MAKING A MOVING-COIL LOUD-SPEAKER

J. H. REYNER ON CONSTANT COUPLING

Amateur Wireless
And Electrics

Vol. X. No. 240 SATURDAY, JANUARY 15, 1927 Price 3d

PRINCIPAL CONTENTS

WELL ILLUSTRATED

Registered at G.P.O. as a Newspaper.

A HOME-MADE MOVING-COIL LOUD-SPEAKER

Full constructional details for making this instrument are given in this issue.

Above: One of the Valves being picked up after its 500 feet drop.

Below: The "Wireless World" man hands-the-Valves to Pilot.

Below: A Stentor Two Valve used for this test.

The most daring test ever conceived

—Cossor valves dropped from an aeroplane at 500 feet to prove toughness of filament

THERE took place on Monday, December 20th, 1926, the most astonishing test to which any wireless valves have ever been subjected. Twelve Cossor Valves were chosen at random from stock by editorial representatives from "Amateur Wireless," "Popular Wireless" and "Wireless World." These valves were numbered and packed in the ordinary cardboard carton without cotton wool, corrugated paper or other absorbent material. They were taken direct to Stag Lane Aerodrome and handed to Capt. Barnard, the pilot of a "Moth" aeroplane, with instructions to drop them overboard one at a time at a height of over 500 feet.

The assistant Editor of "Amateur Wireless" accompanied the pilot.

Out of the 12 Cossor Power Valves which were thrown overboard the following were the startling results:

5 Valves were found to be in perfect condition (one landed on a corrugated iron roof and another on some wooden blocks).
5 Valves suffered from an internal derangement of the electrode system but the filaments were unharmed.
1 Valve was smashed to pieces through hitting the tail plane in flight (even in this case the filament was intact).
1 Valve fell out of range and was lost.

But in spite of the terrific drop and a 35 m.p.h. wind the filaments were intact in all valves.

This proves beyond question that the new Kalenised filament is the world's strongest filament. But only Cossor has the Kalenised filament—if you want long life, low current consumption and superb results see that your next valve is a Cossor.

Test carried out under supervision of
"Amateur Wireless"
"Popular Wireless"
"Wireless World"

TYPES AND PRICES.

Cossor Point One

210H For H.F. use ... 14/-
210D For Detector ... 14/-
(2 volts 1 ampere)

Cossor Power Valves

Stentor Two 18/6
(2 volts 15 ampere)
Stentor Four 18/5
(4 volts 1 ampere)

All above Valves fitted with Cossor Kalenised Filaments

Cossor —the Valve which serves you longest

Advt. of A. C. Cossor, Ltd., Highbury Grove, London, N.5 *Gilbert Ad. 7.59*

Amateur Wireless and Electrics

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Edited by BERNARD E. JONES

Vol. X. No. 240 Technical Editor: J. H. REYNER, B.Sc.(Hons.), A.M.I.E.E. JANUARY 15, 1927

Wireless Honours—A Radio Fatality—Increased Power of PTT—The Canute of Wireless—An Important Development—SOS!

Honours!

WIRELESS honours at last! No two deserve the honours conferred in the New Year's Honours List more than Mr. J. C. W. Reith (now Sir John Reith) and the Rev. H. R. L. Sheppard (Companion of Honour). Listeners owe much to Sir John Reith for the high pitch of efficiency which British broadcasting has attained. The Rev. H. R. L. Sheppard is well known to listeners for his sermons broadcast from St. Martin-in-the-Fields.

A Radio Fatality

ON a recent occasion, when tests were being carried out at the Eiffel Tower with the new 50-kilowatt wireless telephony plant, a young engineer inadvertently came into contact with a high-tension cable carrying a 12,000-volt electrical current and he was instantly electrocuted.

Increased Power

FROM January 20 the P T T Paris broadcasting station will increase the power of its transmissions to 5 kilowatts in order to ensure reception throughout France.

The Canute of Wireless

SIR WALFORD DAVIES caused much amusement at the conference of the Incorporated Society of Musicians at Felixstowe recently, when he referred to Sir Thomas Beecham's recent outburst against wireless music.

"Sir Thomas's tirade, if correctly reported, was as foolish as it was useful," he declared. "He is a great artiste and an amusing fellow and friend, but he sounded the other day like an annoyed Canute watching the tide surrounding him and saying, 'It's all getting wet and messy here. I'm off to re-discover America!'"

OUR WEEKLY NOTE

AVOIDING "HAND CAPACITY"

When attempting to tune in a distant station it is very irritating to find that the station can be picked up, but can only be "held" as long as the hands are kept on the tuning controls.

Now this "hand capacity" can usually be avoided, or at least very much reduced, by suitably connecting up the variable condensers to the rest of the set. When the hand is placed on the knob of a condenser, the part of the condenser which is nearest to the hand is the spindle connecting the moving plates to the knob and dial.

If, therefore, the moving plates are kept at the same potential as the body, that is to say at earth potential, capacity effects will be very much reduced, as the hands need never be brought close to the fixed plates.

It should be remembered that in nearly all receivers, besides those points which are connected directly to earth, the filament leads and both ends of the H.T. battery are at earth potential with regard to H.F. currents.

A New Development

WE would advise all our readers to follow the series of articles on "Constant Coupling," contributed by our technical editor, Mr. Reyner, as the principle of constant reaction coupling will be incorporated in a multi-valve receiver to be described at an early date in this journal. This new departure constitutes a unique development in set design which is of great importance to all.

S O S!

IN Holland, the Hilversum broadcasting station has been entrusted with the task of sending out urgent messages in the event of any serious rising of the Rhine and Meuse rivers. Watching-posts have been specially established in the Maastricht district, and reports on approaching floods are sent by telephone to the authorities, thus permitting due warning to be broadcast through the Hilversum transmitting station.

A Welcome Change

LEEDS-BRADFORD station listeners are delighted at the new change in wavelengths. On the old wavelength of 297 metres for Leeds and 294 for Bradford it required a very selective set to separate the two, but now that the Bradford wavelength has been brought down to the lowest in the country, 254.2, the heterodyne bogey has disappeared.

A Credit

THE latest Chamber Concert was of a very high order, and a credit to the organisers. Sometimes, possibly, the music played has been rather over the heads of the majority of listeners. Not so on this occasion, for the new songs by Debussy were treats in themselves. A really excellent performance!

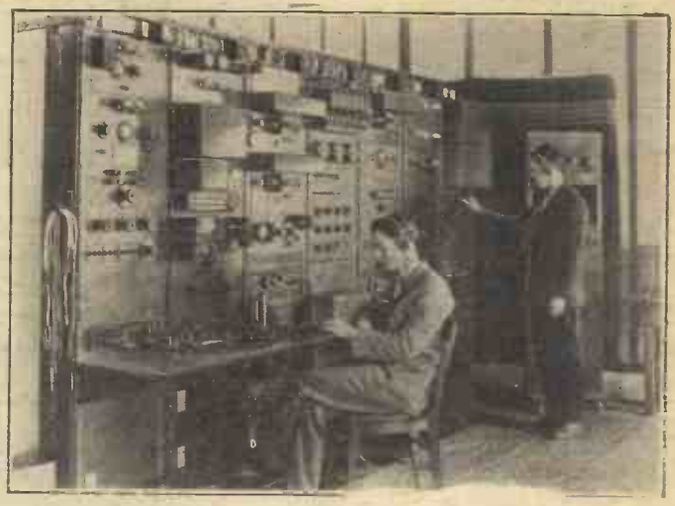
Messages of Good Cheer!

WE have been greatly heartened by the messages of good cheer that have reached us from friends and readers far and wide. Everybody seems pleased that AMATEUR WIRELESS is to be published under independent control, and we have been deluged with congratulations from all parts of the country.

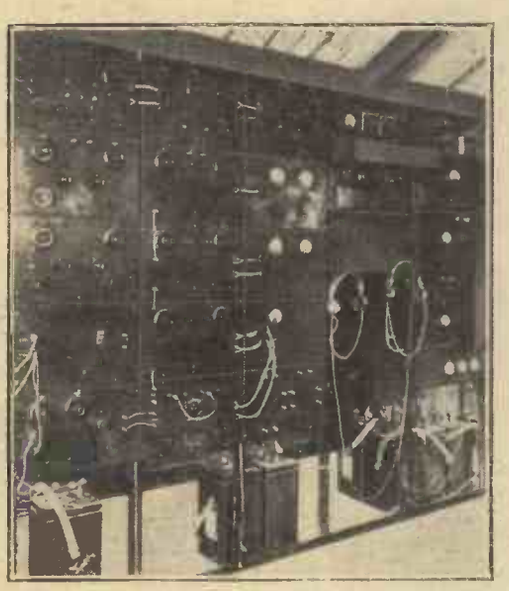
PRINCIPAL CONTENTS

THE LONDON–NEW YORK TELEPHONE SERVICE

Operators at the Trunk Exchange.



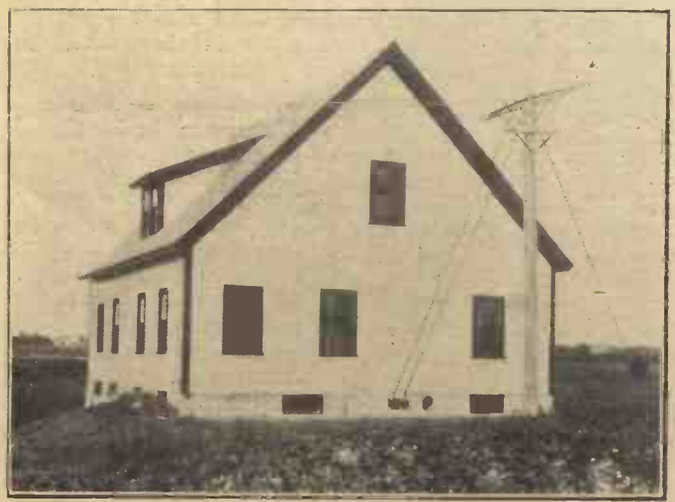
Power-supply board at Houlton, Maine, U.S.A.



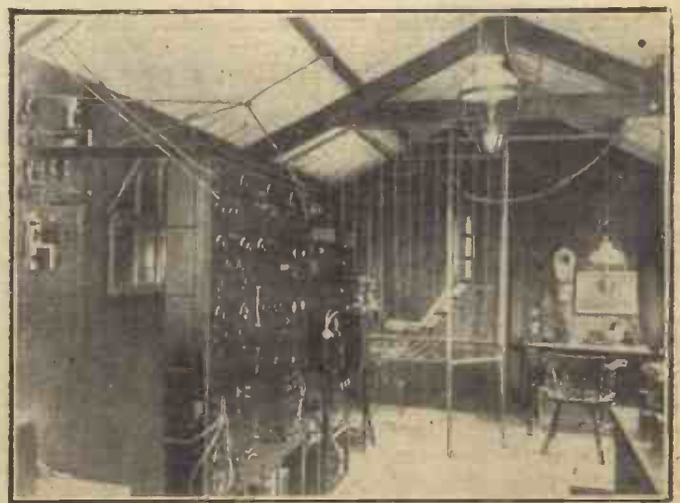
The receiving apparatus at Wroughton, nr. Swindon.

Some pictures of the £5-per-minute Wireless Telephony Service between London and New York

At work on the Control Panel.



The receiving station at Houlton, Maine, U.S.A.



General view of the receiving apparatus at Wroughton

Success With U.S.A. Stations

THE American broadcasting stations were hardly heard at all in this country last winter, and eminent experts told us exactly why this was so—each one giving a totally different reason. It was, however, generally believed that the cause was to be traced to sun spots, which were fairly bad at the time. Throughout the summer and in the early days of last autumn the spots grew larger and more numerous, and it was widely held that we should hear nothing at all of America for a year or two.

Long-distance in Comfort

Having to lie up in bed for a spell from the end of August I had a three-valve receiving set installed by my bedside, whilst the simplest of indoor aerials was run up in the room. I was lying awake in the early hours of August 29, when it suddenly occurred to me to switch on just to see if by any possibility anything was receivable. To my utter surprise I picked up WBZ in a few minutes and held him for over an hour, both speech and music coming through very well. During the following week I was able to hear a round dozen American stations; in fact, a search over the broadcast band between 2 a.m. and 4 a.m. was certain to result in the logging of several. From the middle of September to the middle of October a bad patch occurred, but from that time onwards American stations have been coming in almost as well as they did in 1924-5, which was the best season on record.

Anyone who possesses a reasonably efficient set can now sit up for America with a fair amount of certainty that he will hear something, provided that conditions are not hopelessly unfavourable. There are certain small but important points that make all the difference between success and failure, and a few hints may not be out of place. First of all, do not try searching for Transatlantic broadcasting with a "floppy" set.

Nothing is more exasperating either to yourself or to such neighbours as may be endeavouring at the same time to hear something of WJZ, WGY, WPG, WHAZ, or CNRA. With such a set you simply cannot do the fine tuning that is required, and you are certain to make a nuisance of yourself by causing a deal of interference. If you now use reaction of the swinging-coil type you will probably find it a vast improvement to fit capacity reaction in its stead. It is usually a simple business to do this, and it makes a wonderful difference to results.

Simplicity of Control

Do not go in for a bewildering multiplicity of controls. If you do so you are pretty certain to get lost, for you cannot be sure that you are going up or down in the wavelength scale and keeping your tuned circuits in resonance.

Be quite sure that the "atmospherics" that you hear, if you do hear them, are real ones. Much long-distance reception is spoilt by noisiness in the receiving set. If all your neighbours complain of atmospherics you may feel confident that they really are about; if, however, you are the only person to do so you should look to your batteries, your valve holders and your grid and plate connections.

It is seldom worth while sitting up for America without first ascertaining that conditions are respectably good. My own tip, which has been found very useful by numbers of friends, is this: I make use of what I call a reference station. This is a distant station of small power which cannot be well heard until the set is in a sensitive condition (by sensitive I do not mean oscillating). If your set is neutrodyned you can make it really sensitive without any liability to howling. I used to select for the purpose one of our own relays, but now that these have gone on to common wavelengths I find Karlskrona very good for the purpose. Readers must, however, choose their own reference station according to local conditions.

At about ten o'clock on the evening when an attempt to receive America is contemplated the reference station is tuned in. Should it be well heard without atmospheric interference, then a late sitting is probably worth while; if, on the other hand, its strength is much below normal, or if atmospherics are bad, then one may as well go to bed at one's usual time.

Searching

Should your set not be calibrated, or if you do not possess a reliable wavemeter, I would strongly advise you to try, in the first instance, for one particular American station, and to obtain the necessary settings as nearly as you can before 11 p.m. by making use of broadcast transmissions on this side of the Herring Pond. An excellent station to go for is WGY, whose wavelength is 379.5 metres. This station is often to be heard as early as midnight, at which time a concert usually begins, though his signal strength is generally at its best a couple of hours later. His wavelength is particularly easy to find, since the powerful German station at Stuttgart broadcasts on 379.7 metres, only .2 metre above it. If, therefore, you tune in Stuttgart as sharply as possible before he closes down, you will probably hear WGY when you switch on in the early hours of the morning, and only the slightest adjustment will be needed to bring him up to full strength.

WJZ, the big station at Boundbrook, is almost as easy if you can pick up Stock-

(*Concluded in third column of next page*)

The Studio of KDKA at East Pittsburg, U.S.A.

STATE BROADCASTING IN FRANCE

First Information of a Likely Development

A FURTHER attempt is being made by the French authorities to secure absolute control of all wireless broadcasting in France, and a Bill to this effect, submitted by the Ministry of Commerce and already passed by the Cabinet, will shortly be laid before the Chamber of Deputies. Amongst its numerous clauses the most important would appear to be the one providing for the nationalisation of all broadcasting stations within the next five years.

In French circles it is understood that all transmitters, either already in existence or in course of construction, would at the end of this period automatically revert to the State, to be solely operated and administered by the Ministry of Posts and Telegraphs.

Possible Opposition

Although it is generally realised that the state of anarchy at present obtaining in the French broadcasting world must necessarily impede the development of any regular service, it is also thought that the installation of a high-power transmitter, to be run by a powerful industrial association, would not prove a satisfactory solution to the problem, but it is expected that considerable opposition will be made to any scheme which would secure to the State a full monopoly of radio transmissions.

Connected with the present Government scheme is one for the erection on the Franco-German frontier of a high-power transmitter, to be linked by land-line to the capital for the purpose of broadcasting high-class entertainments, extensive news bulletins and official propaganda with a view to counteracting in Alsace-Lorraine any German influence which may be achieved through the activities of the Langenberg and Freiburg wireless telephony stations.

In the meantime, however, through private enterprise, several new—and unlicensed—transmitters are being set up in various districts of France, as there exists no legislation which could empower any Government department to cope with the matter.

On a recent occasion when Radio-Toulouse, prevented by the postal authorities from using a telephone line for the relay of a sacred service from the cathedral, effected the broadcast by a short-wave transmitter—picked up on a super-het and re-broadcast by its main station—summonses were issued by the Ministry of Posts and Telegraphs and served on both the arch-priest of that city and the broadcasting company. Later, in the courts the State was non-suited, and the Post Office came in for considerable criticism for having adopted so arbitrary an attitude in the matter.

