VOL. 1 APRIL NO. 5 1935

Wireless

AND TELEVISION REVIEW

PRICE 6D

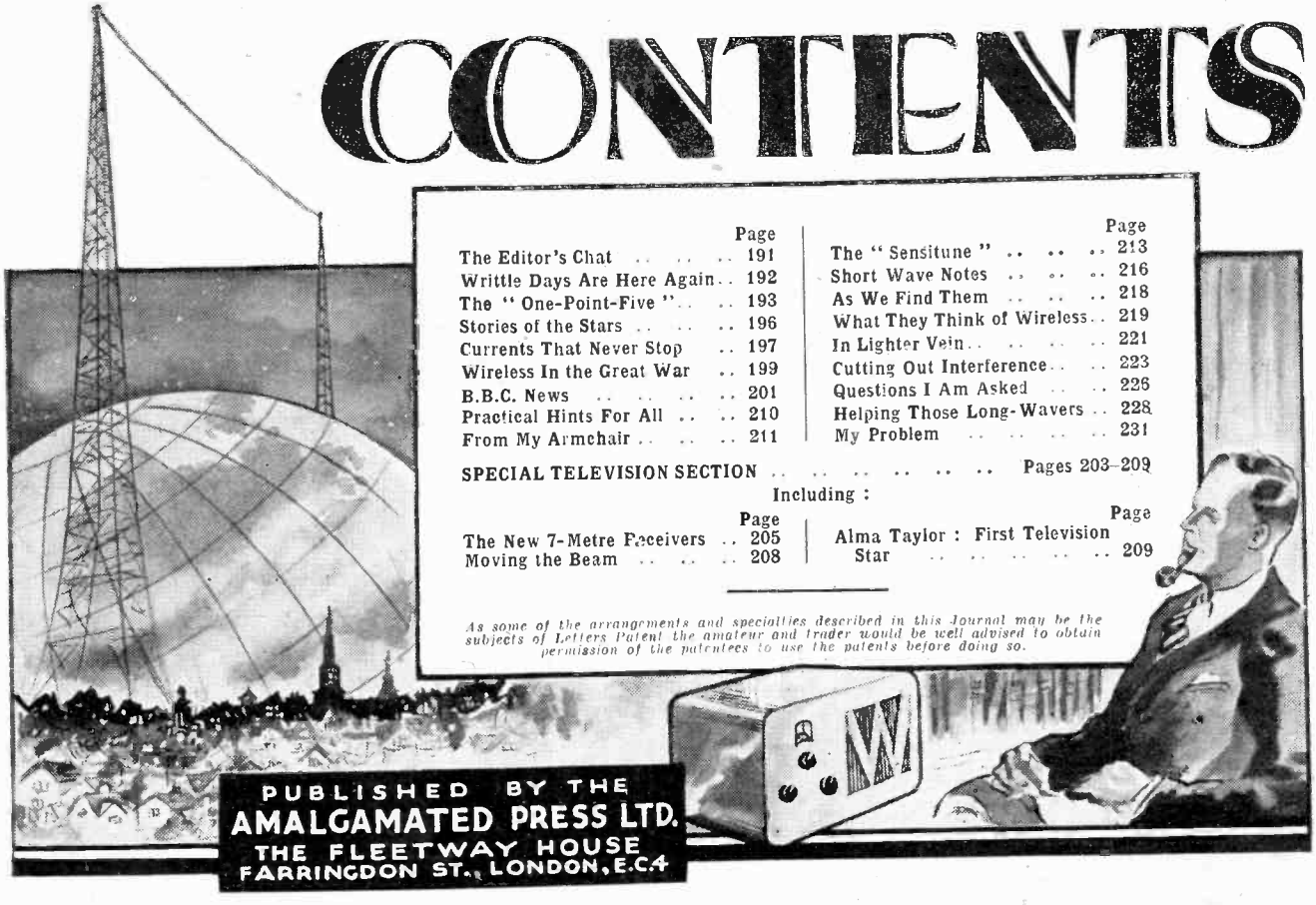
More About the "One-Point-Five"

by John-Scott-Taggart

Also The "Sensitune"

A Receiver for Economic Efficiency

CONTENTS



As some of the arrangements and specialties described in this Journal may be the subjects of Letters Patent the amateur and trader would be well advised to obtain permission of the patentees to use the patents before doing so.

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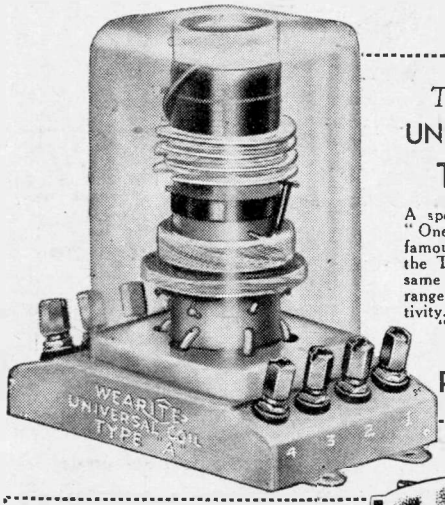
WEARITE

REGD. TRADE MARK

SPECIFIED for the ONE-POINT-FIVE



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A special adaptation for the "One-Point-Five" of the famous "Universal Coil," the Type "A" possesses the same remarkable tuning range and degree of selectivity. It is strictly to "S.T." Specification.

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The WEARITE S.T.400 ANODE COIL
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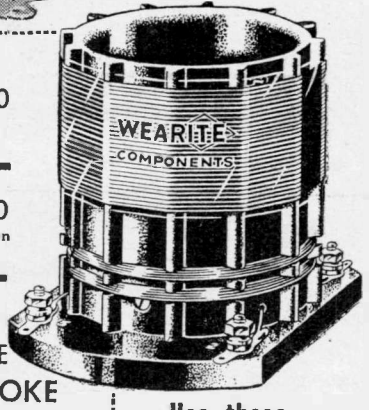

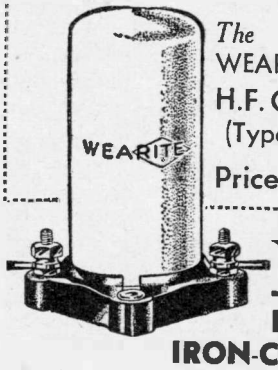

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Price **3/6**

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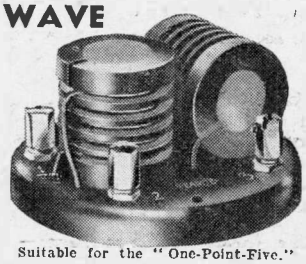
Here is the biggest step forward yet made in Wave Trap design. With .0005 Variable Condenser and switch it is fitted in your aerial lead. It covers both wave bands. Send for full details. Price **7/6**



Suitable for the "One-Point-Five."

Read what a user says:—

"Although I have built dozens of so-called traps this is the first which really does its job . . . . On a very 'flat' S.G. Det. Pen. Set, for the first time it was possible to hear Berlin or Hamburg free of London."

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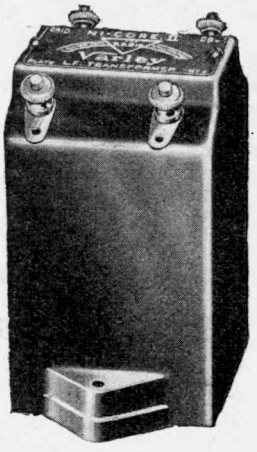
NICORE II FOR THE SENSITUNE



The Nicore II has been specified for the "Wireless Sensitune" as being the best transformer for this circuit. Take the designer's advice and get one for your "Sensitune."

Write now for further information and catalogue.

D.P.2. Nicore II L.F. Transformer **11/6**

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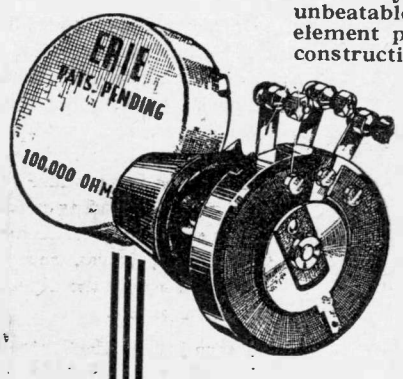

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The Editor's Chat

Wireless & TELEVISION REVIEW

Our Special Television Section—7-Metre Reception—Television and the Home Constructor

WITH this issue of WIRELESS AND TELEVISION REVIEW we introduce to our readers a new special television section. And we are glad to be able to announce that this special section will be conducted month by month by that distinguished physicist, Dr. J. H. T. Roberts, F. Inst. P.

Our readers will doubtless remember that Dr. Roberts was our representative who gave evidence on television generally when the Postmaster-General's Television Committee was sitting.

A New Technique

In his introductory article in this new feature Dr. Roberts points out that the technique of broadcasting transmission and reception on the very short wavelengths of 5 to 7 metres is something entirely new. No one knows what snags may crop up when investigating the possibilities of these ultra-short wavelengths. And it is in this connection that we would draw your attention to the special article contained in the television section on the new 7-metre receivers by Mr. Victor King.

Mr. King emphasizes the fact that there is no ground for fear that constructors may find it dangerous to tinker with cathode-ray tube apparatus requiring, as it does, some 2,000 volts potential, because, as most of you know, the currents required are very small. Mr. King gives an excellent example of the baby-car ignition system, where the average driver deals with some 50,000 volts and doesn't seem to come to much harm because of that!

The truth is, of course, that voltage without current, or shall we say, with very low current, is not harmful. And in due course when you start experimenting with cathode-ray television receivers you will find that cathode-ray systems have very definite current limiting factors.

And, whilst we are on the subject of television, we would invite our readers to join with us in maintaining a sane, level-headed, commonsense attitude to all that is going on in the television world. You all know how many newspapers became almost hysterical with their own ballyhoo before and after the Postmaster-General's television report was announced. The impression got abroad—and a very stupid impression it was—that because of the unexpectedly favourable attitude taken up by the Television Committee, and because of the announcement that a television station was to be built in London by the end of the year, that all present-day wireless sets would shortly be more or less obsolete.

STARS OF THE RADIO

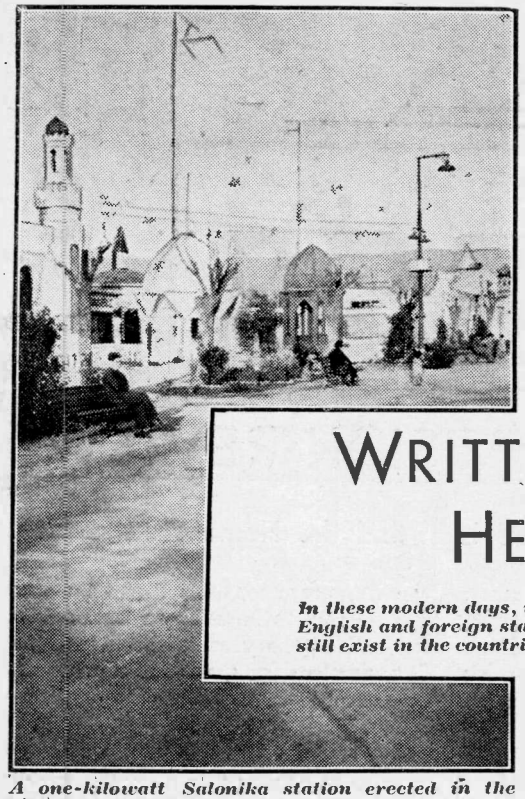
Gwen Vaughan and Alec McGill, otherwise known as "The Cheerful Chatterers." Alec is a golfer and the trophy he is holding was presented to him by the Waters Sisters.

Contradictory Statements

This, of course, had a very harmful effect on the radio industry, and although every effort was made to correct the wrong impression given by many newspaper writers, a good deal of damage was done. And we note—as you readers of this magazine have probably noted—that now some writers of wireless topics in the newspapers have turned right about face in their attitude to television and are now trying to decry it. We who run this magazine are the last people in the world to over-emphasize or exaggerate the present position in the science of television, but when we see it written one day that television is here, and then note a few weeks later that the same writers are calmly assuring their readers that television is ten years off—from the point of view of reasonable entertainment service—we can't help feeling a little sarcastic.

The truth of the matter is that great strides have been made in television; that a television service will start first of all in London towards the end of the year; that television receivers will cost anything between £50 to £80 to start with; and that home constructors will be definitely on their own ground when it comes down to the construction of the new 7-metre receivers necessary.

Please turn to page 232.



A one-kilowatt Salonika station erected in the Exhibition Grounds.

WRITTLE DAYS ARE HERE AGAIN

In these modern days, when a turn of the magic dial brings in powerful English and foreign stations, it is difficult to conceive that Writtle days still exist in the countries whose broadcasting is described on this page.

By Our Special Correspondent

THERE are giant and prominent aerials in Belgium, Germany, Austria, Hungary, and Yugoslavia, but when one leaves the Orient Express at Sofia, Bulgaria, there is no noticeable outward and visible sign of broadcasting. The address, Rue Benkovsky, is given and in that side street we find an inconspicuous, small building with two wooden poles on its roof.

And here is the home of Rodno Radio, a 500-watt station, that has been gallantly carried on since 1930 by the Bulgarian Society of Radio. In one little room the transmitter, Hartley circuit containing one oscillating valve and one modulating valve with choke-in-the-plate system; the other room serves as studio for all purposes.

Short Daily Programmes

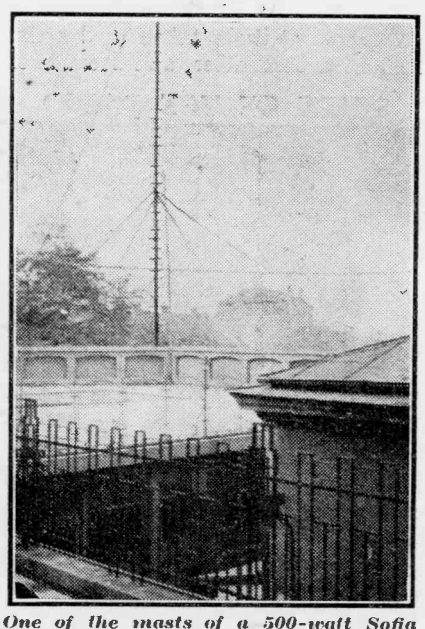
The station, I learned from its officials, is "on the air" daily from 12.30 p.m. until 2 p.m. and from 8.30 p.m. to 10.30 p.m. on Wednesdays, Saturdays and Sundays. The day sessions, I found, embrace gramophone recitals, talks and news, and the evening programmes organised vocal and instrumental concerts, and relays from cafés. Occasional relays are carried out from Parliament, cathedrals and military clubs.

The State retains the whole of the licence fee, and the society carries on by voluntary subscriptions and a little advertising revenue. All enter in the jolly Writtle spirit; artists give services gratis, and there are three voluntary announcers, a woman and two men.

The State has promised a 50 kw. station when finances permit, but in the meantime the amateurs are keeping the radio pot boiling by building a 3 kw. station near the city. The Government gave the masts, bricks, and other materials, practical donations were made by enthusiasts, a working bee was formed, and the erection of the station was soon under way. The original 500-watt station is to be increased in power, and, after the arrival of the 50 kw. transmitter, will be removed to a relaying centre.

I discovered there was the following sliding scale for licence fees, payable half-yearly; sets with more than two valves, 500 leva; two valves, 400 leva; one valve or crystal, 300 leva. The little station has a surprisingly wide range, although mountains prevent its reception in north Bulgaria where listeners tune in to Bucharest, Rumania.

I also found a rival society, Bolgarsko Radio, which sought funds to build a 4 kw. station in a central position and several relay stations. The number of listeners was given me as about 4,000, but, I was informed, there are many pirates.



One of the masts of a 500-watt Sofia amateur station is seen above the building housing the transmitter.

In Salonika courteous members of the Salonika Radio Club took us to the Fair grounds, where the amateurs' one kilowatt station is situated. A wooden shed serves for both transmitter room and studio, while there is another studio, connected by relay line, in the Conservatoire of Music nearby. The station is dependent on subscriptions and in "lean periods" ceases operation.

The station, which was built by a local engineer, M. Tsinguerides, made its début in 1931, and in the following year was taken over by the club.

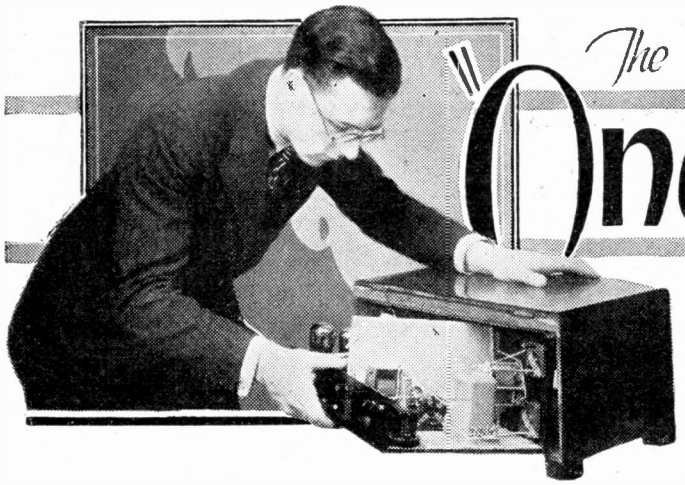
When finances permit it functioning, the station broadcasts records and music from 9 p.m. until 11 p.m. on Saturdays and European music from 1.30 p.m. to 2.30 p.m. Reception reports have been received from England, Rome, Vienna, Budapest, Crete, Cyprus, and Palestine. The call is "Embros, embros, etho Thessalonika."

Station for Athens

There are about 250 listeners in Salonika and about 4,300 throughout Greece. Licence fees have been drawn up by the Government, which, however, is not putting the regulations into force until organised broadcasting is an accomplished fact. The state proposes to build a high-powered transmitter at Athens and several relay stations.

But till the governments of Bulgaria and Greece bring their plans into operation those valiant European "Writtles" will remain, giving their short but exceedingly acceptable programmes to radio-hungry listeners.

How close to the gallant commander of our own pioneer station near Chelmsford the personalities of these continental pioneers come I cannot say. I can, however, wish their listeners no better than that their radio leaders may be of the same indelible stamp as our old friend "P.P.E."



The "One-Point-Five"

Valuable details of construction and important operating instructions for the special "S.T." set introduced last month are here given

By JOHN SCOTT-TAGGART, M.I.E.E., F.Inst.P., Fel.I.R.E.

THE construction of the "One-Point-Five" involves considerable dismantling of the S.T.400 if you are a "converter," but the reassembly is quite simple—in fact it is easier than the 400.

The safest thing, of course, is to dismantle everything. There is otherwise a risk of having too many wires connected!

Commencing Conversion

Here, however, are a few hints which are subject to the blue print as the final authority on the finished set.

Remove panel to baseboard wiring. Remove panel. Remove terminal strip-to-baseboard wiring. Remove terminal strip. Remove wiring between screen and baseboard and discard the ·006 mfd. Dubilier type 670. Remove screen. Remove the 1-mfd. S.G. screen decoupling condenser.

Change the aerial coil for a Wearite Universal type "A" coil. Cut the earth sheet (or scrape off the metallising in case of Metaplex) where the Extractor is to go (the Extractor coil must not stand on metal). The metal earth sheet can be cut with a razor blade while on baseboard, but don't cut yourself as well.

New Resistances

Replace the 1-mfd. S.G. decoupling condenser. Discard the reaction equaliser preset ·0003-mfd. condenser. Modify the positions of the reaction choke, selectivity range adjuster preset, the ·006-mfd. resistance-capacity coupling condenser, grid resistance, the ·0003-mfd. condenser used for keeping the H.F. out of the L.F. circuits. The associated wiring is also modified, of course.

Discard the spaghettis 1,500, 50,000, 20,000, 60,000. New resistors are 1 megohm, 300,000, 25,000, 75,000, 20,000. Now add the grid condenser (·00005 mfd.), the 1 megohm leak, the 1 mfd. used for decoupling the screen of the detector pentode, 300,000 ohm Ferranti resistor, the Extractor coil.

Drill new terminal strip (or buy it ready drilled), fit terminals, Extractor tuning condenser and switch, and tone control condenser.

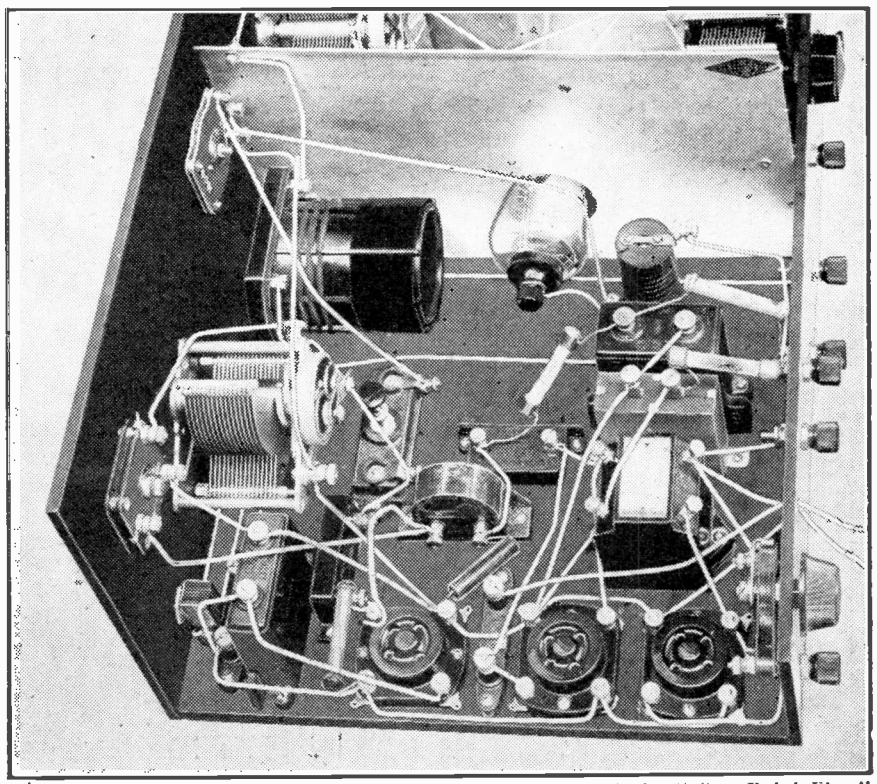
Complete the wiring of baseboard components. Change the aerial coupler to a ·0005 mfd. log-mid-line Litlos. Change aerial wave-change for the 3-point wave-change switch (Bulgin 3 spring). Remove reaction distributor from panel (plug up hole with the bitumen off the top of an old H.T. or flashlamp battery). You can do this by sticking gummed paper over back of hole and filling hole with molten bitumen; bits of bitumen may be held in the flame of a match and allowed to drip like sealing wax into the hole; allow to cool and trim with razor blade.

Overhaul Flex Leads

Drill hole for and fit aerial reaction ·0003-mfd. log-mid-line Litlos. Connect wire to toggle for subsequent connection to L.T.+. Wire up panel to baseboard.

Clean with emery the contact surfaces where screen will be fixed to earth sheet. Refix screen.

USE THIS PHOTO TO CHECK YOUR SET



Compare this photograph of the detector and L.F. side of the "One-Point-Five" with your own S.T.400. It will help you to see where new components are placed, and how the wiring has to be altered during conversion.

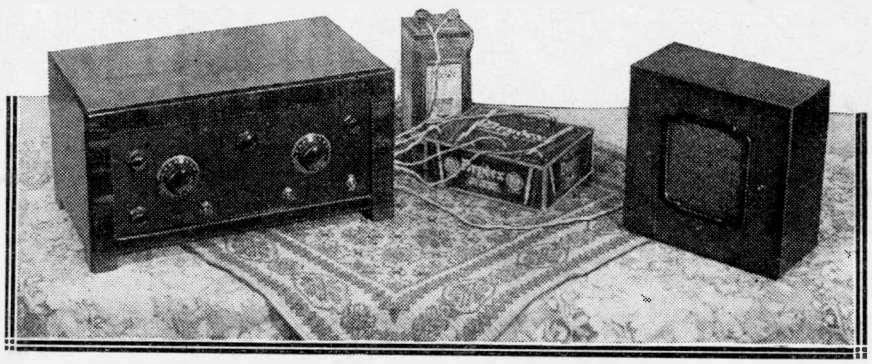
Wire up to screen. Overhaul grid-bias leads and plugs and for the love of mike see they go in their proper voltages when connecting up set.

