

SYNOPSIS OF BROADCAST OPERAS.

Popular Wireless

PRICE 3d.

No. 51. Vol. III.

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

May 19th, 1923.



Princess Alice, Countess of Athlone, photographed in 2 L O's New Studio.

FEATURES IN THIS ISSUE.

More Pictorial Valve Circuits.
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Transmitting Photos by Wireless.

Complete Single Valve Set.
Geary the Toreador.
High Speed Wireless.

And a long article on the Values of Tuning Coils and Condensers, by C. E. Field, B.Sc., compiler of the "Popular Wireless" Wave-length Tables.

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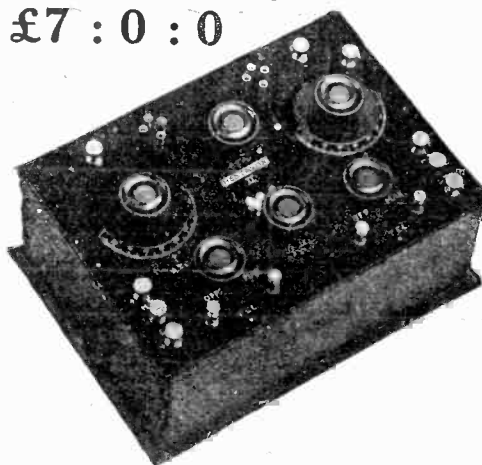
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POPULAR WIRELESS

May 19th, 1923.

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

[Every Friday.]

TOPICAL NOTES AND NEWS.

Music in an Aeroplane.

MR. P. D. ROBINS, who was piloting an aeroplane, announced that he was able to hear music from a broadcasting station whilst travelling at ninety miles an hour at a height of 1,200 ft., and the higher the machine rose, the clearer became the music. Each of the party in the aeroplane wore headphones, listening in on a 4-valve set without aerial or earth, the instrument used was one of Burndept's cthophones.

Cardiff "In Clover."

I HAVE just received a long and interesting letter from Major Corbett-Smith, the versatile and energetic director of the Cardiff Broadcasting Station. He tells me that great things are contemplated in respect of broadcast programmes for the fortunate listeners in Wales. He writes:

"Our Sunday evening programme is always devoted to the best music, and we try also to invest each one with a particular interest. For instance, on May 6th we gave an all-Wagner programme with the items so arranged as to indicate the development of Wagner's creative touch.

"Another scheme which I have in mind is the production of Comic Operas. By way of an experimental start we are giving 'Dorothy' in ten days' time, and if successful, shall follow it up with 'Merrie England,' 'Tom Jones,' and other similar works. I propose also to perform my own opera, 'Elizabeth.' This is Grand Opera in one act, written originally for Madame Kirkby Lunn in the name part."

Wireless Picnics!

I SHOULD imagine that this summer there will be a good deal of outdoor "listening-in," and from all I hear from various of my readers, many amateurs are busy making portable sets. The fun of stringing an aerial up to a tree and the joy of listening in in the open air should add greatly to the delight of *al fresco* parties.

Wireless on Fishing Vessels.

THE latest addition to the development of the uses of wireless at sea is the fitting of English fishing vessels with radio apparatus. This is proving of considerable commercial value and the utility

of the installation has been demonstrated in connection with the rescue of the crew of a sailing vessel by one of the trawlers recently fitted with wireless. This trawler not only rescued the crew of a sailing vessel just before it sank, but by means of its wireless equipment was able to inform the owners of the incident and the relatives of the rescued crew were immediately informed of their safety, and thus all anxiety was allayed.

Awards to Wireless Operators.

I HEAR that the three Marconi operators of the s.s. City of Valencia have each been presented by the German Government and the Hamburg-America line with a pair of valuable binoculars, with suitable inscriptions, as a mark of appreciation of

crystals. Personally, I am going to try an orange with two knitting needles therein fixed. I have heard that it works.

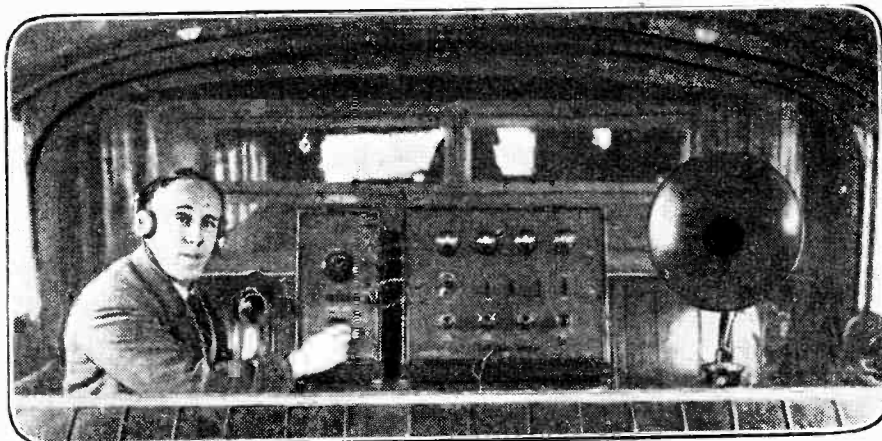
New Direction Finder.

THE latest wireless direction-finder has just been installed on the Cunard liner Mauretania, which left Southampton for New York some days ago. By means of this device, I am told that if touch is secured with two or more land stations, the exact positions of the vessel is easily found by cross bearings.

Wireless Insurance.

SPECIAL insurance policies, available to all owners of wireless sets and aerial equipment, have now been drawn up by insurance companies. These cover the apparatus itself, both inside and outside the building, against risks not under the control of the insured, such as fire, lightning, burglary, theft, and also indemnify the owner against third party liability in connection with breakdown of aërials, masts, and poles.

An annual premium of 7s. 6d. covers loss or damage to the apparatus to the value of £50, and third party risks up to £500 for any one accident, including damage to property belonging to the insured.



Comfortable Road Travelling. A Four-valve Burndept Receiver fitted into the interior of a Thornycroft Motor Coach.

the valuable services rendered by wireless at the foundering of the liner *Hammonia*, which was lost off the Spanish coast last September.

A Modern Miracle.

AN interesting experiment on the powers of wireless telephony to assist deaf people to hear has been described to me by a correspondent from Edinburgh. In the presence of several witnesses, a little girl of twelve, who has been deaf from birth, was enabled to hear speech and music for the first time. She was able to hear clearly with headphones on a six-valve instrument: this in spite of the fact that several ear specialists have been able to give no hope whatever of her hearing sense being developed.

An Original Detector.

WIRELESS is becoming an expensive game. I am told that the latest craze is to use a diamond as a detector instead of the usual, and cheaper,

An Interesting Forecast.

IT seems that very shortly one will be able to sit comfortably at home and watch a performance taking place in a theatre miles away. A French expert tells me that recent tests have been remarkably successful, and that the time is approaching when theatres and concert halls will be provided with apparatus to broadcast not only the voice, but a faithful image of the scene on the stage or platform.

A New Insulator.

GREAT expectations are entertained regarding the production of insulating plates from the rich deposits of silicious earth at Jaellasjoe, in the vicinity of Oerkellunga (Skaane). The deposits are estimated at 800,000 cubic metres, and as the material can be directly pressed into plates it will be possible to produce 1,000,000 square metres of plates annually for a long period.

(Continued on page 506.)

NOTES AND NEWS.

(Continued from page 505.)

Insect Wireless.

A FAMOUS scientist has suggested that by means of transmission through the direct current glow discharge, instead of the diaphragm transmitter, it will be possible to investigate how insects and animals communicate with each other, for there can be no doubt that they do communicate in a way quite unknown at present.

Shall We Hear Them?

ONE great entomologist states that insects speak to each other by electromagnetic waves, while another declares that they speak by sounds far too shrill for the human ear to record, but it seems possible that we shall be able to pick up the sounds and reduce their frequency so that we might hear them.

A Correction.

WE regret to state that in the advertisement, in last week's issue, of a complete Receiving Station, offered by V. V. Bertram, the address was wrongly stated, and the price of the station was

In order to provide more space for Notes and News, and to permit of an extended broadcasting programme, the latter has been transferred to page 527.

omitted. This should have appeared as "Complete Station £18 7s. 6d., and the address 412, Fulham Road, Walham Green, S.W.4."

"Stars" Made to Order.

THE B.B.C. intend to develop their own "stars" of vaudeville and opera, and so successfully make themselves independent of existing "stars" and theatrical productions, agencies, etc. How successful such a scheme can be is proved by the phenomenal rise to fame of Mr. Norman Long, who was comparatively unknown before broadcasting commenced.

Held Over.

OWING to a lack of space due to an extension in the Opera Synopses, "Geary the Toreador" will be held over until next week.

2 O M's New Role.

I HEAR that 2 O M, Mr. H. S. Walker, is taking on yet another rôle. He has promised to judge the home-made apparatus sent in for the competition taking place at "The Pavilion," Clapham Junction, during the "Wireless Week" that is to be held there commencing on May 28th.

King of Italy's Set.

I AM told that King Victor Emmanuel is setting the fashion for wireless in Italy. He is installing an all-British set.

British Sets Preferred.

THE Premier, Signor Mussolini, and Madame Tetravzini are also enthusiastic supporters of radio, while the Postmaster-General in Rome takes a very keen interest in its development. It is significant that British sets are preferred.

Relay Stations.

IT now seems fairly certain that Sheffield and other large towns will be provided with relay stations. This will permit the humble crystal to reign in new territories.

Uncle "Cactus's" Flowers.

CALLING on "Uncle Caractacus" the other day I noticed his room was full of flowers. "I get simply inundated with them," he explained, "large bunches arriving every day from my nieces and nephews."

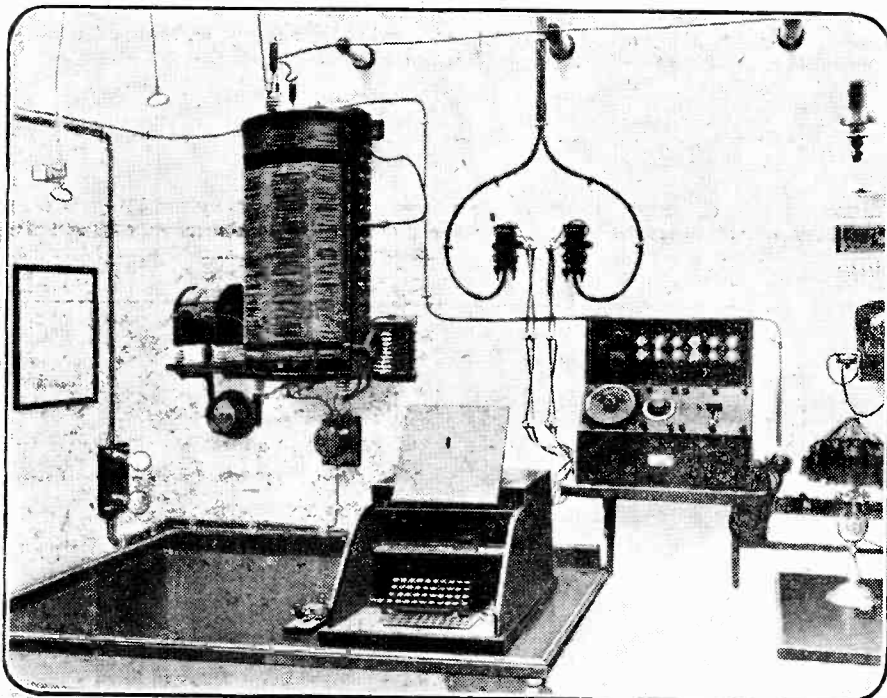
Atmospherics.

HAVE you been troubled with atmospherics lately? Many who have only taken up wireless during the past winter will find a new source of trouble in

you will be kicked out of the profession, and I don't like that sort of thing." This seems to me to put the whole case in a nutshell.

"Georges Carpentier Speaking."

A FRENCH correspondent tells me of an interesting wireless thrill which happened at the Carpentier-Nilles fight. A gentleman was seen sitting in the front row at the ring-side, with a microphone instrument on his knee. When, after eight gruelling rounds, Nilles received "le knock-out," the ever ready Descamps dragged his weary protégé to the wireless expert and told him to talk into the receiver. Imagine the excitement of the army of listeners-in when they heard: "Georges Carpentier speaking. I have just beaten Nilles in eight rounds. I am very pleased with my victory."



A corner in the spacious wireless cabin of the s.s. Majestic, showing the Gell perforator and the Marconi Wireless direction-finder. The Gell perforator is used in connection with high-speed wireless transmission, which is regularly carried out by this giant White Star liner.

these disturbances. A fortune awaits the man who first invents a cheap and effective instrument to eliminate these unwelcome visitors.

New Broadcasting Station.

THE Southern Broadcasting Station will be erected in Bournemouth, and another station will probably be built either in Cork or Dublin.

Wireless on the River.

I SPENT "Bluebell Sunday" at Hampton Court, and was interested to see houseboats all along the reach to Kingston with aerials rising from many of the decks. Wireless seems to have completely captured the river and looks rather like ousting the gramophone.

Mr. Norman Long.

MR. NORMAN LONG spoke very strongly at the Concert Artists' Association. "I will not be bullied into either broadcasting or not broadcasting," he said. "There is a pistol being put at the artistes' heads, with a remark. 'If you do it

Wireless on Trams.

NEW YORK tram drivers are now being provided with receiving outfits to enable them to keep in touch with headquarters.

Cutting of Prices.

WE understand that the T.M.C. are taking strong action in all cases of price-cutting on their products. This action is highly desirable, as there is no doubt that it is in the best interests of the public and the trade that a fair price having been fixed, it should be maintained by all concerned.

2 L O's Pigeons.

CAPT. LEWIS tells me that the instalments of the children's story, "The Fairy Dustman," will probably be sent from the Isle of Wight by pigeon carrier post. This is quite a bright idea and will do a lot towards keeping up the "fairy" illusion, but it is to be hoped that there will either be guards or less than 10 amps. on 2 L O's aerial during the arrival of the birds.

ARIEL.

SHORT STORIES OF THE OPERAS.

Commencing May 14th, the British National Opera Co. began their summer season at Covent Garden, and an arrangement has been made to broadcast certain operas from 2 L O. The following condensed stories of the operas will help listeners-in to follow the action of the various items, and will help them to visualise the acting on the stage. Owing to the fact that last-minute alterations in the time-table are possible, the stories of the operas are not arranged in the order they may be broadcast.—THE EDITOR.

LA BOHÈME.

A Romantic Opera in Four Acts, by
GIACOMO PUCCINI.

SCENE: PARIS. TIME: 1830.

CAST:

RUDOLPH, a poet.
SCHAUNARD, a musician.
MARCEL, a painter.
COLLINE, a philosopher.
BENOIT, a Landlord.
MINI, a flower girl.
MUSETTA, a grisette.
PARIGNOL, a toy vendor.
ALCINDORO, a wealthy Parisian.

ACT I. The four Bohemians, Rudolph, Schounard, Marcel, and Colline are living happily together in a Parisian attic, though in a state of extreme poverty. The landlord arrives to claim his long overdue rent, but they manage to get rid of him. Rudolph is left alone and is visited by Mini, the heroine, who comes to ask for a light for her candle. They exchange experiences, and decide to cast their lot together.

ACT II. The Bohemians are feasting and generally amusing themselves in the Latin Quarter, and we are introduced to Musetta, an old flame of Marcel's.

ACT III. Mini and Rudolph have parted, and Mini comes to find Marcel to ask him to persuade Rudolph to come back to her. She is suffering from consumption and is desperately unhappy. Rudolph and Mini become reconciled, but Musetta and Marcel quarrel because of Marcel's jealousy.

ACT IV. The garret again. Marcel and Rudolph are at work, and on the arrival of the other two Bohemians they try to make merry. Musetta arrives with Mini, who is dying, and they all try to help her, but it is too late. After singing snatches of their former love songs, Mini dies in Rudolph's arms.

* * *

FAUST.

A Tragic Opera in Five Acts, by
CHARLES GOUNOD.

SCENE: A German village.
TIME: The Eighteenth Century.

CAST:

FAUST, a philosopher.
MEPHISTOPHELES, the evil one.
VALENTIN, brother of Marguerite.
BRANDER, a student.
SIEBEL, a student.
MARGUERITE, a village girl.
MARTHA, her servant.

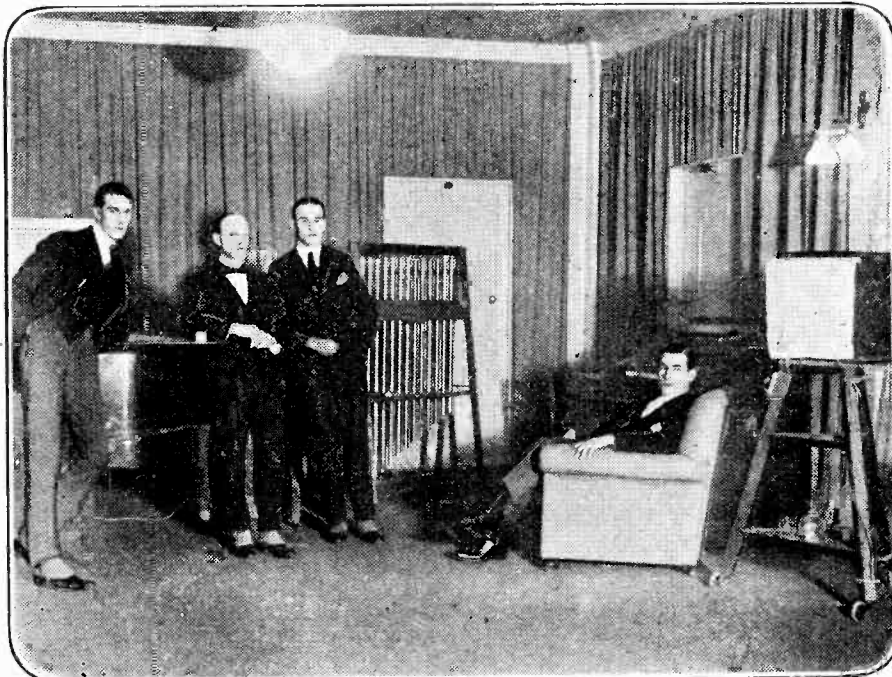
ACT I. Faust's Study. Faust, who has grown old and feels that life has no more joy in store for him, is about to end it with a dose of poison, but stops at the sound of Easter carols. Mephistopheles enters and promises to give him Marguerite, of whom Faust sees a vision, in exchange for his soul. Faust consents to the compact, and is changed into a young and handsome man.

ACT II. A Square in the Village, where a festival is in progress. Valentin, who is going to the wars, leaves his sister in the care of Martha, and Siebel promises to be her champion. Mephistopheles now joins the throng, jests

crosses swords with Faust, who, aided by the Devil, gives Valentin his death-blow. With his last breath he curses Marguerite.

Scene II. Interior of the Church, where Marguerite goes to pray. Mephistopheles pursues her, and tells her that she is damned for ever.

ACT V. The Prison Cell, where Marguerite is awaiting judgment for the murder of her child. Faust appears and urges her to go with him. She refuses; the prison walls open, angels come from Heaven to rescue her, whilst the Devil, who owns Faust's soul for ever, takes him away to the infernal regions.



A view of the B.B.C.'s new London Studio at Savoy Hill.

with Siebel about Marguerite, and Valentin, overhearing his remark, draws his sword. The Devil traces a circle of fire round himself, but slinks away when Valentin and his friends hold up their swords like crosses, and the festivities continue. Faust enters, offers his arm to Marguerite, but she repulses him.

ACT III. Marguerite's Garden. Siebel brings a bouquet for Marguerite, but the flowers fade until he dips them in holy water. Faust, aided by Mephistopheles, who gives Marguerite a casket of jewels, presses his suit, and Marguerite yields.

ACT IV. Scene I. The soldiers return victorious, among them Valentin, who learns of the betrayal of his sister. He

THE VALKYRIE.

A Musical Drama in Three Acts, by
RICHARD WAGNER.

SCENE: The Forests of Germany.
TIME: Antiquity.

CAST:

WOTAN, the mighty.
FRICKA, his spouse.
HUNDING, a warrior.
SIEGLINDE, his wife.
SIEGMUND, her brother.
BRÜNNHILDE, a Valkyr.
OTHER VALKYRIE.

The Valkyrie are a band of warrior maidens, created by Wotan to protect Valhalla, a paradise for warriors. Wotan
(Continued on page 508.)

SHORT STORIES OF THE OPERAS.

(Continued from page 507.)

has two children, Siegmund and Sieglinde, who have grown up in ignorance of each other.

ACT I. Shows us the Forest Hut of Hunding and his wife Sieglinde. Siegmund appears to ask for shelter, which they grant him. Siegmund and Sieglinde are irresistibly drawn together. She gives Hunding a sleeping draught and disappears with Siegmund into the forest.

