconi. Coils, £7; Cox X-ray, £10; 2" Sterling, 15/-; 1" Coils, 5/-; Diathermy 1 KW 100 v. D.G. to 10,000 v. A.C., £15; 250 watt 500 v. Alternators, 70/-.

**MARCONI D.C. 50 COMBINED TRANSMIT AND RECEIVE.** 300/550 metres, in pol. mahog. cabinet, complete and new. Cost £40. £4 each. Cheapest combination ever offered.

**INSULATORS.** Transmit and H.T. Buldix Bellstrain, 1/6; Porcelain Ribbed Ped. brass stems, 2/-; Marconi 4 ft. Rubber cord strain Insulators for Mast Stays and Aerials, 2/-.

Our Bargain Catalogue will save you Pounds. Ad. Stamps.

**ELECTRADIX RADIOS**  
 218, UPPER THAMES ST., E.C.4  
 Blackfriars Stn. Met. Rly. City 0191.

# TECHNICAL NOTES.

(Continued from previous page.)

having a capacity of one farad. Inasmuch as an average capacity for a variable condenser used in wireless is 0.0005 microfarad, it is evident that a condenser with a capacity of one farad will be enormously greater in size than an average wireless condenser. To obtain a capacity of one microfarad, the condenser will evidently have to be 2,000 times as large as a 0.0005 condenser and to give a capacity of one farad it will have to be a million times as great again, that is, two thousand million times the size of an ordinary .0005 condenser! If each plate were made the same in size as the ground area of the Woolworth building in New York, and the plates were placed 1/25th of an inch apart, it is computed that there would be nearly 120,000 plates required, so that the height of the condenser would be 792 feet, the same as the height of the Woolworth building.

## Capacity of the Earth.

In the same connection it is interesting to note that the electrostatic capacity of the earth, considered as a sphere of conducting material, works out at 72/100,000 of a farad, that is, 720 microfarads.

## Frame Aerials.

I often receive questions from readers as to the use of frame aerials for various purposes and I notice that those who write to me frequently do not realise how much less sensitive is a frame aerial than an outdoor antenna as a pick-up device for electro-magnetic energy. It has been said that, other things being equal, it requires another couple of high-frequency amplifying valves to obtain the same result with a frame aerial as is obtained with a moderate outdoor aerial. This will give a fair indication of the relative sensitivity of the two, but it should be said that on very strong signals, such as those from the local station, the discrepancy will not be so great and the frame aerial will, as a rule, show up better in relation to the outside aerial. For distance work, however, the frame aerial will fall very far behind the extended antenna, and extra high-frequency valves will undoubtedly be necessary to make up.

## Directional Effects.

A good deal is said about the directional property of a frame aerial and the value of this property for cutting out interfering stations. As a matter of fact, however, the directional effect is frequently of very little value for this purpose and a great deal depends upon the bearing of the stations in question—the desired station and the undesired station. If the undesired station and the desired station happen to have bearings at the receiver approximately at right-angles to one another, the directional property of the frame aerial may be quite useful, for the undesired station is at a minimum position when the desired station is at a maximum. On the other hand, if the angle between the bearings of the two stations is something very different from a right-angle, it will be found that the frame aerial is not very helpful in cutting out the unwanted station, at any rate it only cuts it out at a considerable sacrifice in the volume of the wanted station.

**WIRELESS & ELECTRICAL.**  
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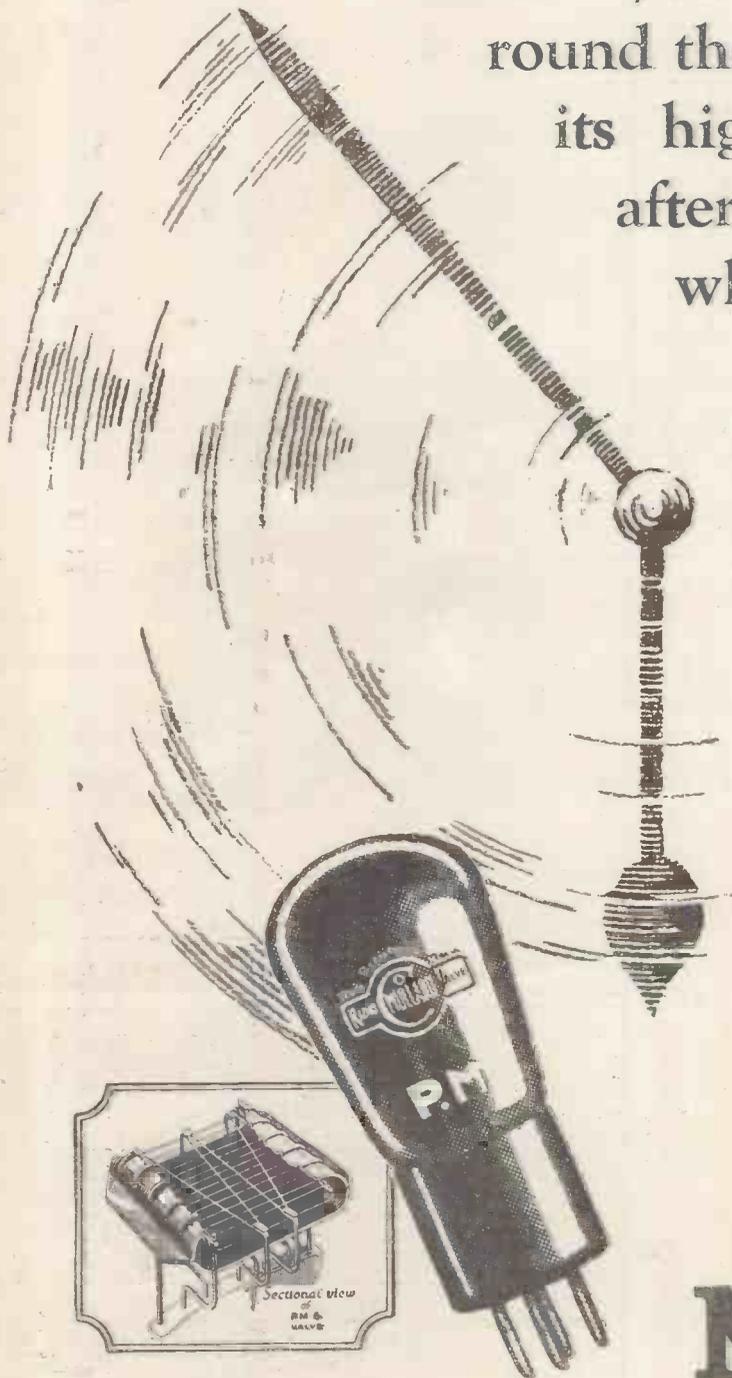
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