These are some general hints, but every detail is not given as the blue print is pretty well self-explanatory. Remember that it is easier to forget something when converting than when starting afresh. It is a sound idea to strip all the wiring of the S.T.400 before building the "One-Point-Five."

What extra components should you buy for the "One-Point-Five"? Well, it's a question of subtracting one list from the other. But there are one or two components which have only been altered as regards manufacturer (but not values or type) because trade conditions at the time of designing made it appear that there might be difficulty in obtaining supplies. But those who have an S.T.400 can use their present chokes, anode couplers, etc. But where there is a change in value, e.g. the aerial coupler, you must make a change. You should use the aerial reaction condenser advised otherwise reaction may be too fierce for proper control. The two-point aerial wave-change switch may be used as the Extractor switch; it will fit tightly in new position but you can file the switch moulding a little.

As regards the L.F. transformer, the original S.T.400 used a Lissen

The "One-Point-Five" fitted in its cabinet and ready connected to batteries and loudspeaker. The latter, by the way, is a W.B. Stentorian Baby. On the following page is a diagrammatic sketch showing how the accessories are connected to the receiver, and the greatest care should be taken that these connections are correctly carried out.



Note that the loudspeaker and its leads to the set are kept well away from the aerial end of the receiver. This is an important point, for closely trailing aerial and loudspeaker leads are liable to cause a great deal of trouble.

THESE ARE THE PARTS FOR MR. SCOTT-TAGGART'S LATEST DESIGN

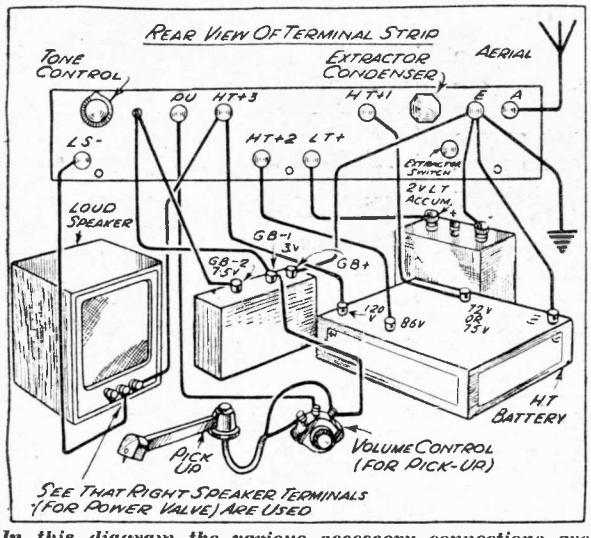
Component.	Make Used by Designer.	Suitable Alternative Makes.
1 L.F. transformer	VARLEY Niclet (Standard 1 : 3·5)	Ferranti A.F.8, R.I. Hypermite
1 Coil	WEARITE Universal "Type A"	
1 S.T.400 or S.T.500 anode coil	COLVERN	Wearite
2 ·0005-mfd. variable condensers	ORMOND R.493	J.B., Polar No. 2
1 Aerial Coupler ·0005-mfd. solid dielectric variable condenser; log mid line	GRAHAM FARISH (Litlos)	Polar, J.B., B.T.S.
1 Aerial reaction ·0003-mfd. solid dielectric variable condenser: log mid line	GRAHAM FARISH (Litlos)	Polar, J.B., B.T.S., Ormond
1 Anode coupler ·0001-mfd. differential condenser	B.T.S.	
1 Anode reaction ·0003-mfd. differential condenser	POLAR	Graham Farish, J.B., Bulgin
1 ·00075-mfd. variable condenser for tone control	POLAR (Compax)	Graham Farish, Ormond, J.B.
1 Selectivity range adjuster, ·0003-mfd. preset	GOLTONE	
1 ·0005-mfd. air dielectric variable condenser for Extractor tuning	ORMOND type as for S.T.600, complete with knob	Polar No. 4 direct drive, J.B. Popular Log, Formo direct drive
1 Extractor coil as for S.T.600	COLVERN Ferrocart	
1 Extractor switch, on-off type (Junior type S.38)	BULGIN	Benjamin, Wearite
1 Aerial wave-change switch	BULGIN (3-spring S.36)	W.B., Wearite
1 Anode wave-change switch	BULGIN S.22	Benjamin, W.B., Wearite
3 4-pin valveholders	BENJAMIN Vibroiders	
1 S.G. valveholder (horizontal)	W.B. (Universal)	
1 S.G. H.F. choke	GOLTONE Super H.F. Choke, R.4/452	Telsen Binocular
1 Reaction choke	B.T.S.	Graham Farish "Snap"
1 ·0003-mfd. tubular condenser	T.M.C.-HYDRA	
1 ·00005-mfd. mica condenser	LISSEN	Dubilier, T.C.C.
1 ·006-mfd. mica condenser	GRAHAM FARISH	Dubilier, T.C.C., Lissen, Bulgin
1 1-mfd. condenser (for decoupling screen of S.G. valve)	DUBILIER 9200	
1 2-mfd. condenser (detector anode decoupling)	T.C.C. Type 50	Dubilier, T.M.C.-Hydra, Graham Farish, Amplion
1 1-mfd. condenser (detector valve screen decoupling)	T.C.C. Type 50	Dubilier, T.M.C.-Hydra, Graham Farish, Amplion
1 2-mfd. condenser (1st L.F. anode decoupling)	T.M.C.-HYDRA, 250 v. working	Dubilier, T.C.C., Graham Farish, Amplion
1 1-megohm grid resistance for 1st L.F. valve	FERRANTI Type G.H.1	
1 1-megohm resistance (grid leak)	ERIE 1 watt	Dubilier, Graham Farish, Ferranti
1 300,000 ohm resistance	FERRANTI Type G.H.1	
1 25,000 ohm resistance	ERIE 1 watt	Dubilier, Ferranti, Graham Farish
1 20,000 ohm resistance	DUBILIER 1 watt	Ferranti, Graham Farish, Erie
1 75,000 ohm resistance	DUBILIER 1 watt	Ferranti, Graham Farish, Erie
1 Toggle on-off switch	BULGIN S.80	
8 Terminals: A, E, H.T. +1, H.T. +2, H.T. +3, L.T. +, L.S. −, Pick-up	BELLING & LEE Type R	Clix, Bulgin
7 Wander-plugs, G.B. +, G.B. −1, G.B. −2, H.T. −, H.T. +1, H.T. +2, H.T. +3	CLIX	Bulgin, Belling & Lee
2 L.T. Spade terminals	CLIX	Belling & Lee
1 S.T.400 screen	PETO-SCOTT	
1 Panel (ebonite), 16 in. × 7 in. × 3/16 in.	PETO-SCOTT	
1 Baseboard, 16 in, × 10 in. × 5/16 in.	PETO-SCOTT	
1 Cabinet	PETO-SCOTT	
1 Earth sheet of metal foil, 7 in. × 7½ in.	PETO-SCOTT	
1 Terminal strip, 16 in. × 3 in. × 3/16 in.	PETO-SCOTT	

VALVES.—220 S.G. COSSOR, 210 V.P.T. COSSOR, P.M.2D.X. MULLARD, P.M.202 MULLARD.

Hypernik. The "One-Point-Five" has a Niclet which will ensure perfect stability under all conditions, and on all mains units. The Hypernik, or one of the better Ferranti transformers, *may* result in motor-boating unless the primary terminal connections are reversed.

On a good H.T. battery or on the average mains unit, the Hypernik will not normally cause motor-boating (a fluttering or plop-plop-plop sound in the speaker). But if it does, the following connections to the Hypernik should be made. Connect its terminal G to grid terminal on last valve-holder and G.B. to bias. The H.T.+ goes to anode terminal of last valve-holder but one (i.e. the third). Terminal marked P on Hypernik goes to the 2-mfd. condenser.

HOW THE ACCESSORIES ARE CONNECTED



In this diagram the various accessory connections are clearly shown. Note how the pick-up and its volume control are joined, and also the grouping of G.B.+, H.T.—, and L.T.— with the earth lead on the earth terminal.

THE POWER SUPPLY

BATTERIES—H.T.: G.E.C., Drydex, Ever Ready, Lissen, Siemens, Vidor, or Block H.T. Accumulators.
G.B.: Drydex, Ever Ready, Lissen, Siemens.
L.T.: Exide, Block, Lissen.

Quality Not Impaired

The reversal of the primary thus effected is only necessary if you get motor-boating, which may be only gentle fluttering at a very low frequency. Nevertheless, this instability would ruin reception and the simple remedy will save you buying a new transformer. Quality of reproduction is not affected because the frequency at which instability would occur if at all is very low.

The wiring to the Hypernik when it has its primary reversed will *look* the same as the wiring to the Niclet, because the primary terminals are differently arranged.

A pick-up terminal is fitted so the "One-Point-Five" can be used for playing records, using an external volume control. All couplers should be at zero and tuning condensers adjusted so that there will be no wireless breakthrough. The aerial could be disconnected if desired.

Some readers complained of medium-breakthrough on the long waves in the case of the S.T.600. The effect was traceable chiefly to wrong operation or ganging, and if the couplers are kept at a low value and anode reaction kept near the critical point; I do not expect trouble with this set.

If there are any cases in localities very close to the B.B.C., especially near the North Regional station, a Lissen anti-breakthrough choke (costing now 2s. 6d.) can be inserted between aerial terminal of set and the aerial lead. This choke must be shorted when working on the medium waves. An even better choke for this purpose is an S.T.300 or S.T.400 or S.T.500 coil (aerial or anode). The whole of the coil, medium and long-wave windings in series, is used, but the reaction winding is ignored. Connection is made to terminals 2 and 5 of an aerial S.T.400 coil, for example.

FROM S.T.400 TO "ONE-POINT-FIVE"

Let me insert here a warning regarding conversion kits you may want to buy. On all previous occasions these kits have contained too much. Check such kits before buying?

As regards operating the "One-Point-Five," you will hear more next month. The Extractor is for cutting out whichever local is bothering you on the particular part of the dial where you want to receive another station. You simply tune the set to the local, keeping couplers at low values; then turn Extractor condenser till the local is cut out or practically disappears. Then tune in the ordinary way of the S.T.400.

SUITABLE LOUDSPEAKERS FOR THE "ONE-POINT-FIVE"

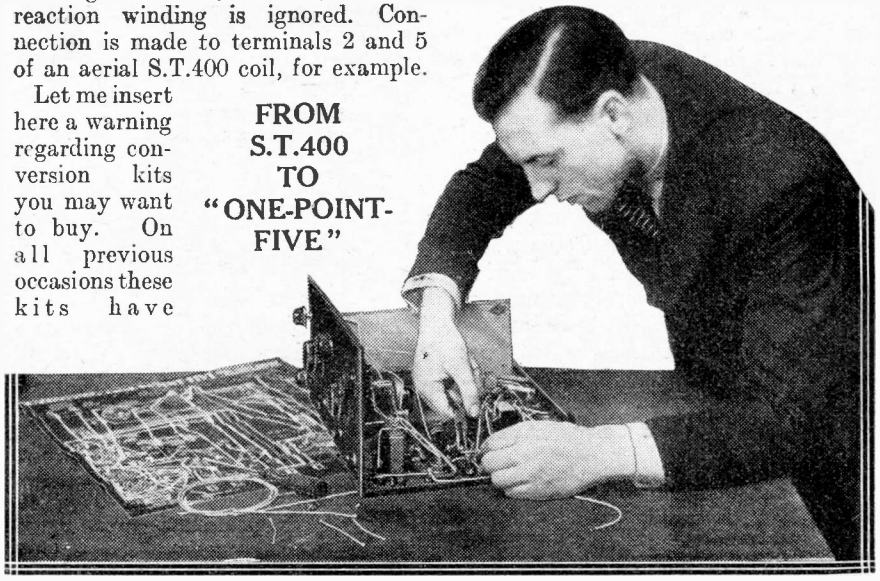
W.B., Rola, Amplion, Blue Spot, Celestion.

Using Reaction

It is important to see that the Extractor is on *its* right waveband. You will not be able to cut out a Regional if the Extractor is on the long waves. Droitwich is cut out in the same way when the Extractor switch is in the long-wave position; if not on the long waves the Extractor condenser will not cut out Droitwich.

Aerial reaction is not often used, but anode reaction will be normally used in all cases. Keep the anode coupler at a low value whenever possible, especially when using aerial reaction which gives extra selectivity. It will be found that altering the anode coupler calls for a retuning of the right-hand dial, but the aerial controls make little or no difference to tuning.

(*Please turn to page* 232.)



This photograph was taken as the final leads of a conversion from S.T.400 to "One-Point-Five" were being connected. Whether you convert your set or build a completely new "One-Point-Five," every wire should be most carefully checked with the blue print (given away last month) before the receiver is connected to its batteries.

STORIES OF THE STARS

Interesting sidelights on some of your favourite recording artists, and some suggested records from the latest lists for you to try.

ONE of the most popular British dance band vocalists is undoubtedly **Les Allen,** the Canadian who came to Henry Hall's band about two years ago, and thousands of listeners are sorry that he has left the B.B.C. dance orchestra for the halls.

But Les Allen is still available on records, and he belongs to the Columbia studios, while with his stage and film activities he is even busier than he was last year when he was still with the B.B.C.

Les Allen has received upwards of 50,000 letters during the comparatively short time he has been before the British public, and his records are high up on the list of sales.

Particularly popular was his family record of "Little Man You've Had a Busy Day," which came out last year. Now he has made another "child" record, "My Kid's a Crooner."

* * *

Probably the title of Grand Old Man of the gramophone can be given to **Peter Dawson,** the world-famous baritone, and holder of the remarkable sales figures of over eleven million records. For thirty years Peter Dawson has held his own in the recording world as one of the most popular artists.

His energy is amazing, for he is always at it, touring the world, singing at various concerts, and regularly recording. He recently left for South Africa where, at the time of writing, he is at the beginning of a fresh tour.

Educated in Australia

Born of Scottish parents, at Adelaide, South Australia, Peter Dawson was educated in that city, and on leaving school entered his father's engineering business. Young Peter soon tired of handling large sheets of metal, and in spite of opposition from his parents decided on a singing career, being influenced by the fact that he had just won first prize in a competition at Ballaret.

He celebrated his twentieth birthday en route for England, where he was to study under the late Sir Charles Santley. Peter Dawson's London début was in a promenade concert under Sir Henry Wood, at the Queeen's Hall, in 1905, and in the same year he made his first gramophone record for H.M.V., then known as the Gramophone & Typewriter Co., Ltd.

But Peter Dawson is not only a singer, he is a composer of no mean order, operating under the nom-de-plume of J. P. McCall. Two of his best-known song compositions are Kipling's "Boots" and "The Friend for Me."

Peter Dawson has no liking for the modern tendency for sickly sentiment in songs, and he deplores what he terms the "bleating" with which such songs are sung. "But," he says, "such vocal items seem to be fading in popularity, and many will be glad to welcome back the honest sentiment of a good home song, or, better still, the manly vigorous song of outdoor men and things." One of Dawson's recent recordings is "The Winding Road," a good example of this type of song.

* * *

An artist that we do not hear enough on gramophone records is **Howard Jacobs.** He is one of the finest saxophonists in the country, and inherits his gift for the instrument from his grandfather and mother.

Grandfather Jacobs formed the first saxophone sextette out in America many years ago, and Howard's mother, Lena Rockwell, also fell beneath the spell of the instrument. It is said that Howard Jacobs has a particularly finely-shaped mouth, that makes him exceptionally adept at saxophone playing. Jacobs records for Columbia, and I should like to have many more records of his than I have at present.

* * *

Among the gramophone lists practically every month one finds the name of **Stuart Robertson.** His latest contributions to the world of wax are "The Skye Boat Song," the traditional song of Flora Macdonald, as she rowed the escaping Bonnie Prince Charlie "Over the Sea to Skye," and "The Road to the Isles."

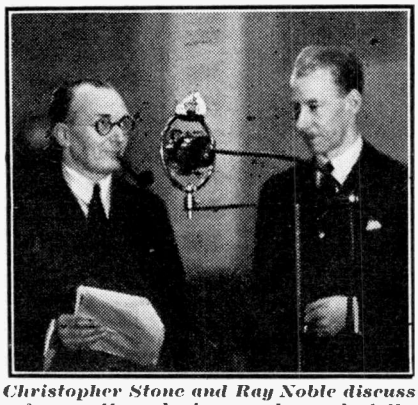
Well Known on the Radio

These are H.M.V. records, and are bound to be very popular. Stuart Robertson has one of the best known radio voices, and is in great demand by the B.B.C.

He has also done quite a bit on the films, though he has not yet had a star part to himself; usually his appearances have been in films that feature his popular sister, Marjorie, known to the public as Anna Neagle. "Bitter Sweet" and "Little Damozel" were two films in which Stuart sang, but no doubt we shall be hearing, and seeing, an increasing amount of him on the screen.

K. D. R.

IN THE H.M.V. STUDIOS



Christopher Stone and Ray Noble discuss a few matters during a rehearsal at the H.M.V. studios. Since Ray Noble went to America we have missed his tuneful orchestrations, and the dance record lists are the poorer for his absence.

LISTEN TO THESE

Records for your Radiogramophone.

VOCAL.

Peter Dawson. "The Winding Road." A typical Dawson recording. (H.M.V. B8262.)

Derek Oldham. "Always" and "Castles in the Air." Two records in different moods. You'll like them. (H.M.V. B8259.)

Comedy Harmonists. "Tea for Two" and "Whispering." Two immortal dance numbers rendered in refreshing style. (H.M.V. B8274.)

Les Allen. "My Kid's a Crooner." It will please his fans. (Col. DB1496.)

Ruth Etting. "Stay as Sweet as You Are." A popular American blues singer returns to Columbia with a tuneful number. (Col. DB1499.)

INSTRUMENTAL.

Albert Sandler. "Sandler Serenades." A twelve-inch record of favourites. (Col. DX667.)

Jack Wilson. "Mayerl Memories." Piano syncopation by a popular artist. (Regal-Zono. MR1547.)

Vivian Ellis. "I'm On a See-Saw" and "Dancing with a Ghost." Two numbers from "Jill Darling" by the composer on the pianoforte. (Col. DB1500.)

ORCHESTRAL.

Silly Symphonic Orch. Walt Disney Selection. Very clever pot-pourri of recent Silly Symphony film cartoons. (Col. DX666.)

London Symp. Orch. Concerto in B flat Major (Mozart). Piano part taken by Arthur Schnabel. Four complete and exceedingly well recorded discs of a tuneful classic. (H.M.V. DB2249-52.)

Gipsy Orchestra. Don Sebastian and his International Gipsy Orchestra, a new combination play a medley, "On with the Waltz." (Regal-Zono. MR1546.)

DANCE NUMBERS.

Debroy Somers. "Home, James, and Don't Spare the Horses." A good, lively number. (Col. FB1014.)

Lew Stone. "Solitude." Wonderful value at a shilling. Other side holds "I Ain't Got Nobody." (Regal-Zono. MR1561.)

Ambrose. "It's Home." Played in his usual polished style. (Decca F5406.)

Jack Teagarden. "Junk Man." Teagarden used to be Red Nichols' trombonist. Excellent voice, too. A good record. Teagarden here gives example of harp played in rhythm! (Brunswick 01979.)

Jack Jackson. "Little Girl, What Now?" A good record by a good band. (H.M.V. BD108.)

CURRENTS That Never Stop

ZERO RESISTANCE! — NO VOLTS NEEDED!

WE are accustomed to think of the electrical resistance of metals as a necessary evil, something that cannot be cured and therefore, as the adage says, must be endured. I wonder if we ever stop to think what would happen if some of these necessary evils—and there are many of them—could really be got rid of? Suppose the resistance of all metallic conductors became zero. It would be very useful in some ways.

Did you know that metal conductors can have their resistance entirely removed? That they become super conductors—100 per cent conductivity, no resistance, no heating—that currents once started go on for ever, with no E.M.F. required?

How would wireless be affected if this became general? Read what Dr. J. H. Roberts says in this absorbing article. He tells you of some amazing scientific discoveries, in his characteristically simple and lucid style.

What Would Happen?

Long-distance power cables would become much less costly, and the same would apply to telephone and telegraph lines. High-frequency radio coils would be more efficient and everything would seem brighter. But not electric lamps; they would definitely "go out." Electric heating and lighting would disappear and many of the other blessings of electricity would go with them. And on balance, I think you will agree with me, we would be far worse off.

So you see, what seems like a burden often turns out to be a benefit and perhaps it is just as well that we can't interfere with Nature.

These thoughts are prompted by the recent discoveries on the effect of very low temperatures on the electrical conductivity of metals. Did you know, for example, that many metals, if brought to a temperature of about 270° C. below zero, completely lose their electrical resistance and become perfect conductors? A current, once started in such a metal, goes on indefinitely, without any further electromotive force. The current produces no heating effect because there is no resistance. A current of 1,000 amperes can be carried by a small metal ring.

Ice Contains Heat

Let me tell you first of all how these discoveries came to be made and for that I must describe how these extremely low temperatures are produced.

The effects with metals, which I am going to tell you about, take place, as already indicated, at temperatures of about 270° below 0° C.; the latter temperature being, as you no doubt know, the freezing point of water—"freezing point" in common parlance.

In order to form some notion of what these extremely low temperatures mean, you must first get rid of the idea, which many people seem to have, that ice is entirely without heat, and that "freezing point" represents the absolute zero of temperature.

This is far from being the case. As a matter of fact, there is still a lot of heat left in a block of ice, and if you put the ice in contact with a colder substance—frozen carbon-dioxide, for example—the ice will lose heat to the other and the ice will become *colder*.

I dare say you have heard of liquid air—that is, the gases of the air reduced (by pressure and special cooling methods) to the liquid state. Well, liquid air boils off, or goes into the gaseous state again, at about a couple of hundred degrees below the freezing point of water, that is, below 0° C.

"Boiling" Air

Since liquid air is some 200° colder than ice, it amounts to the same thing to say that ice is 200° *hotter* than liquid air. Now, if you took a kettle of water and put it on a block of hot metal, at 200° C., the heat from the metal would soon boil the water (water boiling at 100° C.). It is precisely the same sort of thing if you put liquid air in the kettle and stand it on a block of ice, for the ice is as much hotter than the liquid air as the hot metal is hotter than the water.

The result is that the *heat* from the block of ice soon makes the liquid air boil and a jet issues from the spout, looking just like steam only, of course, very cold.

The Temperature Limit

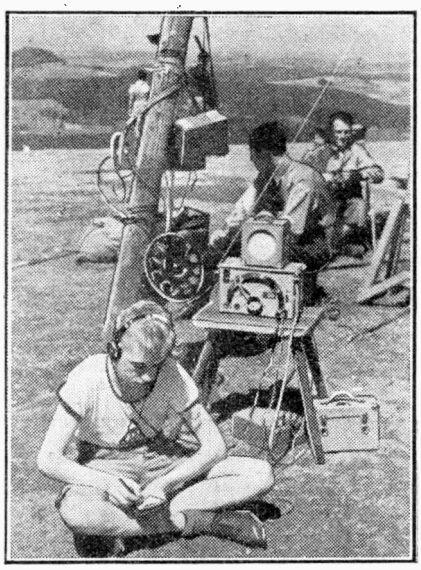
Now I think I have said enough to show you that a substance may be "as cold as ice" and indeed a great deal colder, and yet it may still be capable of having heat abstracted from it and being made colder still.

But there is a limit to all this, a limit of temperature below which it is impossible to go. This limit turns out to be about 273° below 0° C. It is impossible, then, to make anything colder than —273° C., and at that temperature it has no heat whatever remaining in it.

What do we mean, in the physical sense, when we say that a substance is completely devoid of heat?

Well, I dare say you know that heat

A RECEIVING POST



This central station was employed at a glider soaring contest to receive details of landings from various "outpost" transmitters.

is regarded as the *energy of motion* of the molecule of a substance. The molecules of a solid or a liquid are in a state of continual agitation, whilst those of a gas are flying about in all directions. When we reduce the temperature of the substance by removing some heat from it, what we are doing is to reduce the energy of motion of the molecules.