In support of the present wireless Bill a plea will be put forward by the Ministry of Commerce that a law must be passed which will prevent an official administration being made the laughing-stock of the entire country. J. G. A.

WIRELESS IN THE ROYAL COMPARTMENT ON THE "RENOWN."

A Wireless Set has been installed in the day-room of the Royal Apartments on H.M.S. "Renown" for the use of T.R.H. the Duke and Duchess of York.

BATTERY-CELL CONNECTIONS

THOSE who have low-tension battery cells of low amperage may lengthen their period of use by connecting them in parallel.

For instance, if four two-volt cells, each having an amperage of ten hours actual, are available, and it is desired to use four volts, the cells should be connected in two pairs, in series. Each pair is then connected in parallel. Thus four volts with an amperage of twenty hours actual is obtained. H. B.

"SUCCESS WITH U.S.A. STATIONS" (*continued from preceding page*)

holm earlier in the evening. The Swedish station uses a wavelength of 454.5 metres, and that of W J Z is .2 metre less. Failing Stockholm, you are almost sure to be able to pick up Paris P T T and Oslo; Boundbrook's tuning is just midway between the settings required for them.

The third really reliable American transmission just now is W B Z, whose wavelength is 333.1 metres. If you can get Nuremburg on 329.7 metres a very slight increase will bring in Naples on 333.3 metres, a transmission which is usually rather muzzy partly on account of its sharing a wavelength with Reykjavik and partly because a heterodyne from Cartagena frequently occurs. These settings will be almost exactly those needed for W B Z, but should you be unable to find them you have only to tune in Bournemouth and to rise a little above him.

If you follow out these hints you will most likely pick up one or more of the transmissions referred to. Once you have received them you will have no great difficulty in picking up others, for you will have known settings at three points in the broadcast band from which you can work upwards or downwards. J. H. R.

The Chinese Puzzle, a play which scored a considerable success in the British Isles a few years ago, will be broadcast from 2 L O and 5 X X on February 4. Miss Ethel Irving has been engaged for the principal rôle.

THE "HOUSEHOLD TWO"

A Set for the Non-technical Listener

The "Household Two" ready for use.

PRIMARILY this receiver is for loud-speaker work, although, as two valves are employed, the range may be considerably extended if phones are used. For broadcast reception over short distances from the local station a two-valve receiver—one detector and one stage of L.F. amplification—is amply large enough; a third valve is only necessary where great range of reception or additional volume is required.

The receiver here described is neat and compact, simple to operate (simplicity of operation is absolutely necessary in a set to which the adjective "household" may be applied), and gives good loud-speaker reception over a distance of about fifteen to twenty miles from a main station.

General Construction

The set is not self-contained, as regards the high-tension battery and accumulator, since the fumes given off by the latter are apt to corrode metal parts in the receiver, and the cabinet would have to be much larger to accommodate the high-tension battery. The nine-volt grid battery, however, is enclosed in the case, and a terminal strip is provided on the outside of the cabinet for aerial, earth, loud-speaker wires and battery connections.

The loud-speaker stands on top of the polished oak cabinet, and the appearance of the whole is distinctly pleasing, as may be seen on reference to the first photograph. The second photograph shows the interior of the cabinet, and the diagram gives a clear idea of the arrangement of the components on the bottom of the box.

View of Interior of the "Household Two."

A false bottom is provided for the cabinet, so that the few components may be mounted thereon and a large portion of the wiring completed before the base is dropped into the cabinet. It is then fixed in place with four wood-screws.

Of course the transformer, coil holder, valve holders and grid condenser may be mounted direct on to the bottom of the box if desired; wiring up will be rendered a much more difficult task, however, as the sides of the cabinet will prevent free use of the soldering iron.

The only point which calls for notice in connection with the baseboard is the mounting of the two-coil holder. This component, it will be seen, is mounted at the back of the baseboard, and a long extension is fitted to the spindle to bring it through the front of the cabinet near the terminal strip. This is done in order to avoid hand-capacity effects disturbing the coil setting, and also to make the wiring to the holder as short as possible. H.F. wires would have to cross L.F. wires in a number of places were the holder placed close up to the front of the cabinet.

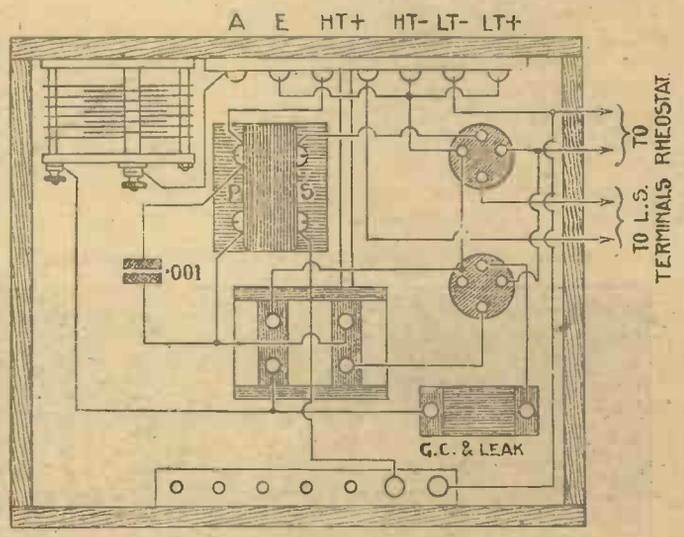


Diagram Showing Connections.

The variable condenser is mounted direct on to the side of the cabinet, ebonite bushes being used, also, the moving plates are arranged to be at earth potential—this, again, to reduce hand-capacity effects.

The filament rheostat—there is only one controlling both valves—is also mounted on the side of the box, but no insulating bushes are needed, as it is at earth potential.

The L.F. transformer, mounted on the false bottom, is an Energo with a .001-microfarad fixed condenser placed across the primary. The condenser is supported only by the stiff tinned-copper wiring.

On the terminal strip are connecting points for aerial and earth, loud-speaker, H.T., with separate tappings for detector and L.F. valve, and the L.T. The wood at the back of the strip is cut away so that the shanks of the terminals do not short-circuit to the cabinet. Flex leads are taken from L.T. negative and IS on the transformer to a grid-bias battery clipped in place against one side of the box; about 4½ volts bias is necessary with most valves, but a nine-volt battery is used, so that there is plenty of margin.

The L.T. positive terminal is earthed, for the only reason that the grid leak is placed direct across the condenser instead of between grid and the L.T. positive wire itself. This method is quite satisfactory and eliminates the need for an extra connection from the leak to the terminal strip.

No theoretical circuit diagram is given, as the "straight" two-valve circuit is well known to most amateurs. Those who are unable to follow a theoretical diagram will find the diagram given here of great use, as actual point-to-point connections are shown. The diagram is not to scale but the false bottom measures 12 in. by 9 in.

K. U.

WITHOUT FEAR OR FAVOUR

A Weekly Programme Criticism by Sydney A. Moseley

OF course I may be too conscious of the new era in broadcasting, but I feel that the last few programmes have been in the nature of experiments. I am fully aware that the change for the moment is in name only; but, nevertheless, there is such a thing as the human element even in broadcasting, and I imagine that a self-conscious effort to make things better on January 1 is the cause of these unsatisfactory programmes.

Ragged is the word rather. For instance, to take one evening's programme. From 7 o'clock to 7.15 we had a talk. Then we had Bach, which is in the nature of being educational, then another talk, and then a story — all in less than an hour! A song recital, preceded by exclamations, and then more classical music —this time Mozart. I suppose announcements are necessary; but since I prefer to use the high-power station I get more than my share of these, and when this is followed by another talk—well, I believe and devoutly hope, however, that the programmes will settle down to something of their old form.

The short programme by the Arts' League Travelling Theatre was, as one expected, efficient and sufficient. The title of the Arts' League is rather awe-inspiring, but, as a matter of fact, they provide fare which all of us may appreciate. They gave me an impression of understanding their job thoroughly, and I hope that the "short" programme will expand to a fuller one in due course.

* * * * *

It is a curious thing that the programme I am now criticising is really full of explanation and exhortation. Even at ten o'clock we were given another lecture under the guise of a controversy as to the respective merits between jazz and classical music. I think some of us have fully made up our minds ere this!

* * * * *

One of my correspondents has asked me to express a view as to the curtailing of the French talk. He is a commercial editor, and is therefore particularly interested. His argument is that French is more universal than Spanish.

"I wager that where one listener wants Spanish, a hundred want French," he says.

Another argument of his is that most of the "boys" who were over in France during the Great Upheaval know a smattering of French, and therefore are interested in the French talk.

On the other hand, as I pointed out to him, Spanish is a language of growing commercial importance, and that if he took a census of opinions among listeners in general he would find that not one in a thousand cared a jot for either language! 'Tis a pity, but 'tis true.

* * * * *

Another correspondent who prides himself on being a God-fearing man objects to there being "far too many religious services on Sunday," the only day on which a good many listeners are free to enjoy a full wireless programme. My reply to this is that the extra services recently were due to the New Year. In any case, I am sure it is not a question of "shoving religion down our throats," because, first of all, the remedy is to switch off if you are not in a receptive mood, and, secondly, you are not bound to believe all you hear. So you see that, in private in any case, I defend the B.B.C. from unfair attacks.

* * * * *

I settled down the other night to hear what I thought would be a first-class programme. In the preliminary notice of "A Dream Fantasy of 1926" we were told that as the fantasy progressed there would be mingled impressions of outstanding transmissions of the year. This was a very fine idea, but strangely spoilt by an undignified effort to reply to critics, and of far too many interruptions in the dream fantasy itself. If the B.B.C. had simply let its critics remain asleep while we were given some of the biggest hits of the year it would have achieved its purpose far more successfully. I felt that I had never witnessed such a grand idea so hopelessly mishandled.

* * * * *

"Looking Backward," too, was overdone. There was far too much Eckersley, and too much exaggeration of the noisy part of the B.B.C.'s early difficulties. The engineer, however, made a real hit in his modernised parody of "The House that Jack Built" stunt. But I suppose one must allow for the exuberance of the last day of the old régime.

WIRELESS ON LIGHTHOUSES AND LIGHTSHIPS.

Part of the crew of the "Royal Sovereign" Lightship enjoying the broadcasting. AMATEUR WIRELESS *has undertaken to design and supply a receiver for the Brachy Head Lighthouse.*

This valuable Booklet is obtainable from your Dealer for a Nominal Sum

THE contents include hints on the construction and operation of wireless sets, notes on valves with a comprehensive list of valves recommended for each stage, and diagrams of connections for eleven different circuits.

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I save 15/- in the £1 by using 2-volt S.T.'s and these batteries.

Do *you* want glorious volume and vivid, clear-cut music?

Of course you do, but why spend more on your valves and four times as much on upkeep expenses by using 6-volt valves? The S.T. 2-volt valves work better than most 6-volt valves, although they only take one-tenth of an ampere filament current, and will work excellently on only 60 volts high tension. All the arguments which have been brought forward in favour of point one valves apply to S.T.'s. All the arguments in favour of glowless filaments apply to the torodium filament common to all S.T. valves. But the real secret of the efficiency of the S.T.'s lies, as the laboratories of the "Wireless World" have stated, in the high amplification combined with the low impedance of the valve. The dynamic curves of the S.T. 2-volt valves explain what everyone finds in practice, that they give wonderful signal strength with smaller batteries than any other valve, and, of course, each valve is tested under the personal supervision of John Scott-Taggart, and it's life is insured at Lloyds.

S.T.21 (H.F.) 0.1 amp. ... 14/-
S.T.22 (L.F. and Det.) 0.1 amp. 14/-
S.T.23 (Power) 0.15 amp. 18/6

S.T. Ltd., 2, Melbourne Place, Aldwych, London, W.C.2 (next to Australia House).

On Your Wavelength!

Congratulations

I AM sure that every wireless enthusiast was delighted to see on opening his morning paper on New Year's Day that the managing director of the old British Broadcasting Company and of the present British Broadcasting Corporation had received the honour of a knighthood. No one has done more than Sir John Reith to assist the progress of wireless as a national hobby, for it is mainly to his efforts that the old company and the new corporation owe both their splendid organisation and their forward policy.

It must never be forgotten that the B.B.C. were the pioneers of broadcasting on this side of the Atlantic. Though transmissions had been made with a certain amount of regularity prior to the formation of the company from a few stations such as the Eiffel Tower and Writtle, nothing like a regular service of news and entertainment had ever been attempted previously. It was then a matter of breaking new ground, and of providing a system to meet present and future requirements. How successful Mr. Reith's system has been may be judged from the fact that nearly all European countries have used it as a model, and that Americans who come to this country seldom fail to express the wish that they had something of the same kind over there.

A Warning

Speaking of America reminds me that there are signs at the present time that manufacturers in the States intend to make efforts to capture a large part of the wireless trade in this country. They have not been exactly idle in the past, for certain American components have a pretty wide sale here. Some of them are undoubtedly extraordinarily good, particularly those intended for use on the high-frequency side of the receiving set, but there are few which are not equalled or bettered by the productions of manufacturers of standing in our own country. What the intending purchaser should remember is that American components are made to suit a public whose requirements are different to ours.

Over here one of the chief problems as regards high-frequency amplification is to obtain such selectivity as will separate transmissions on wavelengths differing by ten kilocycles with outputs of from 1.5 to 10 kilowatts. In America the number of stations rated at 1.5 kilowatts upwards is quite small; the average American broadcast transmitter works with a power of half a kilowatt or less. Now, it is one thing to separate two half-kilowatt stations on neighbouring wavelengths and quite another to bring in, say, Leipzig, at fifteen miles from London when 2 L O is working.

Do not forget, again, that high-frequency coils of special kinds will be at their best only when used with valves of particular characteristics. American coils are designed for American valves. In the States the selection of "toobs" available is a very small one; they have nothing like the variety of types that we have, nor are those that they have on the whole so efficient as our own. It is therefore unlikely that the full efficiency of a British valve will be brought out by American high-frequency couplings.

Push-pull H.F. Circuits

It is a curious thing that although push-pull amplification has been extensively used at low-frequency one rarely sees references to H.F. push-pull circuits. Yet there is apparently no reason why this principle should not be applied to high-frequency currents, and, in fact, the Editor informs me that an ingenious unit operating on this principle will be described by Mr. Reyner in the February issue of *The Wireless Magazine*.

When one looks into the question there are really many advantages of a push-pull arrangement at high frequency, some of which are not present in the corresponding low-frequency circuit. For example, it enables one to obtain satisfactory amplification from two high-frequency valves with only one tuned circuit, so that there is an attendant simplification in this respect. There are, I believe, several other useful points in connection with the scheme, and I am certainly looking forward to Mr. Reyner's set when it does appear.

Two New Valves

I see there are two new valve arrivals, the DEH612 and DEL612 respectively, marketed by the General Electric Co., Ltd. In the normal way one would rather tend to deprecate the advent of more valves to an already well stocked field, but these valves fall into certain well-defined types, and are, in fact, representative examples of a good high-frequency and good low-frequency amplifier valve respectively, and can be used very satisfactorily with existing types of circuit. What is particularly pleasing is the method of classifying the valves, so that the filament current and voltage can be seen at a glance without having either to rely on a colossal memory or to refer to a pocket book.

Can It be Done?

One of the drawbacks to the wide use of the new Transatlantic telephone service by big business firms is that there is not yet any guarantee that conversations will be secret. Many readers who have sets that will reach wavelengths between 5,000 and 6,000 metres have probably been able to pick up and to hear both the transmissions from Rugby and the replies from America. They will have found, though, that if either of these transmissions is tuned-in in the ordinary way with the set in a stable condition only a jumbled sound can be heard. When the set is allowed to oscillate speech becomes quite clear. This is because the transmissions are done on the side-band system.

Transmissions from an ordinary broadcasting station consist of three parts: the carrier wave, the upper side-band and the lower side-band. In those of the Transatlantic service the carrier wave and one of the side-bands are filtered out. Nothing whatever can be understood unless the carrier wave is replaced by allowing the receiving set to oscillate. At present then it is quite easy to overhear conversations. But the authorities are not going to allow this condition of affairs to continue for very long. A system has already been worked out whereby such distortion can be introduced deliberately at the transmitting end that neither head nor tail can be made of messages as picked up by a set such as yours and mine.

A Queer Problem

One of the problems which confronted the engineers engaged in working out the details of the Transatlantic telephone service was that which is known as "singing round the ring." If you possess a microphone you can easily see what this means by connecting it up to the note-magnifying side of your set and placing one of your telephone receivers close to it. If now a sound is picked up by the microphone it is passed through the low-frequency stages, reaching the telephone receiver after amplification. From the receiver it goes back to the microphone, and the process continues until a tiny sound is built up to an ear-splitting roar. Do *not* try the experiment with the Post Office telephone, or it may have serious consequences both to yourself and to the operator at the exchange.

"Singing round the ring" on the grand scale took place when Rugby first started Transatlantic working. What happened was that, despite the difference in wavelength, signals were picked up by a receiving station in this country for which they were not intended, and were so "short-circuited" back to the transmitter. The difficulty has now been entirely overcome, and no trouble of any kind is experienced in this way.