ACT II. A Mountain Pass. Wotan has willed that his two earth children shall meet and marry, but his wife, Fricka, violently opposes his infringement of the marriage laws, and demands their punishment. Wotan summons his favourite Valkyr, Brünnhilde, and commands her to deliver Siegmund to his enemies. She pleads for him, but in vain. She meets the lovers, who are fleeing from Hunding, warns them, and finally resolves to shield them at all costs. Siegmund is killed by Hunding, who in turn falls by Wotan's spear. Brünnhilde flies from Wotan, terrified of his anger, taking Sieglinde with her.

ACT III. The Haunt of the Valkyries. Wotan appears before Brünnhilde, whose sisters have refused to help her. He consigns her to a fate worse than death—she is to be banished from Valhalla, to fall asleep and be claimed by the first passer-by who wakes her. Her entreaties, however, prevail upon Wotan to modify the decree, and he places her on a mountain peak hedged round by magic flames. The mortal intrepid enough to penetrate this almost inaccessible barrier would be considered worthy to claim her love.

* * *

AIDA.

A Romantic Opera in Four Acts, by GIUSEPPE VERDI.

SCENE: Memphis and Thebes.
TIME: Rule of the Pharaohs.

CAST:

THE KING OF EGYPT.
AMNERIS, his daughter.
RHADAMES, a general.
RAMFIS, the high priest.
AMONASRO, the King of Ethiopia.
AIDA, his daughter.

ACT I. The Egyptian King's Palace at Memphis. Ramfis tells Rhadames that it has been decreed that he shall lead the Egyptian army against their Ethiopian enemies. Rhadames is in love with Aida, a beautiful slave, and realises that if he is victorious he can claim her for his bride. But Aida knows that it is her father, the rival king, whom Rhadames will meet in battle.

Scene II. is the Temple of Ptah, the war god of Egypt, in which the consecration of the arms of Rhadames takes place.

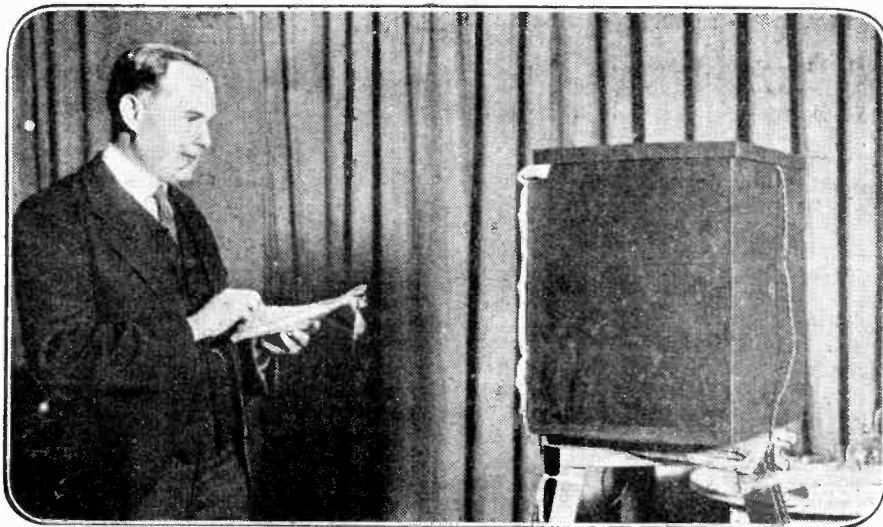
ACT II. Scene I. The apartments of Amneris, who is in love with Rhadames. She hears that he is returning victorious, and orders her maids to dress her in her finest clothes. She tricks Aida into revealing her love for Rhadames.

In *Scene II.* we see Rhadames' triumphal return, with Aida's father taken captive. Rhadames demands the release of the prisoners. The King grants his request, offers him his daughter's hand in marriage, and proclaims him heir to the Egyptian throne.

ACT III. A night scene on the Nile. Aida goes to meet Rhadames for the last time, encounters her father, who urges Rhadames to ally himself with the Ethiopians and promises Aida in marriage as a reward. Rhadames refuses, but Amneris comes from the temple, and, having overheard the conversation, denounces Rhadames, who gives himself up to the guards of Ramfis.

ACT IV. Scene I. Amneris now seeks to save Rhadames, but he will not give up Aida.

Scene II. Rhadames is seen in the crypt of the Temple resigned to death.



Mr. Arthur Burrows, director of programmes, speaking into 2 L O's new microphone.

He is joined by Aida, who comes to die with him. Together they sing farewell to life, and the curtain falls on Amneris, who is kneeling penitently in prayer, and the vaults close on the lovers.

* * *

PHŒBUS AND PAN.

A Satirical Opera in one act, by JOHANN SEBASTIAN BACH.

The story of the "Contest between Phœbus and Pan," founded on an old Greek myth, deals with the competition for the musical supremacy between the Phœbus, the god of the Lyre, and Pan, with his rustic pipe. The opera commences with choruses in six parts, and delightful ballet music is introduced. Mercurius presides over the contest, and Tmolus and King Midas are appointed judges. Tmolus claims the prize for Phœbus. Midas in a rollicking song declares his delight in Pan's untutored skill, and is presented with asses' ears whilst loudly declaiming that "Pan's a Master." Tmolus claims the prize for Phœbus, and the opera ends, as it began, with charming and melodious choruses.

THE MAGIC FLUTE.

A Fantastic Opera in Four Acts, by MOZART.

SCENE: Egypt.
TIME: Antiquity.

CAST:

SARASTRO, priest of Isis.
THE QUEEN OF NIGHT, a sorceress.
PAMINA, her daughter.
TAMINO, a prince.
PAPAGENO, his attendant.
PAPAGENA, the latter's sweetheart.
MONASTATOS, a Moor.

ACT I. A Forest, where Prince Tamino has lost his way and is being pursued by an enormous serpent. His cries bring three fairies to his aid, who slay the serpent. Papageno claims the honour for having killed the serpent, and the fairies seal his mouth with a padlock. The fairies show the Prince the portrait of a lovely maiden who is in the power of Sarastro at the Temple of Isis. The Prince is persuaded by her mother to

try and rescue her, and sets off on the adventure with a magic flute given him to ward off danger, accompanied by Papageno, whose padlock is removed and replaced by a chime of bells.

ACT II. Scene I. The Palace of Sarastro. Monastatos has annoyed Pamina with his attentions, but is frightened by Papageno, who arrives to announce the coming of the Prince, and plans that Pamina shall escape with them.

Scene II. The Entrance to the Temple. Tamino approaches, and is at first refused admission. Sarastro enters, orders that the Moor shall be punished, but tells the Prince that he must prove himself worthy of Pamina's love by passing through the Ordeal of the Temple.

ACT III. Scene I. A Palm Grove, where the priests agree that Tamino and Pamina shall be united if the Prince can come successfully through the ordeals.

Scene II. A Courtyard. The first ordeal is that of silence. Tamino and Papageno must not utter a word, and

(Continued on page 511.)

Harrods EVERYTHING FOR WIRELESS

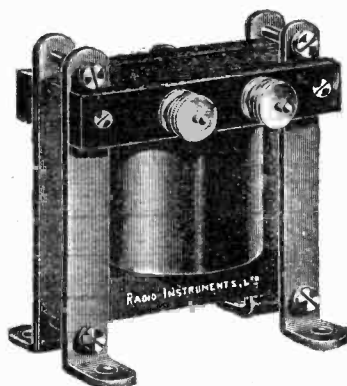
Adjoining the luxurious Wireless Lounge where, amid quiet surroundings, wireless programmes can be heard free every day during broadcasting hours, Harrods have now opened a fully equipped Accessory Section.

Here everything can be obtained by the wireless amateur for building sets and conducting experiments, and wireless experts are always in attendance to give advice and information.

At Harrods you will find an exceedingly wide range of Wireless Accessories from which to choose. And no matter what you select, you know that it carries Harrods famous guarantee.

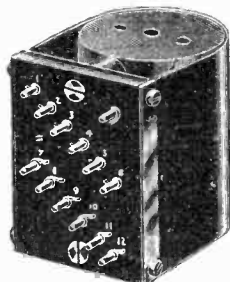
The Wireless Department is on Harrods Second floor.

Order by post if you cannot come to Harrods.



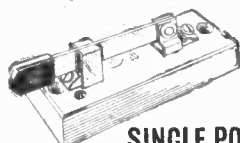
INTERVAL LOW-FREQUENCY TRANSFORMERS

Designed to prevent as much as possible speech distortion in Telephony Reception. Wound on Ebonite Bobbin. No. 34. Ratio 4 to 1. Each **25/-** and **20/-**

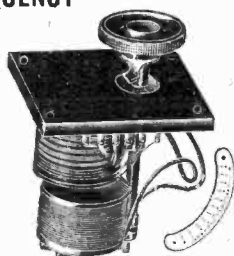


IMPROVED ADJUSTABLE H.F. ANODE REACTION COIL

This capable instrument has been specially designed for Wave Lengths of from 150 to 20,000 Metres. 12 Tappings on coil. Each **25/-**

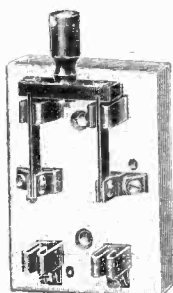


SINGLE POLE, SINGLE THROW KNIFE SWITCHES, mounted on china base. Heavy copper clips and blade. Insulated handle. Each **2/3**



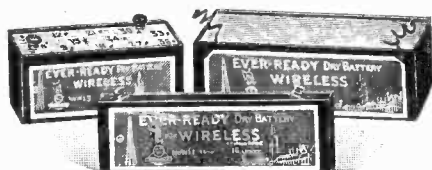
INTERVAL REACTION UNIT

Made from finest quality materials, this short range Unit is highly efficient. Each **38/-**



DOUBLE POLE, DOUBLE THROW KNIFE SWITCH

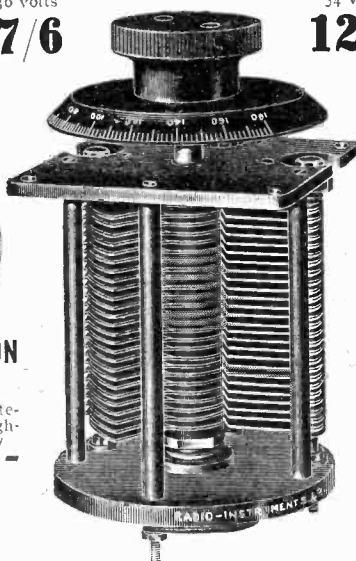
mounted on china. Heavy copper clips and blade. Insulated handle. Each **5/-** D.P. one way. Each **3/6**



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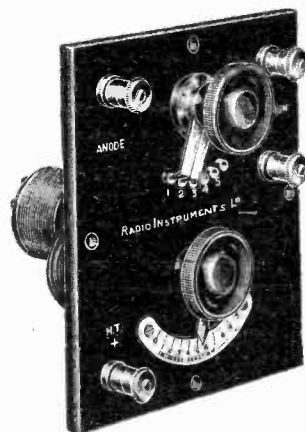
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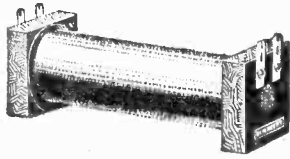
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Wireless Licences & how to obtain them

By E. Redpath

SHORT STORIES OF THE OPERAS.

(Continued from page 508.)

they remain firm, though it is a great effort for Papageno.

Scene III. A Garden. The Moor tries to approach Pamina while she is sleeping, but is again frustrated by Sarastro.

Scene IV. A Corridor in the Temple. Papageno and Tamino are still under the ordeal of silence, which proves too much for Papageno. The Prince, however, remains silent, even when Pamina meets him. She is deeply hurt that he does not reply to her endearing remarks.

ACT IV. The Pyramids. The Prince is commanded to wander into the desert, and parts sadly from Pamina. Papageno feels that he, too, would like a wife of his own, and an old hag appears before him. Just as he is hastily running away, she changes into the young and beautiful Papagena, but Papageno has to prove his worth before he can win her.

Scene II. Pamina believes her Prince to be faithless, and is about to kill herself, but is prevented. Papageno is in despair over the loss of Papagena, but finds he can summon her by ringing his chime of bells.

Scene III. A Fiery Cavern. Tamino is seen undergoing the last of his ordeals. He is threatened by waterfalls and tongues of flames, but he calls to Pamina, they are reunited, and a few strains from the magic flute cause the remaining dangers to vanish.

Scene IV. The Temple of Isis. Sarastro welcomes the Prince and the maiden, and unites them, Papageno and Papagena are married, and the Queen of Night and Monastatos, the Moor, are vanquished.

HANSEL AND GRETEL.

A Fairy Opera in Three Acts, by HUMPERDINCK.

SCENE: A German forest.
TIME: The seventeenth century.

CAST:

PETER, a broom maker.
GERTRUDE, his wife.
HANSEL, his son.
GRETEL, his daughter.
THE CRUNCH WITCH.
THE SAND MAN.
THE DEW MAN.

ACT I. The Broom-maker's Cottage. Hansel and Gretel are so hungry that they lay aside the work their mother has given them, and dance about to forget their appetites. By way of punishment she turns them out into the wood, and they go to Hohenstein, where the bad Crunch Witch lives. When the father comes home, he is alarmed by their disappearance, and he and his wife go post-haste in search of them.

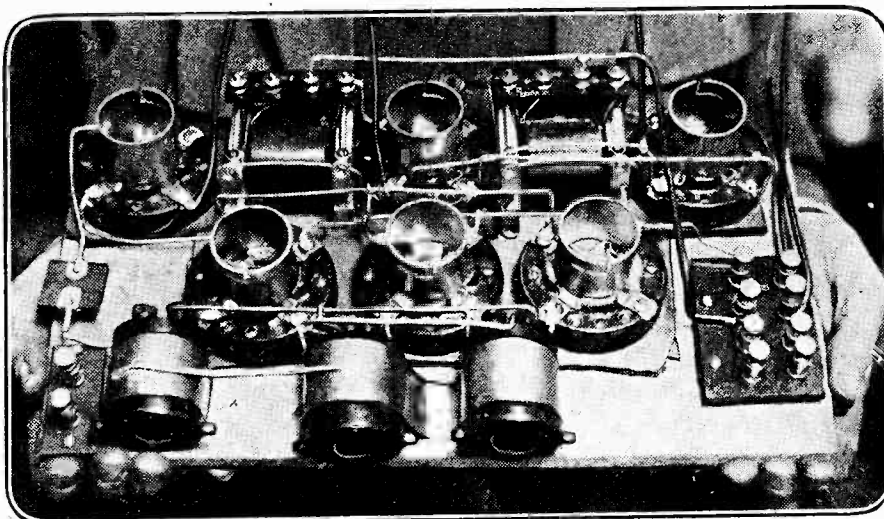
ACT II. In the Forest. The children are afraid to return home, and sink down weary under a large tree, and the Sand

Man comes and sprinkles his slumber sand in their eyes. Then in answer to their prayer, fourteen angels descend a staircase from Heaven and assume guard.

ACT III. The Witch's Gingerbread Hut. The next morning the children are aroused by the Dew Man, and they find themselves in front of the gingerbread hut, which they start to nibble. The witch comes out, captures them, locks Hansel up in a cage to fatten him, but Gretel, who is plump enough to be eaten, is made to bring water and fuel to prepare for the witch's feast. As she looks into the oven door, Hansel escapes from the cage, and they eat their fill of sweetmeats, and as the witch bakes, the oven cracks open, and a row of gingerbread children

of revenge. Canio discovers Silvio and Nedda together, but fails to catch Silvio, and is persuaded by other members of the troupe to make peace with his wife.

ACT II. The show is about to begin, and we see a play which deals with a jealous husband who returns unexpectedly to find his wife (Nedda) with another man. Canio forgets that he is acting, the play reminds him so vividly of the treachery of his wife that his jealous rage gets the better of him, he seizes a knife and stabs her to the heart. Silvio rushes to help him, but Canio, recognising him, kills him instantly. The villagers take hold of Canio, who murmurs as he gazes at the bodies of his victims, "The play is over."



An American adaption of one of the British naval circuits which, using three stages of H. and one of L.F. amplification, is claimed to receive telephony regularly across the Atlantic.

turn into real live children, and thank their deliverers for effecting their escape. The witch is baked into the form of a huge gingerbread loaf, then Peter and Gertrude enter, overjoyed to find their children safe. The opera ends in a general dance and merry-making.

I PAGLIACCI.

Dramatic Opera in Two Acts, by LEONCAVALLO.

SCENE: Near Montalto, in Calabria.
TIME: August 15th, 1865.

CAST:

CANIO (Clown), chief of a troupe of strolling players.
NEDDA (Columbine), his wife.
TONIO (Taddeo), a player.
BEPPO (Harlequin).
SILVIO, a peasant.

The story of Pagliacci is almost completely told in the well-known Prologue which Tonio, in his player's garb, sings before the curtain.

In ACT I. we are introduced to Canio, a travelling showman, and Nedda, his wife. Tonio, another member of the troupe, is in love with Nedda, but she rejects his suit as she is secretly in love with a villager named Silvio, whom she arranges to meet that night. Tonio discovers this, and warns Canio by way

CAVALLERIA RUSTICANA.

Dramatic Opera in One Act, by MASCAGNI.

SCENE: A Village of Sicily.
TIME: The present.

CAST:

TURIDDU, a farmer.
LUCIA, his mother.
ALFIO, a carter.
LOLA, his wife.
SANTUZZA, a peasant girl.

A young farmer, Turiddu, is heard singing of his former love, Lola, "lovely as the spring's bright blooms," who married Alfio, a carter, whilst Turiddu was away on active service with his regiment. Turiddu turns for consolation to a peasant girl, Santuzza, of whom, however, he quickly tires and he goes back to Lola.

The curtain rises on what appears to be a peaceful village scene. It is Easter, and the devout peasants are on their way to church. Santuzza meets Lola, tells her what has happened. Turiddu appears with Lola and treats Santuzza with cruel contempt. In despair she tells Alfio of his wife's conduct. After the church service, the villagers throng the square and drink and make merry together. Alfio appears, but refuses to drink, and challenges Turiddu to a duel, which is fought behind the scenes. There is a tense dramatic pause, and then messengers run in and the cries of the w announce the death of Turiddu. omen

A COMPLETE SINGLE VALVE SET.

By A. W. DRANSFIELD.

This set was actually constructed by the author, who obtained very excellent results on it. The diagrams are almost self-explanatory, and the amateur constructor should find little difficulty in building the set with but a few tools, a modest outlay, and the expenditure of but a few hours.

MANY amateurs that have made crystal sets and gained experience will now turn their minds to the construction of a valve set. The principal parts of a valve set in simple form consist of the following components: A tuner of which

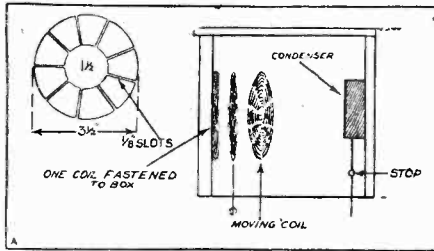


Fig. 1. showing the cardboard coil former and the arrangement of the tuning coils.

the size depends on the length of the wave it is desired to receive, and as this article is written for the reception of broadcasting, all dimensions, etc., will be for that purpose. The tuner will be of the pancake type, a very easily constructed form. Two pieces of card will be required about $3\frac{1}{2}$ in.

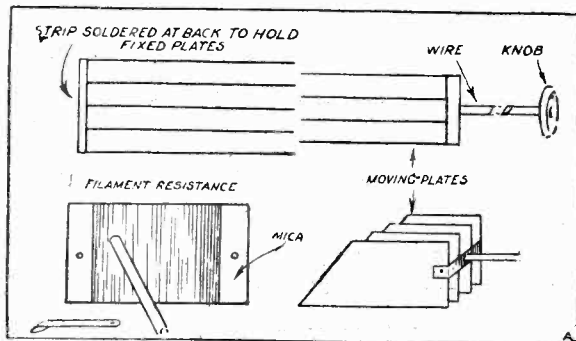


Fig. 2.—The variable condenser and filament resistance.

diameter (see Fig. 1). Mark a circle $1\frac{1}{2}$ in. from the centre, then divide the circumference into 9 equal divisions (40 degrees) and cut towards the centre as far as the inner circle $\frac{1}{8}$ in. slots to take the wire.

The Variable Condenser.

The wire will be d.c.c. 26 gauge. Start winding by leaving about 6 in. of wire for connections, and start at any slot, going down one slot, up the next, and down the next, and so on until on one side count up the spokes and layers of wire until you reach 24. This will give an approx. wave-length range of 600 to 800 metres, and so will pick up ship stations as well. The card should be well dried and paraffin waxed before winding. When the winding is finished warm the coil so as to allow the wire to get well set on to the card.

The next portion will be the variable condenser. This is not a very formidable undertaking, and will be of the sliding type, which is rather easier to construct than a rotary one. The metal used will be of

thin sheet zinc, and 9 pieces will be required, 5 fixed and 4 moving plates, all the same size—4 in. by 3 in. The sliding blocks should be made of ebonite, and as small pieces are required they will not be expensive. The mounting of these plates will be better understood from the diagram (Fig. 2) than from any letterpress on the matter. A larger condenser made on the same lines, and put into the aerial circuit later, will greatly improve matters.