From this you will see that if we could remove *all* the motion from the molecules and bring them to rest, we would then have the substance completely devoid of heat.

The "Absolute Zero"

Experiments on gases and the way in which they change with variations of temperature have shown that if the temperature could be reduced to —273° C. all molecular motion would cease; that is, there would be no heat left. For this reason, the temperature of —273°C. is called the "absolute zero" of temperature. In passing, I may mention that, although this temperature has been nearly reached in the laboratory, it has never been *quite* reached.

Now you know something about very low temperatures, I will go on to tell you how gases behave when they get down into these low temperature regions.

According to the above theory, it ought to be possible to reduce anything not only to the liquid, but to the solid state, by bringing its temperature down sufficiently and before reaching absolute zero. Some gases can easily be liquefied—ammonia, for example—but others, such as hydrogen, nitrogen and oxygen, long resisted all attempts to liquefy them and so came to be regarded as "permanent gases." It was thought that they would remain gases under all conditions and were incapable of being brought to the liquid condition.

Solid Helium Produced

More recently methods have been found for producing extremely low temperatures—nearly as low as absolute zero—and by the application of these temperatures and suitable pressures all the known gases have finally yielded. Hydrogen and helium were amongst the last to fall. There is now no such thing as a "permanent" gas. Every known substance can, in fact, be reduced to the *solid* condition; solid helium was produced by Keesom in 1926.

The temperatures at which gases such as hydrogen and helium liquefy are very near to the absolute zero, and so a supply of liquid helium forms

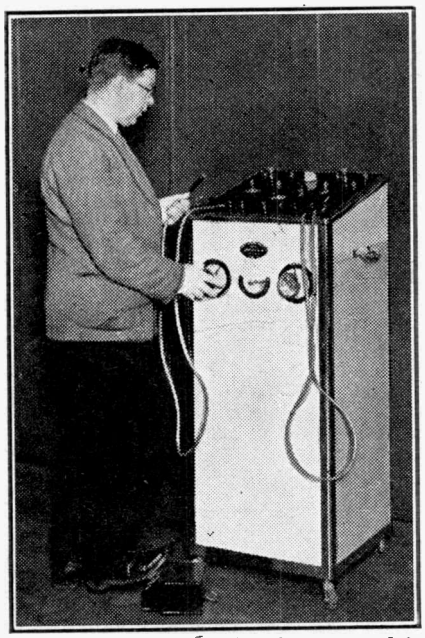
USING LIQUID GASES

a very convenient "cooling agent" for reducing the temperature of any other substance to these very low regions. A metal ring, for example, may be immersed in liquid helium and its electrical behaviour at these low temperatures may then be studied.

And this brings me to the real part of the story. I have told you about the liquefaction of gases so as to give you an idea of the extreme temperature conditions with which we are dealing. Now let me tell you what happens with metals under these same conditions.

You know that generally the electrical resistance of a metal increases as the temperature is raised. An electric fire, for instance, draws less current when the element is red-hot than when first switched on. Conversely, of course, the resistance decreases as the temperature is lowered.

A DOCTOR'S "SET"



This Marconi apparatus is a complete valve diathermy outfit, and can be adjusted for use in connection with both therapy and surgery.

From the behaviour of metals at different temperatures, it was deduced that the resistance would become zero at —273° C.; if a metal could be reduced to this temperature, its resistance would disappear altogether and it would become a perfect conductor—a "super conductor," as we now call it.

This theory could never be put to the test until these experiments on liquefying gases had been made, and means found for producing the temperatures required. The tests have now been made, however, and it has been found that many metals lose their resistance *before* the absolute zero is reached.

Resistance Suddenly Disappears

A curious feature is that the remaining resistance of the metal disappears *suddenly* at a certain critical temperature (near absolute zero). This critical temperature differs for different metals.

Mercury, for instance, increases in conductivity as the temperature is lowered (like any other metal) and suddenly becomes super-conducting at 4·2° absolute.

If a current of electricity is started in a ring of super-conducting metal, it is obvious that (apart from inductive effect, and so on) there is nothing to stop it. In actual tests it has been found that a current of many amperes will persist indefinitely (that is, with no measurable diminution) so long as the metal is kept below the critical temperature.

In some experiments recently a mercury ring was brought over from Holland to London, immersed in liquid helium in a Dewar flask, and a current of some 200 amps. started (by induction) in the ring before it left Holland was still going strong when it reached London many hours later.

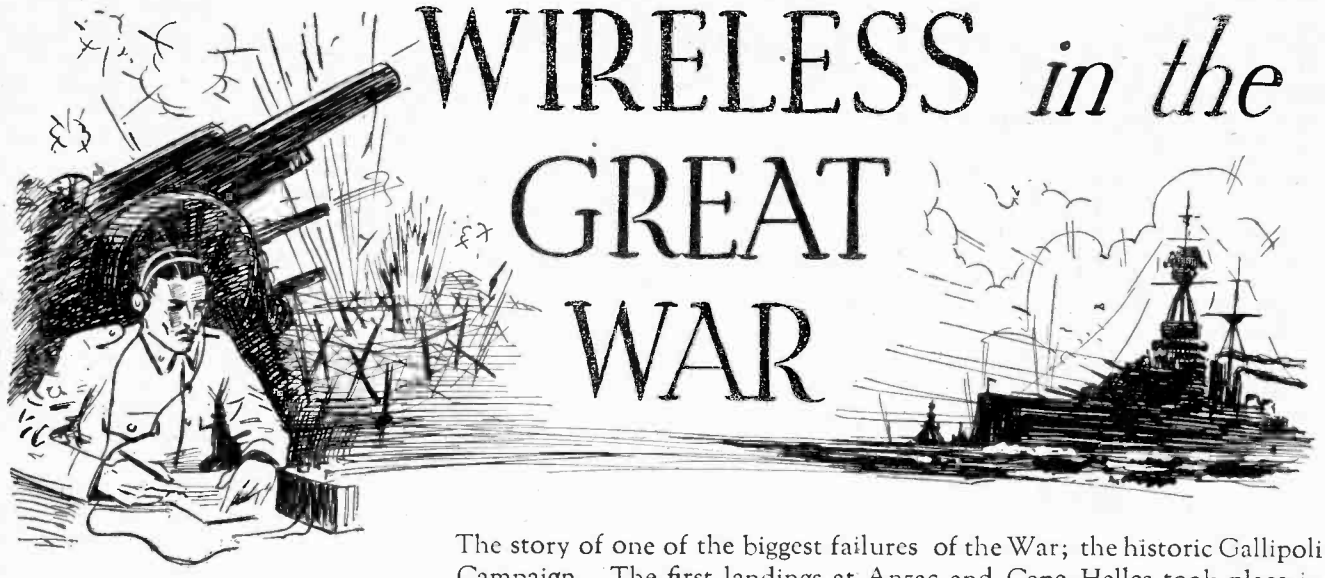
Little Practical Value

What does it all mean? I could go on for hours telling you about the theories that have been formulated to account for this peculiar behaviour of metals—theories concerned with the "space-lattice" and with the freedom of the electrons, but it would take too long. It is evident that we are not likely to make use of metals in this super-conducting state for ordinary purposes; but, at the same time, these discoveries may throw a good deal of light on the mechanism of electrical conduction in metals under ordinary conditions.

It is hard to comprehend what super-conductivity really means. A metal with *no* resistance.

It is all very wonderful; but, on second thoughts, don't you think we are better off with our good old resistance metals as they are?

But we must give all credit to the investigators who, by their patience and skill over many years, have revealed for us these intensely interesting secrets of science.



WIRELESS *in the* GREAT WAR

The story of one of the biggest failures of the War; the historic Gallipoli Campaign. The first landings at Anzac and Cape Helles took place in April 1915, to be followed in August by a further landing at Suvla Bay. But, alas, the great attempt to take the Dardanelles was unsuccessful and the whole of the gallant army under Sir Ian Hamilton was forced to evacuate without any material advantage being achieved.

By "RADIAT"

DAWN is breaking over the hills of Asia Minor, gradually revealing the outline of the Gallipoli Peninsula. It is a Sunday morning in the spring, and the multi-coloured flowers on the Peninsula are just approaching full bloom, red poppies, yellow tulips, blue cornflowers and white lilies—a carpet of flowers more gorgeous than the rainbow.

Blue Sea and Sky

Now the haze is lifting from the Aegean Sea, revealing its deep blueness—the reflection of the bluer sky overhead. Through the haze the dim outlines of the islands of Imbros and Samothrace appear, and over on the mainland where the hills run down to the sea, the coast on which stood ancient Troy appears ghostly and unreal in the half light of dawn.

From the distance the scene is peacefulness personified, but appearances are deceptive and the seagulls flying far overhead are uneasy and alarmed and hurrying inland. Suddenly a curious rattling sound disturbs the dawn, followed instantly by a noise as of thunder.

As the sun rises still further and the shadows disappear, the seagulls see what appear to be ants climbing up the sandy cliffs and gullies of the Peninsula. And now great grey shapes have appeared from out of the sea mist, belching forth flame and smoke.

The ants are men, soldiers; the rattle, rifle fire; the thunder, guns. Soon the flowers are crushed and broken; the peacefulness has turned to frightfulness; men, wounded and dying, presently to suffer the tortures of thirst, are lying amongst the trampled lilies. Death and destruction are on all sides, the very hills of Gallipoli seem crumbling to ruin under the fire of the great grey battleships out at sea, and in the little bays and inlets the water is coloured scarlet with the blood of the British soldiers as they endeavour to dash ashore from their boats under the concentrated and deathly fire of their enemy—the Turk.

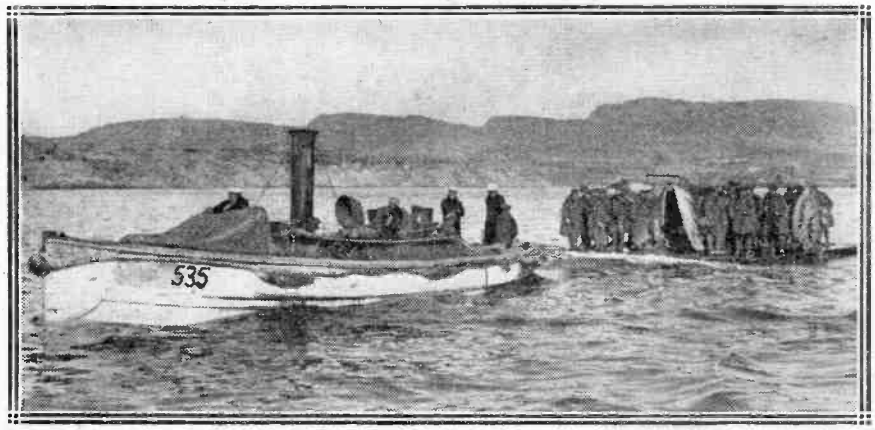
Such was the heroic landing of the British, Australian and New Zealand army on the Gallipoli Peninsula in its endeavour to gain a footing on Turkish soil and capture ultimately the city of Constantinople.

The Intended Plan

British troops had landed at five different points at the foot of the Peninsula, and wireless sections equipped with the usual army pack sets accompanied the landing parties. The idea was that as soon as the landing was made good these portable wireless stations would be erected and wireless communication established with the warships and the Commander-in-Chief, Sir Ian Hamilton, who was directing operations from H.M.S. Queen Elizabeth. In this vessel he was able to move from point to point around the coast and keep in touch with the various heroic landing parties.

Probably the only parallel in history to this landing was the attack on Quebec by General Wolfe of immortal memory. Few of the Great War

FIELD GUNS EVACUATING SUVLA BAY: 1915



Nearing the end of the ill-fated venture. This photograph shows field guns leaving Suvla Bay in broad daylight. The evacuation of the Peninsula was very cleverly carried out and very few lives were lost.

THE ATTEMPT TO TAKE THE DARDANELLES

generals, either British, French or German believed that such a difficult landing would be successful. "The feat was impossible and any force making the attempt is bound to be completely annihilated by the defenders," was the general opinion on all sides.

As is usual in such difficult operations, especially with signalling arrangements, things did not turn out according to plan. In many cases the men were killed or wounded in erecting the wireless sets, and even when erected the stations were promptly damaged by the shell fire from the Turkish batteries.

In some cases landing was fairly easy, as at "Y" Beach where two battalions of Marines got ashore without a single casualty.

A Desperate Fight

At "X" Beach, however, near the point on the coast known as Tekke Burnu, the Royal Fusiliers, Inniskillings and Border regiments had to fight desperately to get ashore. But presently a fierce bayonet charge on their part enabled them to gain the heights and establish contact with the troops which had landed at "W" Beach, on the other side of Tekke Burnu.

At this beach, where the Lancashire Fusiliers had managed to gain a footing, the fighting had also been very fierce indeed. The Turkish defenders followed their usual plan of reserving their fire until the cutters containing the troops were almost on the beach and then opening out with every rifle, machine gun, pom-pom and field piece which they had available.

In spite of this and the fact that the sea literally "ran red" with the blood of the wounded and dying, the gallant Lancashires charged up the cliff, through the barbed wire and land mines, and bayoneted the Turks out of their trenches.

Further round the coast, at "S" Beach, near the old fort known as "De Totts Battery," another force had landed with comparative ease.

The most difficult attempt of all occurred in the case of "V" Beach, near the ruined fort of Sedd-el-Bahr. It had been planned to run a cargo steamer, the River Clyde, to within a few yards of the shore and then to bridge the intervening gap of water by two barges along which the troops from the ship were to rush on to the beach.

Quite Hopeless

As at the other beaches the strongly entrenched Turks opened a withering fire on the British as they started to run over the barges to the beach, wiping them out almost to a man. Over and over again the gallant soldiers rushed forward, and over and over again were they wiped out. The slaughter was terrible and the seashore was filled with the bodies of the wounded, dying and drowned, for many were drowned by the weight of their kit as they endeavoured to swim to the shore.

In the face of such terrific odds it would have been quite permissible for the gallant Irish companies, which led the charge, to falter, but never once did this happen, and time after time they continued to make the attempt until the command came for the survivors to shelter themselves within the steel sides of the River Clyde.

But the toll had already been "awful," dead and wounded were heaped everywhere, on the decks, on the barges, on the beach and caught up in the barbed wire. Never was a more heroic effort made, but the feat of landing was simply impossible.

True, a few brave fellows managed to reach the beach and shelter behind a sand bank. But their lot was pitiable, wounded more or less severely as most of them were, and when a movement of only an inch or so meant instant death from a sniper's bullet. Indeed, had it not been for the machine guns on the River Clyde, the Turks would undoubtedly have swept these few survivors into the sea.

After dark the Turks were unable to aim, and all the troops landed safely on the beach, and thus a footing was firmly established on the Peninsula.

Radio Difficulties

The difficulty of establishing wireless stations through all this fighting and bloodshed on the beaches can well be imagined. The description of the landings themselves is sufficient to show what the wireless sections had to contend with. Add to this the continuous shelling by the enemy, the confusion of landing the baggage, ammunition boxes, horses and mules, petrol cans full of water for the troops, medical equipment, guns, food, and all the impedimenta necessary to an army making a forced landing on a foreign soil.

The pack wireless set which was the type then used by the army, was a fairly simple piece of apparatus to get into operation under normal conditions but owing to the delicate apparatus even then a certain amount of care had to be exercised. The difficulties of erection under fire, therefore, can well be imagined, with shells exploding a few yards away, and mules and horses stampeding and becoming caught up in the guys of the aerial masts.

The standard army pack wireless set consisted of two fairly large boxes

(*Please turn to page* 229)

THE LANCASHIRE LANDING: GALLIPOLI

A view of one of the Gallipoli beaches, known as the Lancashire landing. Note the shell bursting in the water.

B.B.C. NEWS

Larger Premises Required—The Summer Programmes—Broadcast "Understudies"—The Television Station—Studio for Nottingham

By Our Special Commissioner

Big Construction Plans

PLANS have been completed for large-scale construction involving about five of the properties adjoining Broadcasting House. This will mean virtually an extension of the original building to about twice its former accommodation. Even when this is done, there will still be need of the new Studios in Maida Vale, of "No. 10" under Waterloo Bridge, and of special Studios for Television. These ambitious constructional schemes in London, along with parallel schemes in the Provinces, will require a great deal of money, and it looks as if the B.B.C. is counting on a much larger share of the licence revenue after 1936.

Empire Service Extension

The short-wave Empire service which now operates five separate transmissions, running almost continuously from 7.30 a.m. to 1.30 a.m., is about to begin an experimental extension. It has been found that Western Canada, that is, Alberta, British Columbia, and the Yukon Territory, has been inadequately served. So this area is to have a special experimental transmission radiated at London time from about 2.30 a.m. to 3.30 a.m. This will reach British Columbia at the peak listening period there. This is another sign of the special activity of the B.B.C. in maintaining its lead against the keen competition of the Continental short-wave services.

Summer Programme Policy

There is acute difference of opinion between the radio trade and the programme builders at Broadcasting House about the reduction of alternative programmes during the summer months. Last year programmes on the National and Regional wave-lengths were pooled practically all day until eight o'clock at night. This was helpful to the B.B.C. in various ways. It saved money which could be used to greater advantage in the autumn. It relieved the strain on the staff, and it made the holiday period easier. But the R.M.A. contended that this policy hit them hard, also that it was based on the false assumption that the listening habits of people are radically different in summer from what they are in winter. The discussions continue and I prophesy that this summer there will not be as drastic reduction in alternative programmes as there was last summer.

WITH HARRY ROY

Bill Currie, principal vocalist of Harry Roy and his famous dance band which is often heard broadcasting from the May Fair Hotel.

"Chinese Syncopators"

The Light Entertainment experts at the B.B.C. confess to special interest in the appearance in April of the "Chinese Syncopators" in a Radio Music-hall performance. These authentic visitors from the Far East are reputed on both sides of the Atlantic to have developed a unique and uncanny mastery of the gentle art of syncopation.

Artists' "Apprentices"

The B.B.C. is now working out a novel and potentially useful idea for the creation of an active reserve of entertainment talent. The plan is to offer apprentice contracts to young and inexperienced artists who show real promise. As apprentices, these artists would be understudies to the professionals, and would deputise in some of the more untimely transmissions to the Empire. The idea should be welcome as opening a new avenue for the release of at least some of the enormous amount of talent which, in the past, has blushed unheard.

Captain Graves Recovers

Captain Cecil Graves, Director of the Empire Services of the B.B.C., who has been away seriously ill for several months, is now making a satisfactory and rapid recovery. In a few weeks time he will be on his way to North America, where he will spend several months visiting Newfoundland, Canada, the United States and the West Indies. He should be back in London in the early autumn.

News Bulletins Promoted

The growing importance of Broadcast News is once again illustrated by

the separation of the News Department from the Talks Branch in the B.B.C. Organisation. This means that news takes its place as an independent self-contained department on the same status as religion. It also means that experiments in the development of the main News Bulletin will be speeded up.

That Elusive Site

The search for a suitable site for the London Television Station has caused both the B.B.C. and the Television Advisory Committee a great deal of trouble. The last I hear is that opinion is divided between the Alexandra Palace and the Crystal Palace, with the odds slightly in favour of the former. When the site is chosen and the station built, the premises will have to include at least three studios, the work of which will be supplemented by transmissions on a special cable from the auxiliary television studio in Maida Vale.

Other Television Plans

At the initiative of the Advisory Committee the E.M.I. and the Baird Company are exploring possibilities of closer co-operation. It was laid down in the report of the P.M.G.'s Committee that although two systems of transmission were to be used, these should be capable of reception on the one set. This is the case by switching. But there are certain differences of transmission that make the work of the engineers unnecessarily awkward. It is hoped, somehow, to get the two concerns to a much closer identification with each other than at present. I understand that Sir Harry Greer for the Baird Company and Mr. Alfred Clark for the E.M.I. are the negotiators.

Studio for Nottingham

It has taken the B.B.C. nearly five years to make up its mind to complete the organisation of the Midland Region by equipping a proper studio and appointing a representative in Nottingham, which was the headquarters of one of the most efficient and enterprising of the early stations. This decision is being received with much satisfaction throughout the East Midlands.

A "Freedom" Series

The outstanding part of the April to June talks plan of the B.B.C. is a special uncensored series on Freedom. The contributors will include Mr. Baldwin, Mr. H. G. Wells, Mr. Bernard Shaw, Sir Ernest Benn and Mr. G. K. Chesterton. It should be particularly interesting.

Religion for Schools

I congratulate the B.B.C. on its exhibition of courage in attempting a series of religious talks for Secondary Schools in its early summer educational syllabus. But I question the wisdom of the move. If anything goes wrong the consequences are likely to cripple more legitimate and necessary efforts in other directions.

THE "CHIEF CADS" GET A LITTLE "CRICKET"

THE WESTERN BROTHERS, otherwise known as the "Chief Cads," recently inaugurated the first lodge of the Cads Club at the Central London School of Cricket. The object of the club is to aid hospitals. These popular stars are here seen indulging in a little "cricket practice," possibly in preparation for the next Test Match series.

"BEWARE YOUR PENTODE"

If your set has a pentode-output stage you should pay particular attention to these hints.

A FEW of us, no doubt, have suffered unknowingly from the "backfire" of a pentode. The loudspeaker drops suddenly in volume and the quality becomes very poor. After much testing we find that the speaker output transformer is to blame; shorted turns on the primary winding, which, of course, we put down to faulty manufacture.

It is Easily Done

But the manufacturer is not always to blame; we may have been careless and allowed our pentode to "backfire." It is easily done if you have not been warned.

A pentode valve, owing to its peculiar characteristics, can generate quite high voltages under certain conditions, and it is possible to draw a fair-sized spark from the output circuit of even a small battery pentode.

The conditions for this high voltage to occur are set up when the output "load" is suddenly removed; the "load" in this case being the secondary of the output transformer and the loudspeaker connected to it. The momentary high voltage or "backfire" can break down the insulation between some of the wires in the primary of the transformer, causing shorted turns. The consequence is poor and distorted results, for which there is no remedy but a new transformer.

The main danger lies in the fact that many loudspeakers are not incorporated in the set cabinets, but are fed by extension wires. In these cases, the usual and correct method of wiring is to put the speaker transformer in the set and to connect the extension to the secondary.

Danger of "Backfire"

This keeps the H.T. out of the extension circuit. But if a speaker so wired is disconnected while the set is in operation, then the output "load" is removed and there is every possibility of a "backfire" and a damaged transformer or valve.

This trouble does not arise, of course, if the primary of the speaker transformer is disconnected because in this case the H.T. is cut off.

F. N. G.

Special TELEVISION Section

Conducted by
Dr. JOSEPH HARRISON ROBERTS, F.Inst.P.

Now that the first fever of excitement over the publication of the Postmaster-General's Report has died down a little, we are all looking forward to the time when the B.B.C. will begin transmitting high-definition television in real earnest. It has been stated that this will come some time in the Autumn, but personally I think it will be somewhat later than that, although I can tell you that things are moving rapidly forward at the B.B.C. in preparation.

Great Deal to be Done

No time is being lost, and there will be none of the unnecessary delays which so often occur in the public services. My reason for supposing that things will not be ready by the Autumn is simply that there is too much to be done. The amount of preparatory work is simply enormous. Few people realise how great is the organisation that has to be arranged for the inauguration of a public television service by the B.B.C.

Quite apart from the preparation of the studios and the technical gear—transmitting arrangements and so on—there is the question of short-wave transmission to be gone into. I said short-wave, but I should have said *ultra*-short-wave for, as you probably know by now, it is contemplated to transmit on wavelengths as low as 5–6 metres. The technique of broadcast transmission and reception on these very short wavelengths is something new and no one knows what snags may crop up.

One of the most important practical points is that transmissions on these ultra-short waves can only be received over a relatively short distance. This, of course, varies somewhat with the power and so on, but for all-round practical broadcasting purposes it may be taken to be some 25–30 miles.

Now you see this means that, whilst a single transmitting station can serve the area of London, it cannot serve the Provincial area, and for this purpose it will be necessary to set up a series of small stations all over the country, each serving its own little area.

After many years of intensive laboratory research, television has emerged from its early struggles and is ready to take its place with its older sister, broadcasting.

Accordingly, each month we are devoting a special section to the latest news and views of television developments, and we have arranged with Dr. J. H. T. Roberts, the well-known physicist, to conduct this feature.

