

CAN WE WIRELESS TO MARS? (See exclusive article inside)

Popular Wireless

and Wireless Review

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EVERY FRIDAY.

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SCIENTIFIC ADVISER : SIR OLIVER LODGE, F.R.S., D.Sc.

August 16th, 1924.



An elephant who enjoys a wireless concert. He hasn't yet conquered tuning-in!

FEATURES IN THIS ISSUE.

Developing the P.W. "Unidyne."
 The Early Days of Wireless.
 Wireless "Shadows."

A Long-range Loud-speaker Circuit.
 The "P.W." 24-Valve Set.
 Technical Notes.

THE HIGH POWER STATION.

Captain Eckersley's Views.

Jones was prejudiced



against Loud Speakers. His own, distorting the finest performance into a fearful medley of noise had compelled him unwillingly to resign himself to the inconvenience of headphones. Then he met Smith, a keen wireless enthusiast and proud owner of a "Sparta," to whom he confided his not altogether complimentary views on Loud Speakers in general. Smith, seizing the opportunity to make a convert, invited him home for a Wireless Evening.

Jones arrived, coldly indifferent—a man who knew that Speaker reception must necessarily be unpleasantly distorted. 2LO commenced operations—a splendid concert "coming through" with perfect purity . . . and sustained volume . . .

After a few selections Jones's interest quickened—he became enthusiastic—wanted to know why reception with the "Sparta" is so perfect. Smith explained that the "Sparta" is the Speaker of combined excellence—the perfect combination of good components, rendering inevitable the natural reproduction of every tone variation.

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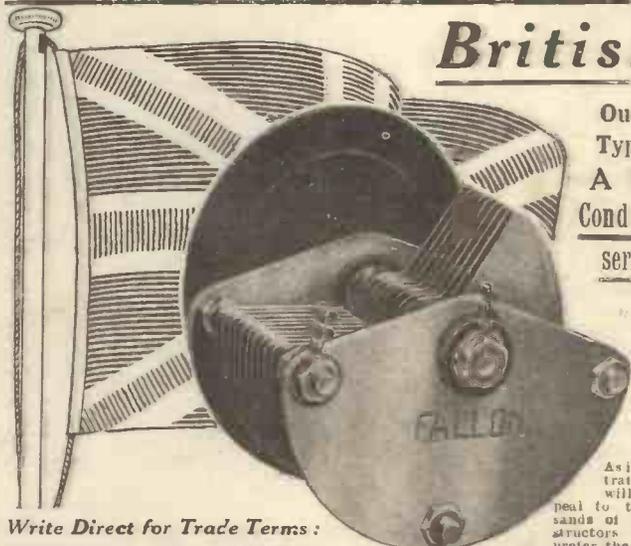
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For those who prefer it, we still supply our original A II Model, which is exactly the same as above, except that instead of having aluminium ends, it has composition ends, and is supplied with our special feature, the Aluminium Screening Disc, which disc is also supplied with the model illustrated.

POPULAR WIRELESS

AND WIRELESS REVIEW.

August 16, 1924] THE RADIO WEEKLY WITH THE LARGEST CIRCULATION. [Every Friday, Price 3d.

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

Editor:
NORMAN EDWARDS, A.M.I.R.E., F.R.G.S.

Scientific Adviser:
Sir OLIVER LODGE, F.R.S.

RADIO NOTES AND NEWS OF THE WEEK.

Side-line "Experts."

IN a trade paper devoted to cycles and motors I saw the other day some illuminating advice. The writer was encouraging cycle- and motor-cycle agents to take up the sale of wireless as a side-line. He suggested that if they were completely ignorant of wireless, some local radio enthusiast would be only too pleased to help them over difficulties, and they could then tackle their customers' problems with confidence. This is all very well from one point of view, but I cannot help feeling sorry for the radio novice who confidently trusts to one of these side-line "experts."

* * *

Radio Exhibitions.

THERE will be a great number of radio exhibitions during the coming season, with several on the Continent, one at Manchester, the "All British" in London, and the "Radio World's Fair" in New York. Sweden has the distinction of holding the first one, which is connected with the Great Swedish Fair, held at Gothenburg during this month.

* * *

Wireless Patrols.

MOTOR-CARS fitted with wireless, in which three detectives patrol the streets day and night, are always ready to receive instructions from police headquarters in Detroit, U.S.A. This flying squad, constantly tuned-in to the chief constable, receives reports as they come in from policemen upon patrol duty. The cars used have bullet-proof windshields, spot or swivel lights, a gun rack on both front and back seats, and a police siren connected with the exhaust. They are capable of doing 75 miles per hour.

* * *

Sharp Tuning and Sharp Work.

WHEN details of a robbery were broadcast recently from the Detroit police headquarters, the detectives who were listening in effected an arrest in thirteen minutes. The late Bill Sikes would have detested wireless, and I cannot imagine him letting Oliver Twist a condenser knob round!

* * *

Improvements at Leafield.

HAVE you noticed an improvement in the working of the Leafield station? My own aerial has always been fairly free from interference by Leafield's "mush," but in some districts the disturbance from this source was heartbreaking. The Post Office have just recently substituted a coupled transmitting circuit for the old arrangement having the arc in the Leafield aerial circuit, and this improvement should eliminate much of the former trouble.

Deep-Sea Broadcasting.

BROADCASTING from the bottom of the sea is the latest thrill for radio enthusiasts. Messrs. Gimbell Brothers, the American dealers, have a station at Atlantic City, New Jersey, and they have arranged for a deep-sea diver with a descriptive and literary gift to go down to the ocean bed about a mile out and tell listeners what he can see through the glass windows of his helmet.

* * *

More New Stations.

A NEW transatlantic wireless station is being opened at Gremeton, Sweden, on October 6th, to handle commercial

WHAT THEY SAY.

"Even now, in its very infancy, wireless is having a profound effect on national life."—Rt. Hon. TOM SHAW, M.P., Minister of Labour.

"Wireless might almost have been invented for the blind."—Capt. IAN FRASER, in "St. Dunstan's Review."

"If the note of the howl varies with your tuning adjustments, it is you. Don't do it."—CAPT. ECKERSLEY.

"Radio may make English the language of the world."—The President of the Radio Corporation of America.

"After the highbrow stuff frequently sent out by the B.B.C. it was a treat to have something which the average person could enjoy."—A. P. STEVENS, in a letter to the "Evening News."

"Broadcasting has become the common possession of us all."—E. TEMPLE THURSTON, in the "Times."

The week's query: Was it just good luck that Chelmsford was chosen as the site for 5XX, or did someone remember that the East Coast was the worst place in England for listening to broadcasting?

Another unanswered query: "I do not wish to use a valve set, so will you tell me how to apply the Unidyne principle to my crystal receiver."

traffic with the U.S.A. Other new stations are springing up everywhere, and people who put away their sets during the summer will hardly recognise the European ether when they tune-in again in the autumn.

* * *

Czecho-Slovakia's Progress.

IN addition to a host of proposed "beam" stations, a number of new transmitters of the older types will add to the ether congestion. Southern Europe will hear Kosice, a new station in Czecho-Slovakia. Other stations are contemplated at Bratislava and Uzhorod, and I hear they will all probably be in operation before the end of the year.

Wireless in Greenland.

GREENLAND is to have a complete wireless system, and in a country where communications are hampered by blizzards and snow it should prove of enormous value. Four stations will be erected, at Godthaab, Godhaven, Angmagssalik, and Julianshaab, the latter keeping the others in touch with the Iceland station at Reykjavik.

* * *

A Belfast Station.

THE new B.B.C. main station at Belfast is due to commence testing on or about September 15th, but the date of the official opening has not yet been fixed. The Duke of Abercorn, Governor-General of Northern Ireland, will open the station, and Mr. Walter Montagu-Douglas-Scott has been appointed station director.

* * *

Arrangements at Belfast.

THE call-sign 2 B E has been allotted to the new station, which will work upon a wave-length of 435 metres. Scientific talks of a popular nature by Queen's University professors are being arranged. Mr. Godfrey E. Brown, conductor of the Belfast Philharmonic Society, has been appointed musical director.

* * *

Twopence A Time.

VISITORS to the B.B.C. offices at Savoy Hill wishing to use the telephone are now directed to a special 'phone placed in the hall there, and a fee of twopence is religiously collected for each call!

* * *

The Telephone Again.

IT seems to me that the B.B.C. are specialising upon 'phones nowadays. The ordinary automatic system has been abandoned, and they have now installed relay 'phones all over the building. I hear it is a great improvement, but I notice that if the "uncles" are really in a hurry they still run up three stairs at a time!

* * *

2 Z Y's "Special."

TO-DAY (August 15th) is the anniversary of the birth of Napoleon, and 2 Z Y is celebrating the event by a special programme. Extracts from Thomas Hardy's "Dynasts" are to be recited, and music directly connected with Napoleon will be broadcast. Residents of Waterloo (Lancs.) should listen in with particular zeal to-night!

* * *

Hull Nearly Ready.

HULL Relay Station is due to commence operations to-day (August 15th), and

(Continued on next page.)

NOTES AND NEWS.

(Continued from page 861.)

the City Hall has been taken for the opening ceremony. The band of the 1st Battalion Durham Light Infantry will be playing during the evening, and the opening speeches by Rear-Admiral Carpendale, C.B., and the Lord Mayor of Hull, will be simultaneously broadcast at 9.30 p.m.

The Little Wooden Hut.

THE little wooden hut in the Stadium at Wembley exactly represents the famous hut in Newfoundland where Mr. Marconi received the first transatlantic wireless signals in 1901. It is interesting to notice that these test signals were sent between 3 p.m. and 6 p.m. because the bad effect of daylight upon reception (now well known to every amateur) had not been discovered in those days!

A Granite Temptation.

EACH mast of the new Rugby station will stand upon a 5½ ft. block of granite, which acts as an insulator. I hope the Post Office will not leave these blocks lying about unguarded, or they might prove a great temptation to amateurs who are short of aerial insulators!

"Mike's" Numbers.

IN 2 L O's studio the other afternoon I was interested to see nickel numbers (similar to those used on street-doors) lying about the floor. They range from 1 to 6, and are screwed down permanently to indicate microphone positions.

At 5 N O.

TO-MORROW'S programme from the Newcastle station is an especially interesting one to music-lovers. The winners of the recent "North of England Musical Tournament" will broadcast, and 5 N O's audience is eagerly looking forward to this opportunity of hearing them.

Captain Eckersley's Car.

I WAS standing on the corner of Savoy Hill the other afternoon, when Captain Eckersley, who is looking very fit after his holiday, nearly "earthed" me accidentally. He was driving his new six-cylinder Essex car, and from the way he shaved past me I imagine that he is still having a little difficulty with "controls."

Wireless for the Blind.

THE current number of "St. Dunstan's Review"—that excellent monthly published for the amusement and interest of men blinded in the war—reminds me that wireless is an ideal hobby for the blind. Have you realised the great happiness which blind people may secure from listening-in? If so, I need not ask my readers with the precious gift of sight to assist their less fortunate brethren, should occasion arise, in overcoming the initial difficulties, such as erecting the aerial.

Admiral Jackson.

ADMIRAL of the Fleet Sir Henry Jackson, who has just retired, was largely responsible for the progress of wireless in the Navy. As long ago as 1895 he

became famous for his introduction of a method of radio telegraphy for ships at sea, and marine wireless suffers a great loss in the "signing-off" of this great scientist and sailor.

Medical Radio.

APPLY hot fomentations neck and heart. Will be alongside soon," was the wireless message from the surgeon of H.M.S. "Queen Elizabeth," to the Glasgow steamer "Jutland," whose captain was taken ill at sea. The warship intercepted the "Jutland," and the surgeon, who had been kept informed of the captain's condition by wireless, was able to perform an immediate operation which saved the captain's life.

part of the receiver that has not been improved by him. Such is the growth of the science of radio that many instruments which would have delighted wireless engineers a few years ago are now considered by the amateur as too inefficient to be given bench-room.

The Aeme of Elimination.

A STRANGE story appears in the "Bradford Daily Telegraph" of broadcasting being heard distinctly in a house at Shipley, where an aerial had been erected but no receiving set installed.

Following dull-emitters and the Undyne, this is certainly carrying elimination to a very fine point.



Mr. Davis, former American Ambassador in Great Britain, and who has now been nominated for the Presidency, listening-in with his wife in Washington.

Call Sign Confusion.

I CAN foresee trouble and confusion arising over the similarity of the Aberdeen and Belfast call signs. When 2 B E comes "on the air" in September (on 435 metres), distant listeners will confuse that call sign and wave-length with Aberdeen's 2 B D (495 metres).

I hope the announcers will bear this in mind, and call themselves "Two Beer Emma," or "Two Beer Don," for the benefit of their long-distance listeners.

Square Law Condensers.

SEVERAL of my correspondents have recently commented upon the improvement in tuning when using "Square-Law" variable condensers, instead of the ordinary and now old-fashioned type. This fits in with my own experience, and for long-distance work, especially I have found them almost indispensable.

The Influence of the Amateur.

A PART from condenser design, there has lately been a steady improvement in the efficiency of components. Wireless receiving apparatus has been revolutionised by the amateur, and there is no

Traffic Test.

BEFORE the proposed "beam" stations can be taken over by the Government they must fulfil certain conditions imposed in the contract, including communication of 100 words per minute for the following average number of hours daily. Between Great Britain and Canada, 18 hours; South Africa, 11 hours; India, 12 hours; and Australia, 7 hours. These figures compare very favourably with the traffic handled by the cables, which are much more costly in outlay and upkeep.

World Wireless.

BOTH broadcasting and wireless "cables" are becoming more popular, and new stations are being erected all over the world. South Africa's "beam" stations will be at Klipheувel, near Cape Town; whilst Canada's two stations are being established at Montreal, and near Vancouver. The B.B.C.'s Nottingham station will probably be in the New Basford district, with the studio near Bridlesmith Gate, and is due to open in mid-September.

THE "P.W." 24-VALVE SET. LISTENING-IN FOR MARS.

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

In this short article Mr. Dowding outlines the main features of the world's largest wireless receiver with which members of the staff will listen-in for Mars. Further details and records of results with the set will be given in a future issue.

I DO not think that we have ever tackled a more interesting task than that of the designing and construction of our 24-valve receiver. It is the result of six months of hard but absorbing experiment, during which period we have entirely dismantled and rebuilt the whole set many times.

The "P.W." 24-valve receiver is a set comprising twenty stages of H.F. amplification (two of which are tuned anode, the rest being transformer coupled), detector, and three stages of note magnification. With switches it is possible to bring in one, two, or three stages of the latter, as desired. The ebonite panel upon which all the components are mounted measures three feet square, is $\frac{1}{2}$ in. thick, and weighs 30 lb. It is formed of two pieces securely clamped together—we were unable to obtain one piece sufficiently large for our purpose. Referring to the photograph which appears on this page, the twenty-four valves can be seen around the outer edge. The eighteen large circles represent H.F. semi-periodic transformers. The twenty-four filament resistances will be clearly seen, while the four small knobs on the right represent grid leaks (variable) and potentiometers for controlling grid bias.

The L. and H.T. Required.

The two single-pole switches control the L.F. stages, and the double-pole switches enable "stand-by" and "tune" and A.T.C. series-parallel arrangements to be obtained. The three-coil holder in the centre carries out the usual functions of such an instrument, i.e. A.T.L., secondary, and reaction coil coupling adjustments. The two-coil holder enables reaction on to the second stage of tuned anode to be carried out if required. Vernier condensers are included, as will be noted from the extension handles visible.

The terminals at the bottom of the panel include bias battery connections and the

usual 'phones, L.T., etc. A and E terminals are provided in order to facilitate connections to outside aerials, although the frame aerial is built into the base of instrument.

To light the 24 Cossor valves which are used, a six-volt 100 actual ampere hour accumulator is used. Some 15 amperes

other at as near right angles as possible, although the spacing between them cannot be gauged owing to the enormous reduction in size from the three feet square size of the set to the approximately similar number of inches of the photograph. Two men can just lift the set—but not too comfortably!

A roller blind is fitted to the back so that the wiring is quickly accessible. Altogether the set must be seen for its dimensions to be fully realised. Some of those few outsiders who have been privileged to inspect it have declared that it resembles a wireless monument, others that it would drive the most ardent multi-valve fiend to madness, while quite a few have been unable to express themselves in words!

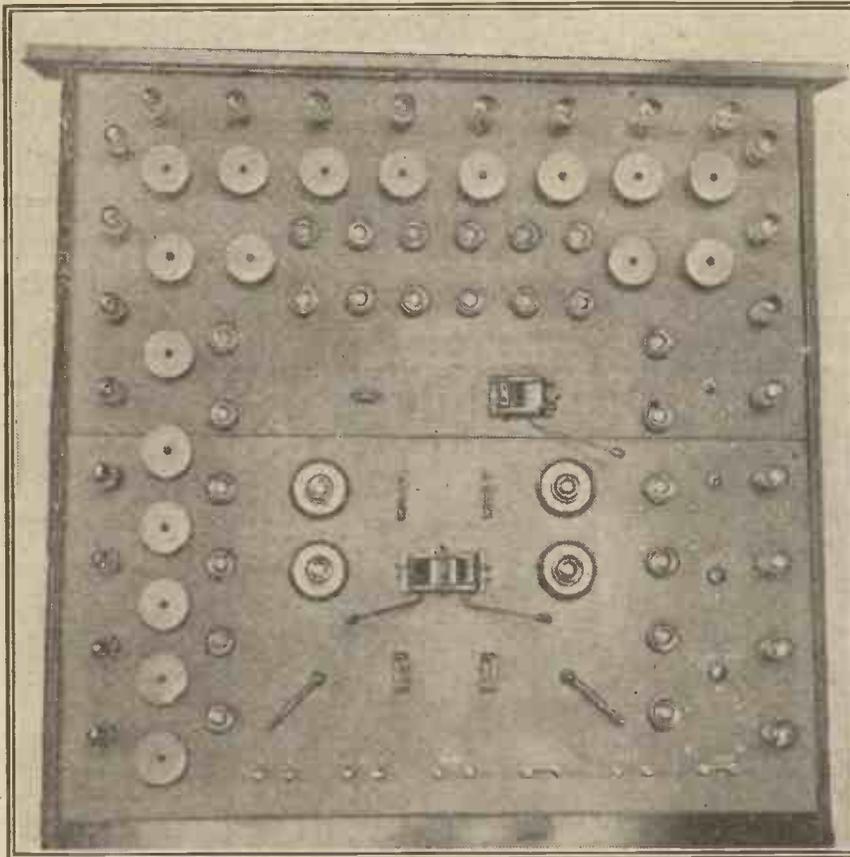
Several Patents Involved.

The problems that had to be solved before the gigantic receiver would do anything but burn out transformers, telephone receivers of special design, and howl so violently that tables and chairs visibly vibrated, are too numerous to detail in this short article. Suffice it to say that several patents have been taken out, the most important of

which, prov. pat. 583/24 of 9/1/24, is a system of H.F. transformer screening except for which the whole project would have been a hopeless failure.

As may be imagined, leakage proved a tremendous bugbear, and was only prevented by the adoption of many special precautions such as are quite unnecessary in the case of conventional wireless apparatus. For the purpose of endeavouring to receive messages from the planet Mars—if any are transmitted—a special twelve foot frame aerial is to be used together with certain coils which are the subject of letters patent. We do not intend to publish full details of these and the other patented devices until we

(Continued on page 864.)



The panel of the "P.W." 24-valve set, which measures 3 ft. square. Its size can be gauged by the relative proportions of the components visible.

are consumed when the valves are turned nearly full on. Two hundred volts H.T. is necessary, and this is supplied by special Ever-Ready dry batteries. (It should be noted that the construction of this receiver was almost completed before the inception of the Unidyne!)

A "Wireless Monument."

Over two hundred feet of square section tinned copper wire was required purely for wiring-up purposes, and, needless to say, soldering was made a most rigid rule throughout. Reference to the photograph of the wiring which appears on another page in this issue will prove with what care it was arranged that leads should pass each

Technical Notes

Conducted by
J.H.T. Roberts, D.S., F.Inst.P.

Mercury Leak and Condenser.

THE use of mercury for a variable condenser was described in these Notes recently, and it was pointed out that not only did it enable fine tuning to be obtained, but it permitted of a variable condenser of the conventional capacity being made within a very much smaller compass. It is, of course, possible to make a variable condenser within a comparatively small space without the use of mercury, but the latter has the great advantage that it may be moved over a surface, and in contact with the surface, practically without friction. If two solid surfaces are brought into very close contact with one another, and moved relatively to each other, it is very difficult in the ordinary way to overcome the effects of the friction between them.

The frictionless nature of the mercury contact makes it useful also for a variable grid-leak. It is well known that the principal difficulty in a grid-leak of the carbon-streak variety is the making of a contact between the movable member and the

carbon. After continued use the carbon trace is apt to be rubbed off, with the result that the value of the resistance cannot be relied upon as being in any way constant.

Frictionless Contact.

For example, if the carbon trace be made upon a strip of ebonite, say three inches in length, and this be inserted to different depths into some mercury in a narrow test-tube, the resistance may be varied, the resistance in circuit being that of the portion of the carbon trace which is not immersed beneath the mercury surface. Another method is to make the trace upon the edge (or upon the flat surface and near the edge) of a circular disc of ebonite about 2 to 3 inches in diameter, the latter being mounted upon an axis so that its lower half dips into a flat trough mounted in a vertical plane and containing mercury. The axis of the disc may be fitted with a knob in the usual way, and as the disc is rotated the amount of the carbon trace which is immersed in the mercury is varied.

Of course the use of mercury, particularly

in an open container, is always objectionable to some extent, and the devices described above are only recommended for a set which is to be used in a fixed position: it would be very undesirable to have any mercury in a portable set.

Adjusting Headbands.

Certain kinds of headphones, provided with the straight pillar or adjusting rod from the horse-shoe, rely upon the friction of the collar to keep the latter in a fixed position on the rod. It is often found, however, that the collar slips up on the rod, with the result that the adjustment of the headband is upset. If no locking nut is provided, it is a simple plan to use a terminal of the ordinary pillar type, and widen out the hole until the 'phone adjuster slips easily into it; this terminal is then soldered, in the horizontal position, to the tag or loop of the headband, and thereafter it serves for locking the adjusting rod in the headband loop, this being accomplished by merely tightening up the screw of the terminal. The pillar or adjusting rod of the other 'phone is then treated in the same way. The side of the terminal which comes against the headband lug may be filed flat, so as to facilitate soldering.

(Continued on page 892.)

THE "P.W." 24-VALVE SET.

