POPULAR WIRELESS, July 23rd, 1927. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

BUILD P. W. HARRIS'S LATEST THREE-VALVER (See Page 765)

Popular Wireless

Every Thursday PRICE 3d.

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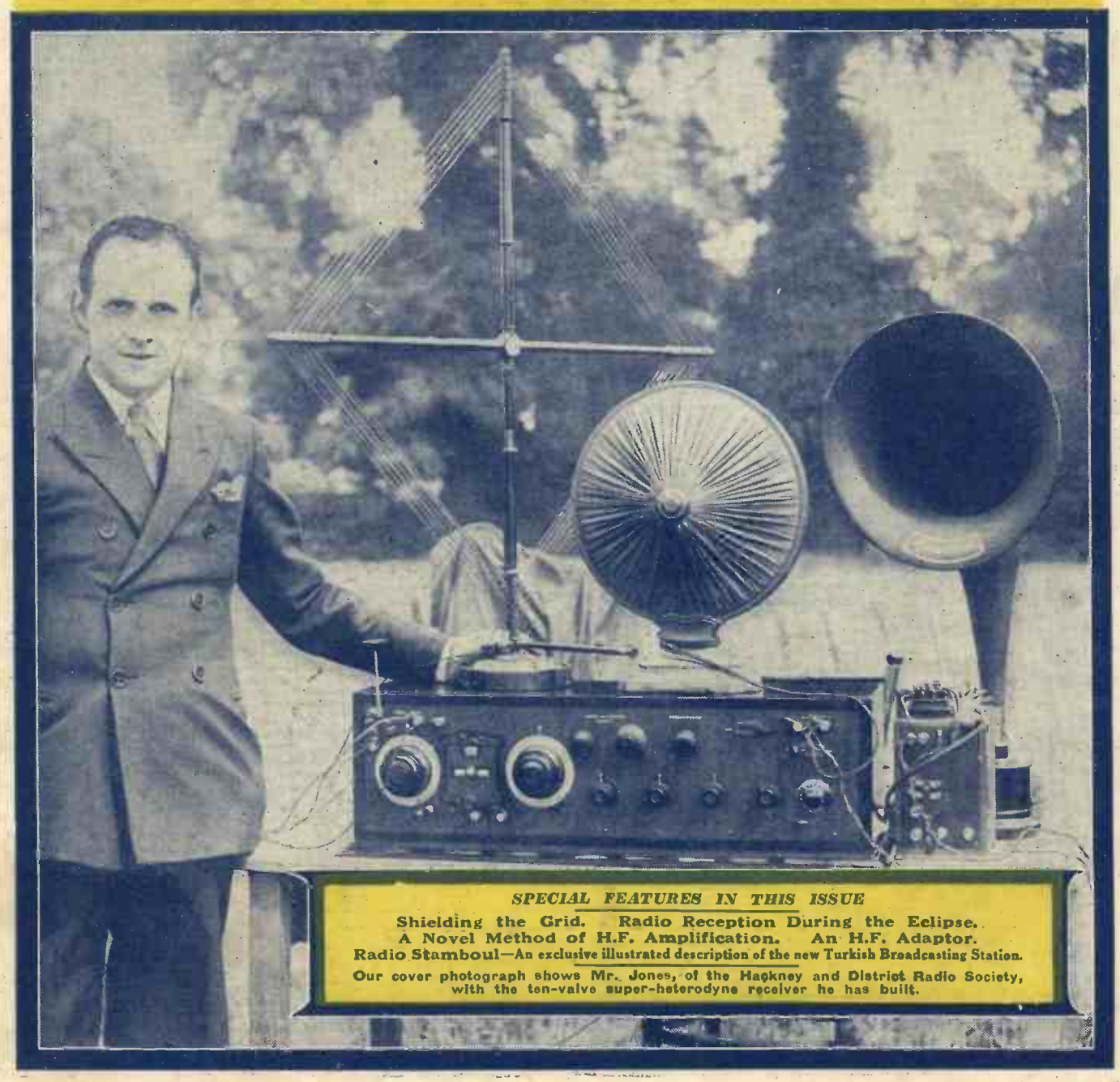

SPECIAL FEATURES IN THIS ISSUE

Shielding the Grid. Radio Reception During the Eclipse. A Novel Method of H.F. Amplification. An H.F. Adaptor. Radio Stamboul—An exclusive illustrated description of the new Turkish Broadcasting Station.

Our cover photograph shows Mr. Jones, of the Hackney and District Radio Society, with the ten-valve super-heterodyne receiver he has built.

COSSOR — the Melody maker

WITHOUT good valves even the best of Receiving Sets will be tongue-tied. Choose your valves with care—choose Cossor Valves, the only valves with the Kalenised filament.

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Technical Editor: G. V. DOWDING, Grad.I.E.E.
Assistant Technical Editors: K. D. ROGERS, P. R. BIRD, Q. P. KENDALL, B.Sc., A. JOHNSON RANDALL.

RADIO NOTES AND NEWS.

Empire Broadcasting—The Indian Beam—The King's Microphone—Daventry Junior—B.B.C. and Variety—2LO's Orchestras—DX Reception.

Empire Broadcasting.

THE news that Mr. Gerald Marcuse, the well-known amateur transmitter (2 N M) of Caterham, is to be permitted to broadcast to the Dominions is particularly pleasing. He is a most successful DX transmitter, and the thought that the first demi-semi-official broadcasting from the old country to the rest of the Commonwealth should first be done by a foreign station and next by a private gentleman, is a little humiliating. Anyhow, Marcuse is bound to do the job well, and the thanks of all Britons are due to him.

The Salient.

WOULD anyone deliberately miss the broadcast of the solemn proceedings in connection with the Menin Gate Memorial? It will be relayed to all B.B.C. stations. A thousand thousand pities that this mighty and rich country cannot broadcast things like this to every country in the Empire.

The Indian Beam.

THIS is to be opened, in India, by the Viceroy. Morse hunters ought to have a happy time on short waves, trying to catch some of the complimentary messages which will be flipped 'twixt Bombay and London. Less than a century ago the only means of communication with India was by ship—unless you walked and did a little swimming as well.

Indian Broadcasting.

THE broadcasting receiving licences issued or renewed in India during 1925–26 numbered 1167. We will hope that this will soon be multiplied by a thousand not long after the Indian B.C. gets to work, and that British exporters will collar the market.

Dutch Broadcasting.

THE proprietors of the Eindhoven Laboratory, Holland, which did the long-distance short-wave broadcasts not long ago are reported to have the intention of constructing a permanent short-wave broadcasting station, and that to carry on the business a limited company with a capital of a million guilders has been formed.

The King's Microphone.

WHEN the King spoke on July 19th at Liverpool his speeches were caught by what is almost certainly the most valuable microphone in the world. It is a Marconi Magnetophone, covered by a silver wire cage bearing the Royal Arms in gold, and has been "used" by His Majesty five times already. It is often on show at Marconi House, in the front window.

B.B.C. and Queen's Hall.

THE B.B.C. has made an agreement with Messrs. Chappell for a six weeks' season of Promenade Concerts from August 13th to September 24th at the Queen's Hall, covering 37 concerts. Sir Henry J. Wood will conduct his Symphony Orchestra, and the old arrangement of special musical programmes on specified nights will be maintained. I think the B.B.C. could not have done a wiser thing, and for this alone — to mention nothing else — we Londoners should take back a lot of what we have said about them.

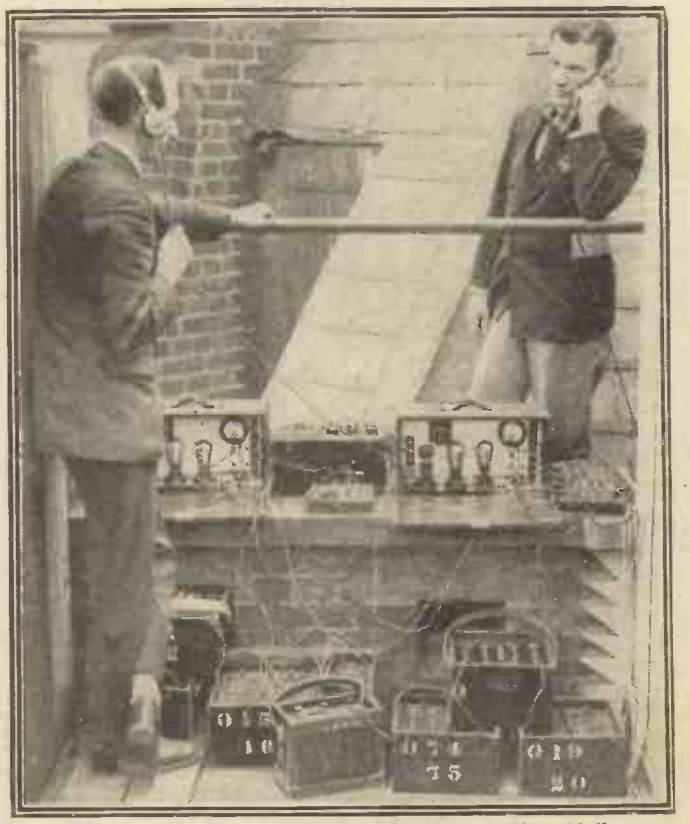
Daventry Junior.

THE news is that Daventry Junior is to strike up early in August with a crystal-set range of 100 miles, on a wave-length of between 300 metres and 400 metres; call signal not yet announced. This will be splendid, provided the programmes are well varied.

Berlin Exhibition.

ANYBODY who plans to be in Berlin between September 2nd and September 11th should try to visit the Radio Exhibition which is to be held between those dates in the Fair Grounds, Kaiserdamm. This is the West End of Berlin. It will be a source of delight to the keen

(*Continued on next page.*)



The apparatus used at Lords cricket ground in connection with the broadcasting of commentaries on cricket matches.

NOTES AND NEWS.

(Continued from previous page.)

amateur. Wireless photo-transmission will be demonstrated, and there will be a restaurant 180 ft. up a 455 ft. radio tower.

Malaya Goes Ahead.

A STRAITS reader sends me a prospectus of the Malayan Broadcasting Service, Ltd., which is applying for a site in the vicinity of Kuala Lumpur on which to erect a station. Of the annual licence fee of $20 the company is to receive $18, and six minutes of each hour of broadcasting time is to be offered to advertisers. I have had plenty of experience of radio in Malaya. The "atmospherics" and mosquitoes got most of the other. But I wish the inhabitants of Malaya the best of luck, and should like to know how the broadcasting is to be divided between English, Malay, Tamil, and Chinese.

Aerial in Vacuo.

AMONGST the patents I have seen recently is one in respect of an aerial which is enclosed in an exhausted tube. Despite inquiries urgently broadcast amongst my highbrow radio friends, I have so far failed to discover what is behind this notion. The aerial is wound on a rod enclosed in a vacuum tube. Will someone give me the theory of this patent? I trust the inventor does not labour under the impression that it will cut out "X's" or Chamber music.

Those Definitions.

HERE are mine. The amateur is he who receives Australia on one valve and thinks the signals weak. The expert gets Australia on two valves, and either does not mention it or else calls it a "freak," and goes to lunch with a man who has proved that all Australian broadcast signals hit the Pyramids, bounce off, and are absorbed in the Red Sea.

Pep!

THE G.P.O. sleuth vans had better look out, for there has been formed the Southend-on-Sea and District Anti-oscillation League. Address: Hon. Sec., 12, Grange Gardens, Southend-on-Sea. Its object is to receive reports of radio interference of any kind. Now, as Southend is a—well, a port, and, as such, particularly liable to interference, I strongly recommend readers in the district to support the League. I don't know whether the League is more troubled by oscillation than by Morse, but I hope local readers will roll up in their dozens and demand peace and quiet.

B.B.C. and Variety.

ACCORDING to a report of a speech by the secretary of the Provincial Entertainments Proprietors' and Managers' Association, negotiations are continuing with the B.B.C. It has been proposed that the P.E.P.M.A. should, in return for a substantial sum, give the B.B.C. a licence to broadcast all artistes engaged by members of the P.E.P.M.A. I assume that the snag is the size of the sum.

Television.

TELEVISION is a wonder which will be exploited to the fullest possible extent in the U.S.A. Already the American Radio Commission has provided for the reservation of wave-lengths for broadcast tele-radio stations.

Typhoon Calling!

THE new radio weather station at Kowloon, which is on the mainland opposite Hong Kong, now makes a speciality of broadcasting typhoon warnings in a number of languages, and it is hoped that Chinese junks will install crystal receivers. I fear that the hope is vain; John would, I verily believe, prefer to get drowned in his usual casual way. Besides, he still paints eyes on the bows of his vessels, saying, "No have eye, how can see?"

S.O.S. for Nuneaton.

WILL C. H. M. (Nuneaton), who wrote to me about his reception of Lindbergh's speech, kindly communicate with Mr. W. H. T. Randle, The Nuneaton Chronicle Press, Ltd., 39, Church Street, Nuneaton?

The Spanish "Fan."

I HAVE been very interested in a copy of a Spanish amateur radio weekly called "EAR," a most appropriate name. It is evident that there is a body of live "fans" in Spain, in spite of the struggling condition of Spanish broadcasting. But I note that the influence and sympathy are entirely American. This is rather strange, firstly because the tide of commercial and Service wireless flows towards Britain and Germany; secondly, because English things and customs are so popular in Spain. I lived there for some years, so I know, and I can say that the young Spaniard is a good "sport." I should like to see some radio transmission to that country.

SHORT WAVES.

A CRUMB OF COMFORT.

The King's English has just been murdered again.

"At any rate," he chortled just before he breathed his last, "I have never been tortured quite so much as a French musical title broadcast by an American radio announcer."

—"Ladies' Home Journal."

* * *

A Howling Receiver: The little boy who gets spanked for touching father's radio set.

* * *

"Small toy as Aerial." Some of those wireless-licence dodgers will do anything to deceive the P.M.G.—"The Star."

* * *

A medical writer mentions the case of a man with elastic arms. When television comes in he should be a useful performer for broadcasting fishing stories.—"London Opinion."

* * *

2 L O amusement—not instruction. (Headline). "Evening Standard.")

2 L O-brow, of course.

* * *

SAY IT WITH——

New Suburbanite: "Two packages of flower seeds."

Clerk: "Anything else, madam?"

New Suburbanite: "Perhaps you'd better give me a couple of radio bulbs; George always raves about them."—"Radio Program Weekly."

* * *

This week's inventor: The man who is trying to devise a means of preventing valve filaments from heating up, and a silencer for loud speakers.

* * *

TUNING IN OLD SOL.

Owner: "I understand now that 'static' is nothing more or less than the sun trying to communicate with us."

Visitor: "So that is why your set has dials."

—"Radio News."

* * *

Oh, what is the use of the B.B.C.,
What use the S.O.S.,
If it can't render help to me
In moments of distress?

Should guests come when we're servantless,
Where else pray should I look
For aid, except to S.O.S.
To conjure up a cook?

In short, if in life's crises I
Am not considered free
To S.O.S.—of what, I say,
Use is the B.B.C.?—"Daily Herald."

Listen for Spain.

SENOR DON LUCIANO GARCIA, E A R 11, transmits on 37·6 metres very successfully. If you should hear him and wish to write, I think the address, Guadalajara, Spain, will find him; or you can try the office of "Ear." Address, Mejia Lequerica, numero 4, Madrid.

2 L O's Orchestras.

THE writers of many of the letters I have received about the 2 L O Wireless Orchestra show a desire to include the London Wireless Symphony Orchestra in their appreciation. By all means! I wish we heard them oftener.

Improving Crystal Sets.

N. C. C. (Lemington-on-Tyne) has been inspired by "P.W." to experiment with crystal sets, and writes to say that he has had splendid results with a circuit which consists of two distinct crystal circuits, aerials as well, one to each earpiece of the head telephones. The two aerials should be spaced well away from each other. From the diagram he sends I notice that the order is: Crystal one—'phone (one earpiece)—earth—second earpiece—second crystal. The aerials are in series with coils each paralleled by a variable condenser and connected to earth.

Is this a Record?

I HEAR that Mr. F. G. Simpson (7 X F), of Seattle, held a two-hours' conversation on June 21st with Mr. J. W. Robinson (2 R N), of Concord, which is 200 miles from Brisbane. The power was 100 watts and the wave-length 38 metres. This is terrific, and should certainly inspire amateur transmitters in this country.

DX Reception

A. G. H. A. (Chatham) picked up the Canadian Jubilee celebrations on 26 metres on his four-valve resistance-coupled set, with short-wave coils of his own design. R. A., of the same address, got the same on 26·18 metres. I like the meticulosity of the point 18; it is dear to my scientific mind. His results were R2 on a 0—V—0 "straight" receiver. Evidently radio "runs" in this family—and "P.W." also.

Super DX.

A STUNNING letter from A. S. (Barnsbury), who coolly turns from a conversation with a man in Chile—some yards distant—to search the broadcast band and hears Lindbergh speak through W J Z on 454 metres. This world is too small.

Those Kilocycles.

JUDGING from our postbag, our readers are not of two minds on the subject of kilocycles. They do not want them. To my way of thinking the new expression is akin to converting pounds sterling to milreis; in other words, you have got to come back to sterling before you know where you are.

ARIEL.

RADIO RECEPTION DURING THE ECLIPSE

Several thousand readings were taken by different observers stationed at various points along the affected region. In this article a clear idea as to the purposes of these and their value to radio science is given.

FROM A SPECIAL CORRESPONDENT.

ALTHOUGH the eclipse proved a sad disappointment to so many people from the purely spectacular point of view, the prevailing bad weather made little or no difference to the effects of the phenomenon on wireless transmission and reception.

In the first place the chief radio problem to be investigated was the result of the temporary cutting-off and restoration of the sun's rays upon the Heaviside layer. As this is located far above the region of clouds, any changes brought about by the abnormal solar conditions took effect irrespective of whether the sky was clear or overcast.