To start with, however, only London will be served and this will be in the nature of a trial arrangement. The experience gained in this way will then stand the engineers in good stead when it comes to setting up the other stations throughout the Provinces.

Another point which most people do not appear to realise is that the technique of television broadcasting is in many ways quite different from that of sound broadcasting. It more nearly resembles the technique of talking-film production, but it differs even from this in some important particulars.

For instance, whilst the television studio personnel includes the lighting expert, the sound-recording engineer, projectionist, photo-electric specialist, camera-man, make-up man, and so on, all part and parcel of the equipment of the film studio, the television studio also includes the television engineer, cathode-ray expert, and many others not found in the film studio. The television studio is, in fact, something new, of which there is precious little previous experience to go on, and all this makes for delay in getting under way with a full-blown television broadcasting service. It is quite evident that whatever else the television service may be, it is something quite different from the ordinary sound broadcasting service. It cannot, and must not, be regarded merely as a sort of development of ordinary broadcasting.

Cathode-Ray and Mirror-Drum

A curious discussion arose the other day amongst a number of people in my presence as to the relative merits of cathode-ray reception and mirror-drum reception of television. I don't know how many of my readers have ever seen either type of reception: I expect only a very few of you have seen cathode-ray reception. At any rate, you know that the cathode-ray

reception is all " the thing " nowadays, owing to the ready response of the weightless cathode beam to the rapid impulses applied to it. The cathode-ray system has many manipulative advantages, and it is this feature that commends it to the television " set designer," as we may call him. But the " looker-in " (what *is* the word ?) does not concern himself (or *her*self—and that's a very important point to note, in passing) with the insides of the set, only with the received pictures.

A Certain "Elusiveness"

Now the picture received on a mirror-drum receiver has a good deal of the look about it of a small home cinema sort of picture, and so far as that goes it appeals to many people.

The picture on the end of a cathode tube, on the other hand, wants a certain amount of getting used to. It is, when all is said and done, a fluorescent picture, and until you get accustomed to it there is what one of my friends called a certain " elusiveness " about it. Some people find this rather fascinating, whilst others feel a bit strange with it. I must say, however, that wonderful improvements have been made in cathode screens of late.

I remember when we used to make our own fluorescent screens in Cambridge for positive-ray work ; what a job it was to make a good one ! But now the screens are turned out amazingly uniform and the sensitiveness is extraordinary. Not only this, but it is possible to reproduce the picture in practically sepia or even black tones. As for brightness, I saw some pictures the other day that were astonishing in their brightness ; it was quite easy to view them in a room with all the lights on : none of the hole-and-corner or peep-show business of three or four years ago.

We have been told that, before long, television will be used by the large stores for transmitting pictures of mannequin parades, and so on, but we hardly thought it was so near at hand. Just lately the Baird Company had a demonstration on precisely these lines, and the Duchess of Kent, whilst sitting in a room in Victoria Street, chose a new spring hat, demonstrated on the television screen by transmission from the Crystal Palace, where the mannequin was showing it off. The Duchess was very pleased with this experiment, the pictures coming through with great clarity ; and the Duke of Kent also expressed his astonishment at the remarkable results obtained.

SPECIAL TELEVISION SECTION—*contd.*

New Mechanical Scanner

I see the Baird Company have lately taken out a new patent connected with mechanical scanning systems, in which two sets of rotating mirrors are used, one drum comprising 30 mirrors and rotating at a speed of 3,000 revolutions per minute, whilst the second drum comprises three sets of 19 mirrors and rotates at a slower speed than the first one. These three sets of mirrors are arranged at a special angle so that each of them throws a separate scanning line over the screen, and the result is that the number of scanning lines is multiplied by three.

You have heard a good deal lately about the system of so-called " delayed " television in which an outdoor scene, for instance, is photographed on to a moving cinematograph film, this passing on to developing and fixing tanks and then, after a space of only perhaps 30 seconds, passing through the transmitter for scanning and transmitting. There are, however, a good many practical difficulties in this arrangement and one of them is that the developing and fixing takes too long in relation to the time of exposure.

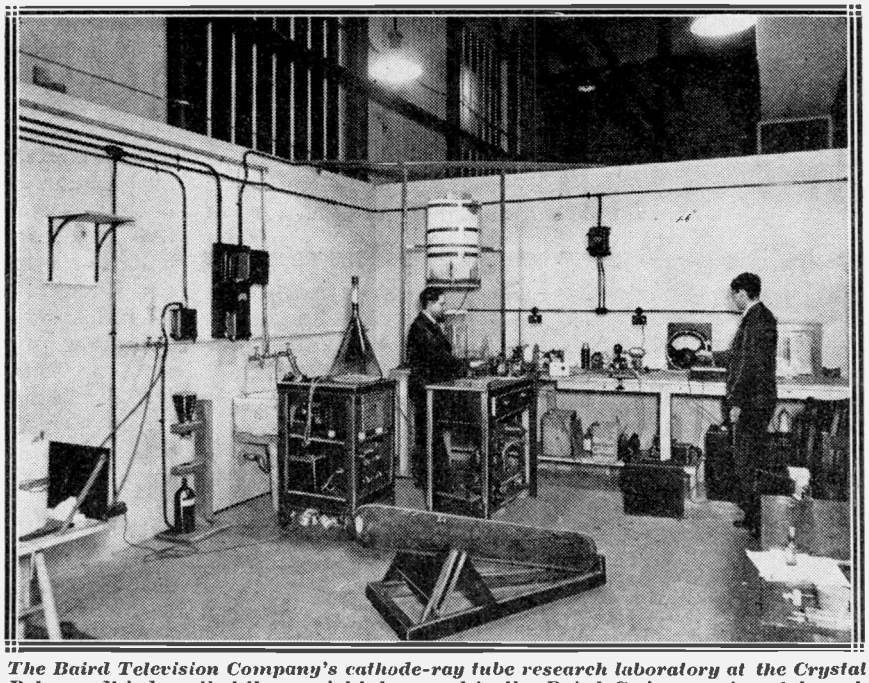
Recent Developments

One possible solution of this is to use the sub-standard 16 mm. size film, but this again is found to have certain drawbacks and a patent has lately been taken out for using standard-size film with two pictures one above the other, in each of the usual pictures spaces. The effect of this is that only half the length of film is required, whilst the developing and fixing operations are much simplified. A curious operating point is that the gelatine coating on the film is apt to get into the tracking holes at the edge of the film and to clog it, but by this new arrangement the difficulty is almost entirely avoided.

A new kind of transmission line, which it is claimed will give a television channel capable of producing very large and clear pictures, has recently been developed by engineers of the Bell Telephone Laboratories in the United States.

It consists of a wire within a wire, or a solid wire within a hollow tube, if you like, the tube being about ½ in. in diameter ; the tube and the wire inside both act as conductors. In the new channel a million-cycle frequencies travel on the outside skin of the inner wire and on the inside skin of the surrounding tube, the outer section of the tube serving to carry away the interfering frequencies and therefore acting as a shield for itself and the inner wire.

A CATHODE-RAY RESEARCH LABORATORY



The Baird Television Company's cathode-ray tube research laboratory at the Crystal Palace. It is here that the special tubes used in the Baird Co.'s experimental work are made.

The New 7-METRE Receivers

by VICTOR KING

With the advent of television ultra-short waves will be brought from the somewhat remote experimental atmosphere that at present surrounds them into the realms of ordinary everyday broadcasting. Mr. King here discusses the subject of reception of the extremely high frequencies and puts forward some interesting suggestions.

I HAVE been doing a certain amount of experimental work and a considerable amount of thinking about television lately. The new science certainly does seem to have got under practical way at last, but there is an awful amount to do between now and the latter end of the year if full advantage is to be taken of the high definition transmissions.

It is certainly going to be a grand adventure for the home constructor. And as in the early days of sound broadcasting, no doubt amateur experimenters will contribute a good deal towards the consolidation and perfection of the apparatus and methods of using it.

The apparatus required for receiving television really comprises two distinct sections. There is first the ultra-short-wave set and then the gear needed to build up the pictures from the energy received.

I think most of us can predict the general form of this latter. Undoubtedly the cathode-ray system will be by far the most widely used. But here again there is plenty of room for experiment and development.

The Voltage Question

Some of the time-bases now being employed for controlling the C.R. tube are rather fearsome pieces of apparatus. I don't think the fact that a couple of thousand volts or so will be required need worry us at all. Fears have been expressed that constructors may find it dangerous to tinker with apparatus having such high tensions.

But the currents required are small, and if you consider for a moment some of the high-tension apparatus in common use you will find it easy to gain self-assurance on that point.

For example, some fifty thousand volts or so figure in the ignition systems of baby cars, and it hasn't been suggested that owner-drivers should not have anything to do with their engines because of that.

Simplification Required

Voltage without current or, rather, with very low current, is not particularly harmful; in fact, if the current is low enough, it can be absolutely harmless. And in most cathode-ray systems there are generally definite current-limiting factors.

But it does strike me as odd that batteries should figure in some of the "all mains" cathode-ray outfits that I have seen. However, those batteries will, I think, be eliminated easily enough and the gear very much simplified. It does need this, though, for at present much of it is somewhat complicated—unnecessarily so, in instances, I believe.

However, for the time being, at least, I think we can leave most of the "C.R." side to the professional engineer. When he has accomplished the spade work, then the constructor can get down to it.

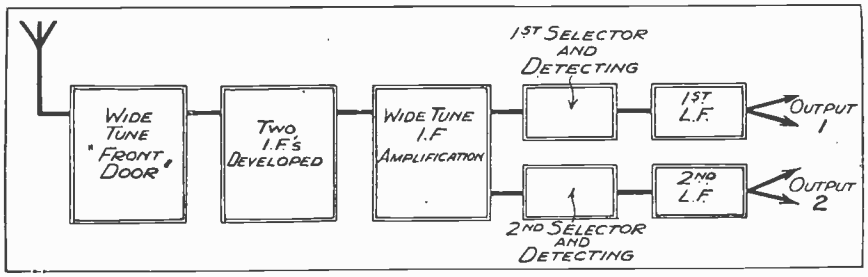
The radio receivers, for picking up the sound and vision signals are, however, right on the home constructor's own ground. At present there are no regular ultra-short-wave television broadcasts available, but there are experimental transmissions to be heard and seen in London and a certain amount of 5-metre stuff sent out by amateurs.

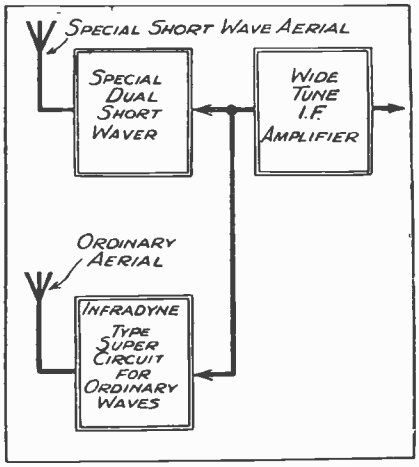
Of course, the difference between five and seven metres is a big one. Actually the difference is several times greater than the difference between the lowest medium wavelengths and the highest long wavelengths used for ordinary broadcasting. Nevertheless, work on five metres with view to developing a set for television reception cannot be wasted, for the conditions on the two bands must be similar.

The Two Wavelengths

The present high definition television transmissions of an experimental nature sent out from the Crystal Palace by the Baird Co. are on 7 metres for vision and 8·5 metres for sound. But the P.M.G.'s committee have made the elastic recommendation that wavelengths between 3 and 10 metres could be allocated.

FOR SOUND AND VISION RECEPTION





The top sketch, Fig. 1, shows a schematic diagram of a double-channel ultra-short-wave television receiver. Below it, Fig. 2, is a suggested arrangement for combining "ordinary" broadcast reception with the Fig. 1 system.

SPECIAL TELEVISION SECTION (*Contd.*)

However, despite the enormous width of a band of a mere metre or two down on these ultra-short wavelengths, I don't anticipate any difficulty in getting sets to tune fairly widely. As a matter of fact, I have already handled a set which can tune from 5 to just over 9 metres—a band wide enough to accommodate about three thousand ordinary broadcasting stations!

But I must get down "to cases," or, in other words, attempt to give my constructor friends some indication of the lines to follow in their consideration of the fascinating subject of television reception.

Only One Receiver

There has been much talk of the necessity of having two sets, one for vision and one for sound. This is not essential and I think we ought to start right in to think in terms of a single set able to take the two together.

This is not as difficult as it might sound. The super-heterodyne principle can be applied in a rather ingenious manner. Glance at the Fig. 1 sketch.

This shows a set broken up into stages, though, of course, there is no reason why the whole thing should not be built into one compact unit.

The aerial is taken first to a very broadly tuned circuit able to accept both the sound and vision channels. The ordinary supersonic heterodyne principle is then employed, but instead of the one Intermediate Frequency there are two developed, one for each of the two wavelengths.

These I.F.'s are then amplified by the Intermediate Frequency amplifier, this being sufficiently broad to accommodate them both.

After I.F. amplification the I.F's are separated and given individual L.F. amplification and therefore emerge separately from the two outputs.

The system is not only quite practicable, but has actually been tried and found to give good results.

So far so good. But several fascinating extensions of the idea have suggested themselves to me. For example, why shouldn't this one portmanteau set be made suitable for reception of medium and long wavelengths as well?

It would seem wasteful to have to have a separate set for that. In any case, there has been official intimation to the effect that in due course a medium wavelength may be used for one of the television channels.

A "DOUBLE" AERIAL

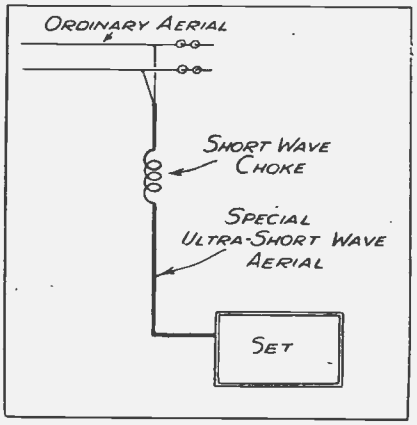


Fig. 3. Using an ordinary aerial for both ultra-short-wave and normal broadcast reception.

In the meantime, and presumably for some years, we shall, however, need to be able to pick up two ultra-shorts for television, and medium and long for ordinary sound broadcasting.

I think something on the lines of Fig. 2 might be quite feasible. This suggested scheme embodies a complete two-channel ultra-short-wave instrument similar to the Fig. 1 idea. A special short-wave aerial is connected to it.

There is an additional stage, but this, too, could be included in the one complete and compact instrument quite easily. This extra unit has its own aerial connection, the aerial in this case being an ordinary aerial such as is now used for picking up broadcast signals.

The unit is a superhet-mixing unit operating on the "Infradyne" principle. That is to say, it produces an I.F. of a higher frequency than that of the stations received, instead of a lower frequency as in normal practice.

A Neat Arrangement

And, of course, this frequency will be such that it falls nicely into one of the channels occupied by the ultra-short wave signals. At the L.F. end of the set it emerges at either Output 1 or Output 2 in accordance with its frequency disposition.

Normally, I presume it would come out of the sound channel output. You could then go straight over from television reception to ordinary sound programmes on the one set and also the same set would be quite ready for any ordinary wave—ultra-short-wave television arrangement.

I am rather proud of this idea. I don't think it has any snags and I believe in it I am anticipating the standard practice of the future both commercial and home constructor.

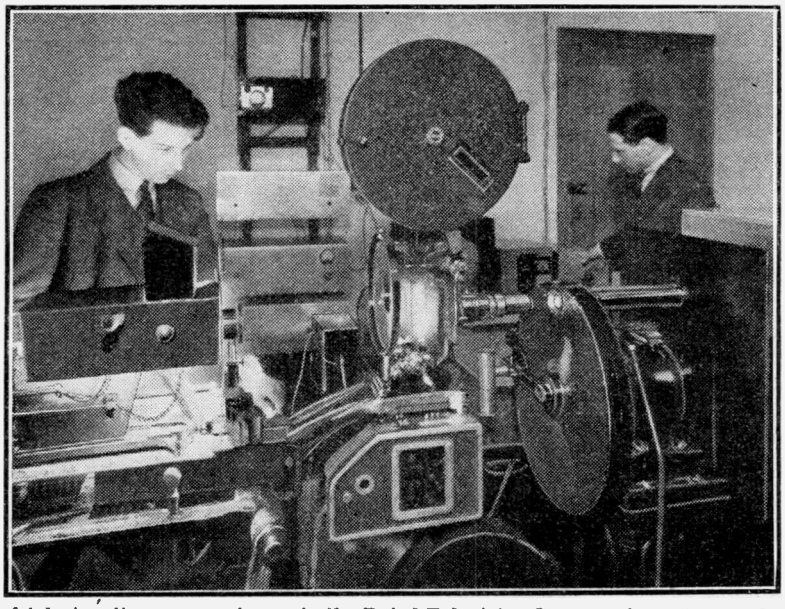
I hope my readers will take note of the scheme and in the years to come we shall see how good or bad a radio prophet I am! In the meantime, perhaps a number of those readers who are active experimenters will get to work and see what they can make out of it.

With a spot of luck someone among you might strike a simple and novel application of the principle which would form the basis of an invention of real value.

I have another combination idea which might hold possibilities. It concerns the aerial system. As you know, the ultra-short waves demand something rather special in the form of an aerial. You cannot take them

(*Continued at foot of next page.*)

"SENDING" TALKIE FILMS BY RADIO



A telecine disc scanner in use in the Baird Television Company's studios at the Crystal Palace. It enables the televising of talking films to be carried out.

SPECIAL TELEVISION SECTION

FOCUSING THE PICTURE

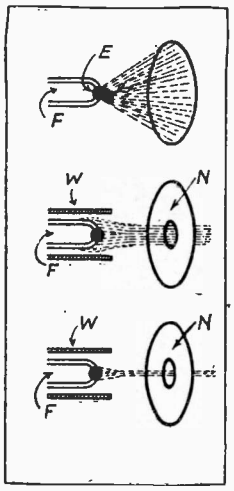
How an ingenious electrical counterpart of optical focusing is carried out in the latest cathode-ray tubes

ONE of the most ingenious electrical devices of recent years is undoubtedly the cathode-ray tube which is so rapidly coming to the fore in connection with high-definition television reception.

A most fascinating feature of the modern cathode-ray tube is that which enables a sharp picture to be obtained.

From the cathode of the tube a stream of electrons is emitted in all directions. If left to follow their own devices, so to speak, the electrons would splay out and cover the whole screen, giving continuous light. So they are bunched together by means of bias on the shield (W) and then pulled rapidly through the accelerator or anode N. This provides a sharply defined ray that, if it would not prefer to diverge again, would form quite a good, clear spot on the screen at the end of the tube.

But without further control this beam would tend to diffuse, and would therefore not give the sharp spot that we require. In the old type of cathode-ray tube such divergence was prevented by filling the tube with gas, which would be ionised by the stream, the ions collecting round the pencil of electrons emanating through the anode. And as the ions were positive they attracted the electrons radially inwards, forming a sort of tube round the electron stream and keeping it within fairly well-defined limits.

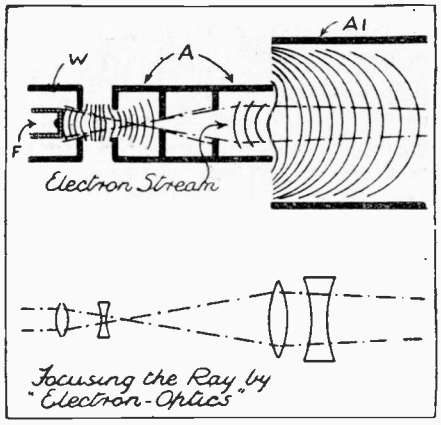


These three sketches depict the "hot-spot" cathode F & E used in the cathode-ray tube and the focusing of the electron stream carried out by the negative bias on the shield W. This causes a fine ray to be projected through the anode or accelerator, N.

An Electro-Static Lens

This "gas-focusing," however, was not sufficiently effective for high-definition television work, and another device had to be resorted to. This was to form a sort of electro-static lens in the tube which would focus the electron stream in the same way as an optical lens focuses light rays.

The first anode was made tubular and provided with a positive potential in respect of the cathode. The electrons are focused and enter it through a hole, but immediately begin to splay outwards again as shown in the second diagram. But they are not allowed to splay out too far, for they come within the static field of another anode at higher potential. Where the fields of the two anodes meet a lens effect is set up, with the result that the electron stream is again concentrated, forming a beam of electrons that can be scanned by the deflectors and thrown on to the screen in a very definite and well-defined pencil, forming a perfectly round, clearly focused, spot of light.



How the system of electrical optics is obtained by the static strain across the electron stream as it passes from one anode, A, to the other, A_1.

It is a simple but very ingenious system, to which we owe a considerable amount of the success of high-definition television.

K. D. R.

THE NEW 7-METRE RECEIVERS

(*Continued from previous page.*)

straight off an ordinary type of domestic aerial.

The best thing seems to be a straight aerial of ten feet in length arranged vertically. This scheme of mine is to have an antenna of that kind in series with an ordinary aerial, the two being joined by means of an H.F. choke of suitable characteristics for choking ultra-short wave frequencies.

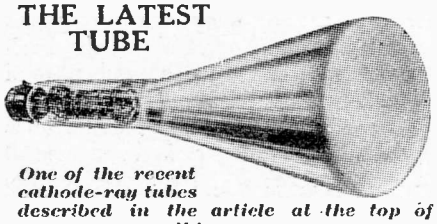
A Combined Aerial

You should be able easily to follow what I mean if you look at my third sketch. So far as the ordinary waves are concerned (medium and long) the H.F. choke offers nothing in the way of a barrier. It is merely a connection between the two aerials.

Therefore, the whole of the aerial system constitutes a pick-up for ordinary waves, the special ultra-short wave part acting merely as perhaps, a part of the down lead.

But a complete barrier is set up to the ultra-short waves by the choke, and so only the special section of correct characteristics for the job works for the ultra-short wave pick-up.

THE LATEST TUBE



One of the recent cathode-ray tubes described in the article at the top of this page.

If the system has to be erected out of doors it would not be at all difficult to have the choke built up in a weather-proof case.

There is only one aerial connection to the set, but it would not be difficult to arrange for the two different kinds of energy to be separated and passed on to their respective stages.

But, again, there may be snags and I leave the idea in your hands for consideration. No doubt many of you will think of other intriguing things which can be done to make this television business easier and less expensive.

There is certainly ample scope for thought and experiment, and the more I think about it the more I find myself wafted back to those days at the beginning of broadcasting when almost every week saw new avenues opening before the home constructor.

In conclusion, I must, of course, say a few words about that little problem of mine. I have received a large number of solutions (or articles, should I call them ?) from readers ; many more than I anticipated.

The task of selecting a winner has been extremely difficult because of the high standard attained. But after long thought I have made my choice and on page 231 of this issue you will see the result.

SPECIAL TELEVISON SECTION

MOVING THE BEAM

Scanning with the cathode ray is really as simple as mechanical scanning. To understand it one merely requires to know the simple principles described in this article.

By L. H. THOMAS

THERE can hardly be a single reader of WIRELESS who does not, by now, know something about the properties of the cathode-ray tube. I do not propose to explain its operation, but to "take it as read." We will start at the stage at which we have our sharply-focused beam of electrons impinging upon our fluorescent screen and giving a bright point of light.

The operation that the amateur seems to find difficult to understand is that of scanning. How can we make this light-spot fly across our screen at the correct speed, return instantaneously, and start again on the next line? At first sight it does seem to be a difficult matter.

The Deflector Action

We have, inside our cathode-ray tube, two completely isolated sets of "deflector plates." Consider the pair mounted vertically, and refer to Fig. 1, showing the screen end of the cathode-ray tube.

If we put a positive potential on the left-hand electrode and a negative on the right, then our light-spot will move over to the left until it reaches the point A. Then, if we reverse the

TWO DISTINCT DIRECTIONS

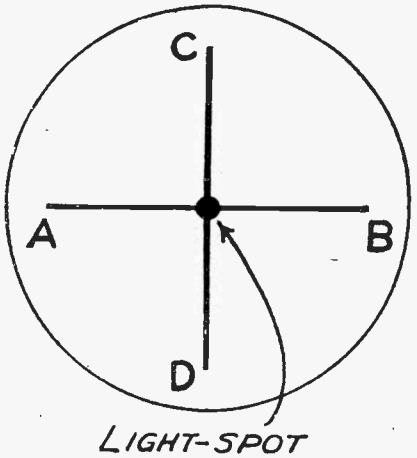


Fig. 1. The spot may be moved vertically up and down C D and horizontally along A B in accordance with the deflector plate potentials.

potentials, it will travel back along the same path until it reaches the point B, on the right.