(Continued from page 863.)

have become fully convinced of their practical value to wireless amateurs, whose sets do not in the usual way run to twenty-four valves!

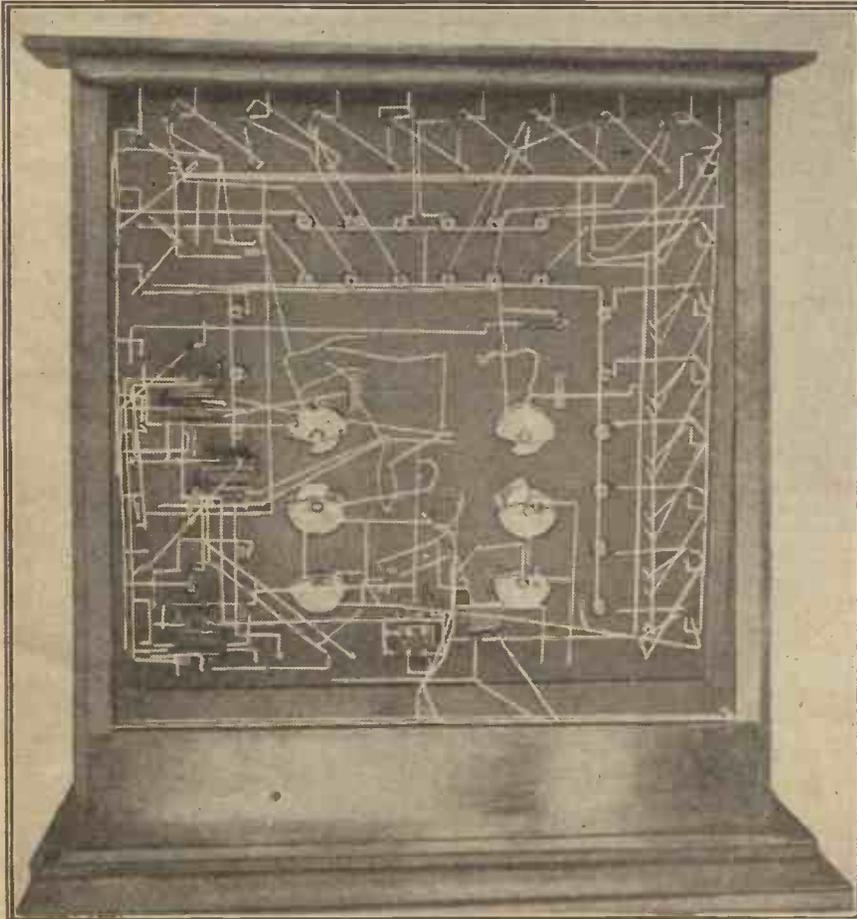
What results have been obtained with this set? Well, on ordinary wave-lengths, such as are used for broadcasting and commercial wireless communication, we have been unable to turn the valves fully on, as the result is that at every point on the wave-length scale something will come in at such strength that transformers and 'phones and loud speakers are apt to get damaged! We will listen in to Mars, however, on extremely long wave-lengths, as we are led to believe that success, if such should come to us, will be achieved by this means.

What Will Happen?

With the first 18 valves but dimly glowing American stations have been brought in at loud-speaker strength, using the 36 in. by 12 in. frame aerial. The final test of the receiver is to be carried out on the night we listen for the hoped-for signals from Mars, and then either most surprising results will be obtained with every valve turned brightly on—or every transformer will dissolve into masses of fused metal!

It is entirely problematical whether we obtain "twenty-four valve" results, but the receiver does at least represent something of real scientific interest and value, the benefits of which we hope to give our readers more fully in some future issue.

The majority of the parts were supplied by Messrs. Stocks Ltd. Messrs. Grafton Electric supplied fixed condensers, Messrs. Ever-Ready, high-tension batteries, while the Cossor Valve Co. provided the valves.



Showing the wiring of the "P.W." 24-valve Set. Over 200 feet of square section tinned copper wire was used. The frame aerial is situated in the base.

Brandes

The Name to Know in Radio



*Result of 16
years' experience*

"None but the brave"—

He certainly deserved what he got. Said there'd be no show and dinner to-night. They would listen to the Savoy broadcast over the wireless, a deck-chair apiece in the cool of the summer evening. At first he thought his decision was rather risky—her manner being sadly disinterested, but "Brandes" stepped into the breach. The "Matched Tone" brought the varying items with such distinct and rich even-toned purity, the "Featherweight" headband rested with such comfort on her dainty head that her wireless adventure proved most entertaining. Now there is only one deck-chair occupied. *Ask your Dealer for Brandes.*

25/-

BRITISH MANUFACTURE.
(B.B.C. Stamped.) Manufactured at Slough, Bucks.

Matched Tone
TRADE MARK
Radio Headphones

"Your lessons have taught us well enough to enable my friend and I to give exhibition dances at the largest hotel in Torquay."—Murray student's letter.

"Thanks to your lessons I am now considered to be one of the best dancers in this locality."—Murray student's letter.



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ALL your life you have wanted to dance really well—to be more than just one in a crowd of dancers—to have a complete mastery of the Waltz, Fox-trot, One-step, Blues, Tango, Five-step, Empire Waltz, and all the new steps—to be more attractive, stylish, popular. Really good dancers get infinitely more pleasure than dancers who only know a few commonplace steps, and their partners get more enjoyment too. Here is a splendid opportunity to make your wish come true in the easiest, quickest, and most delightful way imaginable. My simple home methods have taught more than 150,000 people in every part of the world to dance with grace and skill.

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If you do not know one dance step from another, I guarantee that you, too, can easily and quickly master all the latest dance steps—Fox-trot, Waltz, One-step, Blues, Tango, Five-step, Empire Waltz—through my simple method of teaching dancing in your own home.

Without leaving your own room my easy-to-follow home course will teach you to dance in one evening, and speedily make you a graceful, popular, and accomplished dancer.

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FREE DANCE LESSON COUPON.
Cut out this coupon, attach it to a sheet of plain paper with name and address and 2d. stamp to cover postage, and to convince you how easy it is to learn dancing this way Mr. Murray will send you the first two lessons absolutely free. (612)

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No. 41 CHALLENGE CRYSTAL
Tunes from 95 to 1760 metres without loading, a small switch giving long and short waves. You can switch from Chelmsford to your local station instantly, without a trace of interference from either. Enclosed detector with micrometer adjustment gives easy and permanent setting. Handsomely finished with nickel fittings and dark mahogany case with lid, it is a production of the highest efficiency and outstanding quality.



PRICE 50/- ONLY
(Stamped B.B.C.)

No. 40 SUPER POWER SET. Similar in style but tunes up to 500 metres only. **PRICE 42/- ONLY.** (Stamped B.B.C.)

RADIAX VALVE SETS. Completed or in parts for constructors, all cover to 1,760 metres and can be loaded for longer waves. They are full of refinements and are entirely versatile. If you want a set which will do anything inside on a Radiax. Any good Dealer can supply.

	Factory finished and guaranteed.	Constructors Set.
No. 31 1-Valve Crystal Reflex	£6.12.6	£4.15.0
No. 24 The famous long range TWO	6.12.6	4.15.0
No. 26 The magnificent THREE	10.17.6	7.5.0
No. 28 The Versatile FOUR	15.0.0	9.15.0

All plus 12,6 per Valve Marconi Royalty.

Send stamp 3d. for the full lists of Sets and Units, including also full accessory List.

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A LONG-RANGE LOUD-SPEAKER CIRCUIT.

By W. ISON, R.E., A.M.I.R.E.

The receiver described below will be found excellent for use with either 'phones or loud speaker, and it should be able to operate the latter from nearly all the B.B.C. stations.

THE receiver about to be described employs two high-frequency tuned anode valves, a crystal for rectification, and a final valve as low-frequency amplifier. In addition to this, provision is made for the amplified and rectified signals to be passed back to the first valve for low-frequency amplification.

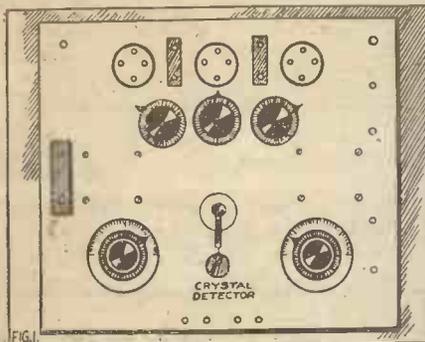
In effect, therefore, we have two high-frequency crystal detector and two low-frequency amplifying valves. The receiver is by no means difficult to construct, and should present no difficulty either in construction or operation. The writer has in previous articles given some general hints

seen that separate resistances are provided for each valve, the reason being that in any type of receiver employing high-frequency amplification, the best point at which a valve may be used can only be found by being able to vary its filament potential.

Single Coil Tuning.

For simplicity's sake, a single aerial coil is provided for, though for selectivity it is always best to use a coupled circuit. Two sockets are provided for the anode

16 or 18 gauge, and all connections soldered. In fixing the terminals it is a good plan to use two nuts, to prevent any possibility of that annoying thing—a shifty terminal. Fix the terminal tight with one nut, then



on the construction and lay-out of sets, and these apply very particularly to this set.

It is hoped that readers will refer to them, as it is not proposed to set them out again here. Suffice it to say that a little care in the selection of the components and in the workmanship of the set amply repays for the slight additional expense and outlay of time.

Lay-out of the Set.

The panel for this receiver may conveniently be of a uniform size with those previously described—namely, about 12 in. by 14 in.—fitted in flush with the top of a box about 5 in. deep. If a lid is fitted to the box, and the valves removed when not in use, a very handsome set can be turned out.

Fig. 1 shows the general design of the instrument in question. Some readers may prefer to vary this somewhat, and there is ample scope for variation. It will be



A complete valve set arranged in the form of a belt is the latest in American portable receivers.

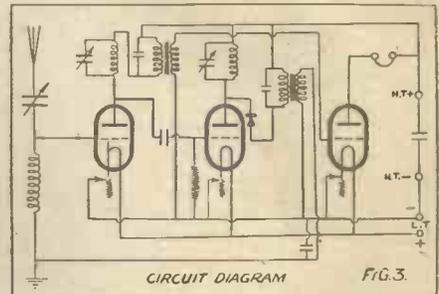
coils, the condensers for these being fitted in the panel. The aerial tuning condenser is used outside the panel. This enables it to be used either in series or in parallel, without complicating the panel with a switch.

Micrometer Crystal Adjustment.

Fig. 2 is the wiring diagram. Before drilling the panel, all the components should be laid out on the sheet of ebonite and their best positions ascertained. The two transformers should be kept as far away from one another as possible.

If it is desired to use low-resistance 'phones, the necessary telephone transformer should be employed outside the set and not fixed inside. This enables high-resistance 'phones to be used when desired, or a high-resistance loud speaker.

All wiring should be spaced, and done with bare, tinned copper wire, about No.



add a washer and second nut to hold the wire. Such connections need not be soldered.

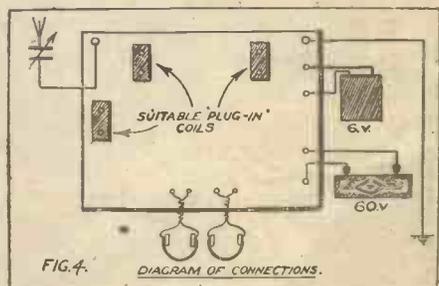
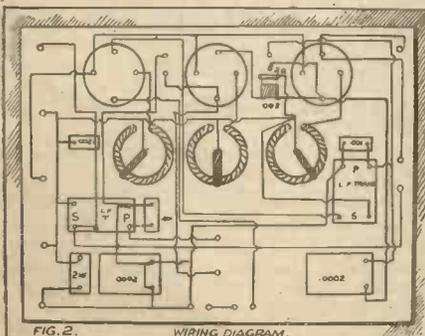
The crystal detector is a most important item, and one having micrometer adjustment is to be preferred.

The circuit diagram of this panel is given in Fig. 3, for the benefit of those who prefer to work out their own wiring. This shows a single coil for the aerial tuning coil. If the coupled coil method is employed in the usual way, the aerial and earth terminals on the set will not be used, but it is a good plan to fit them, so that a single coil may be used if desired.

The Necessary Coils.

With regard to the outside components, any good make of valve will function well, but the special red-top Cossor can be recommended for the first two valves, and any other make for the third. The size of the coils will, of course, depend upon the wave-length.

If a single coil is used for the aerial, a No. S4 Burndept with a .001 condenser in series will be suitable for the lower wave-length broadcast stations. The anode coil



will then probably be No. 75 Burndept. A 6-volt 40-amp. hour battery will be required for the filaments, and a high-tension battery of 60 volts or so for the anodes.

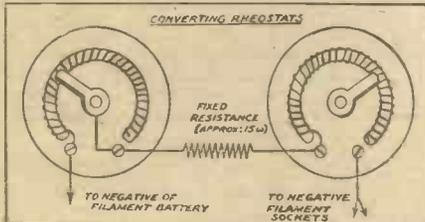
Fig. 4 shows the method of connecting up the panel for use.

Constructional Notes

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

Converting Rheostats.

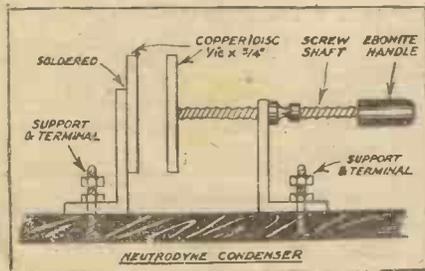
SHOULD you have a set employing, say, two stages of audio-frequency amplification, and you are changing over from bright emitters to dull emitters, it is not necessary to scrap your previous bright emitter rheostats and install higher resistance rheostats specially for the dull emitters. For the dull emitter L.F. valves (assuming they are of the same kind) are not critical in adjustment of filament temperature, and



the one rheostat control will do for both. Therefore, if you have had two rheostats of, say, 7 ohms each, you have only to connect them together in the manner shown in the diagram, inserting an extra fixed resistance if necessary, and they will serve perfectly well for controlling the two dull emitters. There is ample variation of resistance obtainable, since both knobs may still be used.

Neutrodyne Condensers.

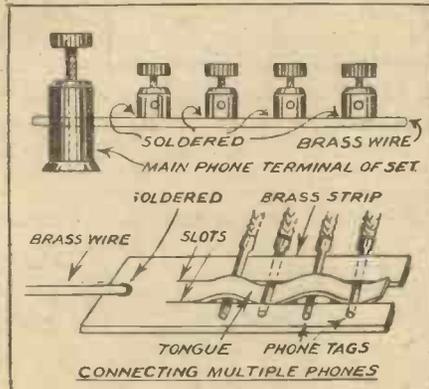
It is often troublesome to get a really reliable neutraliser for the neutrodyne grid circuit. The "neutrodon" shown here-with, however, will be found effective, and is very easily made. All that is required is a couple of small copper discs about the size



of a halfpenny, a brass screw and nut, and an ebonite knob for controlling the screw, with bent brass or copper supports and base-board. A set of these neutrodons is very handy. For the copper discs, use material, say, $\frac{1}{16}$ in. in thickness, and make the discs $\frac{3}{4}$ in. diameter. The screw-shaft may be $\frac{1}{8}$ in. by $1\frac{1}{2}$ in. long. The other details will be seen from the drawing.

Connecting Multiple 'Phones.

Connecting several pairs of 'phones is always rather a nuisance unless you happen to have a pair of special multi-phone connectors. There are several quite good

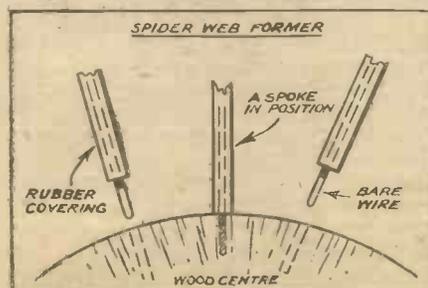


makes of the latter little accessory on the market, but in case you prefer to make your own, you have the choice of a number of simple and inexpensive methods. One way is to take a number of small terminals, say four pairs, and solder four of them to each of two short brass rods, or stout brass wire, the diameter of the latter being such that it can be inserted under the 'phone terminal of the set. This is illustrated in the figure.

Another method is to take a strip of springy brass and cut two longitudinal slots so as to leave a central "tongue," as shown in figure. The 'phone tag can then be inserted under this, in the manner indicated. For the next tag, the tongue should be pulled up to the other side, and so on, much in the same way that the wire is laid upon the spokes of a former. The brass must be fairly thin and flexible, to permit of this being done.

Spider-Web Former.

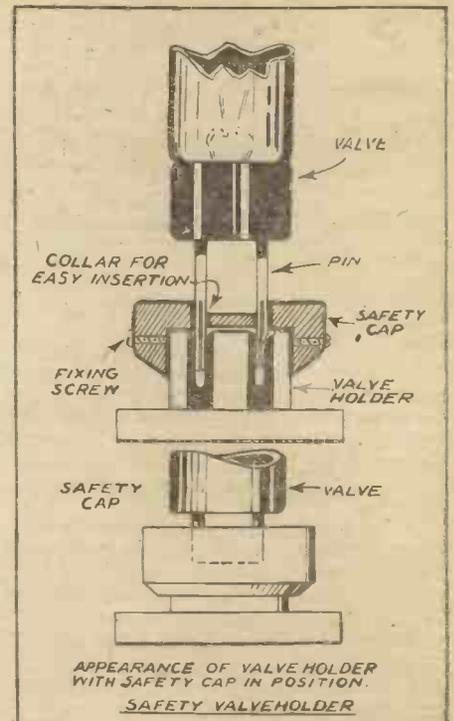
The ordinary spider-web coil former, using a wood centre and wood spokes, is inconvenient in many ways, in particular it is somewhat difficult to make the spokes; and secondly, since the spokes need to be of fair diameter, and the holes in the boss correspondingly large, there is a danger of the boss splitting when drilled with so many holes. If, however, fairly thick insulated wire is used for the spokes, say number 12, the holes do not need to be so large, and the danger of splitting is much less. The wire should be chosen with good, thick rubber insulation, and the pieces should be cut



about half an inch longer than the actual length of the spokes when fitted; the extra half-inch is for insertion into the boss. The rubber insulation is neatly cut away for the length of half an inch at one end of each wire and the holes in the wood should be drilled a shade smaller than the wire, so that the latter makes a tight push fit. A little glue or seccotine may be put into the hole first. In winding the coil, it will be found that the wire sits firmly on the rubber insulation, without any appreciable tendency to shift.

Safety Valve-holder.

In the ordinary valve-holder, the metal socket-tubes come right up to the top of the ebonite, and consequently, when you are plugging-in a valve, unless you are very careful, you may make contact with wrong sockets and burn-out a filament. There are some valve holders on the market in which the metal socket-tubes are counter-sunk, so that they do not reach quite up to the top surface of the ebonite. With these holders, it is only when the valve pins are entering their correct sockets that they make contact. Holders of this kind are very useful, but the vast majority of wireless sets are already fitted with the ordinary kind, and nobody wants to pull his set to pieces to install new parts.



A most valuable little accessory has just been sent to me, however, which gets over this difficulty in a very simple way. It consists of an ebonite cap or cover, which has four holes in the top surface, and which fits upon the existing valve holder, like a shield. To fit the cover, you first push the valve pins right into it, so that they project through. Then you insert the valve-pins into the valve-holder in the ordinary way. This holds the cap in the right place. Whilst thus held, you tighten up the three small screws in the cap, and these grip the sides of the valve-holder firmly, so that the cap then becomes a fixture on the valve-holder, and remains behind when the valve is withdrawn. Burn-outs are, of course, impossible with this safety cap.

The STRAD⁶⁶ of LOUD SPEAKERS

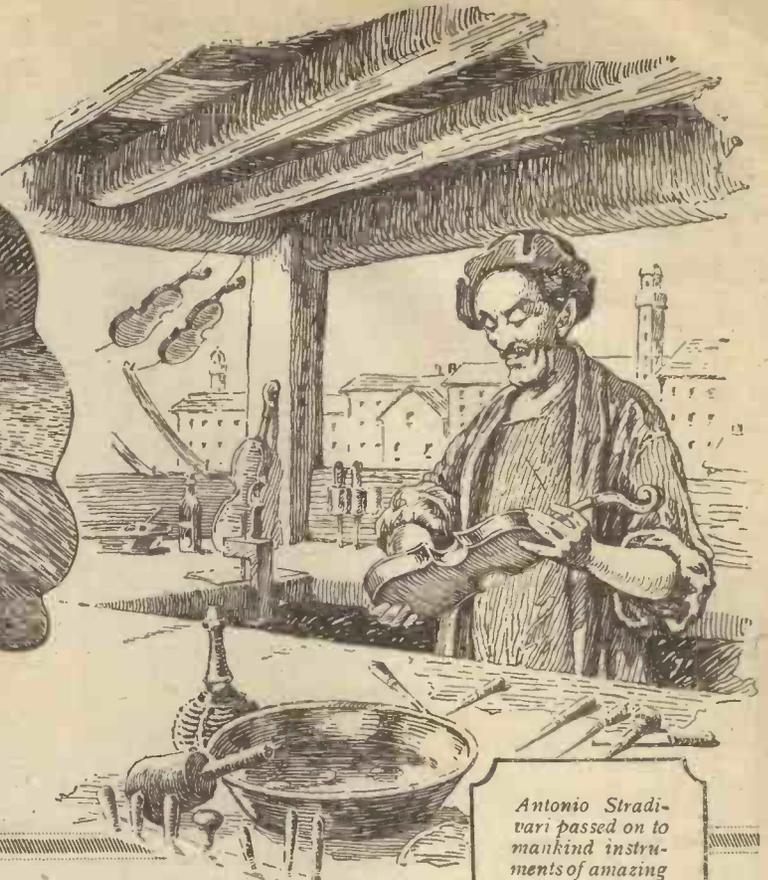


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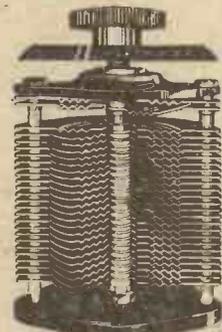
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THE HIGH-POWER WIRELESS STATION.

CAPTAIN ECKERSLEY'S VIEWS.

The following letter was published in "The Times" on July 28th, and we reproduce it here (with full acknowledgements to our contemporary), as it contains many points of general interest for the listener.

TO THE EDITOR OF "THE TIMES."

SIR,—The penalty of being frank is that one is inevitably misunderstood. These words are prompted by a letter in your issue of July 26th signed "Experimentalist," and dealing with the question of reception from the British Broadcasting Company's stations existing and projected.