How To Use The Set.

A grid leak should be made and fastened on underneath the ebonite panel. This is made with copper foil and mica separators, only 4 pieces of foil, $1\frac{1}{2}$ in. long and $\frac{3}{8}$ in. wide, being utilised. The strips of foil are laid on the mica in such a manner that when they are assembled together there will be an overlap of foil of $\frac{3}{8}$ in., care being taken that they are placed together in such a way that the lugs project alternately first from one side and then the other (see Fig. 3). Now cut a piece of thin ebonite to cover the whole, in such a manner that two holes drilled in the ebonite to take the fastening down bolts

will pass through the lugs. Before putting on the nuts, lay a strip of paper across the bolts, and scrape a little lead from a pencil all round the bolts so that the nuts when screwed home will make a good electrical contact. Then with a soft pencil join up the bolts from the lead scrapings with thick line. This will act as a grid leak and condenser in one unit (see Fig. 3).

The valve holder may be of the ordinary type, but the writer prefers the legs which are fitted into holes in the

ebonite. The position of these holes may be easily obtained by pressing a valve on to a piece of blotting paper and, placing the paper on the ebonite, drilling through the dents made by the valve legs.

The other particulars are really better

understood from the diagrams. The panel top may be marked carefully and filled with white jewellers' wax. A slight improvement may be made by having a set of terminals on the panel and appropriately marking them, so that the additions for experiments may be added without having to

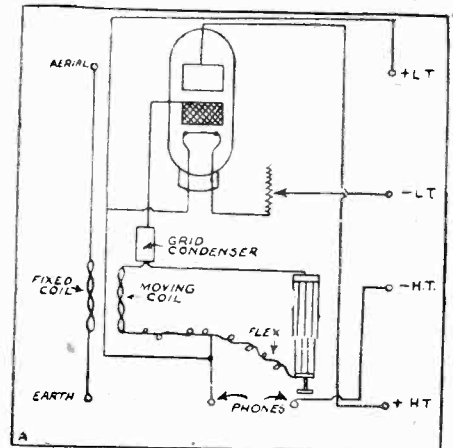


Fig. 4.—A simplified wiring diagram.

open the circuits to get a contact. It will be understood that this is the simplest form of valve receiver.

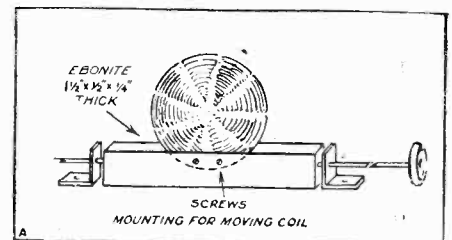


Fig. 5.—A simple method for mounting the moving coil.

The method of using the set is very simple. All that is required is to open the coils a little until a signal, or the concert, is heard, and then by using the condenser and the

(Continued on page 515.)

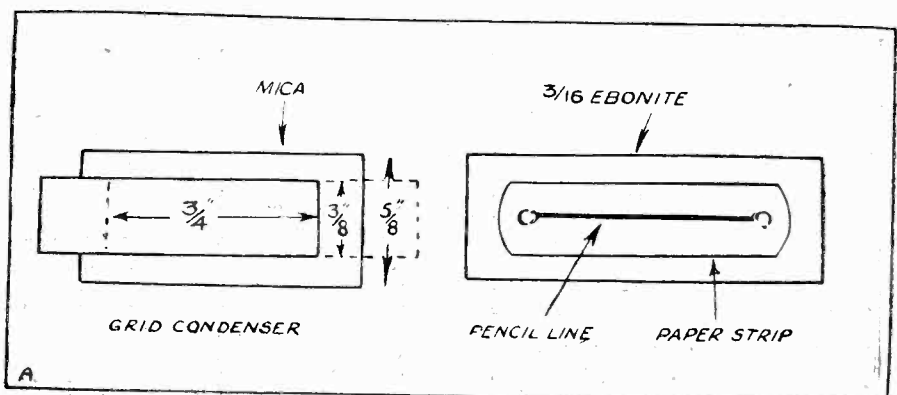


Fig. 3.—The grid leak and condenser.

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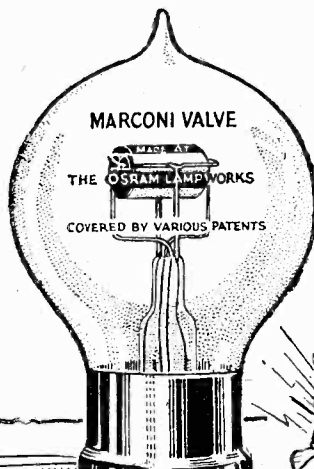
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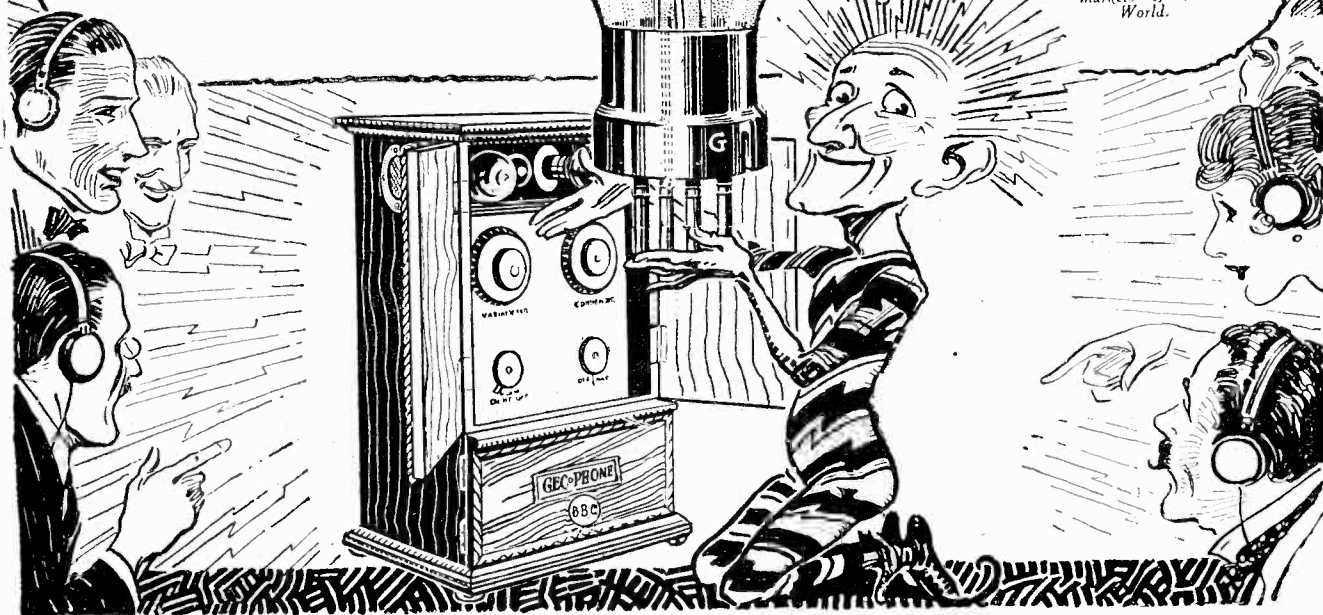
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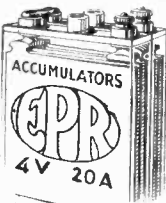
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1315	4	30	15	14 11	
1320	4	40	20	16 11	
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1340	4	80	40	29 -	
1420	6	40	20	27 6	2/6
1430	6	60	30	33 9	
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1840	6	88	44	52 6	
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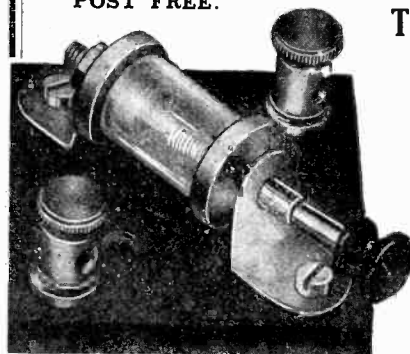
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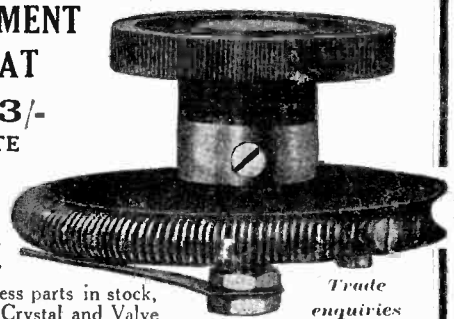
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ASSORTED TIPS

Quite a serviceable, and cheap, earthing switch can be made from an ordinary switch arm and a couple of contact studs mounted on a small piece of ebonite. The aerial down-lead goes to the switch arm, one of the studs to aerial terminal of the set, and the other to earth.

Very few valve sets have the glare of the filaments protected from the eyes, but if you are in the habit of listening-in for lengthy periods, it is advisable to arrange some covering. For the smaller type of valve, such as the "Ora" and "Xtraudion," quite a good cover can be made from empty inverted mantle boxes, although the "R" type will require larger ones. A pinhole would be sufficient to show that the valve was still burning satisfactorily.

Don't think that a higher plate voltage will always give you better signals. Some valves—such as those excellent little Dutch rectifiers—require very low plate voltage, and one step-up with the wander plug will often reduce the strength of the signals considerably.

If your variable condenser is not covered in to protect it from dust, it is a good plan to give the whole instrument a good "blow" with a cycle pump. Dust on the plates will make your condenser noisy in action, and a few "goes" with the pump will clean the plates quickly.

A COMPLETE SINGLE VALVE SET.

(Continued from page 512.)

variable inductance the best results will soon become apparent.

To give the instrument greater efficiency, a small resistance for the filament will be found an improvement, and a piece of thick flat mica wound with about 20 turns of

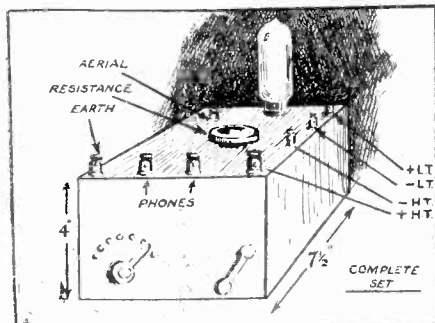
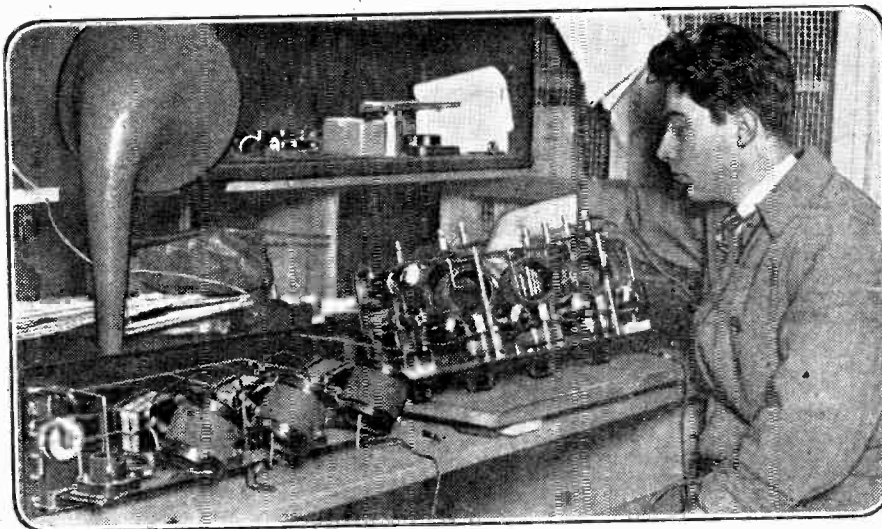


Fig. 6.—The general appearance of the completed set.

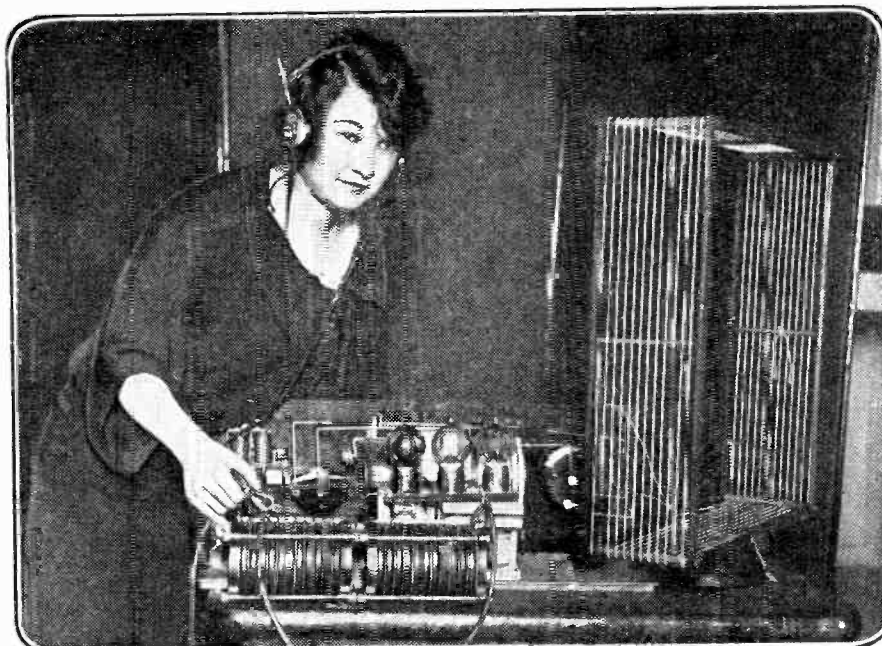
resistance wire should be screwed on the underside of the panel in a fashion similar to the grid condenser. Make the hole for the selector portion low enough to describe an arc across the whole of the resistance wire. This is shown in the diagram (Fig. 2).



The latest wireless product of America: the wonderful Neutrodyne Receiver, invented by Prof. Louis A. Hazeltin. The circuit embodies entirely new principles, and it is claimed that tremendous ranges are possible without even an aerial or earth attached. It is of non-radiating character, and employs two H.F. detectors and two L.F. valves. Dry batteries only are required. The above photograph shows the interior of the set.



The external appearance of the Neutrodyne Receiver. The dial on the extreme left controls all the amplifying valves, no potentiometer being used, while the next dial controls the aerial tuning adjustment. The third and fourth are "neutrostages," and the last the detector valve control.

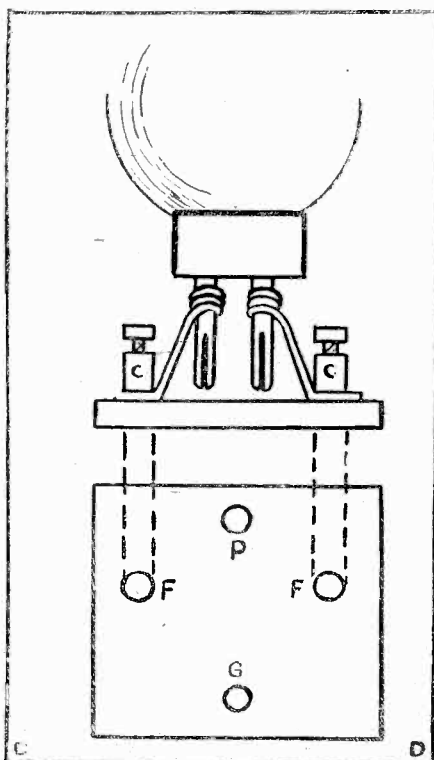


Miss Gladys Ward trying out the latest "super" set.

A SUBSTITUTE VALVE HOLDER.

This little device will prove extremely useful for those who do *NOT* confine themselves to one circuit.

IT is not always convenient for the experimenter when "trying out" various types of new circuits to connect up to the ordinary type of valve-holder in order to complete the wiring of the set. The connections to most valve-holders in the standard type of instrument are usually firmly soldered, or otherwise permanently connected, and everything in the nature of a permanent connection to the enthusiastic and genuine experimenter, is, to say the least of it, entirely undesirable. The device



shown in the illustration, therefore, may prove of interest to those restless spirits who are ever seeking to evolve something new in the way of wireless receiving circuits.

Mark Each Terminal.

A small baseboard of bakelite, ebonite, or even prepared wood, three or four inches square, four brass terminals, and about a foot of ordinary springy brass wire, are all the components that are necessary to construct this simple form of valve-holder.

The diagram is almost self-explanatory. The wire is divided into four equal lengths, one end of each length being turned into a small spiral of a suitable diameter, to support and make connection with the valve leg. A portable valve-holder ready for use is thus easily constructed, and can be placed in any required position and speedily connected in circuit by means of the terminals. Each terminal should be plainly marked as indicated, in order to make certain that the valve is placed properly in position.

Forms a Protection.

The filament circuit should be tested for continuity before connecting the high-

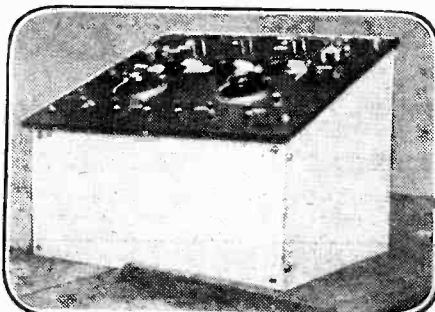
tension battery, although perhaps this advice is unnecessary to the amateur who is likely to make use of this device, as it is probable that he has already experienced that by no means pleasant sensation which always attends the connecting of the plate battery across the filament of an expensive valve. This form of socket works well, provided the spirals make a sufficiently good connection with the valve legs, and the natural springiness of the wire acts as a buffer, and protects the valve against damage should the baseboard be heavily or carelessly placed down during operations.

CORRESPONDENCE.

The Editor, POPULAR WIRELESS.

Dear Sir,—As the advertising adviser to a large London firm dealing with wireless components, and specialising in sets of parts for home construction, I should be glad of this opportunity of replying to the letter signed "Olig" in your issue of April 28th.

In his letter the writer criticised misleading advertisements of wireless manufacturers, and I consider that the publication of his letter is likely to do the wireless industry—particularly as regards mail-order business—some considerable harm.



A valve receiver with an aluminium casing. Less capacity effects and more freedom from parasitic noises is claimed with the introducing of this metal.

It is my business to watch carefully all advertisements of wireless firms, and I cannot recall ever seeing one which appeared to deliberately misrepresent the article it purported to advertise. In my opinion, advertisements of wireless firms are honest, and the firms can be dealt with by anyone without fear of misrepresentation. Obviously, if the standard price for a transformer, for instance, is 21s., no amount of smooth-tongued salesmanship—either in print or in person—should convince an intending purchaser that one at 12s. 6d. would be equally as good.

Undoubtedly there have been some cases of advertisements which perhaps give only half the truth, but probably this is due to the fact that the advertisement writer does not understand his subject. At the present moment, of course, some advertising men are not quite *au fait* with the technicalities of wireless and can only speak and write in generalities.

Wireless enthusiasts living some distance from the nearest large town—and one of the great features of wireless is that it is such a wonderful companion to the lonely country dweller—need have no fear in dealing with regular advertisers in the columns of your paper, for obviously if a firm does not "deliver the goods" they cannot remain in business long.

Yours faithfully,

ERNEST R. GILBERT.

Gilbert Advertising, Ltd.

The Editor, POPULAR WIRELESS.

Dear Sir,—I am writing to ask your readers, who have received United States Broadcasting Stations during the past six months, whether, as a general rule, the reception was clearer on a starlight or cloudy night and what seems to be the most ideal conditions for this long-distance reception.

I find the most ideal conditions to be a wet and cloudy night, and I may state that I have the greatest difficulty in receiving even WJZ, Newark, New Jersey, on a starlight night.

Do any other readers experience this?

Yours sincerely,

HENRY FIELD.

Baggrave Hall, Leicestershire.

The Editor, POPULAR WIRELESS.

Dear Sir,—I read with interest the fact that Mr. P. Norris had received 2 L O at that great distance on a small crystal set.

Perhaps you may be interested to know that I can tune in 2 L O quite distinctly, although I am one hundred and eighty-five miles from London, and my aerial is badly screened on all sides. Cardiff, at the distance of twenty miles, comes through very loudly. This is no freak, as I can do it almost any night.

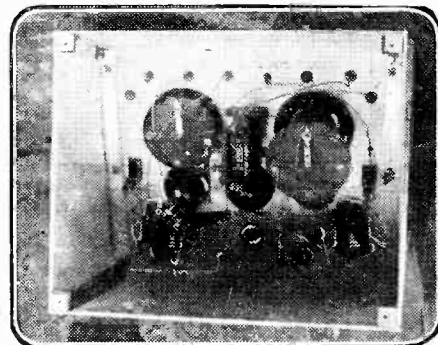
The set I am using is a Gecophone No. 1 Variometer tuned crystal type. My aerial is a single wire one hundred feet long and about forty feet high. The earth connection is made to the heating apparatus about ten feet away.