If we take the other pair of deflector plates and do the same thing with them, the spot will move up and down on the vertical line between the points C and D. In other words, we have absolute control over the position of the light-spot in both directions.

Now the scanning operation is a matter of covering a certain area by means of parallel lines, and for the purpose of making things simpler we will take the present 30-line transmissions as an example.

Fig. 2 shows a picture area of the correct shape, drawn on the end of a cathode-ray tube. To scan this area our light-spot has to begin in the bottom right-hand corner, travel upwards to the top of the rectangle, fly back without loss of time, and start at the bottom again, along a line parallel to the first.

It has to do this 30 times, finishing up in the top left-hand corner, after which it must fly straight back to the bottom right-hand corner and begin again. This complete operation has to be carried out 12½ times per second.

Our spot therefore has to cover the vertical sweep 375 times per second, during which time it is *also* travelling horizontally and flying back at the rate of 12½ journeys per second.

The "Fly-Back"

Both movements are continuous and uniform in speed *in one direction*. The movement of the spot is not, of course, a simple oscillatory movement, but may be regarded as a kind of "build-up" in one direction followed by an instantaneous "collapse" and a fresh start.

I have used those terms simply because they have a bearing on the method usually adopted to bring this result about. Forget about the horizontal movement for a moment and consider the vertical only.

Imagine that the upper deflector is gradually building up in voltage until the spot reaches the top edge of the rectangle. Immediately this occurs, the potential on the deflector is broken down, the spot "released," and the same operation started again.

What does this sound like, in electrical terms? Surely the charge and discharge of a condenser comes somewhere near it? A slow increase in voltage, until we reach the critical point, after which a quick discharge occurs.

One of the most simple forms of "time-base" to understand uses a resistance, a condenser and a neon tube. A source of high-tension is applied, through the resistance, to the condenser, across which is connected the neon tube.

Controlling the Speed

The speed with which the condenser charges up is governed by the size of the resistance. As soon as the potential difference across the condenser (and therefore across the neon tube) is sufficient to "strike" the tube, it will flash over, discharge the condenser, and we shall have to start all over again.

HOW SCANNING OCCURS

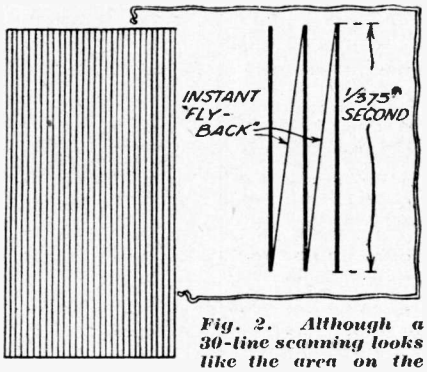


Fig. 2. Although a 30-line scanning looks like the area on the left, the right-hand diagram gives in exaggerated form the path of the spot.

The important thing to note is that the discharge of the condenser takes place at a much higher speed than the charge. By choosing suitable values of capacity and resistance we can control the time taken for the condenser to charge up.

Thus a complete "double-time-base" for 30-line scanning would include, for one dimension, a device that would build up and discharge 375 times per second, and for the other dimension one that would do it 12½ times only.

But we have also to consider other requirements. We have to limit the travel of our light-spot as well.

Consequently a modern time-base circuit is not a simple affair of condensers, resistances and neon-tubes. A more useful scheme employs three-electrode mercury-vapour relays, the grid-bias adjustment giving control over the length of travel of the spot, and the current rate at which the condensers charge governing the speed of travel.

SPECIAL TELEVISON SECTION

ALMA TAYLOR: FIRST TELEVISION STAR

Talks to

ALAN HUNTER

About her first experiences as a television artist during months of research work at the Crystal Palace

To most people the "secret" television transmissions from the Crystal Palace on ultra-short waves must be rather intriguing, especially now that the Selsdon report has given the Baird Company a half share in the air time to be devoted to B.B.C. television.

For many months past the engineers of the Baird concern have been steadily improving their ultra-short-wave television—not only with films but with direct studio productions.

Romantic Story

Behind these real-life television broadcasts is a story as romantic as any connected with the growth of the television science—or art, if you prefer that.

Alma Taylor, glamorous star of the silent film days, takes the title rôle in a drama more strange than any she has acted in for those films. It is this British film star whose work behind the Baird scenes I want to tell you about now.

Under the shadow of the gaunt towers of Crystal Palace I talked with her about how she came to be mixed up in all this television. A lone pioneer of television production technique amongst a crowd of engineers, it must have needed some pluck, I thought, to have forged ahead as she has done.

"It all began," she explained, "when I heard about the Baird television demonstrations last year. I don't know exactly why, but I had a hunch that it was going to be a big thing.

Experience Needed

"At that moment, you remember, they were about ready to photograph people to be televised. It seemed obvious to me that what they needed was someone with film experience—someone who knew something about the camera and all that.

"As you know, I started in films when I was very young. In fact I was only 13 years of age when I first went into a film studio to be photographed."

Alma Taylor laughed.

"People who remember me in the silent films days imagine I must be an old woman—that's the penalty of having started so young!"

I can assure you that Alma Taylor is still amazingly youthful—with a good-looking blonde head that will no doubt charm many a looker in due course.

She tells a good story against herself. As her mother's first child she was naturally, to her mother, the most wonderful baby in the world.

A SUCCESSFUL PIONEER

Miss Alma Taylor, whom you see here, owes much of her success as a television star to her long experience of film work.

When she was growing up a friend remarked: "Do you know, Alma is beginning to look quite beautiful!"

Beginning, indeed—when her mother had thought her the most beautiful child ever since she was born. Alma insists that her sisters were much better looking than she. But then Alma is really a very modest woman—genuinely so, not coyly just for the sake of interviewing journalists.

"At a film dinner I heard Capt. West of the Baird Company remark that he was having difficulty in getting anyone who knew enough to pose in the experiments with the television spotlight.

"I saw my chance. Considering everything, I suppose I have had more experience of the technical side of films than most stars. In the war, you know, I had to help to wash and develop the films I was acting in—to release the men for the army.

"I was always fascinated with the camera and got to know quite a lot about it. Which is why I thought I might be just the right person for Capt. West's experiments."

Needless to say, she was the right person, and for the past six months has been steadily developing her own technique in the large Baird studios at Crystal Palace.

Special Make-up

"The picture for the direct television makes me look as I might have been when under twenty years of age," smiled Alma Taylor, "I really must say that the effect is much more becoming than the films.

"The make-up you have heard about is my own idea, and I don't really see why I should give it away, do you? I thought this question very important right from the beginning, and I have put a lot of work into it.

"No, there is none of the ghastly effect I believe you have seen at the B.B.C.'s television transmissions. The picture is so much finer, that such coarse methods are unnecessary.

"To give you some idea of the perfection of the detail, I can assure you that the picture clearly shows the shine on my hair. And may I say right now that I owe a lot of the success of my part of the work to our Mr. Mitson, who has done an enormous amount of work on the direct television transmissions here.

"Impossible" Accomplished

"There he was, when I came, grappling with his box of tricks, and he might easily have been excused for having no time to spare with film stars. But he has been very helpful always willing to explain anything."

I saw Mr. Mitson for a moment. At one time this young engineer was at the B.B.C., where his faith in direct television was rather questioned by the "higher-ups"—who tried to prove to him that he was attempting the impossible!

PRACTICAL Hints for All

Ideas and Suggestions of Special Interest to Experimenters and Home Constructors.

IT is always my endeavour to keep the ideas and suggestions on this page as up to date and topical as possible, and so this month I am going to start off with a suggestion that concerns di-pole aerials for short waves.

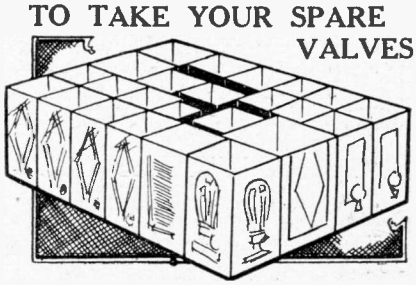
The recent activities in the sphere of television have increased the interest in five- and seven-metre reception, and on these waves the di-pole aerial proves best in the elimination of interference from motor-car ignition systems. The first sketch on this page shows a real way of arranging twin, spaced down-leads from the two sections of the aerial.

It is made up from one of those old cartridge-type resistance holders, a type of component many of you will have on hand. First of all, remove the terminal head and the fixing nut below it, and also the clip, but leave the bolt in the ebonite.

Secure Fixing

The stranded aerial wires are threaded through the holes normally used for fixing-down screws, then the strands are separated and run on either side of the terminal bolt. After this they are lightly twisted round the wire and the clips replaced in a sideways position and clamped down on to the wire with the fixing nuts.

TO TAKE YOUR SPARE VALVES



Empty valve cartons stuck together in a group form an ideal housing for spare valves.

The ends of the strands may now be finally twisted up tightly.

Rubber-covered flex downleads are now threaded through the holes in the clips and clamped down under the terminal screws. A somewhat similar scheme at the set end of the down-leads will keep them nicely spaced and securely held.

While on the subject of aerials I must tell you of an incident which was described to me recently. It concerned a mains-type receiver in which there was provision for the use of a mains aerial.

When the mains aerial was not in use there was a spare socket into which its plug should have been inserted. But it had been left plugged on, and an outside aerial had been plugged into one of the alternative aerial sockets.

Joined to Mains

The net result in this particular case was that the aerial was joined up to the mains. This, in itself, did not matter much until a friend was called in to see if he could improve the selectivity.

It was decided that the aerial must be shortened; so it was lowered, and the friend, standing on damp earth, got the surprise of his life when he caught hold of the wire. In this case the shock was not bad, and no harm was done, but the obvious moral is worth noting.

And now for the second diagram on this page. The other day I happened to pull open a draw in the Research Room while looking for a particular pair of pliers, and spotted a collection of valve boxes looking like those in the sketch.

It immediately struck me as a rather ingenious way of housing valves, and so I am passing it on for those who have gathered together a small collection of spare valves.

It consists of pasting together a number of valve cartons after cutting off their tops. It does not matter if all the boxes are not the same size, as any gaps that may occur can be arranged to come in the middle as in the diagram, and can be bridged by pieces of cardboard if desired.

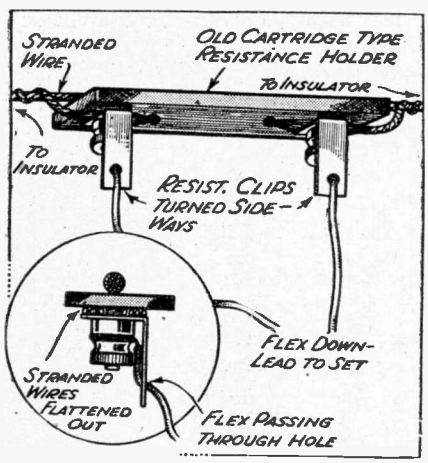
An improvement on the scheme would be to print the type of each valve in large letters on a piece of paper and stick these pieces of paper inside on the bottoms of the compartments. A lot of time would thus be saved in reading the type of valve on the glass bulb.

Those Sticking Baseboards

It is not a very far cry from valves to baseboards, with which my next suggestion is concerned. Usually, with a new set, the panel is attached to the baseboard or wooden chassis before the cabinet is made or purchased, and often the baseboard proves a tight fit in the cabinet.

Even after considerable work with a rasp it may still prove tight; and while a snug fit is desirable, one does not want to have to use too much force to get the baseboard to slide into the cabinet. When this state of affairs is reached a little soap rubbed along the tight edges of the baseboard will work wonders, making it slide in with the greatest of ease.

FOR DI-POLE AERIALS



The di-pole aerial is very popular for ultra-short-ware working, and here is a neat way of arranging the down-leads.

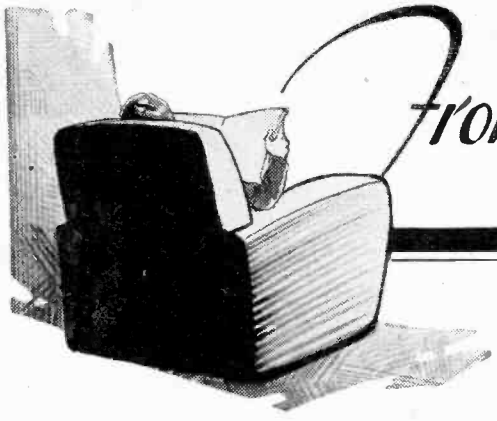
And, finally, a point concerning the marking out of ebonite panels for units or sets that you design yourself. Especially is this applicable to compact apparatus in which there is little room to spare between the panel and the baseboard components.

It Saves the Panel

If you use a piece of stiffish cardboard in the first place instead of the panel, you can try the components in different position on it while arranging them in relation to those on the baseboard. Thus there is no likelihood of spoiling a good panel, and the marking out is simplified because you have a rough template from which to take the measurements for the positions of the holes.

It may sound a small point, but it has helped me considerably in designing many receivers and units of a compact nature.

A. S. C.



From My Armchair by S.T

"The cloud that was no bigger than a man's hand is going to produce luxuriant new pastures," says Mr. Scott-Taggart, in discussing the new field of exciting television research that is open to the home-constructor. He also has a few words to say about the "One-Point-Five" and future S.T. receivers.

WELL, television is about to burst upon us.

Between now and Christmas there will be a tremendous lot of talk on this topic. Reservoirs of ink will flow, and I expect to spill a pint or two myself. For now—and only now—has come the time to talk as well as do.

You all know how sceptical I was in 1930, not with the scepticism of the armchair critic, but with the caution of the serious student who had personal practical experience, and who had studied television systems in Europe and the United States. Like several others, while convinced of ultimate success, I knew the chasm that lay between promise and performance.

A Bombshell!

I have just been re-reading seven television articles I wrote in 1930, and compared my prophecies with what has materialised, and even in details progress has been on the lines I indicated.

Let me say at once that since then the ballyhoo element in various quarters has disappeared, and real research has taken the place of misplaced publicity and ill-timed optimism.

In fact, so indefatigable has been the experimentation, and so reticent the protagonists, that to the general public the Committee's Report came as a bombshell.

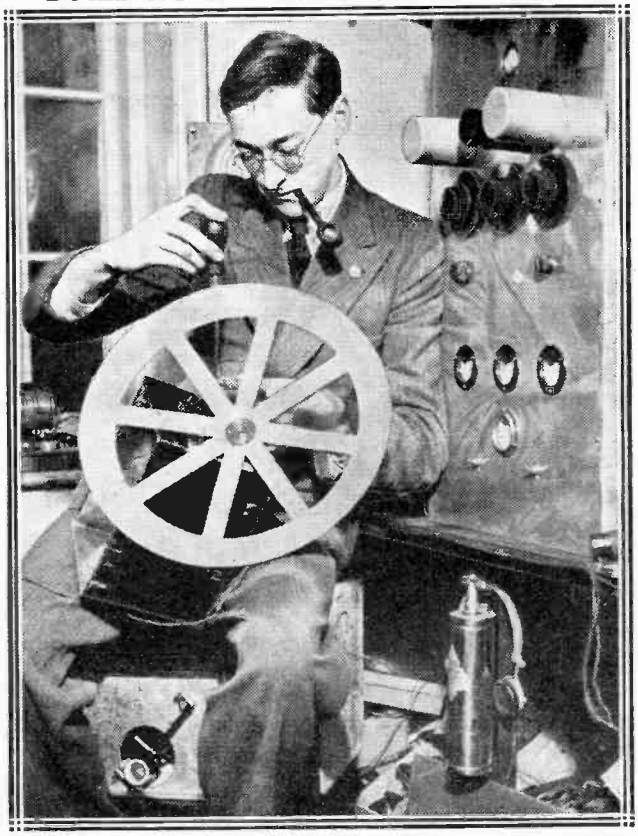
This is no place to analyse the new situation that arises. But you can take it as very definite that my readers will be kept as well-informed on television as I hope they have been in the broader field of radio, of which television is simply an offshoot.

"How do I stand now?" will be the question every amateur will ask himself. The position is briefly that every amateur will once more become important in the eyes of his neighbour—just as he was in 1922, and the few years that followed. He will become "the man who knows." Let us hope he keeps up to date and *does* know something about this new source of entertainment. I, and no doubt other workers in this field, will be asked to contribute something of what we know to the technical press of this country.

For, of course, it will be in the technical press that you will get the "low-down" on television. The "low-down" is never as sensational as the "write-up" and your withers will not be unstrung. But we shall expect you to gird up your loins, for the cloud that was no bigger than a man's hand is going to produce luxuriant new pastures.

In other words, television will bring a sparkle to the tired eye of the amateur who, surrounded by a plethora of mass-produced mains superhets, has felt the thrill of radio grow stale.

BUILDING A TELEVISION RECEIVER



The opportunity for television experiment by the home-constructor is immense, and there is still plenty of work to be done before the new science reaches perfection. Here is a Yorkshire amateur, Mr. J. H. Hargreaves, who has spent considerable time on the subject.

But although a great new thrill is in store for all, television may be "cut" but it is not "dried"; it is on the mat but not yet in the home.

Many Problems

There are many problems and difficulties to face and overcome. There has been a panic as a result of wild statements in the daily press to the effect that present sets are obsolete.

I was told that for a week not a single commercial set was bought! It is up to you to dispel this fallacious attitude. Television will progress side by side with broadcasting as we know it. It will always cost about twice as much as a broadcast receiver because a television receiver needs a "radio" portion. Ordinary broadcasting will continue for many years to come.

The first year or two of television are sure to be experimental, and the person who does not build or buy a radio set until television is both ripe and cheap will rob himself of the best developments in broadcast reception. I admit that talk about

television is unsettling, but even that is no reason why any one should be unseated between two stools.

Television, however, is going to be a marvellous excuse for the husband who does not want to buy his wife a new broadcast receiver!

* * *

Great interest has been aroused by my "One-Point-Five" receiver described last month and, as usual, I have had a number of letters from readers asking whether I have any other receiver designs up my sleeve.

The answer is No. I am a great believer in telling readers how they stand as regards my sets and the S.T.600 is virtually guaranteed a two years' life at the very least. The "One-Point-Five," of necessity, also has a long life ahead of it, since its performance so closely approximates to that of the S.T.600. So you can get ahead with the "One-Point-Five" with every confidence.

New S.T. Designs

I have two other "sets" for WIRELESS constructors. One is an short-wave unit for attaching to any receiver—especially my own—and the other is an A.C./D.C. universal receiver.

The short-wave unit is the result of constant pressure by readers over three years. I think you may be quite interested in what I have to say in the near future when I describe the unit.

A SHORT-WAVE LIMIT COMING

A new portrait of Carlos of Portugal, complete with his two dogs (which assisted in the capture of the savage inkstrain), appears next month.

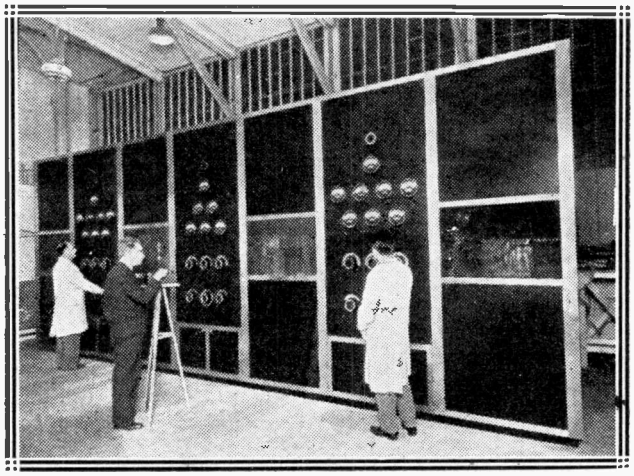
* * *

Coming back to television, I should not be surprised if this country became a leader as regards popularity of the new entertainment. We have a much simpler problem than the United States with its steel buildings, "apartments" (anglicé flats), and lack of unified control.

They are worried by the financial aspect of the transmitting stations. They anticipate that a nation-wide service would cost initially from $50,000,000 to $200,000,000. In other words it is bound to cost ten million sterling and it may need forty million pounds.

To me the most striking part of our Television Committee's report is their nonchalance over the cost of the stations and their statement that ten stations will cover half the population. I wonder how many more stations would be needed to cover the other half? Certainly more than ten, unless the radiation technique is altered. We may yet have captive airships raining down television programmes on our di-pole aerials!

AT THE CRYSTAL PALACE



The TEN K.W. TRANSMITTER used at the Baird Television Studio in the Crystal Palace for the transmission of vision. Feeder lines run up from the transmitter to the top of the tower where the omni-directional aerial is situated.

Effect on Talkies

How is it going to affect the talkies? I doubt if the talked-of 12 in. by 7in. picture will compete. A 3 ft. by 2 ft. screen might be another pair of shoes but even that will be unable to boot out human nature which, unless my sight fails me, is responsible for three-quarters of the cinema patrons, bless them.

* * *

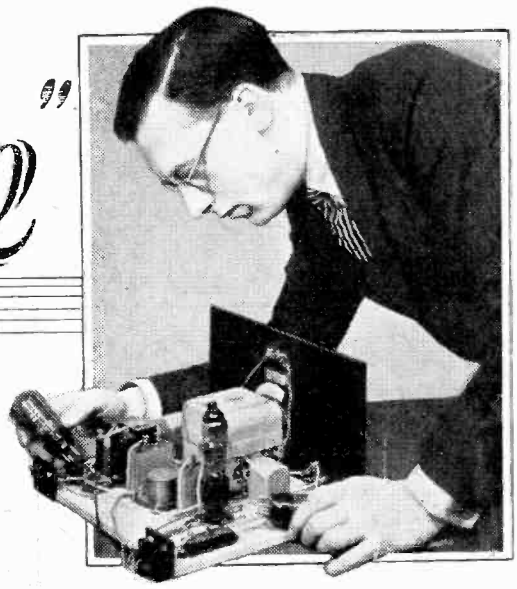
I wonder if you know that speech sent over the Atlantic by radio is "compressed"? It is an ingenious idea and has been developed in addition to the "scrambling" process which makes for secrecy. Speech is ordinarily mixed up so that no eavesdroppers can make head or

(*Please turn to page* 232.)

THE MEN WHO HAVE PUT TELEVISION ON THE MAP IN THIS COUNTRY

*THE SELSDON COMMITTEE which has done so much to push forward television in this country. Since its report an Advisory Committee on television has been formed with Lord Selsdon in the chair. Lord Selsdon is the second from the left in the above photograph. The others are Sir John Cadman (on right of Lord Selsdon), *Mr. F. W. Phillips, *Mr. J. V. Roberts. *Mr. O. F. Brown, Vice-Admiral Sir Charles Carpendale, *Mr. Noel Ashbridge, and *Col. A. S. Angwin. Those with asterisks are also members of the Advisory Committee.*

The "Sensitune"



ECONOMIC EFFICIENCY—EASY ASSEMBLY

With the recent B.B.C. wavelength shuffle more and more reliance for the National programme has been placed on the Droitwich station. Listeners in the London, West and North areas who are outside the immediate ranges of their "little" national stations have to turn to Droitwich for their National programmes.

This is because London, West, and North National stations on the medium band have been so-called synchronised, and now share the same wavelength.