The writer, in effect, states that the Broadcasting Company definitely guaranteed at the beginning that their main stations would serve a radius of 50 miles, but that these guarantees have not been fulfilled, and he ingeniously compares the actual with the promised areas—always a most misleading comparison. I would point out, however, that the original guarantee was justified, inasmuch as loud signals may be obtained at 50 miles from any main stations with adequate apparatus, although I admit that the listener is at the mercy of local interference. That this is a bar to perfect results I admit, but that the listener at this distance is not "served" I deny; ideals may have to be approached through compromises. It seems a little unjust to blame the Broadcasting Company, who have done all that is humanly possible to put before the authorities the desirability of curtailing interference, for the existence of such interference and in places its growth. They are framing costly schemes to give listeners something nearer perfection, but this policy, too, is made to suffer criticism from your correspondent. It must be realised that broadcasting is an entirely new art, and it is a little unfair to blame those who had to frame a scheme and give certain indications at the beginning when no real data were, in the nature of things, available.

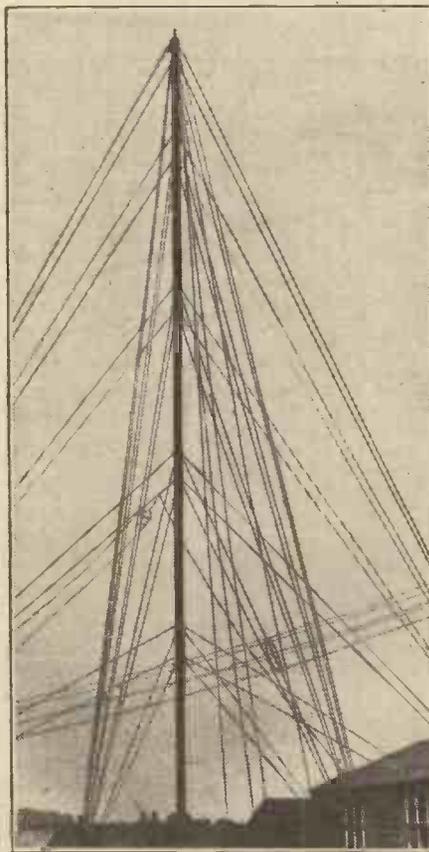
Range of Crystal Reception.

Realising, however, that interference was a bar to perfect results, the company framed a scheme in which a high-power station should transmit, broadcast, and give an additional and better service to all those not perfectly served. Experiments have been, and are being conducted, but "Experimentalist" challenges my statements as to results and the conclusions drawn therefrom. In the first place, he questions whether a crystal range of 100 miles is feasible, basing his doubts upon the fact that certain receiving stations have failed to obtain satisfactory reception at this range. Might I point out to him that, because certain motor-cars can only attain a speed of 30 miles an hour at maximum, it does not therefore argue that no motor-car can travel faster, and that since thousands of comparatively unskilled listeners have obtained crystal reception beyond the hundred-mile radius, am I not justified in thinking that it is safe to tell people that crystal reception is possible up to this distance? Furthermore, I am surely justified in asking the unsuccessful to

take my advice on the rigging of their aerials, since my research staff have found that on long wave-lengths, unless certain precautions are taken, results may not come up to expectations. I have never said that certain interferences are the fault of a listening set, as "Experimentalist" states; nor have I ever dared to criticise the receiving end without myself, or my research staff, making full investigation to prove the justice of my contentions.

The Jamming Problem.

"Experimentalist" denies that the high-power station solves the problem of inter-



One of the masts at 5 X X, Chelmsford.

ference, inasmuch as he says the high-power station jams and is jammed by Paris Radiola. He cites, I hope to prove wrongly, but one interference with which to condemn the station. With a difference in wave-length of 10 per cent., this interference, where it exists, is surely blameable on the receiving set, and in support of this I have signed evidence from many people that with proper apparatus they can in London listen to one station or the other. I must agree that many have complained of Paris being jammed by Chelmsford (scarcely ever *vice versa*), but I must ask

them to realise that the receiver is as important a link in the chain of broadcast as any other part, and that with the growth of the broadcast service it behoves listeners to arrange their apparatus to take full advantage of what is offered to them.

Question of Location.

Finally, the site itself is criticised, "Experimentalist" pointing out that at Chelmsford the station is serving a large area of sea. First, Chelmsford is only the experimental, not the final site (it being assumed that sanction will be obtained to erect a high-power station). Secondly, the station, if and when sanction for its permanent existence is obtained, will radiate a London programme and will be fed from a London studio, and it is impossible for greatest reliability to use anything but buried cable for linking up. The maximum length of existing buried cable to give no practical distortion of broadcast is 30 to 40 miles; hence the station is of necessity fixed 30 or 40 miles from London, assuming a London programme is to be radiated. It is obvious that the largest broadcasting station in the world should be fed from the capital of the Empire.

May I thank "Experimentalist" for his generous appreciation of our work, and you for publishing his views, since his letter has given me an opportunity to illumine certain facts which, in spite of wide publicity, still seem to have been misunderstood?

Yours faithfully,

For the British Broadcasting Company,
Limited,
P. P. ECKERSLEY
(Assistant Controller and Chief Engineer),
2, Savoy Hill, W.C.2.

BRITISH PROGRAMMES IN GERMANY.

Proposal to convert station to relay
from the B.B.C.

THE high quality of the B.B.C.'s programmes is appreciated [in Germany, and there is a proposal to relay them regularly there by means of a specially converted station.

Writing from Berlin to "The Times" their correspondent says:

The "Vossische Zeitung" urges, in a leading article this morning, that Station No. 1 should be converted for the purpose of relaying the British wireless programmes.

The conversion would require the adoption of a new wave-length, preferably under 200 metres, because Station No. 2 is only a few streets removed from it, but this change could be carried out at a low cost.

WAVES AND STRAYS.

By HIGHAM BURLAC.

III.—A Famous Case.

THE history I am about to relate seems to have been overlooked by the fellows whose regular jobs are to hand out radio news to us, yet I submit that as a guide and precedent it is super-important, and should be incorporated in the Appendix to the Articles of the Listeners' League.

How it Began.

We begin with a small "fill up" paragraph which appeared in the "Uddles and Clackover Weekly" for July 12th, sandwiched between a blurry smudge of a lady who despaired of regaining that school-girl complexion until she tried Madame Sophia's Guaranteed Blackhead Killer and an announcement about a cantata at the Wesleyan Sunday school. It reads:—

"Yesterday, at 11.30 p.m., Police-constable Turvey found, suffering from a contused eye and severe bruises about the body, Edwin Holystoke, 29, auctioneer's clerk, of Praggles' Pound, Great Uddles. After receiving treatment, Holystoke was able to return to his home."

This seems ordinary beer; the man, you surmise, hated some passing motor-vehicle like mad, but lost. However, there is more in it than met Holystoke's eye (contused). The vehicle had an unpleasant disposition; he had been brought up by a bad auctioneer. Therefore he did cite before certain justices, one Harold Starfish, 25, toasting-fork sharpener, as the offender against his (Holystoke's) person, and said Starfish was duly summoned under all manner of Acts, Caps., and Vics., to be jolly well tried.

A Crystal Prevaricator.

Holystoke in evidence alleged as follows:—"I was walking along Snooker's Bend and saw defendant sitting on the fossil megatherium's thighbone in Godbehere's Four Acre. I entered into conversation with him and borrowed a cigarette; just as I was handing him back his matches, and borrowing a stamp, defendant assaulted me with a harrow and mixed me up with a patent reaper and binder. I do not know the defendant from Adam, but believe he uses a frame aerial."

Next came P.-c. Turvey: "At 11.15 past meridjium of the 11th instant, I was on point duty outside the "Pig and Fishpond," when I observed defendant approaching me whereabouts. He said he had bashed summun. I said 'oo was he, and he replied, 'A liar.' I thereupon said, 'What kind?' To which defendant answered, 'A crystal liar.' I replied 'Oh,' and the hincident then closed. Later, defendant said he was afraid he had not struck appellat hard enough, and, on being questioned, admitted

he had laid appellat all in one piece horizontal. I then proceeded to Godbehere's field, where I found appellat suffering from certified contusion of eye and his cloes all of a maumble. Taking his deepersitions I 'ands 'im over to Dr. Glarker and informs the Sargent."

Mandrill, J.P.: "Ah—you say Starfish said Holystoke was a *crystal* prevaricator. What exactly did you understand by that term?"

P.-c. Turvey: "A nawful perverter, y'w'ship."

Starfish, in evidence, said: "On the evening in question I was sitting smoking in old Godbehere's patch, thinking about a postcard I was intending to send to the B.B.C., about how I had received the 'Lost Chord' with my aerial 'earthed'



Transmitting time signals from United States Naval Observatory at Washington.

and my 'earth' disconnected, no high tension, telephones made from a set of parts (complete with telephone cords and chart of faults), and a repaired valve. Holystoke came up, cadged a cigarette, dropped most of my matches, trod on my white shoes, asked me the time, tried to cadge a stamp, told me it was very hot, called out 'beaver' to Henery Godbehere, bit his nails, said the cigarette was musty, and asked me whether I had any string.

"I began to feel tired of him, but presently we began to talk radio, and I felt I could love him better then. But when he said he never used anything but a crystal my flesh crept. Eventually he said he had got Chelmsford at 125 miles in such a superior tone that I lost consciousness and biffed him. I told old Turvey to look him up, and went home and wound four honeycomb coils. I doubt whether this action can legally lie in respect of a crystal user,

and leave the matter to your decision with confidence."

A witness, Angus MacSpey, deposed that he had seen Holystoke reclining on Godbehere's reaper-and-binder, looking gay and bad, but noticing who it was and knowing that appellat was a crystal user, merely shut the gate and went away. He did not see anything alarming in the incident.

Getting "Bobbish."

Parson Bunfield also gave evidence to the same effect, adding, in reply to Mandrill, J.P., that he did not see anything in an (apparently) deceased crystal user to make a fuss about. He had often lynched them. Personally he used four valves, and was glad of it. Far be it from him, etc., etc.

The President of the Wireless Academy of Great Britain stated that crystal users were originally a harmless lot. Nobody took much notice of them. They were useful to assist wireless people by climbing trees during aerial erection, and so on. Yes! sometimes they fell out of the trees, but it did not cause much inconvenience, for if they were crippled they were generally used for digging holes during "earth-plate" burials. Yes! he was aware that at Ealing a shortsighted and impetuous wireless man had buried a crystal user as well as the plate. No! It was not considered to have reduced the earth resistance appreciably and no further experiments of that nature would be tried.

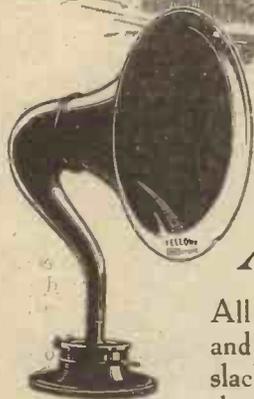
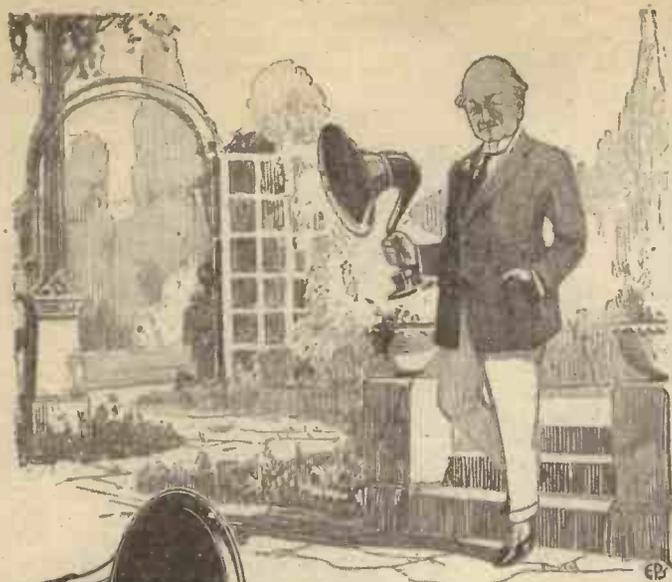
The President went on to say that after the B.B.C.'s big station at Chelmsford began its trials it was noticed that crystal users became bobbish. Questioned, the President explained that they had certainly got a bit above themselves, used to come out into the street quite openly in broad daylight and make noises like 4-valve men. (Cries of "Shame.") One of them had even addressed him (the President). No! he was not alive now; he departed hurriedly, and his father owing to the disgrace had since committed bankruptcy.

The Verdict.

Arising out of that, he was not prepared to say whether the Academy would claim damages from the estate of deceased; it might perhaps have a salutary effect. He took note that he was to lay the point before his council. He considered Starfish had taken the only possible step. He did not think Holystoke was much injured—not half enough—but, then, it must be understood that Starfish was not a member of an affiliated club, and had no legal responsibilities towards recognised Bodies. In reply to Parson Bunfield, he said it was true that each member of the Council had at least one crystal-user to his credit, otherwise he would not be eligible.

After this evidence the magistrate stopped the case and Holystoke was hurled about 365 metres into the landscape in a due W.S.W. direction and a rough manner, and Starfish was made an Honorary Lieutenant of the Uddles Fire Brigade.

This case, I say, will go down in the Annals, and I am surprised that nobody but me noticed it.



A Stolen Hour.

All the sweeter because it is stolen—and from my work, too. The so-called slack season has proved so successful that I simply don't get a minute to myself; it doesn't look as if I'll even get a holiday. I don't really mind, though; perhaps it's because of my record wireless Summer, but somehow a quiet hour or two in the garden after dinner—with my Volutone—seems to me easily enough recompense for just a holiday.

I'm really glad, however, we did produce the Volutone; the Junior is a fine little instrument, even better now we're fitting it with an adjustable diaphragm, but you do need something a little more powerful in the open air. You want to listen to a Volutone to appreciate how perfectly a modern Loud Speaker can give a large volume of sound without distortion. But more than anything I'm pleased about its price. It really is

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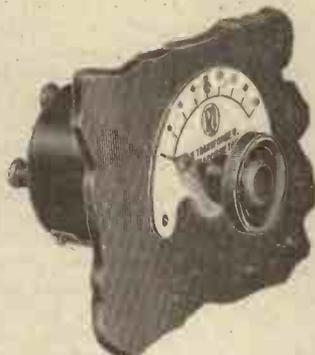
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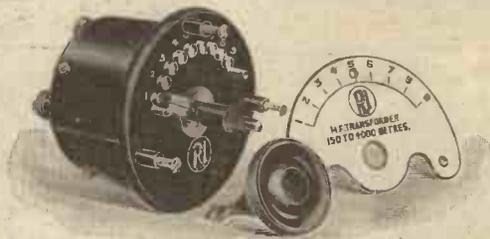
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FORECASTING EARTHQUAKES BY RADIO.

Though numerous experiments in seismography are always being carried out it is only recently that radio has been looked to as a means of making the recording instrument still more sensitive. It seems highly probable that in the near future not only will the slightest earth tremors be recorded, but that it will be possible to foretell the approach of an earthquake with a considerable degree of accuracy.

RADIO is coming to the front in seismatic observation, and if the experiments now being conducted in Japan are successful it will in all probability be possible to foretell the occurrence of earthquakes, and thus rob this act of nature of many of its devastating effects.

For many years past instruments have been developed that record earthquake shocks, but it has not yet been found possible to discover a method by which it can be determined when and where they will occur.

Two Points of View.

Earthquakes, generally speaking, are of two distinct types; those accompanied by volcanic eruptions and those from earth slides. To the geologist and seismologist an earthquake is the result of some sudden displacement within the earth's crust, and whether tectonic or volcanic it represents to them something to be explained by research, but to the rest of the world it is a horror. Scientists have been working since 1885 with many forms of seismograph instruments which are extremely sensitive to any rupture occurring in the surface of the earth and which are capable of measuring oscillations from the opposite side of the earth.

The standard instruments used are of the type which employs a suspended mass, the framework of which is attached to the earth's surface. A needle attached to the suspended mass is actuated on the lever principle so as to give a greatly amplified movement on a graphed smoked paper, the principle involved being that the suspended weight tends to remain in position, while the earth moves under it. Various types of this apparatus are in use in some three hundred seismatical stations throughout the world, and while sensitive enough to record earthquakes, can in no way correctly measure minute slips of the earth strains which precede a big earthquake.

How Radio Will Help.

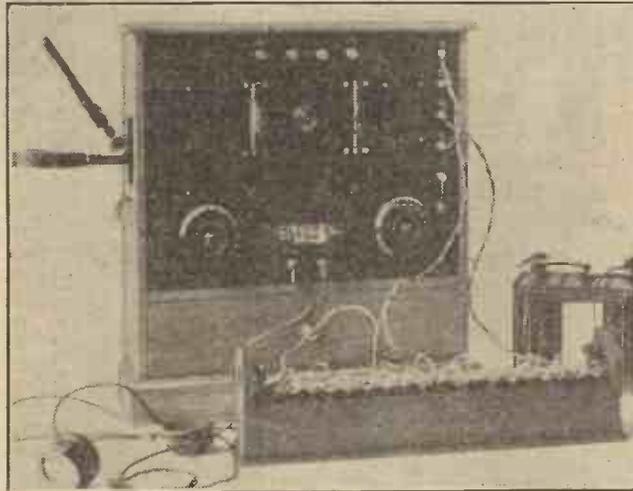
The radio-seismograph, however, is capable of measuring the slightest movement or sound emanating from either the porous or dense strata immediately below the surface, and by studying the various sounds and heretofore indiscernible vibrations, it is hoped that it may be possible to discover some method of foretelling not only the location of an expected earthquake or volcanic eruption, but also its magnitude.

Earthquake waves are very similar in their directional action to light waves or

radio waves, as they travel in a straight line in all directions from the source of their emanation.

The use of a series of radio-seismatic instruments to locate the direction from which the sounds are coming is therefore necessary, so that the area can be charted in a similar manner to which ships are given their bearings along the coast by triangulation. So that it will be necessary to have three stations working in conjunction to make the observations.

The exact details of these radio instruments are not generally known, but are believed to be a method of clamping on the earth's floor highly sensitive radio pick-up devices and then through amplification and the use of an oscillograph to record all motions and noises.



A crystal and two-valve set constructed for West Hill L.C.C. School, S.W.18., by a member of the scholastic staff.

WIRELESS IN NORTHERN IRELAND.

By J. P. ALLEN, B.Sc.

A new broadcasting station, 2 B E, is to be erected in Belfast early this autumn.

WITH the prospect of a main station in Belfast working in a few weeks' time, a great deal more interest in wireless matters has been aroused locally, and, indeed, throughout Northern Ireland, than had hitherto been the case.

If the new station can transmit programmes of such merit as to interest them as much as those being transmitted from, say, Bournemouth or London, then it will indeed be a welcome one. It is to be hoped

that by means of submarine cable or wireless link we will be able to enjoy the advantages of simultaneous broadcasting, as it will be obvious to everyone that such stations as London and Manchester have a greater source of talent to draw upon than we can hope for in Northern Ireland.

The studio of 2 B E, the new station, is stated to be 31, Linenhall Street, a central position in the city, while the aerial and transmitting plant is being erected at the Corporation Electricity Station at East Bridge Street. The aerial is to be of the "sausage" type, and the ends will be supported by the two tall smoke-stacks of the generating station, the halyards already being in position.

Reception from 5 X X.

No permission is being granted yet in Northern Ireland to experimenters who wish to erect transmitting sets, and it is to be hoped that the Home authorities will soon modify the regulations and allow the local amateurs to be heard in Great Britain as regularly as the amateurs there are heard over here. At present we can carry out only one-way tests in transmission, and during last winter several local amateurs carried out successful tests with London transmitting amateurs. Even now, on any Sunday morning, one has only to tune to 440 metres to hear a host of amateur transmissions, mostly from Lancashire, and one station, 5 D C of St. Anne's-on-Sea, is "getting over" loudly on a power of less than 10 watts. During the winter, 5 V R (London) was received here very loudly on a three-valve set, while his speech was quite readable on two valves, H.F. and detector.

The new high-powered station of Chelmsford is being well received here, but, as far as reception goes, one will really require three valves to allow a reasonable factor of safety. This refers to daylight, as there is no opportunity of hearing the station after darkness. I have not heard any jamming of 5 X X by Morse stations in this area, and so far the oscillators have not troubled this wave-length.

Oscillation Troubles.

If the interference from spark stations has decreased here, as it undoubtedly has, the interference caused by the misuse of valve sets has increased a great deal. The increase in the oscillation is mainly due, I believe, to the increase in the number of people who use only a single valve. The prospect of a local station may be responsible for this increase, or the flood of one-valve "super" circuits last winter; but whatever the cause, the result is only too clearly obvious, and when the new Belfast station opens I hope Captain Eckersley will come over and give a few of his famous talks on this question.

Foreign broadcasting is being fairly well received here, and among the numerous stations on the Continent which transmit regular programmes may be mentioned Radio-Paris, Brussels, Eiffel Tower, Königswusterhausen, Vox Haus, Ecole Supérieure des Postes et Télégraphes, and Madrid. The latter, on about 390 metres, comes in very well on three valves.

DEVELOPING THE "P.W." UNIDYNE.

SOME SUGGESTIONS FOR THE EXPERIMENTER.

By **GEORGE V. DOWDING**, Grad. I.E.E. A.C.G.I.

(Technical Editor "Popular Wireless.")

In this article Mr. Dowding outlines some aspects of the "Unidyne" which offer fruitful avenues of research for the experimenter, and invites the co-operation of all readers interested in the furtherance of Radio science.

IN America, owing to certain trade-mark complications, it has been necessary to rename the Unidyne, the Solodyne, and under this title it has been introduced to, and, I believe, cordially received by, the vast army of U.S.A. wireless amateurs and listeners.

When no less a person than Hugo Gernsback, the well-known American expert, says that "we are confident that during the next few years the 'Solodyne' principle will be adopted in the majority of radio receiving sets," one begins, as it were, to "sit up and take notice," and what formerly were at the most but firm beliefs become more or less concrete convictions.

Work for British Amateurs.

In a few words, Mr. Gernsback has unleashed the American experimenter, and when the U.S. and Canadian "fan" really gets going on a job something is going to happen. Now, although this is good news from one point of view, one's patriotic feelings prompt one to hope our own country will not be too far behind in following up the lines of experiment that Mr. Rogers and myself have commenced.

There is one salient point that I wish to impress upon readers of POPULAR WIRELESS: no matter how good the Unidyne circuits so far evolved have proved themselves to be, there is still a lot to be done. We know the possibilities of the Unidyne as well as most—I think I can be allowed to say that without being accused of blowing my own trumpet; and, for all its success, we know its shortcomings and can indicate its possible lines of development.