If this letter does not take up too much of your valuable space, I would be very pleased if you would publish it in one of the issues of your excellent paper, as I think it would interest other readers.

Yours faithfully,

H. E. LANKIN.

Derlwyn House,
Tonda, Glamorgan.

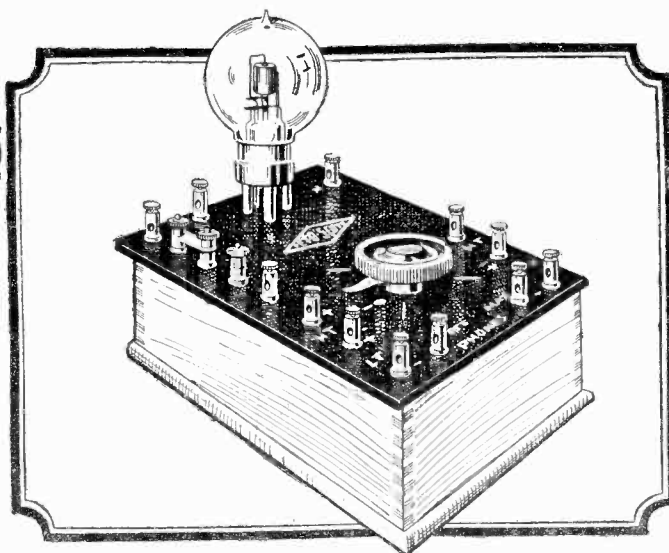


The interior view of the aluminium-cased valve receiver.

No. 2 of a series of
interesting talks on
Peto-Scott Units.

The Detector

—the heart of a
Receiving Set



AN efficient Detector Valve is as essential to a Receiving Set as the balance wheel to a watch.

Without a good Detector Valve, a Receiving Set cannot be expected to give good results.

What does the Detector do?

When wireless waves are intercepted by your aerial, and your Set is tuned to receive them, they are oscillating at such a high frequency, that no telephone—or other similar instrument—could possibly be made to reproduce them. It is necessary, therefore, to detect—or rectify—them. This is effected by means of a grid leak and grid condenser acting in conjunction with the Valve. If these two have the correct value the frequency of these oscillations will at once be brought down from millions per second to thousands per second, and converted into audible sounds through the telephones. Note then, therefore, the immense importance of this Detector Valve Unit with its grid leak and grid condenser.

Almost any form of grid leak will give some sort of result, but only a Peto-Scott Grid Leak—tested and guaranteed permanent under all conditions—will give the results for which Peto-Scott Sets are famed.

If you are tired of spending money on unsatisfactory instruments, decide to take up the Peto-Scott standardised Radio Unit system and begin to get wonderful results right from the first Valve.

A Booklet, "Radio," price 6d., post free, describes the system fully, and shows how each Unit can be constructed at home.

PETO-SCOTT Co., Ltd.,

Featherstone House,

64, HIGH HOLBORN, W.C.1.

Additional Demonstration Lounge:

93, HIGH HOLBORN, W.C.1.

**Read what an
efficient Detector
can do—**

5, Leighs Fold, Green Lane,

Patricroft.

Messrs. Peto-Scott, Ltd.

Dear Sirs,—No doubt you will be interested to know that the reception of the American Broadcasting stations W J X and W G Y on a single-valve home constructed set as described in my letter to "Popular Wireless" of March 17th issue, was made from a set of Peto-Scott (No. 4 unit) parts. To prove that this is not a case of "freak" reception, may I state that since that date I have received these stations eight times. I also get, apart from the above B.B.C. stations, the F.L., Radiola, Posts and Telegraphs (all French stations) telephony.

Wishing you the best of success with such an excellent panel.—Yours faithfully,
J. H. Brittain.

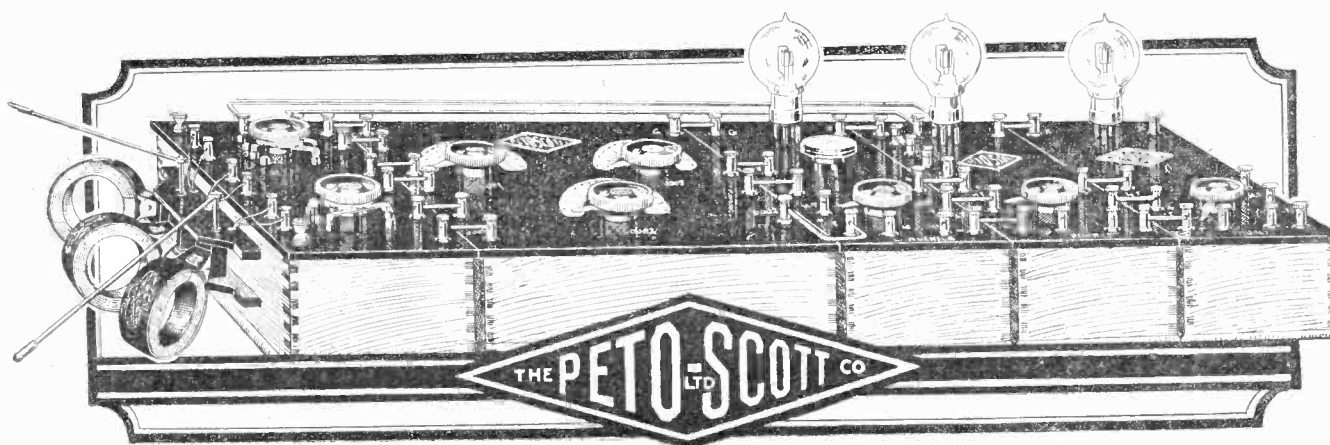
P.S.—I am demonstrating my set before the Eccles and District Radio Society this week, and expect to pay a visit to the Manchester Wireless Society in a fortnight's time.

PRICE LIST OF SETS OF PARTS.

Ready for home construction.

No. 1 Tuner Unit	27/6
No. 2 Condenser Unit	42/-
No. 3 H.F. Amp. Unit	13/6
No. 4 Detector Unit	17/6
No. 5 L.F. Amp. Unit	33/6
Mahogany Cabinets to fit Nos. 1, 3, 4 and 5, 3/6.	To fit No. 2, 7/-.

Postage 9d. per unit extra, but paid on all orders over £2.





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when buying
Ericsson 'Phones

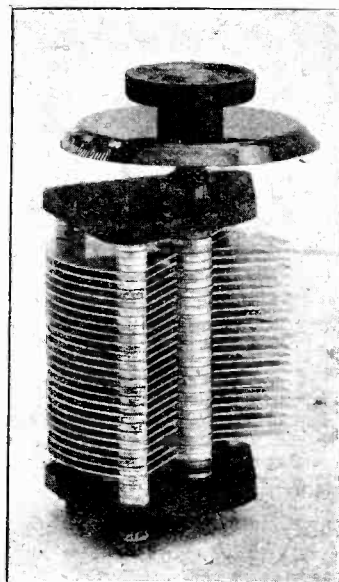
WHEN you ask for a pair of Ericsson Telephones see that you get them—with their trade mark and BBC stamp. Certain dealers are pushing another line made abroad as Ericsson's which do not approach in efficiency **our** world-famous make. So when you want **Ericsson** 'phones firmly refuse any telephones without these marks.

Write to-night for lists, also particulars
of our valve and crystal sets.

THE BRITISH L. M. ERICSSON MFG. CO. LTD.
International Buildings,
67-73, Kingsway, London, W.C.2

Ericsson
(British)
Telephones

2,000 ohms, price
31/-; 4,000 ohms,
price 32/-. All re-
sistances in stock.



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Correctly designed to take up less
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Guaranteed not under adver-
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Don't read this—

if you are content to pay high prices for very often inferior components, compare our prices, then send a sample order and compare our goods. For the next two weeks we will give free of charge to purchasers of our complete sets of parts of Crystal and 1, 2, and 3 Valve Sets, a highly polished Cabinet to suit. This is not a catch line, but a genuine gift, as we not only want this order from you but your future orders.

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from our List—

Moulded Ebonite Knob and Dial, solid Ebonite..	1/9
Valve Holders, also solid Ebonite ..	1/0
Knobs, bushed 2 B.A. ..	4d.
Sliders and Plungers ..	6d.
Variometers, built on Ebonite Tube ..	6/0
Vario Couplers do. do. ..	10/6
Intervalve Transformers, high class ..	21/6

All orders over 30/- carriage paid.

BAINTON & CO.,

(Late of J. L. Cartwright & Co.)

Dept. A, BOUNDARY STREET EAST,
MANCHESTER.

TRADE SUPPLIED.

TRANSMITTING PHOTOGRAPHS BY WIRELESS.

By MICHAEL EGAN.

It is quite a general idea that the transmission of pictures by wireless involves extremely complicated and elaborate systems of "different currents and wave-lengths," but, as this article clearly shows, the principles that render this wonderful operation possible are really comparatively simple.

IT is probable that modern improvements in wireless telephony have awakened a deeper and more wide-spread public interest than has ever previously been awakened by the developments occurring in any other particular branch of science. There are numerous reasons to account for this extreme interest in wireless telephony, and at the base of all these reasons lies one dominant fact—the universal value and utility of the wireless telephone. So rapid has been the growth of interest in telephony, as manifested by the "characteristic curve" of public opinion, that the supreme importance of work that is being done in other fields of radio science has been somewhat disregarded. Among such work may be classed the research that is at present being conducted in connection with the transmission of photographs by wireless.

Preparing the Photograph.

It is generally assumed that the principles underlying all systems of photographic transmission are of so abstruse a nature that they cannot be grasped with any degree of satisfaction by the ordinary amateur. Whilst this may be so—and, indeed, is necessarily so in connection with a large portion of the experimental work that is carried out in all departments of science—it is, nevertheless, an easy matter to give to the intelligent amateur an intelligent mind-picture of how a radio-photographic apparatus works. What follows is an account of a system of photographic transmission developed by a French scientist named Edouard Belin, and used by him to transmit a photograph of President Harding across the Atlantic on one occasion last year.

The photograph which it is desired to transmit is first prepared in a special manner. The process itself need not be considered here, it being sufficient to know that the photo is reproduced on a cylindrical drum, and that it is reproduced in relief. It can thus be resembled to one of the old-time phonographic cylinders with which many of us were wont to produce drawing-room atmospherics in the days gone by. The surface of the cylindrical photograph is "raised"—i.e. is made to consist of minute hills and valleys—in accordance with whatever variations in light and shade occur in the original photograph. The height of any point above the surface of the cylinder therefore indicates the amount of light or shade occurring at the corresponding point on the photograph.

Method of Transmission.

The cylinder is fitted to a revolving drum, which comprises part of the transmitter.

A sensitive needle makes contact with the surface of the cylinder as it revolves, and the needle is in turn directly connected to a carbon granule microphone. This microphone works on exactly the same principle as those used in connection with ordinary wire, or wireless, telephony transmission. As the granules are contracted by pressure of the needle—resulting from contact with a high point on the cylinder surface—their electrical resistance is decreased, and, consequently, a larger current is permitted to flow. This increase in current strength in turn affects the radiation from the aerial.

So far as the methods used in telephonic and photographic transmission are concerned, the only important difference with which we need trouble ourselves is as follows. In telephony, the radiated energy is controlled in the first place by the vibrations of the human voice impinging on the diaphragm of a sensitive microphone; in photography—referring, of course, to this and kindred methods only—the original controlling factor is the sensitive needle

similarly, when large variations in the electro-magnet are brought about by the received wave, the little mirror is deflected through proportionately larger angles.

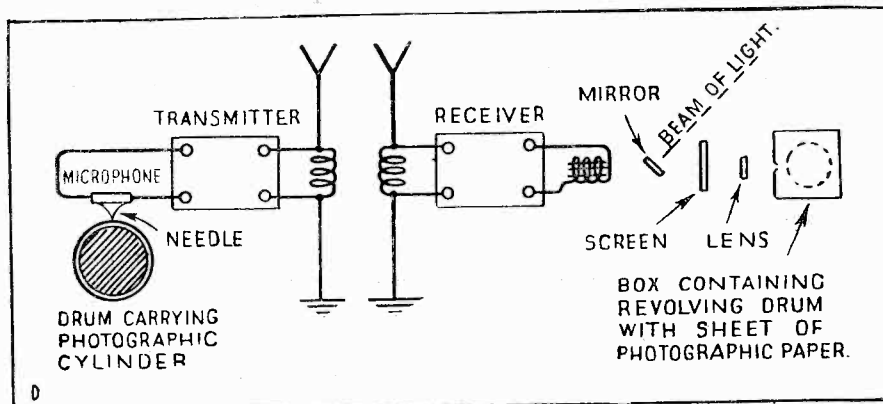
Upon the reflecting surface of this mirror a beam of light is concentrated. This beam is reflected from the mirror on to a small screen, which is of such a nature that it offers a varying resistance to the passage of light through it. That is to say, at one end the screen is quite opaque, and at the other end quite transparent, the intervening part being composed of a substance that exhibits various degrees of transparency between these two extremes. As the mirror vibrates, it reflects the beam of light on to different points of the screen. The light that penetrates the screen will therefore be of a varying intensity. This varying light is now focused, through a lens, on a small aperture in a box, which contains a revolving drum carrying a sheet of sensitive photographic paper. Each variation in the received wave is thus utilised to focus a beam of light—of a particular intensity—on a sheet of photographic paper.

Reproducing the Picture.

When the transmission has taken place, the photographic paper is taken from its dark box and developed and fixed in the ordinary manner. Great care has to be taken, of course, to ensure that the rotation of the drum at the receiving station is synchronised with the rotation of the drum at the transmitting station.

What has been said above represents, of course, a bare outline of this very ingenious system of photographic transmission. Radio-photography is still in its infancy, as the phrase goes, but it must not be forgotten that it is already an older and more precocious child of science than was radiotelephony five or six years ago. And, as the rate of its development will depend directly on its value to humanity, we may look forward to some amazing achievements in this branch of science during the next few years.

The value of an efficient system of radio-photography to modern life can scarcely be estimated; it can certainly not be overestimated. Take, for example, the simple operation of affixing a signature to a document. What effect will it have on the business of the world when you can sit in your office in London and write your name with a wireless pen in Singapore? What chance will the criminal have who leaves the scene of his crime—in London, say—by one of the Great Northern expresses, and arrives in Glasgow in time to learn that his photograph had appeared in the "Glasgow Herald" some five hours before his arrival?



This diagram clearly illustrates the elements of the apparatus employed in the transmission and reception of photographs by wireless; its comparative simplicity will be apparent to even the veriest "tyro."

passing over the raised surface of the cylindrical drum. As it moves over the surface of the cylinder with varying pressure, it alters the electrical resistance of the carbon granules in the microphone.

The Receiver.

So much for the transmitter, then; the different shades of light and dark on the original photograph are converted into variations in the carrier wave radiated from the transmitting aerial. This wave is picked up by the receiving aerial, from which it is passed through a coil of wire which comprises the winding of an electro-magnet. The variations in the transmitted wave are thus reproduced as variations in the magnetic field of this electro-magnet in the receiving station. At some distance from this electro-magnet a small mirror is suspended in such a manner that its movement in one plane is controlled by the impulses passing through the electro-magnet. (See accompanying diagram.)

In simpler terms, when a small variation occurs in the field of the electro-magnet, the mirror moves through a minute angle;

THE CREED TELEGRAPHIC APPARATUS.

By P. J. RISDON, F.R.S.A.

High-speed wireless telegraphy is intensely interesting, and no doubt many readers will have heard the spasmodic "purr" of the large commercial stations that are continually transmitting at speeds varying up to 175 words a minute—faster than one can comfortably speak. The great White Star liner, the *Majestic*, has recently had high-speed wireless apparatus installed, and can communicate with land stations by this means up to a distance of 700 miles. This article clearly explains the working of such a system, and should prove of utmost interest to every amateur, especially those who have heard and puzzled over the prefix signal NW (Now Wheatstone), signifying the commencement of a high-speed transmission.

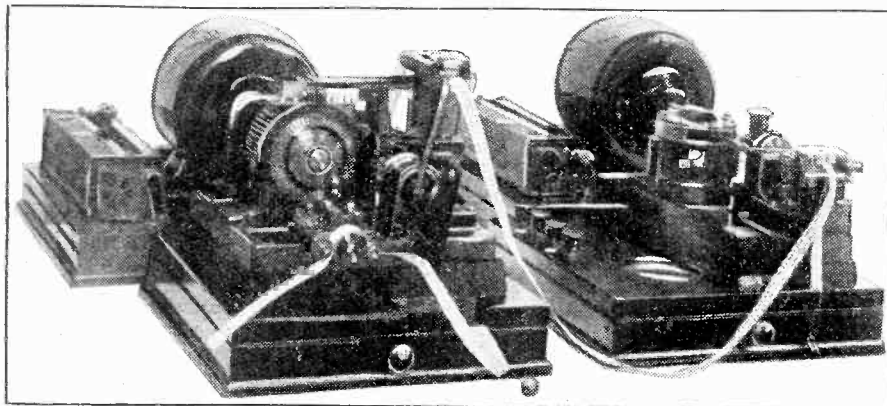
FOR reasons explained in other articles, big wireless transmitting and receiving stations are usually placed as near the sea coast as is conveniently possible, with the result that messages have to be despatched by overland wires from inland cities (and, conversely, telegraphed after receipt) by apparatus such as is used for ordinary rapid telegraphy. Since such apparatus is essential for the completion of

being typed, the instrument automatically selects sets of punches, and perforates the tape with the Morse-code equivalents. A good operator will turn out about 40 to 45 words a minute.

An Automatic Contact.

The perforated tape is then passed on through the transmitter, over a pair of tiny rods called "peckers." The central row of

by the contact pins as they respond to the movements of the peckers. Thus the message is consigned to the transmitter, passed through a relay of a special adjust-



The receiving perforator and the high-speed printer. The latter is on the left of the photograph.

wireless telegraphic systems, a description of the latter would be incomplete without that of the part played by land wire instruments more or less common to all systems.

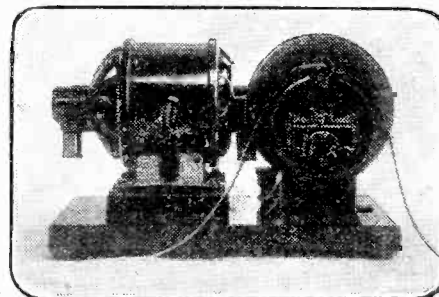
If an operator who lived in the early days of telegraphy could be resurrected now, his astonishment would surely be great—indeed, if modern telegraphic appliances were placed before him, he would be entirely at a loss how to use them. In his time, 20 words a minute, despatched and received by hand working, was about the limit of speed.

A Perforating "Typewriter."

At a later date, the invention of the Wheatstone transmitter rendered it possible to work at a speed of 300 words a minute, but such a speed necessitated the services of about two dozen operators at the sending and another two dozen at the receiving end, for all messages had to be deciphered and written out by hand.

In the latest type of Creed transmitter, the Wheatstone principle is retained, but its somewhat complicated mechanism is replaced by a simpler one with fewer wearing parts. It may be explained that a paper tape is first punched with the Morse code of dots and dashes on a keyboard perforator. This instrument has a keyboard lettered and numbered just like that of an ordinary typewriter. But when the operator depresses the keys, instead of letters and numbers

closely spaced holes in the tape engage the teeth of a rotating star wheel which draws the tape through the instrument. The peckers are pressed gently against the underside of the tape by means of springs so that the two side rows of holes pass centrally over them. Whenever a hole passes over a pecker, the latter rises through it and, being connected by levers with the contact pins, make and break is automatically effected



The transmitter.

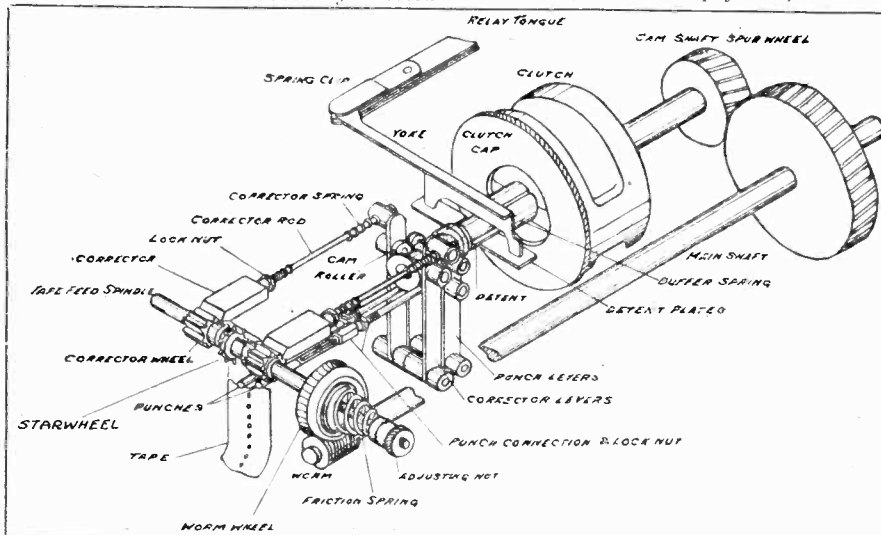
able type for correcting "bias," and in a flash reaches the wireless transmitting station at the rate of from 100 to 150, or even 175, words a minute.