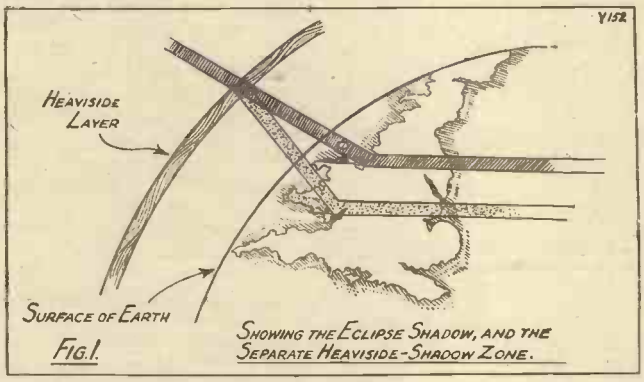


FIG. 1. SHOWING THE ECLIPSE SHADOW, AND THE SEPARATE HEAVISIDE-SHADOW ZONE.

In the second place the centre of interest of the ordinary observer did not wholly coincide with that of the radio investigator. Owing to the fact that the sun's position was low on the horizon during the period of the eclipse, the cone of shadow struck the earth's surface not vertically but at a considerable angle.

Now the Heaviside layer is located at a height of approximately sixty miles above sea-level. Consequently the impact of the shadow zone upon the layer (which determines the radio "ceiling" for a wireless observer) is displaced from the visual effect. Its vertical projection marks out a zone which forms an equally important area for wireless observations to that of the actual track of the totality shadow across the surface of the earth.

The Heaviside Layer Track.

The projection of the Heaviside layer track is illustrated in Fig. 1, and shows a displacement of roughly 100 miles to the south-east of the track of totality. Incidentally the critical period of the change of Heaviside "ceiling" occurred nearly three minutes before the moment of visual totality.

The Radio Research Board stationed special observers along this zone, in addition to those located on the visible belt of totality, in order to ascertain which region was most affected. The results are at present being tabulated and will be published in due course.

The actual effect of the sun's eclipse may be likened to that of a rapid sunset followed by an equally accelerated sunrise. It is known that the existence of the Heaviside layer is due to the ionizing action of the very short or ultra-violet rays upon the gaseous molecules forming the atmosphere.

As one ascends from the surface of the earth the density of the atmosphere diminishes. Finally, a point is reached where each molecule of the air is separated from its neighbours by an appreciable space. In this region it is a comparatively frequent occurrence for one of the electrons associated with a gas molecule to be broken away from the nucleus by the action of the short-wave light-rays from the sun, and to remain in a free or unattached condition.

The presence of free electrons constitutes the state of ionization, and this in turn implies a degree of conductivity, and therefore a region in which some of the energy of an electro-magnetic wave will be absorbed in the form of eddy currents.

When, however, the degree of ionization becomes sufficiently great, the medium becomes a reflector in which the direction of an incident ether wave may be deflected or changed without appreciable loss of energy.

During the daytime the penetrating power of the sun's rays is sufficient to reduce the height of the Heaviside "ceiling" to forty or fifty miles. In addition there is an extensive lower region of feeble ionization in which considerable absorption of ether-wave energy can occur before reflection takes place.

During the night-time the area of diffused ionization shrinks backwards, or rather upwards, to form a ceiling of dense ionization located at a height of between 60 and 70 miles above sea level.

For this reason short-wave signals from between twenty to one hundred metres travel farther by night than by day. They reach the true reflecting zone without having to pass through an intervening layer of low ionization where absorption losses occur, and consequently they are reflected practically at full strength. During the daytime they have to struggle past this "bad region" and lose energy *en route*.

Short Waves Not Affected.

In the case of short-wave signals of from ten to twenty metres the frequency of the wave is so high that absorption losses become comparatively insignificant. Such waves consequently travel equally well, and sometimes even better by day than by night.

From these considerations it will be seen that for waves of between 30 and 100 metres the shrinking-back of the Heaviside layer during the artificial night-time of the eclipse, should produce a temporary increase in signal strength, followed by a reversion to the normal as the penetrating power of the sun's rays are restored.

(*Continued on next page.*)


A "P.W." reader making radio observations during the period of totality.

RADIO RECEPTION DURING THE ECLIPSE.

(Continued from previous page.)

This action is, in fact, borne out by the reported observations, amongst others, of Mr. S. R. Wright, who carried out experiments at Giggleswick on behalf of the Radio Research Board. He says:

"No unusual events were recorded by my instruments during the period of totality, but the rapid darkening of the sun, followed by the rapid growth of light, produced a large increase in signal strength, commencing a minute before totality, and reaching zenith when the sun was obscured and diminishing as the light reappeared."

On the other hand, marked fading of the short-wave signals from P C J J (Eindhoven, Holland) on 30 metres was reported by observers with the Colwyn Bay party under the charge of Professor Dingle and Dr. Clark. This behaviour was, however, probably due to the sudden "lift" of the Heaviside layer and a resulting change in the "skip distance" of the reflected wave.

A "Wandering" Effect.

Special observations were taken on D.F. apparatus, both in the totality area in Yorkshire and in the Heaviside shadow zone near Bristol, to test the effect of the eclipse upon the direction of the wave-front. In both cases the apparent bearings of the transmitting station showed fluctations similar to the well-known "night-error" or "wandering" commonly experienced during the twilight hours. The effect was pronounced at sunrise, then decreased, and again came into evidence during the moments of totality. Shortly afterwards directional reception became normal and gave accurate bearings.

Theories Amply Corroborated.

In all, several thousand readings were taken by different observers stationed at various points along the affected regions, and some considerable time must elapse before they can all be collated and published in cohesive form. Meanwhile, it is interesting to know that the theories of such scientists as Eccles and Larmer regarding the action of the Heaviside layer on the propagation of wireless waves have received ample corroboration and support as the result of the trials carried out during the eclipse.

It may perhaps be argued that the vast amount of time and energy spent in taking wireless observations during this period hardly justify the results obtained.

In this connection one must bear in mind the uniqueness of the occasion. A total eclipse of the sun only occurs once in a period that is measured by the lapse of 18 years 11 days and a few hours. This period, it may be worth mentioning, was known quite accurately to the ancient Chaldeans, and was called by them the Saros.

Unfortunately, although a total eclipse does recur once every Saros, and is visible somewhere on the earth's surface, it by no means follows that it will be seen in the same neighbourhood or even approximately so on successive occasions.

The map shown in Fig. 2 illustrates the track of totality of the recent eclipse and of four future ones. It will be seen from it that we must wait until the year 1999 for a recurrence of this remarkable phenomenon in our own country, and even then it will only be visible over a small area in the south-west corner of Cornwall.

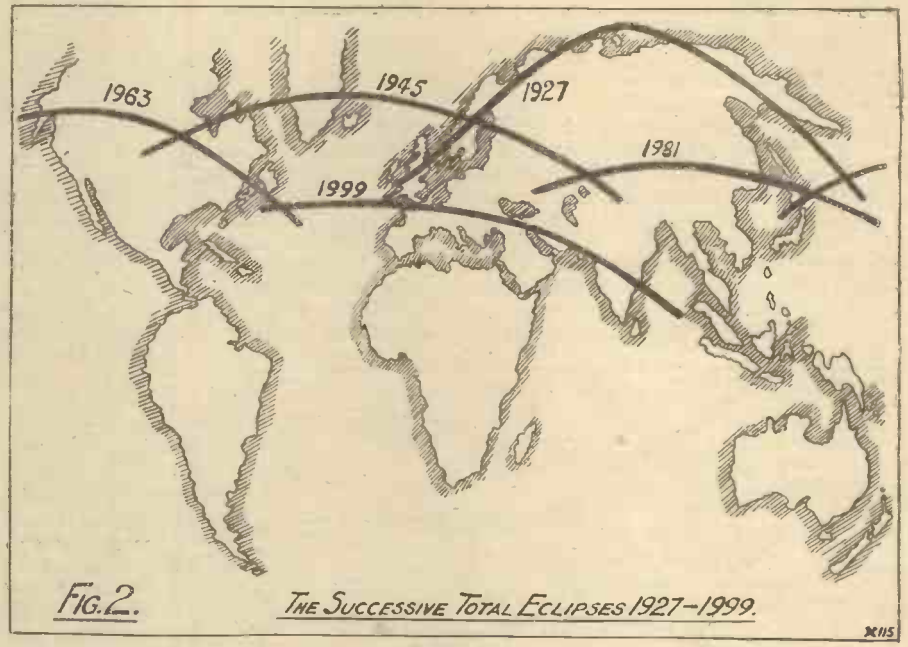
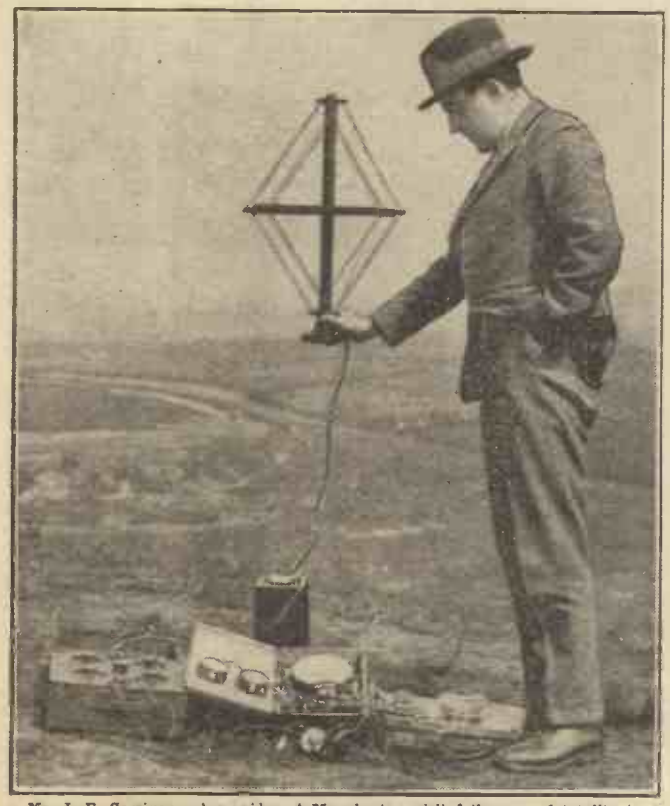


FIG. 2. THE SUCCESSIVE TOTAL ECLIPSES 1927–1999.



Mr. J. F. Corrigan, who resides at Manchester, visited the area of totality in order to make some independent radio observations.

SPARE YOUR LOUD SPEAKER.

THOUGH the passage of a small, steady current through the windings of the loud speaker is not likely to do any damage so long as it flows in the right direction, so as to assist the permanent magnets, the current flowing in the anode circuit of the last valve of a multi-valve receiver is often too large for safety. The windings of the magnets of a loud speaker are not usually any more robust than those in headphones, and too heavy a current may overheat the fine wire and injure the insulation between the turns.

The employment of a filter circuit to prevent such injury to the loud speaker is quite common practice. A further advantage of the insertion of a filter circuit is that the loud-speaker adjustment then does not need to be touched when it is once set. You will appreciate this if you are accustomed to set your loud speaker to its most sensitive state. If you switch an extra L.F. power valve into circuit, the larger anode current makes the loud-speaker diaphragm just "go over" on to the magnet poles, and it has to be reset.

Since there is no steady current through the loud speaker when the filter is used, the adjustment of the diaphragm can be made once and for all.

HOW VALVES ARE MADE.

Notes on the fascinating subject of valve making as seen at the factory of one of our leading manufacturers.

BY A SPECIAL CORRESPONDENT.

THE three-electrode valve used for wireless reception varies in design according to the special purpose to which it is to be put: H.F. or L.F., detector or power; but for these various types the manufacturing details are roughly similar. There are variations in shape and size and in the disposition of the electrodes, and it is with these variations that alterations in the so-called characteristics are obtained. Now let me try to explain the processes of valve-making as I have seen them conducted in that famous valve works in whose laboratory the first wireless valve was made.

The electrodes are mounted on stout nickel wires which are sealed in to the glass "pinch," this unit forming the valve stem, as it is called.

"Soft" and "Hard" Valves.

The stem is built up in this manner: A piece of glass tubing, accurately gauged and cut to a prescribed length, has one end softened in a blow-pipe flame and spun outwards to form a funnel, or flare. This funnel is then mounted on a jig and the nickel wires for the electrodes are placed in position. A series of blow-pipe flames soften the opposite end of the funnel, which is finally squeezed round the nickel wires, forming the pinch (mentioned in the preceding paragraph).

The electrode supports are connected to the socket pins by copper wires which are joined to them through intermediate pieces of fine platinum wire. The use of platinum wire is of first importance, since it ensures a perfectly airtight joint where the connections pass through the glass pinch. The slightest trace of air in the exhausted bulb would render the valve "soft," with a consequent impairment of its life and efficiency. (A "hard" valve is one in which the vacuum has been carried to an extremely high degree.)

Mounting the Electrodes.

In the making of the pipless type of valve the air is exhausted through a small glass tube which is welded into the stem at the time the connecting wires are sealed into the pinch. The four composite wires and the exhausting tube are inserted in the jaws of the rotating stem-making machine, where they are exposed to powerful blowpipe gas-jets until the glass is quite soft. The molten glass is then pinched at the top end, and the enhausting tube automatically sealed in position. It will be appreciated with what care these operations are conducted, because unless the glass is correctly melted and pinched accurately and tightly into the wires it would be impossible to obtain an efficient vacuum in the later stages of manufacture.

The next series of operations is concerned with the sealing of the electrodes to their supports, the filament being welded to its supports by hand.

The grid, in the form of a helix of molybdenum wire of about six one-thousandths of an inch diameter, is wound on a mandril of about one-tenth of an inch diameter, cut to its required length, and electrically welded to the backbone—a length of nickel wire.

The anode is made of sheet nickel of about eight one-thousandths of an inch thick, and is electrically welded to its support.

With the completion of these operations the mounted stem is ready for sealing into the bulb.

As received from the glass-blowing department, the bulb has what might be called a useless piece of glass at the end, termed "the moil." This is cracked off at the rim, so that a slightly flared mouth is left, into which the mounted stem is inserted. The stem is held in a special chuck, the flared bulb placed over it, and the whole rotated in a machine where the stem and bulb pass through a series of blow-pipe flames; the heating process being continued until the glass of the bulb is melted into the glass of the funnel. A perfectly homogeneous joint is secured.

In the process of "exhausting" the valves are sealed, in batches of a dozen, to a glass tube which is connected to a motor-driven oil pump. During the preliminary stages of pumping a gas-heated canister is placed over the valves; this is done to heat the bulbs and drive off any trace of moisture and air which may have adhered to the surface of the glass. The electrodes are generally freed from gas by a similar process of exhausting before being sealed in the bulb, although the exhausting is repeated when the valve is on the pumping bench.

The final stages of vacuum are effected by means of mercury pumps capable of exhausting the air to one-thousandth of a millimetre barometric pressure.

Making the Vacuum.

Following this pumping, the vacuum is still further improved by the use of chemicals (curiously called the "getter") which are liberated in the bulb during a later stage of manufacture.

Automatic machinery is employed for exhausting, the valves being placed on a revolving table connected to pumps which exhaust the valves completely, as each passes round. The machine delivers the valve sealed off, ready for capping. Inefficient vacuum is automatically signalled to the operator.

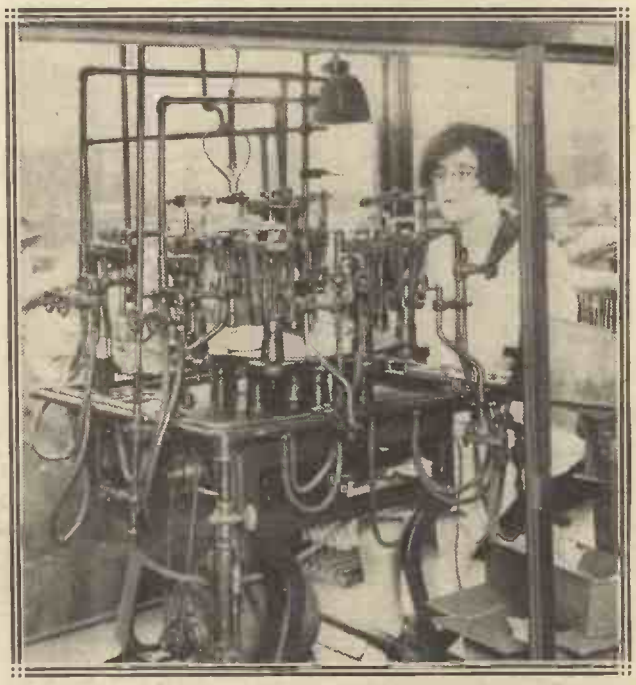
The valve-caps are made of a black insulating material and are secured to the glass of the bulb with a special kind of rapidly setting cement, assisted by heat.

When capped the valve is placed in an induction furnace, in which high-frequency currents cause the electrodes to become red-hot and which volatilises any residual magnesium (the "getter") adhering to the anode. The magnesium is deposited on the inside surface of the glass, carrying with it the last traces of gas.

The Inspection "Window."

As is well known, every Ediswan valve is provided with an inspection "window" to enable the user to see the lighted filament (the glow being so dull). A small mica disc is left in the bulb, and when the magnesium is deposited on the glass the disc acts as a screen, leaving the glass clear at the top of the bulb, through which the electrode system may be clearly seen. The valve is so manipulated, of course, that the disc falls on just the right spot.

The valve is now passed to the "ageing" department. Here it is run for a time to mature and stabilise its characteristics. At successive stages of manufacture each valve is subjected to stringent tests; none the less, after even the ageing process, every valve made is tested yet again.



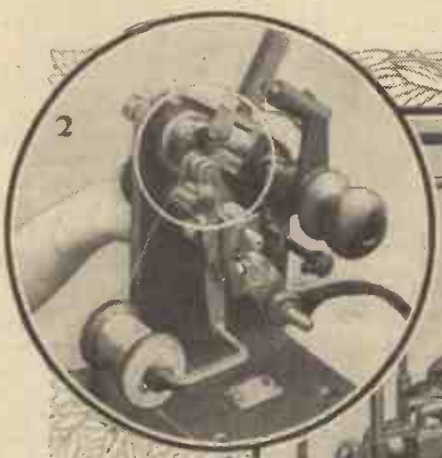
A demonstration of valve making given in the window of Messrs. Ediswan's London showrooms.