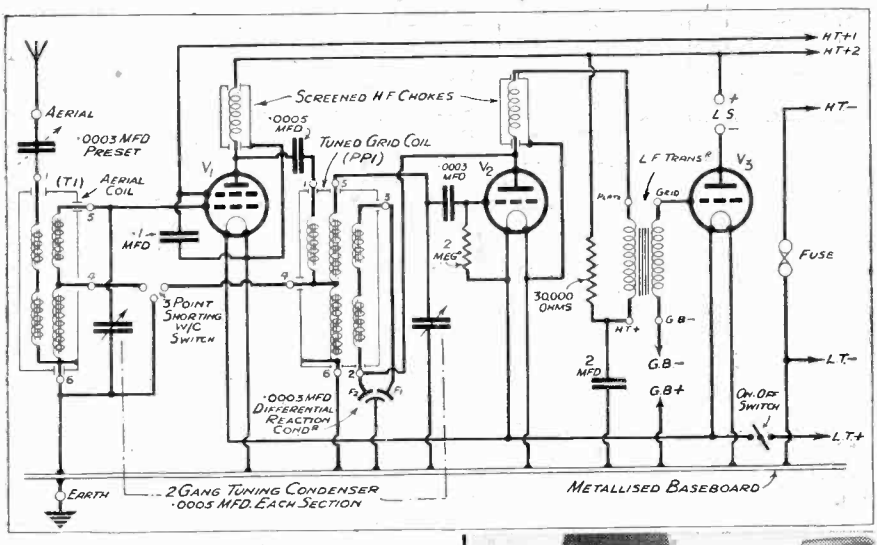
Good Long-Wave Performance

Certain Regional stations have been able to get better wavelengths, and there is an improvement in these cases, but where a very large number of listeners is concerned the need for a set that is really good on the long waves, and therefore will enable the National programmes to be received satisfactorily is a very vital one.

Not that the medium waves are not important, they are. But the question of long-wave efficiency has increased in importance.

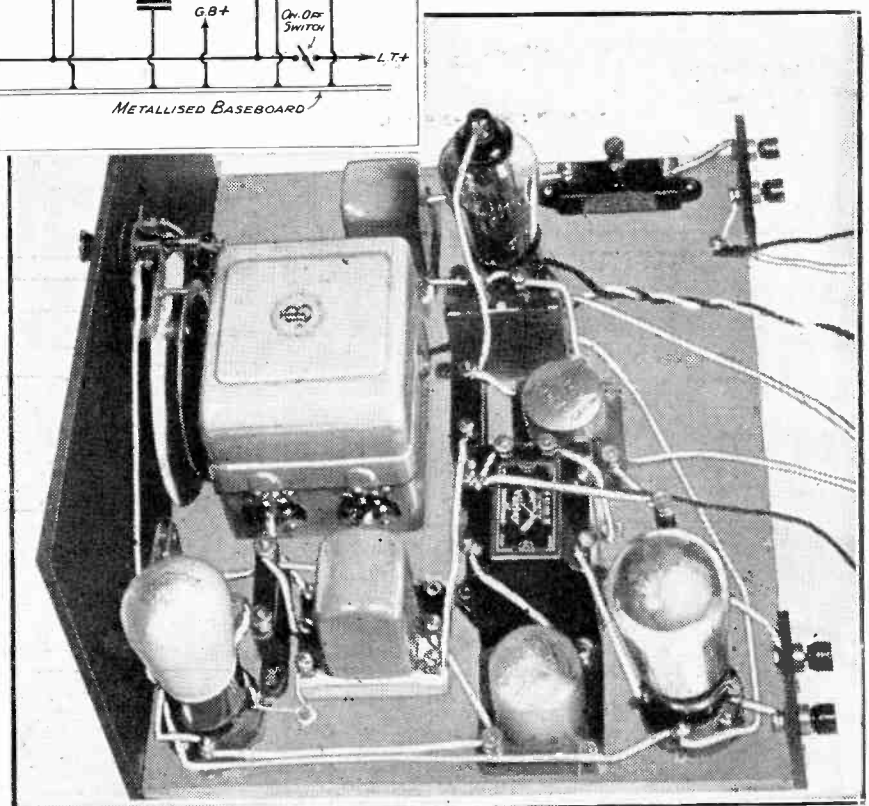
To meet the needs for a cheap, simple-to-build receiver that will be a good station-getter on medium waves but will also make no bones about the long waves, we have designed the "Sensitune."

SPECIALLY SUITABLE FOR MODERN CONDITIONS



The coils are of the iron-core variety, compact in design, and inexpensive; two qualities that are not often found together with efficiency in performance.

The windings are designed to give good medium-wave reception with an adequate degree of selectivity, which by the way, can be adjusted by means of the preset condenser we have included in the design. At the same time the method of coupling the aerial and the anode of the S.G. valve on the



A general view of the receiver. The set is both economical to build and inexpensive to run. The theoretical diagram shows the straightforward circuit used.

long waves is such that the very best is made of long-wave signals that come along.

In the case of the aerial coil the coupling between the aerial and the grid windings is purely inductive, two windings being used for the aerial coil section and two for the grid coil, one of the latter being shorted out when the medium waves are required.

Where the anode coil is concerned, however, the disposition of the windings is different and the electrical coupling scheme is changed. On medium waves the ordinary inductive coupling between a single anode coil and a normal grid coil is employed. But on the long waves not only does the medium-wave primary winding come into action by coupling with the medium-wave section of the secondary, but the anode feed is auto-coupled as well into the junction between the medium and long-wave windings of the secondary coil.

ACCESSORIES

1 W.B. Standard "Stentorian" loudspeaker.
1 Peto-Scott cabinet.
1 Drydex 120-volt standard H.T. battery.
1 Drydex 9-volt G.B. battery.
1 Exide 2-volt accumulator.

This means that on the long waves the coupling is particularly tight so that the greatest amplification for that stage of H.F. consistent with adequate selectivity is obtained.

So many sets give good results on the medium waves and fail, through coil design, to give sufficient strength on the long waves that the "Sensitune" will come as a particularly welcome arrival to those for whom the Droitwich station is the main source of British programmes.

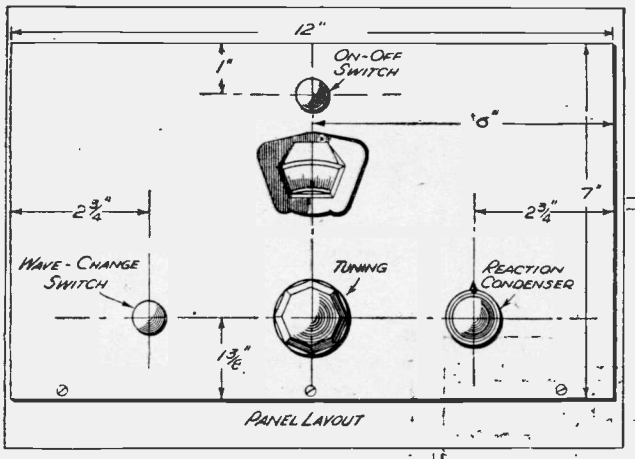
And with Droitwich one must couple that popular foreigner, Luxembourg, to whom so many of us turn for light entertainment during the week-ends.

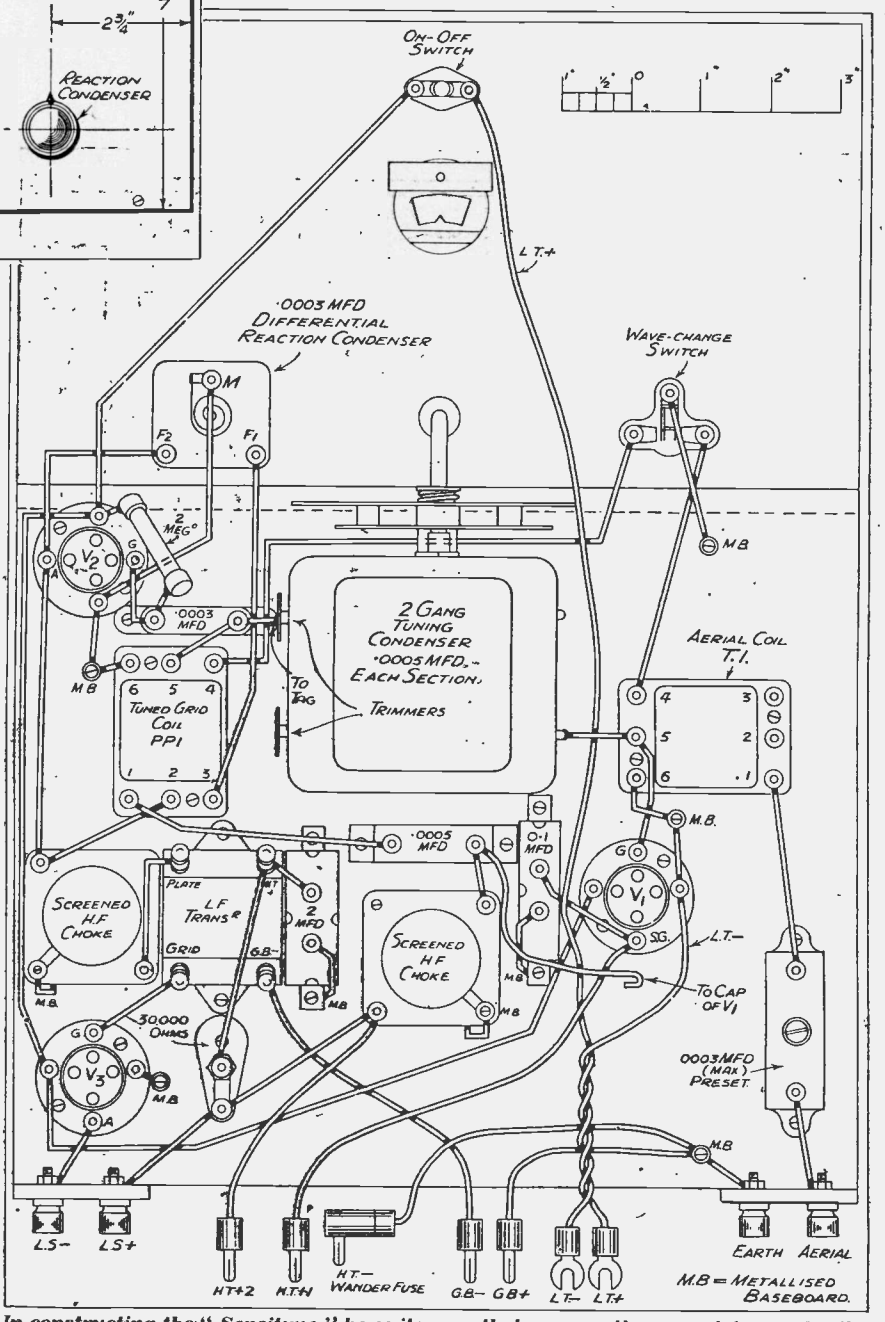
Whether a simple cabinet or a consolette type of housing is used the panel drilling is carried out in just the same way.

THE PARTS YOU WILL REQUIRE

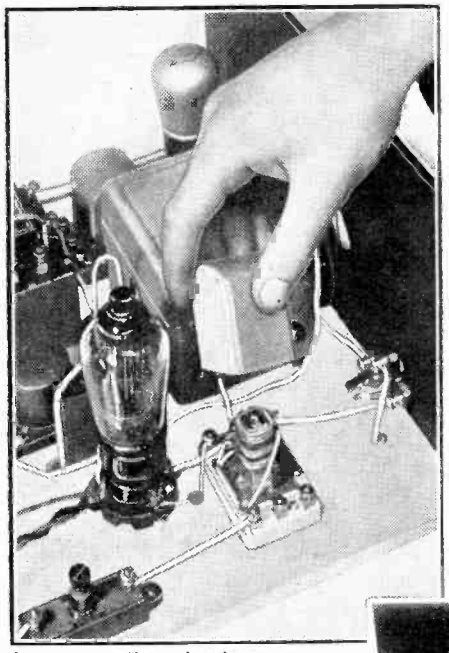
1 J.B. 2-gang "Nugang" type "A" tuning condenser.
1 Formo "Sensity" coil, type T.1.
1 Formo "Sensity" coil, type P.P.1.
1 Varley "Nicore 2" L.F. transformer.
1 T.M.C.-Hydra 2 mfd. fixed condenser, type 25.
1 T.M.C.-Hydra ·1 mfd. fixed condenser, type 25.
1 Dubilier ·0005 mfd. fixed condenser, type 620.
1 T.C.C. ·0003 mfd. fixed condenser, type 34.
1 Polar ·0003 mfd. differential reaction condenser.
1 Formo ·0003 mfd. preset condenser.
1 Bulgin 3-pt. push-pull shorting switch, type S.12.
1 Bulgin 2-pt. push-pull on-off switch, type S.38.
3 W.B. 4-pin valveholders.
2 Graham Farish screened H.F. chokes, type H.M.S.
1 Dubilier 2-meg. grid leak, 1-watt type.
1 Graham Farish 30,000-ohm "Ohmite" resistance in vertical holder.
4 Clix indicating terminals, type B.
1 Peto-Scott ebonite panel, 12 in. × 7 in.
1 Peto-Scott "Metaplex" baseboard, 12 in. × 10 in.
2 Peto-Scott terminal strips, 2 in. × 1½ in.
1 Coil B.R.G. "Quikon" connecting wire.
2 Clix accumulator spades.
4 Clix wander-plugs.
1 Belling & Lee wander-fuse. Screws, flex, etc.

PANEL AND BASEBOARD LAYOUT





In constructing the "Sensitune" be quite sure that you use the correct types of coils. It should be noted that the T.1 coil is employed in the aerial circuit and the P.P.1 in the detector grid circuit. These coils must not be transposed.



Compact coils, using iron-cores are employed in this design. Here is the aerial coil unit with its screen removed to show the neat windings.

Apart from the coils there is nothing very striking in the design of the "Sensitune Three"; it is just a really good, honest-to-goodness receiver that has been built to do a good job at a reasonable price. It can be used in an ordinary cabinet with outside speaker, or in the consolette illustrated, complete with speaker and batteries on board.

Independent Trimming

The tuning is carried out by a double-gang condenser which has a double set of trimmers so that the two-tuned circuits can be accurately matched.

Ordinary transformer coupling with generous decoupling of the detector valve has been used, making the set as sensitive as possible without causing any unnecessary initial or upkeep expenses.

Inexpensive to Run

As a matter of fact, the upkeep of the set is remarkably cheap, for quite a small total anode current can be arranged for if the valves are carefully chosen. Only a small output valve need be used, giving comfortable room strength on quite a number of stations. It is not claimed that the set will give sufficient strength to fill a small hall, or that the results will be uncomfortably loud in a large room. We do not believe in exaggerating the performance of our designs.

The "Sensitune" will give good, medium strength with the type of loudspeaker named, and it will give that strength on not only the local stations but also on a number of foreign transmissions provided that it is used on a reasonably good aerial.

A word here should be said about the question of a volume control for the benefit of those who live near a station. As the set is likely to be built by many constructors who are well away from a powerful station, no volume control has been fitted. It is felt that in most cases where no local exists reaction will be used to some extent, and this will automatically provide a control of volume.

For those who want other means of controlling the strength of the reception we would recommend a potentiometer feed for the aerial. This consists of a potentiometer being connected across the terminals 1 and 6 of the aerial coil and the slider taken to the aerial terminal, which is not, of course, connected to terminal 1 in this event.

The value of the potentiometer should be about 5,000 ohms, and should be wired so that the volume increases as the knob is turned clockwise, that is, as the slider approaches the end joined to terminal 1 of the coil.

The construction of the set is simplicity itself. It is built as an ordinary baseboard and panel design, using a metallised baseboard, which greatly simplifies the wiring, enabling many of the earth return leads to be taken to the metallising and thus saving many a long and untidy lead.

The operation is quite normal, the trimming is done on a distant station of low wavelength, while anode voltages are approximately 80 for the screen of the S.G. valve and the maximum of 120 or even 150 for the other H.T. tap.

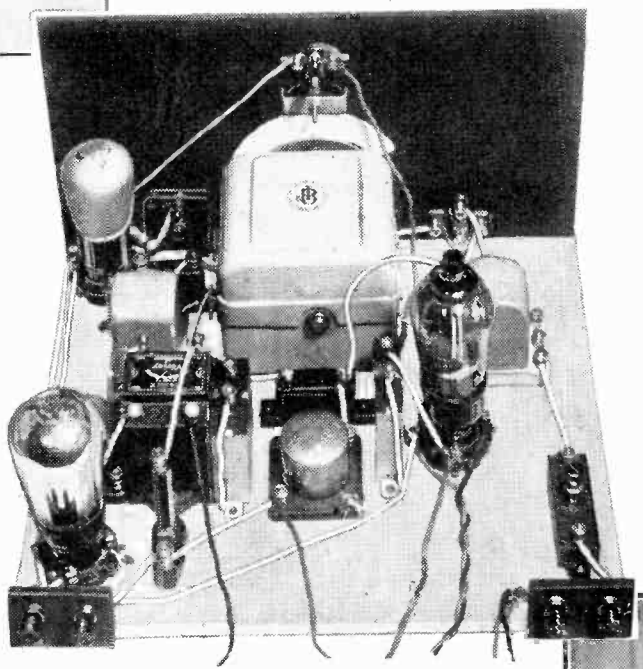
Any normal type of mains unit can be employed with this set, provided it has a variable voltage tap for the S.G. valve, and an output tap that will give the desired current for the last valve.

It can be housed in the consolette cabinet in just the same way as the H.T. battery, but don't forget that you will have to switch off the unit as well as the L.T.

Suitable Valves To Use

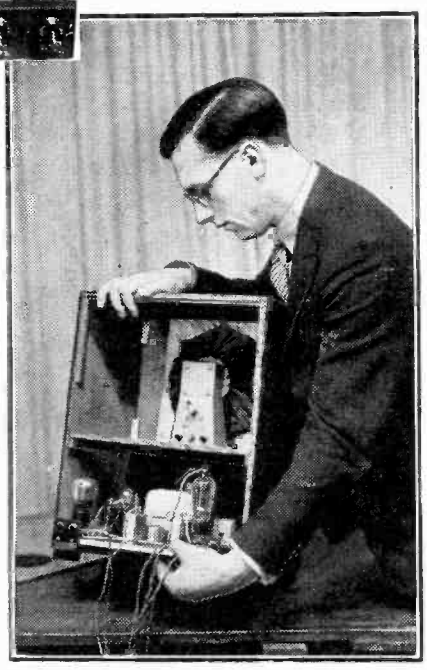
	S.G.	Det.	Output
Cossor	220 S.G.	210 H.F.	220 P.A.
Hivac	S.G.220	H.210	P.220
Marconi	S.24	H.L.2	L.P.2
Mazda	S.G.215	H.L.2	P.220
Osram	S.24	H.L.2	L.P.2
"362"	S.G.2	H.L.2	L.P.2
Tungsram	S.210	H.R.210	L.P.220

THE "SENSITUNE" THREE



Above is a general view of the set from the back, while the photo on the right depicts the receiver being placed in position in the consolette cabinet. The W.B. speaker and the batteries are housed in the top section of the cabinet.

IN CONSOLETTE FORM



Short Wave Notes

This month our short-wave expert, W. L. S., gives details of two straightforward circuits with which he has obtained excellent results. One of the circuits is especially suitable for loudspeaker work.

A REGULAR reader of these notes has sent me rather an interesting letter, chiefly concerning the question of short-wave receiver design, and he concludes with the following remarks.

A Reader's Demand

"If you would only give us circuit diagrams of two good receivers—one for 'phones and the other for loudspeaker—and do a little talk about them in one of your series of articles, we should all learn no end. Don't bother to give baseboard diagrams; any keen short-wave man can lay out a set from a theoretical, and the others waste space that you could be devoting to talk. How about it, W. L. S.?—Your *obedient* reader, J. F. C."

That word "obedient" rather makes me feel my responsibility. If there are readers who blindly follow everything that I tell them, I shall have to be very, *very* careful.

I *was* thinking, however, that after all I have said about layout it might be time to talk about the circuit itself for a bit, so J. F. C. will find his wishes gratified right away.

Let us get straight down to brass tacks and look at Fig. 1. It shows a typical Det. and L.F. receiver of a straightforward type of which some thousands must be in use. It is essentially a headphone set; no attempt has been made to use a terrific amount of L.F. amplification.

Perfectly "Straight"

The detector circuit may be called what you like—Hartley-Reinartz, Reversed-feed-back, Schnell or any of the other fancy names that are all applied to the same basic circuit. It is just a detector circuit with capacity-controlled reaction, and as such, the same as all the rest of them except in purely unimportant matters of detail.

The aerial is inductively coupled, and the three coils L_1, L_2, L_3 may either be in the form of one unit on a six-pin base, or may be three separate plug-in coils. If the latter arrangement is used, the grid coil should be in the middle, with the aerial coil coupled looscly to it and the reaction coil as close up as it can possibly be fixed. Remember the old adage about a small coil with tight coupling being the best way out.

The H.F. choke need not be a particularly good one. The circuit is series-fed, and the only purpose of the choke is to ensure that the detector

A GOOD TWO-VALVE CIRCUIT

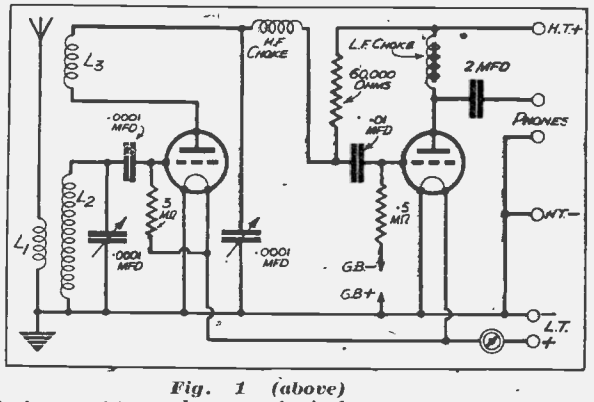


Fig. 1 (above) shows a typical two-valve detector and L.F. circuit with capacity-controlled reaction. Fig. 2 (right) is a more ambitious arrangement and will give good loudspeaker results from American short-wave stations. In either circuit the coils can be of plug-in variety, or of the unit type with any convenient form of mounting.

will stop oscillating when the reaction condenser is reduced in capacity. The anode resistance has a value of 60,000 ohms, which is well suited to a detector valve of the "H.L." class.

The L.F. valve should be of the "P" class, and is provided with choke-filter output. The grid condenser value is ·01 mfd., and a grid-leak of ·5 megohm is used. The amount of grid-bias obviously depends upon the particular valve chosen.

Readers may take it from me that this is a circuit which simply cannot fail to give excellent results. There is no room for "snags," and if you build this up and have trouble, it's ten to one that your layout or wiring is at fault. Turn up some of my earlier articles in this series, particularly that dealing with the laying-out of a detector stage, and I honestly don't see how you can fail to produce a "sure-fire" short-waver.

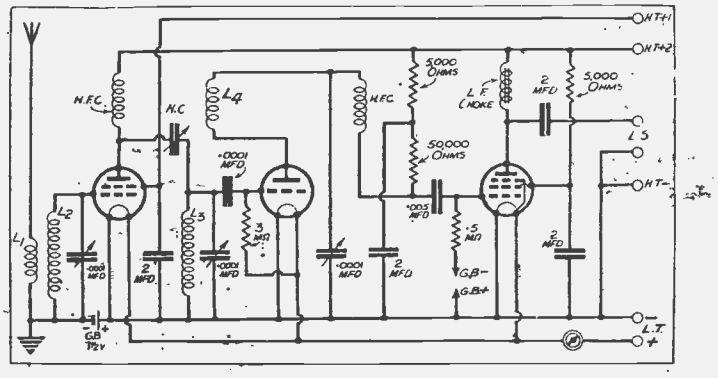
Loudspeaker Reception

Now we'll suppose that you are a little more ambitious than that. You want a short-wave set that will work a loudspeaker on the Americans, and, moreover, one that will do so every night of the year and not just when conditions are good.

This means three valves, and one of them a pentode. Rather than use a detector and two L.F.'s—a type of set that is usually far too noisy for my liking—you had better use a tuned H.F. stage, detector and pentode output as shown in Fig. 2.

First we will take the detector, which is exactly similar to that in the Fig. 1 circuit. No aerial coil is needed, however, and the grid and reaction coils may be accommodated on a four-pin former this time. As a matter of fact, it is an excellent plan to use two commercial coils of the four-pin type, one for L_1-L_2 and the other for L_3-L_4. L_2 and L_3 are both the grid

FOR PICKING UP THE AMERICANS



coils, and the winding that is used for reaction as L_4 is usually of a suitable size to use as aerial coupling (L_1).

Two complete sets of coils will therefore be needed, and you may assume that the settings of the two tuning condensers will always be about

(*Please turn to page* 227.)