Beam Telephony

Meanwhile the Marconi beam stations report that telephonic communication with Canada is so good and so reliable that a

On Your Wavelength! (continued)

service could be started almost at any time if the necessary facilities were granted. Experimental working with Australia has also been carried out with great success. There seems to be no doubt that the beam system is by far the more economical of the two, for a power of only 20 kilowatts or so will suffice to drive signals from one side of the world to the other. For this reason it is held that if the beam system were used for long-distance telephony it could be made to pay with charges very much smaller than those in force for the present Transatlantic service.

I have always held that the future of commercial wireless was inseparably bound up with the short waves and the beam system, and to this belief I still adhere. I cannot see the use of "telling the world" by broadcasting with equal intensity in all directions when you are conducting a conversation intended to be simply from London to New York.

Good for D X

Reception conditions have been for some little time now about as good as they could possibly be. Except for very brief spells, associated usually with rapid fluctuations of the barometer, atmospherics have been almost entirely absent, and the ether has about it that pleasant "liveliness" that warms the cockles of the hearts of all keen D X'ers. You, I have no doubt, know what this means. On certain nights you can turn your dials through quite a number of degrees and find the wavelengths over which you have passed apparently completely deserted. If, in fact, you go from one end of the scale to the other, you will hear nothing except the nearer of the home stations and such Continental giants as Frankfurt, Hamburg and Leipzig. Those are the nights when the ether is dead. Such transmissions as you do get seem dull and lacking in quality.

Fading

On a lively night stations come in at every tick of your condensers. If they are far away they may be but faint, but they are there all the same. On several occasions lately I have been able to run right over the broadcast band, picking up almost every main transmission or common wavelength group that appears in the Geneva list. I do not mean to say that I have received every one of these stations well. Some of them were, of course, jammed by mush, sparks, or heterodynes, and others were too faint to be of much use. Still, one could listen with enjoyment to more than a score of different programmes. The only thing that has been against long-distance reception of late is fading, and this has unfortunately been rather marked. It has, in fact, affected at times practically every station with the exception of the local one.

Have Home Stations Benefited?

There can be no doubt that, taken as a whole, the Geneva wavelength scheme is a big success, despite the interference that is still experienced through the standing out of the Russian and Spanish stations, and a few small ones in other countries. But how has it affected the stations of the B.B.C.? My experience is that Birmingham, Glasgow and Manchester have scored considerably by being cleared from heterodyne interference, but, on the other hand, Cardiff has had a bad time from a Spanish heterodyne, whilst Bournemouth, Newcastle and Belfast suffer severely from the effects of morse signals.

Bournemouth I can sometimes get free from spark interference, but it seems to be almost invariably present when either of the other two is tuned-in. However, if local listeners are not worried by sparks it does not matter very greatly, since the rest of us have now an ample number of alternative programmes to choose from. Balancing up the gains and the losses, we must, I think, agree that we do not wish to go back to the old disorder, in which there was sometimes not a single programme, not even excepting that of the local station, that could be heard without an unwanted accompaniment.

Better News Bulletins

One of the first of the good deeds of the British Broadcasting Corporation has been to improve the news service. In future we are to have long descriptive accounts of important sporting and other events, which should be most attractive. It has always seemed to me rather ridiculous that, though the sounds of the racecourse could be broadcast, as they were last year, we could not be told via the loud-speaker the name of the winner of the Derby. In future all this will be altered. Big fights, races, football matches and so on will be reported, as they are now in America, in France, and in other countries. I am sure that the new service will in no way hurt the newspapers, though, on the other hand, it will give a tremendous impetus to the popularity of wireless.

Transatlantic Television

That there is some prospect of seeing by wireless across the Atlantic before very long is made evident by the demonstration which has just been given before the American Institute of Electrical Engineers by Dr. Alexanderson, consulting engineer of the General Electric Co. and the Radio Corporation of America.

Some time ago it was pointed out in AMATEUR WIRELESS that the tremendous number of separate signals which it is necessary to transmit every second in order to build up recognisable images in television would necessitate the use of oscillations of enormous frequency. It is rather interesting in this respect to find that it is this very problem which is holding up the practical application of Dr. Alexanderson's process at the moment. The inventor pointed out that it would be necessary to establish a television wave band 700 kilocycles wide—that is, a radio channel occupying waves between 20 and 21 metres.

Speed Requirements

Dr. Alexanderson stated that the speed requirements for distinct vision are at the moment "beyond the present capabilities of radio." In order to transmit minute changes in facial expression between two persons conversing in New York and London, it is necessary to transmit no less than 300,000 separate signals per second. With wireless systems of transmission at present available across the Atlantic this is not possible, and he is therefore attempting to employ seven separate radio circuits, each of 40,000 picture-units per second.

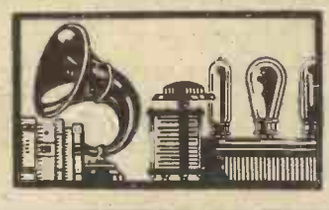
Dr. Alexanderson's work on the generation of high-frequency currents for radio telegraphy is so well known that his prophecy of an early solution of wireless television across the Atlantic demands serious attention. Some excellent examples of the almost instantaneous transmission of images were shown on the occasion of his lecture at the American Institute of Electrical Engineers, which support the fact that the mechanical side of his system has reached the stage of commercial practicability.

Much depends on the future progress of short-wave telegraphy; but apart from the somewhat ambitious project of seeing across the Atlantic there is no doubt that we shall shortly be hearing more of this famous engineer's system of television over shorter distances.

A Jolly Half-hour

The half an hour of Policemen's Minstrelsy was quite jolly. Who would have imagined our burly guardians of the law capable of such sentimental ditties? The last man I heard singing "Arise, O Sun!" was a pale, thin, æsthetic-looking fellow. I imagined that the "bobby" who sang it over the microphone would have sung him off the planet! Whenever I see a policeman at point duty I shall imagine him with a black visage, short-cropped curly hair, and eyes rolling to heaven, proclaiming a song of love to the sun. Well, pass along, please.

THERMION.

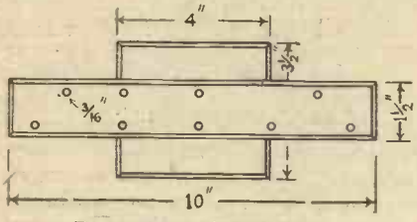


PRACTICAL ODDS & ENDS

A Useful Coil Rack

PLUG-IN coils will last longer if a rack is provided for those coils which are not in use.

Most of the required dimensions are given in the accompanying sketch. Two



Dimensions of Coil Rack.

pieces of hardwood 10 in. by 1½ in. by 1 in. should be obtained. One other piece is required for the base, measuring 4 in. by 3½ in. by 1 in.

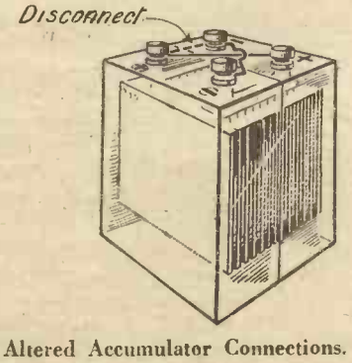
If the coils are of the plug-and-socket variety, alternate holes drilled in the long piece as shown will be sufficient.

If two-pin coil plugs are used, pairs of holes should be drilled, their distance apart depending, of course, on the distance between the pins on the plug. H. P.

Using a Faulty Accumulator

A FOUR-VOLT accumulator with a leak between the two compartments may be successfully used as a 2-volt cell by altering the lug connections at the top.

The original bridge piece, shown dotted, should be removed and substituted by connectors as shown in full lines in the diagram. The leak between the compart-



Altered Accumulator Connections.

ments will then make no difference to the working of the accumulator.

The voltage will, of course, be reduced to 2, while the ampere-hour capacity will be doubled.

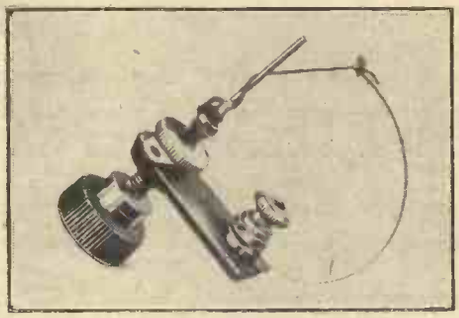
Immediately a leaky separator is discovered it is imperative that the original lug connector be removed, or the accumulator will quickly run down and begin to sulphate. M. R.

A Home-made Variable Grid Leak

SHOWN in the photograph below is a variable grid leak which can be very easily made up from odds and ends.

It will be seen that an ebonite knob is connected to a brass rod which is free to move inside a large terminal top.

To the end of the rod nearest to the knob is connected a 2-in. length of twine which has been soaked in Indian ink. A short length of thin clock spring is then arranged so that one end is held under a terminal and the other end is secured to the free end of the twine. When the



Photograph of Home-made Grid Leak.

ebonite knob is rotated the brass rod progressively short-circuits the prepared twine and so decreases the value of the resistance. A. P.

Winding Honeycomb Coils

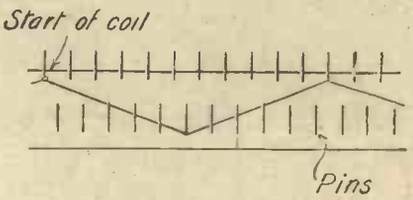
MANY amateurs who wind their own honeycomb coils will have found difficulty in deciding the correct number of pins to miss when crossing the wire from side to side, and also in ascertaining when the required number of turns are wound on the former.

In the case of a former consisting of 24 pins on each side the twist is made round every sixth opposite pin as illustrated.

When all the 48 pins have one twist round them it will be found that there are 11 complete turns on the former.

Thus it is an easy matter when winding, say a 100-turn coil, to wind until there are nine twists round each pin (giving 99 turns) and to add the one extra turn to make the required 100; or, similarly, when winding a 75-turn coil to wind until there are seven twists round each pin (giving 77 turns), and then *unwind* two turns to make the required 75.

In the case of a coil-winder consisting of 15 pins on each side, the twist should be made round every *seventh* opposite pin,



A Honeycomb-coil Former.

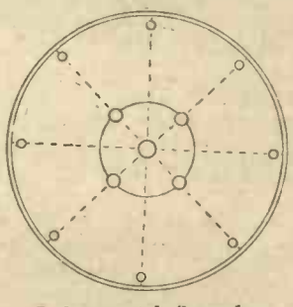
and when there is one twist round each pin there will be 13 turns on the former G. A. H.

Indoor-aerial Spreaders

OLD gramophone records, particularly the larger ones, make excellent spreaders for indoor aerials of the "sausage"-type. They are also good insulators, and therefore the usual porcelain insulators may be dispensed with.

An aerial arranged on this principle comprises two large records, a quantity of No. 22 d.c.c. wire (single bell-flex is preferable), and eight short lengths of cord, each disc being marked off and drilled as shown in the sketch, so that the wires may be fitted as near to the periphery as possible.

The holes for the supporting cords (four in each disc) are drilled in the approximate positions shown, the cords being



Indoor-aerial Spreader.

joined together at their outer ends and attached to the wall in the usual manner.

To mark off the discs, first decide upon the number of wires to be used, mark off a corresponding number of divisions on a piece of drawing paper which is cut to the same dimensions as one of the discs, and use the paper as a template. O. J. R.

(Photo: Olive Edis.)

Sir John Reith.

THE KING HONOURS MR. REITH

A Knighthood for the Director-General of the B.B.C.

THE King has been pleased to confer a knighthood upon Mr. John Charles Welsham Reith, Managing Director of the British Broadcasting Co., Ltd. since the formation of that company, and now Director-General of the British Broadcasting Corporation.

Born 37 years ago, Sir John is the son of Dr. George Reith, who for fifty years was minister of the College Church, Glasgow, and also Moderator of the United Free Church of Scotland. His grandfather was General Manager of the Grand Trunk Railway of Canada, and subsequently for thirty years head of the Clyde Navigation Co.

Sir John was educated at the Glasgow Academy, Gresham School and Royal Technical College, Glasgow, and commenced his business career as an apprentice in engineering at the North British Locomotive Works. During the war he served with the Royal Engineers and was badly wounded at Loos, being incapacitated from further active service. He was then sent to the United States of America, where for two years he was the officer responsible for British contracts in America, and had six hundred inspectors working under his control.

He returned to this country to take up a special Admiralty appointment until 1919, when he took charge of the liquidation of ordnance contracts. In 1920 he went to Beardmore's at Coatsbridge as general manager, a position he filled for two years. It was in 1922 that he was appointed General Manager of the British Broadcasting Co., Ltd. We are sure that our readers will join with us in congratulating Sir John on the honour bestowed.

TORODIUM-FILAMENT VALVES

Some Details of the New S.T. Productions

WE have recently had the opportunity of testing a new group of valves known as S.T. valves, manufactured by S.T. Ltd., of 2, Melbourne Place, London, W.C.2.

These valves are made in the usual 2-, 4- and 6-volt ranges, there being three valves in each range, consisting of one H.F. and two L.F. With the exception of the "super"-power valves, the filament consumption of the entire range is .1 ampere, and no glow is visible from the filaments.

The filament is made of Torodium, a recently-invented alloy of precious metals which gives off, at a very low temperature, a copious stream of electrons which does not decrease in quantity throughout the life of the valve. A torodium filament is extremely strong, and no ordinary mechanical vibration will fracture it.

A glance at the accompanying table of the electrical properties of the valves shows that the low-frequency valves have a low impedance, together with a comparatively high-amplification factor for such types, while they possess a large grid base enabling the valve to deal with powerful signals. It should be noted that the 4- and 6-volt super-power valves have identical characteristics with a grid base of approximately 30 volts at a plate voltage of 120.

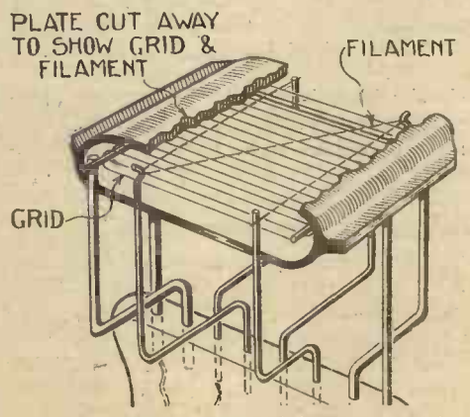


Diagram showing Internal Construction of S.T. Valves.

These super-power valves, when tested, gave great volume and exceptional purity of tone. In this latter respect the valves are among the best we have tested.

The three H.F. valves are also particularly efficient and bring in the distant stations with surprising volume. We can recommend them particularly for neutrodyne circuits and for resistance-capacity amplifiers. The S.T. 61 is a particularly good detector.

Mechanically, the valves are well made, having a horizontal flat plate, grid and filament. A silvered pipless bulb and a grained ebonite cap give a very handsome appearance.

Nomenclature of Valve	*Purpose*	*Fil. Voltage*	*Fil. Current*	*Anode Voltage*	*Impedance*	*Amplification Factor*
S.T.21	H.F.	1.8	.1	40-120	26,000	16
S.T.22	L.F.	1.8	.1	40-120	16,000	10
S.T.23	Power	1.8	.15	80-120	6,000	6
S.T.41	H.F.	3.7	.1	40-120	16,000	13
S.T.42	Power	3.8	.1	40-120	6,000	6
S.T.43	Super-power	3.8	.25	120	4,000	3 33
S.T.61	H.F.	5.6	.1	50-120	20,000	20
S.T.62	Power	5.6	.1	80-120	6,000	8.3
S.T.63	Super-power	5.6	.25	120	4,000	3.33

Constant Coupling

A New Development

by J.H.REYNER B.Sc.(Hons.)A.M.I.E.E.

SOME FURTHER ARRANGEMENTS

IN my article last week I showed that in a simple wireless receiver there were factors which make the tendency to oscillation vary as the tuning capacity is altered, so that the receiver was more lively at certain parts of the condenser scale, more usually towards the bottom. I further showed that as a result of recent research, circuits had been devised in which the various effects had been caused to balance one another out, so that the receiver maintained a constant sensitivity over the whole of the tuning range.

It was shown that the most satisfactory solution to the difficulty lay in the use of what are known as *constant-coupled* circuits. Energy is transferred from one circuit to another, either through an amplifying device, such as a valve, or by means of magnetic or capacity coupling. In the case of a simple transformer, for example, we place the primary coil in such a position that it is coupled magnetically to the secondary, and any current flowing in the first coil then produces corresponding currents in the secondary.

Different Methods of Coupling

A diagrammatic representation of a transformer-coupled circuit is given in Fig. 1 (A). Any currents flowing in the primary circuit will affect the secondary by magnetic coupling.

We can achieve the same result, however, by taking a direct tapping on the secondary coil, as at B, in which case we obtain the well-known *auto-transformer*

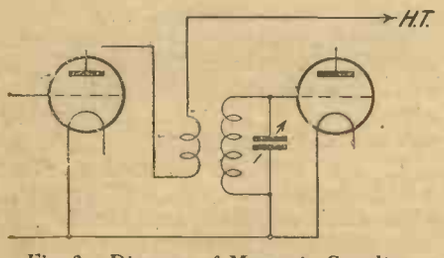


Fig. 2.—Diagram of Magnetic Coupling.

arrangement. Here the portion of the coil which is included in the primary circuit replaces the primary winding, while still acting as a portion of the secondary circuit.