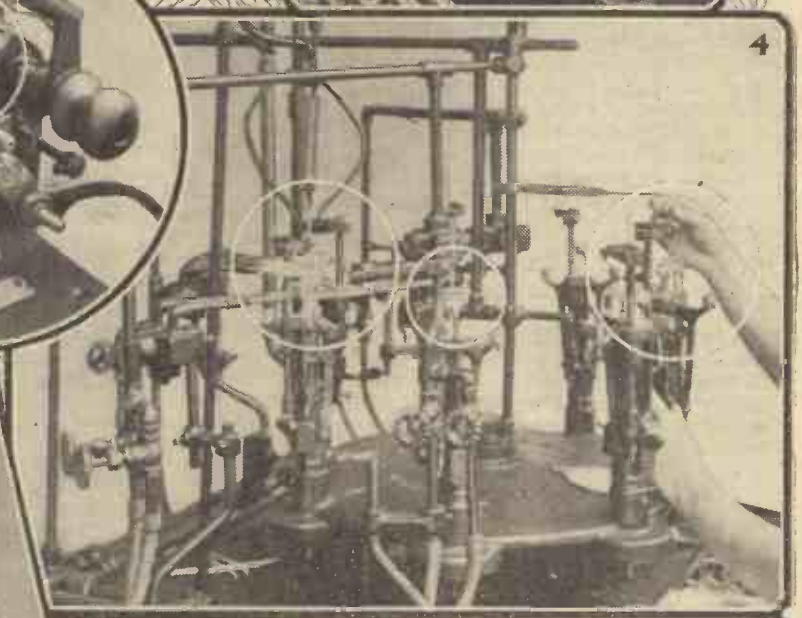
Valves in the making

THE intricacies of valve-making can only be appreciated fully in a personal tour of a valve works, but here are several illustrations which give an idea of the chief operations.

Although certain of the machinery employed performs almost uncannily humanlike movements much of the work is necessarily done by hand, so delicate are the parts and the processes of assembly; and in the Ediswan valve works, where these photographs were taken, the skilled workers were observed to be extraordinarily deft and speedy, yet deadly deliberate.

A long course of training is necessary before a valve-making operative can be considered proficient; and there is a homely touch in the circumstance that shortly after the R.C. Threesome was launched the Ediswan organisation (faced with an unprecedented demand for resistance coupling valves) was largely dependent—so scarce was skilled labour—on the loyalty of those ex-members of the female staff who had married and settled down to housekeeping!





THE ABOVE SIX PICTURES REPRESENT SOME OF THE MORE IMPORTANT STAGES IN THE CONSTRUCTION OF A VALVE.

1. Electrode welding. 2. Flat-grid winding and welding. 3. Capping. 4. Stem-making. 5. Testing. 6. Exhausting with condensation pumps and liquid air.

Photographs courtesy The Edison Swan Electric Co., Ltd.

"Simple Simon"

There is nothing on the panel of this most compact three-valve set, excepting the switch which switches it on and off, although it embodies reaction and is a really efficient receiver.

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

"THE set of the future," said a relative of mine who knows nothing whatever about wireless, "will consist of a small box with a knob like an electric light switch, by which you will turn the music on and off. There will be no knobs and dials and adjustments and minute scale divisions and jaw-cracking names. And it will be about a quarter of the size of that awful contraption you've got there!"

As he happened to be connected with the motor-car trade I had "my own back" by giving him an airy sketch of what I thought the motor-car of the future would be like, and left him fuming.

Joking apart, however, there is much to be said for the simplification of those wireless sets which are designed for the non-technical listeners. It is only too true that a collection of dials and knobs has often scared away a would-be "broadcastee" and given him or her the impression that wireless is really a complex business.

Useful Ranges of Reception.

"Simple Simon" is a further attempt to reduce a plain, straightforward loud-speaker set to its simplest proportions, and I think I have managed to compress such an instrument into a smaller space than has hitherto been possible. Look at the above photograph. Inside the cabinet is a complete three-valve set sufficiently powerful to give loud-speaker reproduction from your local station, or from Daventry, provided the former is not more than twenty or thirty miles away, and the latter not more than 120 or so. In such circumstances the set is tuned once and for all to either the local station or Daventry, and is operated by the on-and-off switch seen in the middle of panel. As, however, the experimenter likes to get more than this out of three valves, I have provided a reaction adjustment so that on the shorter wave—i.e. between 250 and 600 metres—the sensitivity of the set can be very considerably increased.

Two Most Interesting Features.

With this the set can be adjusted once and for all to some individual station, and will give loud-speaker strength from that station at a considerably greater distance than at first indicated. It can then be operated by the on-and-off switch just as before, and the lid need not be opened again except to change valves.

The set, however, is what may be termed a "one-station receiver," and is designed to fill the needs of those people who wish to have the simplest possible set in the house—a set which the smallest child can turn on and off without risk of upsetting adjustments. Although a reaction adjustment has been provided so that a number of stations other than the local can be picked up, the set is not primarily intended for quick searching, and should not be used for such. As an example of how its sensitivity can be increased with more or less skilled handling, I may say that at Wimbledon it can be tuned to Langenberg, from which station it will give full loud-speaker strength in broad daylight.

To the more technical reader the two most interesting features of "Simple Simon" are the methods adopted to put a straight three-valve set into so small a space. The panel measures 10 in. by 7 in., and the cabinet is only 8 in. deep externally. It is, in fact, the type of cabinet I generally use for a single-valve receiver.

COMPONENTS REQUIRED.

- 1 Panel, 10 x 7 x ¼ or 3/16th in.
- Suitable cabinet with 7 in. baseboard.
- 1 Fixed condenser, ·0002 mfd.
- 1 Adjustable Formodenser, ·0005 maximum.
- 1 Adjustable Formodenser, ·0001 maximum.
- 1 Baseboard mounting coil socket.
- 1 Fixed condenser, ·0003 mfd.
- 1 Separate leak holder.
- 1 Grid leak, 2 megohms.
- 1 Anti-phonic valve holder
- 2 Rigid valve holders
- 1 R.C. unit.
- 1 Low-frequency transformer.
- 2 Fixed resistor bases.
- 2 Fixed resistors (one to control current for two valves of the type you choose, and one to control only one valve).
- 1 On-and-Off switch.
- 1 Terminal strip, carrying ten terminals, as follows: Aerial, earth, low-tension negative, low-tension positive, high-tension positive, high-tension negative, grid-bias negative, grid-bias positive, loud-speaker negative and loud-speaker positive. It will be found that the terminals can be spaced exactly an inch apart.
- Suitable plug-in coil for your nearest station (see particulars given in article).

Saving Space.

Following the researches published in the last issue of POPULAR WIRELESS, I have economised a certain amount of space by using an anti-phonic holder for the detector stage only, with two small rigid sockets for the note magnifiers. Secondly, having investigated the possibilities of small adjustable condensers for semi-permanent tuning, I have adopted them in this receiver, with a great saving of space, and incidentally of cost. Such condensers, while not having the wide capacity range of the more conventional inter-leaving plate type, have yet sufficient tuning range to make their use practical with the conventional plug-in coils. For example, the tuning condenser used in this set has a maximum capacity of ·0005 mfd. and a minimum which is sufficiently low to give what may be termed an "overlap" tuning range with the various plug-in coils.

The Coils to Use.

By using a ·0002 fixed condenser in series with the aerial, the effect of the aerial capacity is very considerably reduced and the wave-length range of the plug-in coil correspondingly increased. With this arrangement the adjustable condenser shown covers the

(*Continued on next page.*)

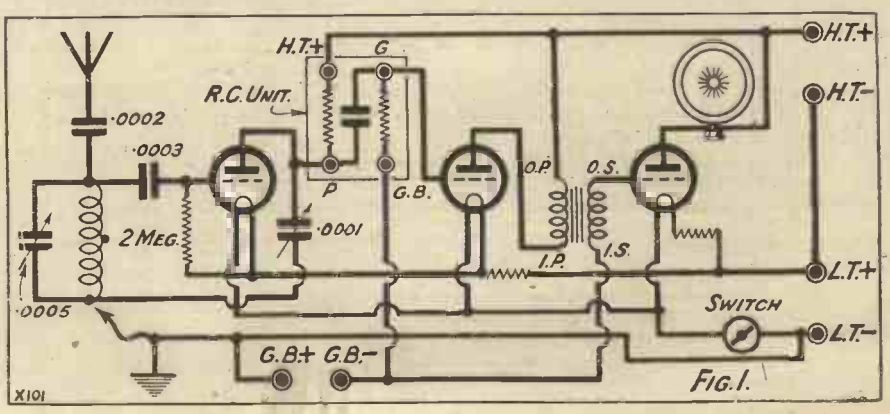


FIG. 1.

"SIMPLE SIMON."

(Continued from previous page.)

following ranges with the under-mentioned coils:

Coil		
No. 50	..	480 to 620 metres.
„ 40	..	370 „ 500 „
„ 35	..	315 „ 450 „
„ 25	..	Any B.B.C. stations below 315 metres.

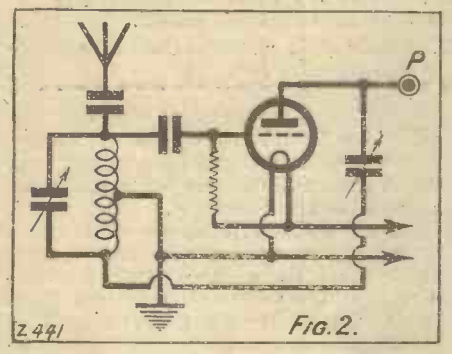


FIG. 2.

There will be, of course, slight variations of wave-length range with different plug-in coils, but you are safe in using any of the good makes with sufficient overlap to find the station you want. For the Daventry range a No. 150 is used.

Two of these condensers are used in the present set, and there are many other uses to which I hope to refer in a subsequent article. They are not intended for regular and frequent tuning as are the ordinary condensers, but they are admirable for tuning a receiver once and for all to a particular station, or for occasionally varying the tuning when, say, the aerial is altered, as occurs on moving from one house to another. Furthermore, the cost of the make I have used is but 2s. 6d.

The Components Used.

Fig. 1 shows the circuit, which consists of a detector followed by one resistance-coupled note magnifying stage and one transformer-coupled stage. For the resistance coupling a complete R.C. unit is used. There are several available on the market, and I have used the new R.I.-Varley type B. For the second stage any good L.F. transformer can be used; and, as a matter of fact, there is space available for any make on the market, even the largest. I have used the new Ediswan L.F. transformer in the set. All the remaining components too are of perfectly standard types, and any good makes can be used, viz.: Lissen or Dubilier grid leak and condensers, etc.

Considering the circuit in detail, it will be seen that ·0002 fixed condenser is placed in series with the aerial and the ·0005 adjustable condenser (it is known as the Formodenser and is sold by Arthur Preen & Co., Ltd.) in parallel with the plug-in

(Continued on next page.)

WIRING-IN WORDS.

BEFORE attaching panel join E and L.T. —. Join flexible lead to E, finishing it with spade terminal. Join L.T. + and H.T. —. L.T. — to G.B. +. L.S. + to H.T. +. Aerial to ·0002 fixed condenser. Latter to coil holder and ·0005 Formodenser, and to grid condenser. Other coil holder terminal to second terminal of ·0005 Formodenser and to one side of ·0001 Formodenser. Grid condenser to grid leak holder, and to grid of first valve. Other grid leak terminal to + fil. terminal of first valve holder.

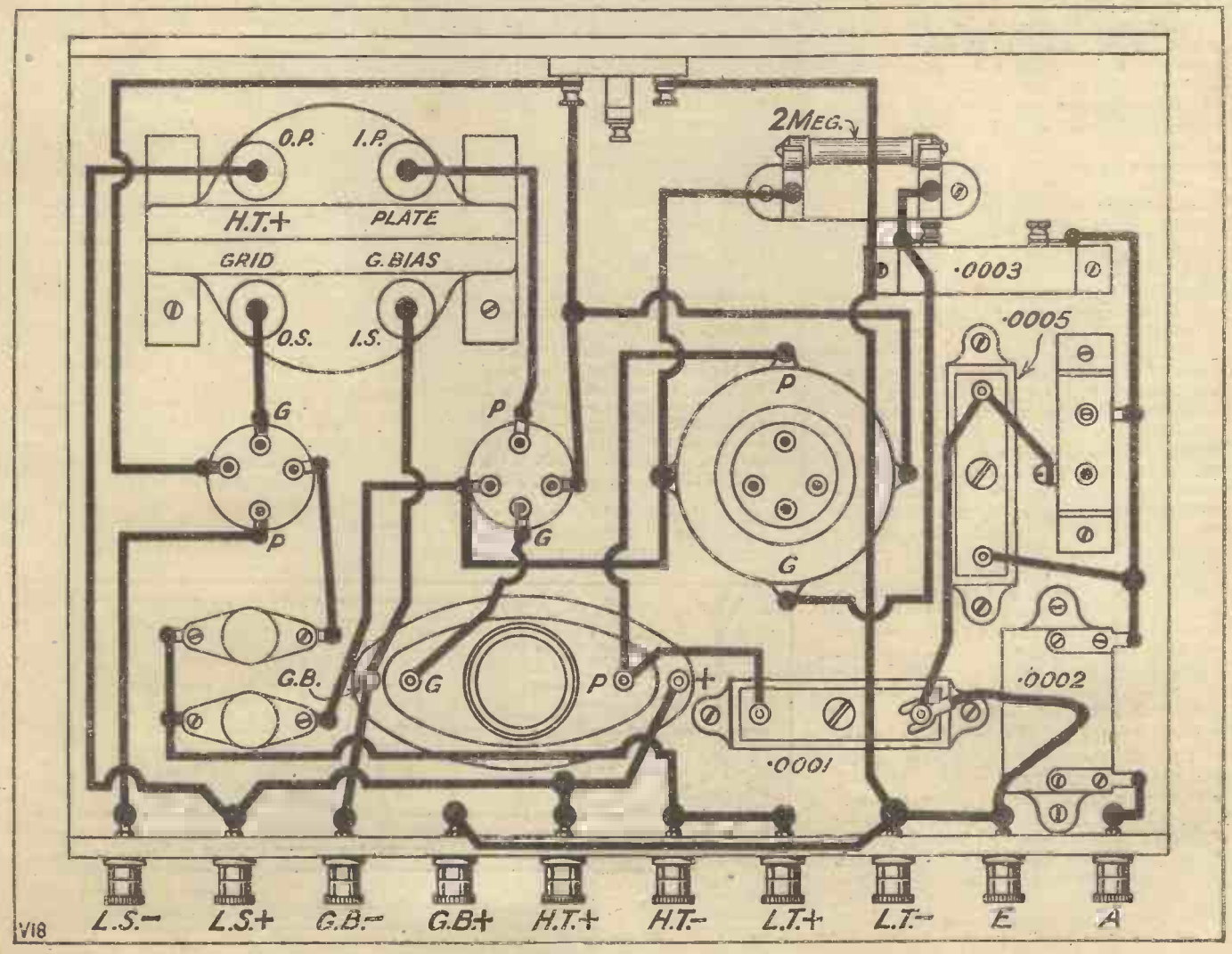
Join + fil. terminals of first two valve holders together and to one fixed resistor. Join two fixed resistors to + L.T. terminal. Join remaining terminal of fixed resistor to + terminal of third valve holder.

Join three — fil. terminals of valve sockets. Join plate of first valve to "P" of R.C. unit and to remaining ·0001 Formodenser terminal.

Join "+" of R.C. unit to + H.T. Join "G" of R.C. unit to grid of 2nd valve. G.B. of R.C. unit to G.B. — terminal, and to G.B. (or I.S.) terminal of transformer.

Join plate of 2nd valve holder to "Plate" (or I.P.) of transformer. Join H.T. + (or O.P.) of transformer to L.S. + terminal. Join grid (or O.S.) terminal of transformer to grid of last valve. Join plate of last valve to L.S. — terminal.

AFTER panel is attached join one terminal of switch to L.T. —, and other to common negative lead of three valves.



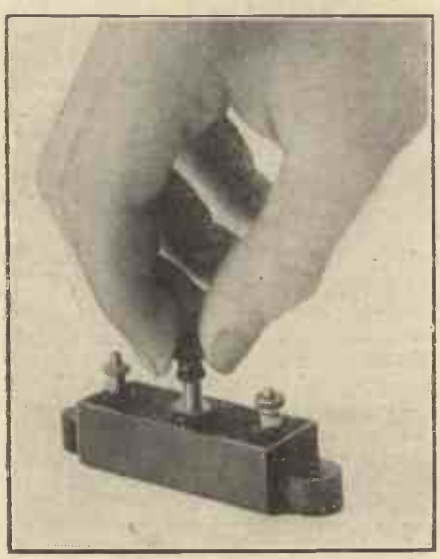
"SIMPLE SIMON."

(Continued from previous page.)

coil. The grid leak is taken from the grid to the positive leg of the valve, and between the plate of the detector valve and negative L.T. is placed another adjustable condenser, this time with a maximum of ·0001 mfd.

The Reaction Control.

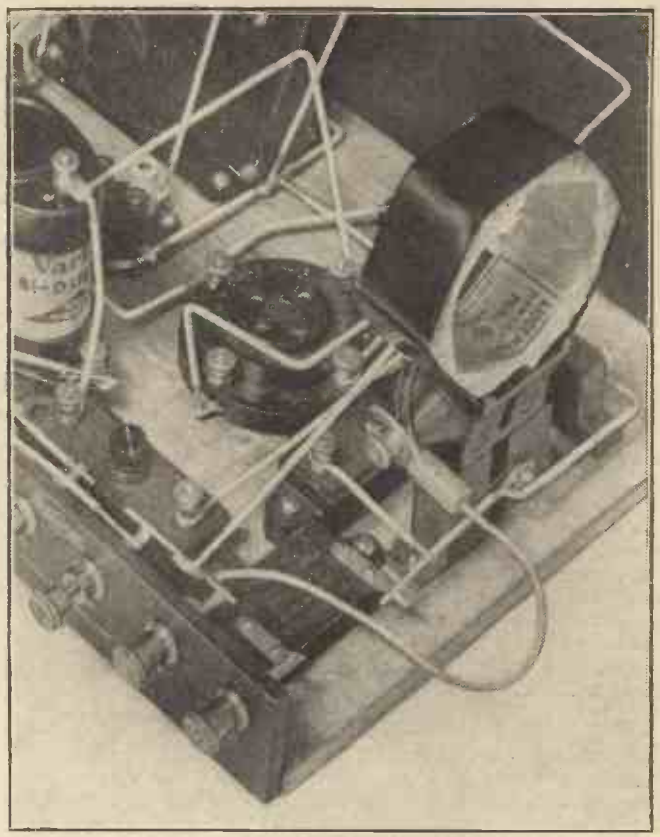
It is worth digressing one moment to explain why this condenser is used in the place shown and why it is made adjustable.