EUROPE'S LARGEST STATION

Details of the Moscow Giant.

MOST English listeners have heard "the voice of Moscow" from the giant 500 kw. Comintern station which shares with Ohio, Cincinnati, the distinction of being the world's most powerful broadcasting transmitter.

Actually the Comintern station is some 25 miles from Moscow, being situated in rather remote and inaccessible grounds behind the village of Noginsk. Russia, like Austria, Hungary and Germany, allows no loopholes for trespassers, and I found the gate to the Comintern station guarded by a soldier with bared bayonet.

Forbidding Appearance

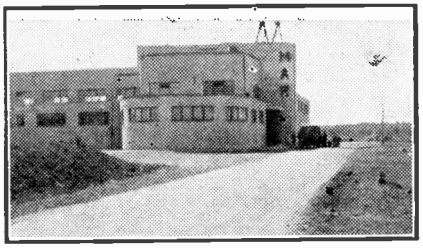
The concrete transmitter building itself resembles a fortification, as does the Bisamberg station, Vienna, and its right wing, as the motor-car brought me within visual range, reminded me of the gun turrets of a battleship.

I first noticed the water-cooling system in the form of miniature exterior fountains which are more exposed than those at Droitwich or at Warsaw. No air-cooled valves are used and the 2,100 litres of water necessitated every hour of transmission are obtained from an artesian well in the grounds.

I found that the 500 kw. transmitter, which made its ether début on May 1, 1933, and which was built with Soviet equipment, had no technical features radically different from those at the B.B.C. or principal European stations.

The Comintern adopts remote crystal control, and incorporates nine power stages in push-pull (including two stages in reserve), each comprising six 100-kw. valves.

IN THE U.S.S.R.



A photograph of one corner of the huge premises of the Moscow broadcasting station.

As with Droitwich and the modern European stations all units, power machinery, etc., are duplicated to obviate any possibility of break-down. The aerial system is supported by four 650 feet masts

Moscow employs fourteen broadcasting studios, and ten of these I found in the Commissariat of Communications structure. The sizes of the studios, which are of modernistic design, vary from 250 square yards to "one-man" studios.

Studios in Cathedral

I also visited the special Radio Theatre which seats about 800 people. I was advised by the Radio Committee that the former Miusski Cathedral, Moscow, was being converted into a "Broadcasting House" to contain between 36 and 40 studios, and that the new headquarters would be ready in 1936.

I was interested to learn of the Radio Committee's successful experiments with television. These transmissions are being carried out on the kino-multiplication system under which images somewhat akin to "Micky Mouse" figures are broadcast. Tests, I found, are also being made with ultra-short-wave television.

C. W. L.

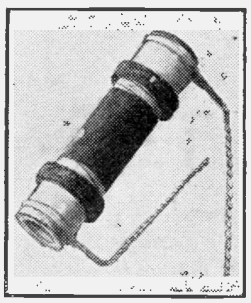
NEW APPARATUS TESTED

Interesting reviews of the latest products submitted by radio manufacturers and traders for examination and test in our laboratories.

B.T.S. Components

We have recently had on the test bench several radio components marketed by Messrs. British Television Supplies. Among these may be mentioned three types of H.F. chokes, two of which are for ordinary broadcast reception, while the third is designed for short-wave work only. The two broadcast chokes have binocular windings, and are styled the "Minor" and "Major" respectively. The "Minor" retails at 2s. 6d., and gives very good results in normal detector reaction circuits. The "Major" is larger and definitely a first-class component in every way.

It retails at 4s. 6d., and functions admirably in those positions in a circuit which call for low self-capacity and very high inductance. For example, in H.F. circuits for choke-capacity coupling.



FOR S.-W. SETS

This B.T.S. short-wave choke can be wired directly in circuit and is self-supporting. The length of the leads is thus kept down to a minimum.

The third choke is illustrated on this page. It is essentially a short-wave job, and comprises a special winding on a former of a material having low dielectric losses.

It will be noticed that two wire ends are provided so that the choke can be wired directly into circuit with the minimum possible lead length. This, of course, is a practical point which short-wave enthusiasts will appreciate. It is a good choke.

Another B.T.S. component which we would draw our readers' attention to is a 30-henry L.F. choke. This is a substantially constructed job, and will take currents up to 60 milliamps satisfactorily. Priced at 10s. 6d., it is excellent value for money.

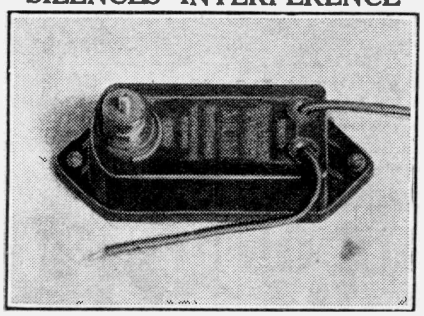
The Anacos Earthing Rod

A good earth is a necessity, and many methods are employed to achieve this end.

From the point of view of simplicity it is difficult to improve on a metal rod or tube driven into moist soil.

One of the best earthing devices of this type we have tried is the "Anacos" earthing rod. This is a particularly

SILENCES INTERFERENCE



The Graham Farish "Mum" is designed to suppress "man-made" static such as is frequently caused by domestic electrical equipment or picked up on the mains wiring.

rigid rod of hard-drawn copper having a girder-like construction which, in addition to giving great strength, also provides an increased surface area.

No soldering is required, a simple and highly effective connecting device ensuring satisfactory electrical contact between the earth lead and the rod.

It is definitely a first-rate earthing device, and, moreover, is inexpensive, the 18-inch rod costing 1s. 8d. and the 24-inch type 2s. We can recommend this earthing rod. The makers are Frederick Smith & Company, Anaconda Works, Salford, 3, Lancs.

The Graham Farish "Mum"

If one can judge from what one hears and from correspondence, the percentage of listeners who are troubled with external interference must be fairly high. And it is surprising how many people "sit tight" and do nothing simply and solely because they believe that there is no cure. But most of them do not realise that a considerable proportion of the interference is picked up on the ordinary lighting mains wiring and so passed through into the set, or alternatively into the aerial system and thence into the set.

These cases in which the mains wiring is the cause of the trouble can be tackled successfully by the listener.

A particularly inexpensive suppressor especially suitable for this type of interference has recently been placed on the market by Messrs. Graham Farish. It is aptly called "Mum," and retails at the extremely low price of 2s.

"Mum" is a neat little unit comprising two condensers joined in series. There are two leads and a terminal. The two leads are connected across the input from the mains and the terminal is joined to earth.

It is an advantage to connect the unit as close as possible to the point where the mains enter the house, since this reduces the chances of aerial pick-up to a minimum.

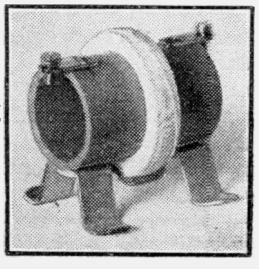
There are other uses to which "Mum" can be put. For instance, it can be joined across interfering domestic apparatus, and so on. We advise those readers who suffer from interference of the "man-made" variety to get into touch with Messrs. Graham Farish, who will supply them with fuller particulars. The address is Graham Farish, Ltd., Bromley, Kent.

For Superhet Adaptors

Messrs. A. F. Bulgin, of Abbey Road, Barking, Essex, have developed an

(*Please turn to page 227.*)

TUNED COUPLING



The Bulgin S.W.50 coil for use with short-wave superhet adaptors. It is tuned with a small .0005-mfd. condenser.

What They Think of Wireless

By Rosita Forbes

During the winter months Rosita Forbes has been on a lecture tour comprising the main industrial towns of England, Scotland and Ireland. At our request, she invited her hosts who represented every variety of interest and occupation, to tell her what they like best—or least—on the wireless.

In Newcastle I stayed with an eminent physician, who devoted his holidays to the inspection of foreign clinics, prisons and sanatoriums. His study was a solid mass of books. Under them, rather than among them, were a few invisible chairs. The forms of tables could be discerned under mountains of printed material. A few inches of space had been partially cleared upon the desk. In front of this, elbow deep in papers, surrounded by a barricade of ponderous tomes, sat my host. "What do I prefer on the wireless? Well, really, I don't know. I don't think I mind very much, so long as there's a gentle noise. No, no, I don't listen, but the sound helps me to work."

Something Definite

"That won't do at all," I protested. "You must tell me something definite that you like, or dislike."

There was a pause. The eminent scientist moved an arm. Books slithered to the floor. "I remember a particularly interesting German discussion on the prison system," he said, "and, yes, when I got Moscow, I heard some remarkable speeches about leprosy." Pleased at the idea that he had at last, satisfactorily, answered my questions, he burrowed down among works of reference and prepared to forget me.

"Monstrous"

In Hoylake, on the other hand, a worthy minister was disturbed because when seeking to tune in to a concert relayed from some European capital, he had found himself listening to an anti-religious lecture, red-hot from Moscow. "That the air should be used for such blasphemy is bad enough," he protested, "but that it should be expressed in our own language is monstrous," he concluded, and he continued to mutter, "monstrous, monstrous," in spite of the lecturer's suggestion that he could escape contamination by turning the handle.

In the house of a cloth-manufacturer at Keighley, Yorkshire, there was warfare between the generations. In the drawing-room the mother listened to chamber music. In the old school-room, a grown-up son and daughter devoted themselves to jazz—as many hours of it as the wireless could provide. On the staircase, therefore, considerable conflict of orchestras took place.

"Don't you like anything except music?" I asked, seeking for copy.

"No," retorted the family in most unusual concord.

"Well, then, tell me what you don't like."

Above the confusion, the youngest daughter shrilled, "I can't bear all those little talks about nothing."

But her mother had the last word. "I detest poetry recited at eleven o'clock at night. I don't know why, but it sounds so tired and tinned."

The Morning Service

In a Welsh farm, where everyone was out at crack of dawn, after snatching what refreshment they found as they passed through the kitchen, there was a general breakfast at ten o'clock. In the huge, high raftered kitchen, a table stretched from wall to wall. At one end—metaphorically above the salt—sat the farmer and his family. Round the other clustered the labourers and a couple of stalwart land-girls. While we drank black tea from enormous cups and ate home-cured bacon, the wireless droned from the top of a period chest. "Dearly beloved brethren——" drifted across the room. The farmer noticed my surprise and above the clatter of crockery and the steady munching he asked what was the matter.

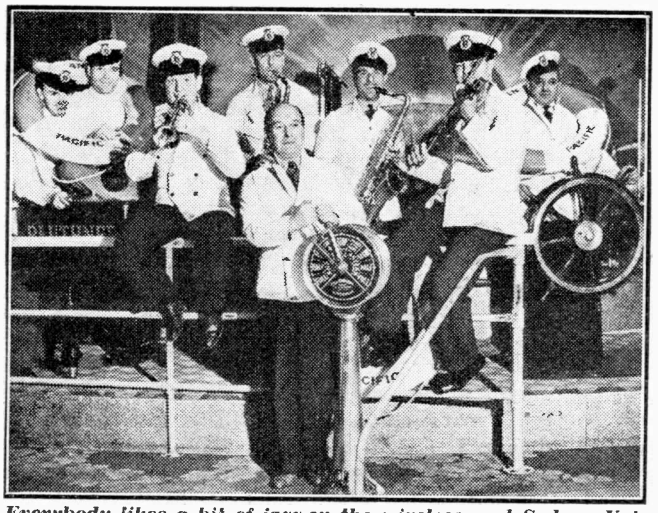
"D'you always eat in tune to the morning service?" I asked.

My host nodded. The day, he felt, wouldn't be at all right without matins and three cups of tea. "But it doesn't interfere what-effer," he added, as the age-old words of prayer echoed against beams blackened with smoke and hung with hams and onions.

On Sunday

In what house-agents describe as one of England's "major country seats," near Chester, the old nurse, as colourful and true to type as any family retainer on the stage, was delighted with her new set because, by timing very carefully, she was able to listen to five full services every Sunday.

SYDNEY KYTE AT PICCADILLY HOTEL



Everybody likes a bit of jazz on the wireless, and Sydney Kyte and his band are always a popular broadcast. Here is the famous leader with some of his boys in nautical dress for a special ball held at the Piccadilly Hotel.

The secretary liked Admiral King-Hall's talks to school-children.

"They used to come on at two-fifteen, just after my lunch, and I found them so helpful to the digestion," she said.

The family was divided. Over forty, they liked the political news, so that they could abuse foreign Governments for whatever they were doing at the moment and their own for doing nothing at all! Under that critical age they preferred sport.

"And I don't mind travel, if it's the genuine article. I mean, right out beyond geography. But what's the use of all this potted stuff about places you can see out of a train window?" said a young man for whom the calendar consisted of shooting seasons.

Adventure Best

In a doctor's household at Farnworth, in Lancashire, where the family breakfasted at seven, so that the children could get off early to school, the grown-ups found the wireless "companionable." The mistress of the house liked to hear it from the sitting-room while she was planning menus in the kitchen. The doctor liked it late at night.

"It helps me to sleep," he said.

When I insisted on knowing what sort of programme he preferred, he said:

"If I'm quite sure I'm not going to be called out, and I can get sunk into my chair with my slippers on, I like travel; but there must be lots of hardships about it, so as to make me feel how comfortable I am."

WHY NOT MORE CELEBRITIES?

A booking-clerk in a Scotch hotel told me he always listened to Lady Muir (Nadejda Stancioff), because he could tell she knew such a lot and she had such a nice voice.

Several people disliked a series called "God in the World through Christian Eyes."

JACK PAYNE AND . . .

"Dick" is the name he goes by, and he is always masked when he makes a professional appearance. He is referred to in the B.B.C. programmes as the "Unknown Singer," and is here seen before the "mike" with the popular dance band leader.

"It was just words, words, words," said a spinster of means in Liverpool. But she had much enjoyed Beverley Nichols.

"What was he talking about?" I asked, sympathising with this particular predeliction.

"I don't remember exactly, but he was very pleasant and amusing, and he must be a nice young man, because he ended by saying, 'Now *do* all go to church to-morrow morning.'"

In Hull, an ironmaster told me he liked "a good, controversial talk," but he was unable to instance a subject which he considered sufficiently "meaty." He added that our broadcasting was "milk and water," and "didn't get down to it like the German.

"The air's big enough, in all conscience. It ought to be the one uncensored element, whereas, in effect, it's full of cotton-wool!"

At a secondary school in Bridlington, the wife of the headmaster liked listening to classical plays.

Play Difficulties

"It's too difficult if you haven't read them before, because few voices keep any character on the wireless and personalities disappear altogether. But when I've seen a Galsworthy play on the stage, I like re-hearing it, because I can visualise what's happening."

Several people liked discussions between good speakers, but the criticism was always the same.

"The subjects are not sufficiently vital," or the participants "not well enough known." One man, a spectacles salesman in the colliery district round Durham, said:

"I can't understand why we don't hear on the wireless all the people we read about in the newspapers."

The general opinion seemed to be that more popular celebrities should be "turned loose" on the air. Otherwise, generally speaking, the older people wanted little but chamber music and good concerts, while the younger like jazz. Few cared for variety turns.

CANADA'S 72 RADIO BROADCASTING STATIONS

By James Montagnes

THERE are 72 Canadian broadcasters in operation, according to the official list published towards the end of last year. Included are six stations operated by the Canadian Radio Commission, of which the latest is C R C K, a 1,000 watt station for Quebec City. The other Commission stations are at Chicoutimi, Que.; Montreal, Ottawa, Toronto and Vancouver. The rest of the Canadian stations, with the exception of two operated on the short waves, are all commercial broadcasters.

Many Changes

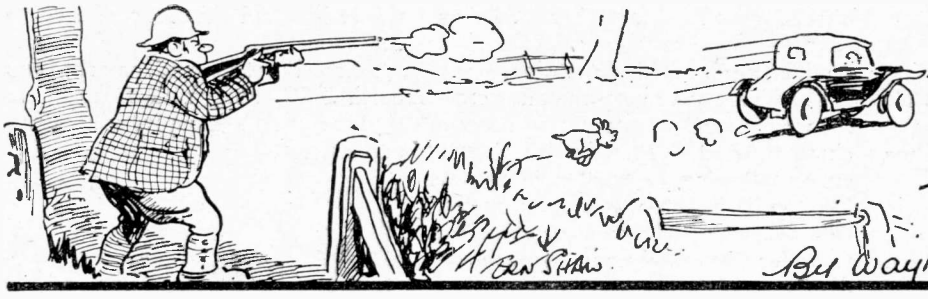
While the number of stations is much the same as before the days of the Radio Commission, many call letters have lapsed, phantom call letters are scarcer, and many new call letters are included in the new list, showing a greater diversity of broadcasters throughout the Dominion. This is especially noteworthy in northern Ontario, Quebec and the Maritime provinces, where there were but few stations formerly, but where many stations are now located, built in the past few years.

That the actual number of stations to-day is not greater than before the Radio Commission went into office, two years ago, is not altogether due to the work of the Commission, but rather to a definite Canadian broadcasting policy. Many firms and individuals wanted to open stations from 1929 to 1932, but the uncertainty of government policy, whether government monopoly or private ownership, deterred most potential broadcasters from opening stations. More powerful stations than now operating were planned during those years, but were finally dropped because there was no definite government policy.

Varied Assortment

The new list of broadcasters shows that ten newspapers and publishing firms have stations in operation, that 9 radio manufacturers and dealers are on the air with their own stations, that 34 individuals and broadcasting companies are in the commercial broadcasting field.

The other stations in the list include a grain company with 4 licences, radio clubs, churches, a provincial government telephone system, and universities.



IN LIGHTER VEIN

By Wayfarer

"Do you know," inquired the Professor, "what the Luxembourg Effect is?"

"Of course," I replied. "It's when they stuff geese with food by machinery and their livers go all puffy and they make them into *pâté de foie gras*."

"Ass!" cried the Professor; "that's Strasbourg."

A Wireless Problem

"Much the same thing," I replied. "I knew it was one of those bourgs."

"Anyhow, I'm not talking about geese and things. This is a wireless problem."

I closed my eyes, settled well down in my armchair, and placed my feet on the mantelpiece.

"Proceed, my dear fellow," I cooed, "I'm all attention."

"You may have noticed," continued the Professor, "that when listening to stations such as Beromünster you sometimes hear the Luxembourg programmes as a background."

"Yes, indeed," I murmured. "And often I get Budapest, and Athlone, and Vienna, too."

"FORGET YOUR BLINKING GEESE"

"I'm not talking about a rotten unselective set like yours. A set that can't separate stations half a dozen channels apart isn't *worth* talking about."

"But I thought you said that you had got Luxembourg on yours as a background to Beromünster?"

"So I do."

"Then why worry to talk about a set that can't separate a station on 1,304 metres from one on 539·6?"

"My set *is* selective," screamed the Professor, "and it is just with sharply tuned sets that the Luxembourg Effect is most noticeable."

"What do you mean?" I inquired.

Our famous pair—Professor Goop and Wayfarer set off to the West Country to investigate the Droitwich Effect, only to find that other problems arise which they also have to solve. Incidentally they give their names to another most important effect which will be well known to readers of "Wireless."

"That *pâté de foie gras* doesn't agree with its owners?"

"For heaven's sake stop thinking about Strasbourg and geese."

"Very well," I replied obligingly, "but since you first mentioned *pâté de foie gras* I have found it rather hard not to think about it, for I'm feeling distinctly peckish. However, continue."

The Professor went at some length into an explanation of the Luxembourg Effect which, so far as I can remember, he stated to have been discovered only a short time ago by a famous Dutchman.

It seems, from what I could gather, that when a long-wave and a medium-wave station are in a straight line or something with the receiving aerial the Heaviside Layer or something gets such a kick in the neck or something from the long waves that the reflecting surface is all sort of jobbled up.

"That's what's meant by rending the welkin," I suggested helpfully. "The poor old Heaviside Layer goes all woffy like the goose's liver?"

"For heaven's sake forget your blinking geese," cried the Professor, and went on.

Waves Mixed Up

According to the Professor the long and medium waves become all mixed up or something and so you hear one station as a background to the other, or *vice versa*, I really forget which.

"And now," burbled the Professor, "the Luxembourg Effect is manifesting itself in our own country."

"Rot," I ejaculated, opening my eyes and almost springing from my chair. "The R.S.P.C.A. or something would never allow the forcible feeding of geese."

The Professor tore metaphorical handfuls of hair from his almost bald dome.

"Will you remember," he roared, "that it is nothing to do with geese?"

"Very good," I assented; "very good. Since you say so I will bear it in mind, but go on with your strange story."

"In this country of ours," continued the Professor, "we have a manifestation of what is known as the Droitwich Effect."

"You Just Can't Sink"

"That's easy," I smiled. "The water is so salt in the swimming baths there that you just can't sink. I suppose that geese using ponds of this kind for their natatory exercises have their livers much more easily inflated. Or something," I added as a safeguard.

The Professor's countenance went rapidly through the whole gamut of the rainbow's colours. Then, remembering that he had little more hair to spare, he counted ten deliberately and proceeded.

"THIS IS PICKENS & BONES, LADIES' OUTFITTERS"

I gathered that Droitwich and the West Regional station lie virtually on a straight line with large portions of the West Country. Hence when you try to listen to the West Regional you hear mainly Droitwich, and when you try to listen to Droitwich you hear mostly nothing because Droitwich fades or something.

"The cry of the Men of the West," chanted the Professor, "has gone up: you and I, my dear fellow, are surely called upon to go into those parts and help them. We must journey forthwith to Devon and Cornwall, investigate this Droitwich Effect and discover how to make reception as good as it was

before the great national transmitter was so vastly improved."

I assented with alacrity. Leaping to the telephone and remembering that the call would be put down on the Professor's bill, I rang up the Editor of WIRELESS on the trunk.

A voice answered and for the space of nine minutes I poured an account of our project into what I felt must be a sympathetic ear.

Sounds All Right

"And what," I asked, "do you think of that? The Professor and I are quite prepared to do it for our bare expenses and a trifling fee of a hundred guineas apiece."

"Sounds very jolly," said the voice at the other end, "but I think you've got a wrong number. This is Pickens & Bones, Ladies' Outfitters."

After several further abortive attempts on the telephone I wrote to the Editor and received a reply to the effect that he was delighted to hear of a proposal to spend a little holiday in the West. He was, he added, all in favour of our going West as rapidly and as effectively as possible. As for

INSPECTING THE INTERIOR OF EVERY QUAINT OLD INN

exes., those were supplied in profusion by Mother Nature to any user of a wireless set and we had his official permission to receive them to any amount.

An Important Mission

Happily the Mudbury Wallow Wireless Club realised the importance of our mission. A fund was started for our benefit and ere long the guarantees were amply sufficient for our needs. I mean, when I went to see Sir K. N. Pepper he first of all said that he couldn't give a penny, but as soon as I mentioned that I was sure he wouldn't like the little story of his home-made superhet that wouldn't work to appear in print he readily put himself down for a tenner. And once I got his name on the list it was easy to collect from Captain Buckett, Miss Worple, Tootle, Primpleson and the rest. Packing our belongings into the Professor's 1923 baby Forcedin, we set off on our long trek westwards.

We decided to make straight for Land's End, to start our investigations of the Droitwich Effect there and then to move as nearly as possible in a straight line towards Droitwich.

The idea was to keep the most careful records and eventually to draw a chart thing all covered with waggly curves showing in what regions the Droitwich Effect was at its worst. Our journey took us a considerable time, for the Professor is a great lover of antique buildings, and nothing would persuade him not to stop and inspect the interior of every one of the quaint old inns that we passed on our way. However, we got there at last and prepared to set to work.

Easy in Theory

My job was to erect a temporary aerial by throwing a weight attached to a string over a branch of a convenient tree. The theory is easy. You hold the string about a foot and a half above the weight, whizz the latter round until it has got up a real good speed and then let fly. It then sails gracefully over the required branch, taking the string with it. You attach the string to your wire, haul it up, and there you are.

In practice matters are apt to be somewhat different. My first shot clean missed a spreading oak and went through the window of a farm house. Nothing daunted, I hauled in and was preparing to try again when there emerged from the said farm an outsize in farmers *plus* an unpleasant-looking dog and a shotgun at full cock.