It matters little to us who are responsible, be it ourselves or others; but our one great wish is to see the Unidyne progress from one stage to another until Mr. Gernsback's predilections are fulfilled. We would greatly prefer, however, that its culminations should eventuate in the land of its birth, Britain, and it is up to British amateurs to see that this happens.

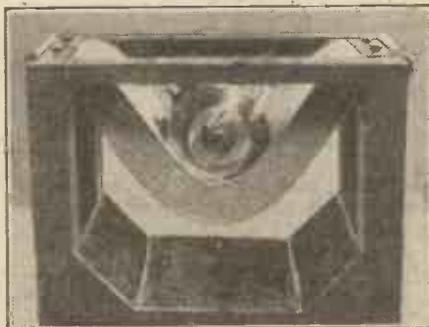
Readers must not think for a moment that Mr. Rogers and myself intend to "rest on our laurels," but everyone must realise that we have placed the whole world of wireless on an equal footing to ourselves in that we have, without reserve, placed the full details of our experiments at its disposal through the medium of POPULAR WIRELESS. In short, it is now an open competition and no handicaps.

Dull-Emitter Problem Solved.

The average amateur cannot tackle the valve, for unquestionably there is a vast scope for development in this direction. The dull-emitter problem has been solved; I have a set in my laboratory which is no larger than a fair-sized crystal set. On

lifting the lid all that can be seen is an earth, aerial, and telephone terminals, one knob and a simple switch. To operate the receiver all that is necessary is to connect up the earth and aerial and telephone receivers or loud speaker, throw the switch over, and twist the knob until the desired station is heard.

This Unidyne receiver, for such it is, employs dull emitter four-electrode valves and carries the only necessary battery inside its case. When this battery runs out, a little door can be opened and another dry battery slipped in. Battery connections are made to clips on the battery, which make contact with rigid brass straps inside the set. Dull emitter four-electrode valves are not yet on the market, but when they are I hope to be able to describe the construction of this unique receiver. I mention the above merely to show that the day of



A "close up" of 2 L O's microphone, a wonderfully sensitive instrument which is the result of much experiment and research.

the really portable receiver is not so far distant. The above set, complete with a frame aerial in its lid, does not weigh as much as an average-sized portable gramophone!

Room for Improvement.

Where, readers will doubtless say, is there room for development and improvement? Two words will suffice to answer this question: the circuit. We want a very stable circuit of sufficient sensitivity to bring in distant stations on a small frame aerial using only two or so valves. Yes, it might be said, but we have no dull emitter tetodes to get on with the job. That does not matter; what bright emitters—such as are on the market—can do, dull emitters can be made to do also.

We do not want super-regenerative circuits such as we know super-regeneration at present. The average listener cannot handle them; average wireless amateurs cannot; even experts fail at times to keep such freaks of the wireless laboratory under control. In my humble opinion we

don't want the ubiquitous crystal. Dual amplification is a fruitful source of research, but now that it is possible to operate a valve efficiently with but one battery—and that little larger than the battery employed in a carborundum crystal circuit, and not as large as that which is necessary in a microphone amplifying circuit—why employ a crystal detector, which is, after all, a source of continual annoyance, requiring, as it does, unceasing adjustment and replacement in reflex receivers?

Endless Possibilities.

Clarity of tone, beautifully noiseless rectification! Listen to a single-valve Unidyne employing negligible reaction and compare its reproduction to that of a crystal set. There is no difference, except that the Unidyne will, of course, give louder signals. So much for that. Then the first field of experiment to be crossed is Unidyne dual amplification. There are endless possibilities in this direction, always remembering that no more current is extracted from the one battery in a Unidyne circuit than is required to light the filament of the valve.

There are supposed to be scientific objections against the efficient introduction of Unidyne dual amplification. Brush these aside as you would brush aside a growth of weed in a fruitful orchard. Previous to the publication of articles dealing with it, we were told by people who should know that low-frequency amplification was impossible—mark the word!—without high-tension batteries, and that loud-speaker reproduction could not be carried out.

Unidyne Dual Amplification.

In view of the fact that our first demonstration to the public consisted of providing loud-speaker signals from stations as far away as Birmingham and Brussels using only two valves, such people can safely be accused of having talked nonsense.

So far I have indicated but one line of research upon which both Mr. Rogers and myself are engaged, and which we invite readers of POPULAR WIRELESS to enter in friendly competition against our American friends.

At the moment of writing I have before me a Unidyne dual-amplification circuit evolved by one of our readers, with which it is claimed excellent results are possible. This will be published, possibly, in the same issue as this article. If this circuit is as efficient as is stated, then the first point is scored in this country. In my next article I intend to discuss further Unidyne possibilities, and will give full details of any further discoveries made by Mr. Rogers and myself—if any.

THE CATHODOPHONE. A WIRELESS RECORDING DEVICE.

By Dr. ALFRED GRADENWITZ.
(Our Correspondent in Germany.)

THE fact that an incandescent metal wire treated with oxides of barium, strontium, calcium, or other metals of the earth-alkali group, when charged with negative electricity, acquires a remarkable faculty of discharging electrons in an atmosphere of rarefied gas was first ascertained by Wehnelt's researches. It was taken advantage of in the familiar Wehnelt rectifiers, comprising an incan-

the arrangement shown in Fig. 2. S is a rod of fireproof material coated with oxide and raised to incandescence by a hot wire, and D a nozzle opening funnel-like in a backward direction, which is perforated like a sieve and separated from S by a narrow air gap. B is the heating battery of the incandescent rod, H a battery of higher tension, W an ohmic or inductive resistance, A an ammeter.

Valve Amplification.

The oxide rod is connected up to the negative terminal, while the nozzle through the resistance communicates with the positive terminal of the H.T. battery. If the rod now be raised to incandescence, it will, at a given temperature, depending on the distance between electrodes and the actual potential, give out electrons, as ascertained by the deflection of the ammeter and by a bluish luminescence of the narrow air gap between the rod and the nozzle. Any acoustic vibrations striking it will result in a periodically alternating compression and exhaustion of the air column in the gap, corresponding with periodical variations of the current emitted, which are eventually noted as variations of potential in the ohmic or inductive resistance W. Moreover, any variations of current intensity and potential may be reinforced as desired by means of valve amplifiers.

It will be seen from the above that the membrane of the cathodophone, as this arrangement is termed, being constituted by an air column, in opposition to any other type of microphone, comprises no solid masses, and accordingly is free without any inertia to follow any air vibrations. While the highest sounds perceived by the human ear correspond to more than 20,000 vibrations per second, air as a vibratory medium is able to transmit far higher frequencies.

"Inaudible" Sounds.

It may thus be taken for granted that many insects communicate with one another by sounds far above the hearing range of the human ear, and the cathodophone, in connection with some suitable amplifier, will possibly enable even these sounds to be actually perceived. The most striking feature of the arrangement is that vibrations are rendered correctly by current variations, even with regard to their actual amplitude, thus enabling the most complicated musical

systems, such as the sounds of large orchestras with their many fundamental and upper harmonic vibrations, to be rendered with absolute faithfulness. Moreover, the cathodophone will respond to even the slightest acoustic stimuli, whereas in the case of ordinary microphones a certain minimum intensity is required.



Fig. 1. A recent model of the Cathodophone.

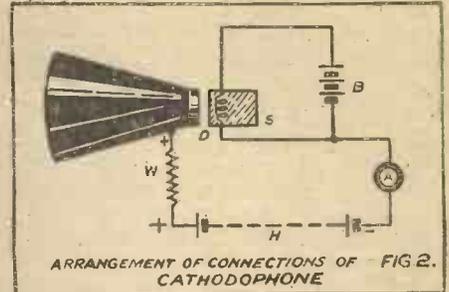
descent cathode and an anode in an atmosphere of mercury vapour or some rare gas at low pressure, and more recently in connection with high-vacuum valves, with a view to reducing the consumption of heating current.

However, an ample supply of negatively charged ultimate particles of electricity (electrons) is, even in air at atmospheric pressure, given out from an incandescent oxide as soon as the field intensity at the surface of the latter has reached a given limit. Whereas, in a high vacuum or in strongly rarefied gases, these particles are bound to assume a considerable speed, thus submitting the anode as well as the glass walls of the vessel to an intense bombardment, their behaviour in air at lower pressures is strikingly different, each particle immediately as it issues from the incandescent oxide associating with an air molecule, and thus forming what is called an ion—i.e. an electrically charged air particle.

Simple Arrangement.

These air particles will, at a given average speed, move towards the positively charged anode, which, of course, exerts a striking attraction, thus becoming carriers of what is called the ionic or emission current. Being thus linked up with the air particles, this electric current should be dependent on all atmospheric changes, and vary in accordance with any variations in the pressure and flow of the air column.

This has been confirmed by means of



ARRANGEMENT OF CONNECTIONS OF FIG. 2. CATHODOPHONE

Fig. 1 shows the cathodophone as at present constructed by Messrs. C. Lorenz.

In spite of the relatively high initial output of the instrument, a valve amplifier should be inserted. In designing this, any transformer has been dispensed with, the only intermediary parts being resistances and capacities of sufficient magnitude to eliminate any chance of deformation, and to make the rendering of music and speech behind the amplifier remarkably faithful. The cathodophone and amplifier together constitute a unit designed to be connected up to recorder arrangements or wireless telephone transmitters.

Successful Results.

The first tests made with the Poulsen transmitter at Messrs. Lorenz' experimental station at Eberswalde, near Berlin, which was equipped with a Pungs-Gerth iron throttle system, gave remarkably good renderings of the characteristic timbre of pianos.

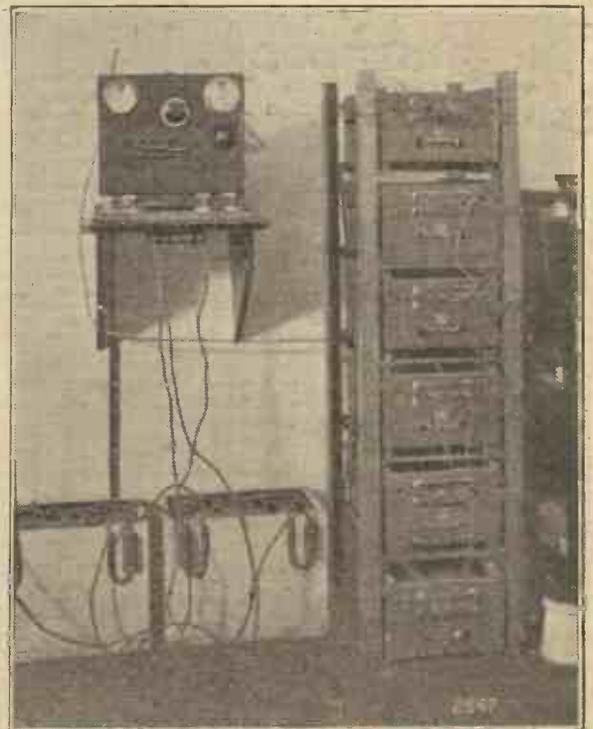


Fig. 3. The instrument fitted up in the laboratory.

SIDELIGHTS ON WIRELESS.

A NEW SUMMER SERIES FOR THE AMATEUR.

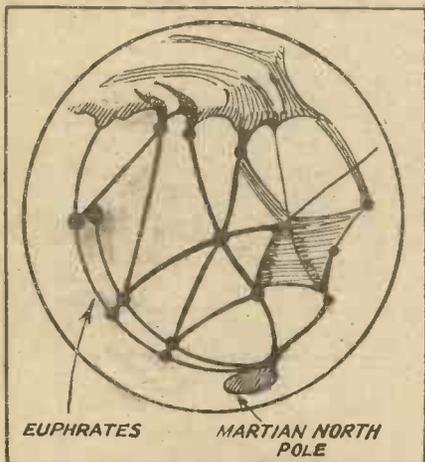
No. 4.—COMMUNICATING WITH MARS.

By G. H. DALY.

During this month Mars will be only 34,000,000 miles away, and this will provide the best opportunity of the century for attempting communication with the planet. In this article Mr. Daly gives a brilliant survey of the whole question, and on another page the reader will find details of a powerful set designed by "P.W." in order to listen-in for possible transmissions from the Red Planet.

SHALL we talk to the men of another world by wireless? Or, conversely, will we hear the strange and distant voices of the inhabitants of another world talking to us?

It seems absurd to suggest such a thing, yet it is quite possible, even probable, that sooner or later we shall at least try to carry on communication with Mars—the brilliant orange-red star which appears in our heavens for a few months every two years.



Diagrammatic map of Mars by Schiaparelli showing the canals. The double canal on the left, known on this earth as the Euphrates, is nearly 3,000 miles long, and appears to cross huge tracts of sandy desert. These canals have every appearance of having been constructed by intelligent beings. Professor Lowell firmly believed them to be the work of Martian engineers.

In August of this year the planet Mars will be only thirty-four million miles away—not so very far as star distances go—and this will be the best opposition, as it is called, of the century.

But why should we try to speak to Mars? What reason have we for believing that intelligent life exists on that planet at all?

Life on Mars.

While there is no direct evidence to show that beings do exist on Mars, the circumstantial evidence, as will be seen later, is very strong indeed. Furthermore, if there is life on Mars at all, it must be far more advanced than life on our own planet, for the following reason:

It is now generally accepted that all the worlds of our solar system were at one time intensely hot, having cooled down in the process of time. It follows, therefore, that the smaller worlds will have cooled down before the larger, and the former will be further advanced in their development. Now, Mars is less than half the size of the earth, and so will have cooled down more quickly, and life will have begun on Mars, if it began at all, millions of years before it started on earth.

Before life, as we understand it, can exist, however, certain conditions must be fulfilled. In the first place, there must be an atmosphere—air. Astronomers are no longer in doubt that there is an atmosphere on Mars, and, although it is much rarer than our own, it is quite sufficient to support life provided the bodies of the beings are adapted to the pressure as are our bodies to the earth's atmosphere.

The day temperature on Mars is more or less equal to our own, while at night the temperature is only a little colder. There is also good reason to believe that Mars has seasons similar to our own. The light green vegetation of spring has been observed, changing to the brilliant green of the summer, and later to the deep brown tints of the autumn.

The Canals.

The Martian day is 24 hours 37 minutes 22½ seconds—very little different from our own, although the Martian year is twice as long as ours. Like the earth, Mars is tilted on its axis, and has large areas of snow at the poles which vary winter and summer. Morning mists, clouds, frosts, and sandstorms in the midst of great deserts like our Sahara, occur; and, most important of all, water and vegetation exist on Mars. In fact, taken on the whole, Mars is the elder, though smaller, brother of the earth.

It can be said right away that there is life on Mars, for what is vegetation but life? And if there is vegetable life on Mars—a world which is infinitely more advanced than our own—it follows that there must be higher forms of life like the animal in our primeval forests, and finally "beings," counterparts of ourselves.

But we can go further and say that there are signs of intelligent beings on Mars. For all astronomical observation reveals the fact that the surface of the planet is covered with straight lines, or "canals" as they are called, which criss-cross the surface of Mars like our railway lines on earth. It is also interesting to note that these "canals" intersect at certain definite and convenient points, like our great railway junctions.

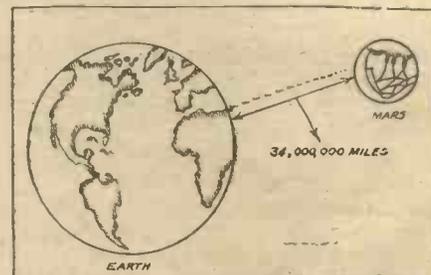
Professor Lowell, the foremost authority on Mars, believes that we do not actually see water canals, but the strips of vegetation growing upon their banks. He considers that these "canals" have been built by intelligent beings to convey the water from the oceans at the poles to the more distant parts which are hot and dry.

We have, of course, no direct proof that the "canals" are the work of intelligent beings, yet, taken in conjunction with other facts concerning Mars, the probability that they have been constructed by Martian civil engineers is quite likely; and, indeed, it can be said that vegetation in certain parts of Mars would be impossible without some sort of artificial irrigation.

If we assume that there are beings on Mars, it follows that, owing to their more advanced state, these beings would surpass us in intelligence, and consequently they would undoubtedly have attempted to signal to the earth long ago. There is always the possibility, of course, that Martian civilisations rise and fall as do our own on this earth, and in this case the Martians may be just beginning a new civilisation and may not be in such an advanced state as ourselves. Leaving this point aside, however, as incompatible with the evolutionary theory, the question arises: are the Martians at the present time endeavouring to signal to us over intervening space? It is possible.

If, for example, you were to tune your broadcast receiver to a wave-length ranging from 80,000 to 120,000 metres, you would hear at certain times three distinct dots resembling somewhat the letter "S" of the Morse code. These dots caused a great sensation when they were first heard by Marconi some years ago. It was presumed that these dots were merely atmospheric disturbances due to local thunderstorms and other natural causes.

But, as anyone who has listened-in will know, atmospheric disturbances are principally noted for their irregularity—quite unlike the mysterious "S's." What is more peculiar, they were heard in places as far apart as England, the United States, and Australia, at the same time—a phenomenon which does not occur with ordinary atmospheric disturbances. Research now tends to show that these "S's" come from somewhere outside the earth; another world, in fact, seems to be the culprit.



If wireless waves propagated from the earth can exist for four minutes during this month, they will reach Mars provided they are radiated in the proper direction.

This does not imply that they are the work of intelligent beings, however, for it is quite possible that they are due to some natural electrical disturbances taking place in another world.

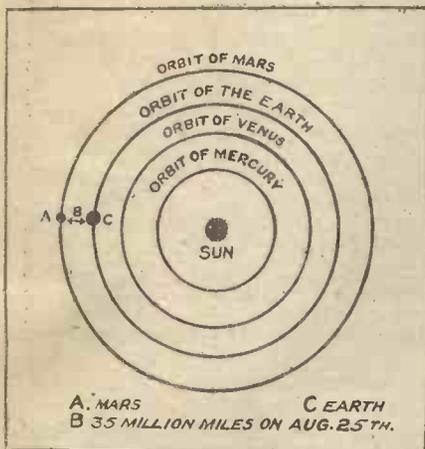
At the same time, if we endeavour to prove that these mysterious "S's" are the work of intelligent beings on another world,

(Continued on page 878.)

SIDELIGHTS ON WIRELESS.

(Continued from page 877.)

we should find a number of peculiar coincidences. The three dots which comprise the letter "S," for instance, would be the natural call sign of this earth, which is the third planet in the solar system from the sun, Mars being the fourth. Then, again, there are some very good reasons technically why a long wave-length such as 80,000—120,000 metres should be used by the Martians or anyone for signalling across millions of miles of space to the earth, just as our high-power transatlantic wireless stations employ comparatively long wave-lengths to transmit long distances. There



The above diagram shows the relative positions of the earth and Mars in August. It will be seen that the earth is the third planet from the sun—Mercury and Venus being respectively first and second. Thus three dots would be the natural call sign of the earth to any intelligent beings. Hence the mysterious S signals—the three dots heard by Marconi two years ago.

is also the probability that the Martians have discovered that very long waves will more easily penetrate the earth's atmosphere than shorter waves. This important point will be discussed later.

Taken on the whole, if we ourselves were to build an exceptionally high-power wireless station to communicate with Mars, it is likely that we would find it necessary to employ a wave-length somewhere approaching the wave-length upon which we hear the mysterious dots.

The Heaviside Layer.

In the meantime, Mars is rapidly getting nearer the earth, and if these mysterious dots really emanate from that planet they should be at their maximum strength on the day when Mars is nearest the earth.

In 1879 the astronomer Schiaparelli discovered a small dazzling white spot in Mars, and since that date quite a number of these spots have been discovered. It was at first thought that these were areas of snow, but this has since been disproved, as some of them are situated in very hot places where snow would be impossible. It has been suggested that these spots may have been created artificially in order to signal to other planets or satellites upon which the Martians have discovered life. Some astronomical books, in fact, state that

flashes of light have been seen emanating from Mars, and the probability is that they have originated in these spots.

So much for Martian methods of communication. But what are the prospects of making our own earthly voices or signals heard on Mars?

Many people are of the opinion that wireless communication with Mars is impossible owing to the presence of a layer of gas called the Heaviside Layer, which is suspended above the earth's surface at a distance of about 30 or 60 miles. It is said that this layer reflects all wireless waves which strike against it just as a mirror reflects light waves.

This is not quite correct, however, for this layer, being a gas, will only reflect those wireless waves which strike it at an angle round about 45 deg., whereas wireless waves which strike the layer at an angle of 90 deg. are pretty certain to penetrate through it into outer space.

Now it is also probable that the mysterious "S" signals or atmospheric waves which are heard on the 80,000—120,000 metre wave-lengths come from outside the earth's atmosphere, so it follows that if these can penetrate the Heaviside Layer from the outside, why not our wireless waves from the inside? Consequently the Heaviside Layer is not likely to stop inter-planetary communication altogether.

Here we come to another point indicating intelligence behind these "S" signals, for, while all wireless waves—ranging from the 100 metres, of short-wave broadcasting stations, to the longest commercial wave, namely, the 20,000 odd metres of Bordeaux—are subject to a certain amount of reflection from the Heaviside Layer, it is probable that very long wireless waves, like very short wireless waves which have merged into heat and light waves, are not affected by the Heaviside Layer at all. And for this reason the Martians, having greater knowledge of world atmospheres than ourselves, have perhaps chosen these very long waves to signal to us.

Four Minutes Enough!

It may be argued that it would require enormous power to transmit wireless waves over the millions of miles of space separating the earth from Mars. But this does not necessarily apply in practice, for there are certain idiosyncrasies about wireless transmission which we have not as yet fathomed.

For instance, our large transatlantic stations make use of enormous power to transmit across the Atlantic, yet it is no uncommon thing for an amateur to carry on communication with the States on a thousandth part of the power used by the large stations. Working on this basis it is possible that some of the signals from our high-power stations may penetrate to Mars pretty frequently.

There is also the possibility that wireless signals never completely die out. We know that some of the light waves which arrive on this earth have been travelling for hundreds of thousands of years. In fact, the astronomers at the Mount Wilson Observatory claim to have discovered a star, the light from which takes one million years to reach the earth!

Now, wireless waves and light waves are very similar, both being waves of the ether, and it has been found that what is common to one is also common to the other. To reach Mars, however, we do not want wire-

less waves to travel for thousands of years—three or four minutes is quite enough; for wireless waves, like light waves, have a speed of 186,000 miles per second. Therefore, any wireless waves which can carry on for three or four minutes at present are bound to strike Mars, provided they are radiated in the proper direction.