One of the little condensers with which reaction adjustments and tuning are accomplished.

With all resistance capacity couplings there is always the unpleasant possibility of the high-frequency component getting into the audio-frequency side, when trouble and distortion may occur. A large condenser usually overcomes this difficulty very successfully by by-passing the radio-frequency component back to the filament, allowing the audio-frequency impulses to pass on, but if the condenser is too large it will by-pass certain of the audio-frequency currents also, and give distorted reproduction.

It is advisable to keep such a condenser as small as possible, and by using one of the new adjustable type we can cut the value down to a minimum. At the same time, by making a very slight change in the circuit (provision is made for this to be done in a moment), the condenser can be used as a reaction control, thus augmenting the sensitivity of the circuit very considerably. However, when this is done there is more danger of the radio-frequency component getting into the audio-frequency side and the experiment should be performed with care and in the manner which will subsequently be explained.

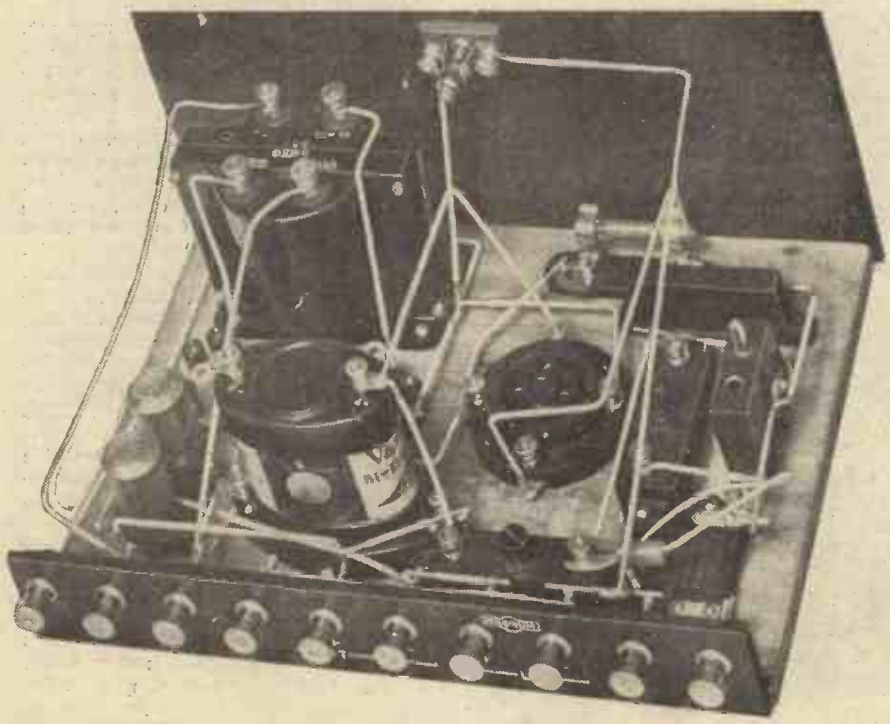


A "close-up" of the aerial end of "Simple Simon," showing the "variable condensers."

The Filament Resistors.

It will be noticed that only two filament resistors are used for three valves. The reason for this is that practically all makers are standardising on ·1 or ·12 ampere filaments, and it is a very simple matter to arrange that the filament current for the first two valves shall be of the same figure. By doing this we can make one filament resistor do the work of two and again save money. A separate filament resistor is provided for the last valve as, although most users will probably adopt the same filament current setting throughout (when, of course, they could use one resistor only), many more advanced experimenters may care to try a super-power valve, and as such valves usually take more filament current than the ordinary types the separate fixed resistor will take care of this.

Normally and for simplicity's sake, as well as economy, most users will adopt the same type of small power valve for both note magnifying stages. The same high tension is provided for all three valves, as the first (detector) valve, having a high resistance in its anode circuit, needs a fairly high voltage, and the note magnifying valves require such a voltage for pure reproduction. Although the set will work quite well on 60 or 72 volts, unless very loud signals are required, purity is gained by raising the H.T. voltage and, in fact, any voltage up to about 120 can be used according to the facilities available.



A back-of-panel photograph of "Simple Simon," which will help you with the wiring.

Separate Grid Bias Possible.

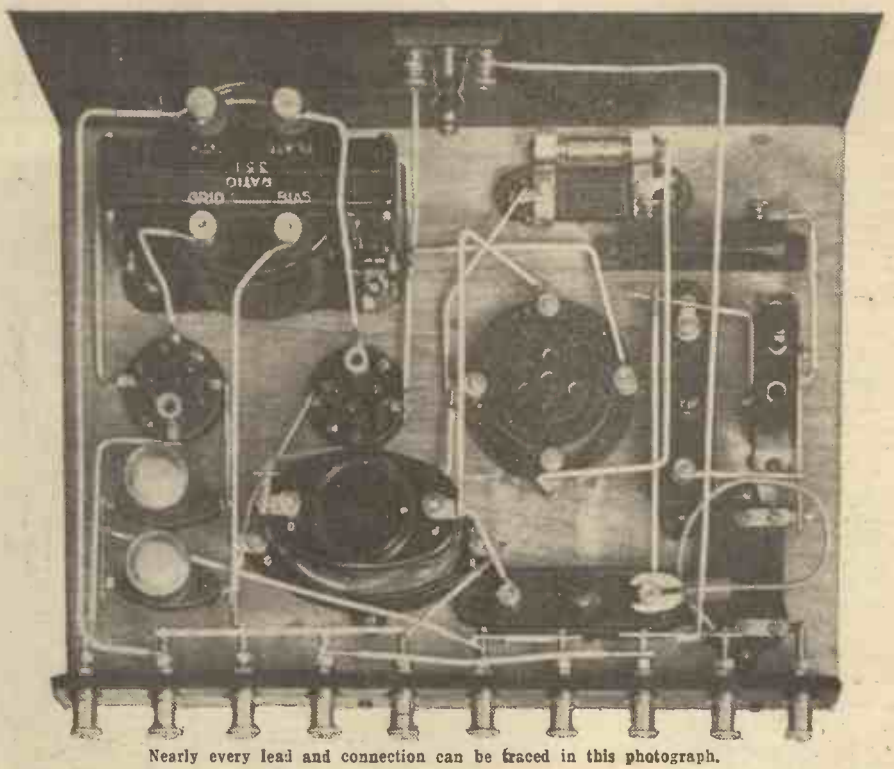
In view of the fact that most people will use the same type of valve in the note magnifying stage a common grid bias is provided for the last two valves; but to give the necessary variations when required it is but the work of the moment to detach the wire which goes from the grid-bias terminal of the transformer to the common grid-bias negative, and to substitute for it a flexible lead to a separate wander plug. When this is done a super-power valve can be correctly used in this stage.

(Continued on next page.)

"SIMPLE SIMON."

(Continued from previous page.)

The preparation of the front panel is, of course, an extremely simple task, for it is only necessary to drill one hole to take the on-and-off switch, and three small holes for securing the panel to the baseboard. You can mount the switch first of all and lay the panel aside as all other components can be screwed in position and wired up without the panel. There are but two leads from the on-and-off switch, one going to low-tension negative and the other to the common lead to all three valves. Notice that the connection between low-tension negative and the side of the ·0001 mfd. condenser which is joined to the tuning condenser and coil, is flexible, and finished with a spade terminal. Normally, this is screwed under the terminal of the ·0001 mfd. condenser, which is also joined to the tuning condenser, but by disconnecting it and joining it to the centre tapping of a centre-tapped coil the circuit is changed at once to a "Hartley" and will function as shown in Fig. 2.



Nearly every lead and connection can be traced in this photograph.

The Formodenser Adjustments.

Before dealing with the reaction adjustment, let us see how the set is tuned for normal use. The first valve should be one of the many types now sold for R.C. coupling, and the second and third should be low-frequency valves of any good make. Normally, both of these valves should be of the same type and make, so that the same grid bias can be used for both. The batteries are joined up in the usual way to the terminals marked, and as previously suggested, the high tension should be any convenient value up to 120 volts.

When you have decided on the high-tension voltage look at the valve-maker's chart and see what grid bias he recommends for that voltage, and use it by connecting up the leads to the grid-bias terminals. Join up aerial and earth, and then take a stick of wood and cut one end into a kind of screwdriver blade. Then, inserting this sharp end into the slot of the knob of the Formodenser, next to the coil, turn this slowly one way or the other until you get best signals from your nearest station or from Daventry.

Now screw down the ·0001 condenser as far as it will go—do not use force—and listen to the quality of reproduction. If this is good and you are satisfied, leave this condenser as it is. You can, however, if you like, by turning the knob in an anti-clockwise direction, lessen the amount of capacity here, but if on touching the grid terminal of the transformer with your finger, there is a buzzing sound or an indication of distortion, screw the condenser up again until there is no effect when you touch this terminal. Normally, the condenser can be screwed to its maximum without any appreciable distortion of signals.

Notice how the absence of the ordinary variable condenser economises space and simplifies the lay-out.

Room for everything and everything in its place, and no "crowding"!

The Reaction Arrangement.

And now for the Fig. 2 arrangement. For this you will need a centre-tapped coil of any of the well-known makes and at the same time the wave-length range covered by any given coil will be greater. A centre-tapped 50, for example, covers from about 370 to 550 metres, and a centre-tapped 40 or 30 will cover the ranges below. For adjusting this arrangement, set the ·0001 condenser (which now acts as a reaction condenser) at its minimum position (as far as this will go in an anti-clockwise direction), and tune in your station on the tuning condenser as before. Now slowly turn the ·0001 condenser in a clockwise direction, occasionally retuning on the ·0005 condenser until you get the station desired at best strength without oscillation.

In a very large number of cases this scheme works admirably on the shorter band, but it is not recommended for the Daventry range.

If, with the particular components you are using, you get howling or distortion, you should revert to the normal arrangement. Made up, however, with the parts illustrated, the set gave no trouble in this regard on the 300 to 600 metre band, and has received quite a number of foreign stations at full loud-speaker strength.

THE MARCUSE EXPERIMENT.

BY THE EDITOR.

EXPERIMENTAL broadcasting from this country to the Dominions is likely to begin on August 14th.

The above sentence is one which should at least arouse considerable interest among amateurs and make them feel that at last Britain is "getting a move on" in the direction of short-wave broadcasting.

As reported in POPULAR WIRELESS, a provisional permit has been given by the Postmaster-General to Mr. Gerald Marcuse, an old contributor to our columns, whose transmitting station, 2 N M, at Caterham is well known all over the world. The history of Mr. Marcuse's negotiations with the B.B.C., and the Postmaster-General in connection with short-wave Empire broadcasting is interesting.

The Preliminary Offer.

About seven weeks ago Mr. Marcuse first made an offer to the B.B.C. to relay its programmes overseas. The proposal was rejected without any reason, although later on the B.B.C. stated that it refused Mr. Marcuse's offer owing to copyright difficulties.

"The items which Mr. Marcuse wants to broadcast to the world," said an official of the B.B.C., "we take for broadcast to Great Britain and Ireland only, and if permission were given to Mr. Marcuse we should be infringing copyright."

There is no doubt that this objection is a legitimate one, for the broadcasting rights and copyright material for which the B.B.C. to-day pay large sums of money annually cannot in their present form be construed in such a way as to include the relaying of programmes by an amateur station to other countries.

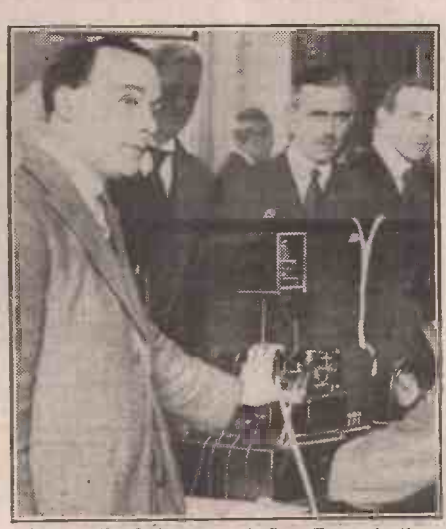
In fact, the Postmaster-General has only given Mr. Marcuse *provisional* permission to carry out his Empire tests, and this does not mean that full official sanction has been given. Amateur experimenters who can satisfy the Postmaster-General that the experiments on which they are engaged are likely to benefit radio science and broadcasting generally can, in rare cases, obtain permission to use a higher power than ten watts—that being the normal power permitted to the average experimenter. Further, permission can be obtained to use special low wave-lengths. These concessions have been given to Mr. Marcuse and, at his own expense—for the next twelve months at any rate—he is prepared to carry on a series of experiments to prove that Empire broadcasting is a feasible proposition.

Nothing Done.

As our readers know, very little indeed has been done in this country in connection with short-wave broadcasting except by amateurs. The B.B.C., for example, has done practically nothing, although nearly four years ago American short-wave stations were erected and have ever since continued to interest listeners all over the world. An official of the B.B.C. recently said that "while we appear to be no nearer being able to put short waves into actual service, research and experiments in reception give us reason to hope we are."

This is rather an ambiguous sort of statement to make, but if the B.B.C. is carrying out research work and experiments in connection with short-wave broadcasting, why on earth does it not let the public hear about these experiments, or at any rate why does it not keep the public informed and thus save itself from the adverse criticism of being asleep and allowing other countries, especially Holland, to leave us far behind? One wonders exactly what short-wave experiments the B.B.C. is making.

The position in connection with this Empire broadcasting business is really rather curious. The B.B.C. has placed no ban on any proposal in connection with relaying of programmes to the British Empire for, to begin with, it has no power to grant or withhold such permission. The B.B.C. states that it is anxious to begin an Empire broadcasting service, and it further states that experiments of a technical nature are being carried out with a view to setting up a permanent and reliable short-wave broadcasting service for the Dominions. It realises all this is very essential; but it says that although the problem is a simple one in statement it is a difficult one in solution!



Sending the first message to Cape Town via the recently-opened South African Beam service.

The chief difficulty seems to be in connection with reception and not in transmission, and it sums the whole position up by saying the B.B.C. will attempt to start a real short-wave service at the proper time in the proper way.

Too Much Perfection?

That is a blunt and unequivocal reply to those critics who demand it should get busy at once in connection with short-wave broadcasting. When the proper time will arrive and what its idea is of a proper way remains to be seen. The outlook doesn't seem very cheerful.

In the meantime, American short-wave stations are giving excellent service on the whole, and PCJJ, of Holland, although not capable of giving a *guaranteed* regular service, has demonstrated that a high percentage of its broadcasts can be picked up successfully in many distant parts of the world.

The trouble is the B.B.C. is out for perfection to such a degree that anything which falls short of the extravagantly high standard it sets itself it regards as not worth while. This is very nice in theory, but if we all set such high standards in life very little would be achieved.

Question of Relays.

Let us look at what the B.B.C. has been doing with regard to relays. The first relay this month was on July 1st, Dominion Day, when part of the programme from the Drummondville Station was relayed over Britain. Owing to the cast-iron rule that programmes cannot be altered in the evening this Canadian relay had to take its allotted place in the programme, although if it had been broadcast earlier or later the success of the transmission would have been greater.

Another relay was fixed for broadcasting a speech by Captain Byrd. This was to have been relayed through one or two Paris stations which were broadcasting, but the B.B.C. did not send it out from any of its stations because one station was being heterodyned and another station was suffering from Morse interference!

Anyway, the experiment was worth trying, despite the heterodyning and despite the Morse, and despite interference on the whole it would have interested many people indeed if they had only caught a few words of Captain Byrd's speech.

The other evening, just when London had finished its variety programme, signals were being excellently received from 2 X A D (on 22 metres), the American experimental station. Unluckily 2 X A D closed down at 10.34, just when 2 L O had finished its variety programme. If 2 X A D signals were coming through so well, surely it would have been worth while cutting short this variety programme in order to finish up with a brief selection from 2 X A D's transmission? But no, again the cast-iron rule of not interfering with the allotted programme spoiled an interesting transmission.

Why Not Attempt It?

If the B.B.C. is going to wait until conditions are as well nigh perfect as possible, it means we shall get an Empire relay, or a foreign broadcast, once in a blue moon. But, for short periods, listeners would be only too willing to put up with atmospherics and Morse interference, fading, and all the rest of it, for the pleasure of listening even to a scrappy portion of a foreign programme relayed by one of our stations. Variety is the spice of life, and there is a chance of a thrill for thousands of people in listening to a distant station being relayed.

The same with Empire broadcasting. No one would blame the B.B.C. if it failed to give a perfect service. One does not expect it to do so. An immediate service of Empire broadcasting would in all probability be thoroughly bad, but that wouldn't make any difference. It is *the attempt* which listeners want, and the spirit behind the attempt—a spirit which they rightly feel is so sadly lacking at Savoy Hill.

RADIO-STAMBOUL

THE NEW TURK BROADCASTING ST

By W. GORDON CAMPBE

ABOUT a year ago the Turkish a[illegible]ities granted to a French group the concession for the erection of b[illegible]casting stations both at Angora, the c[illegible]l, and at Constantinople. The former station had to be specially built and is not yet ready, but at Constantinople use has been made of the existing Osmanié station, situated in a lonely spot about eight miles to the north of the city.

The Studio at Stamboul.

It was erected by the Germans during the War, and was afterwards used by the British military authorities during the occupation of Constantinople. Here, broadcasting has already begun. The studio where the music is performed is not at Osmanié but on the top floor of the principal post office building in Stamboul—the native portion of the city, where the principal mosques and govern[illegible] studio is [illegible] ordinary te[illegible]

The Two Or[illegible]

The wa[illegible] metres, bu[illegible] to avoid in[illegible] stations'; [illegible] 6 kw. Pr[illegible] to increas[illegible] 12 kw.