The result is similar in effect to that of a pure transformer circuit, and the step-up ratio obtained from the arrangement is dependent on the relative proportions of the tapped portion of the windings and the whole coil.

At C we have a third arrangement,

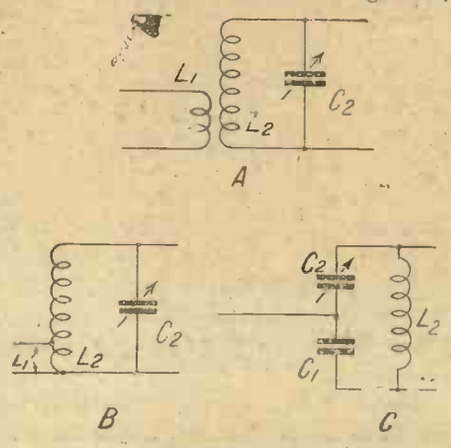


Fig. 1.—Transformer-coupled Circuits.

which is really a development of the auto-transformer arrangement just discussed. In this case, however, it is not the inductance which is tapped, but the capacity. We have divided the tuning condenser into two portions, the primary circuit being connected across one portion only. It will be clear, therefore, that any currents flowing in the primary circuit will cause a voltage to be developed across this common capacity, and this voltage will give rise to current in the second circuit, so that we obtain a similar effect to that resulting in the case of a magnetic coupling.

Variation with Frequency

Now let us consider the application of these two types of coupling to a simple radio-frequency transformer circuit. We will commence with the consideration of a magnetic coupling, in which case the circuit, simplified by the omission of batteries, would be as shown in Fig. 2.

I pointed out last week that the voltage produced in the secondary of the transformer depended not only upon the value of the mutual inductance or coupling between the two coils, but also directly upon the frequency of the current. Thus, if we double the frequency, keeping other conditions the same, we obtain twice as much voltage in the secondary circuit.

We can, if we like, plot a graph showing the relation between the voltage induced in the secondary circuit, under given conditions, as the frequency is varied over the normal tuning range, which in the case of the usual broadcast receiver is from 500 to 1,500 kilocycles (600 to 200 metres). Such a graph would be a rising line, as shown by the full line in Fig. 3, indicating that the voltage in the secondary constantly increases as the frequency is increased.

Capacity Coupling

Let us now consider the effect of a capacity-coupled circuit, such as that shown by Fig. 1 (C). Here the total voltage developed in the circuit is divided across the two condensers C1 and C2, each of which carries a certain proportion of the full voltage. The actual proportion in which the voltage is divided across these two condensers, C1 and C2, depends upon their relative values.

For example, if we make these two condensers equal, then the voltage will be equally divided across them, and we shall obtain an equivalent to a centre tapping on the circuit.

An Inverse Effect

The voltage developed across a condenser, however, decreases as we increase the value of the condenser. In this respect it behaves in exactly the opposite manner to an inductance, and it is really this effect which is made use of in the particular circuit which is being described. This is a very important point, and one

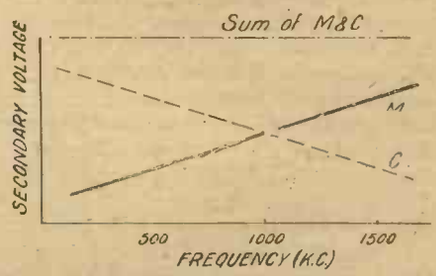


Fig. 3.—Graph showing Relation of Voltage and Frequency, with Magnetic and Capacity Couplings.

which must be thoroughly appreciated, although at first sight it appears a little complicated, and for this reason I propose to elaborate the matter in a little more detail.

Suppose we increase the value of the

CONSTANT COUPLING *(continued from preceding page)*

capacity C1 to a considerable extent. The voltage developed across this condenser would then be very small, and consequently the coupling between the two circuits would also be extremely small. In the extreme we can increase the condenser to an infinite extent, in which case it becomes simply a short circuit.

Consider, for example, the two circuits shown by Fig. 4. If we increase the value of Cm until it becomes a short circuit the arrangement may be redrawn, as shown by Fig. 4 (B); and it will readily be appreciated that if the coils L1 and L2 are not magnetically coupled together, then there is no coupling at all between these two circuits.

Conversely if we reduce the value of the condenser Cm, we should increase the coupling between the circuits until, if we remove the coupling condenser altogether, both the circuits will become part of the same circuit, which is the maximum possible coupling between them. Thus, reverting to Fig. 1 (C), we see that according to the relative proportions of the condensers C1 and C2, so we can vary the coupling between the two circuits.

A Practical Circuit

Now let us examine the effect of a capacity-coupled circuit, such as that shown in Fig. 5. We have here a fixed value for the coupling condenser C1, but in order to tune the circuit we have made the condenser C2 variable. The anode circuit has, of course, to be slightly modified, because the condenser C1 would act as a complete barrier for the high-tension current, and we must therefore arrange for the high-tension supply to the first valve by means of a high-frequency choke. This, however, does not enter into the consideration of the circuit, and we are only concerned with the transformer portion.

Let us assume that the maximum value of the capacity C1 is about the same order as the capacity of C2, for the sake of argument. At the low frequencies—that is to say, with the condenser C2 all in—the voltage across the condenser C1 is then about one-half of the total voltage. As we decrease the value of the condenser C2, however, the ratio between the two condensers varies continually.

An Automatic Variation

At the other end of the scale, therefore, where the frequency is considerably higher, we have the condition of affairs that C1 is several times as large as the capacity C2; and since the voltage is in the inverse ratio of these capacities, we find that the voltage developed across C1, instead of being about one-half of the whole, is only a much smaller fraction, something like one-tenth.

Now we have seen that the coupling between the circuits depends entirely upon the proportion of this voltage across the coupling condenser to the total voltage, and we see, therefore, that as we increase the frequency of the currents in the circuit, so we decrease the value of the coupling in the transformer. This is the exact opposite of the condition of affairs obtained with the magnetic coupling, and if we plot the voltage introduced into the

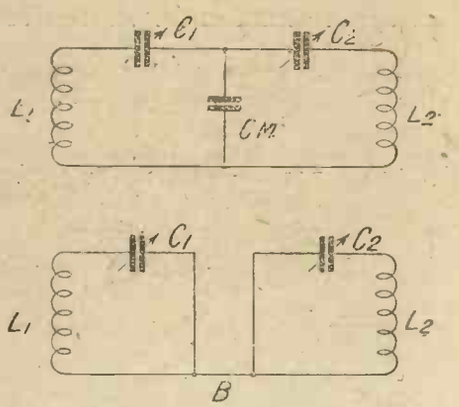


Fig. 4.—If *CM* is very large, the circuits become completely isolated.

secondary by this capacity coupling we obtain a falling line as the frequency increases, indicated by the dotted line in Fig. 3.

The Basic Principle

At this stage the basic principle of the idea becomes immediately obvious. It is only necessary to proportion the circuit in such a manner that the rate of variation of the capacity coupling is the same as that of the magnetic coupling. Then if we add these two effects together we shall

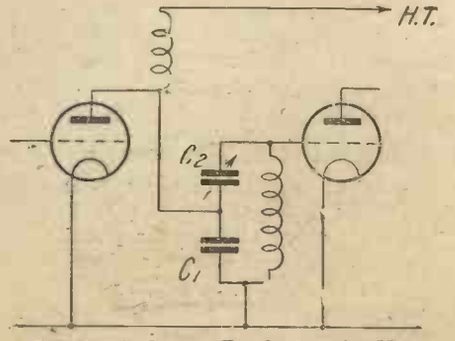


Fig. 5.—A Circuit Employing the New Capacity-coupling Principle.

obtain a constant coupling over the whole of the range. In the particular cases shown in Fig. 3 we have plotted curves which have the necessary characteristics, and it will be seen that by adding up the two curves, the total coupling at any point is always the same, giving us a horizontal line of constant coupling.

Considerable Possibilities

This, then, is the new principle which is going to give rise to a whole host of new and interesting circuits. We have only to design our transformers such that they make use of a combination of magnetic coupling and capacity coupling in the manner just defined, and we can then devise a balance between the two, such that the energy transfer at all points of the frequency scale is the same. Once we have achieved this result, we can proceed to apply it to all manner of different circuits.

In the particular example a high-frequency transformer has been chosen for purposes of explanation. One of the disadvantages of the present type of transformer is that it is much more lively and sensitive on the higher frequencies (lower wavelengths), whereas if we adopt a method such as this we can obtain a uniform sensitivity over the whole of the scale.

If we can do this we can at once dispense with the reaction control, which is one of the advantages gained from this system. Again, I pointed out in my previous article the possible application of this principle to a simple single-valve circuit, in which by maintaining the constants of the circuit fixed over the whole wavelength scale, we could apply a fixed amount of reaction which would not require alteration over the tuning range, thus obtaining the "stay-put" single-valver which has been the ideal of many a radio designer.

Further Developments

There is, however, an even more important development still, which I shall deal with in a future article. It is possible, having once achieved this constancy of coupling in inter-valve circuits, to dispense entirely with the usual methods of stabilisation without any loss of efficiency. A modern neutralised circuit is a flexible arrangement, and gives stability and efficiency under widely differing conditions; but it has several limitations, which are entirely eliminated with this new type of circuit, and we shall discuss later how this can be done.

For the present, however, I propose to give some practical details of simple circuits which readers can try out for themselves. Although the principle itself is so pleasingly simple, yet it will be realised that some experimental work is necessary in order to find the correct proportions of the various parts of the circuit.

I have now completed the preliminary experimental work, and my next article will contain some practical details of simple circuits incorporating the new principle.

"A.W." TESTS OF APPARATUS

Conducted by our Technical Editor, J. H. REYNER, B.Sc.(Hons.), A.M.I.E.E.

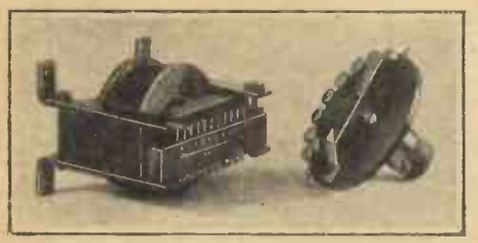
G.E.C. Tapped L.F. Transformer

A DISTINCTLY interesting component which has been submitted to us by the General Electric Co., Ltd., Magnet House, Kingsway, is the Gecophone tapped transformer. The object of the tappings in this instrument is not the variation of the step-up ratio in an attempt to match the valves in use, the variation being provided in order to produce a satisfactory method of volume control.

The instrument in question has a high-inductance primary winding, since the transformer is intended to be used in the first stage following a comparatively high-impedance valve.

The maximum ratio with the full secondary winding in use is 4/1, while there are eight definite tapping points on the secondary, the connections being brought to a small terminal bar at the top.

An 8-point tapping switch is also supplied with the above transformer, designed for panel mounting by a single-hole fixing. A definite "click" device is provided, so that the correct position of the switch may be readily felt.



G.E.C. Tapped L.F. Transformer.

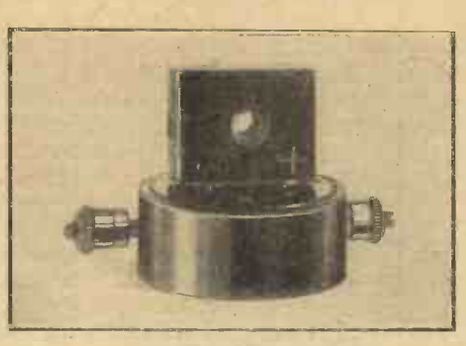
On test we found that this instrument gave excellent quality in the first stage, and that the method of volume control was admirable, the volume being reduced on the lowest tapping to something like one-fourth of the full sound. The quality was unimpaired by this tapping arrangement, and we can thoroughly recommend this interesting component to our readers.

We understand the tapping switch is also supplied as a separate unit at a price of 4s. 6d.

Crawford Phone Jacks

THERE is an increasing tendency nowadays towards the use of house wiring systems for loud-speaker or telephone reception. We have received from Messrs. Crawford and Co., Derby Road, West Green, London, N.15, some samples of their special jacks which are designed for this and other spheres of wireless activity.

Various types of these jacks are made according to the different uses to which they are to be put. They consist in general of a socket and a plug, the latter carrying two pins which fit into the socket. The actual shape of these pins depends upon the type of the unit, various different designs being arranged to suit different requirements.



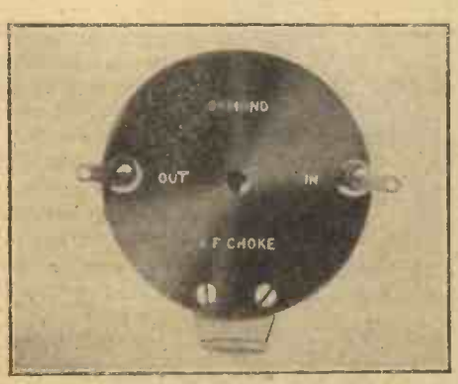
A Crawford Plug and Jack.

An ingenious feature of the jacks is that they short circuit when the plug is removed, so that in the case of a house wiring system a series wiring may be adopted, the loud-speaker (which is connected to the plug) being inserted in the jack in the particular room required.

Jacks are also made by this firm which do not contain this internal shorting mechanism, and we should recommend readers interested to apply to the firm in question for a catalogue of their goods.

Ormond H.F. Choke

SHOWN in the photograph below is the Ormond radio-frequency choke which has been sent to us for test. It is quite satisfactory on the broadcast wavelengths.



Ormond H.F. Choke.

It chokes high-frequency oscillations up to a wavelength just above that of Daventry, and will be satisfactory for use when receiving Daventry. It would, however, have been more suitable had the choke been designed to function at a higher wavelength than that of Daventry.

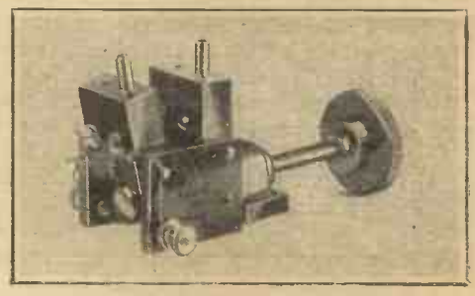
The choke is easily mounted on a baseboard or panel by means of two screws passing through a small aluminium bracket.

Two soldering tags of convenient size are mounted one each side of the choke, the two ends of the winding being clearly marked. In appearance the choke is all that could be desired.

The address of the Ormond Engineering Co., is 199-205 Pentonville Rd., N.1.

A New Coil Holder

WE have received from the London and Provincial Radio Co., Ltd., of Colne Lane, Colne, Lancs, one of the L. and P. two-coil holders. This coil holder is designed for baseboard mounting, the spindle which operates the moving coil holder coming through a hole in the panel. The moving coil holder rotates on an axis parallel to the panel, being operated by a worm and pinion mechanism. Six complete rotations of the spindle are required in order to rotate the moving coil block through 90 degrees.



The L. & P. Coil Holder.

The instrument is soundly constructed, and we are pleased to note that pigtail connections are provided between the moving coil block and the two terminals.

We also received with the instrument a special dial engraved 0 to 90 over a space of about 340 degrees. By means of the special reduction gear this dial is caused to rotate at one-sixth of the speed of the operating spindle. It thus gives a definite indication of the actual angular position of the moving coil block which would normally be obscured by the panel.

The whole instrument is cleverly thought out, and we feel sure it will recommend itself to our readers.

As a result of the latest re-allocation of wavelengths, Bournemouth is reported by listeners in the West of Scotland to be the best British distant station.

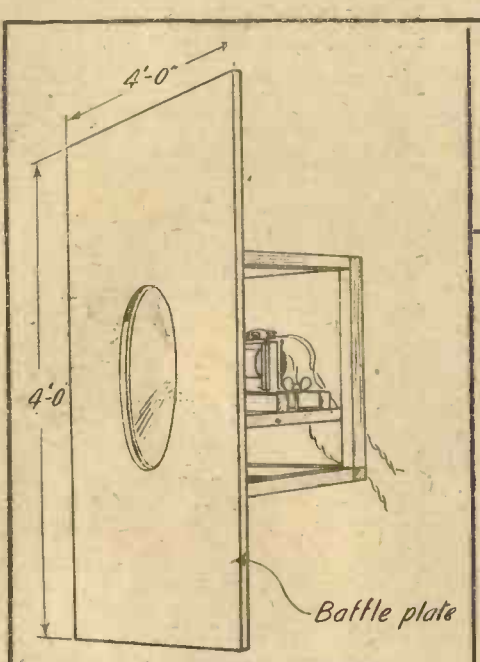


Fig. 7.—Arrangement of Baffle-Plate.