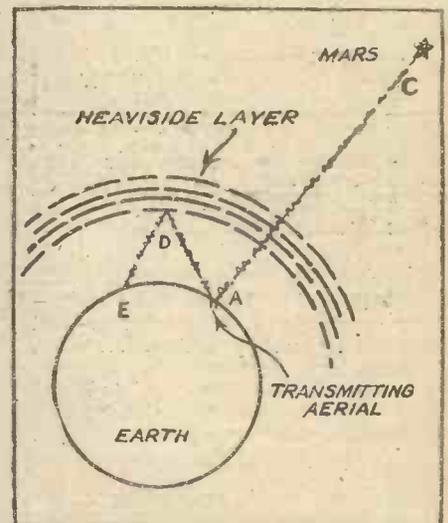
Nevertheless, it is quite possible that wireless waves, like light waves, can, and do, travel for enormous periods of time. In this case all broadcasting, from the first "Daily Mail" concert four years ago when Melba sang to the world, to the present-day concerts from 2 L O, may be travelling through space, and will travel on and on long after we are dead and gone. This is, of course, only a theory, advanced, as a matter of fact, by Hudson Maxim, the famous American scientist; but there is much evidence to show that something of the sort does happen.

Methods of Signalling.

Although not generally known, it is also possible to carry on wireless telephonic communication over a beam of light, and this has been suggested as a means of signalling to Mars.

Gernsback, a well-known inventor and writer, has estimated that we could telephone to Mars by means of a thousand powerful searchlights erected on high ground. He rightly claims this to be the cheapest and most convenient way of speaking to that planet, and if his method were adopted there is no reason why it should not be successful.

Scientists have hinted that our voices might be as strange a sound to the Martians



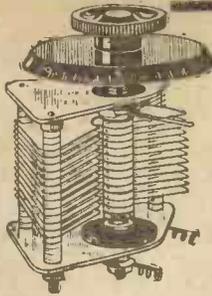
Wireless waves from the transmitting aerial A, which strike the Heaviside Layer at an angle round about 45 degrees, as at D, will be reflected back to earth to the point E. On the other hand, owing to the gaseous nature of the Layer, waves from the aerial A, which strike the Layer at right angles (90°) will pass right through the layer and describe the straight path A B C. Consequently the Heaviside Layer will not prevent the waves from passing into outer space to Mars.

as are some of the hisses, grinds, and clicks of the wireless atmospherics to our ears.

It is naturally rather absurd to imagine that atmospherics—which we know to be caused by thunderstorms and other causes—are the voices or signals from another world, yet often, when on the watch, in some part of the world where all that could be heard was one continuous stream of

(Continued on page 880.)

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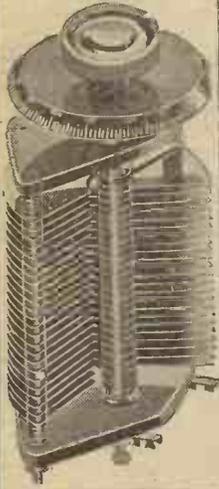
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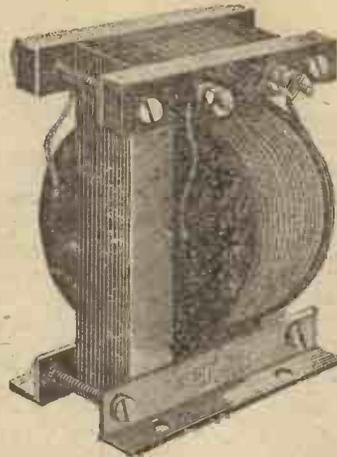
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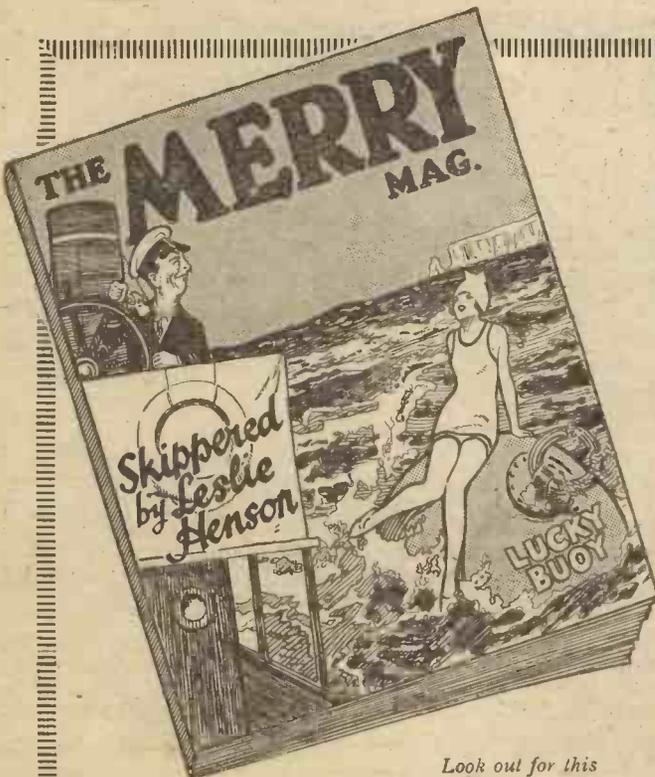
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SIDELIGHTS ON WIRELESS.

COMMUNICATING WITH MARS.

(Continued from page 878.)

atmospherics crashing and hissing in the phones, the present writer has heard sounds unlike the usual run of atmospherics which have appeared to be full of intelligence, as it were, as if someone were endeavouring to get through from the "outside."

It may have been imagination—very probably it was; but, nevertheless, this phenomenon has been observed by many sea-going operators trading to distant lands.

"An Unknown Intelligence."

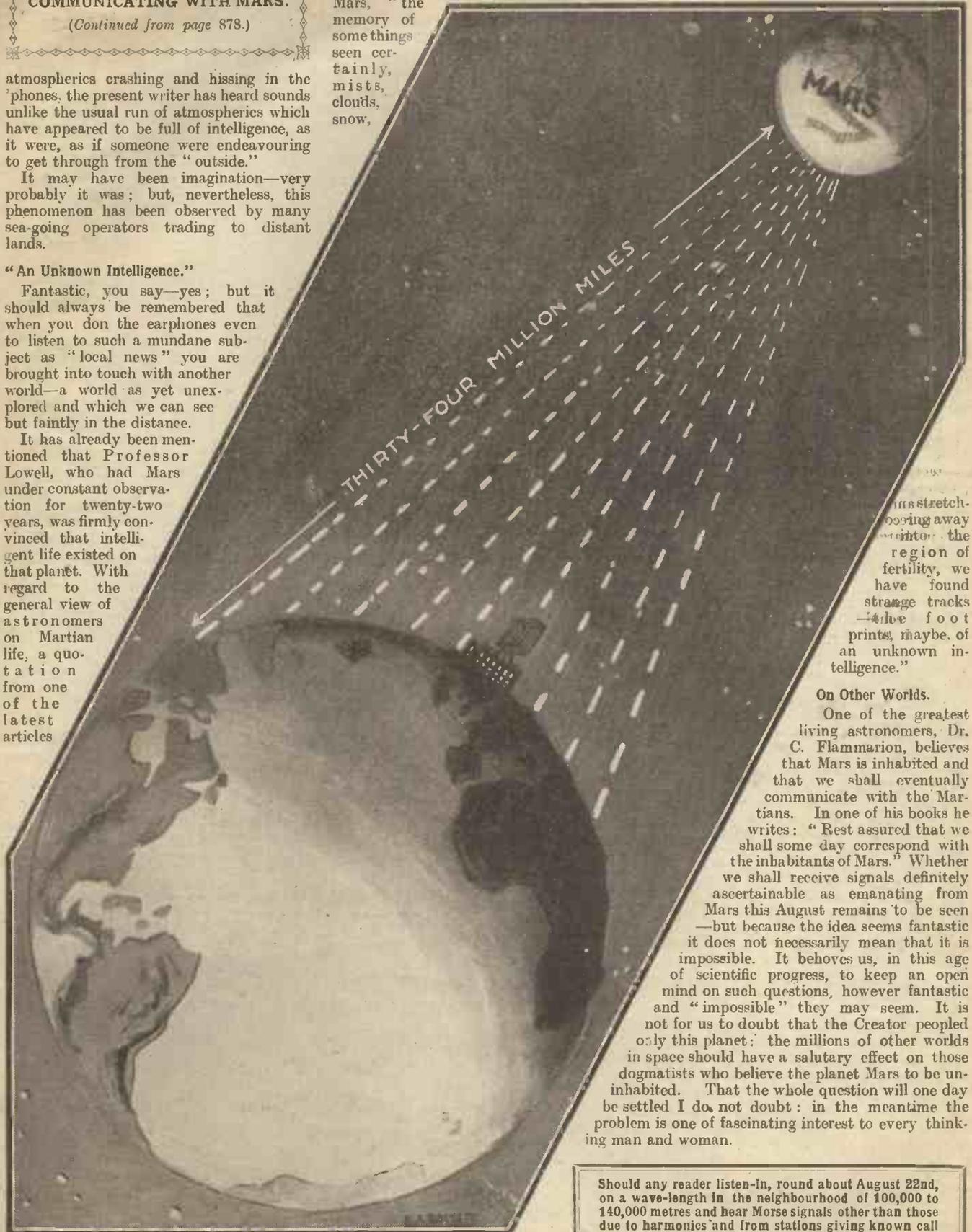
Fantastic, you say—yes; but it should always be remembered that when you don the earphones even to listen to such a mundane subject as "local news" you are brought into touch with another world—a world as yet unexplored and which we can see but faintly in the distance.

It has already been mentioned that Professor Lowell, who had Mars under constant observation for twenty-two years, was firmly convinced that intelligent life existed on that planet. With regard to the general view of astronomers on Martian life, a quotation from one of the latest articles

on Mars by R. L. Waterfield, F.R.A.S., in the "Splendour of the Heavens," will give some idea of their attitude towards the subject.

"We shall take away with us," he says, referring to Mars, "the memory of some things seen certainly, mists, clouds, snow,

water, vegetation, and deserts. But there is something else we cannot forget, a something as seen through a glass darkly. For outlined upon the sands of the deserts and



A pictorial diagrammatic view of the earth and Mars, with an enlarged view of a listening-in post with frame aerial. On August 22nd, Mars will be closer to the earth than it has ever been since 1845, the distance being about 34,000,000 miles.

... stretch-
... away
... into the
... region of
... fertility, we
... have found
... strange tracks
... the foot
... prints, maybe, of
... an unknown in-
... telligence."

On Other Worlds.

One of the greatest living astronomers, Dr. C. Flammarion, believes that Mars is inhabited and that we shall eventually communicate with the Martians. In one of his books he writes: "Rest assured that we shall some day correspond with the inhabitants of Mars." Whether we shall receive signals definitely ascertainable as emanating from Mars this August remains to be seen—but because the idea seems fantastic it does not necessarily mean that it is impossible. It behoves us, in this age of scientific progress, to keep an open mind on such questions, however fantastic and "impossible" they may seem. It is not for us to doubt that the Creator peopled only this planet: the millions of other worlds in space should have a salutary effect on those dogmatists who believe the planet Mars to be uninhabited. That the whole question will one day be settled I do not doubt: in the meantime the problem is one of fascinating interest to every thinking man and woman.

Should any reader listen-in, round about August 22nd, on a wave-length in the neighbourhood of 100,000 to 140,000 metres and hear Morse signals other than those due to harmonics and from stations giving known call signals, the Editor would be pleased to have a report for publication in "Popular Wireless."

Mainly About Broadcasting

By
The Editor

THERE is a story—probably apocryphal—about a Hebrew gentleman and his son who installed a wireless set. One day the father was listening-in, while his son amused himself by playing with a money-box. Suddenly the father managed to tune-in a station. After making careful adjustment and listening to the announcer's voice, he flashed round to his son and cried out: "Ikey, stop rattling that money-box, Aberdeen is calling." I do not know whether there is any truth in this story, but it suggests an idea to me.

Broadcasting Clues.

How many readers who have listened-in to the various broadcasting stations and who do not know the characteristics of the various announcers' voices and who do not happen to be familiar with the various call signs, etc., can recognise, by vocal inflections alone, the names of the various stations broadcasting? It would seem that every broadcasting station in this country has characteristics which make it recognisable, quite apart from any deliberate clue given by the announcer. Cardiff used to be very easy to recognise when Major Corbett Smith was in charge of the station. His voice was probably more easy to recognise than anyone else's, with the exception of Mr. Arthur Burrows. And the use of that weird term "comrados" was a clue no amateur could possibly miss.

But I tried listening-in to the other stations a few days ago and found it very difficult indeed to judge by the voices of the announcers exactly what stations were calling. Perhaps some of my readers who are more familiar with the provincial B.B.C. stations have recognised, through habit, various characteristics of the B.B.C. stations which enable them to determine what station is calling when they tune-in and do not catch the call sign given by the announcer, and are not quite certain to what particular wave-length they are tuned to.

Continental Stations.

It would be rather interesting to compile a list of clues for the benefit of listeners-in who suddenly hear a broadcasting station and want to know right away which particular station it is. I should like to hear from any reader who has compiled, or who is familiar with, any clues of this nature.

The same applies to Continental broadcasting stations. I have noticed that the Continental stations are very apt to forget to give the name of the station more than two or three times in an evening, and, when one suddenly tunes-in to a Continental station, it is sometimes 20 minutes before the announcer remembers to give the name of the station.

There are several stations in France which, apart from wave-length considerations, sound very much alike, as regards the announcer's voice, to the average listener-in, and, unless one knows approximately the wave-length on which one is receiving, very

often half an evening goes by before one is able to determine the name of the station.

And that reminds me that the growth of Continental broadcasting stations has been so rapid of late that the amateur with a good valve set has now at least a dozen good Continental stations to choose from if he wants a change from the B.B.C. programmes. It is very interesting indeed to spend a couple of hours "searching" for Continental stations.

The other evening I made quite a wireless "tour"—listening-in to Paris, Brussels, Berlin, Lausanne, Madrid, and, by way of a change, to a little Bolshevik Morse code from Moscow. Personally, I found these Continental transmissions far more interesting than those of the American variety. I have not yet been able to pick up the new broadcasting station at Vienna, and, as far as I know, nobody of my acquaintance has succeeded. But if any reader of POPULAR WIRELESS has managed to get this station, I hope he will write to me and give as many details as possible, for the benefit of other readers.

* * *

Wireless on a 'Bus.

On Saturday afternoon, August 30th, POPULAR WIRELESS is carrying out a series of experiments of general interest to every listener-in. At 3 o'clock sharp we are leaving this office, which is situated at The Fleetway House, Farringdon Street, E.C.4, in an omnibus, kindly loaned to us by the London General Omnibus Co. The 'bus is being fitted up with a portable frame aerial, a loud speaker, the P.W. 6-valve suit case receiver, and, possibly, a specially constructed 4-valve Unidyne receiver, which is now in process of construction, under the supervision of Mr. K. D. Rogers, Assistant Technical Editor of POPULAR WIRELESS.

We are going to drive straight to Epping, and on the route intend carrying out various experiments in connection with the reception of 2 LO on a frame aerial attached to a motor-'bus. Experiments will also be made to determine the practicability of using a Unidyne set with a frame aerial on a vehicle. Various "gadgets" in connection with eliminating interference trouble from the magneto of the car will be tried out.

I am not quite sure the exact route we shall take to Epping, but it will certainly be the most direct one from The Fleetway House. 2 LO commences transmission on August 30th, I believe, at 4 o'clock, and we anticipate making interesting and useful results from the experiments we shall carry out.

I extend a cordial invitation to all readers of POPULAR WIRELESS, living in the direction of Epping, to look out for us on August 30th, and, when we reach Epping and the 'bus pulls up, readers who manage to spot us will, I hope, make themselves known.

* * *

In this issue the reader will find a special article by Mr. G. H. Daly dealing with the problems of wireless communication with Mars, and details are also given of the

super-valve set constructed by the staff of POPULAR WIRELESS. This 24-valve set has occasioned us a good deal of amusement.

To begin with, we decided to build it more as a joke than anything else, because both Mr. Dowding and Mr. Rogers, as well as myself, were convinced when we planned out the set that the control of so many high-frequency valves would be impracticable, and that the efficiency loss would practically nullify the excessive number of H.F. valves used.

The 24-Valve Set.

But, as we progressed, so many problems presented themselves that the work became more and more interesting. Mr. Dowding hit upon several ingenious ideas for screening the H.F. transformers and for reducing leakage losses, and by the time we had completed the set we began to feel almost enthusiastic about its possible efficiency. Frankly, we only anticipated being able to work the set with the valves barely glowing, that is, on the low part of the characteristic curve of the high-frequency valves.

But a series of tests which we have recently conducted have shown us that this set, which has been built to Mr. Dowding's own design and which embodies several patented improvements of his own invention, is capable of giving exceedingly efficient results, and that the loss on the high-frequency side is comparatively small, when one considers the number of valves used.

And so, if there is anything in this story about mysterious wireless signals from Mars, and if these signals are again transmitted this August, I think we stand a very good chance of receiving them, should they by any possible chance emanate from Mars.

The Jungfrau Experiments.

This reminds me that a rumour has somehow got afloat—and which found a quotation in POPULAR WIRELESS recently—to the effect that Mr. William Le Queux is to conduct, with two American professors, a series of experiments to signal to Mars from the top of the Jungfrau. This rumour has apparently arisen from the fact that on three different occasions during the past twelve months, Mr. Le Queux has, with Professor Müller, of Berne, and Mr. Max Amstrutz, of Mürren, both well-known Swiss wireless engineers, carried out certain wireless experiments on the Jungfrau. Mr. Le Queux now writes to tell me that these experiments were solely concerned with reception tests from 2 LO and Bournemouth. I understand that Mr. Le Queux is making further tests of this nature on the Matterhorn in mid-September.

In connection with transmissions from 5 X X, he tells me that reception results at high altitudes are absolutely marvellous, but one's enthusiasm is usually damped by blizzards and avalanches if the weather happens to be in a bad temper!

Therefore, the story about the listening-in post on the Jungfrau has no foundation at all.

THE EARLY DAYS OF WIRELESS.

By G. W. De TUNZELMAN, B.Sc.

The author's experience goes back to the very early days of the first practical wireless experiments, and his reminiscences in this article will interest every reader.

THE earliest examples of wireless telegraphy were the bonfires on the hilltops employed by our primitive forefathers to call together the fighting men to resist an anticipated attack from some hostile tribe. For the showing of a light is the transmission of light rays, which we now know to be electric waves. But a development on such lines would require not an article but a treatise.

Electric Waves.

A more suitable starting-point is the recognition by Joseph Henry in 1841 and by the great German physicist, Hermann von Helmholtz in 1847, that, to quote the words of the latter, "the discharge of a (Leyden) jar is not a simple motion of the electricity in one direction, but a backward and forward motion between the coatings in oscillation, which becomes continually smaller until the entire *vis viva* (kinetic energy) is destroyed by the sum of the resistances."

It is a legitimate starting-point, since all the earlier transmitters, even for long-distance transmission, were varied types of Leyden jar. In 1853 the first step forward was made by Professor William Thomson, afterwards created Lord Kelvin, by expressing the frequency N of the oscillatory discharge in terms of the inductance L , the capacity C , and the resistance R of the circuit.

In 1865, in his classical paper on the Electro-magnetic Field, and in 1873 in his treatise, James Clerk-Maxwell, Lord Kelvin's greatest pupil, made a great step forward by the foundation of his electro-magnetic theory of light, according to which light waves are simply electric waves of the limited range in frequency which are perceptible to the human eye.

In 1876, Dr.—now Sir Oliver—Lodge, at Heidelberg, read and studied Maxwell's treatise, and his scientific paper of that year describes a mechanical model illustrating some of the features of Maxwell's radiation theory. At this time he also studied Lord Kelvin's 1853 paper referred to above. From that time onwards it was his ambition to succeed in producing electric waves, and various suggested methods occur in his notebooks in that and subsequent years.

The Leyden Jar.

In 1878 Professor G. F. Fitzgerald contributed an extremely able mathematical paper to the Royal Society, in the last paragraph of which he states: "The investigation is put forward as a confirmation of Professor Maxwell's electro-magnetic theory of light, which, though there are some points requiring investigation, shows that the foundation has certainly been laid of a very great addition to our knowledge, and if it induced us to emancipate our minds from the thralldom of a material ether, might possibly lead the most im-

portant results in the theoretic explanation of nature."

At this time Lodge and Fitzgerald were intimate friends, and the then abstruse question of electric wave propagation was discussed between them. It was not until 1882 that Fitzgerald was able definitely to accept the conclusion that a direct artificial generation of waves was really possible on Maxwell's theory. In 1883, at the Southport meeting of the British Association, he expressed his conviction that such generation was possible by utilising the oscillatory discharge of a Leyden jar.

In 1887 and 1888 Lodge made many more Leyden jar experiments, some recounted to the Society of Arts and others published in the "Philosophical Magazine," August, 1888, in which he showed how waves guided along the circuit could be detected and their lengths measured, and discussed very fully the conditions of resonance so that two circuits could be tuned. He also showed how a lightning flash is just the discharge of a condenser through its own dielectric, and he discovered the coherer effect and experimented with single-contact coherers.

Then came the accounts of the splendid series of researches by Dr. Hertz, Helmholtz's greatest pupil, who won the race in which he and Lodge, unknown to each other, were attempting to produce electric waves in the free ether. As Hertz himself said, if he had not made the discovery then, Lodge would have done so.

Syntony.

Hertz's system was not capable of tuning, but suggested directly to Lodge how to accomplish it with two Leyden jar circuits.

But Lodge, though he admits disappointment, at once constituted himself practically an apostle of Hertz, repeating his experiments and showing the way to others to follow up his success.

In papers in the "Philosophical Magazine," one by Lodge the other by Lodge and Howard, the difference in radiation between the open circuit Hertz transmitter and the closed circuit ordinary Leyden jar, was clearly laid down, and the conditions for resonance or *syntony*, as Lodge termed it, were set forth. Lodge's second lecture in 1894 appears to have stimulated Captain Jackson, R.N., F.R.S., Professor Righi, and Admiral Popoff to carry on further researches.

In June, 1895, Guglielmo Marconi, then twenty-one years old, who had studied physics under Professor Rosa, of Bologna, and studied Professor Righi's published papers on electric waves, set to work to increase the distance of transmission and improve generally the methods hitherto employed. He succeeded well in the former by replacing Hertz's oscillator by the connection of one terminal of the secondary circuit of his induction coil to a metal plate or wire net laid upon the ground, and

the other by a wire to a metal can on the summit of a pole.