Two Types of Relay.

It is not our purpose to deal with the wireless side of transmission and reception in this article, and we must therefore break our story here and take it up where the message, having been waylaid by the distant receiving station, is passed on to the receiving apparatus. Here it passes first through a line relay, and then through a power relay fitted on the same base plate as the receiver.

There are two principal types of relay. One of these is known as the "line relay,"

(Continued on page 521.)



This diagram shows clearly the essential working parts of the receiving perforator.

THE KENOTRON.

CONCURRENTLY with the development of the three-electrode valve as a generator, there arose the need for a source of high voltage direct current supply for application between its plate and filament. For certain powers a D.C. generator with revolving armature meets this need, but for higher voltages than such machines can deliver the kenotron was developed.

The one-way conductivity of valves has already been described in POPULAR WIRELESS and this description covers the kenotron.

Thus it is easy to see that if a kenotron is connected in series with an alternating current supply it will act as an open circuit during alternate half-cycles, and will allow the current to pass only when its direction is from filament to plate.

Fifty per Cent. Efficiency.

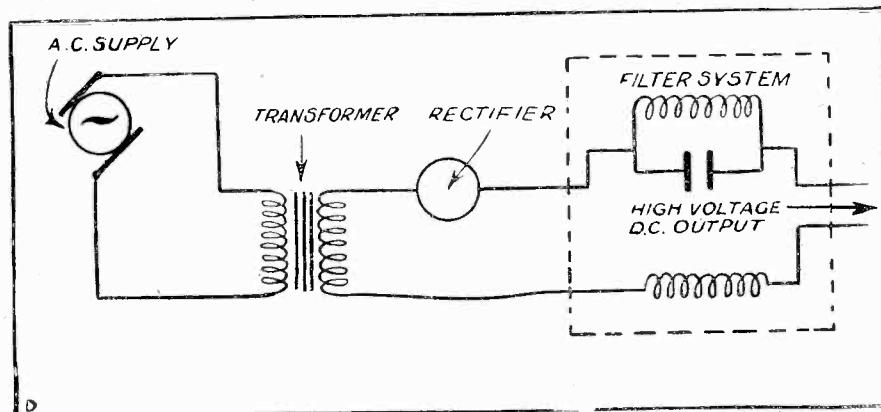
The current derived from the kenotron under these circumstances will be in the form of pulses of direct current. In order to derive this direct current at high voltages, the A.C. supply is first transformed up to a voltage exceeding the value required, to compensate for the drop along the rectifier

and any system of filters which may be employed. These filters are necessary for the smoothing out of the ripple in the D.C. output when the current is required to be constant, and consist in general of various combinations of condensers and choke coils. By using a number of rectifiers and phases, it is possible to produce a current with only

a small percentage of intermittent current remaining in it.

Kenotrons are applicable not only to wireless circuits, but to any requiring a high voltage direct current, and have been made with a capacity of 30 kilowatts at 15,000 volts D.C.

Thermionic rectifiers, though noiseless in operation, and free from the moving parts and the drawbacks attendant upon chemical rectifiers, probably do not in efficiency exceed 50 per cent., but for amateur work form, with the subject of filters, an interesting study.



THE CREED HIGH-SPEED APPARATUS.

(Continued from page 520.)

used in connection with the magnification of signals received, and the other as the "power relay," for use with apparatus requiring power to operate it, such as the receiver and high-speed printer, the principle of working being the same in both cases.

The receiver (see diagram) is operated by an $\frac{1}{8}$ h.p. electric motor mounted at one end of the instrument. An extension of the motor shaft operates, through worm gearing, a cross shaft at the other extreme end. This shaft drives, through a tiny friction clutch, a star wheel that engages the central holes in an otherwise blank paper tape, and draws the tape through the instrument.

The Perforator.

At an intermediate point, the motor shaft extension is geared to a parallel shaft which, through another friction clutch, drives a shaft in which cams are formed. Two punches, parallel with the shaft, terminate in sleeves that work in the cams, another pair of small rods terminating in another pair of sleeves. The last pair of rods is for controlling the speed of the paper tape, and stopping it whilst it is being punched, to prevent its being torn, and for synchronising or timing the punching with the signals as they are received.

The relay tongue (an extension of the armature of the power relay) is connected to a transverse yoke resting on a pair of "stop" or "detent" plates, one on each side of a "snail" or "detent" fixed to the clutch shaft. When the relay tongue moves in one direction, the detent plate arresting the "snail" moves with it, allowing the snail

and the shaft to make a half-revolution when it is stopped by the other detent plate. The cams controlling the movement of the correcting and punching rods are so proportioned as to push the corrector rods forward at the right moment, and cause pawls or "correctors" to engage the teeth of a pair of corrector wheels on each side of the tape-feeding star wheel, and stop it, whilst the punches are forced forward and perforate the tape. Thus, for every movement of the armature, there is a half-turn of the snail and a corresponding movement of the correcting rods and punches. The two friction clutches slip when the shafts are stopped, thus permitting the motor to continue running.

From the foregoing description it will be seen that the function of the receiver is to punch a tape at the receiving station, which is a facsimile of the original tape punched by the keyboard perforator at the transmitting station.

High Speeds Possible.

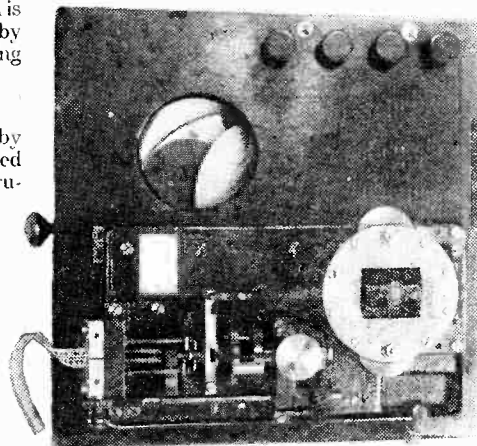
The paper tape punched and delivered by the receiver now passes on to the high-speed printer—a delightful but complicated instrument. In ordinary working, this machine turns out from 100 to 140 words a minute, but when occasion demands, a speed of 150 words may be attained. Higher speeds are not usually necessary; when they are, it is usual to employ two printers and divide the tape from the receivers between them, by which means a working speed of from 200 to 300 words a minute is possible. At the ordinary working speeds, vibration is scarcely perceptible, and the printing is wonderfully clear and distinct.

The Final Process.

As the perforated tape is fed into the printer, it passes over a series of ten pairs of small pins or "selectors." The two selectors of each pair are spaced exactly the same distance apart as the holes in the tape corresponding to the Morse code. The

selectors are pressed lightly against the underside of the tape, so that whilst on perforations are encountered nothing happens. But immediately a hole comes opposite a selector, the latter rises through it, and in so doing lifts the end of a horizontal "actuating" lever pivoted on a pin. The different combinations can thus print various letters.

A great advantage of the Creed system is, not only that a message can be repeated over another telegraph line when desired simply by passing the same perforated tape through another transmitter, but it can also be used in conjunction with a syphon recorder or undulator by which the message is recorded in ink on another tape by a fine, trailing, syphon tube in line dot and dash corresponding to the Morse code.



The Creed Receiving Perforator.

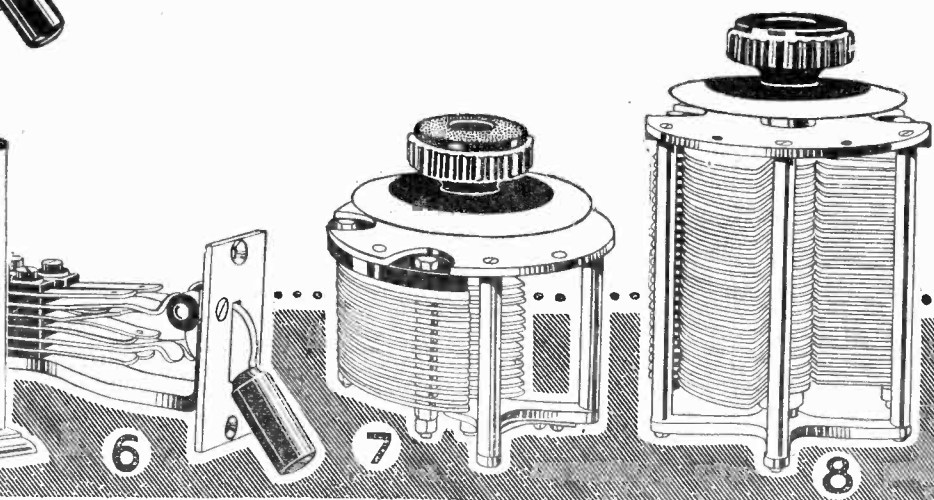
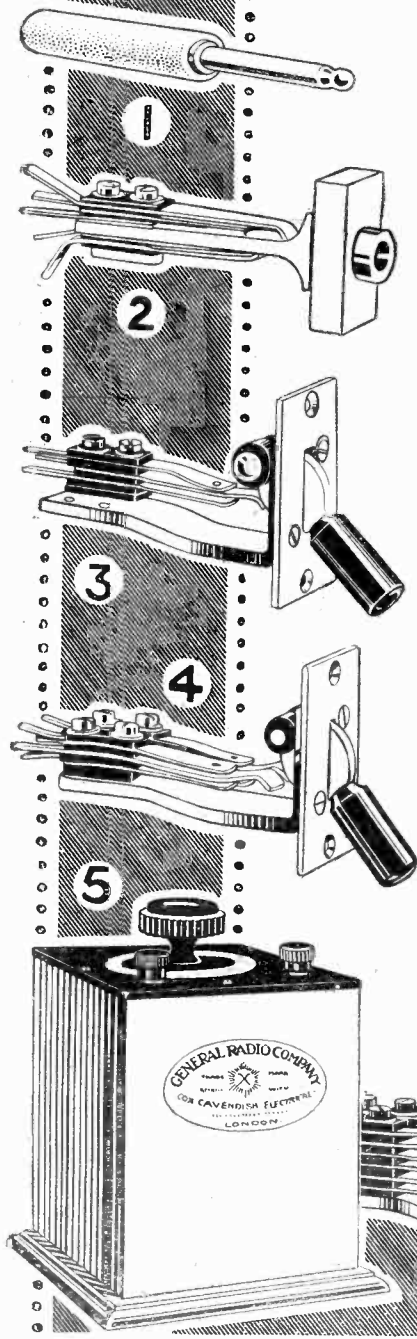
The Creed can also be employed on practically any line, and for direct wireless relay communication. It is also extremely useful when similar messages to several different addresses are being dealt with, as the perforated tape can be run through the printer any number of times.

G.R.C. Parts.

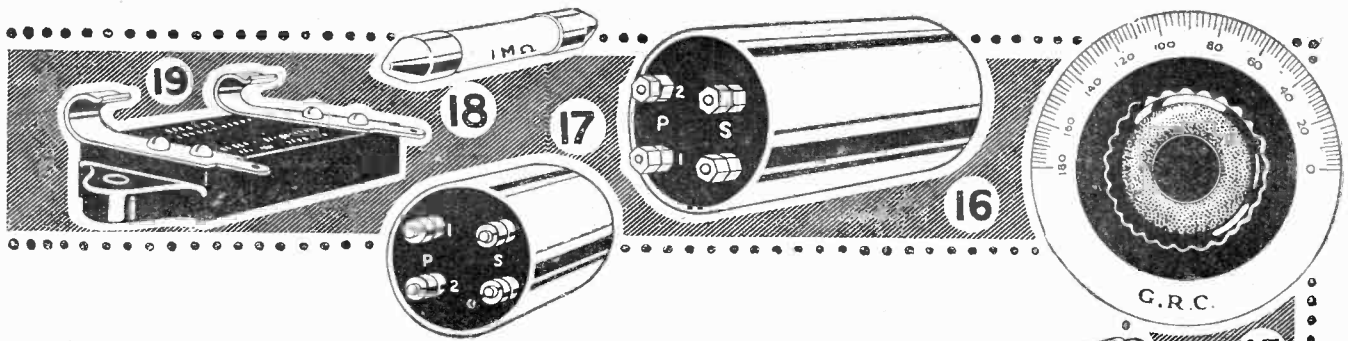
G.R.C. Parts are produced with the same meticulous care as the famous G.R.C. Receiving Sets. From the stamping, turning, or moulding of the components and winding the various coils, through the assembling and finishing of the units to the final test, every operation is subjected to the most rigid inspection.

Although the G.R.C. Factory, employing 300 highly skilled hands, is pressed to its utmost capacity by the enormous demand for G.R.C. products, every single unit is carefully tested before shipment.

Keen Radioists will know that G.R.C. parts are far in advance of the conventional designs—and quantity production means reasonable price. Our free book "*A Radiophone in Every Home*" tells the whole story. Write for it to-day.



GENERAL RADIO COMPANY



- No. 1. G.R.C. 111 Radiophone Plug.
 No. 2. G.R.C. 113 Jack.
 No. 3. G.R.C. 115 Jack Switch (Single pole—single throw).
 No. 4. G.R.C. 116 Jack Switch (Double pole—single throw).
 No. 5. G.R.C. 61 .0011 Variable Condenser in Case.
 No. 6. G.R.C. 117 Jack Switch (Four pole—double throw).
 No. 7. G.R.C. 64 .0005 Lab. Variable Condenser.
 No. 8. G.R.C. 63 .0011 Lab. Variable Condenser.
 No. 9. G.R.C. 81 Variable R.F. Transformer.

- No. 10. G.R.C. 71 Variometer
 No. 11. G.R.C. 72 Vario-Coupler.
 No. 12. G.R.C. 104 Frame Aerial.
 No. 13. G.R.C. 91 Potentiometer.
 No. 14. G.R.C. 92 Filament Rheostat.
 No. 15. G.R.C. 122 Dial and Knob.
 No. 16. G.R.C. 83 Audioformer.
 No. 17. G.R.C. 82 Radioformer.
 No. 18. G.R.C. 96 Grid Leak.
 No. 19. G.R.C. 66 Condenser.

GENERAL RADIO COMPANY,

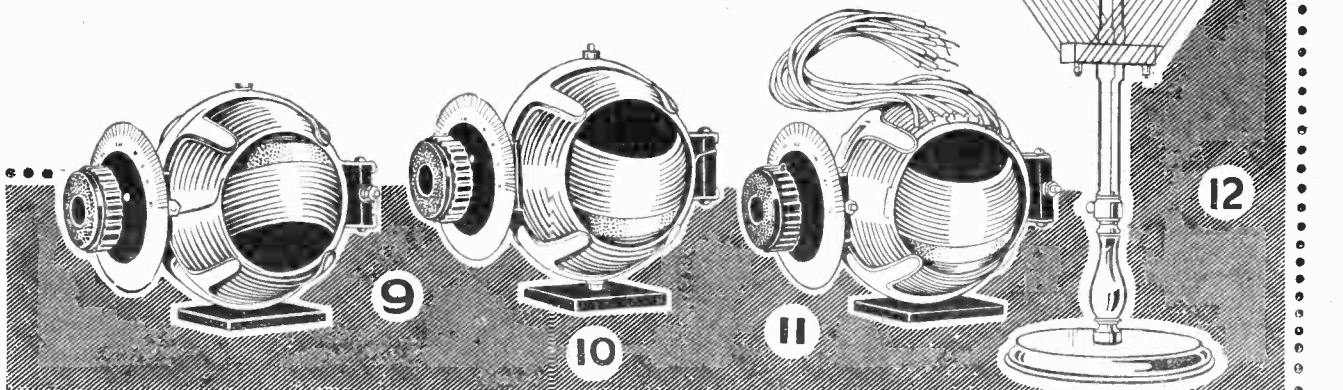
TWYFORD ABBEY WORKS, ACTON LANE, HARLESDEN, N.W.10.

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SHOWROOMS: 105, Great Portland St., W.1.

'Grams : Milliamper, 'Phone, London.

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MORE PICTORIAL VALVE CIRCUITS.

By O. J. R.

IN a recent issue of POPULAR WIRELESS, we described three different types of single valve receivers which, we said, were the best circuits for the newly graduated valve-set operator to try. This week we publish a similar article dealing with two-valve receivers in which is outlined three popular methods of arranging two valves in one unit. As time goes on we hope to proceed with three-valve and four-valve receivers until our late Crystal Fans ultimately become real valve experts.

We commence with a two-valve low-frequency amplifier or note magnifier suitable for use with a valve or crystal receiver. It will be remembered that the strength of the received signals, using a single valve L.F. amplifier, was $1 \times 5 = 5$. By adding another valve and transformer we get $5 \times 5 = 25$, so that the signals are now twenty-five times louder than they were originally. The signal strength is squared each time another valve is coupled to the next with a 5 to 1 step-up transformer.

Will Work Loud Speaker.

Thus if we have three valves we get $25 \times 5 = 125$, and so on. If an enthusiast is fortunate enough to reside in close proximity to the broadcasting station, say within a radius of 5 to 8 miles, then the two-valve L.F. amplifier shown in Diagram A will operate a loud speaker quite well, providing it is of a reputed make and that the receiver is as efficient as possible. The small fixed condensers C which are in shunt with the primary windings of the transformers may be of the Mansbridge type as shown or made up in the usual way. It is sometimes only necessary to provide one of these connected either to the first or second transformer, but this is a little matter best determined by first trying both and then disconnecting each in turn. This circuit is very simple to operate. If desired one of the filament rheostats may be dispensed with and the other made to control both valves.

To effect this alteration we will retain the rheostat nearest the accumulator, and take the other rheostat and three connecting wires out of the circuit. The wire then leading from the arm of the single rheostat to the lower valve filament leg is simply extended to the corresponding leg of the second valve and the O.S. of the second transformer joined to the O.S. of the first or to the negative accumulator lead, in any convenient position. The same remarks apply to any of the circuits shown. This is naturally the cheapest method, but for efficiency it is always advisable to provide a separate control for each filament.

The Tuner.

Providing one is within a reasonable distance of the broadcasting station the best way to arrange two valves as a complete receiver is to employ one as a detector and the other as a L.F. amplifier, as shown in Diagram B. This, of course, amounts to practically the same thing as the single valve receiver coupled to the single valve L.F. amplifier previously described, made up

in one unit. The single slide inductance may be replaced by any other suitable tuning device, but it is always best when trying a new circuit to commence with a simple form of tuner and elaborate it, if necessary, after

becoming acquainted with the other circuit adjustments. Experiments here will be chiefly confined to the grid leak and the 'phone condenser. Condensers of different

(Continued on page 525.)

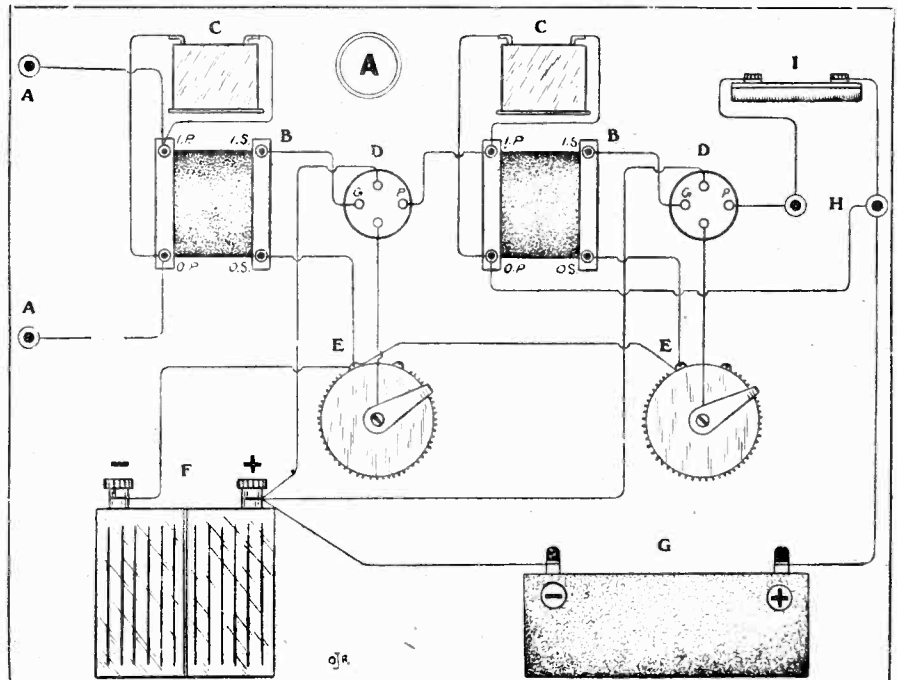


Diagram A: A two-valve low-frequency amplifier; A A, input from receiver 'phone terminals; B B low-frequency inter-valve transformers; C C, .001 mfd. fixed condensers; D D, valves; E E, filament rheostats; F, accumulator; G, high-tension battery; H, telephone terminals; I, .002 mfd. fixed condenser.