MAKING A MOVING-

The first published Article on the construction of the most mo

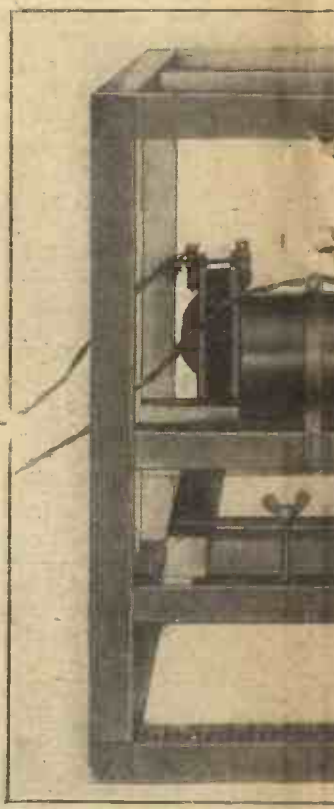


Fig. 1.—A Photograph of

THE writer is of the opinion that the nearest approach to a perfect loud-speaker lies in a construction with a lightly suspended cone (made of paper or similar material) with a moving-coil drive. The loud-speaker described in the present article is built on these lines, and although it lacks external finish, and is capable of improvement both in general layout and appearance, it nevertheless works excellently and will serve as a basis for readers to start upon if they feel inclined to take up this line of experiment.

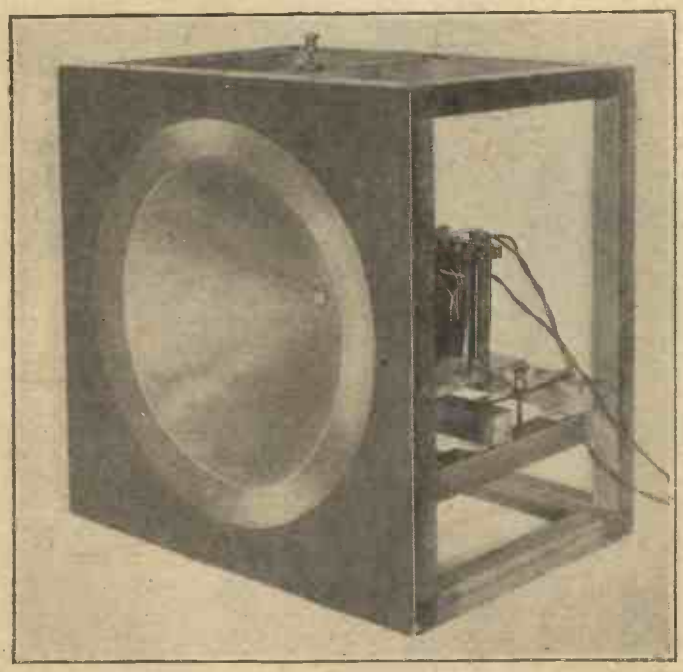


Fig. 2.—This Photograph shows the Front of the Loud-speaker.

Figs. 1 and 2 are photographs of the instrument. The whole of the framework is of wood except for the front facing, which is of thick cardboard (plywood would be better).

Framework

The dimensions of the framework are shown in Fig. 3 (p. 94). It is built of wood of 1 in. square cross section. The corners are secured with ordinary countersunk 2-in. wood screws. The corner struts on the front give rigidity to the frame and also serve as extra support for the cardboard or plywood facing, which is fastened on with small tacks. These corner struts need not be repeated at the back. The reasons for using such an open framework instead of a box with closed-in sides are twofold. First, it is more convenient for experimenting, and secondly, any enclosed cavity such as a box is liable to produce resonance effects.

The Diaphragm

The diaphragm is made of ordinary cartridge paper. Considerable care must be exercised in marking out, cutting and sticking it in order that the finished article may be neat, symmetrical and without kinks. To start with, the paper must be absolutely flat. First of all, lay the paper upon a flat surface and mark out a circle of 8-in. radius as shown in Fig. 4 (p. 94).

Mark out two points on the circumference 14.2 in. apart, as measured round the circumference, and draw a straight line from each of these two points to the centre. The portion between these two lines (shown shaded in Fig. 4) is cut out, but it is important to leave an extra edge about ¼ in. wide to overlap and allow for sticking. This allowance will be quite clearly understood from the figure. The part of the paper disc which is retained is now bent until the radial edges meet all along and overlap by the width of the margin referred to. If the paper does not bend to shape readily it may be softened temporarily by moistening both sides slightly with a damp sponge. The edges may be stuck together with Seccotine, and the surfaces should be held together under slight pressure until the adhesive has set.

It will be noticed in Fig. 4 that a number of small circles of various diameters are drawn about the centre point of the paper while still in the flat. The reason for this is that the tip of the finished cone will have to be cut off to allow for the moving coil, and to leave a clear space inside the latter for the centre core of the field magnet. It is difficult to set out a neat circle round a finished cone, but if a number of circles are set out before the bending process, one of them will be nearly enough correct on the finished cone to serve as a guide for cutting.

The Moving Coil

The moving coil itself requires more care in construction than any other part of the apparatus, as the annular gap into which it has to fit is very narrow. No attempt should be made to construct this

-COIL LOUD-SPEAKER

dern type of Loud-speaker By E. HOWARD ROBINSON

the Complete Instrument.

coil until the complete field magnet is to hand, as the obvious procedure is to fit the coil to the field and not vice versa. The field used in the present case is taken from a standard Magnavox loud-speaker, and fulfils the purpose very well.

In making the moving coil, the first thing to do is to make or obtain a cylinder of ebonite or metal having a diameter about $\frac{1}{64}$ in. greater than that of the centre core of the field. This cylinder is mounted in a wheel-brace, so that it can be rotated and used as a former. In order that the finished coil will not stick to the former, it is best to wind one or two thicknesses of thin waxed paper round the latter. Next cut a strip of cartridge paper ½ in. wide and long enough to go round the former twice. Wrap this strip neatly round the former and secure the overlapping edges with Seccotine, taking care that the little paper tube thus formed does not stick to the waxed paper beneath.

Winding the Coil

When the adhesive has set the wire may be wound on. No. 36 gauge enamelled wire is suitable for this purpose, and it must be free from kinks. Start winding the wire on the paper tube $\frac{3}{16}$ in. from one end of the tube, proceeding for ¼ in. towards the other end, and taking care that the layer is wound compactly, turn touching turn. The end of the first layer will come within $\frac{1}{16}$ in. of the end of the tube. A second layer is wound back on top of the first to the point from which the winding was started.

It is more difficult to wind the second layer than the first, and it is impossible to wind the second layer nicely unless the first is perfect. A good light and a large magnifying glass are of assistance. The finished windings can be effectively secured by smearing a layer of Seccotine all over them; better still is celluloid solution. When everything has set the coil may be removed from the former, but it is advisable to keep it plugged with a tightly-fitting cylindrical object of some kind until it has been finally fixed to the diaphragm. It is only by making the coil as compact as possible that the necessary number of turns can be got into the small space available. A clumsy coil would necessitate a larger annular gap in the magnetic field, which would result in reduced efficiency.

Fixing

The method of fixing the moving coil to the diaphragm is shown in Fig. 5. The tip of the cone is cut off to leave a circular hole of a diameter of about $\frac{5}{16}$ in. smaller than the coil. A number of equal radial cuts are made round the coil, so that when the little tongues thus formed are bent back the coil will fit just friction-tight into the enlarged hole. It is in this operation that the circles previously set out round the apex will be found useful as a guide to accurate work. When the coil is in position the tongues are bent up and stuck.

When the tongues have stuck, the joint may be reinforced by smearing inside and outside with some more of the adhesive. The ends of the wire from the coil may be secured to the diaphragm, as shown in Fig. 5, by means of two small squares of paper and some adhesive. This keeps the loose leads out of the way of the magnetic field pot and serves as an extra precaution against the coil becoming unwound.

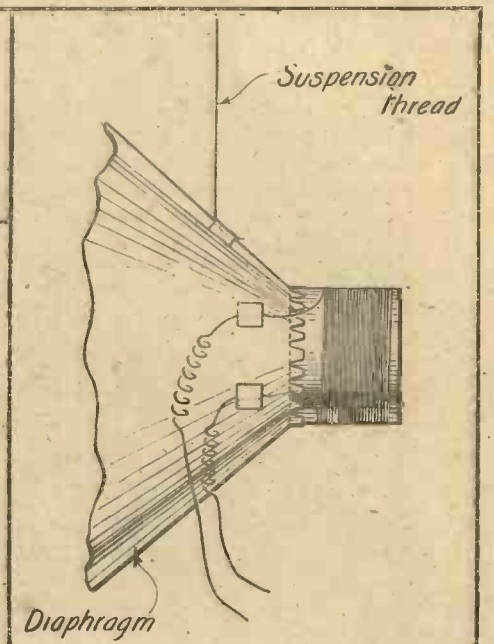


Fig. 5.—Method of Fixing Moving Coil.

The next thing is to mount the diaphragm. The front of the loud-speaker is faced with cardboard or thin wood and has a circular hole 4 in. greater in diameter than the edge of the diaphragm.

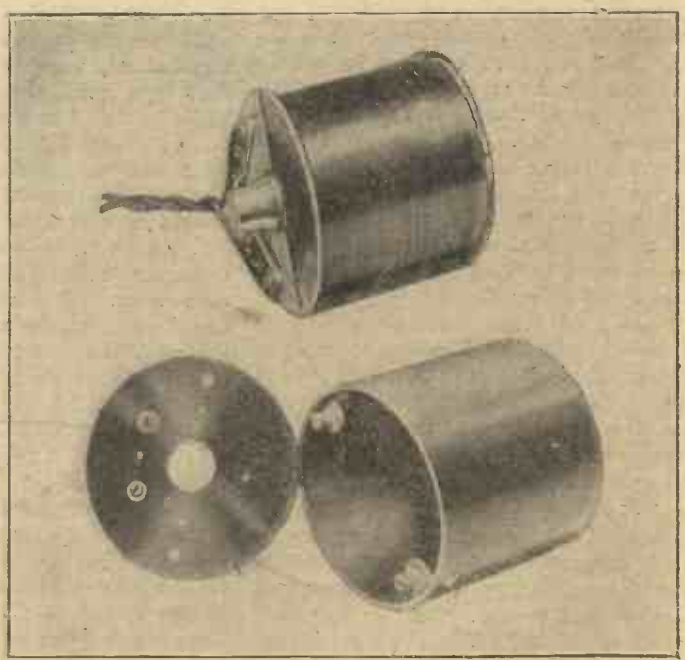


Fig. 6.—A Photograph of the parts of the Magnetic System.

MAKING A MOVING-COIL LOUD-SPEAKER

(Continued from preceding page)

This provides a 2-in. margin to be bridged with oiled silk. A ring of oiled silk is cut out having a suitable width to cover this margin and to leave an extra margin of ½ in. on either side to allow for sticking to the diaphragm and the front facing of the frame. Fix the oiled silk ring to the diaphragm first. To do this, place the diaphragm face downwards on a flat surface and treat the edge on the outside with a ½-in. margin of Seccotine. Now bring the oiled-silk ring down on to the edge of the diaphragm from above and arrange the inner edge of the ring to overlap the edge of the margin of the diaphragm evenly. Except where it overlaps the edge of the diaphragm it must lie flat. Press the overlapping edges together to ensure adhesion.

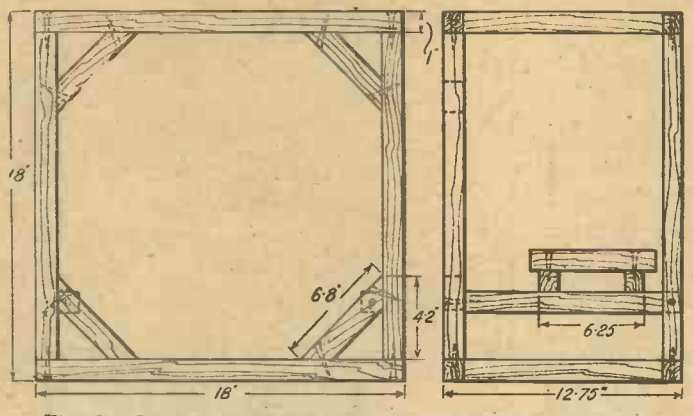


Fig. 3.—Constructional Details of Loud-speaker Framework.

Attaching the Silk

A certain amount of creasing of the oiled silk is bound to occur, and it is desirable that any such creasing be evenly distributed all the way round. Allow the Seccotine two or three hours to set before proceeding further. The outer margin is next stuck to the back edge of the front facing of the loud-speaker frame so that the diaphragm is held centrally. The oiled silk margin should be just sufficiently tight to avoid undue sagging, but should not be drum-tight; the diaphragm should be capable of being wobbled backwards and forwards freely. The best plan when sticking the outer edge of the oiled silk, is to lay both loud-speaker frame and diaphragm face downwards upon a flat surface so as to remove all stress from the oiled silk during the sticking and setting process.

A conical diaphragm thus hung by its edge is supported at a place not vertically above its centre of gravity. The apex will therefore tend to sag. This is remedied by means of a vertical linen thread attached to the diaphragm near its apex. The upper end of this thread is attached to the top of the frame through an adjustable screw, allowing an adjustment of length. The latter is arranged to take up the weight of the apex of the diaphragm and maintain its axis horizontal. Backward and forward movement is in no way impeded by this arrangement.

Owing to the small number of turns which it is possible to use on the moving coil it is not satisfactory to connect it directly in the anode circuit of a valve; a suitable step-down transformer must be employed. The transformer from a Magnavox loud-speaker gives good results, but a closed-core transformer specially constructed for the job is better. This may be built on the lines of an inter-valve transformer, with a primary wound on the usual lines to match the impedance of the valve in whose anode circuit it has to function. The secondary, however, instead of being wound to give a step-up, is wound with a comparatively small number of turns of thick wire to give a step-down ratio of about 30 : 1. For instance, quite a good transformer could be made from a Marconi Ideal transformer by scrapping the existing secondary and substituting one consisting of 100 turns of No. 26 d.c.c. wire. This is a somewhat expensive procedure however.

A Home-made Transformer

The writer constructed a very suitable transformer, using a core built up from shell-type laminations such as are used in bell-ringing transformers. The cross-section of the central core was 1 in. square. This was wound first with 100 turns of No. 26 d.c.c. copper wire to serve as the secondary and then with 3,000 turns of No. 40 s.s.c. as primary, primary and secondary being carefully insulated from each other. The secondary is wound in two layers, as the wire is comparatively thick. The primary may work quite well if it is wound on anyhow, but the possibility of breakdown is greatly reduced if neatly layer-wound.

It is advisable to incorporate this input transformer somewhere in the loud-speaker itself, and to make the leads from the secondary to the moving coil as short as possible. Resistance in the circuit constituted by the moving coil and the secondary of the transformer must be kept low, as since the number of turns in the moving coil is limited we need all the ampere-turns we can get. Long leads to the primary of the transformer, on the other hand, will not reduce the efficiency appreciably, as the impedance of the valve and the transformer primary is already several thousand ohms.

A few extra ohms in the moving-coil circuit will effect a considerable reduction in the strength of reproduction. At the same time the leads from the moving coil to the transformer should be thin and just long enough to exert no pull on the diaphragm.

There is a lot of room for experiment in connection with the best design of input transformer, the best number of turns, the best ratio, etc. It is a good plan to make an experimental transformer with tapped primary and secondary windings so that various ratios can be tried. The same remarks apply to the moving coil. In the space we have at our disposal for the latter we can either have a small number of turns of thick wire or a larger number of turns of fine wire. In any case the transformer must be made to match the moving coil and the valve with which it is working. The particular transformer described above works well with an LS5 in the last stage of the receiver.

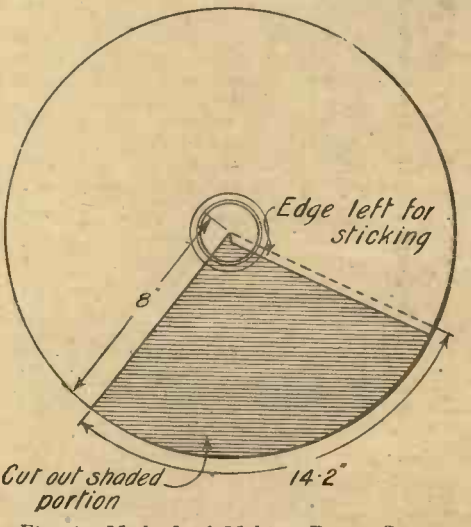
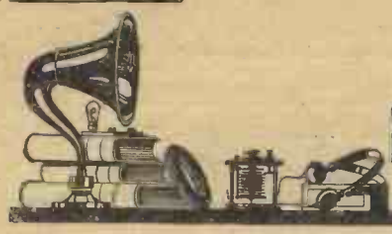


Fig. 4.—Method of Making Paper Cone.

We have now to consider the question of the magnetic field, and here, perhaps, is the chief stumbling block from the average experimenter's point of view. In the first place, a special iron casting is necessary, and subsequently, when the finished loud-speaker is in use, the field will need battery power. In the writer's opinion the extra encumbrance due to this is more than compensated by the results. Good results can be obtained with a field-magnet taking less than one ampere from a 6-volt accumulator.

In the loud-speaker being described the magnetic field is taken from a Magnavox loud-speaker. This, of course, is an easy way of avoiding a constructional difficulty.