At the receiving end he similarly connected a metallic filings coherer of his own design, and making other improvements in details. In 1896 he came to England, applied for a patent in June, and brought his apparatus to Sir William Preece, engineer-in-chief to the Postal Telegraph Service. Almost immediately afterwards, the papers were filled with the wildest accounts of what was declared to be an entirely new discovery.

Sir Oliver Lodge, to protect his own credit for the discoveries he had made, applied for a British patent in May, 1897, and without knowing the contents of Marconi's, not then published.

A Master Patent.

In order to show that his 1894 work, though published, and therefore unpatentable in this country, was recognised as of value, and as patentable for telegraphic purposes in the United States, he applied the same year for a United States patent for work recorded in 1894 and introduced into the United States in that year, and obtained it. The British Patent, duly granted, contained 11 claims, forming a master patent for tuned telegraphy.

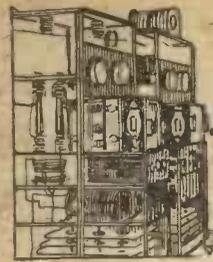
Marconi's system was admittedly incapable of tuning prior to his coupled circuit patent of 1900, of which Lodge stated, in connection with the Lodge-Muirhead appeal in 1911, for extension of the 1897 patent: "I do not wish to contest the value of that patent, I only assert that it does not mark a new scientific departure, or any new discovery, or any change of principle. It is merely a matter of practical convenience, applying things which had been known, and to some extent published before."

The appeal was heard by Mr. Justice Parker, who said in course of his judgment:

"It is, in my opinion, beyond dispute that the system of wireless telegraphy disclosed by the patent in question was one of great merit, and so far as concerned the utilisation of the principle of resonance and the consequent possibility of securing that selectivity which is indispensable for practical purposes, constituted a great advance on Marconi's 1896 patent. It is, in my opinion, equally certain that the patentees have been inadequately remunerated. There have been various causes contributing to this result. It naturally required time and money to put the system into operation on a commercial scale. Further, at the date of the patent a really satisfactory coherer had to be invented, and this was only done after experiments lasting over several years. Lastly, the owners of the patent have been seriously embarrassed by the Post Office monopoly, and I understand have not yet been able to obtain the licence necessary for working the system in this country. . . . The essence and merit of the patented invention appears to me to lie in the conception of the compromise which enabled full use to be made, for the first time, of the principle of resonance."

The Seven Years' Extension.

The patent was extended for seven years for seven out of the eleven claims in the original, with a proviso making it incumbent on the patentees to grant licences on such terms as a duly qualified arbitrator, to be nominated by the Board of Trade, should think fair and reasonable.



Artistes of the Aether

By "Ariel"



Some of the artistes who have given you pleasure when listening-in.

A BRAVE fight has been made for the British composer this last few years, and the names of Sir Dan Godfrey, Sr Henry Wood, Isidore de Lara, as well as the great teaching centres of The Royal College and Royal Academy of Music, will be long remembered for their work; but it is very hard to make the concert public pay high prices to hear unknown and, it must be admitted, very often unworthy works.



Mr. Benjamin J. Dale.

With the advent of wireless, however, a new era has been opened up, for a huge audience is ever present, though invisible, and if once interest is aroused by the merit of the work it is up to the composer himself to continue to make further progress and name. Let them but remember that a lengthy incoherent and unmelodious score will result in the headphones being dropped, and the loud speakers reduced to silence.

British Compositions.

2 L O, with its "Hours with British Composers," has done much to familiarise the public with native music and to prove the existence of native talent. One of the best of these "Hours" was that spent with Benjamin J. Dale. An organist as well as composer, Mr. Dale owes much of his musical training to the Royal Academy of Music, where he is now, by the way, a professor, studying under Frederic Corder. He made his debut with an orchestral composition at the Portman Rooms. Subsequently an overture, "The Tempest," was played at Queen's Hall, and from that time onward Mr. Dale appears to have devoted much time to the viola.



Mr. Raymond Jeremy.

A Suite, a Romance, a Phantasy, as well as a Sxctette, have all been heard, and the latter works were those broadcast recently. During the war Mr. Dale had the misfortune to be taken prisoner, and suffered greatly in health consequently. His music is essentially English in character—sturdy, virile, and full of individuality.

At 2 L O for several of these works Mr. Dale had the support of Mr. Raymond Jeremy as principal viola player.

Like many other famous musicians, Mr. Jeremy hails from the Principality, and his musical career started with the violin, for which he won the "Ada Lewis" Scholarship at the Royal Academy of Music, and whilst there took up the viola under the man who may be said to have made the viola a solo instrument—Lionel Tertis. In 1912 Mr. Jeremy joined the Henkel Piano-forte Quartet, and in 1915 helped to found the Philharmonic String Quartet, which has been so successful at the classical concert halls.

The Lighter Side.

He is now also a member of the Meredy String Quartet, the Virtuoso String Quartet and the Brussels String Quartet. He has already toured the Continent, and contemplates a world tour next year. The viola, next to the 'cello, broadcasts most successfully, and for that reason works for that instrument are always enjoyable.

2 L O has also catered well for the lighter side of its programmes, and there is no doubt as to the success of Mr. Dan Godfrey in London.



Miss Queenie Pinder.

The entertainers, however, have had a very large share in the work, and some first-class artistes have been heard. At a recent miscellaneous concert Vladimiroff's Bala-laika Orchestra vied with the comedy duets of Marcia Bourne and Jean Copping, and the well-known entertainers Mike Eman, Queenie Pinder, and Syd Mac.

Mr. Eman has made a speciality, among other turns, of that most difficult yet popular study, the Yiddish alien, and his subsequent rise in society. From the days of Potash and Perlmutter this character study has found favour both in theatre and music-hall, and Mr. Eman justly prides himself that he has contrived to make his studies "carry over" without causing offence to the Jewish peoples themselves.

He is a great favourite with the Sunday League Concerts, with which he has appeared the last three years, as well as at the regular halls and Press functions. For several of these he has been booked several years in succession.

A Promising Comedienne.

In the same programme was Miss Queenie Pinder, a young comedienne who has a good theatrical career before her. Com-

mencing at the age of eight (she is yet only seventeen), her professional experience has included dancing, character studies, and principal parts in many comedies. During the war Miss Pinder spent four years in entertaining the soldiers, joining the well-known concert party The Shamrocks at the Y.M.C.A. camp at Seaford, where they entertained over 33,000 Canadian soldiers in a fortnight. Her first London engagement was made at St. George's Hall, 1919, since which she has made successes wherever she has appeared.



Miss Isabelle Pagan.

Some remarkably interesting work has been done at the Northern stations recently, one of the most unique being the pioneer production of the unknown Ibsen drama "Emperor and Galilean" (The Apostasy of Julian). Heard for the first time in Europe, and performed subsequently at the Lauriston Hall, Edinburgh, under the auspices of the Orpheus Lodge (Theosophical Society), Ibsen himself declared "this will remain as my chief work," and though extracts have been seen in Norway, it has remained for that brilliant writer and producer, Isabelle M. Pagan, to introduce the play in its working form here.

Shakespearean Plays.

Miss Pagan is a well-known figure in Scottish literary circles, of wide experience, and one which has led her all over the world. She has devoted many years to the writing and adapting of plays from other novelists such as Dickens. She has produced working productions of "Peer Gynt," "King Lear," "Antigone," as well as compressed productions of Wagner's operas, including "The Ring." For the latter Miss Pagan has had assistance from her musical sister, Mrs. Bailey, who composed also the special music for the "Emperor." These productions would broadcast admirably, by the way, and will no doubt be given. Miss Pagan has had many of these interesting recitals given under the ægis of the Theosophical Society, and she has worked also for the British Empire Shakespeare Society.



Mr. Mike Eman.



The Technical Editor of "Popular Wireless" will be pleased to receive wireless sets and component parts for test. Reports will be published under this heading.

in this capacity as well as it does for purely crystal receiver work.

Messrs. Alfred Graham & Co have asked us to point out that the recent reduction in price of the Amplion Junior Loud Speaker was made merely to encourage summer radio. They state that there was no question of inability to dispose of their output, and that demand has invariably exceeded their supply. This latter, we should imagine, judging by the popularity of all types of Amplions, must be truly colossal. They further state that no firm other than themselves manufacture Amplion loud-speakers, although Messrs. Alfred Graham design Amplions for a number of the leading wireless companies, which are marked with their name in addition to the word "Amplion."

A very ingenious device in theory is the "Double Wave Tuner," with which it is claimed the extra energy available when 5 K X is relayed 2 L O can be made use of by 2 L O in order to provide signals. It consists of a duolateral transformer the centre of which is fitted a signal amplifier.

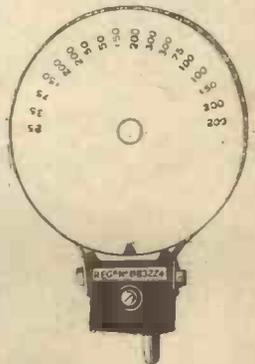
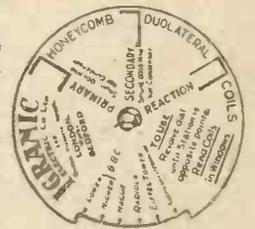
Terminals are provided for taking connections to the existing aerial and earth terminals of a set. All that seemed to happen when the instrument was on test was that the tuning of our receiver developed most critical characteristics, but no increase in signal strength was noticeable, although a considerable amount of time was spent in manipulating the various necessary controls.

We would rather like to know who are the manufacturers of this instrument, as they did not supply their name and address when the instrument was submitted for test. The retail price, 21s., was supplied, but, candidly, we fail to appreciate the truth of the statement which appears on an accompanying leaflet, i.e. "The Double Wave Tuner will double your signal strength."

We have been asked by Messrs. K. Raymond to point out that a slight error occurred in their advertisement which appeared in last week's issue. The price of ebonite quoted at 9" x 10" at 2s. 3d. should read 9" x 6"

"The Wireless World Directory of Experimental Transmitting Stations and Regular Transmissions" is the title of a most useful handbook recently published by the Wireless Press Ltd. Price 1/-.

An interesting wave-length reckoner issued by the Igranico Co. The top disc is fixed to the bottom one by means of a brass pin, and when revolved the figures appear in the three "windows" in their correct order as shown.



THE G.W.I. "Plateless Valve" is illustrated on this page, and in view of its novel construction readers will appreciate the opportunity of studying it in detail. The name is rather misleading, because, although this valve does not possess a normal plate or anode, it nevertheless possesses something, which, if not called a plate, should be given an alternative title. Messrs. G.W.I. allude to the silver lining of the bulb as an anode. We suppose, therefore, that we were wrong in thinking that the word plate did not refer specifically to the anode of a thermionic valve whatever its shape or type. However, this has little to do with the G.W.I. valve as a valve, whatever the latter should not be its classification in nomenclature, our first concern on receiving a sample for test was to determine its relative efficiency in operation.

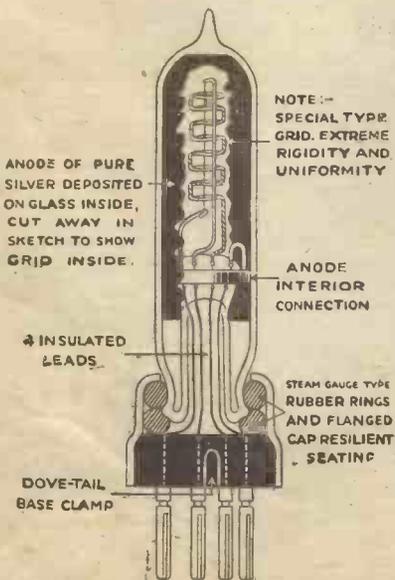
We are pleased to be able to report that from this point of view the G.W.I.'s new product leaves nothing to be desired. It differs but little in functioning from any other first-class valve, except that in a detecting capacity we believe that it provides a tone of such mellowness that the G.W.I. claim of "valve power with crystal purity" is fully justified. In detecting and amplifying stages there is also a slightly greater degree of amplification, or perhaps it is "fulness of tone," distinctly noticeable when a rapid comparison is made. These valves are by no means "soft," inclining, in fact, rather to the "hard" side, and they are fully capable of standing up to considerable H.T.

voltages without ill-effects. We can without hesitation recommend the G.W.I. Plateless Valve to the consideration of our readers. A small matter, perhaps, but we cannot agree with Messrs. G.W.I. that their new valves are non-microphonic. However, the rubber seating to the glass bulb that can be seen in the accompanying diagram, reduces the possible annoyance from this cause to a minimum quantity, so it is a factor that will not trouble the average listener who employs these valves.

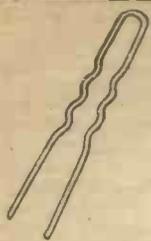


"Blue Spot" telephone receivers, a new type that is to be put on the market by N. Heywood, the manufacturer of "Galene" and other crystals.

"Galene" is the name of a synthetic crystal, several specimens of which have been sent to us for test by N. Heywood, of 386, Richmond Road, Twickenham, Middlesex. The samples arrived well packed, and in small boxes marked 1s. 6d. We noticed with pleasure that, besides being carefully protected with cotton wool, each piece of crystal is enclosed in a tiny transparent envelope. Thus the crystal can actually be seen and handled without the fingers coming in contact with its surface. "Galene" is a very sensitive crystal, and provides the same purity of rectification (without the instability) as natural galena. Signals that were comparatively weak, using another patent crystal which shall be nameless, came up with gratifying loudness, using "Galene" on a "P.W." Ultra crystal set, 25 miles from 2 L.O. "Galene" itself possesses a fairly low ohmic resistance at low voltages—i.e. one specimen tested registered 300 ohms at 1 volt. This is 10 ohms less than is claimed by Mr. N. Heywood. It stood up quite well in a reflex valve set, using a fairly heavy contact, but it does not shine



A diagrammatic representation of the G.W.I. "Plateless Valve." Owing to the heavy silvering on the inside of the glass the interior is not visible in ordinary circumstances when the valve is examined.



"Why didn't someone think of it before?"

Pondering feminine problems one fine day, a clever man hit upon the idea that has made the modern hair-pin a miracle of efficiency (both as a hair-pin and as a pipe-cleaner)—the kink that keeps it in. Millions of women bless the idea, relieved of the fear of looking "frights."

Pondering wiring problems many years later, a radio genius hit upon the simple device that has entirely superseded all switches, plugs and terminals—the inexpensive universal contact, CLIX. And now it is the turn of radio enthusiasts to bless.



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CLIX with locknut, **3d.**

INSULATORS (six colours), **1d.** each.

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Write for Wates' lists of value-for-money components—a wonderland for wireless workers and enthusiasts. There are fascinating bargains on every page.

HERE ARE A FEW:



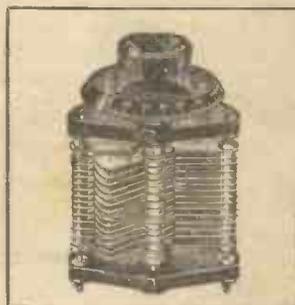
The "MICROSTAT" AT 2/9

The most perfect form of filament control you can use, its resistance being from zero to 200 ohms. It is a real protection to your valves, whatever type you may use.



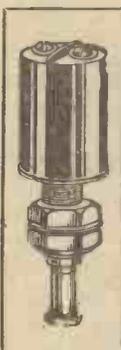
The "SUPRA" L.F. TRANSFORMER AT 12/6

The secret of its wonderful popularity is in the windings which are in insulated layers each having six sections. Laminated iron core. Ratio 5:1.



The "KINGSWAY" VARIABLE CONDENSERS at

'001 .. 8/- '00075 .. 7/-
'0005 .. 6/- '0003 .. 5/6
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3-plate vernier 3/9. Hard sheet aluminium vanes most exactly spaced. Ebonite end pieces. Handsome "Troilite" knob and dial.



The "KINGSWAY" PULL & PUSH SWITCH. VERY EASILY MOUNTED.

Heavily nickelled, with self-cleaning contacts that ensure a perfect make or break with a reassuring "click." Under panel space only 1 1/2 inch. The switch of a hundred uses. **2/6**

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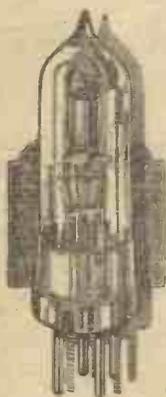


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Thousands upon thousands of valves have been manufactured by the producers of the "Amrex" valve in research work covering a period of 15 years.

The "Amrex" embodies all the advances thus attained. There is nothing freakish or useless in its design, but there is a great deal in its manufacture that means much in radio reception. As H.F.—Detector—or L.F. it is equally efficient, achieving the summit of modern radio valve performance.



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Plate Volts, 40-120.

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The Editor desires to direct the attention of his readers to the fact that, as much of the information given in the columns of this paper is of a technical

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

PATENT ADVICE FOR READERS.

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

Questions and Answers

F. R. B. (Oswestry).—I find that my accumulator (celluloid type) is leaking slightly at one of the seams. What is the best way to stop this ?

Amyl-acetate should be used for cementing together the celluloid. Some shredded celluloid should be dissolved in the amyl-acetate to a consistency of thin cream, and this cement then applied to the parts that require uniting. Note that this material is highly inflammable, and should therefore not be used near a naked light. It is best to empty the accumulator before applying the cement, of course.

J. E. J. (Clapton).—In the case of a loose coupler, when loading coils are added in both circuits to increase the wave-length, should coils of similar size be placed in both circuits, or should the secondary circuit have larger coils than the aerial circuit ? I notice that instructions for making secondary coils generally give them as being much larger than the coil on the primary of the same set.

The coils should be loaded in the same proportion, and if the inductance of one circuit is increased by a No. 50 coil, the other circuit will need a similar coil to bring it into tune.

The reason that the original primary and secondary coils are of different dimensions should be apparent if it is remembered that the aerial itself is connected to the aerial coil, and therefore a smaller coil in the aerial circuit will be required in order to give the same wave-length as the secondary circuit, which has no aerial.

Once the circuits have been brought into tune in this way they will need equal loading in order to remain in tune with each other.

A. B. C. (Luton).—What alteration to my crystal set will be necessary in order to add an H.F. amplifier to increase its range ?

If the following connections are made, there will be no necessity to alter any of the connections in your existing crystal set, as the inductance included in it can remain to act as a tuned anode coil, as this method of coupling the H.F. to the crystal is to be used. Connect aerial to one end of A.T.I. and other

IMPORTANT NOTICE.

Readers are please requested to note that not more than three queries can be answered in one letter addressed to the Technical Queries Department. Owing to the extraordinarily heavy pressure on this department, readers are requested only to send in questions which they find they cannot possibly solve for themselves. On no account will more than three questions be answered in one letter, and telephone calls and personal calls at this office cannot be dealt with, owing to pressure of work on the technical staff.

A stamped and addressed envelope must accompany all queries. A copy of the questions asked should be kept by the sender, as it is not always possible to reproduce the original query when replying. Number your queries 1, 2 and 3, and answers will be given to each item.

end to earth—or slider to earth if a solenoid coil with slider is to be used. A variable condenser is connected across the A.T.I. if a plug-in coil is utilised. The aerial also goes to grid of valve, while the plate goes to the aerial terminal of crystal set. The earth terminal of crystal receiver should go to H.F. + and H.T. — be taken to earth, as also are one of the filament and L.T. —. The remaining filament is connected through the rheostat to L.T. +. The phones remain in their old position on the crystal set. It may be found necessary to connect a small fixed condenser across A. and E. of crystal set to load up the coil before it will act as an anode coil.

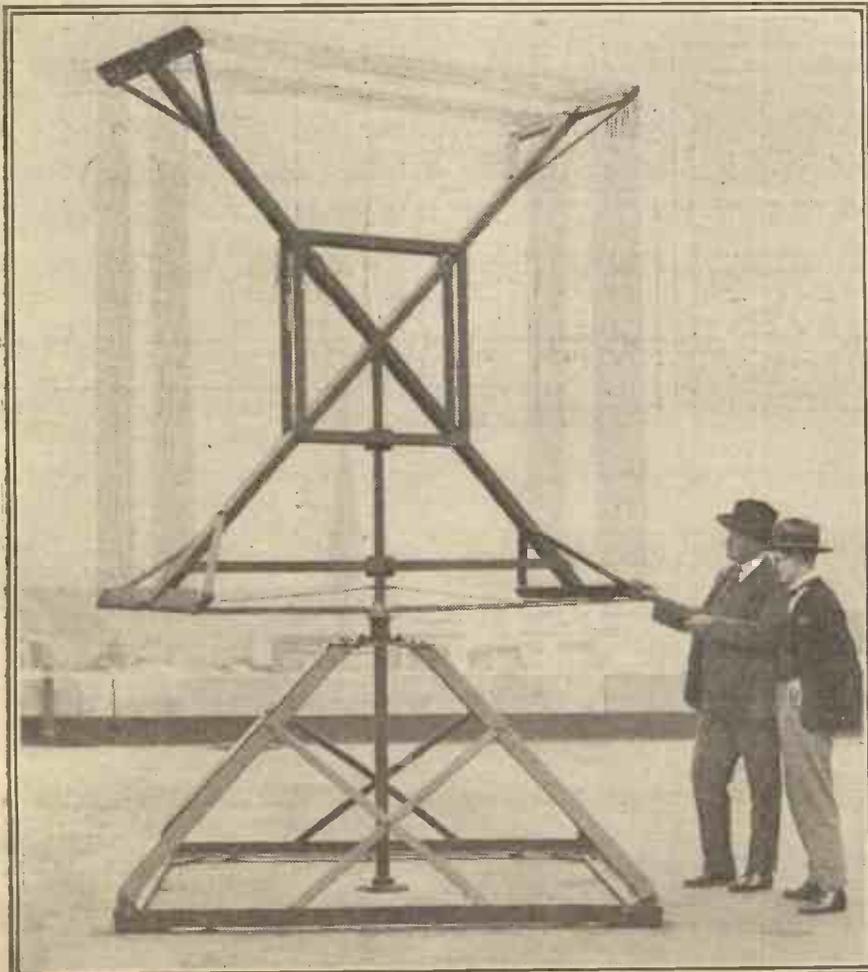
A. B. M. (Maidenhead).—Is reaction allowed by the P.M.G. on a single-valve set ? If not, is there any other method whereby I can increase my range and volume ?

The P.M.G. specifies that reaction is not to be used in such a manner as to cause interference to other stations. Therefore there is no definite rule against reaction being used on a single-valve set, but great care must, of course, be taken to prevent it causing interference. Another valve is the only satisfactory method of increasing your range and volume. Try adding an H.F. valve, then you can use a form of reaction which is less liable to cause interference to your neighbours.