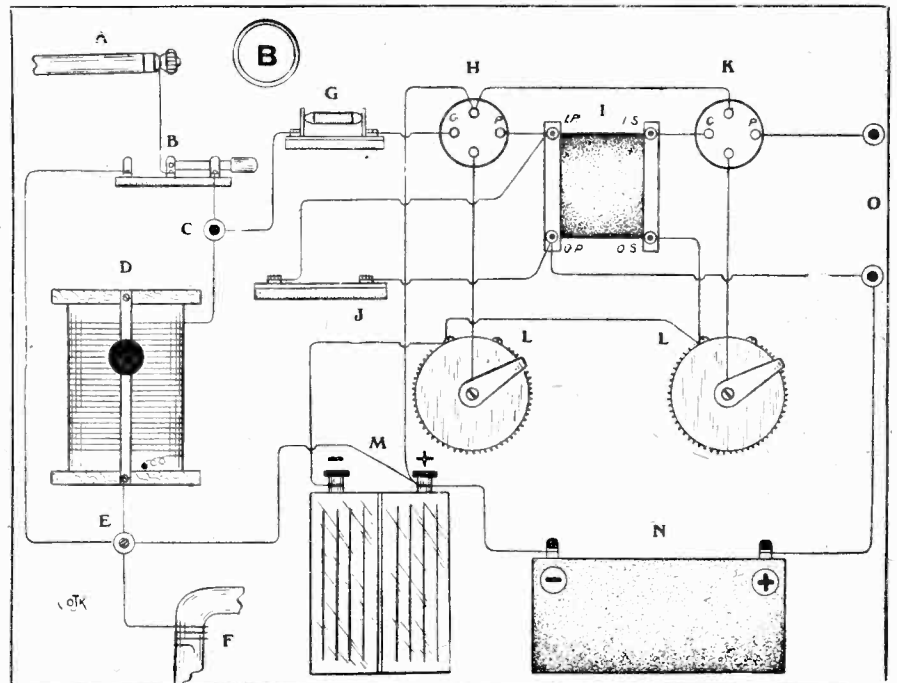
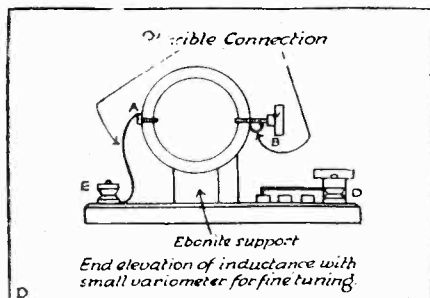


Diagram B: First valve as rectifier, second as L.F. amplifier; A, aerial lead-in insulator; B, earthing switch; C, aerial terminal; D, tuning inductance; E, earth terminal; F, earth; G, grid leak and condenser; H, detector valve; I, low-frequency inter-valve transformer; J, .001 mfd. fixed condenser; K, L.F. amplifying valve; L, filament rheostats; M, accumulator or low-tension battery; N, high-tension battery; O, telephone terminal.

FINE TUNING.

FINE tuning is absolutely essential for good results for both the most primitive to the most elaborate wireless receivers. The variable condenser is most commonly used for this purpose, and it usually takes the form of the moving plate



air-dielectric type. The wireless enthusiast usually finds difficulty in constructing this type of condenser and abandons the condenser made with two test-tubes as being most inefficient.

The following device was found to be an excellent method for obtaining fine tuning, and it is, moreover, very simple in construction.

It consists essentially of a small coil connected in series with an ordinary hollow solenoid inductance, and mounted inside it in such a way that it can be rotated upon a diametrical axis. In fact the device is a small variometer used in conjunction with another inductance.

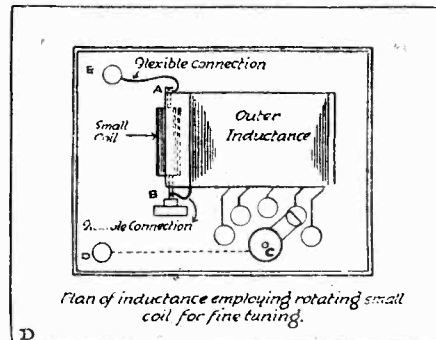
For the broadcast wave-lengths wind 75 turns of 26 S.W.G. double cotton covered wire on a hollow 2 in. cardboard former, taking tapplings at every 15 turns.

The former should be $3\frac{1}{2}$ in. long, and a space of $\frac{1}{4}$ in. should be left before the winding commences. Next construct a second coil of 10 turns of the same wire on a $1\frac{1}{2}$ in. former, leaving a space of $\frac{1}{16}$ in. between the fifth and sixth turns.

Useful for Any Coil.

Pivot this coil inside the larger inductance by means of a small screw (A), and a

screw with ebonite knob (B). Solder the free ends of the small coil to A and B. By means of short pieces of flexible wire connect B to the near end of the outer inductance, and A to a terminal (E) mounted on the base. The five tapplings should be taken to five contact studs mounted on the base-board, and connect the switch arm (C) to a second terminal (D). Incidentally copper rivets make excellent contact studs.



It will be noticed that this small coil for fine tuning may be fitted to any solenoid inductance and not necessarily to an inductance made for the purpose.

MORE PICTORIAL VALVE CIRCUITS.

(Continued from page 524.)

values should be tried across the 'phone terminals and then across the plate 'phone terminal and the negative side of the high-tension battery.

High-Frequency Amplification.

If the reader is unfortunate enough to be "out in the cold" as far as reasonable distance is concerned, then the best way for him to arrange the two valves is to employ the first as a high-frequency amplifier and the second as a detector or rectifier, as shown in Diagram C. The valves are here shown coupled by means of a plug-in type of air core transformer, this being considered the most satisfactory method of coupling consistent with general utility and ease of manipulation. These transformers are wound to cover specified wave-lengths and mechanically arranged to engage an ordinary valve-holder so as to be readily interchangeable. The most usual arrangement of the winding is *in* and *out* primary to the grid and plate legs, and *in* and *out* secondary to the filament legs. See I, Diagram C. The tuning arrangement of this circuit may, of course, be modified at will. If the two honeycomb coils are used, a .0003 mfd. variable condenser (not shown) should be connected in shunt with the secondary coil D. The connecting wires for this would conveniently lead from the terminals on the coil holder or from the grid of the first valve and the positive L.T. terminal. The other variable condenser may be tried in series with the primary coil C instead of shunt as shown. This alteration will reduce the wave-length range of the coil. Disconnect the left-hand side of the condenser from the earth terminal F, and the top of the coil from the aerial terminal B.

Do not interfere with the lead from the right-hand side of the condenser to the aerial terminal, but connect another lead from the other side to the top of the coil.

A double pole double throw or "two-way" switch is often employed to effect a quick change over from series to parallel and vice versa, and the wiring of this was shown in a previous article. The small earthing switch as shown at B, Diagram B, may conveniently be included in either of the circuits.

PHOTOGRAPHS

of amateurs' sets, if clear and interesting, are always welcome, and are well paid for if accepted for reproduction in "Popular Wireless."

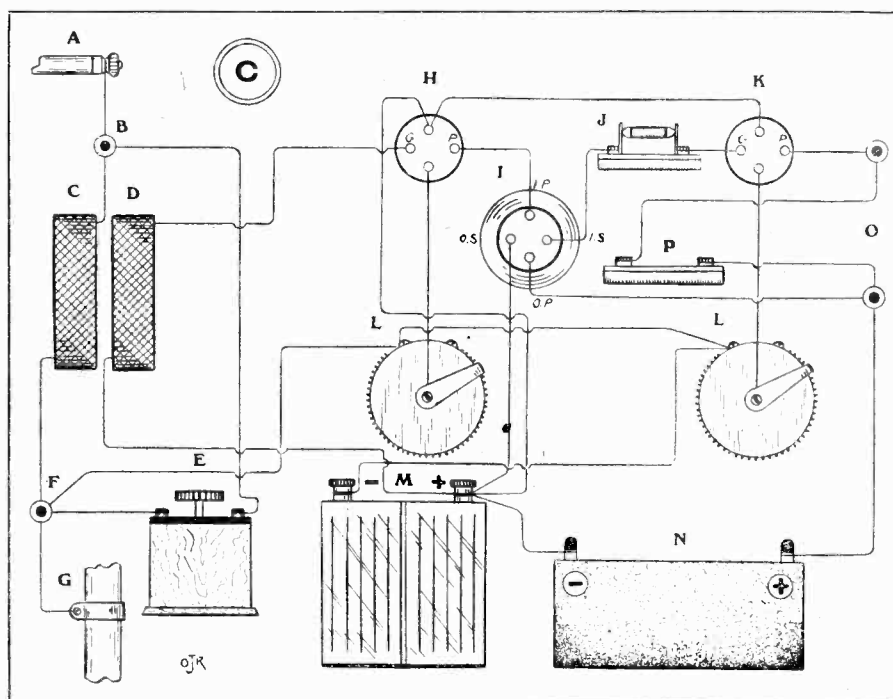


Diagram C: First valve as high-frequency amplifier, second as rectifier: A, aerial lead-in; B, aerial terminal; C, primary tuning coil; D, secondary tuning coil; E, .0003 mfd. variable condenser; F, earth terminal; G, earth; H, H.F. amplifying valve; I, plug in type high-frequency transformer; J, grid leak and condenser; K, detector valve; L, filament rheostats; M, accumulator; N, high-tension battery; O, 'phone terminals.

AN IMPROVISED FILAMENT RESISTANCE.

THE first article to obtain is a spring sleeve band. The bands are made of steel wire, tightly coiled. Next obtain a piece of dry wood, four inches square; on this should be marked a circle of four inches diameter. The wood should then be cut away to this circle with a sharp chisel, and finished with glass-paper.

A hole, large enough to take a small brass bush, as sold by all wireless dealers, should next be drilled in the centre of this wood.

The wood must then be impregnated with paraffin wax, and put by until it is cold.

The metal collar should now be taken off the sleeve band, and the band stretched so as to separate the individual turns of wire slightly; it should then be fixed round the edge of the wood, with the edge of the band slightly protruding above the surface, and

When wiring up, attach one wire to the terminal and the other wire to the brass collar.

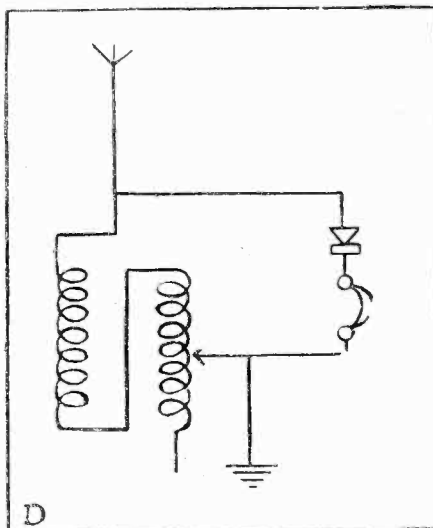
If carefully made, the resistance, although larger than the bought article, will be found to be smooth and reliable in action, and the use of the sleeve band will get over the difficulty experienced in obtaining Eureka resistance wire of sufficient springiness to prevent dragging the turns together when adjusting filament brilliancy.

The total cost should be about ninepence.

SMALL BUT EFFICIENT.

WE have received for test a wonderful crystal set from one of our readers.

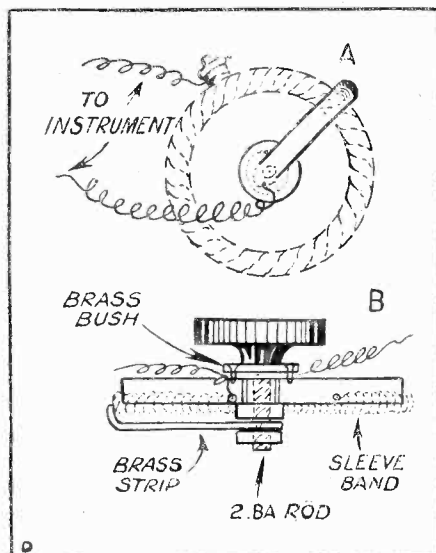
The set, while being perfectly efficient and of the highest finish, stands no higher than a penny piece, as can be seen by the accompanying photograph. Everything is hand made, even to the terminals. It is mounted in a highly-polished ebonite case, truly an excellent piece of amateur



The circuit is very simple, as can be seen by the diagram above.

Many people use the plug-in telephones and find that provision has been made for only two pairs of 'phones on their sets. The following is a quick way of overcoming the difficulty of adding a third pair. The plugs usually have a grub screw in the side to grip the tags of each 'phone lead. Remove these grub screws and insert ordinary telephone terminals of the same thread, usually 4 B.A., into each hole, and connect the leads of the third pair to these.

A hand drill taking $\frac{1}{8}$ -in. and $\frac{1}{4}$ -in. drills should always be kept at hand, as it will come in useful for making clean-cut holes in ebonite panels, wood, or metal.



fixed in position with a few brads spaced round the edge, one end being attached to a small terminal and the other secured to the wood.

Care should be taken that the individual turns do not touch their neighbours.

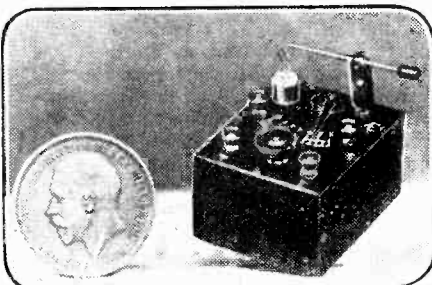
A piece of brass $\frac{3}{8}$ in. wide by $2\frac{1}{2}$ in. long should be cut, and a hole drilled in one end large enough to take a 2 B.A. rod.

Next cut a piece of 2 B.A. rod $1\frac{1}{2}$ in. long; on to this screw an ebonite knob. Screw the brass bush to the wood, with two small wood screws, pass the 2 B.A. rod through this, screw a nut on to the rod until it will just rotate in the bush.

Total Cost—9d.

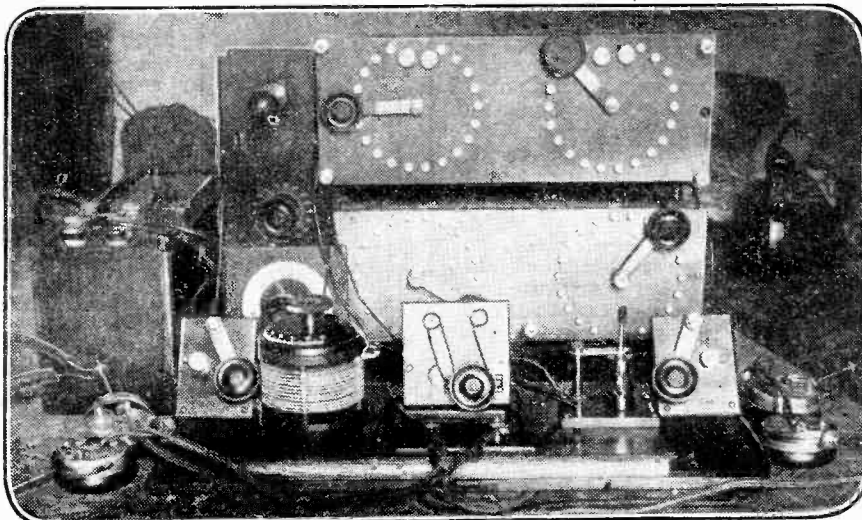
Then slip on the strip of brass and screw on another nut until it grips the strip tightly. It will then be found that the brass strip just makes a light contact with the edge of the spring; if it does not quite touch, bend the strip down until contact is made.

The resistance can be fixed to an instrument panel by drilling two holes in the wood and attaching with two nuts and bolts.



The diminutive receiving set mentioned in this article, showing its size in comparison with a penny.

workmanship. The set is variometer tuned with perfect micrometer adjustment, tuning, of course, being restricted to the broadcasting wave-lengths, but, nevertheless, giving excellent results over these bands. The coils were of the minutest possible size, and great patience must have been exercised in winding them. We tested the set on a



The efficient receiving set assembled by Mr. C. V. Carpenter, of 11, Washwood Heath Road, Saltley, Birmingham.

THE BRITISH BROADCASTING STATIONS.

WIRELESS BROADCASTING PROGRAMME.

Station.	Call Sign.	Hours of Transmission.	Items Transmitted.	Wave-length in Metres.	Remarks.
London	2 L O	11.30-12.30	Music	369	Every week day.
"	"	5 p.m.	Women's "Hour"	"	"
"	"	5.30-6.15 p.m.	Children's Stories	"	"
"	"	7 and 9.45 p.m.	News	"	"
"	"	8-10.30 p.m.	Music and various	"	"
"	"	8.30-10.30 p.m.	News and music	"	Sundays.
Newcastle	5 N O	11.30-12.30 p.m.	Music	400	Every week day.
"	"	Usually 5.0-10 p.m.	Music, News, etc.	"	"
"	"	8.30-10 p.m.	Music and News	"	Sundays.
Manchester	2 Z Y	11.30-12.30	Music	385	Every week day.
"	"	Usually 5.0-10 p.m.	Music, News, etc.	"	"
"	"	8.30-10 p.m.	Music and News	"	Sundays.
Birmingham	5 I T	11.30-12.30	Music	425	Every week day.
"	"	Usually 5.30-10 p.m.	Music, News, etc.	"	"
"	"	8.30-10 p.m.	Music and News	"	Sundays.
Glasgow	5 S C	11.30-12.30	Music	415	Every week day.
"	"	Usually 5.30-10 p.m.	Music, News, etc.	"	"
"	"	8.30-10 p.m.	Music	"	Sundays.
Cardiff	5 W A	11.30-12.30	Music	353	Every week day.
"	"	Usually 5.0-10 p.m.	Music, News, etc.	"	"
"	"	8.30-10 p.m.	Music and News	"	Sundays.
Croydon	G E D	Throughout day	Aeroplane Traffic	900	"

NOTE.—All times are B.S.T.

FORTHCOMING EVENTS FROM THE LONDON BROADCASTING STATION (2 L O).

SENDAY, 20th inst.—The Prince of Wales, Earl Haig, and Marshal Foch will speak from the Queen's Hall to the British Empire League.

All the broadcasting stations throughout the country will be connected with landlines for the purpose of broadcasting these speeches.

THURSDAY, 24th inst. (Empire Day).—Rt. Hon. Lord Islington, G.C.M.G., D.S.O., P.C., address at 8 p.m. Rt. Hon. Earl Meath, P.C., G.B.E., address at 9 p.m.

FRIDAY, 25th inst.—H. E. Blain, Esq., C.B.E. Chairman of the London Safety First Council, address on "Safety First," at 9 p.m.

Extracts from the following Operas, as performed by the British National Opera Co., will be relayed from Covent Garden and transmitted from 2 L O on the dates mentioned: 19th inst., "Faust"; 21st inst., "Aida"; 23rd inst., "Magic Flute"; 26th inst., "Phœbus and Pan"; 30th inst., "Hansel and Gretel"; June 1st, "La Bohème"; June 2nd, "Cavalleria Rusticana" and "Pagliacci." In "La Bohème" it is hoped that Madame Melba will sing.

NOTE.—See notes and news page for later details or alterations, if any, to hand.

THE CONTINENTAL BROADCASTING STATIONS.

BELGIUM

Station.	Call Sign.	Hours of Transmission.	Items Transmitted.	Wave-length in Metres.	Remarks.
Brussels (1)	Brussels	12 noon	Weather report	1100	Working days.
		4.50 p.m.	Aeroplane traffic	1100	When necessary
		6 p.m.	Concert	1300	Sunday, Tuesday and Thursday.

HOLLAND

The Hague	P C G G	3-5 p.m.	Concert	1050	Sunday.
		8.40-9.40 p.m.	Concert	1050	Monday & Thursday
The Hague	P C U U	7.45-10 p.m.	Concert	1050	Tuesday.
(Laboratorium Heussen)		9.40-10.40 a.m.		1050	Sunday.
The Hague (Velthuyzen)	P C K K	8.40-11.40 p.m.	Various	1050	Friday.
Ymuiden (Middelraad)	P C M M	8.40-11.40 p.m.	Concert	1050	Saturday.
Amsterdam	P A 5	8.10-11.10 p.m.	Concert and News	1050	Wednesday.

FRANCE

Levallois-Perret (Radiola)	S F R	2-3 p.m.	Music	1780	Sunday.
		5 p.m.	Stock Exchange News	1780	Every day.
		5.15-6.15 p.m.	Instrumental music	1780	Every day.
		8.45 p.m.	General News	1780	Every day.
		9-10.30 p.m.	Vocal and instrumental concert	1780	Every day.
Paris (2) (Eiffel Tower)	F L	6.40 a.m.	Weather Forecast	2600	Every day.
		11.15 a.m.	Weather Forecast	2600	Every day.
		3.30 p.m.	Stock Exchange News	2600	Every day.
		6.20 p.m.	Weather Forecast, Concert	2600	Every day.
		10.10 p.m.	Weather Forecast	2600	Every day.
École Supérieure des P.T.T. Radio-Riviera (Nice)		7.45-10 p.m.	Radio Concerts	450	Tuesday, Thursday,
		2.30-7.30 p.m.	Radio Conferences	450	Saturday.
		11 a.m.	News, Concert, tzigane	460	Every day.
		5-6 p.m.	News, instrumental Concert	460	Every day.
		9-10 p.m.	Latest News, Concert.	460	Every day.