(Concluded on page 100)



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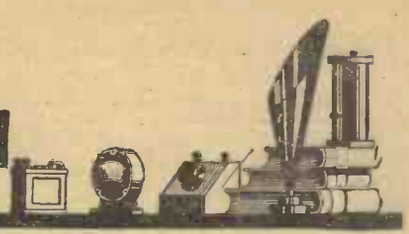


RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, layouts, diagrams, etc., on separate sheets containing your name and address. See special announcement below.

Calculating Frequency.

Q.—*If the wavelength of a station is known, how can the frequency be found?—S. E. (Leicester).*

A.—By dividing the wavelength in metres into the velocity of wireless waves. The velocity of these waves is 300,000,000 metres per second.—J. F. J.

Low-loss Receivers for Long Waves.

Q.—*Is there any advantage to be gained from adopting low-loss methods of construction in a receiver to be used exclusively for the reception of Daventry?—T. P. L. (Northampton).*

A.—Some slight gain in signal strength might be obtained, but H.F. losses are far less serious on wavelengths over 1,000 metres than on the shorter ones used by the main broadcasting stations. In fact, these losses become the more serious as the wavelength is reduced, and are of comparatively little importance on the longer waves.—M.

L.T. Connections.

Q.—*As I understood that the function of the L.T. accumulator was merely to raise the filaments of the valves to a sufficiently high temperature, I was surprised to find that reversing the connections to the accumulator made a great difference to the strength and purity of reception. Why should this be?—H. G. N. (Birmingham).*

A.—The chief function of the L.T. battery is to heat the filaments, but the return grid leads of the valves are connected either directly or indirectly to one side of the filament battery. Consequently reversing the connections to the L.T. battery will alter the mean potentials of the grids of the valves, which may cause the valves to be operated under quite unsuitable conditions. It should be remembered that whenever the grid potential is considered it is with regard to the negative end of the filament. If the L.T. connections are reversed, so also is the polarity of each of the filaments.—J. F. J.

Applying Separate H.T. and G.B.

Q.—*I have a straight-circuit three-valve receiver consisting of a tuned-anode coupled H.F. valve, detector, and transformer-coupled L.F. valve. At present there is only one positive H.T. terminal and no provision for grid bias. How can I apply separate H.T. voltages to each of the valves and G.B. to the last valve?—G. T. P. (Ilford).*

A.—First of all fit two new H.T. positive and two G.B. terminals on the panel. Now disconnect that end of the transformer primary which at present goes to the common H.T. positive terminal, and join it to one of the new H.T. positive terminals. Disconnect that phone terminal which goes to the common H.T. positive terminal, and connect it to the new H.T. terminal. The old H.T. positive terminal will remain connected to one side of the anode coil. Disconnect that end of the transformer secondary which goes to L.T. negative, and join it to one of the G.B. terminals, which will be G.B. negative. The other new terminal, G.B. positive, is to be connected to L.T. negative.—M. R.

Hollow-toned Loud-speakers.

Q.—*Why should a loud-speaker which gives very satisfactory reproduction when used after a transformer-coupled amplifier sound "hollow" when used after resistance-coupled stages?—T. P. (E.5).*

A.—Many L.F. transformers tend to accentuate the medium and high frequencies, so that the amplifying stages in which they are used do not amplify the lower frequencies in the correct proportion for faithful reproduction. Some loud-speakers are designed to correct this fault by accentuating the low frequencies. In this way nearly perfect reproduction may be obtained, although neither the amplifier nor the loud-speaker, taken separately, deals faithfully with the input signals. When resistance-capacity coupling is used, on the other hand, the amplification can be made nearly perfect, so that if a loud-speaker which gives undue prominence to the lower notes is used after such an amplifier, the effect you mention may be noticed.—B.

When Asking Technical Queries—

PLEASE write briefly and to the point

A Fee of One Shilling (postal order or postage stamps) must accompany each question and also a stamped, addressed envelope and the coupon which will be found on the last page.

Rough sketches and circuit diagrams can be provided, but it will be necessary to charge a special fee (which will be quoted upon request) for detail layouts and designs.

Finding Earthed Main.

Q.—*I understand that in the case of a D.C. lighting supply one of the mains is often earthed. How can I find out whether this is so in my case, and which main it is that is earthed?—R. L. A. (Lancs).*

A.—Connect one side of a lamp which is rated at the mains voltage to one of the mains, and earth the other side of the lamp. If nothing happens change the lamp over to the other main. If nothing happens again neither main is earthed. If in one case the lamp lights up, the main which is *not* connected to the lamp is earthed. It is, of course, essential to use a good earth for this test.—J. F. J.

Carborundum Receiver.

Q.—*Can you give me point-to-point connections for a carborundum crystal receiver? The following components are available: Variometer, carborundum detector, potentiometer, 4 dry cells of 1½ volts each, terminals, etc.—T. C. N. (Manchester).*

A.—Connect the aerial terminal to one side of the variometer and one side of the detector. Connect the other side of detector to the potentiometer slider. Join the four cells in series and across the potentiometer winding. Take a tapping from the centre of the dry-cell battery to one phone terminal, and a lead from the other phone terminal to the other side of the variometer and earth.—M.

Crystal Sensitivity.

Q.—*What is it that causes a crystal to lose its sensitivity after a time?—G. L. B. (Edinburgh).*

A.—It is rather difficult to answer this question, as it is not yet known what causes the crystal to be sensitive in the first place. It is known, however, that the sensitivity of a crystal can be impaired by the application of excessive heat, so that care should be taken when securing the crystal in its cup. The presence of grease on the crystal's surface may also interfere with the crystal's action as a rectifier, as can also the passage of a fairly heavy current through the crystal contact.—M. R.

The Reinartz Circuit.

Q.—*What advantages does the Reinartz circuit possess over the ordinary straight circuit with a similar number of stages?—C. S. (Beckenham).*

A.—There are two main advantages of the type of circuit to which you refer. One is that, owing to the aperiodic coupling between aerial and detector grid circuit, considerable selectivity is obtained without complicating the tuning. The other is that, owing to the special method of obtaining a reaction effect, the reaction adjustment is almost constant over the whole tuning range with a given set of coils, so that altering the reaction adjustment has less effect on the tuning than is the case in the ordinary circuit.—J. F. J.

RADIOGRAMS

ALL B.B.C. stations now broadcast the official Greenwich time signals (six dot seconds) at 6.30 p.m. on weekdays, and three times daily, namely, at 10.30 a.m., 4 p.m., and 10 p.m., they are relayed to Daventry. In the case of the high-power station the signals are superimposed if necessary on any item of the programme which may be in course of transmission, but from the London station this is not done, except when circumstances permit. The chimes from Big Ben are regularly broadcast at 11 a.m., 1 p.m. and 7 p.m., and at other hours when programmes permit.

From several parts of Scotland reports are made that German stations come in better than any of the B.B.C. stations. In the island of Jura, it is stated, the only station which can be heard clearly since the new wavelengths scheme was inaugurated is in Germany.

A Glasgow wireless firm has instituted a regular service scheme available for set owners at £1 per annum within a radius of ten miles of the city. The scheme includes free insurance.

A recital by famous artistes, to be given in London on January 27, will include two groups of songs and verse by Mr. D. Cleghorn Thomson, the B.B.C. northern-area director.

Spark interference with Belfast programmes has lately been rather severe, and many Ulster listeners urge that action of some sort is essential to ensure reasonably free reception.

Statements in certain quarters that the removal of the Scottish headquarters of the B.B.C. from Glasgow to Edinburgh was under contemplation are categorically denied by corporation officials. On the contrary, it is understood that under the projected high-power regional system the importance of Glasgow in a broadcasting sense will become still greater.

Mr. J. L. Baird, the inventor of the Televisor, by which objects can be seen by wireless at a distance, has gone a stage further. He has now made it possible for objects to be seen even when the objects and the observers are in darkness. He does this by an invisible beam, a beam composed of infra-red rays.

King Alfonso, General Primo de Rivera, together with over 200 Government officials, diplomats and leading citizens of Spain, participated recently in the establishment of a new European long-distance telephone record, when a conversation was carried on over a circuit 3,800 kilometres long, as a feature of inauguration of standard rotary automatic telephone service throughout Madrid.

The Postmaster-General announces that it is hoped to open a preliminary public Transatlantic telephone service as from January 7 at 1.45 p.m. (British time). The service will be available daily between 1.30 p.m. and 6 p.m. (British time), and will be restricted at the outset to conversations between subscribers in the London telephone area and subscribers in New York and its suburban area.

A radio version of *The Beggar's Opera* will be given at the London studio on January 14. The original orchestra from the Lyric Theatre, Hammersmith, will take part in the performance.

The Bulgarian Government has granted a broadcasting licence to a small limited company which is now erecting a wireless station in the neighbourhood of Sofia.

Many wireless listeners in the Rugby, Coventry and Leamington district have been perplexed by increased interference with their reception, and they are blaming the experiments in wireless telephony which Post Office engineers are carrying on at the Hillmorton Radio Station.

Provision for the proper regulation and control of wireless telegraphy and the maintenance of State broadcasting stations in the Free State is made in the new Wireless Telegraphy Bill. It prohibits the use or possession of apparatus for wireless telegraphy without a licence under a penalty of £10 and the forfeiture of the apparatus, and a further fine of £1 for every day during which the offence continues.

The new Langenberg (Rhineland) high-power station, although not yet officially on the air, is already relaying daily programmes from the Münster, Dortmund and Cologne studios on a wavelength of 468.8 metres. Full power is not yet used, but it is being increased daily, and it is hoped that by January 15 the limit of 25-kilowatt aerial energy will be reached. The call, as given by the announcer, is *Hier Deutschland Rhein und Ruhr sender zu Langenberg*.

West-of-Scotland listeners are far from satisfied with the re-introduction of the Greenwich time dots at 6.30 p.m. The demand is still strong that this feature be revived at the old hour of 10 p.m., and further protests are being directed to the B.B.C. and the newspapers. Stories of "public meetings and street processions" arising out of the dropping of the dots are, however, unfounded.

Although but little has been heard by the general public of the short-wave tests made by the Admiralty during the past two years, considerable progress has been made in long-distance wireless communication. Almost daily two-way communication has been maintained with ships of H.M. Navy proceeding to and from distant stations. During H.R.H. the Duke of York's trip to Australia and back the Admiralty has every hope of keeping in direct and constant touch with H.M.S. *Renown*. Experimental wireless amateurs who may pick up messages are requested not to make any attempt to communicate with this battle cruiser; such calls cannot be answered, and the only results attained would be unnecessary interference on the wavelength adopted for the transmissions.

Competition in Paris amongst the rival broadcasters is daily becoming keener, and each station in turn endeavours to secure special attention to its subscribers. Outside broadcasts, however, are impossible to any but the official P.T.T. transmitters, as, jealous of this monopoly, no authority is granted to others for the use of the existing telephone landlines. Radio-Paris some months ago had expressed the intention of relaying sacred services from the Cathedral of Nôtre Dame, but, failing this possibility, has secured the assistance of the Archbishop of Paris (Cardinal Dubois) for the broadcast of religious sermons from the Boulevard Haussmann studio every Sunday between 12 and 12.15 p.m. Announcements have been made to the effect that the Cardinal would personally select his very best preachers for these transmissions.

The French police have at last prohibited the use of loud-speakers used for the purpose of publicity in the streets of Paris. Considerable use had been made of this method of advertising goods, and many shops had installed them with a view to attracting the attention of passers by; even daily papers placed loud-speakers on the balconies of their premises for the broadcast of musical items, intermingled with advertisements; one of the local wireless journals actually opened a species of Fun Fair, in which mechanical speakers were used for the purpose of boosting wares of every description. Broadcast publicity has now been adopted by most of the Paris wireless telephony stations as a source of revenue to the organisers of programmes.

A small association of wireless enthusiasts recently installed a private broadcast transmitter in some disused military barracks at Limoges (France). At the request of the French Posts and Telegraphs Administration the local authorities have ordered its removal. A new site is being found, and it is expected that the station will be in operation within the next few weeks.

To Ensure Speedy Delivery, Mention "A.W." to Advertisers

MAKING A MOVING-COIL LOUD-SPEAKER

(Continued from page 94)

Nevertheless, the magnet pot is quite a simple casting to have made, and the finishing work is well within the scope of the average owner of a metal-turning lathe. The following are details of the Magnavox field. The cylindrical iron casing is cast in one piece with the bottom, the outside diameter being 4 in. and the overall depth also 4 in. The walls are ⅛ in. thick. The lid, which is separate and can be bolted in position, has a central circular hole ⅞ in. in diameter. The centre core is a solid iron cylinder 1 in. in diameter except for the last ¾ in. at the end near the lid where it is turned down to ¾ in. diameter. The end of the centre core projects through the hole in the top-plate and extends about $\frac{3}{32}$ in. beyond it. The annular air-gap thus left is $\frac{1}{16}$ in. wide. The winding consists of 1,600 turns of No. 18 enamelled-copper wire wound as compactly as possible in layers round the centre core. The latter is provided with brass discs to keep the windings in place. The parts of the field-magnet are shown in Fig. 6.

Making a Magnet

Those who intend making their own field-magnet are advised to make the annular gap somewhat larger in diameter and to have the gap just a little wider, say $\frac{3}{32}$ in., as this makes it easier to ensure that the moving coil will not touch the centre core or the sides of the hole in the top-plate. A good value for the mean diameter of the annular gap would be 1 in. to 1¼ in.

The method of mounting the field-magnet will be understood from Figs. 1 and 2. The field-magnet is fixed to a carrier made of square-section wood fixed together with screws. This carrier slides backwards and forwards, and to some extent sideways, on the two horizontal side-pieces which form part of the main frame. This movement allows the magnet core and the moving coil to be centred with respect to each other laterally. With regard to the vertical adjustment for centering, the field-carrier should, in the first instance, be made so that it holds the field-magnet as nearly as possible at the right height. Final slight vertical adjustments are made by turning the screw head at the top of the frame which controls the length of the thread supporting the apex of the diaphragm.

Adjustment of Moving Coil

The moving coil should enter the gap until the wound portion extends equally both sides of the top-plate. Some little patience is required in centering the moving coil, as the position of the whole field has to be right to about $\frac{1}{64}$ in. If the moving coil binds against the magnet, or even only just touches it, a rattle will be set up when the loud-speaker is in operation, and the reproduction will be thin and unsatisfactory. When the centering has been accomplished, the position of the field carrier is fixed by the fly-nuts seen in the photograph.

The magnetic field described above takes .8 ampere from a 6-volt accumulator, a consumption scarcely higher than that of some receiving valves. A considerable increase in loudness of signals is obtained by putting 12 volts on the field, but this is not necessary for ordinary use.

Although it is undoubtedly capable of improvement, the loud-speaker described here gives amazingly faithful reproduction. Not only is the middle register practically free from resonance, but the lowest base notes come out and the highest frequencies in both speech and music are reproduced. From the point of view of quality the writer has heard nothing which approaches it except other instruments built on similar lines.

The Baffle-Plate

In conclusion, it is of interest to mention a very interesting accessory to the moving-cone type of loud-speaker, namely, the baffle-plate, which is a patented feature of the Rice-Kellog B.T.H. loud-speaker. This consists of a screen of wood or equivalent material about 4 ft. square with a circular hole in the middle just a little larger in diameter than the diaphragm of the loud-speaker. This screen is placed right up against the front of the loud-speaker with its hole concentric with the diaphragm, as in Fig. 7. The purpose of the baffle-plate is to increase the efficiency of the diaphragm as a sound radiator, especially on the lower audible frequencies.

A baffle-plate may be constructed from three-ply wood, but it is better to use something thicker if possible, say ½-in. wood. The loud-speaker described and illustrated in this article is improved by the addition of a baffle-plate, but it should be clearly understood that very good results are obtained without.

A baffle is only effective with a diaphragm having both sides exposed to the air. It cannot be used with a horn-type loud-speaker.

It is well to add that the baffle-plate is the subject of a patent (No. 231,421) in the name of C. W. Rice, and is embodied in the loud-speaker made by the British Thomson-Houston Co., Ltd.

In Scotland the broadcasting of a "Calendar of Great Scots" is contemplated. This will take the form of a couple of crowded minutes devoted to men famous in all walks of life when their anniversaries come round. Humour will play a large part in these "thumb-nail" sketches.

CHIEF EVENTS OF THE WEEK

SUNDAY, JANUARY 16.

London	Military Band Programme.
Aberdeen	Concert relayed from the Cowdray Hall.
Bournemouth	Full Church Service relayed from Christchurch Priory.

MONDAY

London	Spanish programme conducted by Percy Pitt.
Aberdeen	Ballad Concert.
Belfast	Request programme.
Bournemouth	*The Blue Penguin*, played by London Radio Repertory Players.
Cardiff	*Emperor II*, Radio Drama by John Cooper.
Daventry	Musical Plays of Older Days.
Glasgow	*The Gentle Shepherd*, Pastoral play by Allan Ramsay.
Manchester	Foden's Motor Works Band.
Newcastle	*Admiral Peters*, Comedy by W. W. Jacobs and Horace Mills.