B. R. H. (Gloucester).—I wish to construct a telephone transformer with a ratio of 8 : 1. How many turns and what wire should I use ?

On a 3 x 1/2 in. former wind 1,200 turns of 38 (1/2 oz.), cover with tape or thickly waxed paper, and wind 3 1/2 oz. of No. 42 S.W.G. for the primary. The core should be formed of 22 gauge iron wires.

(Continued on page 887.)



London's largest frame aerial on top of the Bush House.

RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from page 886.)

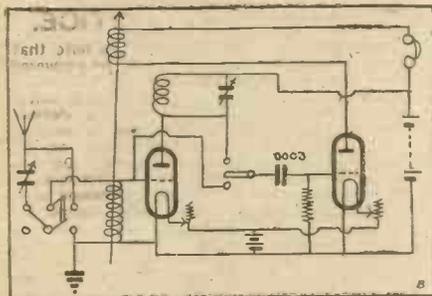
C. R. C. (Highbury).—What are the connections for a crystal set employing a solenoid coil for tuner, with two sliders?

The following connections should be employed: Aerial to one end of coil and to one terminal of the crystal detector. Other side of detector to one 'phone terminal, the second 'phone terminal going to one of the sliders. The remaining slider is connected to earth. It is sometimes advantageous to take the remaining end of coil also to earth.

* * *

J. J. W. (Walton-on-the-Naze).—What are the connections for a long-distance two-valve set employing H.F. amplification (tuned anode) and detector valve with reaction? I propose to use plug-in coils, and should like to know how a switch may be arranged to place the aerial condenser in series or in parallel? Can another switch be arranged to cut out the first valve when it is desired to use only the single-valve detector with reaction?

The accompanying diagram shows the connections for a circuit of this description, which is capable of extremely good long-distance reception upon 'phones. The switch on the left places the aerial condenser in series when thrown over to the left, and in parallel with the coil when thrown to the right. The capacity of this condenser is not important, and is generally somewhere between .001 or .0005. The value of the anode condenser should not be greater than .0005, and generally .0003 or .0002 gives better results.



Between the valves is shown a single-pole double-throw switch, with the grid leak and condenser lead connected to its central terminal. The outer terminals go to aerial and anode circuits, so that when the switch is "up" both valves are in circuit, and when it is "down" the detector valve is connected direct to the aerial circuit. The H.F. valve's filament may in the latter case be turned off, and the set used as a single-valve detector with reaction.

The usual fixed 'phone condenser may be placed across the 'phone terminals if desired, or a fairly large fixed condenser may be connected across both the H.T. battery and 'phones. If the circuit oscillates too readily the leads from the L.T. battery to the first valve may be reversed so that the grid will be indirectly connected to the L.T. + terminal instead of to L.T. —.

The grid leak shown is of the fixed type, and has a value of 2 megohms, but better results on long-distance work are obtainable with a leak which is variable.

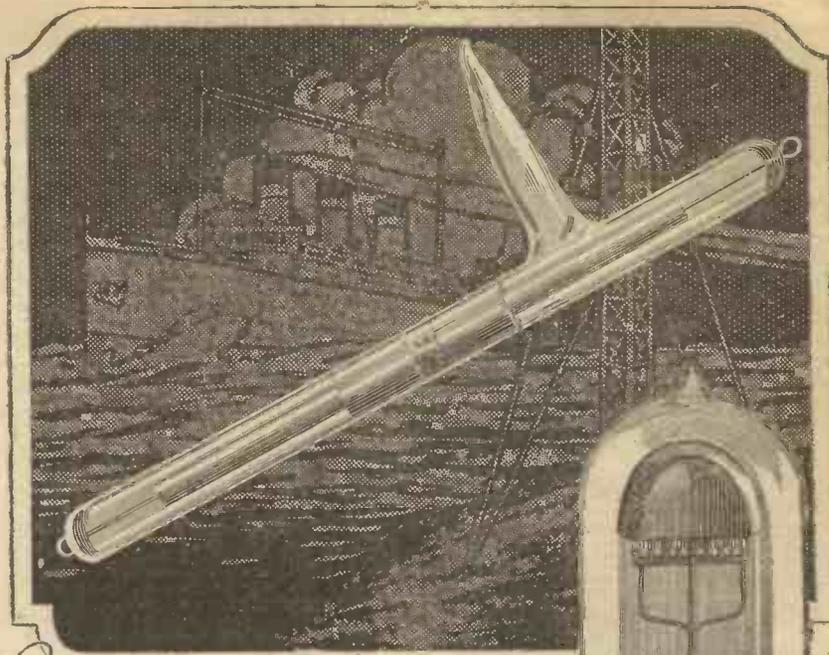
The reaction coil is shown coupled to the aerial coil, and this is essential when the first valve is not in use, but for two-valve work it should be coupled to the anode coil for best all-round results.

The correct voltage of the L.T. and H.T. batteries depends upon the type of valve which is to be used. Dull emitters are quite O.K. for this circuit, but in all cases the battery voltages should be those recommended by the makers of the valves which you are employing.

* * *

D. D. (Wigan).—I am about to make the 2-valve Unidyne set (detector and L.F. amplifier) described in recent issues of POPULAR WIRELESS, and wish to use a 10-1 telephone transformer. Can this be used instead of a low-frequency transformer?

No, the 10-1 ratio transformer is not suitable, as the ratio is far too high. The only transformer needed in the two-valve (det. and L.F.) Unidyne receiver is the 4-1 ratio inter-valve transformer, such as is usually used in ordinary wireless sets.



*Yesterday the Coherer
—to-day a Cossor.*

It is a far cry to that memorable December's day nearly 25 years ago when the first wireless signals ever sent across the Atlantic were received on a Coherer at Signal Hill, near St. John's, in Newfoundland.

Experimenters in those days had no thermionic valves to help them. Instead, we know that their apparatus was so delicate and easily put out of adjustment that reception was often more a matter of good luck than judgment. And instead of an aerial anchored to a huge kite swaying in the breezes five hundred feet above the ground, the modern wireless enthusiast can often receive strong signals from powerful land stations several thousand miles distant on a mere 20 feet of wire running round the picture moulding.

For long-distance work to-day there is one Valve universally recognised as being developed to a high pitch of perfection for this specific purpose—the Cossor P2.

To distinguish it from other Cossor Valves it has a red top. If your Set uses high-frequency amplification (practically all Receivers with more than one Valve do), then be sure that the one on the extreme left is a Cossor P2—no other Valve can give you such results.

Cossor efficiency (whether P.1 or P.2) is due to its unique construction (patented throughout the world), for its hood-shaped Anode traps practically the whole of the electron stream. Incidentally this improved design has many other advantages. For instance, its curved filament—arched for strength like an old bridge—is self-supporting and cannot sag.

Therefore the normal life of any Cossor is considerably greater than any Valve with a long and slender straight filament.

Manufactured in two types:
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From all Dealers.

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EXTENDS TO ALL COMPONENTS
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 SPECIAL 4-ELECTRODE VALVE for this circuit.
 12/6, post free. DUTCH R. VALVES (not for Unidyne), 5/3 each, post free.
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CABINETS YOU WANT.
PICKETT'S CABINETS—they're good value, from 1/6 each, highly polished.
 Cabinet (P.W.) Works, Albion Road, Bexley Heath, S.E. Write for List.

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THE VALVE CRYSTAL.
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BUILT FOR SERVICE.
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J. & J. Laker Co., 457, Romford Rd., London, E.7.

Correspondence

THE "P.W." UNIDYNE.

The Editor, POPULAR WIRELESS.
 Dear Sir,—I enclose results obtained on first evening of trial with a 1-valve Unidyne set built by me. Parts used were as follows:
 Ormand 0005 variable condenser, with vernier.
 Thorpe K 4 5-pin valve.
 6-volt accumulator.
 Polar Cam vernier coil holder.
 Burned coils (2 1/2, 3, 4—2 L O—2 B D) and 75-100 reaction Watnal variable grid leak.
 Fil. Res.: microstat.
 Fixed condenser, Dublier.
 1-Valve Unidyne circuit.
 Stations received on above circuit—
 Manchester, 2 Z Y, on loud speaker, 3 1/2 miles.
 London, 2 L O }
 Bourneimouth, 6 B M } Pure and clear on
 Birmingham, 5 I T } 'phones.
 Glasgow, 5 S C }
 Newcastle, 5 N O }
 Also two continental stations (wave-length, 400-450).
 All these stations were logged in one evening, August 1st, 1924.

The following note may also be of interest:
 My wireless dealer is in the centre of City of Manchester, and therefore has fairly large sales. He acquired stock of Thorpe K 4 valves on my recommendation, and has since brought his complaints re the circuits with these valves to me for inspection. I give a list of the sixteen cases of failure to get any signals at all after constructor has built his set.
 Largest fault, variable condenser (bad contacts).
 Second, 5-pin valve holder (bad contacts).
 Third, Faulty grid leaks.
 Fourth, Fixed condensers, cheap rubbish.
 Fifth, Filament res., cheap rubbish.
 All sets are now working A1.
 The new amateurs seem to be worried by series A.T.C. tuning, so I advise parallel tuning, with '0001 mfd. in A.T.I., which assists set to oscillate. This circuit is also much easier to find the various stations; it is simplicity itself to tune.
 Final adjustments for clear signals being made on grid leak.
 Thanking you and staff, etc.
 Yours truly,
 H. BANNISTER.
 6, Church Lane, Harpurhey, Manchester.

"STEREOSCOPIC" WIRELESS RECEPTION.
 The Editor, POPULAR WIRELESS.
 Dear Sir,—I was very much interested to read in a recent issue of POPULAR WIRELESS an account of Dr. John Hays Hammond's tests in multiplex wireless transmission. It seems to me that his system would make possible what I have for years felt to be the final improvement in the reproduction of music: that the music should be presented to the ears as a stereoscope presents a picture to the eyes—giving the idea of relative position of, say, the instruments of an orchestra just as the stereoscope presents in relief the objects in a picture.
 Two microphones would be used at the transmitting station and placed in the same relative positions as are the ears. The two transmissions would then be received separately by each of the telephones in the usual headgear—the right and left ears receiving the transmissions of the right and left hand microphones respectively. This would enable the listener to fix, mentally, the positions of the various musical instruments instead of—as is at present the case—all instruments seeming to be placed in the plane, which bisects at right-angles the line joining the ears.
 Yours faithfully,
 W. L. LAWRENCE.
 Wylfa, Highfield Park, Rhyl.

RECEPTION OF 5 X X.
 The Editor, POPULAR WIRELESS.
 Dear Sir,—On a recent evening, I had very good reception from Chelmsford, 5 X X, on my home-made crystal set. I heard the announcer very plainly, also singing and orchestra.
 I am, yours truly,
 SYDNEY H. THOMPSON.
 4, The Elms, Melrose Street, Hull.

The Editor, POPULAR WIRELESS.
 Dear Sir,—As a reader of your journal, I am writing to you re the new high-power station, 5 X X. When I first tuned-in to the new station with a two-valve tuned anode straight set, I was frankly rather disappointed at the result.
 I had rather expected to have to tie my set to the table, but it came in at average loud-speaker strength only, although I could feel there was plenty of push behind it.
 I discovered that there is one point of advantage with valve set users which I have not seen mentioned,

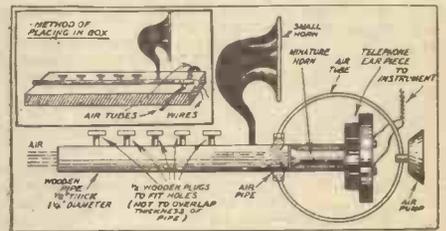
namely, that an aerial, i.e. a P.M.G. 100 ft. stretch of wire, is quite an unnecessary luxury. I am from sixty to seventy miles from Chelmsford, using no aerial and no earth, signals are just discernible using earth and no aerial signals are quite readable (using reaction), holding the aerial terminal between thumb and finger and returning signals are as loud as London on full aerials. With five feet of No. 24 D.C.C. wire signals are at more than 50 per cent full strength, and it is possible to tune-in sharply on the carrier wave alone.

Wishing every success to your valuable paper.
 V. SAVAGE.
 Barrett's Park, Heathfield, Sussex.

BROADCAST PROGRAMMES.
 The Editor, POPULAR WIRELESS.
 Dear Sir,—"W. E. P." in his needlessly irritable criticism, is really "begging the question" all the time. The charge that the B.B.C. programmes are predominantly "strictly classical" is an absurd overstatement, and can be disproved by an unbiased study of the "Radio Times." The programmes must be considered as a whole, as anyone can make out a case by partial selection, and personal impression alone is no guide. The B.B.C. cater for a vast audience, and I think they are wonderfully successful in providing the best music of all types, but, as always when one tries to please everybody, there always remain plenty of people dissatisfied, because they are not getting everything to suit themselves. And, of course, such critics always think their own views represent those of the "ordinary man" (if he really exists!).
 Putting this on one side, however, I must protest against "W.E.P.'s" reference to the B.B.C. musical critic. To speak of Mr. Scholes as a "high-brow musician, wishing to impose his own ideas," etc., is so unjust it can only be excused by ignorance. No musician has shown more sympathy with the ordinary man, nor helped him more to increase his musical enjoyment. If "W. E. P." knew a little about Mr. Scholes' writings, he would hesitate before calling him "impertinent." Mr. Scholes has already pointed out that he is not responsible for the programmes, but, in any case, he ought to be spared these ungenerous attacks.

The question of giving the public what it wants is not so simple as most people think. Many popular works are not so immediately, and if the public were given only what it asked for, it would never have heard its own favourites.
 I have not used the educationalist argument here, but will point out that a purely commercial policy in art is always bad, as it does not leave taste as it is, but tends to lower it.
 S. H. CLARKE.
 20, Glen Eldon Road, St. Anne's-on-Sea.

AN INTERESTING EXPERIMENT.
 The Editor, POPULAR WIRELESS.
 Sir,—The diagram below shows how a loud volume of sound may be got, just as the flute-player with his fingers on five holes of the flute gets a loud note, from the sixth uncovered hole.
 With a stout piece of wood 20 in. long by 1 in. diameter, and made to shape as in diagram, I got one of my brothers to speak in the mouth of it, and my other two to blow air at the space in both sides. With my fingers on five holes and the top



last uncovered and a tin horn inserted into it, the voice was indeed very loud. In the diagram some other device could be used for supplying air; such as a revolving propeller. I am a "P.W." reader, aged nineteen, and served three years in the P.O. fitting instruments and removing faults on telegraph, telephone and staff instruments as line-man's assistant. I have been studying wireless for the past eight months and have a fair knowledge of the function of the valve. I like wireless very much, and expect to add an improvement to the valve one of these days.
 I remain, yours truly,
 JOHN J. MCSHERA.
 14, Dominic Street, Limerick, Ireland.

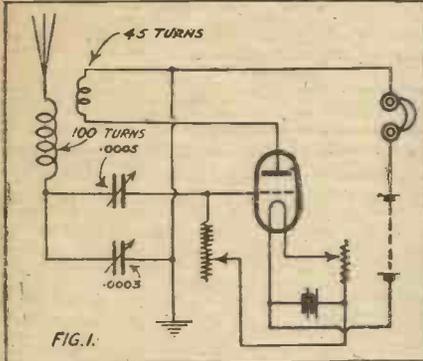
A NOVEL CIRCUIT.
 The Editor, POPULAR WIRELESS.
 Dear Sir,—I am a regular subscriber to your excellent publication, and in return for the many useful articles I have gleaned therefrom I am enclosing a sketch of a single-valve circuit I stumbled on while experimenting with "single-valve supers." I think you will agree the circuit is different to any
 (Continued on page 898)

CORRESPONDENCE.

(Continued from page 888.)

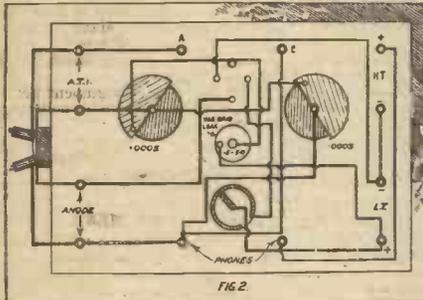
so far published, and for quality of reproduction and volume of sound it excels any of the "supers" I have heard.

A great point is its simplicity of construction and easy operation. As it requires but few components, the cost is low. Following are those required: Ebonite panel, 10 in. x 7 in.; rheostat, valve



holder, variable condenser, '0005, ditto '0003; 2-way coil holder (basket coils), variable grid leak, and 12 terminals.

One peculiarity of this circuit is that it requires a large aerial coil, and I find the best values for broadcasting are 100 turns for aerial, and 45 for anode.



Tuning is very sharp on the '0003 condenser, and I have been successful in tuning out 2 L O and receiving Birmingham with fair strength. My aerial is very screened.

If your technical staff will try it, I am sure you will find it well worth publication in your journal, and I shall be glad if you will put it before your readers with any criticism you care to offer.

Yours faithfully,
H. G. CHITOS.

1, Lyneroft Gardens, Ealing, W.13.

EFFICIENT CRYSTAL RECEPTION.

The Editor, POPULAR WIRELESS.
Dear Sir.—In your issue dated July 12th, I noticed a letter from a correspondent, on page 728, who signs himself W. K. Reef, but omits his address. As I am interested in crystal sets myself, I should very much like to get into touch with him, if possible, my object being to know what are the component parts which go to make up the set to which he refers in his letter, if he is, of course, willing to pass on his experience to others. The set I have at present is not very satisfactory, as the nearest station to me is nearly forty miles away, so I should be very pleased to know how to obtain a real good set. Trusting that you will be able to oblige me in this matter, I remain,

Yours faithfully,
J. NEWLAND.

11, Abercrombie Street, Landport, Portsmouth.

ANOTHER 5 X X REPORT.

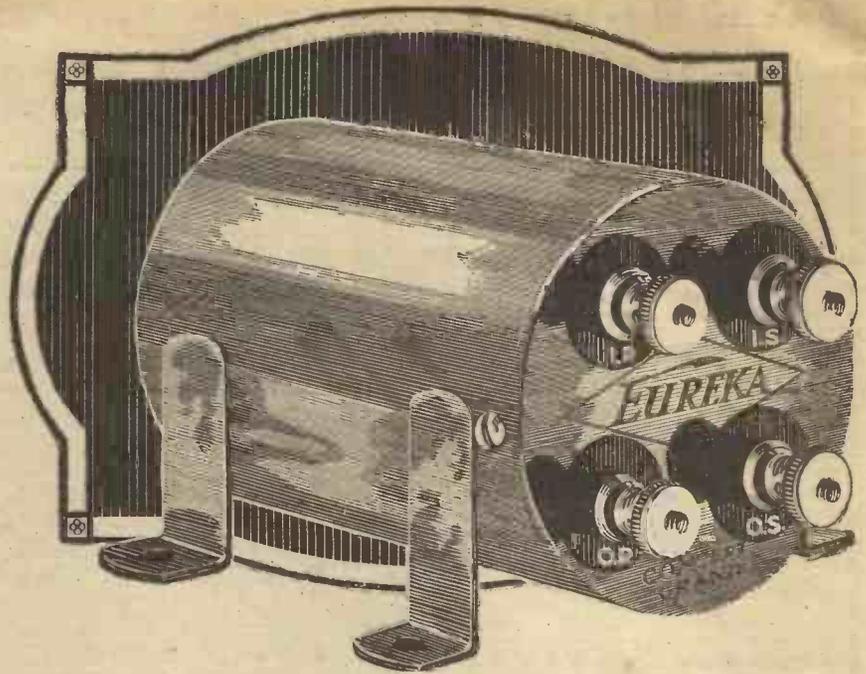
The Editor, POPULAR WIRELESS.
Dear Sir,—Re your invitation for reports of reception of the Chelmsford high-power station, may I say that with the help of my POPULAR WIRELESS Dual Amplification Receiver, I have heard it several times during the last week.

Signals are so strong that, on placing a small gramophone horn on one of the 'phones, the speech fills a fair sized room. It is impossible to bear the 'phones on the head.

On a crystal set signals are quite good.

Yours faithfully,
P. FARROW.

39, Guildhall Street, Thetford, Norfolk.



14 days' immersion in water won't affect it!

It is safe to say that few other Transformers could live up to half the stringent tests which every Eureka has to pass before being issued.

For instance, each one is hermetically sealed within its coppered steel case and guaranteed to be absolutely impervious to all atmospheric influences. If you want to try out an interesting test you can immerse one in water for a fortnight, take it out and wipe it dry and your Eureka will still function perfectly—our guarantee stands at the back of this test.

The insulation on every Eureka is so perfect that on Faraday House tests the tremendous pressure of 2,000 volts was required to break it down.

Thus you can be sure that the Eureka you may buy to-morrow will be giving you faithful service years after other cheaper Transformers have broken down through inferior insulation. In the Eureka we make sure that the insulation is as perfect as modern electrical engineering methods can make it and then we seal it up for good. That's why when a man contemplates spending a few pounds on parts for a new Set intended to give him and his friends real pleasure for a very long time to come he should eliminate trouble by fitting a Eureka Concert Grand.

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PORTABLE UTILITIES CO. LTD.,
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- H.F. Transformers Plug-in type 250/700 .. 3/11
- Ebonite ex handles 6 in. 9d.
- Ebonite Bushes 2 or 4 B.A. .. doz. 1/-
- D.C.C. I.R.C. Bell Wire 10 yds. 1/7d.
- Gauze Valve Windows 7d.
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- with four insulators
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- Set of 5 (one gold) .. 6d.
- 100000 ohm fixed .. 1/3
- Real Ebonite Dials .. 1/3
- 1 in. Knobs 2BA .. 6d.
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- RHEOSTATS.**
- Ormond .. 2/-
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- Do. with dial .. 2/-
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- T.C.B. 6 ohms .. 4/-
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- Potentiometer T.C.B. .. 5/-
- Microstat for D.E. & R. 2/9
- WHEN VISITING WEMBLEY CALL HERE. WE PAY YOUR FARE up to 2/6 in £ on Ordinary Prices. (N.A.R.M. and fixed excluded.)**

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 Nickel .. 1/6 2/-
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(With Zincite and Bornite)
 OUR WONDERFUL MICROMETER ADJUSTMENT GLASS-ENCLOSED DETECTOR. 1/11
 WHY PAY MORE! POST 6d. each.

HERTZITE SHAW'S GENUINE



1/- BEATS ALL OTHER "ITES." Coil Plug and Clips 10d. Post 4d.

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	Standard Super	S.W.G.	1 lb.
.001	8/6	20	9d.
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Vernier	4/-	36	1/4

Other sizes stocked. Post 6d. reel.