GERMANY, CZECHO-SLOVAKIA, AND SWITZERLAND

Berlin	L P	6-7	Financial News, etc.	2800	Every day.
(Königswusterhausen)		11-12.30			
		4-5.30 p.m.	Financial News, etc.	2800	Every day.
Prague	P R G	7-11 a.m. and 3 p.m.	Weather News, General News	1800	Every day.
		9-2 p.m. and 9 p.m.	Concert	4500	
Geneva	H B	6-7 p.m.	Concert	1200	Every day.

(1) If, at the indicated times, a station has to receive or transmit service communications, the weather transmission will take place after these communications. Tuesday: Operatic selection on the gramophone. Thursday: Various on gramophone. Sundays: Various by artistes.

(2) Special concerts given during the evening are announced in the course of the preceding transmissions.

(3) All times are G.M.T., not B.S.T. in the Continental section only.

THE VALUES OF TUNING COILS AND CONDENSERS.

By C. E. FIELD, B.Sc.

This article, specially written for "Popular Wireless," covers many constructional details more or less inadequately dealt with by the majority of wireless textbooks. Constructional details of apparatus intended for specific purposes can easily be found, but the most voluminous of works on the subject seem to miss many of the essential points dealt with by Mr. Field.

FOR the amateur who is constructing his own receiving set, a knowledge of the values required for his tuning coils and condensers is of primary importance.

We will consider first the aerial tuning coil. Generally speaking, amateurs will find that the single layer cylindrical coil is the most satisfactory, as it is simple to construct, and when fitted with a slider adjustment, permits of very close tuning. For short-wave reception, No. 22 S.W.G. enamelled wire will be found most suitable, while for long-wave work No. 24, 26, or 28 may be required in order to prevent the dimensions of the coil from becoming too great. The thicker wire is, of course, to be preferred where possible.

Number of Turns Required.

Using No. 22 wire, the following will suffice for the reception of broadcasting: 60 turns on a $3\frac{1}{2}$ in. diameter former, 70 turns on a 3 in. former, or 80 turns on a $2\frac{1}{2}$ in. former, while 80, 90, or 110 turns on formers of $4\frac{1}{2}$, $3\frac{1}{2}$, or 3 in. diameter respectively would bring in ships' signals. For the reception of the Dutch concerts, 110, 130, 150, or 170 turns on $6\frac{1}{2}$, 5, $4\frac{1}{2}$, or 4 in. diameter formers make convenient windings.

Signals on wave-lengths up to 3,000 metres (these, of course, include Paris telephony) could be received on the following windings: 420, 470, or 530 turns of No. 24 wire, on diameters of 6, $5\frac{1}{2}$, or 5 inches respectively; 380, 420, 480, or 520 turns of No. 26 wire, on diameters of 6, $5\frac{1}{2}$, 5, or $4\frac{1}{2}$ inches; or, on the same formers, about 50 turns fewer in each case of No. 28 wire.

For wave-lengths much above 3,000 metres, the single layer coil becomes unwieldy and inefficient, and the amateur is recommended to buy honeycomb coils of some reputable make.

Loose Coupler Coils.

If he contemplates constructing these for himself, he should make a fairly comprehensive series of coils, each one being wound with an ample margin of turns, and finally adjusted to the required wave-length by actual tests on the set with which it is to be used.

For long wave-lengths, a honeycomb coil with a winding of rectangular section requires fewer turns than a single-layer coil of the same diameter, whilst on broadcasting wave-lengths the number of turns required are nearly the same.

If a loose coupler is employed, the secondary winding may have the same number of turns as the primary; but if the A.T.C. and the A.T.I. are connected in parallel, more turns will be required on the secondary. A good plan is to make the secondary coil to slide inside the primary, and compensate for the smaller diameter; and for the inductance and capacity of the aerial, by winding it for the same length as the primary, with wire of one or two sizes smaller.

In all tuning coils no pains should be spared to make the adjustments as fine, or the values as exact, as possible, in order to reduce to a minimum the additional capacity required for tuning.

Three Classes of Condensers.

Condensers in a receiving circuit fall into three classes.

First, those required for tuning purposes; secondly, those required for filtering out high-frequency and low-frequency currents; and thirdly, those required for temporarily storing electrical energy.

In the first class, the most important condenser is the aerial tuning condenser, placed in series or in parallel with the aerial tuning coil. From considerations of efficiency, this condenser should be as small as possible, but for tuning-in, a large condenser is much more convenient.

Perhaps the most useful maximum value is .001 mfd., a capacity of .0015 mfd. being sometimes preferable for use with long-wave honeycomb coils, while .0005 mfd. will generally suffice in conjunction with a small diameter coil fitted with slider adjustment. The same values are suitable for use in parallel with the secondary winding of a loose coupler.

Small tuning condensers are often connected across the primary windings of high-frequency intervalve transformers, and across the terminals of reaction coils and anode tuning coils. For these a maximum capacity of .0003 or .0004 mfd. is sufficient.

Moving Vane Type.

Assuming that these condensers are constructed in the usual way, with semicircular metal vanes separated by spacing washers of, say, $\frac{1}{8}$ inch thickness, a capacity of .0005 mfd. will be given by 30 plates of 3 in. diameter, 23 plates of $3\frac{1}{2}$ in. diameter, or 18 plates of 4 in. diameter. The number of plates required for other values, except in the case of condensers containing only two or three plates, is very nearly proportional to the capacities, so that a capacity of .001 mfd. would be given by 36 plates of 4 inch diameter. These numbers refer to all the plates, both fixed and moving, and the figures given assume the use of No. 20 S.W.G. sheet metal. The use of No. 16 S.W.G. metal would make the values half as large again for the same numbers of plates and thickness of spacing washers.

The second class of condensers, used for separating high-frequency and low-frequency currents, are generally referred to as "by-pass" or "by-path" condensers, because they provide an alternative path through which high-frequency currents can flow, but which offer a high resistance to the passage of low-frequency currents.

Such condensers are used in parallel with the primary windings of low-frequency intervalve transformers, or with iron-core intervalve choke coils or across the telephone receiver terminals, and are especially neces-

sary when the output current from a detector or low-frequency valve has to pass through a reaction coil on its way to the high-tension battery.

A by-pass condenser may be roughly likened to a strainer which is required to separate sago grains from peas. If the strainer has too fine a mesh, neither the sago grains nor the peas can pass through it, whilst if the mesh is too coarse both will pass through together. Between these extremes a great many different meshes may be employed.

In the case of the by-pass condenser, a very small capacity will not only block the passage of low-frequency currents, but will also offer a very high resistance to high-frequency currents, whilst too large a capacity will let both types of current through. The correct values, however, are not at all critical, and in general it is as well to err on the side of too large a capacity. Values varying from .001 to .005 mfd. are quite satisfactory.

Various Fixed Condensers.

These condensers are generally constructed of sheets of metal foil and waxed paper. Using ordinary cartridge drawing paper, 120 square cm. of active area of metal foil will give a capacity of .001 mfd., this area, of course, being split up among several sheets, according to the dimensions required for the condenser. Thus, 10 sheets, each having an area of overlap 3 cm. by 4 cm. could be employed. For other values, the area, or number of sheets, will vary in direct proportion to the capacity required.

The third class of condensers used in receiving circuits are known as "reservoir" condensers. A reservoir condenser is connected across the terminals of the high-tension battery, in order to prevent variations in the plate voltage and current of the valves, the condenser acting as a kind of shock absorber to any irregularities in the output of the battery.

Scope for Experiments.

The capacity of a reservoir condenser may be anything from .001 mfd. up to a quarter, or even half a mfd. If the capacity is made too large, however, the condenser becomes inconveniently big, and the insulation resistance between its terminals becomes low.

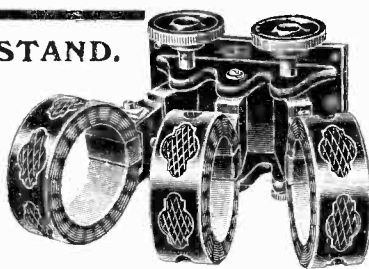
There is one more very important condenser which stands in a class by itself, for it really operates both as a reservoir condenser and a by-pass condenser of very small capacity. This is the grid condenser, which should have a capacity of from .0002 to .0003 mfd.

A capacity of .0002 mfd. would be provided by 24 square cm. of active area of waxed cartridge paper, cut into smaller sheets as required, and interleaved with metal foil.

There is still much to be learned about the best values of condensers for different purposes, and amateurs can do useful work by experimenting in this direction.

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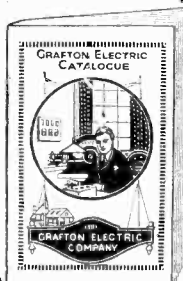
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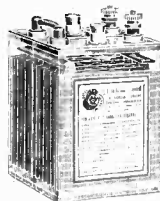
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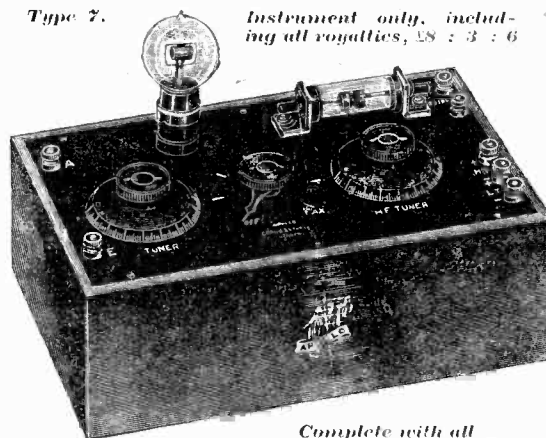
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WIRELESS CLUB REPORTS.

The Editor will be pleased to publish concise reports of meetings of Wireless clubs and associations, reserving the right to curtail the report if necessary. Hon. Secretaries are reminded that reports should be sent in as soon after a meeting as possible. Reports sent in cannot appear in this paper in less than ten days after receipt of same. An Asterisk denotes affiliation with the Radio Society of Great Britain.

Exeter and District Wireless Society.

A very interesting and instructive lecture was delivered by Mr. Smitham recently before the Exeter and District Wireless Society, at their headquarters, 31, Longbrook Street, Exeter.

The subject dealt with was that of Induction Coils as applied to the reception of short wave-lengths.

The lecturer made it abundantly clear why the construction of the coil played such an important part for the purposes of reception, as by lessening the self-capacity of the windings, a larger range of wave-lengths could be brought under control.

Every amateur knows the importance of eliminating self-capacity, but the reason why it should prove such an obstacle to successful working is often obscure to him.

The subject was so well handled that all derived great benefit from it, also from the many lucid diagrams that supported the explanations.

The various coils were dealt with in the following order: Single layer, pile wound, slab, basket, honeycomb, Burdept, duolateral, and also a coil specially designed by the lecturer.

Hon. Sec., F. S. Valentine, 10, College Avenue, Exeter.

Hackney and District Radio Society.*

A meeting of this society took place at the Y.M.C.A., Mare Street, Hackney, E.8., on Thursday, April 26th, and was presided over by Mr. H. A. Epton. The chairman reported that he had, in the company of the secretary, paid a visit to the studio of 2 L.O., where he had been received most kindly by the various officials. He spent a pleasant and interesting evening in the studio, operating and receiving rooms.

The lecture of the evening was given by Mr. F. G. Francis, B.Sc., a member of the society, who had previously given several lectures. Mr. Francis' subject this evening was "The Characteristic Curves of Valves." The lecture commenced with a brief explanation of the use of graphs, explaining how these were applied to

the pictorial representation of damped, continuous, and modulated continuous waves. The processes of amplification and rectification were explained, and the operation of a valve in these respects, gone into by the aid of graphs showing characteristic curves of valves.

The lecturer then proceeded to take the characteristic curves of a French "R" valve and a Cossor C.V.C. valve, the latter kindly lent by Messrs. Negretti and Zambra. These curves being constructed, some explanation was given as to the relative merits of the two valves, both as detectors and amplifiers. A short explanation was given as to the use of valves as note magnifiers.

That the lecture was an interesting one was proved by the large number of questions put to the lecturer, all of which were answered to satisfaction. Mr. Francis kindly promised a further lecture shortly on the Dual Amplification Circuit.

The chairman announced that, by the kind permission of the owners, a party of members were to be allowed to visit the S.S. Patricia, lying in Millwall Dock, on the following Wednesday, for the purpose of inspecting the radio equipment; also that a visit was being arranged on a Sunday afternoon to the Croydon Aerodrome.

Hon. Sec., C. C. Phillips, 247, Evering Road, E.5. (Letters only.)

Peckham Wireless and Experimental Association.

The Wireless and Experimental Association gave a most successful demonstration at the Central Hall, Peckham, on Thursday, April 26th.

The fact that a special programme was being broadcast in honour of the marriage of the Duke of York, enabled Mr. P. Voigt, B.Sc., a member, to give the audience a higher standard of programme than usual; but the great achievement of that gifted demonstrator was that of filling the hall with an ample volume of melody, using only a crystal detector and one valve employing dual amplification, and the four Amphon loud speakers, kindly lent by Messrs. Graham, of Brockley, did the rest.

The exhibition of members' home-constructed

apparatus fully proved the contention that we are an experimental association, and that the experimental licence is the only one which can suit our case.

Hon. Sec., Geo. Sutton, A.M.I.E.E., 13, Melford Road, S.E.22.

North London Wireless Association.

At the 126th meeting of the association, on April 23rd, Mr. F. S. Angel gave his seventh paper on the elementary principles of wireless.

After giving a brief outline of the valve—past and present—a full explanation was made upon the action and course of the electrons from filament to plate. Various curves were drawn, showing the correct point for obtaining maximum results, and the method used for retarding saturation point.

The potentiometer was shown in circuit with the grid, and the manner in which it was used for assisting the passage of electrons to the plates when the grid became too negative to function correctly.

In closing a most interesting and instructive lecture, Mr. Angel added that he thought it would be a great benefit to users of valves if the various makes were sold accompanied by their characteristic curve.

Full particulars of membership from:

Hon. Sec., J. C. Lane, Northern Polytechnic Institute, Holloway Road, N.

North Middlesex Wireless Club.

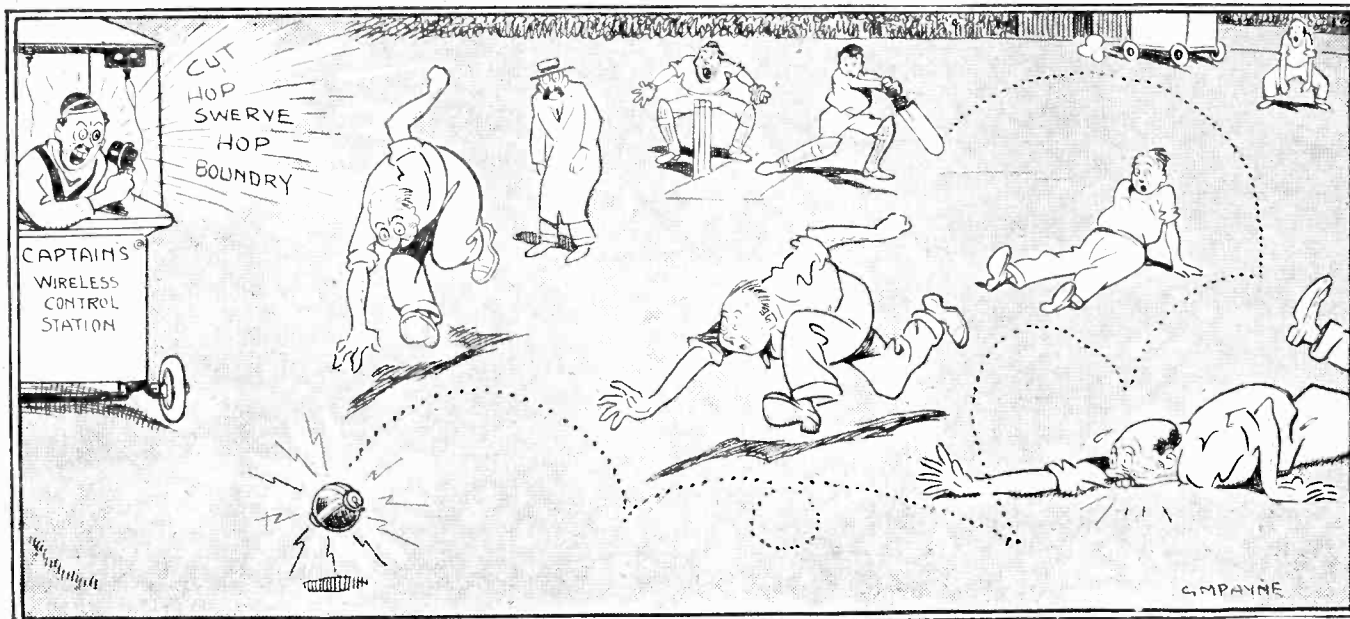
The 112th meeting of the above club was held at Shaftesbury Hall, Bowes Park, N., on April 4th. The chair was taken by Mr. M. F. Symons, who introduced the lecturer for the evening—Mr. W. Gartland.

The members present enjoyed a very instructive and interesting account of Mr. Gartland's experiments with high-frequency amplification. The lecturer pointed out that experimenters living in London who wished to hear the provincial broadcasting stations were compelled to adopt some means of tuning out the London Broadcasting Station—no easy matter. The most effective way of increasing the selectivity of receiving apparatus is undoubtedly, in Mr. Gartland's opinion, the use of high-frequency amplification. He described various circuits he had himself used, and discussed their relative merits. Dual amplification, as a means of increasing signal strength, was also mentioned.

Following the lecture, Mr. L. C. Holton answered various questions which had been placed in the club question box at the last meeting. This question box promises to be a very popular institution among the members.

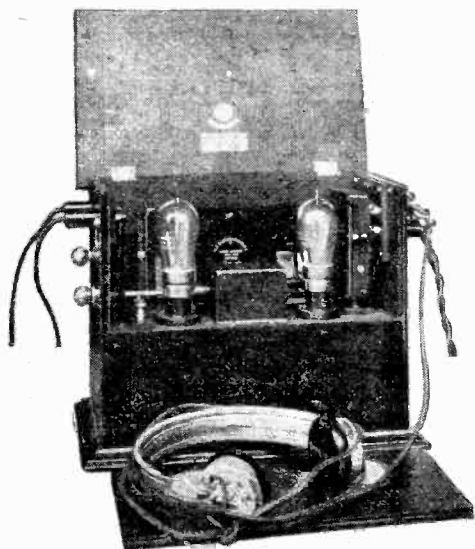
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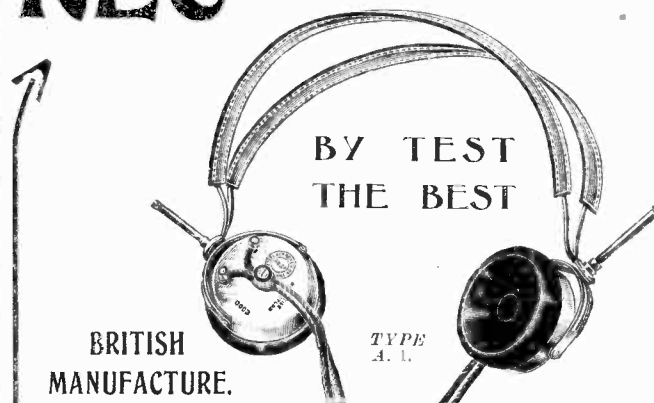
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RADIOTORIAL

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

Controversy seems to spring up with every new phase in the advancement of science, but it seems to me that wireless broadcasting is getting rather more than its fair share. There is no need to recapitulate with regard to the series of obstacles that have arisen, and which hedge round the actions of the B.B.C. like so many barb-headed spears, but I do not doubt for one moment that broadcasting has come to stay, and that eventually it will successfully surmount all its difficulties and occupy its rightful position. Broadcasting, is comparatively speaking, a new thing, and everybody knows the fate of anything that happens to be new. Remember the motor-car and its "red flag" restrictions, and, farther back, Arkwright's great invention and the welcome given to it by the world at large. Broadcasting is going through that inevitable stage of its existence where prejudice and opposition, backed up by existing interests that have, colloquially, "got the wind up," is doing its utmost to kill the usurper at its birth. Of course, one can no more hope to stop the march of progressive science than Canute could ever have hoped to stop the tide coming in. Anyway, he might, and probably did, HOPE to do so, but history records the result.