The pr[illegible] and Europ[illegible] plied by [illegible] bourse qu[illegible]

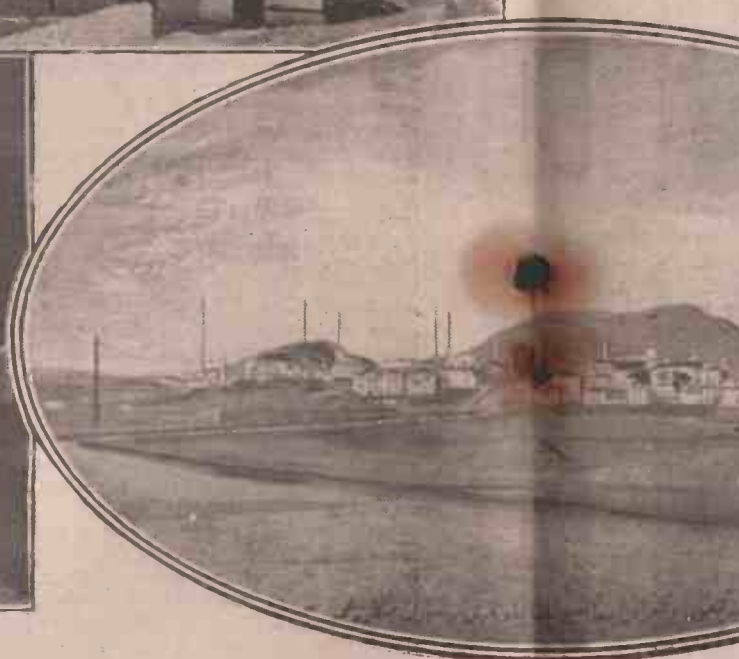
(Above). A general view of the Osmanié station, showing the masts and aerial and station buildings; and (right) a corner of Angora showing in the distance the masts of the Angora station.

(Right). The wireless station at Angora, showing one of the steel masts used. The frame aerial emblem is the official monogram of the new wireless company.

* * *

Below is a general view of Angora, in the background of which can be seen the wireless station masts.

A view of the studio, showing the microphone (on left) and the Turkish orchestra.



KISH TATION.

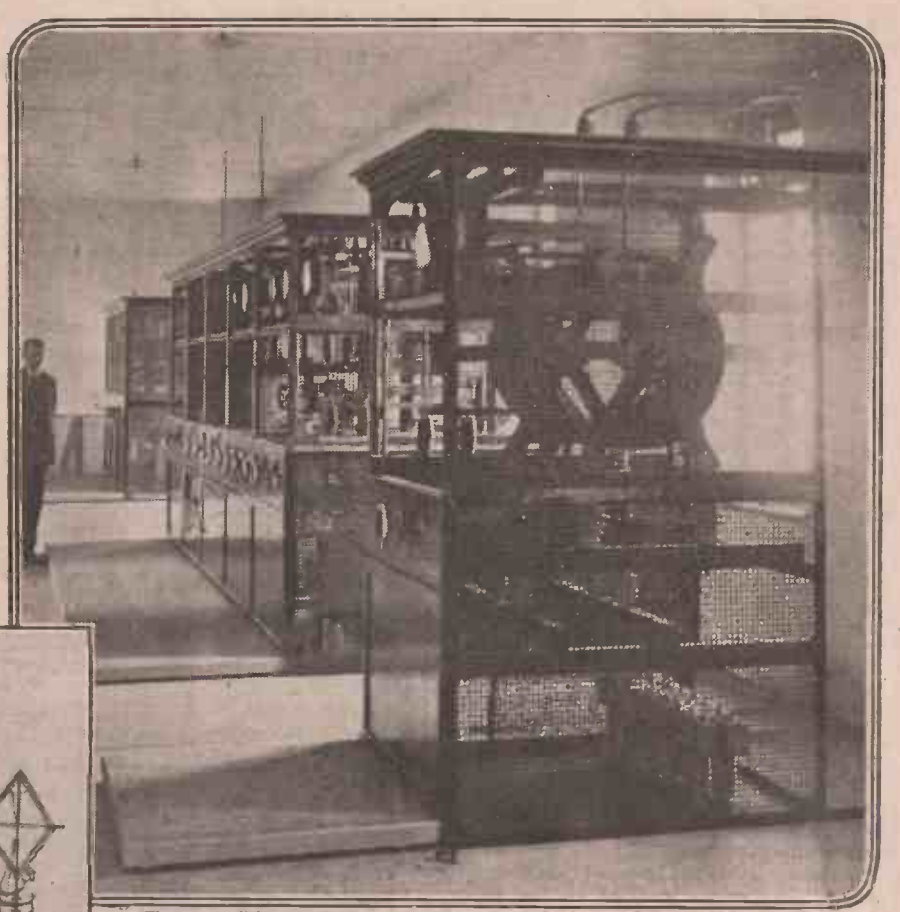
LL.

nment offices are situated. This connected with Osmanié by an elephone line.

rchestras.

ve-length was originally 1,200 t is now reduced to 1,180 metres nterference with certain European and the power at present used is ovision has been made, however, e the power in case of need to

ogramme includes both Turkish pean music, as well as news sup- the local telegraph agency and otations. The Turkish music is

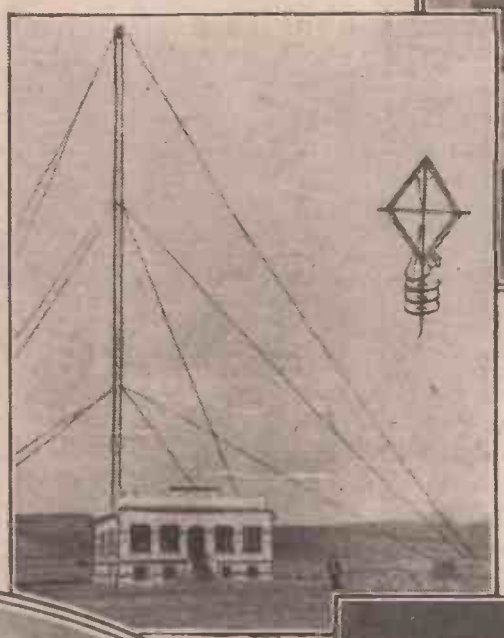


The transmitting plant at the new Osmanié broadcasting station is quite European in character.

discoursed by a different orchestra from that which supplies the operatic, classical, and jazz music.

The photograph of the Turkish orchestra is of special interest as showing some of the peculiar instruments used to produce the music, which European listeners will no doubt consider as weird and monotonous sounds. The man on the extreme right holds against his breast an instrument resembling a diminutive violin—called a *kemancha*. The man next to him holds on his knees a zither-like instrument called a *canon*. It has steel wires, and is played by means of special plectrons attached to the index fingers of both hands.

(*Continued on page* 783)



The orchestra at the new Turkish broadcasting station, which handles music of a European nature.

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

THE THERMOPILE

ARTISTIC LOUD-SPEAKERS—SOUND WORK—VOICE ENERGY—A BUGBEAR MADE USEFUL.

The Thermopile.

READERS who recollect my articles in POPULAR WIRELESS a year or two ago on the "Thermopile" for filament heating will remember that the output voltage of the thermopile is affected by the output current; the greater the current which is drawn from the instrument, the lower the voltage at the instrument terminals. This is due to a similar cause, namely, the appreciable (though not high) internal resistance of the thermopile. Here, however, the internal resistance—once the correct current and voltage have been decided upon—does not affect the reproduction in the slightest, and the current for the filament from a thermopile is in every respect as satisfactory as that from an L.T. accumulator.

Perhaps I ought to add just one qualification and say that, whereas the current from a satisfactory and well-charged accumulator is, to all intents and purposes, constant from the moment the filament current is switched on, the current from the thermopile is apt to creep slowly during some minutes to a final steady value. But as regards absolute smoothness and freedom from crackle, it is, if possible, even superior to that from an accumulator.

Artistic Loud-Speakers.

Some new and very interesting loud speakers are, I understand, about to be put on the market in which the loud-speaker unit and the sound-reproducing chamber are incorporated into various styles of artistic figures—statuettes and so on. Some of these represent squatting Indian and Chinese figures, birds (such as "talking" parrots), and so on; whilst in other models the loud speaker is so arranged that it can be formed into an artistic lamp or lamp-shade. A great variety of models of all kinds is available in pleasing and attractive styles.

Rotating Loud-Speaker.

Whilst on the subject of loud speakers, I should mention that Mr. F. E. Miller, a well-known American radio engineer, has just lately invented a loud speaker on what is claimed to be a totally new principle. This is known as the "Miller Rotating Loud Speaker," and it comprises a conical horn, to the small end of which the reproducer unit is fitted, the whole cone being mounted on an axial shaft so as to be capable of rotating about its own axis. Inside the cone are two curious tapering spirals, one inside the other, the taper of the spirals conforming to that of the cone.

The cone is rotated rapidly by means of a small electric motor with belt and pulley. The action of the device is not quite clear, but it is claimed that its performance is much ahead of that of the conventional types of speaker. By various manipulations with the spirals inside the cone, and with the speed of rotation, "head resonance" may be cut off (when a singer's voice is being reproduced) and "chest resonance" may be increased, whilst volume may be augmented to a degree rather inaptly described as "positively painful."

The music of a gramophone record, electrically reproduced with the aid of the Miller loud speaker, according to the inventor, "throws forth a Niagara of sound which offends the ear, and immediately afterwards tones it down to a mere thread of gently whispering harmony."

Sound Work.

Have you ever wondered how much actual energy is represented by the sound that comes out from the loud speaker? It is quite interesting, and in some ways very surprising, to work out the energy which is transmitted through the air in the form of sounds of ordinary loudness.

The first thing to notice is that the actual energy transformed into the shape of sound waves is only a very small fraction of the energy which is required to operate the sound-producing device. For example, an appreciable wattage may be consumed by the reproducer unit of a loud speaker, but only a very small proportion of that energy makes its appearance in the form of sound waves, by far the greater percentage being dissipated in other ways.

Voice Energy.

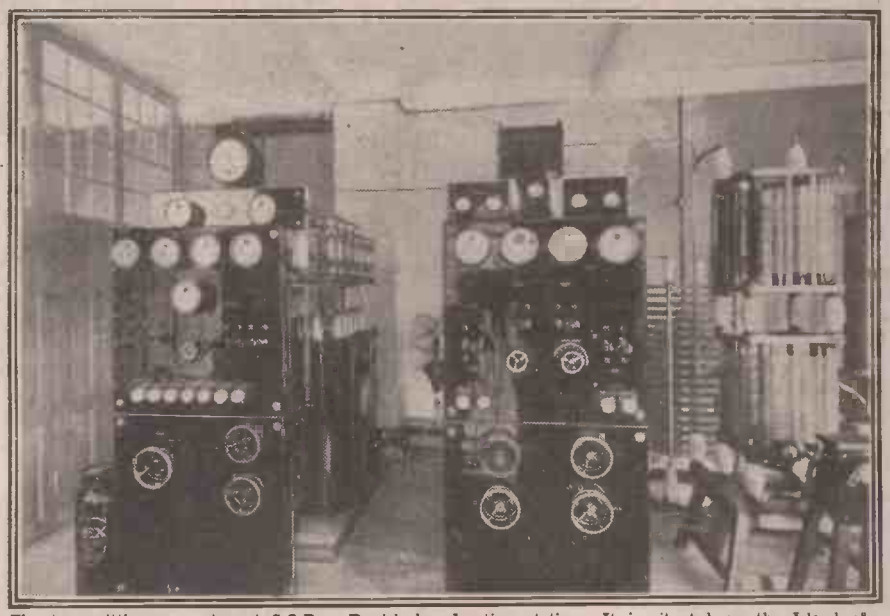
Some very interesting experiments and calculations made by telephone engineers have shown that the energy contained in the sound waves of the human voice is excessively small, so small, in fact, that if 1,000,000 persons were to talk steadily and the energy of the sound (*not* the energy which they expend in *producing* the sound) were converted into heat, it would be necessary for them to talk steadily for about two hours in order to produce sufficient heat to make a cup of tea!

A well-known acoustic expert has divided English speech sounds into 36 different varieties, and he has found that the vowels carry most of the energy. It is estimated that at the upper and lower limits of the human hearing range, it takes 100,000,000 times as much energy to make a sound audible as in the range of 1,000 to 5,000 cycles, where the ear is most sensitive.

Through the telephones or loud speaker the sounds "TH," "F," "S." and "V" are the most difficult to hear correctly. This is attributed chiefly to their very weak energy.

A Bugbear Made Useful!

An ingenious American radio engineer has found a method of turning what has hitherto been a bugbear to a useful purpose. He has specially designed a valve so that it acts as a really sensitive pick-up for sound-waves, converting the sound-wave energy into electrical energy and amplifying at the same time. In other words, the new device is a *valve-microphone*. The inventor describes it as a "vibrating-grid microphone."



The transmitting apparatus at S O R, a Danish broadcasting station. It is situated on the Island of Sjaelland, about 50 miles south-west of Copenhagen.

The valve is provided with the usual filament and plate, these being mounted more or less in the conventional way. The grid, however, although located between the filament and plate, is supported upon the extremity of a short pillar which proceeds from the centre of a glass diaphragm. This glass diaphragm forms part of the glass envelope or bulb of the valve; it thus has the atmospheric air on one side and a vacuum on the other. When sound-waves fall upon the device they set the glass diaphragm in vibration and, owing to the rigid support between the diaphragm and the grid, the two vibrate similarly; in this way the grid is made to vibrate directly in

(*Continued on page* 784.)

W G Y'S SHORT-WAVE SCHEDULE.

The Editor, POPULAR WIRELESS.

Dear Sir,—I was interested in a letter in a recent issue of POPULAR WIRELESS from Mr. H. B. Evershed re W G Y's short-wave schedule, and as I am able to give further particulars, I thought I would do so, as I also have never previously seen this item mentioned in print anywhere. I have made a point of getting this regularly for some time now, as it saves me wasting time during the week trying for a station that is not transmitting. The "short-wave schedule," as they term it, is sent out every Saturday night at 12.40 a.m. (Sunday) British Summer Time. It is read through twice and is then morsed, which takes about ten minutes to transmit, then it is read through twice again. This is about 12.50, so that with the four chances you are sure to be able to write it down for reference later in the week. The schedule issued last night was as follows: 2 X A D, on 22·02 metres, Monday 5 to 6.30, Tuesday 4 to 4.45, Wednesday 5 to 7 and Friday, 5 to 7.30. 2 X A F, on 32·77 metres, Tuesday 5 to 7.30, Thursday 5 to 11.30 and Saturday 6.25 to 11. These times Eastern standard, as announced.

The times have been much the same each week lately, except for the early transmission, Tuesday, from 2 X A D, which came into the programme about three weeks ago; and also there is usually a transmission from this station on Sundays, but not this week. I was rather struck by the efficiency of short waves last night, when I received the news on a simple two-valver that W G Y would have to close down till 7.30 E.S.T., as a gale had blown down the wires and prevented their doing the relay from the Hotel Onondaga, Syracuse. As regards my experience of reception from these stations, I do not find any particular difference in the results on either wavelength, but I listen to 2 X A D most, as it is more often transmitting nowadays. I think one can practically always get signals of some sort, and I think it safe to say that on ninety per cent of the time they are readable, and certainly more than fifty per cent of the time you can sit down and enjoy them. Another interesting item always worth listening for on either of these stations is their news bulletin, which is sent out at 11.15 (approx.) B.S.T. The circuit I use is the ordinary modified Reinartz or Schnell. Should this letter be worth printing I hope it may be of some use to somebody.

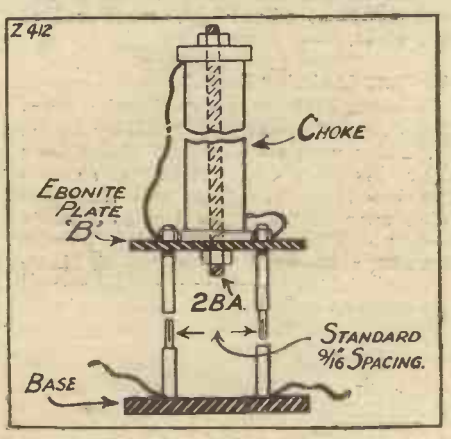
Yours faithfully,
W. FOXWELL.

68, Trinity Square,
Borough, S.E.1.

A PLUG-IN L.F. CHOKE.

The Editor, POPULAR WIRELESS.

Dear Sir,—Sets employing capacity reaction and consisting of det. and 1 or 2 L.F. stages, while primarily designed for broadcast reception, are frequently suitable for short-wave work on a modified scale. The difficulty lies, however, in the choke. For between 250–2,000 metres a high-class commercial choke is extremely efficient; while for, say, 30–200 metres small low-capacity plug-in coils are



essential in sizes varying from 20–60 turns. An adaptor may be easily constructed which carries permanently a commercial long-wave choke, while for short-wave reception an ordinary coil may be plugged in.

The sketch shows a "Varley" choke, but any of the well-known makes—i.e. Cosmos, R.I., McMichael, etc., may be easily adapted by varying the size of base "B" and method of fixing to same.

Yours faithfully,
WILLIAM BLAIR.

CONCERNING L.F. TRANSFORMERS.

The Editor, POPULAR WIRELESS.

Dear Sir,—In your issue of June 18th I notice further reference to resistance coupling and transformer coupling.

Although it is theoretically impossible to obtain such a uniformly flat curve with transformer coupling as with R.C. coupling (in the hands of an expert), I think, however, that for the average constructor better results can be obtained using a transformer if it is a high-class instrument.

I entirely agree with Mr. T. H. Walker and Mr F. R. Lupton that the advert. by Metro-Vick Supplies, Ltd., was very unfair. If the transformer they used for the test was an experimental instrument, then the results hold no value whatever; but if, as we were led to suppose, it was a commercial product, then the test was very unfair to the makers.

That Mr. J. Moore should get better results with a five-year old transformer than a moderu R.C. receiver is little short of absurd. I should also like to know what effect a turn or two of wire on an inductance has to do with the performance of an L.F. amplifier.