TUESDAY

London	R. A. Roberts in *Dick Turpin*.
Aberdeen	*Così Fan Tutte*, Comic Opera by Mozart.
Belfast	*The Shadow of the Glen*, a one-act comedy.
Birmingham	Ballad Concert.
Cardiff	Beethoven Sonatas.
Manchester	Four short recitals.

WEDNESDAY

London	*Through Another's Eyes*, by Adolphe Hallis (piano).
Aberdeen	Community Concert relayed from Wesleyan Hall, Inverness.
Belfast	Spanish programme.
Birmingham	*Mary Stuart*, played by the Station Players.
Bournemouth	Shakespeare programme.
Cardiff	*A Sharp Attack*, by London Radio Repertory Players.
Manchester	*Playing with Fire*, in two acts.

THURSDAY

London	National Concert.
Manchester	Voice and Personality Test.

FRIDAY

London	Farewell Recital by Stuart Robertson (bass).
Aberdeen	The Radio Concert Party present "Bon-Accord Nights."
Birmingham	Chamber Music.
Cardiff	"My Favourite Songs," Recital by Kenneth Ellis.
Manchester	*Landing the Shark*—London Radio Repertory Players.

SATURDAY

London	*Fire*, a play by A. J. Alan.
Belfast	Ulster Provincial Series—Lisburn.
Birmingham	Shakespearean Hour.

A Charger for H.T. Accumulators.—On page 13 of "A.W.," No. 238, is a circuit diagram of an H.T. charger. For the correct functioning of this circuit it is necessary to connect together the bottom end of the primary winding of the transformer to the bottom end of the secondary winding. With the addition of this connection the circuit is correct.

Oscar Straus's well-known comic opera *The Chocolate Soldier*, based on George Bernard Shaw's satirical comedy *Arms and the Man*, will be simultaneously broadcast from most B.B.C. stations on the evening of January 14.

MARCONI DIRECTION FINDERS

INSTALLATIONS of Marconi direction-finding apparatus on ships are rapidly increasing. Ships included in recent orders for equipment are six P. & O. liners, five New Zealand Shipping Company's liners, and many others. The application of wireless direction finding to cross-Channel boats is particularly interesting, and there is very little doubt that its use will obviate to a great extent the delays and uncertainty caused by the dense fogs and currents which are met in the neighbourhood of the Channel Islands.

On one of the advertisement pages will be found an interesting announcement by H. Maddison, of 2A, Ronalds Road, Holloway Road, Highbury, N.5. Each of the first fifty purchasers of "Allwoodorn" loud-speaker horns will be presented with a propelling pencil and fountain pen.

£50 CASH PRIZE WON BY A READER!

RESULT OF CROSS-WORD No. 11.

One coupon agreeing exactly with the sealed solution was received, and the Cash Prize of £50 has, therefore, subject to the conditions, to be awarded to the sender:—

Miss Mollie Haworth, 22, Rawcliffe Street, Blackpool.

A cheque will be forwarded in due course.

The correct solution was as follows:—

Across:—1, My; 2, Assagai; 8, Ye; 10, Ripe; 11, Owns; 12, To; 14, Lanyard; 15, Ai; 16, Eaten; 18, Yield; 20, Sod; 21, Emu; 24, Ant; 25, Wis; 26, Fling; 27, Gas; 29, Ossa; 30, Ere; 31, Carp; 32, Omens; 34, Desire; 37, Detest; 40, Den; 41, Ewe; 42, Adze; 44, Tod; 46, Sadi; 49, Guise; 51, Aspen; 52, Een, 53, Xeres; 54, Esk.

Down:—1, Mite; 2, Ailed; 3, Span; 4, Sen; 5, Cca; 6, Awry; 7, India; 9, Enid; 13, Oasis; 15, Altar; 17, Tosses; 19, Engage; 21, Element; 22, Mire; 23, Unended; 25, Wold; 28, Spat; 32, Ore; 33, Sew; 35, Endue; 36, Ides; 38, Tess; 39, Sides; 42, Age; 43, Zin; 45, Oar; 47, Ape; 48, Ink; 50, Ex; 51, As.

TWO NEW G.E.C. VALVES

A TEST REPORT

By J. H. REYNER, B.Sc. (Hons.), A.M.I.E.E.

WE have received from the General Electric Co., Ltd., samples of two additions to their 6-volt series of valves. These valves are known respectively as type DEH612 and DEL612, and, as the name implies, are intended for high- and low-frequency use respectively. This system of rating the valve in terms of its filament voltage and current, which are 6 volts and .12 amp. respectively, is excellent.

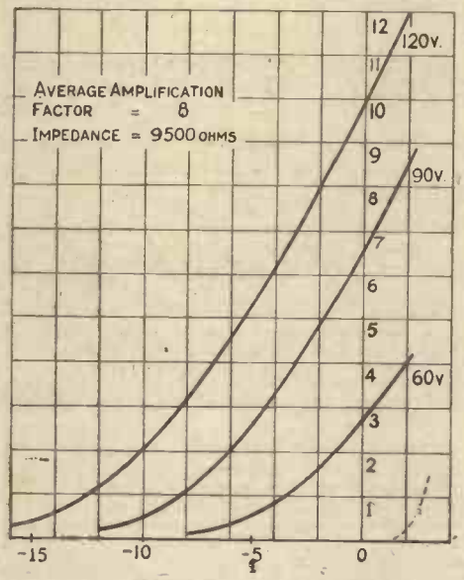


Fig. 1.—Characteristics of the DEL612.

Characteristics

The characteristics of these valves are shown in Figs. 1 and 2 on this page. The high-frequency valve is rated at 30,000 ohms impedance, with an amplification factor of 20. On test we found that the impedance was somewhat higher than this when taken at normal voltages, the average value with about 90 volts on the anode being about 40,000 ohms. The amplification factor varies from about 16 at 60 volts anode potential up to 25 at 120 volts, giving an average value of 20, which is in accordance with the specification.

The characteristics indicate that this valve improves considerably in efficiency as the anode potential is increased, and a definite test in a receiver showed that this was the case. A particular point of interest is that the grid current does not commence to flow until 1.4 volts positive potential is placed on the grid. This is indicated by the dotted line on the characteristic. It is possible in consequence to obtain a grid swing of ±1 volt maximum without the least fear of running into grid-current damping, even when no grid bias is placed on the valve. It was tried as a detector and gave excellent signals, but was inclined to be microphonic.

The L.F. Valve

The low-frequency valve, again, gave an excellent performance. The makers' figures are 9,000 for the internal impedance and 7 for the amplification factor. In this case also the actual value of the impedance was found to vary with the anode voltage, the average value at about 90 volts, with suitable grid bias, being 9,500 ohms. The amplification factor was somewhat better than the rated value, ranging from 6 to 10, giving an average value of 8.

In this valve, again, we found that the grid current did not lift until over 1 volt positive was reached, and from the characteristics it will be seen that a considerable grid swing can be obtained on the negative side. Allowing for the flattening of the characteristics which results when an impedance is placed in the anode circuit, a swing of ±9 volts is perfectly possible with 120 volts on the anode.

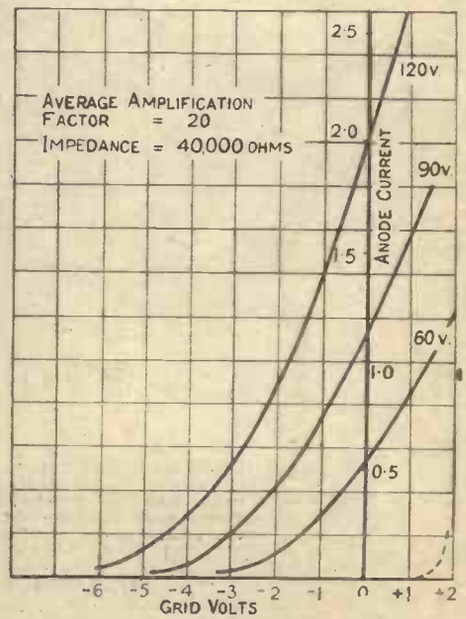


Fig. 2.—Characteristics of the DEH612.

On test this valve was found to give excellent signals, and was comparatively free from microphonic noise as an L.F. valve, although it was somewhat microphonic as a detector. We can confidently recommend these valves to our readers.

TRADE BREVITIES

INTERESTING particulars have been received from the General Electric Co., Ltd., of Magnet House, Kingsway, W.C.2, regarding their special "kits" of components for the home construction of H.T. battery eliminators for use with A.C. mains. Among the components is a tapped power transformer for use with 100/115 volts supply and 200/230 volts supply. A D.C. unit can also be constructed from Gecophone parts.

Two informative pamphlets have been received from the Carborundum Co., Ltd., of Trafford Park, Manchester. One deals with the carborundum stabilising detector unit, and the other gives several useful crystal and crystal-valve circuits in which the stabilising detector can be incorporated.

The General Electric Co., Ltd., of Magnet House, Kingsway, W.C.2, have recently marketed a new fool-proof H.T. accumulator. Made in 20-volt units, any number of which can, of course, be coupled together, this "Geeko" battery incorporates many novel features. Tappings can be made at every 2 volts. Each unit has a capacity of 2,500 milliamps. at 15 milliamps. discharge rate. Thus it is very suitable for multi-valve sets requiring a large plate *current* supply.

Siemens Ebonite is dealt with in a thoroughly interesting manner in a 52-page booklet sent to us by Siemens Brothers and Co., Ltd., of Woolwich, London, S.E.18. The reader is led from the origin of ebonite, manufacture and electrical properties through successive stages, such as machining, cutting and blanking to the final finished article in sheets, rods, and tubes. Examples of extruded work are included, which should prove useful to home constructors. Altogether a booklet worth reading.

"Electric Power from Rivers" is the title of a most interesting article on a Hydro-electric Power Station, planned on original lines and employing the most up-to-date machinery, published in "English and Amateur Mechanics" (3d.), January 14. Other articles of interest and utility include: "Lathe and Ornamental Turning," an article of interest to amateur turners. "How to Repair and Adjust Your Clock." "Passé Partout Picture Framing," by original methods. "How to Charge Your Accumulators for Nothing." "Wireless Notes for the Amateur." "Modern Microscopes in the Making." "An Equatorial Telescope Mount made from a Gramophone Motor." "Latest Commercial Inventions," etc. etc.

"The Wireless Trader" Year Book and Diary for 1927 (published by the proprietors of "The Wireless Trader," 139-140, Fleet Street, E.C.4).—This annual is a comprehensive volume of practical utility to all engaged in the wireless trade. The 1927 edition besides providing an interleaved diary, contains an alphabetical list of manufacturers, agents, associations and publishers, a list of factors (arranged territorially), an alphabetical list of proprietary names of wireless sets and components and data on technical and broadcasting matters. The price is 5s. 6d. (7s. 6d. Overseas). It should prove of the greatest assistance to every trader in wireless goods.

BROADCAST TELEPHONY

NOTE.—*In the following list of transmissions these abbreviations are observed: con. for concert; lec. for lecture; orch. for orchestral concert; irr. for irregular; m. for metres; and sig. for signal.*

GREAT BRITAIN

The times given are according to Greenwich Mean Time.

London (2LO), 361.4 m. 1-2 p.m., con.; 3.15-4 p.m., transmission to schools; 3.30-5.45, con. (Sun.); 4.15 p.m., con.; 5.15-5.55, children; 6 p.m., dance music; 6.30 p.m., time sig., news, music, talk; 8-10 p.m., music; 9.0, time sig., news, talk, special feature. Dance music daily (exc. Sundays) from 10.30 until midnight.

Aberdeen (2BD), 500 m. **Belfast** (2BE), 306.1 m. **Birmingham** (5IT), 491.8 m. **Bournemouth** (6BM), 326.1 m. **Cardiff** (5WA), 353 m. **Glasgow** (5SC), 405.4 m. **Manchester** (2ZY), 384.6 m. **Newcastle** (5NO), 312.5 m. Much the same as London times.

Bradford (2LS), 254.2 m. **Dundee** (2DE), 288.5 m. **Edinburgh** (2EH), 294.1 m. **Hull** (6KH), 288.5 m. **Leeds** (2LS), 277.8 m. **Liverpool** (6LV), 297 m. **Nottingham** (5NG), 275.2 m. **Plymouth** (5PY), 400 m. **Sheffield** (6FL), 272.7 m. **Stoke-on-Trent** (6ST), 288.5 m. **Swansea** (5SX), 288.5 m. **Daventry** (25 kw.), high-power station, 1,600 m. Special weather report, 10.30 a.m. and 10.25 p.m. (weekdays), 9.10 p.m. (Sun.); 11.0 a.m., light music (exc. Sat. and Sun.); relays 2LO from 1 p.m. onwards.

IRISH FREE STATE.

Dublin (2RN), 319.1 m. Daily, 7.25 p.m. Sundays, 8.30 p.m. until 10.30 p.m. Frequently relays sporting matches on Sundays, 3.0-5.30 p.m.

Cork (under construction), 400 m.

CONTINENT

Unless otherwise stated, all times are p.m. (G.M.T.).

AUSTRIA.

Vienna (Radio Wien), 517.2 m. (5 kw.) and 577 m. 7, con.; 9.30, dance (Wed., Sat.).

Graz, 365.8 m. (750 w.). Relays Vienna. Also own con. (Wed.), 7.10.

Klagenfurt, 272.7 m. (750 w.). Relays Vienna.

Innsbrueck, 294.1 m. (750 w.). Testing.

BELGIUM.

Brussels, 508.5 m. (1.5 kw.). 5.0, orch. (Tues., Thurs., Sat. only), news; 8.0, lec., con., news. Relay: Antwerp, 265.5 m. (100 w.).

CZECHO-SLOVAKIA.

Prague, 348.9 m. (5 kw.). Con., 7.0 (daily).
Brunn, 441.2 m. (3 kw.). 6.0, con. (daily).
Koszice, 300 m. (2 kw.).
Bratislava, 400 m. (500 w.).
Kbely, 1,110 m. (500 w.). 6.45, lec. (daily).

DENMARK.

***Copenhagen** (Radioraadet), 337 m. (700 w.). Sundays: 9.0 a.m., sacred service; 3.0, con.; 7.0, con. Weekdays: 7.0, lec., con., news; dance to 11.0 (Thurs., Sat.).

*Relayed by Sorö (1,150 m.).

FINLAND.

Helsingfors (Skyddskar), 500 m. (500 w.).
***Tammerfors,** 368 m. (250 w.).
***Jyvaskyla,** 297 m. (100 w.).
***Pori,** 254.2 m. (100 w.).
***Oulu,** 233 m. (100 w.).

*Relay Helsingfors.

GRAND DUCHY OF LUXEMBURG.

Radio Luxemburg, 1,200 m. (250 w.). Con.: 2.0 (Sun.), 9.0 (Tues.).

FRANCE.

Eiffel Tower, 2,650 m. (5 kw.). 6.40 a.m., weather (exc. Sun.); 11.0 a.m., markets (exc. Sun. and Mon.); 11.20 a.m., time sig., weather; 3.0, 4.45, Stock Ex. (exc. Sun. and Mon.); 6.0, talk, con., news; 7.0 and 11.10, weather; 9.0, con. (daily). Relays PTT, Paris, Sat., 9.10-11.0, and weekday afternoons.

Radio-Paris (CFR), 1,750 m. (about 3 kw.). Sundays: 12.45, con., news; 4.30, Stock Ex., con.; 8.15, news, con. or dance. Weekdays: 10.30 a.m., news, con.; 12.30, con., markets, weather, news; 4.30, markets, con.; 8.0, time sig., news, con. or dance.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 458 m. (800 w.). 8.30, lec. (almost daily); 9.0, con. (daily).

Le Petit Parisien, 340.9 m. (500 w.). 9.15, con. (Tues., Thurs., Sat., Sun.).

Radio L.L. (Paris), 350 m. (250 w.). Con. (Mon., Wed., Fri.), 9.30.

Biarritz (Côte d'argent), 1,200 m. 6.0, con. (Mon., Wed., Fri.).

Caen (Normandy), 277.6 m. (500 w.). 9.15, con. (Mon., Fri.).

Lille, 1,300 m. Testing.

Radio-Toulouse, 389.6 m. (2 kw.). 5.30, news (exc. Sun.); 8.45, con.; 9.25, dance (daily).

Radio-Lyon, 291.3 m. (1.5 kw.). 8.20, con. (daily); 4.0 (Sun.).

Strassburg (8GF), 222.2 m. (1½ kw.). 9.0, con. (Tues., Fri.); 9.30-12.0, dance (Sat.).

Strassburg (Military Stn.), 200.1 m. (15 kw.). Con., 9.0 (Wed.).

Radio Agen, 297 m. (250 w.). 12.40, weather, Stock Ex.; 8.0, weather, Stock Ex.; 8.30, con. (Tues., Fri.).

***Lyon-la-Doua,** 475 m. (1 kw.). Own con., 8.0 (Mon., Wed., Sat.).

***Marseilles,** 351 m. (500 w.).

***Toulouse,** 260 m. (500 w.).

*Relays of PTT, Paris.

Montpellier, 252.1 m. (1 kw.). 8.45 (Wed., Fri.).