H.F. PLUG-IN TRANSFORMERS		D.C.C. WIRE	
No.	Value	S.W.G.	1 lb.
No. 1.	150-450	18	9d.
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 T1 Transformers 30/-
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 275 metres upwards. 25/-
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Coils: 25, 5/-; 35, 5/-; 50, 5/2; 75, 5/6; 100, 7/-; 150, 7/10; 200, 8/8; 250, 9/-; 300, 9/5; 400, 10/3; 500, 10/6
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 2 way coil stand Cam Vernier .. 11/-
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STERLING Square Law Variable Condensers

with Vernier.
 .001 .. 30/0
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 All orders in rotation, limited number.

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Patent Valve Holder 1/6
 Cam operated Vernier, Two-way Coil Stand 9/-
 Ditto, with Switch 12/6

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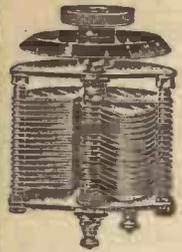
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.0003	4/6	1 3/8 in.
.0002	4/-	1 1/2 in.
.0001	3/6	1 in.
.00005 (vernier)	2/6	

Nat. Phys. Lab. Certificate for Guaranteed Capacity.

EBONITE DIAL 8d. extra.
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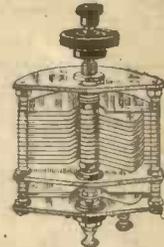
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P.1, P.2	12/6
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3,000 Brunet (for Crystal sets only)	19/11
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Lightweight "K"	10/9
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Chelmsford (Tandco) 2/-	Tandco 1,300/1,750 metres	1/8
(All Tandco in Stock)	Waxless set of 5.	1/11
	200/2,000	1/11
	Waxed set of 6.	1/11
	200/3,600	1/11
Special Duplex Coil fitted on adapter for Chelmsford	2/11	(for variometer 650 metres).
	Post 4d. each.	

H. T. C.

Special valve holder above panel	1/9
Ditto. for under panel	1/6
	Post. 2d. each.

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Variable Condenser .0005	5/3
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Filament Rheostat	2/6

TESTIMONIAL that speaks for itself.

July 20, 1924.
From C. Walton Esq., Radio Engineer, Andover.
I have tested your new variable condensers on Megger and get "INFINITY."
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No. of Coil.	PRICE
25	4/10
30	4/10
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50	5/-
60	5/4
75	5/4
100	6/9
150	7/7
200	8/5
250	8/9
300	9/2

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.25	3/6
.05	3/6
1	3/6
1 MFD	4/-
2 MFD.	4/6

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Stand for 'Phones	1/6
Aluminium Button	5/-
Brass Button	4/6
Hedgehog Transformer	14/-
Single 120 ohm 'phone	5/6
Do. 4,000 ohm 'phone	7/-

CALLER'S COLUMN. NO POST ORDERS.

Wound Coils (1,600) 1/6	TERMINALS.	60 v. H.T. Batt.	7/6
Tapped Coils (1,600) 1/8	'Phone nut and washer	H.F. Transformers	3/6
Filament Dials	1d.	250/700	
Ebonite 4 1/2, with knob	5d.	Single Phones,	5/-
Copper Foil foot	2d.	Ditto 4000 "	7/-
Washers, 2 & 4 B.A.	1d.	Skinderviken Transformer	12/9
Nuts, 2 B.A. 2 doz.	3d.	(Made to specification).	
Nuts, 4, 5, 6 B.A. 2 doz.	3d.	Button Bracs	3/9
Filostat (D.E. or R. Valves)	1/9	Button Aluminium	4/9
Microstat (D.E. or R. Valve)	2/6	Stand for Phone	1/3
Allen Var. grid leak	1/6	Coil Stands, 2-way	2/6
Ditto Anode Res.	1/6	Ditto extension handles	3/3
Good Fixed Condensers	9d.	Ditto 3-way	4/9
Dutch Valves Tubular	4/9	Brunet Single, 4,000 ohms	7/11
Dutch "R"	5/-	Electron Aerial,	
Phillips "R"	7/6	100 ft.	1/4
French Metal	6/6	Copper Aerial, 100 ft.	1/10
Porcelain Switches, S.P.D.T.	1/3	Extra Heavy, 100 ft.	2/3
Ditto Switches, D.P.D.T.	1/11	Egg Insulators	1d.
Insulated Pliers pair	1/-	Rubber Lead-in, 10 yds.	1/3
Screwed Rod, 2 B.A.	2d.	English 4 1/2 Batteries	4d. & 4d.
Ditto, 4 B.A.	2d.	Clips	2 a 1d.
Boxes, 8 x 6 x 5 deep	2/8	Sleeving 4d.	3 yds. 10d.
Knobs, 1 1/2 in. 2 B.A.	1d.	16 G. Sq. Tinned Copper	18 ft. 6d.
Best quality ditto	3d.	Twin Flex., 4 yds.	6d.
1 in. 2 B.A.	2d.	Burniept Detector	5/-
1/2 in. 4 B.A.	2d.	Variometers, 250/650 1/8	Raymond Trans-
Real Ebonite Dials	1/3	former	9/11
Set of Spanners, etc.	1/3	Mic-Met Detector	6/-
Best Grid Leak and Condenser	2/2	Similar	4/6
Grid Leaks, 2 meg.	1/1	Many good ones at 10d.	
Ebonite Ex. Handle, 6 in.	7d.	Also splendid value 1/2 Nickel or Brass, best 1/8	
2, 4, 6, B.A. machine screws	3/-	(All above glass enclosed.)	
Easi-Fix crystal cups	1d.	Accumulator, 4 v. 40 amp.	16/6
Vario. Couplers	3/-	Midite or Hert-zito	8d.
Vario. Crystal Sets	7/11	Tungstaltite	9d.
Ebonite Variometer	3/11	Geosite	1/3
		Neutron	1/6
		Whiskers, silver	2d.
		Gold do.	2d.
		Spearpoint	2d.
		5 in packet (one gold)	3d.
		Filament Rheostats	1/3
		Also, 1/6, 1/9, 2/-, 2/3	
		Ormond Rheostat	1/9
		Insulated stapes, 5 a 1d.	
		Lightweight Phones	9/11
		Soft Iron Wire	8d.
		30 v. H.T. Batt.	4/6

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TECHNICAL NOTES.

(Continued from page 864.)

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ILLUSTRATED CATALOGUE
Now Ready. Send 3d. Stamps.

LOUD SPEAKERS. 30/-. Accumulators from 4/6. Hydrometers, 2/6. Mill-Ammeters, 6 m/a, 30/-. 5 m/a, 35/-. Buzzers, 1/3 and 3/6. Valve and Coil Boxes, 1/6. Loud Speaker Units, 7/6. Phones, 2/6 to 32/6.

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 Two-Valve C.W. Transmitters, 70/-. Ammeter panel for same, 17/6. Tuners, R.A.F. 8/-. to 40/-. Potentiometers, 5/6.

RECEIVERS. Complete Crystal, 5/- 2-valve, 80/-. 5-valve, 105/-. Switches all sizes, Dewars to 200 amps. Safety first Thunderstorm Lightning Arresters, 3/-. Wire of all sizes and quantities. Sq. Panel wire, 2d. per 24 inch rod. A splendid selection of highest grade instruments, all in perfect condition up to Government standards, yet at ridiculously low prices. We carry £10,000 stock of Wireless Apparatus and Instruments of precision.
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 A visit to our showrooms will well repay you. If you cannot call, send 3d. for Radio Bargain Illustrated Catalogue.

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 Phone Avenue 4166. Close to Aldgate Sta., Met. Rly.

CHELSFORD
 The World-famous LEDER Diamond-weave, Air-spaced, calibrated COILS, 1,600 metres, 1/6 ea. Set of five, 180-980 metres, 2/3 per set. Suitable for all circuits. Post free.
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 Employ the **CARPAX PORTABLE AERIAL.**
ROLLS UP LIKE A BLIND WEIGHT 11 oz.
PRICE 7s. 6d. Ask for Leaflet 703.
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PANELITE
 Will withstand 5,000 volts. Sizes 6" x 6" x 3/16", 1 1/2" x 6" x 1/8", 12" x 10" x 2/8". Post free. Other sizes proportionate rates. Will not fracture. Radio inquiries invited.—**RADIO PANEL CO.** Dept. P. 8, Westmoreland Bldgs, Aldersgate St., E.C.1.

HIGH POWER 5XX—Post Free—Watkln WAXLESS ENCLOSED Coils—NOT flimsy unwieldy baskets, but NEW TYPE, strong, air-tight coils. D.C.C. wire, 5XX (No. 150-8d.) (175-9d.). Anode 200-11d.) (230-11). Reaction 8d. 5XX Variometer, 1/5. B'cast Vario, 1/- Set of 6 Coils (180-4,500 m.) 1/9. Coil Mount Standard Plug, 1/- 2-Coil Holder, 2/6. Tuning Chart, 3d. Watkln Wireless, Fernbrook Av., Southend-on-Sea

MICROPHONE BUTTONS.
 Ex-Government Stock, 1/6 each, post free. Still a limited number left. Contain Carbon Balls—not granules—therefore CANNOT "PACK." Beautifully made. *Easily worth three times the price.* Cross P.O.—**EDWARD A. GRAY & CO.** 256, Commercial Road, Peckham, S.E.15.

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IS NOW ON SALE
 Complete set, including loud speaker & horn, £4-18-6
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 Separate parts can be supplied to those making their own sets.
SEND YOUR ORDER TO-DAY
Note that this amplifier can be used with equal efficiency with valve sets.
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 (3rd Edition of "The Marvels of the Microphone" now on sale, post free, 6½d. (P.O. not stamps).

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1-HOLE FIXING RHEOSTAT EBONITE BOBBIN RETAIL 1/6
 SEND FOR COMPLETE ILLUSTRATED LIST OF OTHER COMPONENTS
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 Phone: Clerkenwell, 7346. 26-31, Eyre Street Hill, E.C.1.

Obviating Crystal Adjustment.

The continual readjustment of the cat's-whisker on a crystal contact is one of the great drawbacks to this otherwise excellent form of detector. Various methods have been proposed and tried at different times in order to overcome this trouble; for example, the use of a bunch of fine wires for the whisker, instead of only one, and the employment of brass filings instead of the cat's-whisker, are well known, the object in both cases being to provide a large number of contacts, so that if one happens to find a poor spot on the crystal, the chances are that another will find a good spot.

Such systems of multiple contacts, although by no means up to expectations, are frequently better than a single contact. Reverting to the subject of the uses of mercury in wireless apparatus, I may mention that a multiple crystal contact can be obtained by the simple process of inverting the crystal over a small cup (a crystal cup will serve) containing mercury, the crystal being depressed until its exposed surface just dips into the mercury. The mercury thus makes contact with the crystal at a large number of points and is equivalent to a large number of cat's-whiskers operating over a small area. A wire dipping into the mercury, or soldered to the mercury cup, forms one terminal of the crystal detector, while the crystal cup proper, which is now uppermost and inverted, forms the other terminal. In case a wire is soldered to the mercury cup, it should be remembered that mercury dissolves solder, and therefore the soldered joint should be made on the outside of the cup, where the mercury is not likely to get to it. For the same reason it is as well to secure the crystal in its cup by means of a screw instead of Wood's metal.

An Improvised Condenser.

When you are experimenting and want a condenser in a hurry, it is not always easy to see how one can be made up without a fair amount of trouble. The following is one of the quickest ways of making an improvised condenser that I have come across, and requires only materials which every experimenter may reasonably be expected

to have available. Take an ordinary foolscap envelope, and a piece of cardboard or stiff paper, of about the same size, so that the cardboard sheet will slip easily into the envelope.

Wrap a layer of tinfoil round the outside of the envelope, pierce a hole through tinfoil and envelope at the closed end of the latter, insert a terminal and screw up tightly. This forms the terminal for one "plate." Now wrap a layer of tinfoil round the cardboard, and similarly insert a terminal. If the cardboard is now inserted into the envelope (the end of the cardboard without terminal being the leading end), a variable condenser will be obtained, the card being inserted into the envelope to different extents for different capacities. The tinfoil on the cardboard should be wrapped round sidewise, not endwise, and should not reach to the end, otherwise it may make contact with the envelope terminal when pushed right in.

Preventing the "Howl."

In spite of warnings and entreaties, the "howler" is still very troublesome in many parts, and a new invention has appeared, which is officially known as a "radiation preventer," and unofficially as a "howl killer," which should do much to overcome

NEXT WEEK'S SPECIAL FEATURES
 The following special features are appearing in the August 23rd issue of "Popular Wireless."
The Mystery of Fading: All about the Heavyside Layer. By SIR OLIVER LODGE, F.R.S.
How To Build a Two-Valve Receiver.
Preventing Interference.
How to Make an Efficient Crystal Set.
ORDER YOUR COPY NOW.

the annoyance. This device is small enough to be attached inside the cabinet, and when properly connected offers no obstruction to the incoming impulses but prevents the energising of the aerial from the valves.

The only trouble we foresee from a commercial point of view is that it is not the man who ought to have the thing who wants to buy it; it is his friends (or enemies) who want him to have it. In extreme cases, of course, they may even be driven to buying it and presenting it to him, with full instructions and best wishes. Possibly next Christmas Day may see a sudden drop in the interference nuisance. I wonder if you can guess the principle of the device. It has four terminals: the first is connected to the aerial, the second to the earth, while the third and fourth are connected respectively to the aerial and earth terminals of the set.

THE SUPER ONE-VALVE SET
 Has received all B.B.C. and CONTINENTAL STATIONS. Loud Speaker results possible. Simple to operate. Marvellous Range and Power. 37/6, plus Royalties. (Continually worth £4.)
WORLD'S WIRELESS STORES, WALLINGTON.

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 is the only vario. in the world having two distinct circuits tuned with one control. PRICE 5/6
 Steps up voltage—tunes sharply—extraordinary results—wound on ebonite one pole fixing.
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MAKES CRYSTAL EQUAL VALVE.

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WIRELESS ACCESSORIES

FOR INCREASING YOUR WAVE-LENGTH TO THE NEW 1,600 METRES WHICH WILL BE IN USE FOR BROADCASTING FROM CHELMSFORD. LOADING COILS TO LOAD ON FROM 950 to 1,700 METRES. WAXLESS COILS at 1/- each. COTTON COVERED at 1/6 each.

The Latest. "RADION" Valves, B. 4 detector and A. 2 amplifier, B.B.C., 10/- each. Note the consumption of these Valves is only 1/4 ampere.

As the new range will be approximately 33 miles from London it behoves you to get a really reliable and super sensitive crystal. TRY DAYZITE AND ZINCITE AS A PERIKON.

Try one of our new Variometer Sets fitted with "Dayzite" Crystal with Plug for Loading Coil for New Chelmsford Station - - - - - **£1 15 0**

Large illustrated Catalogue now in course of preparation. Postage and Carriage on all Goods extra.

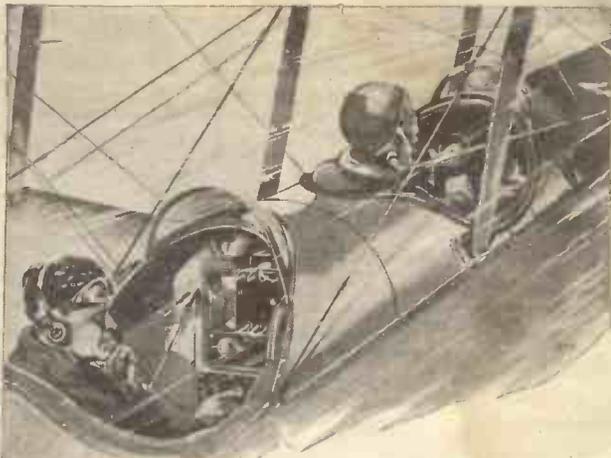
MAKE NO MISTAKE IN YOUR SELECTION Do not keep wasting money on crystals of unknown repute. GET A CRYSTAL THAT HAS STOOD THE TEST OF TIME.

DAYZITE REGD.

As one delighted Customer writes:—"Send another Dayzite Crystal for my friend. It is as good as a valve, and if the price was 5/- each it would be cheap." Secure a Registered DAYZITE Crystal, sold only boxed with silver Cat's-whisker, 2/6 each, postage 3d. extra.

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They were used in the cockpits of the R.A.F. — read what a user says to-day

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Read the accompanying letter just sent us. Try a pair of Ericsson (British) Telephones and you will "without hesitating" agree as to what are the best 'phones to-day.

Prices at all good dealers:—

120 ohms ..	24/6
2,000 ..	25/6
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But insist on seeing "Ericsson, Beeston, Notts," on each ear-piece to avoid "continental" imitations.

Write us to-day (or our agents) regarding Ericsson products. Information gladly given of our famous valve and crystal sets, loud speakers and component parts.

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Buy British Goods Only

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Dear Sirs,
Please forward me a pair of your British Ericsson 4,000 ohms 'Phones, advertised at 26/6, which I enclose. They have been recommended to me by a friend who has used a pair for years.

I asked another friend the other week which were the best 'phones. Without hesitating he answered, "Ericsson's." This shows how well-known your 'phones are.

I remain,
Yours Sincerely,
F. G.

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LISSENIUM.

A few words about
Some NEW LISSEN LINES

A CHOKE for Audio Frequency Amplification—

A GOOD Choke coupling will give amplification of a quality comparable to the best Resistance Capacity Coupling without the disadvantage of using the large H.T. voltage necessary with Resistance Capacity Coupled amplifiers.

This LISSEN Choke is different to any other Choke—there is no sharply defined resonant peak anywhere in the band of audible frequencies.

It is a highly efficient Choke—two other important characteristics are, firstly, its *uniform impedance to all audible frequencies*, and, secondly, its high inductance value, **THE FIRST CHARACTERISTIC RESULTING IN PERFECTLY PURE AMPLIFICATION, AND THE SECOND ENSURING THAT THE MAXIMUM SIGNAL VOLTAGE IS TRANSFERRED FROM THE PLATE OF THE ONE VALVE TO THE GRID OF THE SUCCEEDING VALVE.**

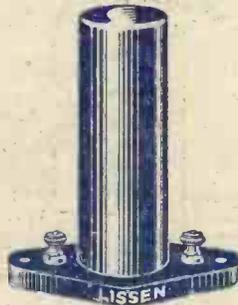
THE object of using LISSEN Choke L.F. amplifiers—

The difficulty in ordinary use of employing more than three stages of L.F. Transformer amplification is well known. An interesting experiment, therefore, will be to see how many stages of LISSEN Chokes can be successfully employed, and to what extent it will be possible to build up a volume of perfectly pure sound.

The construction of an L.F. amplifier using LISSEN CHOKES instead of transformers is comparatively quite simple—the connections are as follows :

One terminal of the LISSEN CHOKE is connected to the plate of the preceding valve, the other terminal to the H.T. battery. A fixed condenser of or capacity is connected between the plate of the preceding valve and the grid of the L.F. valve, and a grid leak (preferably use the LISSEN VARIABLE GRID LEAK) is connected between the grid of the L.F. valve and the L.T. negative. Grid cells should be introduced between the grid leak and L.T. negative if they are found necessary. Each succeeding stage is connected up in the same manner.

Price
10/-



A NEW LISSEN 5-POINT SWITCH—

Here is a little switch which does the following things :

- (a) Switches off one stage of L.F. without touching the filament control—a separate switch for each stage.
- (b) Connects the telephones to the plate of whichever valve it is desired to use and at the same time switches off the L.T. current from the unused valve.
- (c) Cuts out a stage of H.F. in the same way as it does L.F. (we do not recommend any switching in H.F. circuits where it can be avoided, but where it is decided to use a switch, this is the switch to use).
- (d) Will also disconnect both the H.T. and L.T. Batteries and short the aerial to earth, so that the receiver can be left adjusted ready for switching INSTANTLY into commission next time.



Price

4/-

LISSEN PUSH-PULL MOVEMENT—LISSEN ONE HOLE FIXING, OF COURSE.

Don't Mix Your Parts—if you build with *all* LISSEN Parts your receiver will give results which would never be possible with mixed parts

LISSEN LIMITED
8-16, Woodger Road, Goldhawk Road, London, W.12
PARTS WITH HIDDEN POWER - - - - - LISSEN PARTS

AN AUXILIARY RESISTANCE —size of a Penny.

This is a neat little device which can be quickly and conveniently used in conjunction with any rheostat to provide a pre-determined safety minimum resistance for dull emitter valves. *Should be left in circuit only when dull emitters are being used* (when valves of the R type are used it is only a matter of a moment to detach this little LISSEN Auxiliary Resistance).

How to fit to any ordinary rheostat—

It should be used in series. Can be screwed direct on to some rheostats—with others it can be easily fixed on the panel.

CAN BE EASILY ATTACHED TO THE LISSENSTAT ALSO.

Simply withdraw the screw from the bottom end of the LISSENSTAT and place the auxiliary resistance over the centre hole and replace screw—this clamps the LISSEN Auxiliary Resistance in place. The connection which would previously have been taken from the bottom end of the LISSENSTAT is now taken off the terminal on the side of the Resistance—the other connection on the side of the LISSENSTAT remains unaltered. Proceed exactly the same with the LISSENSTAT MINOR.

Price
1/3



N.B.—With dull emitters, care has to be taken to see that the resistance of any rheostat is not reduced below the safety point necessary for the valve. **WE CONSIDER EVERY RHEOSTAT SHOULD PROVIDE AN AUTOMATIC SAFETY POINT OF RESISTANCE—BY FITTING THE LISSEN AUXILIARY RESISTANCE THIS IS EASILY ACHIEVED—and at little cost.**

YET ANOTHER LISSEN SWITCH—

(Similar in appearance to LISSEN 5-point Switch).

This little switch will be particularly useful when the LISSEN 5-point switch is used for cutting out one stage of H.F. When a H.F. stage is cut out and reaction is being taken from the aerial circuit, it is necessary to reverse the reaction coil connections for each H.F. stage cut out, and this new LISSEN switch conveniently does it. Can also be used anywhere when it is necessary to reverse the connections of a battery, a coil, or a condenser for instance. **VERY USEFUL FOR COMPARATIVE TESTS.** LISSEN PUSH-PULL MOVEMENT—LISSEN ONE-HOLE FIXING, OF COURSE.

Price
4/-

ALL THE ABOVE ARE READY FOR IMMEDIATE DELIVERY.

OTHER LINES ALMOST READY ARE—

1. A UNIQUE CRYSTAL SET (prov. pat.) With excellent features—different to any crystal set yet made.
2. TWO-WAY COIL HOLDER (prov. pat.). Gives very nice tuning—unique design.
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