Seeing that Mr. J. Moore gets such perfect quality, I must assume that he does not use reaction.

It would seem to me therefore impossible to obtain such an efficient aerial system that distortion (cutting off of side bands) should take place.

I am, however, open to correction.

Yours faithfully,
A. BOOT.

18, Richmond Road,
Bearwood, Smethwick.

CORRESPONDENCE.

WGY's SHORT-WAVE SCHEDULE

A PLUG-IN H.F. CHOKE—MAINTAINING DANIEL CELLS.

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

THAT "BLASTING STUDIO."

The Editor, POPULAR WIRELESS.

Dear Sir,—With reference to Mr. V. A. M. Powell's remarks in this week's "P.W." concerning "blasting" of the piano in one particular studio at Savoy Hill, I should like to confirm these observations.

Piano transmissions have suffered from almost incredible variations of quality. Sometimes the purity is exellent, even in very loud passages; on other occasions the reproduction is very bad, and in passages of even moderate loudness mushiness and blasting occur regularly. So bad has it sometimes been that the piano has become unbearable, and I have been obliged to switch off. Even during one evening such variations occur. Why? The transmissions referred to have, of course, all been direct from Savoy Hill, and not relayed; otherwise one could understand.

I am particularly fond of the piano, and the above fault is very objectionable, especially in view of recent improvements in general transmission. I can state definitely, as Mr. Powell does, that it is not my set in this case.

Yours faithfully,
P. R. MANSELL.

37, Avenue Road,
Brentford, Middlesex.

MAINTAINING DANIEL CELLS.

The Editor, POPULAR WIRELESS.

Dear Sir,—I was rather surprised to read Mr. Robb's letter in a recent issue, stating that he and his friends have been unsuccessful with the Daniel cells for charging small accumulators. I made up a battery from particulars given in the same article, and have found it satisfactory as far as the charging of the accumulators. It has been in use for some time now, and I have had no trouble of the type he mentions.

The disdavantages I find are:

As stated by him, the zincs do not last more than two months, and I should be glad to hear if anything can be done to lessen this expense.

The six Daniel cells only give 6 volts when fully charged. The voltage drops as the copper sulphate gets used up, and in three days the total voltage is only about 4. Although I have no technical knowledge (and may be quite wrong) it seems to me that six Daniel cells are not sufficient to charge a 4-volt accumulator, whose E.M.F. (whilst on charge) rises to about 5 volts when nearly fully charged, and should be kept at that for about five hours. Also it means that fresh copper sulphate must be put in every two or three days, or else, when the voltage of the Daniel cells falls to four or less, the back pressure of the accumulator causes it to discharge into the Daniel cells.

I purpose adding two Daniel cells, making the initial voltage 8, which will allow a longer time without attention or risk of back pressure. I find that it is better to make up a strong solution of copper sulphate by pouring hot water on the crystals, and when cold putting it into the jars in place of the used up solution, which can easily be withdrawn by means of a syringe. It takes too long for the crystals to dissolve in the jars.

I venture to suggest that Mr. Robb's troubles were caused by one or both of the following. The voltage of the Daniel cells has fallen below 4, thus allowing the accumulator to discharge into them. Owing to the wording of the original article being very ambiguous; he put the sulphuric acid into the copper sulphate solution instead of into the solution of Epsom salts.

Perhaps the writer of the original article will reply to Mr. Robb, or other readers give their experiences, so that these difficulties can be overcome, as I think the idea is a good one.

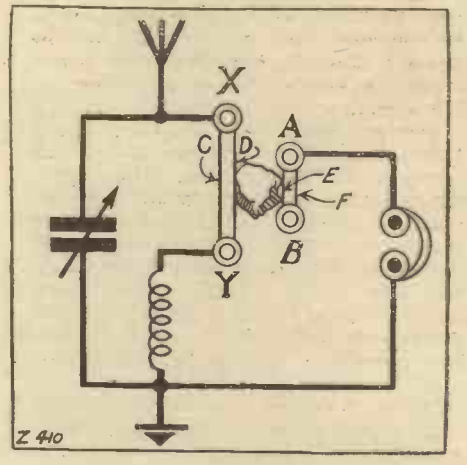
Yours faithfully,
T. PERKINS.

7, Frodsham Street,
Rusholme, Manchester.

THE FOUR-POINT CRYSTAL DETECTOR.

The Editor, POPULAR WIRELESS.

Dear Sir,—With reference to that interesting article "A Four-Point Crystal Detector," by G. V. Dowding, in POPULAR WIRELESS, May 21st, there is one point I should like cleared up. I think the following diagram correctly represents the theoretical circuit of the set incorporating Mr. Dowding's four-point detector.



Now, in explaining the theory of a three-point detector the writer says, referring to the point between X and Y, where the crystal touches the wire D: "It will be noted that all the received energy flowing in the aerial circuit *must* pass that delicate point of contact." Now this is all right in the Fig. 2 to which he refers, but surely in the detector he has devised *all* the energy does *not* flow through that point, but is shorted partly by the wire C in my diagram. I think the guide wires C and F ought to be omitted.

I have made a detector of this type, but instead of rocking the set I adjust the crystal by means of a small pair of tongs. I find it a very sensitive detector.

Is Mr. Dowding going to give us any more articles on this interesting subject? I have been hoping for further information about his experiments.

Yours sincerely,
KENNETH A. ROBBINS.

Vicarage Farm, Hounslow.

FROM DR. C. W. SALEEBY.

The Editor, POPULAR WIRELESS.

Dear Sir,—Listeners-in amongst your readers who have heard me speak at one time or another about the value of sunlight may be interested in a novel and arresting piece of independent testimony. It has just come to me from Kew.

Some weeks ago two boxes, each containing six lettuce, were sown on the same day, one beneath ordinary glass, the other beneath the special glass which admits the sun's ultra-violet rays. They have been tended in exactly the same manner, and they have been plucked on the same day and weighed.

And with what result? The weight at the end of six weeks of the six grown under ordinary glass was 8¼ lb.; of the six grown under vitaglass 9¾ lb. That is to say, the ultra-violet rays, and any others of value which vitaglass may transmit, have added 1½ lb. to the weight of six lettuce in six weeks. Under them they grew up much sturdier, of a deeper shade of green, and with bigger hearts.

The authorities, very naturally, are now proceeding to test other plants of economic and dietetic value on the same lines. I, for one, should be very much surprised if the results do not give added proof of the value of ultra-violet rays in the cultivation of plants, as of animals and children.

Yours faithfully,
C. W. SALEEBY, M.D., F.Z.S., F.R.S.E.

13, Greville Place, N.W.6.

BROADCAST NOTES.

By OUR BROADCASTING CORRESPONDENTS.

A New Concert Party—Forthcoming Seasonable Programmes—An Academy Talk—Dogs on Holiday—Minnehaha Minstrels for Manchester—The Rydal Trials—Handel from Liverpool—The Eisteddfod Broadcast—Shelley's Anniversary—Two Talks of Interest—Sir Harry Lauder's "Hoose"—Tennis in Scotland.

A New Concert Party.

NO one can accuse the B.B.C. of lack of persistence in the search for a good concert party. After four efforts, more or less successful—chiefly less—Savoy Hill is having another shot. This time the name is to be "Entre Nous." Three initial appearances at London and other stations have been arranged for Saturdays, August 6th, 20th, and 27th. The chief members of the new concert party are Vivienne Chatterton, Esther Coleman, Foster Richardson, Eric Greene, Rex Evans, Florence Oldham, Harold Clemence, and Yvette. Mr. Gordon McConnel, until recently of the staff at Cardiff, where he wrote "The Phantom Pantomime," and "Bertie's Bath Night," is the director and producer, and has written most of the words, while Stanford Robinson, B.B.C. chorus-master, has composed most of the music.

The entertainment will include a potted three-act play, "W.O.W.," and a surprise item. Apparently the Savoy Hill people are trying to make an entirely fresh start with concert party work. Previously their policy has been to try to adapt both material and artistes from the stage and music-halls. Now they are trying to build on purely radio lines, using the experience of those members of their staff whose work in this direction has been most successful. There would appear to be much more prospect of success this time. The omission of Donald Calthrop from the new cast is understood to be at his own request.

Forthcoming Seasonable Programmes.

London: Monday, July 25th (10.15 p.m.), Sydney Nesbitt and Ned Small in Variety. Wednesday, July 27th (7.30 to 8), "Dolly's Little Bills," a play by Henry Arthur Jones, performed by Ethel Irving, Farren Soutar and Gilbert Porteous. Negro spirituals, by the Utica Jubilee Singers, a combination of six exceptional coloured gentlemen arriving in this country on July 23rd. Friday, July 29th (7.45 to 8.30), Josephine Trix, Ed. Lowry, Harry Hemsley, and Jan Wien. Tuesday, August 2nd, Ada Reeve, the world-famous comedienne, who will be making her first appearance in England after a long absence abroad.

An Academy Talk.

The Diploma Gallery at Burlington House, which curiously is usually overlooked by the majority of visitors to the Royal Academy, and where certain pictures are shown only on written application, will be described by Miss Mary Elphinstone during a talk in the London studio on Tuesday, August 2nd.

Dogs on Holiday.

Count Vivian Hollender, a prominent member of the Kennel Club, will give some good advice on the treatment of animals, and more particularly of dogs, while their owners are away on holiday, in the course of a talk from London on Wednesday, August 3rd.

Minnehaha Minstrels for Manchester.

The Minnehaha Amateur Minstrels are reappearing at the Manchester studio on Wednesday, August 3rd, in a programme of negro melodies and modern syncopated music. This troupe, probably the only one of its kind, consists of about seventy men and boys and includes a choir, a banjo band, players of bones and tambourines, and a good array of comedians. All their performances are on behalf of charity, and during the fifty years of their existence they have raised the magnificent sum of over £44,000.

The Rydal Trials.

Running commentaries on the famous Rydal Sheep Dog Trials, which every year attract people from all parts of the country to the picturesque mountain glades of

Sir Wm. Mitchell Thompson, the P.M.G. (right), watching the operation of the S. African Beam Service.

Cumberland, will be broadcast from London, Manchester, and other stations on Wednesday afternoon, August 17th. On the following afternoon another running commentary will be similarly broadcast of the Annual Grasmere Sports, which consist, among other things, of wrestling matches and crag climbing.

Handel from Liverpool.

London, Manchester and other stations will broadcast a Handel concert arranged by the Liverpool station for transmission between 9.35 and 11 p.m. on Monday, August 8th. The programme will consist to a large extent of vocal and orchestral extracts from the Handel operas, and Keith Falkner (baritone) will sing some of the famous arias. There is a noticeable revival of activity at the Liverpool station since the discussion of the Regional scheme.

The Eisteddfod Broadcast

The Royal National Eisteddfod Orchestral Concert which London, Daventry, Liverpool and other stations are relaying from Holyhead on Thursday, August 4th, will be in the nature of a tribute to Beethoven, the centenary of whose death has been celebrated this year. The principal works which will be heard are the Symphony No. 5 in C Minor, and the Choral Fantasia.

Shelley's Anniversary.

The birth of the poet Shelley on August 4th, 1792, will be remembered on that day this year at the Newcastle station by a recital of his poems by Mr. Lee Dixon, and a few of his lyrics sung by Miss Ruby Longhurst. A short talk on Shelley's place in literature will also be given.

Another interesting anniversary which is being observed at the same station takes place on Saturday, August 6th, when on that day in 1809 Alfred Tennyson, the one-time Poet Laureate, was born. Mr. Robert Strangeways (baritone) will sing the Maud Cycle by Somervell, and Mr. Nicol Pentland will recite one or two of Tennyson's best known shorter poems.

Two Talks of Interest.

The Lord Mayor of Norwich, Mr. C. R. Bignold (incidently the youngest Lord Mayor in the kingdom), who recently inaugurated the Norfolk and Norwich Acro Club, is giving a talk in the London studio on Wednesday evening, July 27th, on "Norwich as an Air Port."

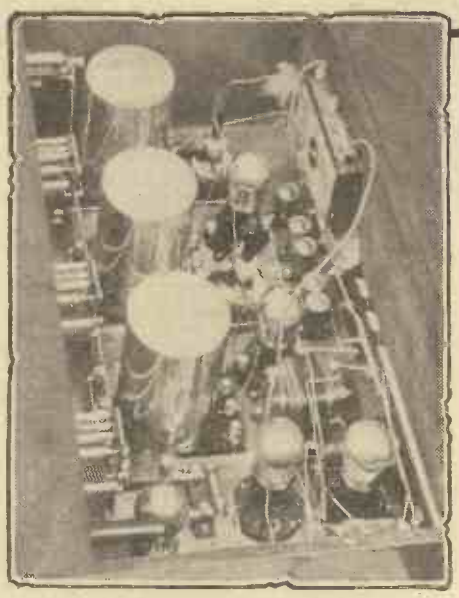
A talk on the forthcoming World Conference on Faith and Order, which is to take place at Lausanne in August, will be given by Canon E. S. Woods from the London Station on Thursday, July 28th. Nearly 90 religious bodies will be represented at the Conference by some 500 delegates, who are coming from all parts of the world.

Sir Harry Lauder's "Hoose."

Glasgow listeners are, on Tuesday evening, July 26th, to be entertained by Mr. T. P. Maley with reminiscences of the local Fair Week which terminates on the previous Saturday. They will then proceed upon an imaginary trip to Dunoon—where boatmen reap a rich harvest showing visitors the "hoose" of Sir Harry Lauder—in the company of Miss Nell Ballantyne, Miss Bertha Waddell, Miss Elsie Brotchie, Mr. Gordon Gildard and Mr. William Murtagh.

Tennis in Scotland.

Eye-witness accounts of the International Lawn Tennis Match between England and Scotland, and of the final day of the Scottish Lawn Tennis Championships are to be broadcast from Edinburgh on Tuesday, July 26th, and on Saturday, July 30th, respectively. Both events take place at Murrayfield, the famous ground of the Scottish Football Union, from whence listeners have already heard broadcasts of International Rugby games. The International Lawn Tennis Match will be described by Mr. S. N. Doust, the well-known English player and writer on tennis, and the final day of the Championships by Mrs. Robin Welsh, who has won the Scottish Championship on many occasions.



A Novel Method of H.F. Amplification

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

IN groping about for some novelties in ways of using valves, some years ago I hit upon the method of rectifying in which the valve was used in a different way from normal, and the behaviour of the valve in this condition is still a little bit of a mystery. If in the grid circuit of the valve is placed an H.T. battery of between 40 and 120 volts, and a voltage between 0 to 4 positive is applied to the plate of the valve, with the filaments dulled a little below the normal value, certain valves show a curious characteristic between plate volts and grid current, the input circuit being applied to the plate.

A Successful Circuit.

Unlike the ordinary grid condition of a valve, the low voltage plate input circuit has now a current flowing in it, and any increase of this current on altering the plate voltage is accompanied by an equal decrease of grid current, approximately the two changes of current being equal, providing the valve is dulled to the correct value. This condition does not hold if the valve is fully bright.

In this dulled condition there are one or two points on the plate characteristic which

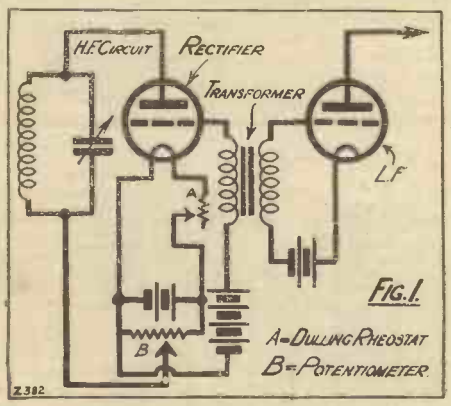


Fig. 1.

are very good rectifying points and I have used this method in certain receivers, partly for circuit convenience. Such a rectifier is shown in Fig. 1, as used in the Marconi Straight Eight, and the characteristic of one of these valves is shown in Fig. 2. A little calculation from the characteristic indicates that there should be a magnification on the straight part of the curve, although this magnification might not amount to very much.

Unfortunately one has to be rather particular in the choice of valves, and I am not at all sure whether all valves will give this magnification. D.E.3's and D.E.R.'s, however, are the best ones I have used, and with these a certain amount of magnification can be obtained in the H.F. circuits. In an attempt to test this magnification I built up a cascade amplifier with five high frequencies, a rectifier and two low frequencies. Fig. 3 indicates the elementary H.F. circuit used with one valve.

Research Required.

Differing from the ordinary valve circuits in use, the input circuit has a low resistance of about 15,000 or 20,000 ohms, so that it is not possible to use the whole of the coil on to the plate. A suitable tapping position is about a third of the way from the bottom of the coil. The grid can be connected right

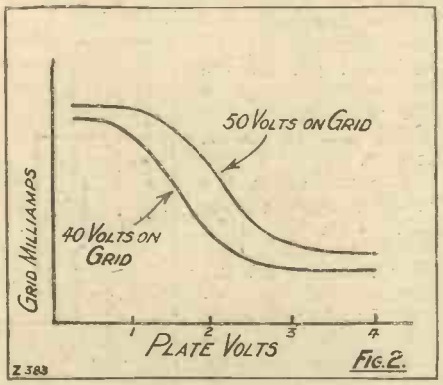


Fig. 2.

to the end of the output coil. For circuit convenience it is advisable to put a thin wire winding on the top of one's input tuning coil for the purpose of attaching it to the plate of the valve. This modification I show in Figs. 4 and 5.

No theory has yet been given for the reason of this amplification of the valve, but that it does amplify is shown very definitely by one's ability to apply reaction and get oscillation, particularly when one or two valves are cascaded. I show two of these valves and a plate-band rectifier cascaded, indicating how the subsidiary winding is used to separate the different potentials.

Different valves of even the same batch seem to give different magnification and different characteristics, and perhaps after the publication of this article some experimenters may find how to increase this magnification considerably. One curious point should be noted, that whereas in an ordinary valve any rise of potential of the grid is followed by a fall of potential on the plate,

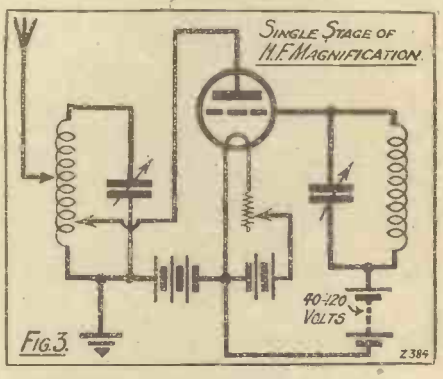


Fig. 3.

in this circuit a rise of potential on the grid is followed by a rise of potential on the plate, which seems to be conducive to anti-reaction rather than to reaction.