Angers (Radio Anjou), 275.2 m. (250 w.). Daily: 8.30, news, lec., con.

Bordeaux (Radio Sud-ouest), 238 m. (1 kw.). 7.25, con. (Thurs.).

Bordeaux (Lafayette), 396 m. (1 kw.). Con., 5.0, 9.0 (weekdays), 2.30 (Sun.).

Mont de Marsan, 400 m. (300 w.). Con. (weekdays only), 8.30. Relays PTT, Paris, 8.30 (Sat.).

Algiers (N. Afr.) (PTT), 310 m. (100 w.). 10.0, con. (Mon., Thurs.).

Carthage (Tunis), 1,800 m. (2 kw.). 8.30, con., dance.

Casablanca (Morocco), 306.4 m. (3 kw.) 8.30, con. (daily); 10.0, dance (irr.).

GERMANY.

Berlin, on 483.9 and 566 m. 8.0 a.m., sacred con. (Sun.); 11.55 a.m., time sig., news, weather; 5.30, orch.; 7.30, con., weather, news, time sig., dance music until 11.30 (daily, exc. Tues.). Relayed on 1,300 m. by Königswusterhausen (1,300 m.) and Stettin (252.1 m.).

Königswusterhausen (LP), 1,300 m. (12 kw.). 10.30-11.50 a.m., con. (Sun.); 2.0, lec. (daily); 7.30, relay of Berlin (Vox Haus) con. (daily). 2,525 m. (5 kw.), Wolff's Buro Press Service: 5.45 a.m. to 7.10. 2,960 m., Telegraphen Union: 7.30 a.m. to 6.45, news. 4,000 m., 6.0 a.m. to 8.0, news. Relays Berlin on 58 m.

Breslau, 322.6 m. (4 kw.). 11.0 a.m., con. (daily), Divine service (Sun.); 4.0, con.; 6.0, lec.; 7.30, con. Relay: Gleiwitz, 250 m.

Frankfort-on-Main, 428.6 m. (4 kw.). 5.0 to 5.15 a.m. (exc. Sun.), physical exercises; 7.30 a.m., sacred con. (Sun.); 3.0, con. (Sun.); 3.30, con.; 7.0, lec., con., weather. Dance: relays Berlin. Relay: Cassel, 272.7 m.

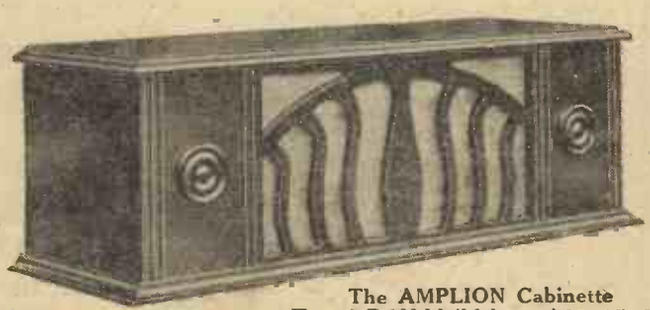
Hamburg, 394.7 m. (4 kw.). Relayed by Bremen (400 m.), Hanover (297 m.), Kiel (254.2 m.). Sundays: 7.25 a.m., time sig., weather, news; 8.15 a.m., sacred con.; 12.15, con.; 5.0, con.; 7.0, con. Weekdays: 6.0 a.m., time sig., weather, news; 11.55 a.m., Nauen time sig., news; 1.0, weather, con.; 8.0, con., dance.

(*Concluded on page 188*)

The AMPLION CABINETTE

Here is a new AMPLION! An inexpensive model housed in a very attractive cabinet and providing excellent reproduction.

The tone is natural, yet pleasingly mellow, and is somewhat reminiscent of that associated with the famous Amplion "Dragon" models.



The AMPLION Cabinette
Type A R 100 M (Mahogany) £3 15 0
Type A R 100 (Oak) £3 3 0

Announcement of Graham Amplion Limited, 25, Savile Row, London, W.1.

Does your radio set rewrite the music?

Supposing you were a musician and listened to radio concerts with the score in your hand . . . how much would you find your radio set had re-written . . . how many notes it had played too *piano*—how many too *forte?*

Fit PYE L.F. Transformers. Then you will get reproduction as it should be . . . clear, pure and lifelike, high and low notes amplified uniformly. The PYE frequency-efficiency curve certified by the National Physical Laboratory is practically a straight line and is unrivalled by any other published authoritative curve. PYE Transformers create no parasitic noises, and voltages up to 300 can be used with perfect safety. Made for horizontal or vertical fitting. Each one tested by an actual measurement of amplification and a guarantee is given with each.

Ref. No. 651.	Ratio 2.5	: 1	**17/6**
„ „ 652.	„ 4	: 1	**17/6**
„ „ 654.	„ 6	: 1	**20/-**

W. G. PYE & CO.,
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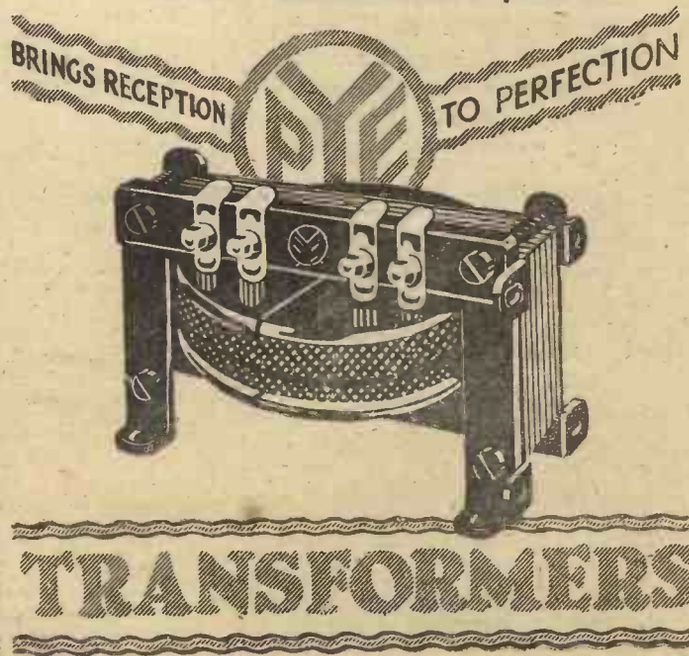

"BROADCAST TELEPHONY" (*continued from page* 106)

Königsberg, 303 m. (4 kw.). 8.0 a.m., sacred con. (Sun.); 7.0, con. or opera, weather, news, dance (irr.). Relay: Danzig, 272.7 m.

Langenberg (Rhineland), 468.8 m. (22 kw.). Relays Elberfeld, Muenster.

Leipzig, 365.8 m. (4 kw.). Relayed by Dresden (294.1 m.). 7.0 a.m., sacred con. (Sun.); 7.15, con. or opera, weather, news, cabaret.

Munich, 535.7 m. (1½ kw.). Relayed by Nuremberg (329.7 m.). 10.30 a.m., lec., con. (Sun.); 3.0, orch. (Sun.); 3.30, con. (weekdays); 5.30, con. (weekdays); 6.15, lec., con.

Muenster, 241.9 m. (1.5 kw.). Relayed by Elberfeld (468.8 m., 750 w.), Dortmund (283 m.). 8.0 a.m., Divine service; 11.00 a.m., news (Sun.); 6.40, news, weather, time sig., lec., con.

Norddeich (KAV), 1,800 m. 11.0 and 3 a.m., weather and news.

Stuttgart, 379.7 m. (4 kw.). 10.30 a.m., con. (Sun.); 3.30, con. (weekdays); 4.0, con. (Sun.); 5.30, time sig., news, lec., con. (daily); 8.15, time sig., late con. or cabaret. Relay: Freiburg, 577 m. (1½ kw.).

HOLLAND.

Hilversum (HDO), 1,050 m. (5 kw.). Sundays: 10.0 a.m., sacred service; 2.10, con.; 4.40, church service; 7.40, weather, news, con. Weekdays: 4.30, con.; 7.50, news, con.

Scheveningen-Haven, 1,950 m. (2½ kw.). Irr. throughout day.

HUNGARY.

Buda-Pesth (Csepel), 555.6 m. (2 kw.). 7.0, con. or opera; dance nightly.

ICELAND.

Reykjavik, 333.3 m. (700 w.). Con., 7.30.

ITALY.

Rome (IRO), 449 m. (3 kw.). 9.30 a.m., sacred con.; 4.30, relay of orch. from Hotel di Russia; 4.55, news, Stock Ex., jazz band; 7.30, news, weather, con.; 9.15, late news.

Milan, 315.8 m. (1 kw.). 8.0-11.0, con.

Naples, 333.3 m. (1½ kw.). 8.0-11.0, con.

JUGO-SLAVIA.

Agram (Zagreb), 310 m. (500 w.). 7.15, con.

LATVIA.

Riga, 480 m. (5 kw.). Con. daily, 7.0.

LITHUANIA.

Kovno, 2,000 m. (15 kw.). 6 p.m. (daily).

NORWAY.

Oslo, 370.4 m. (1.5 kw.). 6.15, news, time, lec., con.; 9.0, time, weather, news, dance.

Bergen, 461.5 m. (1 kw.). 6.30, news, con. Relayed by Aalesund, 400 m.

*Fredriksstad, 434.8 m.

*Porsgrund, 500 m. (1½ kw.).

*Rjukan, 443 m.

*Relays Oslo.

POLAND.

Warsaw, 400 m. (2 kw.). 7.30, con.

Warsaw (High Power). Testing on 1,000 m.

Posen, 270.9 m. (4 kw.). Testing.

Lemberg, 247.9 m. Under construction.

RUSSIA.

Moscow (RDW), 1,450 m. (12 kw.). 4.55, news and con.; 10.0, chimes from Kremlin.

(Popoff Station), 1,010 m. (2 kw.). 6.0, con. (Tues., Thurs., Fri.).

Radio Peredacha, 420 m. (6 kw.).

Trades Union Council Station, 450 m. (2 kw.). 5.0, con. (Mon., Wed.).

Leningrad, 1,165 m. (10 kw.). 5.0.

SPAIN.

Madrid (EAJ7), 373 m. (1.5 kw.). Con. daily. Closes 1 a.m. (daily).

Madrid (EAJ4), 375 m. (2½ kw.). Con. (irr.). Testing on 350 m.

Barcelona (EAJ1), 325 m. (1½ kw.). 6.0-11.0 (daily).

Barcelona (Radio Catalana) (EAJ13), 460 m (1 kw.). 7.0-11.0, con., weather, news.

Bilbao (EAJ9), 415 m. (500 w.). 7.0, con.

Bilbao (Radio Vizcaya) (EAJ11), 418 m. (500 w.). 8.0-12.0, con. (daily).

Cadiz (EAJ3), 344.8 m. (550 w.). 7.0-9.0, con., news. Tests daily (exc. Sun.), midnight.

Cartagena (EAJ15), 335 m. (500 w.). 8.30-10.0, con. (daily).

Seville (EAJ5), 357 m. (500 w.). 9.0, con., news, weather. Close down 11.0.

Seville (EAJ17), 300 m. (500 w.). 7.0-10.0, con. (daily).

San Sebastian (EAJ8), 343 m. (1.5 kw.). 5.0-7.0, 9.0-11.0 (daily).

Salamanca (EAJ22), 405 m. (1 kw.). 5.0 and 9.0, con. (daily). Closes down 11.0.

SWEDEN.

Stockholm (SASA), 454.5 m. (1½ kw.). 10.0 a.m., sacred service (Sun.); 5.0, sacred service; 6.0, lec.; 8.15, news, con., weather. Dance (Sat., Sun.), 8.45.

Relays.—Boden (SASE), 1,200 m.; Eskilstuna, 250 m.; Falun (SMZK), 400 m.; Gothenburg (SASB), 416.7 m.; Gefle, 204.1 m.; Joenkoeping (SMZD), 201.3 m.; Kalmar (SMSN), 254.2 m.; Karlsborg (SAJ), 1,365 m.; Karlscrona (SMSM), 196 m.; Kristinehamn (SMTY), 202.7 m.; Karlstadt (SMXG), 221 m.; Linkoeping, 500 m.; Malmo (SASC), 260.9 m.; Norrkoeping (SMVV) 275.2 m.; Orebro, 218 m.; Ostersund, 720 m.; Saeffle (SMTS), 252.1 m.; Sundsvall (SASD), 545.6 m. (1 kw.); Trollhattan (SMXQ), 277.8 m.; Uddevalla, 294.1 m.; Umea, 229 m.; Upsala, 315 m.; Varberg, 297 m.

SWITZERLAND.

Lausanne (HB2), 850 m. (1½ kw.). 7.0.

Zurich (Hongg), 492 m. (500 w.). 10.0 a.m., con. (Sun.); 4.0, con. (exc. Sun.); 7.15, lec., con., dance (Fri.).

Geneva (HB1), 760 m. (2 kw.). 7.15, con. (weekdays). No transmission on Sun.

Berne, 411 m. (1.5 kw.). 9.30 a.m., organ music (exc. Sat.); 3.0, 7.30, con.

Basle, 1,100 m. (1½ kw.). Con. daily, 7.30.

"Something Different in Crystal Sets"

SIR,—As the author of the article with the above title, and the designer of the set concerned, may I be permitted to offer an explanation for "the rather nebulous suggestion of the circular arrow" mentioned by your correspondent A. L. B.?

It is obvious that your correspondent has made a statement of fact without considering the corollary. He states: "Reverting to elementary principles, a rectifying crystal is not one crystal, but myriads. Therefore, according to the short-circuiting theory, no crystal would ever work owing to internal short circuits."

But *is* a rectifying crystal "not one crystal but myriads?" If this is so, what becomes of the thermionic theory, accepted by many radio engineers, that the rectifying action takes place entirely at the point of contact, and that the mass of the crystal and its constitution, apart from the minute area under the contact point, is of no account?

Obviously the crystal cannot short circuit internally in the normal sense of the word, as in effect it is one complete rectifying body. But if only *two* of the myriad crystals in one detector could work independently of one another *dual detection would be possible.*

I regret that I should not have made myself sufficiently clear in the description of the receiver. I admit that it is possible (after patient search to find two good spots) to work two detectors in parallel, provided they are placed the right way round. Can your correspondent explain why the detector does not work when they are reversed?

I do not know where your correspondent's receiver is situated, but I note that he states my type of receiver works O.K. I am positive that if he tries both the Fig. 1 and the Fig. 2 circuits under the shadow of a main broadcasting station he will find the Fig. 1 circuit will give results equal to those given by a conventional receiver.

Fig. 2, the proper dual circuit, will, I assure him, give a noticeable increase in signal strength.—K. U. (Essex).

"Improvements in Design"

SIR,—With reference to R. Y.'s (Saltburn) letter on improvements in the design of components, I note that a further correspondent puts forward the interesting theory that the increase in the number of aerials is responsible for the now general noticeable decrease in signal strength.

This can scarcely be taken as adverse criticism of "improvements in design."

My contention is that while such components as variable condensers, transformers and coils have steadily improved during the last four years, the one essential component—the valve—is now, in general, not so efficient as it was at the commencement of broadcasting.

The perfection of the dull-emitter filament has made the valve economical, and the use of the chemical "getter" has facilitated exhaustion and lowered manufacturing costs.

We cannot grumble about the cost of valves; still less about economy and longevity. But the fact remains that a present day two-volt one-tenth-amp. dull-emitter, price 14s., does not *work* as well as the five-volt three-quarter amp. R valve costing in 1920 approximately 22s. 6d.—P. E. (Leytonstone).

Which is the Best Type of Loud-speaker?

SIR,—Your correspondent R. T. raises a question of considerable interest in his letter published in the issue of January 1.

In choosing a loud-speaker, there are several points which should influence us apart from the question of expense.

It is of no use seeking perfection of results if in the first place we are to attach the loud-speaker to a set with poor transformers and wrong valves, nor to a set that we bought three years ago.

Nor is it of any use to seek perfection if we are quite incapable of appreciating

(*Continued on next page*

CORRESPONDENCE (*Continued from preceding page*)

the difference between the small horn-type loud-speaker and the latest type of cone speaker.

If one cannot detect the difference, the only motive for using the hornless type appears to be that one's friends may be capable of doing so!—F. S. (Birmingham).

Accumulator Identification

SIR,—With reference to your paragraph on an accumulator identification disc which appeared in "A.W." No. 237, another good method of identification is to write your name and address on a small piece of white cartridge paper. Then cut a piece of celluloid a little larger than the paper and rub the edges with amyl acetate and stick it on to your accumulator with the name and address underneath.—F. T. (Middleton Junc.).

A TREBLE-DUTY TERMINAL

WE have received from J. J. Eastick and Sons, of 118, Bunhill Row, E.C.1, a specimen of their "treble-duty" terminal.

Of substantial size, this terminal is nickel plated, with a neatly-engraved terminal head. True to its name, the terminal can be used in three ways for securing a lead.

The head of the terminal includes a socket into which can be inserted a plug of the valve-pin variety.

A hole in the body of the terminal will take a phone plug. A wire can also be clamped between the head and body of the terminal.

Altogether it is a terminal which can be heartily recommended to all home constructors and experimenters.

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