Several interesting alterations have been made in the arrangement of the items in this week's POPULAR WIRELESS. Greater space is devoted to Notes and News, and the broadcasting programmes have been greatly extended. It remains to be seen whether or not this meets with the approval of readers, and I would welcome criticism in this respect. The stories of the operas are briefly given, together with other interesting details. This will allow readers to clearly follow the sense of such extracts that are broadcast, and should prove a very useful and popular feature.

THE EDITOR.



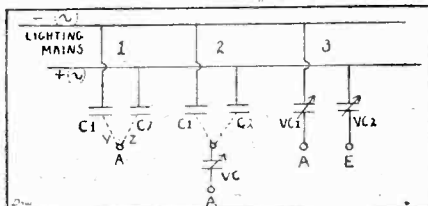
Owing to the enormous number of queries received daily from readers of POPULAR WIRELESS, I have temporarily decided to limit the number of questions sent in by one reader to three. Readers are asked to keep their questions as short and as concise as possible in order that the minimum of delay can be exercised in answering queries. Until further notice three questions from one reader will be the limit for one letter. All questions should be addressed to POPULAR WIRELESS Queries Department, Room 138, Fleetway House, Farringdon Street, London, E.C.4.

Readers are requested to send the necessary postage for reply.

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.

B. E. (London, W.) asks several questions regarding the use of lighting mains for the reception of wireless signals.

The usual method is to employ two fixed condensers of some .02 mfd. capacity, C1 and C2, in series with each pole of the main and connected together through fuses Y and Z to the terminal A as shown at (1) in the accompanying diagram. A is the aerial terminal, whilst the usual earth is employed. This method is adopted in the "Ducon," which is a patented device. A variable condenser can be usefully placed in series as shown at (2). A third method



involving the use of two variable condensers of fairly high capacity and illustrated at (3) in the diagram uses one wire as the aerial and the other as the earth.

"Valve Crystal" (St. Albans).—In the case of a valve crystal circuit can I use variometers throughout? The circuit would be the ordinary one valve (H.F.) and treated galena crystal. Is this type of valve circuit O.K.?

Yes, you could use variometers quite well, though we prefer the ordinary basket or honeycomb coil tuned by condensers. The reason for this is that in the case of these coils reaction can be easily accomplished by coupling the anode coil to the A.T.I. In the case of the variometers this reaction cannot be carried out unless small loading coils are placed in series with the variometers in each circuit, the loading coils being coupled together. You will find that the H.F. valve and crystal combination will give very good results, and 2 L.O. should come in loudly.

A. C. (Burnham).—Can bichromate batteries be used for lighting the filaments of valves? What are tonic train signals?

Unless they are of the type known as dull emitters, when primary cells can be used quite well, bichromate batteries cannot be used for your valves, as the voltage falls rapidly with the comparatively large current required for the purpose. Tonic train signals are C.W. signals interrupted by a buzzer or break at the transmitting station.

L. N. (Bristol).—Is a grid leak an improvement in the Armstrong super-regenerative circuit?

It is not necessary in the three-valve circuit. Two small dry cells should be inserted into each valve circuit with the negative terminals connected to the grids. In the case of the one-valve "super," a grid leak can be used quite well, but you will find it needs only about $\frac{1}{2}$ to $\frac{3}{4}$ of a megohm instead of the usual 2 megohms.

"FORMER" (Hounslow).—How much, and of what gauge wire, and what size former tubes shall I require to make a loose coupled tuner to tune between 300-4,000 metres? I want to use it with two variable condensers, one blocking condenser, 4,000 ohms phones, a P.M.G. aerial and crystal detector. What capacity should the condenser have?

There is not much spark transmission on wave-lengths as high as 4,000 metres, so it will not be necessary for your set to tune as high as this. The primary should be wound on a former 4 in. by 8 in. long, using 24 D.S.C. wire, and the secondary on a former 3 in. by 6 in. long, wound with 28 D.C.C. both tapped off at intervals. The two variable condensers should be .001 mfd. and .0005 mfd. and the telephone condenser .001 mfd. This will allow you to tune to 3,000 metres or so.

"FRAME" (Ipswich).—I cannot possibly arrange an outdoor aerial, and wish to get the Hague on a frame aerial. Please give size for frame and number of valves.

The aerial should have sides of 5 ft., with about ten turns spaced $\frac{1}{4}$ in. apart. You will need at least six valves to get anything like good results.

"ELECTRA" (Wargrave).—Which is generally best, 100 ft. single aerial or 70 ft. double aerial? What are the objections to bringing down the lead for a considerable distance indoors? Which are the most efficient for crystal reception, honeycomb, pancake, or single layer coils?

There is not any appreciable difference between the two, though for low wave-lengths the single aerial will probably give slightly better results. The chief objection is the extra resistance, while there is also increased risk of leakage. If the lead-in runs near the walls there will also be a great deal of loss of energy due to capacity effects and the resultant damping of the signals. We prefer single layer coils for crystal reception.

(Continued on page 534.)

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28	4 5	6 2	7 2
30	5 5	6 10	8 6
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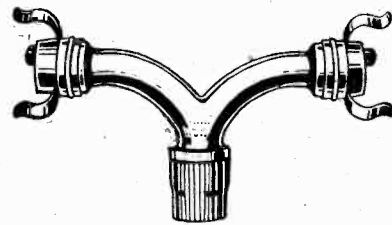
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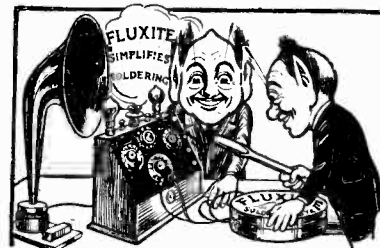
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RADIOTORIAL QUESTIONS AND ANSWERS.

(Continued from page 532.)

A. B. V. (Blackpool).—I have a quantity of red fibre that I believe is an insulator, will this do for a panel?

Your details as to the fibre are not very clear, but we would advise you to use ebonite. Most fibres, even those that are vulcanised, are liable to leak, owing to the fact that water readily condenses on them. In addition to this the finished effect is not so neat as when ebonite is used, and fibre panels are very liable to warp and swell.

D. R. (Amesbury).—How can double reaction be accomplished on a two-valve set?

We presume, of course, that the two valves are used as H.F. and detector respectively. The method of double reaction is best used in conjunction with honeycomb or basket coils, and a tuned anode rather than a transformer. Instead of mounting the tuned anode coil away from the aerial tuning, it is mounted on one side of a three-valve holder, the aerial coil on the other side and the reaction coil in the centre. It is best to tune in the set with reaction on the anode, the aerial coil being as loosely coupled to the reaction as possible. Then, when best results are obtained, gradually bring the aerial coil nearer the reaction coil, and after the tuned anode coils coupling slightly until loudest signals are heard. Needless to say, this form of reaction should not be used during broadcasting hours, as the reaction being coupled to the aerial, the set will be liable to oscillate and cause interference. During those hours the reaction upon the tuned anode can be employed, while the aerial coil is kept as far away as possible.

C. W. (Reading).—How is C.W. transmitted?

By means of an arc or valves instead of the former spark discharge, and this causes a continuous wave to be emitted from the transmitting aerial. In order to break this up into signals, a very general method used is to change the wave-length every time the transmitting key is depressed. Thus, by the careful tuning of the receiving station the normal continuous wave, or spacing wave, as it is called, can be tuned out, and only the new wave on a slightly different wave-length is then audible, so that the dashes and dots of the Morse code are easily distinguished. The buzzer of a crystal set can be made to interrupt the waves at a regular frequency, and so when the frequency of the incoming waves changes, as it does when the key is depressed and the wave-length altered, this variation is audible in the 'phones of the crystal set.

"COUPLER" (Reading).—Please give me details of a loose coupler for use as reaction to tune from 180-400 metres with a .0005 mfd. variable condenser.

Put the condenser in series in the aerial circuit. Use an outer former of 3 in. diameter by 3 in. of winding of No. 22 D.C.C. for the aerial circuit with five tappings. Reaction inductance may be 2 in. diameter by 1 in., wound with No. 28 D.C.C.

E. M. (Slough).—I am using a crystal set, and I do not hear amateurs as well as 2 L.O., even though they are nearer. Why is this? Who is 5 B.Q.?

The amateurs transmit on a much lower power than 2 L.O. They are only allowed a power not exceeding 10 watts by the P.M.G., while 2 L.O.'s power is 1½ kilowatts. 5 B.Q. belongs to Mr. D. Douet, and is situated at Putney.

APOLOGY

In our advertisement in the issue of the "Popular Wireless" dated 14th April, 1925, we advertised for sale B.T.H. French Headphones. We have to admit and express our regret that such description is false, such headphones not being made by the British Thomson-Houston Co., Ltd. (whose registered office is at Crown House, Aldwych, W.C.2), and we withdraw any further sale of headphones under the above name or description.

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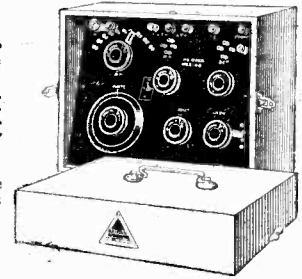
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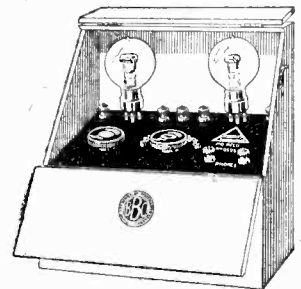
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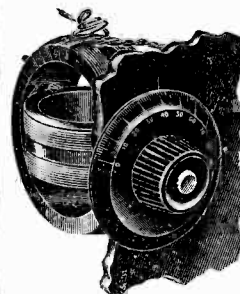
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INSULATORS, white Egg, each 2d., 1/9
SPECIAL HERTZITE CRYSTAL. large piece. each 10/1d.
WOUND INDUCTION COILS (postage 5d.). 12 x 4 9 x 4 8 x 2 6 x 3 6 x 2 2/8 2/5 2/2 1/11 1/8
TAPPED INDUCTION COILS, 20 tappings wound to 1,600 metres. each 2 1/2
VARIOMETERS (Tube Type) complete with knob. 4/6

Please remit ample postage.

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Trade Supplied—Accumulators charged on premises.

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Our prices bring Radio Experimenting within the reach of everybody.

Rotax Accumulators, limited number, 4 volt. 60 amp., new, 16/6 each.

Marconi T.R.T. Double Headphones, H.R. De Luxe finish, a few left, 25/- each.

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French "R" the finest soft valve, 13/6 ea. 7/22 H.D. Copper Aerials, 3 6/100 ft.
Insulators—Bobbin or Egg, 2d.; Rigger, 4d.; Large Shell, 6d. each.
Lead-in Tubes, 6-in., 1/4; 10-in., 1/8; 12-in., 1/9
Valve Holders, complete, 1/- each. Earth Clips, 5d. each.
Switch Arms, 1/8 each. Hertzite, 9d. Bornite, 4d. Silicon, 3d.
Galena, 3d. Zincite, 9d.

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LOWER FORD STREET, COVENTRY.

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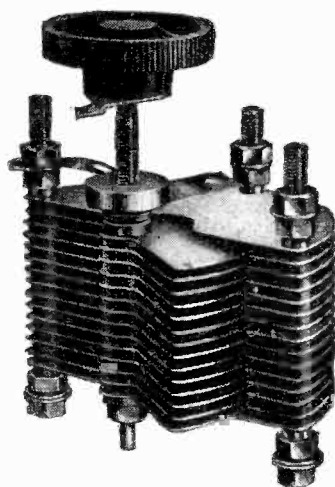
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Quality counts as well as price, something "cheap" and "nasty" is of no use to anyone. See you get an article worth the amount asked for it.

VARIABLE CONDENSERS ASSEMBLED

Approx. Cap. in Mfd.	No. of Plates	Price
·001	57	6/6
·0005	29	4/6
·0003	19	3/3
·0002	13	2/6
·0001	7	2/3

Vernier 1/9



If required to be sent by post, the charge for post and packing is 1/3 per Set extra. Orders only accepted on this condition.

DRILLED EBONITE ENDS with above 1/- per pair.

NOT A BAG OF PARTS, but assembled as shown above. Knob has a bushed nut 2BA.

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ORDERS in STRICT ROTATION

AERIAL WIRE, 7/22 100 ft. 3/9
 ALUMINIUM VANES 12 pairs 1/6
 Switch Arms 1/3, 1/6
 Filament resistances, each 2/3 & 2/-
 7 ohms Filament resistance 4/-
 Valve Holders, moulded each 1/3
 Valve Holders, turned . . each 1/9
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 INTERVALVE TRANSFORMERS . . 15/-
 do. very special quality each 22/-
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 Twin Flex, 36 yds. 5/6
 Bell wire, 12 yds. 1/-
 Glass dustproof Detectors . . 4/3
 Green Egg insulators . . doz. 4/-
 Knobs, 2 B.A. bush . . 3 for 1/3
 Scales 0-180 3 for 1/3

TERMINALS, ALL DESIGNS,

Telephone, W.O., P.O.,
 Fancy, etc., nuts and
 washers doz. 2/6
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 Fixed Condensers, up to ·001 1/4
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Foreign Orders must be accompanied by extra postage in addition to above.

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Saturdays - 9 to 5 p.m.

EVERYBODY

Come along, Everybody. This is the place for the right goods at the right price. No rubbish offered.

Prices to Callers

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H.T. BATTERIES, 60 v.	9/-
Basket Coils (6) ...	2/8
Aerial Wire 7/22, 100 ft.	2/1½
Valve Holders 10d., 11d., 1/3	
Switch Arms ...	10½d
Fixed Condensers ...	11d.
Filament Resistances ...	1/10
Do. Extra quality	2/-, 2/3
Do. 7 ohms ...	3/6
Crystals, all kinds from	3d.
Genuine Hertzite	9d., 1/-
Talite ...	9d., 1/-, 1/3
Crystal Detector (glass)	3/6
Crystal Detectors from	1/6
Parts for Crystal Detector	9d.
Shellac Varnish (large)	6d.
Rotax Accumulators,	
4 v. 40 amp. ...	17/-
Accumulators Charged	1/-, 1/6
Valve Pins, dozen ...	7d.
ABOVE very best possible value.	

Trade Supplied.

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(For post see special column).

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" " 4 BA 12"	2½d.
Cheaper for dozen.	
Scales, 0-180 (good) ...	3d.
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All Nuts, 3 dozen ...	7d.
Transformers, L.F. ...	12/6
Do. Extra special quality	20/-
Slider Rods drilled 7" ...	3d.
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EBONITE DIALS 0-180	11d.
Bell Wire, dozen yards	8d.
Twin Flex, dozen yards	1/9
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W.O. " 2 for	3½d.
P.O. " 2 for	3½d.
Various designs 2 for	3½d.
Above complete with nut and washer, 1/6 for dozen.	

Trade Supplied.

All Goods are worth much more than I ask for them. Prices are no comparison, it's value for money you want.

HEADPHONES

2,000 Pairs

ERICSSON B.B.C.

(Continental Type)

with small Ebonite Earcaps.

Beware of large earcap on some being offered, these are WOOD!

Single Pairs, **17/6**; post 1/6
Offers for dozens or hundreds wanted.

FRENCH Headphones, 4,000 ohms 15/-

FRENCH Headphones " 16/-

FRENCH Headphones " 17/6

BRUNET Type " 17/6

Post, 1/6 pair extra.

BRUNET, genuine 25/-

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Above are Real Bargains not Rubbish.

RAVOPHONE Sets, B.B.C.
(Royalty paid), Complete sets in box with 4,000 ohm Phones, Aerial Wire, Lead-in Tube and wire **65/-**
Guaranteed or money back. Post 2/-

TESTIMONIAL. 3,523
The Stratford-on-Avon
and District Radio Society.

Dear Sir,

The Condensers to hand and many thanks for prompt dispatch. I consider condensers are good value for money. You shall have further orders from this society.
Yours faithfully,
E. W. Knight, Hon. Sec.

Trade Supplied.

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Saturdays 9 to 5 p.m.

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WE shall be glad to supply one of these illustrated showcards to all bona-fide wireless dealers, complete with strip to paste across, reading: "IN STOCK—ALL COMPONENTS FOR MAKING THE 'B.D.V.' WIRELESS SET." This is a great opportunity for the live trader to reap the benefits of our extensive advertising campaign now being launched.

The demand for these cards is very great, and we urge you, in your own interest, to apply at once.

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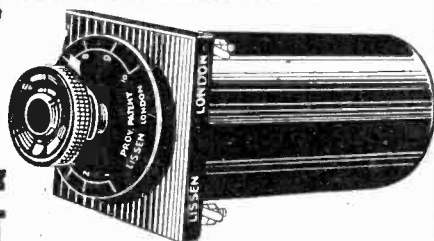
With this set working and a packet of "B.D.V.," your evening will be one long round of enjoyment and satisfaction. Start collecting to-day.

10 for 6^D. **B.D.V.** 20 for 11^D.
The King of Cigarettes

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(Prov. Pat.)

Enormously increases the range and sensitivity of every receiver.

REACTION is not obtained with the usual swinging coil.

The new unit is self-contained and complete.

Screened to shield it from stray capacities.

ONE KNOB CONTROLS TUNING AND REACTION. Can be fixed in a few minutes by drilling one hole only.

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TRY AND RECEIVE YOUR LOCAL BROADCASTING STATION WITHOUT AERIAL OR EARTH

This new LISSEN component represents many months of experiment.

1 stage H.F.—Use it alone (or the LISSEN REACTANCE for the most efficient alternative)

2 stages H.F.—Use the LISSEN REGENERATIVE-REACTANCE for the first stage, and the LISSEN REACTANCE for the second stage—an unequalled combination.

Blue print and instructions sent with each.

Range 150 to 4,000 metres (10 tapings), and FULL REGENERATION OVER THE WHOLE BAND. Price complete **£2 12 6**

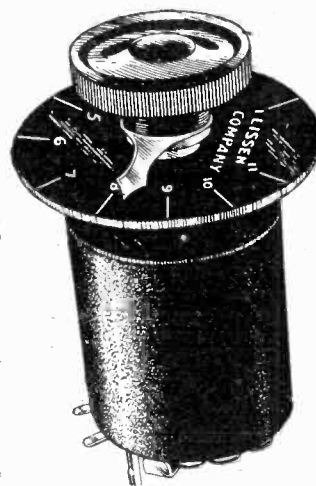
Self tuned—May be used without a variable condenser, but a new LISSEN Vernier Condenser is recommended to be put across it. Latter takes up hardly any room. Lissen one hole fixing, price 12/6.

LISSEN REACTANCE (PROV. PAT.) —STILL TO BE USED

Range 150 to 600 metres (6 tapings), complete **27/6**.
Range 150 to 10,000 metres (11 tapings), complete **32/6**. Blue print shows easy connections. LISSEN one hole fixing: Use this component for 1 stage H.F. and add the LISSEN REGENERATIVE-REACTANCE later.

For great range and power turn to using LISSEN Radio Frequency. AMATEURS—If your dealer is not equipped to serve you, send direct, post free. Take no substitute.

DEALERS—Order through factor, or send direct. Apply for list on trade heading.



LISSEN COMPANY

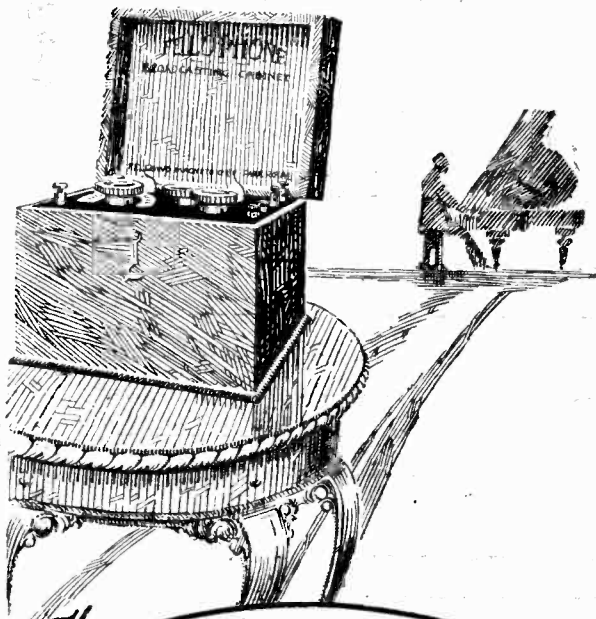
8-16, Woodger Road, Goldhawk Road,
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(Phone: 1072 Hammersmith).

N.B.—Woodger Road is close to Goldhawk Rd. Met. Rly. Station.

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2-VALVE RECEIVING CABINET

A high-grade instrument at a very low price. This set has been especially designed for receiving broadcasting, and complies with all the Postmaster-General's regulations. It can be used either for listening-in with headphones or with a loud speaker.

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British Made Throughout.

Made under Marconi Licence and approved by the B.B.C. and Postmaster-General.

PRICE COMPLETE **£12** inclusive of all taxes without valves. Carriage - - - 2/-
EXTRA FOR 2 VALVES - - - 30/-
EXTRA FOR ADDITIONAL FELLOWS
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PRICE
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