Five H.F. Stages.

Certainly up to the number of valves I have cascaded there seems to be no tendency to reaction, but of course this may be partly due to the low magnification per valve. So far, I have only cascaded five valves and the complete circuit used is shown in Fig. 6, which, with a trace of reaction put on from end to end of the circuit, as indicated in the figure, gives strong daylight signals from Langenberg and Bournemouth. The best results were given with D.E.R. valves, and the next best with D.E.3's.

The circuit seems so stable that it might be possible to put on still more valves if necessary and, of course, due to the number of condensers in cascade, the tuning can be made quite good.

To improve the tuning, if necessary, less

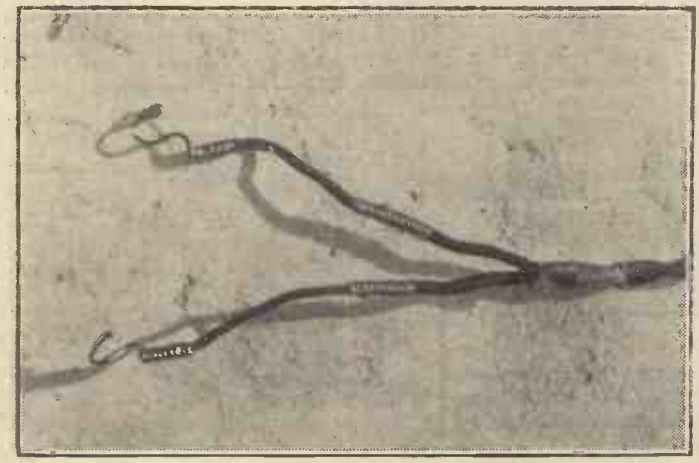
(*Continued on next page.*)

The Marconi "Straight Eight" receiver embodies a scheme similar to that which is described by Capt. Round.

MAKING FLEX NEAT.

By E. A. ANSON.

THE problem of finishing off flex is always with us. For the very nature of the thin, innumerable strands of wire makes this problem difficult. Unless care is taken the flex breaks eventually at the join, and we all know how difficult it is to try and persuade flex to solder. Particularly if it is an old piece.



A twin flexible lead neatly finished off in the way suggested.

Fortunately, there is a method that solves all these problems in a delightfully simple manner. In addition, no special gadgets or spade terminals are required. All that is wanted is an inch or two of, say, 18 S.W.G. tinned copper wire. The gauge is not important, provided the wire is sufficiently stiff.

A Simple Method.

Really the photograph explains itself. Bare the end of the flex and cut away the cotton or silk covering for an inch or so. When damp, this cotton covering conducts electricity and unless removed tends to set up local action that eats away the bared wire.

Take about two inches of the stiff copper wire. With the aid of pliers, coil it tightly along the bared flex, starting about a quarter of an inch along the rubber insulation. Continue the coiling along the bare wire, but not quite to the end. The bared wires need not be cleaned. With a pair of scissors nip off the projecting ends of the flex until they are flush with the last coil of the stiff wire. This automatically cleans the ends.

Dab on a tiny spot of Fluxite. Then apply a blob of solder to the cut ends with a really hot soldering iron.

Solder Carefully.

It is important that the solder on the ends of the flex unites with the stiff copper wire. It is also advisable to do the soldering quickly.

The projecting end of the stiff wire can easily be bent to any shape desired for connecting to a terminal or for soldering. In fact, this is an excellent method of soldering two pieces of flex together.

Bind the flex at the yoke and where the outer coverings terminate. It is a good plan to brush on a little shellac solution to hold the binding firm.

The result is a thoroughly workmanlike job of low resistance that will never go wrong or break off, for the coiled copper wire grips the rubber above the bared flex, and holds it firm.

A word about the soldering part of the job. Care should be taken that the Fluxite does not flow up the flex to the rubber insulation, as it might cause trouble later on. Use as small a quantity of the paste as is consistent with the obtaining of a satisfactory joint, and do not smother the work with it.

A NOVEL METHOD OF H.F. AMPLIFICATION.

(Continued from previous page.)

turns can be used on the input winding to the plate of each valve, and I am now carrying out tests to determine what is actually the best winding. Each condenser tuning in my receiver is comparatively flat.

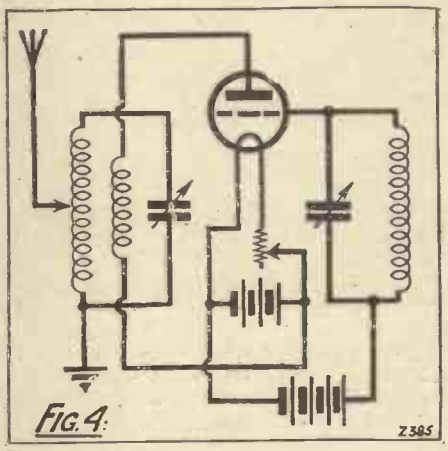


FIG. 4.

No doubt with a grid leak rectifier and transformer amplification the signals would be very considerably stronger, but an anode bend detector and resistance amplification were available for the experiments.

The idea, as yet, is comparatively new, so that a great deal yet remains to be done before we can satisfy ourselves as to the merits or demerits of the system.

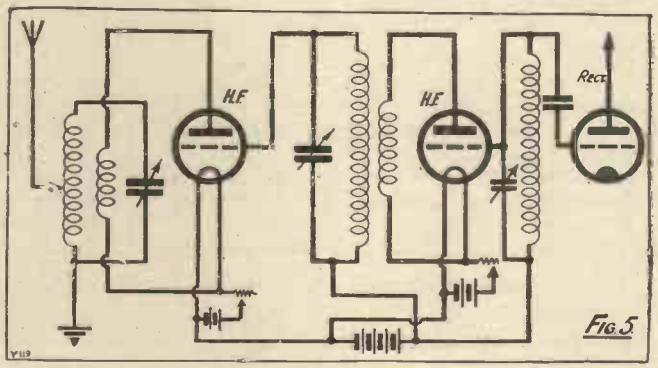
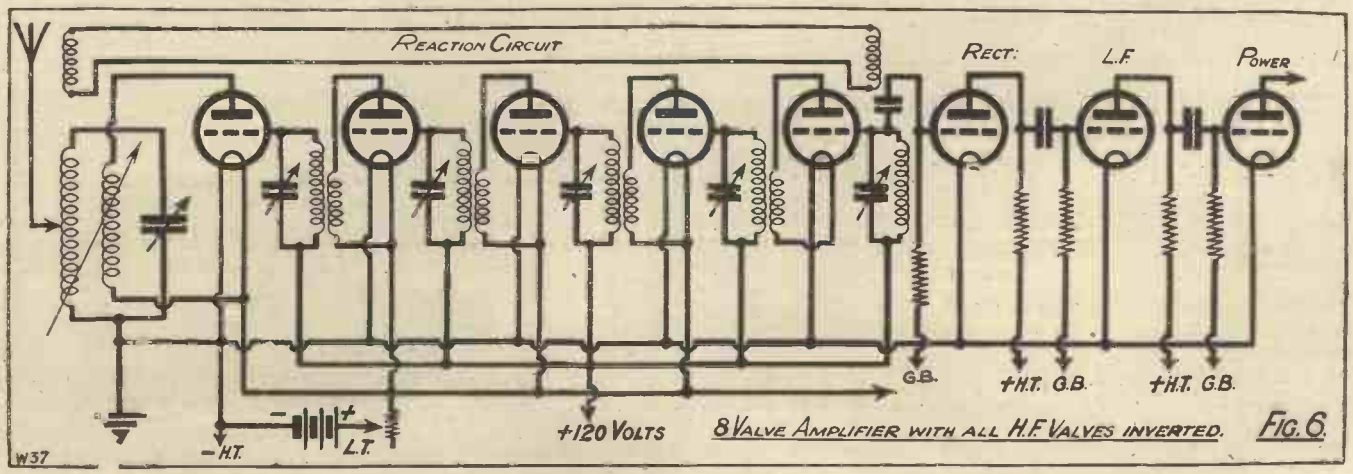


FIG. 5.



8 VALVE AMPLIFIER WITH ALL H.F. VALVES INVERTED. FIG. 6.

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

A WORD TO RETAILERS.

A FEW weeks ago Messrs. Clarke, of Manchester, mentioned in a letter that they frequently receive complaints from constructors to the effect that many local dealers do not stock materials and components referred to in constructional articles published in "P.W." and other radio journals. They particularly instance their "Pirtoid" coil former tubing. Now it would seem to us that the radio dealer misses many opportunities if he fails to keep closely in touch with the various technical journals concerned. The problem of forming a comprehensive stock without at the same time tying up too much capital is, of course, a very difficult one to solve. But it is the dealer who fails to keep *au fait* with the development of radio who is most likely to find himself "landed" with unsaleable apparatus—components and accessories of an obsolescent or even an obsolete nature.

Therefore, it seems obvious that it would be in the best interests of both the constructor and dealers themselves for the latter to read carefully their "P.W.'s" every week. We do not claim that we dictate radio "fashions"; we merely supply to the best of our ability what we think our readers require, and our circulation and daily post-bag are indexes to our success.

In future, for the benefit of both the constructor and the dealer we propose to give a brief summary in these pages at approximately monthly intervals, of the main tendencies of radio set, component and accessory designs, drawing our conclusions from the many sources of information at our disposal. We do not intend to indulge in the dangerous art of prophecy, and we would like to point out that no one is in a position to make dogmatic statements in respect of the *future* of such a progressive science as radio. Nevertheless, there are at present no indications that anything of a revolutionary character is likely to happen for some time that can cause consternation among dealers holding nice large stocks of first-class British wireless gear. And they can be certain that they will receive ample warning of such an event in our columns if ever such a probability appears on the far horizon.

In conclusion, the radio trade may not be a particularly happy one during the summer months, but there is every indication that this next winter season is going to be as happy, or happier than ever, and our advice to dealers is: "Stock up and be cheerful, and be prepared for every demand."

USEFUL COIL COMPONENTS.

Constructors who wind their own coils will be interested in the new "Nile" series of coil formers and coil holders, samples of which were recently sent us by the Associated Battery Co., of 101, West Nile Street, Glasgow. These are supplied in sets consisting of six formers and two holders. The latter are formed of flat pieces of ebonite measuring approximately 3 in. by 1¼ in. At the one end of each are a socket and plug designed to fit any standard coil holder, and three pins are fixed through the other end, projecting from each side. The

Miss Renee Kelly and Mr. Hilton Allen broadcasting from the Melbourne station.

coil formers, which are of the "spider-web" type, each have three brass bushes in their centres, and these fit over the pins in the holder.

One of these pin connections can, if desired, be used for a central tapping on the coil, but the main reason for the three points is so that in an ingenious manner two coils can be fitted to the one holder in series. The result is that not only can the coils be interchanged very easily, but the six can be quickly adapted to do the work of twenty-one different sizes. The formers measure 4¼ in. in diameter, and each has fifteen slots. The brass bushes are provided with soldering tags to which the ends of the wire can be joined, and they are numbered in order to facilitate the coil arrangements above mentioned. With each set a clearly-worded instruction leaflet is provided. The whole outfit is well schemed and well produced, and should have a strong appeal to the home constructor. The spider web winding is very easy to carry out, and additionally is very efficient. Hitherto some little difficulty has been experienced by some amateurs in making them neat in appearance, and if these Nile products do nothing else they will have earned commendation in that they will certainly solve this problem.

AMPLION CONE SPEAKER.

With the addition of their new cone speaker, Messrs. Graham Amplion, Ltd., must have made their Amplion range the largest and most comprehensive of any in the world. And there are four types of Amplion Cones! We recently had the "Jacobean" Model A.C.7 sent us. This is one of the more expensive types, and costs £6 10s. But it is a large speaker, and has the general appearance of a high-class instrument.

The cone proper is contained in an oaken cabinet modelled on Jacobean lines, and although the instrument is specially suitable for a room furnished in this scheme, it harmonises well with practically any other class of furniture. Similarly with many of their other speakers, Messrs. Graham have managed to obtain a design which is both distinctive and neutral!

The speaker is a true "cone," and has a large diaphragm formed of a strong fabric material which is claimed to be impervious to all changes in climate and temperature.

This new Amplion does not demand the employment of a large receiver employing stages of R.C. amplification, but can be used with any ordinary set. It does not tend to develop drumminess or to exaggerate the low notes to the detriment of the higher ones. This is an exceptionally commendable feature of the speaker in our opinion, for although the average listener is not apt to be particularly worried by even a fairly sharp falling off in the reproduction of the lowest notes, he will quickly perceive any loss in the higher ones.

We found the results given by the Amplion cone to be pleasing. There is an entire absence of "booming," and everything leaves the instrument in a clear-cut, undistorted manner. It appeared to take considerably more driving than the average Amplion, although against this it must be admitted that most of these are rather more than usually sensitive—but there is no doubt whatever that the instrument has superior qualities in respect of faithfulness of reproduction. It is a speaker well worth hearing, and one that cannot fail to appeal to the majority of amateurs both as to its appearance and to its performance.

The A.C.7 Model Amplion Cone Speaker, which is dealt with on this page.

RADIOTORIAL

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

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

Technical Editor:
G. V. DOWDING, Grad.I.E.E.

Assistant Technical Editors:
K. D. ROGERS. P. R. BIRD.
G. P. KENDALL, B.Sc.
A. JOHNSON RANDALL.

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

Readers' letters dealing with patent questions, if sent to the Editor, will be forwarded to our own patent advisers, where every facility and help will be afforded to readers. The envelopes should be clearly marked: "Patent advice."

Questions and Answers

CONNECTIONS FOR A SAFETY FUSE FOR H.T.

E. D. (Nottingham).—"Where should a safety-fuse for H.T. be connected, outside a three-valve set? I have had the fuse given me, but as there are no directions with it I am not sure which H.T. lead I ought to put it in."

The fuse should be connected in the negative (black plug) lead of the H.T. battery.

CHANGING OVER TO 2-VOLT VALVES.

J. S. E. (Ipswich, Suffolk).—"Would it be worth my while to change over to 2-volt valves, instead of using up my old bright emitters? The set is a three-valver, which is turned on by a single rheostat. I know that I should save a lot of current by using the 0·1 amp. valves instead of the others, which take about half an amp. each. But I am wondering about the accumulator. The one I have is in very good condition, but as it was rather expensive (6 volts, 40 actual ampere-hours) I am reluctant to let it go second-hand for a mere fraction of what I gave for it. Would you advise changing over to 6-volt dull-emitters so that I can keep the accumulator, or shall I go the whole hog and get right down to two volts? Please say which is the most economical plan in the circumstances."

The best way out of your difficulty is to slightly modify the filament wiring of the set itself, after which you will be able safely to use your present 6-volt accumulator with the new 2-volt valves. You will thus get the full benefit of the low current consumption of the 2-volt valves, without the necessity of buying a new accumulator.

The modification of the filament wiring that is required is very easily carried out. All that is necessary is to wire the filament sockets of the valves "in series" instead of "in parallel," as at present arranged.

In order to do this, turn the panel over, number the valves 1, 2 and 3, and then carefully note the wiring from the L.T. + and L.T. — terminals. (It will be advisable to draw a sketch of this.) You will find that one of these terminals is connected to valve 1, to valve 2 and to valve 3, whilst the other terminal is connected to the rheostat, and thence to the remaining filament-sockets of valves 1, 2, and 3 respectively.

There will be several other wires (such as the grid leak return) joined to the filament wiring, and these should be marked on your sketch, so that when the new wiring is done you can make sure that they are connected as before, to either the L.T. + terminal lead, or to the L.T. — terminal lead.

To re-wire the filaments in series, start from that side of the rheostat which is not connected to one of the L.T. terminals, and join this point to the third valve's filament socket. The opposite socket of valve 3 should then be joined to one of valve 2's filament sockets.

Then the remaining filament socket of valve 2 is connected to one of the filament sockets of valve 1. Finally, the remaining filament socket of valve 1 is taken to the other L.T. battery terminal, and the various extra wires (such as the grid leak return) are joined up again to the L.T. — or L.T. + lead, as before.

Now the 6-volt L.T. battery is connected up. If the 6-volt valves are placed in the valve holders they will not light up brightly, as formerly, because owing to the new connections each valve is in effect only getting two volts. But if 2-*volt* valves are placed in the valve holders, each will be getting one-third of the accumulator's pressure—i.e. its correct two volts. And instead of the accumulator lasting only 25 hours or so before it runs down, it will now last fifteen times as long before requiring recharging.

AMPLIFIER FOR ONE-VALVE SET.

M. R. F. (Southend-on-Sea, Essex).—"Where can I get full how-to-make details of a two-valve amplifier (to add to a straight one-valve set)? I should like it to be one-transformer and one resistance-capacity-coupled stage, if possible."

Full details of an amplifier with one stage transformer-coupled and one stage resistance-coupled, will be found on the "P.W." Sixpenny Blue-print No. 15.

TESTING OLD CONDENSERS.

S. B. L. (Coventry, War.).—"I have three or four old half-microfarad condensers knocking about in the junk box, and I want to use some of them for making a choke-coupled loud-speaker filter circuit. One of the condensers was discarded because it was leaky and ran the H.T. battery down too quickly. How can I test them to find out which was the faulty one?

You can make a rough-and-ready comparison test quite easily by means of 'phones and a small battery. Put the 'phones on, stand the condensers side by side on a table, and arrange leads from the battery,

(*Continued on next page.*)

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

Take care not to touch the condenser terminals or 'phone terminals with the fingers, during the whole of the test.

First of all, charge each condenser by touching the wires from the battery across its terminals. Let them stand a few minutes, and then, avoiding handling except with insulators, join the telephone terminals across teach condenser in turn.

As the 'phones make contact with the terminals a distinct "click" will sound in the earpieces, and if the insulation of the condenser is O.K. this click will be comparatively lond.

If part of the charge from the battery has leaked away owing to the faulty insulation of the condenser, the click will be correspondingly reduced, whilst in the case of a very poor condenser it will be almost impossible to obtain any click at all.

A STABILISING RESISTANCE.

R. N. (Penzance, Cornwall).—"What are the connections for a stabilising resistance in the aerial circuit of an H.F. valve?"

One class of "stabilising resistance" takes the form of a variable non-inductive resistance inserted in the tuned aerial circuit. The value shonld be abont 400 ohms, and if such a resistance is inserted in the lead which joins the aerial coil to the tuning condenser (on that side which is farthest from the grid) it forms a convenient control for oscillation, and for volume.

Another form of so-called "stabilising resistance" which is often used in the aerial circuit of an H.F. valve is the high value fixed resistance which is now generally incorporated in a neutralised H.F. stage to prevent the occurrence of parasitic oscillations. In this case the value of the resistance is fixed at about 100,000 ohms or so, and it is placed permanently in circuit in the lead which joins the tapping on the split coil to the filament of the H.F. valve.

THE TECHNICAL QUERY DEPARTMENT

Is Your Set "Going Good"?

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

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

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

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

THE STUDIO ECHO.

"INTERESTED" (Bradford, Yorks).—"Is it true that the amount of echo which is broadcast during the B.B.C. transmissions can be controlled by the engineers?"

Yes. The controlling engineer can add any desired amount of echo, and this can if necessary be done without the knowledge of the artiste in the studio. (The subject was fully dealt with in an article which appeared in the June issue of "Modern Wireless.")

SIGNS OF A FULLY-CHARGED ACCUMULATOR.

A. V. B. (Aberdeen).—"What are the signs which indicate that accumulators on charge are 'up,' and require no further charging?"

Continued on next page.)

RADIOTORIAL QUESTIONS AND ANSWERS.

(*Continued from previous page.*)

When an accumulator is fully charged its positive plates have a healthy chocolate-brown colour, whilst the negative plates are a light grey, or blue-grey (according to the age of the accumulator).

Another sign is that the plates gas freely, and that this gassing appears to be equally distributed, no cell being behind its fellows in this respect.

The most reliable measurement test is that with the hydrometer, which should prove that the specific gravity of the acid has attained the maximum value indicated by the makers, and that it remains stationary. Similarly, the voltage should be at its maximum, and remain steady.

REVERSED GRID BIAS.

S. R. (Armley, nr. Leeds).—"My set is a straightforward two-valver (Reinartz detector and transformer-coupled low frequency). Back in February it was working well, but I had to leave home for a time, so it was put away till last week.

When I tried to connect it up then I found I could hardly get a sound out of it, but I expected this, as the H.T. battery had been bought in November, and the grid battery long before that!

I got two new batteries of the same voltage as before, hoping this would cure the trouble. At first I could only get very bad results when everything was connected up again. But then I found that taking the grid-bias plug out gave much louder and clearer results than when it was in, though the set was still nothing like its old self as far as clarity was concerned. Whilst trying to put this right I discovered that by *reversing* grid bias I could get moderately good reception. So I am now using the set with L.T. negative connected to grid-bias negative, and the black grid-bias plug is tapped into 1½ volts "positive." There is still a trace of harshness, and I should like to know what was wrong and why grid bias has to be reversed."

From your description we have but little doubt that the cause of the trouble is a "cheap" grid-bias battery. You have evidently purchased a battery that is marked + at the negative end and − at the positive end! This would account for the required reversal of your grid-bias connections. And it is quite likely that the use of a good quality G.B. battery would clear up the "harshness" complained of, for it is improbable that a reversal of the polarity markings would take place in a factory which is turning out first-class batteries.

BIG COIL FOR H.F. CHOKE.

A. P. D. (Johannesburg, South Africa).—"Is there any disadvantage in using a big coil for an H.F. choke? I have been trying a Reinartz circuit for which a choke is recommended and results are not too good, so I wondered if the use of a proper H.F. choke instead of a home-made 300-turn coil would improve matters?"

Generally speaking, the substitution of a large coil for an H.F. choke has no disadvantages, unless the spacing is inadequate and the coil becomes magnetically coupled to other coils in the circuit. Apart from this, a home-made coil should be quite satisfactory if it has been well-made and is of low self-capacity. If not, a good purchased choke would be far better.

A SUDDEN "FALLING OFF."

C. H. E. (Forest Gate, E.).—"I followed the diagram you sent me last September and put my loud speaker on a choke-coupled two-condenser unit. It has been going perfectly ever since until a few days ago when reception suddenly got very weak, and a nasty harsh "choked" sound accompanies 2 L O, when I can hardly hear with one ear right in the loud speaker! Before it had been very loud and clear, with no hum at all from the H.T. unit. What has caused the falling off?"

Probably you have a broken connection. Try connecting the loud speaker direct to the set's loud-speaker terminals again. If signals are then O.K. the broken connection is in the filter circuit, probably in one of the extension leads. If, however, signals are still weak, make sure that the leads to the H.T. battery eliminator are not broken anywhere. A likely place for a break is inside the rubber insulation close up to the plug. (Constant plugging-in tends to weaken the leads at these points, especially if the weight of a multiple-wire cable is allowed to pull direct on to the plugs.)

DETAILS OF A TWO-VALVE REINARTZ.

H. L. (Cambridge).—"I should like to try a two-valve set (detector and one low-frequency amplifier) in which condenser-controlled reaction is employed. Where can I obtain particulars of an easily-made receiver of this kind?"

Details of a suitable set are given on the "P.W." Blue-print No. 25 (2-Valve Reinartz). This may be obtained from The Technical Queries Dept., on receipt of a 6d. Postal Order, and stamped addressed envelope for return.

IONISATION.

H. S. H. (Rugeley, Staffs).—"What is meant by the 'ionisation' of the atmosphere? In reading of short-wave experiments and of the effect of the Heaviside layer upon wireless waves, one often comes across the expression 'ionised atmosphere.' How does ionisation differ from the normal state?

Put briefly, ionisation may be considered as electrification. No doubt you are aware of the belief that all matter—including air—is made up of atoms, each atom consisting of an electrically positive nucleus, around which one or more electrons (negative charges) revolve. Normally, the electrons (negative) are counter-balanced by the nucleus (positive) so that the atom *as a whole* is neither positive nor negative—i.e. is not electrified, because its electrical constituents are equal and opposite. But certain substances possess spare electrons which may be taken away from the atoms without altering the essential construction of the latter—they remain atoms of the same type, but they become electrified atoms. (Positively electrified if a "spare" electron has been taken from them, or negatively because they have acquired a "spare" electron.) This process, or electrification, is called ionisation, and it is important because whereas a gas, for instance, may be a perfect insulator normally, it becomes a conductor when ionised. This is true of the gases which form the earth's atmosphere. At a height of 60 miles or so they are ionised, they cease to be insulators, and electro-magnetic waves can be either reflected or refracted by them.

POTENTIOMETER FOR A CRYSTAL SET.

T. F. (Ventnor, Isle of Wight).—"I have been trying a carborundum crystal detector without much success, and am told that it will be improved by connecting a dry-cell and potentiometer, so as to give it a small initial voltage. I have a 4½-volt dry cell and 400-ohm potentiometer by me. Would these be suitable and if so what are the connections?

The dry cell and potentiometer are quite suitable, and probably when fitted they will improve reception greatly. To join up, first connect the dry cell across the two ends of the potentiometer. (It is advisable to do this through a switch so that when not in use the battery is not slowly discharging itself through the resistance.)

Break one of the leads to the crystal detector, and then join up the slider to one side of the crystal. Then one end of the potentiometer (with its battery across it) is connected to the other wire which goes to 'phones, or to the aerial coil, as the case may be.

Adjust the slider and listen to see if signals are improved. If not, reverse the battery connections by turning the cell right round, so that the end of the potentiometer that formerly was joined to the long strip on the battery is now connected to the short strip and vice versa.

It will be found that there is a certain sharply-defined setting for the potentiometer slider, in which position the rectifying properties of the crystal are at a maximum.

A NOISY ELIMINATOR.

J. A. (Leytonstone, Essex).—"To cure a reedy whistling sound which accompanies the use of my H.T. Battery Eliminator, I have been recommended to use H.F. chokes. Can I make them myself, and do you think they might cure the trouble? (An acquaintance tells me that he put one in the negative lead and thus stopped the same kind of interference.)

It frequently happens that an H.F. choke will cure this class of trouble. You can either make the chokes or utilise large tuning coils for the purpose, as such chokes are generally not at all critical. For the plug-in coils, any type having from 100 to 250

(*Continued on next page.*)

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from previous page.*)

turns or more are required. If you decide to make the choke it simply requires several hundred turns of, say, No. 24 enamelled wire wound upon a convenient former. We should try one choke in each lead to the eliminator, if one in the negative lead fails to cure the noise.

DRILLS FOR TAPPING.

A. M. (Market Harborough, Leics).—"What number drills should be used for tapping 2 B.A., 4 B.A., and 6 B.A. ?

The respective numbers of the drills required are 25, 33, and 43.

THE DIFFERENCE IN DIELECTRICS.

"Condenser" (Norwich).—"How do the other common insulators such as ebonite, mica, shellac, paper, rubber, etc., compare with air when used as the dielectric of a condenser ?"

Mica is five times as efficient as air for a given thickness, the comparative efficiency being called the "Specific Inductive Capacity" of the dielectric. Air is taken as unity, the principal insulators and their specific inductive capacities (or S.I.C.'s) being as follows :

Air, 1 ; mica, 5 ; ebonite, 2 to 3·2 ; glass, 4 to 10 ; shellac, 2·7 to 3·7 ; dry paper, 1·5 ; porcelain, 4·4 to 6·8 ; india-rubber, 2·2.

RADIO-STAMBOUL.

(*Continued from page* 771.)

The third man from the right holds an ordinary violin, while the next man, who seems to have nothing to do, is a singer. The man sitting directly under the portrait of Mustapha Kemal, the president, with crossed legs, holds a *tambour*—a six-stringed instrument resembling a banjo. The lady is another singer in ordinary European dress, short skirts and all. Finally, the man in a light suit next the microphone is the announcer. His voice is heard very clearly by listeners. He announces the items both in Turkish and French, prefacing the latter announcement in every case by the words "ici radio-Stamboul." It is, therefore, easy to recognise the station. At the end of the programme he repeats his announcement in German, wishing his German listeners "angenehme Ruhe," that is, a restful night.

Hours of Transmission.

The hours of transmission are from 5 to 7.30 p.m. and from 8.30 to midnight. As there are two hours of difference in time between London and Constantinople, the programmes are heard two hours earlier in England according to Greenwich mean-time (*not* Summer-time).

The opening of this station is an important and interesting event. It is the first station established in the Near East to transmit Oriental music—Turkish, Arabic, and Persian. It also manifests the desire of the Turks to come into line with the western powers by adopting modern ideas and institutions, even down to the latest ideas in broadcasting.

A separate orchestra, under the direction of a Russian artiste, provides the European music. This orchestra also includes two American men of colour who announce in English or rather "American," the various jazz items, and sometimes sing comic songs in the same language.

It is announced that the Osmanié station will shortly relay some of the European programmes.

TECHNICAL NOTES

(*Continued from page 772.*)

accordance with the received sound-waves and electrical variations are set up in the thermionic current in the valve, these variations corresponding to the sound-waves. It is then a perfectly simple matter to amplify up in the usual way.

A Valve Microphone.

Everyone is famjliar with the microphonic effect set up in a valve when it is subject to mechanical or atmospheric vibrations. In the ordinary way these microphonic effects are objectionable, since they interfere with the proper reproduction of the programme.

The microphonic effect, as is well-known, is due to the relative vibrational displacement of the electrodes, so that at one moment more current passes through the valve, at another moment less current. In this way a vibrational effect is super-imposed upon any reproduction that may be passing through the valve, and a more or less amplified acoustical version of the vibration is produced in the loud speaker.

Radium Battery.

I suppose it is many months ago since I mentioned in these Notes the invention of a radio-active battery, which had been made by Mr. J. B. Kramer, of Birmingham. In the meantime, Mr. Kramer has been proceeding with his experiments and he has made many interesting and important improvements.

The radio-active material consists of a special kind of natural sand, and one of the principal difficulties which the inventor had to meet was due to the fact that this sand proved very susceptible to atmospheric changes: humidity set up what appeared to be an electrolytic action between the sand and the plates, thus causing corrosion which naturally interfered with the passage of the current.

For reasons such as these Mr. Kramer has now adopted certain other radio-active materials containing compounds of thorium, actinium and uranium. With these materials he claims to have produced a type of battery which is really a practical proposition.

Alpha Particles.

The action of the battery is, of course, due to the emission of alpha and beta particles from the radio-active substances, the alpha particles being positively charged atoms and the beta particles being negative electrons. The former are ejected from the atom at a rate up to 10,000 miles per second, and the latter in some cases at very much higher velocities.

It is not clear to what extent the gamma radiation (which is an ethereal vibration, similar to wireless waves themselves) takes part in the action, but it has been suggested that the carbon and zinc which are used are affected by the gamma radiation, the carbon becoming positive and the zinc negative.

A battery made on this principle is stated to have given very satisfactory service with a two-valve set, loud-speaker reproduction of excellent quality having been obtained without the use of reaction.

Aerial Absorption.

If two or more aerials are in fairly close proximity, do they tend to rob each other of a fair share of the broadcast radiation? This is a question which must arise in the mind of any experimenter who finds his aerial closely surrounded by others. It is a question which is quite easy to answer on theoretical grounds, and, moreover, the matter has many times been put to practical test, the results of the tests confirming the theoretical conclusions.

The aerial acts as an absorber of the electro-magnetic energy which is flowing through the ether in its vicinity. In the language of applied mathematics, the aerial would be described as a "sink" of energy, and if the "field" before the aerial were introduced were one represented more or less accurately as a field of uniform flow of energy, the introduction of the aerial or energy "sink" would have the effect of setting up at once, in the immediate vicinity of the aerial, an "energy gradient." This "gradient of energy" is due to the fact that the energy is flowing into the aerial, and it is precisely analagous to the potential gradient which exists along an electrical conductor when electricity is flowing from one end to the other.

The efficiency of the aerial as an absorber or "sink" for the energy is, of course, greatly increased if the aerial system (connected to earth) happens to be tuned to the electro-magnetic waves.

Therefore, we can see at once, without going into any involved mathematical discussion, that each aerial is robbing the region about it of electro-magnetic radiation, or, in simple language, is *weakening* the wireless waves. Consequently, if several aerials are crowded together, any one will be unable to abstract as much energy as it would do if the others were absent.

"Popularity Indicator."

Some important investigations on this subject have been made recently by Mr. R. H. Barfield, of the Radio Research Board of the Department of Scientific and Industrial Research, and he has obtained results in accordance with the considerations mentioned above.

This raises the question whether it might not be possible to devise some kind of "load indicator," as it is called, which would give the broadcast engineers some idea of the amount of absorption of the broadcast radiation which was taking place. For example, if a very popular item were being broadcast it is presumable that the "absorption indicator" or "load indicator" would show a heavy absorption load, whereas if an item of limited interest were "on the air," the indicator would show a low value. Electrical power lines, as every engineer reader knows, are always equipped with load indicators, and the engineers in charge can tell at a glance what load is on the line. No one has yet succeeded in devising a corresponding instrument for indicating the "load" on the broadcast transmitters, but if such an arrangement could be made it would prove very useful to the broadcast engineer in several ways. For one thing, quite apart from technical reasons, it would help him to determine very readily the popularity of different items by giving an indication of the percentage of listeners who tuned in (or tuned out) each particular item.

R/R

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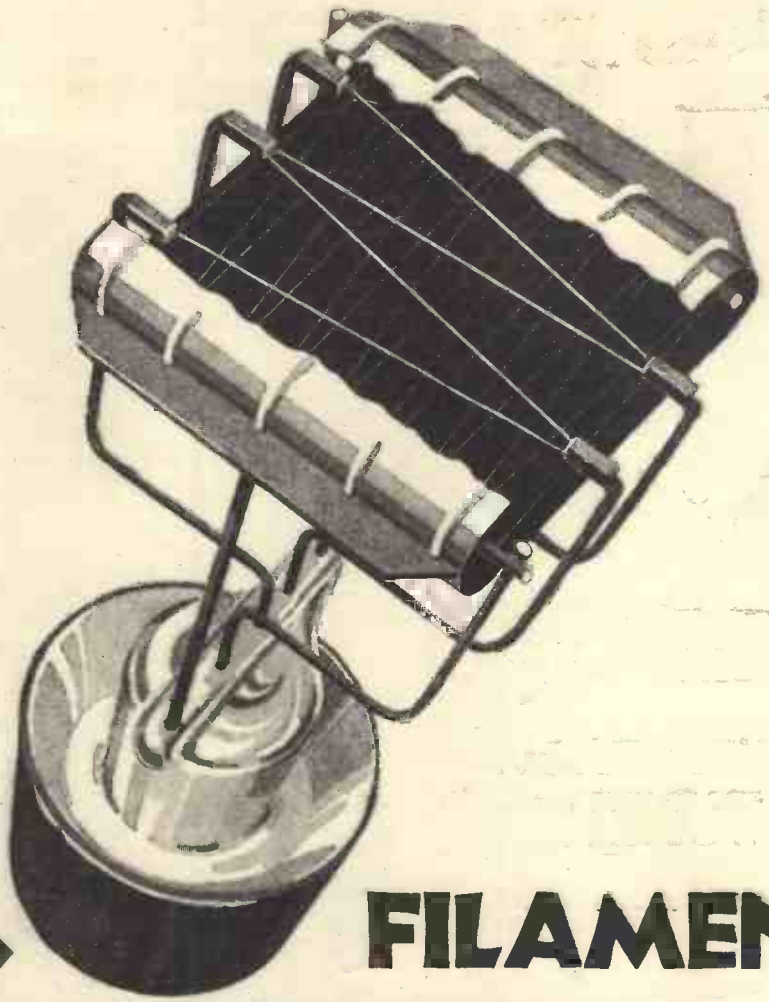

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E/R