The Professor and I decided instantly that it was not worth while to begin our experiments so far to the South-West. We made a combined leap for the baby Forcedin, which luckily started at the first stab, and passed out of that farmer's life at a rate of knots. He gave us both barrels as a parting salutation and the left caught the professor where his poppa's slipper used to catch him in bygone days. Luckily we had fitted the little car with the Goop-Wayfarer Instanto Sunshine Roof and the Professor is an expert at driving in the standing position.

Fixing Up the Aerial

When we had put ten good miles between us and the fellow who had shown so little appreciation of our efforts on the part of him and his countryfolk, we decided to make a further attempt, selecting this time a tree which had no house of any kind within half a mile of it.

Naturally when missing the tree nothing more exciting could result than hitting a tuft of grass, I scored a bull's-eye at the first shot. That, I think, is called the irony of fate. Or isn't it?

I rigged up the aerial, smacked in an earth tube, and, with a smart and soldier-like salute, reported all present and correct.

"DIDN'T YOU PACK THE WIRELESS?"

"Bring out the wireless set," I cried, "and we'll soon see whether Droitwich is making *pâté de foie gras* in the old Heavyside Layer."

The Professor, whose rear elevation only was visible was being very busy pulling things out of the back of the car. Suitcases, umbrellas, overcoats and what not he flung out on to the sward behind him, now with his right hand and now with his left.

At length his top half emerged from the interior of the car, a puzzled look mantling his countenance.

"Didn't *you* pack the wireless set?" he inquired.

"No," I said. "That was your job."

For a moment we gazed upon one another blankly. Then I realised that we had made a great scientific discovery.

"Do you appreciate," I inquired, "that we are the inventors of a new 'effect' which will ever be associated with our name?

"The Goop-Wayfarer Effect is that in the West Country Droitwich is not receivable without a receiving set!"

The "Strasbourg Effect"

The Professor appeared slightly stunned by the magnitude of our discovery. First-aid was clearly called for. Opening my attaché-case I took out a small earthenware pot and unwrapped a paper package of crisp toast.

"Have some *pâté de foie gras*, my dear fellow," I said. "You'll find that the Strasbourg Effect is just what you want."

It was.

THE RESULT OF
VICTOR KING'S CONTEST
(Given in the February Issue of WIRELESS)
Is announced on Page 231

Cutting out Interference

By M.C. PICKARD

Here are details of an interesting aerial coupling system that is of particular value to the listener suffering from "man-made" static.

NOISES are the bugbear of wireless reception. Research has overcome nearly every other obstacle to distant listening; sets have been made sensitive beyond our wildest dreams and A.V.C. has reduced fading. Only noises remain unchecked—"background" noises that can on occasion come so far in the foreground as to blot out that distant station we so much want to listen to.

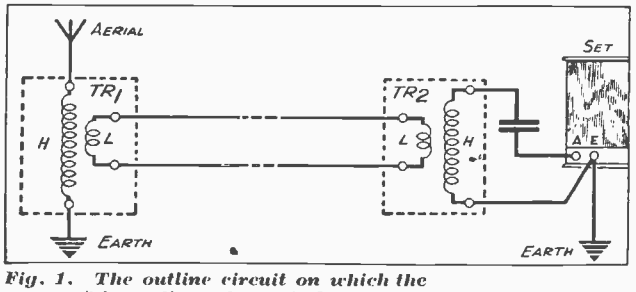


Fig. 1. The outline circuit on which the aerial coupling scheme is based.

We in this country have reason to congratulate ourselves that true atmospherics are rarely powerful enough to hinder our listening; the exception being when thunder is actually in the air. But being a highly industrialised country a large proportion of the population lives in cities—cities in which electrical machinery of all kinds comes increasingly into use with each day that passes.

Where Interference Originates

You have only to walk through the main street of any town after dark, and see the growing garden of electric signs that make such a splash of colour in the night, to realise that it is so. Electric signs are not all: motors, X-ray and ultra-violet equipment, trams and trolley buses, vacuum cleaners—we are hedged in by an army of such machinery waiting to destroy our enjoyment at the closing of a switch.

Much of the interference is picked up on the aerial with the wanted signal. A screened down-lead helps to cure the trouble but is not always a cure. To earth a screened down-lead it is usual to connect a wire to the lower extremity of the metal sheathing and run this by the shortest route to the earth connection. This earth lead might be six feet long—and that sounds a good enough earth for anybody. But if the down-lead is thirty feet long it follows that the sheathing near the top has a lead some thirty-six feet long interposed between it and earth. That is not so good.

This thirty-six foot lead, comprising the sheathing of the down-lead and the earth wire proper, will have an appreciable inductance and will therefore offer

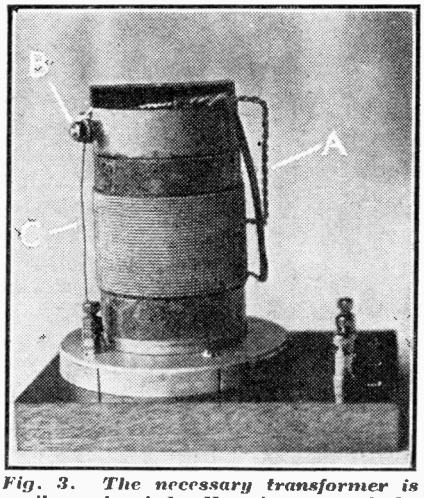


Fig. 3. The necessary transformer is easily contructed. Here is one made by the author of this article.

an impedance to the flow of fluctuating current along it. This means that such a current would develop a potential—fluctuating like itself—between the extremities of the lead.

Unwanted Currents

The electric fields against which we are striving to shield the inner core of the down-lead are fluctuating; also they will induce currents in the sheathing as they would in the core were the sheathing absent, hence a fluctuating potential difference will be produced in the sheathing, the variations of potential becoming greater as we proceed further from the earth-connected end.

This should make it clear that a screened down-lead can never be totally effective; unless indeed the metallic sheathing is "earthed" at every point along its length—buried in fact.

Loss by Leakage

A second defect lies in the loss of energy by leakage through the capacity between the core and the sheathing. These two together form a long tubular condenser, of which the outside plate is connected to earth. The trouble in increased by the inductance of the inner core, which tends to choke back the signal and compel it to take the alternative path through the capacity of the core and sheathing, to earth. To reduce this loss to unimportant proportions necessitates a wide spacing between core and sheathing, which makes for a bulky-looking wire—not the sort of wire that is welcomed in the drawing-room.

And now for a moment let us divert

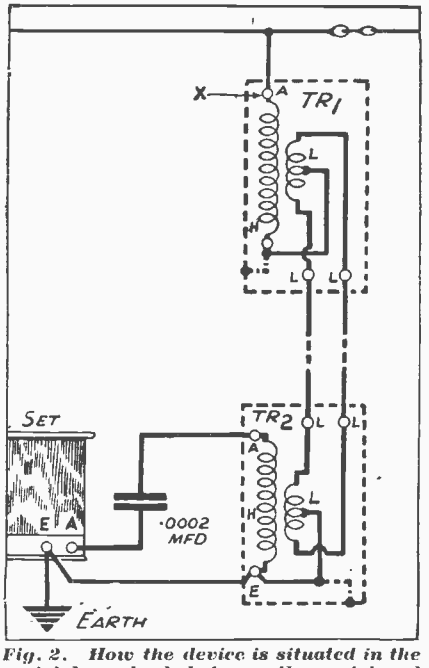


Fig. 2. How the device is situated in the aerial down lead, between the aerial and the receiver.

the train of our thoughts. This question of the "drawing-room" is not as irrelevant as it may seem; it is a constraint arbitrarily imposed on technically-minded folk, and though it sometimes makes us fume, there it is. Long, loose aerial and earth wires are looked at askance, and a screened lead-in might be out of the question.

And this is the more regrettable since we have come to an era of wireless-set and speaker combined.

It was this problem as much as that of devising an interference-free down-lead that led me to the very easily constructed and simple device I am now going to describe.

Well-Tried Scheme

The germ of the idea is contained in Fig. 1. Here is shown a modification of a system that is employed almost universally in the case of high-powered transmitters. Here we have a transformer TR_1, aperiodic, which steps the voltage of the signal coming in from the aerial down to a low value; it is fed to a pair of feeders by means of which it can be carried all over the house if necessary; let us say to a three-point plug in every room in which wireless is wanted, the third point being for the earth connection. Incorporated with the set is a second transformer TR_2, by which the signal is stepped up again to its original value.

SHIELDED COILS ARE REQUIRED

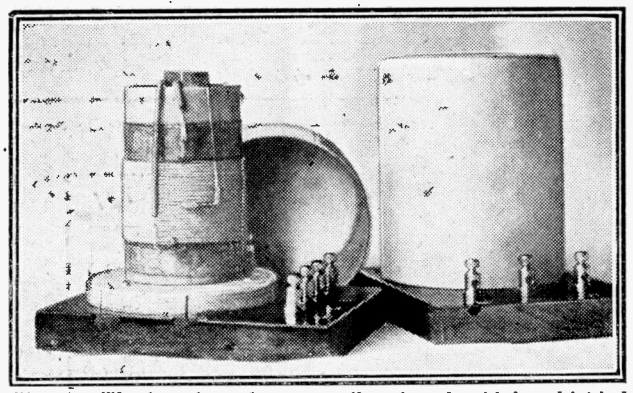


Fig. 4. The two transformer coil units should be shielded so that no direct pick-up is possible.

But why does this scheme work? We have seen, in the case of the screened down-lead, that loss of energy occurs through the capacity between the down-lead and the sheathing: will not a similar loss occur between the feeders, and between each feeder and the wall, if the wires are fastened down? The fact is, a loss does occur; but by stepping down the voltage of the signal it can be reduced to negligible proportions.

Thus, if the ratio between H and L in TR_1 is 10 : 1, the potential between the feeders will be only a tenth of what it would have been if aerial and earth had been connected to them direct, and the total current flowing in the feeders will be nearly ten times that in the aerial coil H.

This makes it possible to use in practice a compact twin wire such as bell-wire. It can be run round the skirting-boards and finished off at plug-sockets, as described. Another advantage of these close-lapped twin wires is that their magnetic fields mutually cancel each other, and the feeder line, as a whole, has consequently no inductance to speak of.

It is, in fact, astatic, and out of this arises the second and perhaps more important advantage of the system. It is incapable of picking up any sort of outside signal whatsoever, since any voltage induced in one feeder is cancelled by that induced in the other.

Avoiding Long Earth

The idea in the simple form shown does not represent its ultimate development. For instance, if the device were to be used in place of a screened down-lead, it would be necessary to mount the transformer TR_1 actually on the horizontal part of the aerial, and to take an earth wire up the aerial mast or the chimney to it would be a very clumsy expedient.

Consequently the modification shown in Fig. 2 was arrived at. The difference is that each of the low impedance coils of the transformers now has a centre-tap to which the low potential end of the high impedance coil is connected.

How It Works

Let us trace out what happens. The signal current received in the aerial flows through the high impedance coil H of TR_1 to the tapping on L. Here it splits in two, a half flowing in each direction through L, and so down the twin feeder, which acts as an earth lead. After passing through the two halves of coil L in TR_2, this signal current is reunited and flows from the tap to earth.

The important point is that any

THE AERIAL IN ANY ROOM

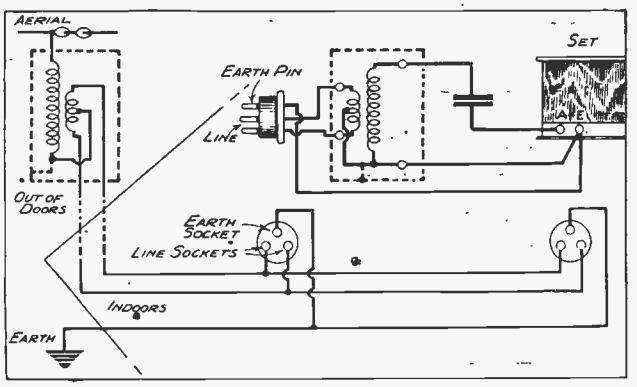


Fig. 5. By means of plugs and sockets the aerial feed can be taken to various points in the house, enabling the receiver to be used in any room.

current induced in the feeder lines, not the aerial, cannot directly affect the receiver. In passing round the low impedance coils (L in TR_1 and TR_2), it is divided and passes in equal parts and in opposite directions round the halves of the coils. The two magnetic fields created are in opposition and neutralise each other: so that no response is created in coil H of TR_2, which feeds the set.

But the aerial signal current flowing in H (TR_2) creates an E.M.F. in L, which is applied to the feeders. Current flows along the feeders by virtue of it, *but in opposite directions*, and round coil L of TR_2. This produces an E.M.F. in H of TR_2, which is applied to the set through a ·0002 mfd. condenser.

Interfering Currents Cancelled

One point should now be clear: only currents flowing in opposite directions in the feeders can affect the set. Potentials that might be induced in them by electrical interference would be equal and in the same sense in each, and so could not affect the set. The proof of the pudding is in the eating: if the aerial is disconnected from the point marked X in Fig. 2, the whole instalation is completely dead.

And now, for the benefit of those whom I have roused to the pitch of wanting to try out this idea for themselves, some constructional details. Figs. 3 and 4 illustrate the coils as I have finally developed them,

(*Continued on next page*)

CUTTING OUT INTERFERENCE

(Continued from previous page.)

though it should be mentioned that the aerial coil shown was not designed to be installed out of doors. It will be seen that they are screened—an important point in the case of the aerial coil, at least, especially if it is externally mounted.

The screens must be earthed. Earthing the screen on TR_2 is, of course, simple, but TR_1 can only indirectly be earthed by connecting its screening can to the centre-tap on its L coil. How this is done is shown very well in Fig. 3. A is the wire from the tapping, B is the terminal screw for one end of the H coil, and C is the wire going to the screen. The screens themselves are old coil cans.

NEXT MONTH

FULL DETAILS OF THE "FERRO-MAINS" THREE

A special high-mag receiver for modern reception conditions.

The coils are identical in construction and numbers of turns. Each is wound on a paxolin former, 3 in. long and 2 in. in diameter. The high impedance or H coil is wound on first, consisting of 300 turns of forty-gauge silk-covered wire. The ends of the wire are taken through holes to two terminal screws mounted at the top end of the coil.

This coil is then doped with shellac varnish, and a layer of tissue-paper wrapped over it, and on this the L coil is wound with 30 turns of twenty-gauge wire, with the tapping 15 turns from either end. As it is impracticable to pass the wire ends of this coil through holes in the tube, they are tied in position with thin string, and subsequently bent out away from the tube.

Leads from all the windings are taken over the top end of the coil, down the inside of the tube and through the base to suitable terminals The terminals A at the high potential ends of the two H coils may advantageously be mounted with ebonite bushes, rather than directly on the wood.

Questions I am Asked

From the varied selection of queries sent in by readers our distinguished contributor has chosen some which he considers to be of universal interest. These, together with their answers, appear below.

Q. 127. Shall I be able to use my present set for television when it arrives?

A. I don't know what kind of set you have, but it is pretty safe to say it will be no use whatever for television.

First of all, television will be radiated on a wavelength below 10 metres. This calls for a special unit or else a special receiver. Next, it is extremely important to avoid distortion. This can very easily occur in the high-frequency circuits. Side-band cutting is not of so much consequence where music is concerned, but it will destroy the reality and detail of vision. The width of side-bands is much greater in the case of television, and the greater the "definition" the wider the side-bands. Flat tuning is thus a desirable feature from this point of view.

The third point is that the low-frequency side of a television receiver must cover a very wide range of frequencies without distortion. The lower frequencies which can be dispensed with in broadcast speech and music without serious consequences take on extra significance in television.

I am quite aware that some results are obtained even with fairly conventional receivers on the present 30-line transmission, but the "new deal" in television will call for a really first-class set.

Q. 128. What is going to be the position of the home-constructor when television arrives? Will we be able to build our own "viewers"?

A. I think it is highly probable that home-constructors will share in the new source of entertainment. It is impossible to forecast *exactly* in what way. The 7-metre receiver presents no difficulty at all. As regards other features, even if difficulties present themselves, it is pretty certain that some manufacturers will issue self-contained already-adjusted units. I strongly suspect that those who have—quite without justification, except from price considerations—fought shy of mains set construction, will have to overcome their prejudices. Television is likely to be an all-mains affair, for best results, at any rate.

It is quite possible that television will be put on the map by amateurs, just as was broadcasting.

Q. 129. I have a short-wave unit of the superhet type connected to my ordinary three-valve receiver. Whereabouts do I tune the main receiver? I get fairly good results on the strongest signals, but find very great difficulty in even finding the weaker ones. Can you make any suggestions?

A. Tune your main receiver to a position near the top end of the long waves, seeing, of course, that all the circuits are in tune. Reaction may be applied cautiously. If you tend to pick up a long-wave station such as Huizen (due to direct pick-up) you will have to tune your main receiver to one side of such a station.

The problem of picking up a weak short-wave station is greatly simplified by making the last high-frequency circuit of the main set oscillate. This will be done by applying anode reaction till the set "oscillates." Care should be taken to see that apart from the last circuit, the main set is perfectly stable. This is done by reducing the anode coupler in a set of the S.T.300 type or by increasing negative bias if a variable-mu H.F. amplifier is in use.

With the main set oscillating you adjust your short-wave condenser or condensers until whistles are heard. If the whistle sounds as if it were due to the carrier-wave of a short-wave broadcasting station you reduce reaction on the main set until the latter just stops oscillating. You will then be able to complete the accurate tuning in of the station. You will hear dozens of morse stations, but these you would ignore and not stop the main set oscillating for their sake.

You need not worry about causing interference by working your main set. The oscillations will not be radiated from your aerial.

Q. 130. On the "One-Point-Five" I find there is a tendency to microphony when the speaker is in a certain position. How can I avoid this?

A. By not putting the speaker in that position! An infallible (in my experience) method of stopping any microphony on the S.T.600 or "One-Point-Five" is to weight the top of the pentode detector. Moulding some plasticine round the anode terminal (at the top) will do the trick. I have used a heavy rubber grommet (like a rubber ring), and this may be slipped over the anode terminal. Messrs. Peto Scott could supply such a grommet. You can also stop microphony often by "tying down" the valve by tying the end of a string to the top terminal and then tying the other end to any suitable anchoring point such as a component; the valve is thus pulled a trifle out of the vertical and valve vibration is greatly reduced or made impossible.

Q. 132. Why is a commercial A.C. set for 25 cycles more expensive than one for the usual 50 cycles?

A. Partly because it is not a standard job, but chiefly because the mains transformer has to be more substantial and the smoothing apparatus has to be more thorough and therefore more costly.

AS WE FIND THEM

—*continued from page* 218

interesting component which is especially applicable to short-wave superhet adaptors.

Most superhet adaptors consist simply of a first detector-oscillator valve which is choke-coupled to an existing set, either of the superhet or straight H.F. type.

The component in question consists of a coil having an inductance of 2,200 microhenries, so that, in conjunction with a preset condenser of ·0005-mfd. max., it can be tuned to a suitable intermediate frequency.

Connected in the anode circuit of the adaptor valve, in place of the H.F. choke, this Bulgin coil (when tuned) provides an effective tuned coupling, with its resulting improvement in amplification.

Once adjusted there is, of course, no need to alter the setting of the preset condenser. It is interesting to note that the cost of the coil and its preset condenser is no more than that of an H.F. choke suitable for coupling purposes.

SHORT-WAVE NOTES

—*continued from page* 216.

the same. The S.G. valve is coupled to the detector grid circuit by means of a neutralising condenser. Quite a small amount of capacity is sufficient, giving ample transfer of H.F. without introducing sufficient damping to flatten out the tuning of L_3 very much.

If you feel like tackling the thing in a more elaborate way, you can build this set in a metal box with a suitable partition, and the two ·0001 tuning condensers may be ganged. If you do this, connect a small trimmer across the S.G. tuning condenser—not the other.

The Pentode Output

Once again the detector is resistance-coupled, but this time a pentode is used as the output valve, and a suitable L.F. choke must be chosen. Several excellent pentode output chokes are available, or you may, instead, be able to connect the output direct to a moving-coil speaker.

A set of this type, naturally enough, is a little more difficult to handle than the detector and L.F., but it need not be a two-control set in the strict sense of the word. The tuning of the S.G. grid coil should not upset the setting of the detector tuning condenser at all; it should act more or less as a volume control. That is to say, you should be able to tune in any signal on the detector tuning condenser, whether the S.G. condenser is at the right setting or not.

Increasing the Coupling

When you do set that, afterwards, it should not de-tune the signal that you have already found; it should just bring it up in strength when the correct setting is reached.

If the S.G. tuning *is* very sharp, it probably means that your aerial is not coupled tightly enough, and you might try dispensing with L_1 and connecting the aerial, through a preset condenser of ·0001 maximum capacity, to the top end of L_2.

A tuned S.G. stage is always worth its keep, particularly if you specialise in short-wave broadcast reception, because it relieves you of much of the necessity of critical handling of the reaction control.

For amateur band C.W. reception its advantage is not so noticeable.

I should be very interested to hear from readers who decide to try out these two circuits (or either of them) for themselves. Both are of the "good old stand-by" type, with no freaks about them; but both lend themselves to little additions and improvements, with which I hope to deal next month.

HELPING THOSE LONG-WAVERS

How often do you find that just a little more strength would enable you to hear those long-wave stations as you want them? Here is a suggestion for overcoming the deficiency in a very simple manner.

By FREDERICK LEWIS

IN the January issue I mentioned that in some cases the addition of aperiodic H.F. stages was very beneficial. Not that it has no snags, but in some circumstances it can be very useful indeed.

One of these is the lack of pulling power on long waves in a set due to a poor aerial which owing to circumstances cannot be improved. If the set is already a ganged tuning one it may be more convenient to add a tuned H.F. stage, but if it already has two tuning condensers a simple improvement may be made by the addition of the aperiodic stage.

Weakness on long waves is a distressingly frequent state of affairs, due to various causes, but probably mainly to aerial deficiencies, so I make no excuse for giving a few details of the aperiodic method of H.F. amplification.

It has its snags, of course, for it is not selective and will tend to *flatten* the set tuning a little rather than to sharpen it, as would be the case were the additional stage tuned. If the set is none too selective without the stage I would advise the use of a tuned H.F. amplifier instead of an aperiodic one. But if selectivity is good then try the aperiodic stage by all means.

It is just as useful in a battery set as it is with an all-mains outfit, and I have given two skeleton circuits showing the H.F. stage (using a screen pentode) in battery and A.C. circuits.

In the first case the anode and screen voltages are taken via leads tapped into the supply for similar electrodes in the main portion of the set. These points are marked X and Y and should be situated on the battery side of any decoupling resistances that may be used in the set. If desired they can be made *at* the battery itself by the insertion of wander-plugs at suitable voltage taps.

Decoupling Arrangements

The anode and screen-grid of the new valve are decoupled by resistances of 1000 ohms and condensers of ·1 mfd. Bias, as shown, should be included by means of a single 1·5-volt cell in series with the grid return, the battery being by-passed by a ·1-mfd. condenser.

In the case of the mains version the H.T. feed is taken from the maximum feed of the power pack. Thus we have to provide some means of breaking down the voltage so that the anode of the valve gets 200 volts (250 in the case of certain types such as the Triotron), and the screen gets 100 volts.

The potentiometer scheme shown is best for this. The resistance values are so chosen that they pass sufficient current without overheating and at the same time "drop" the right amount of voltage.

The potentiometer takes not only its own current due to it being across the H.T., but the top section "A" has also to deal with the anode and screen currents—these being a matter of about 6–8 milliamps, dependent on the valve; "B" has to deal with the screen current as well as the potentiometer current.

The grid-bias resistance will probably have to be of about 200 ohms to give something like 1–1·5 volts negative bias.

The attachment of the unit to the main set in both battery and mains cases is the same. The aerial lead-in goes direct to the unit, while the earth of the set and that of the unit are joined together and taken to earth.

The output of the unit is connected to the aerial terminal of the set, and that is all there is to do, except one thing—if the set uses ganged tuning. In this case the aerial section of the gang condenser may want re-trimming when the aperiodic stage is substituted, owing to the absence of the aerial capacity and inductance.

The Extra L.T.

Apart from this everything is perfectly straightforward. The L.T. (from battery or mains unit) for the new valve is tapped off at the source in the same way as the H.T., so that no difficulty arises there.

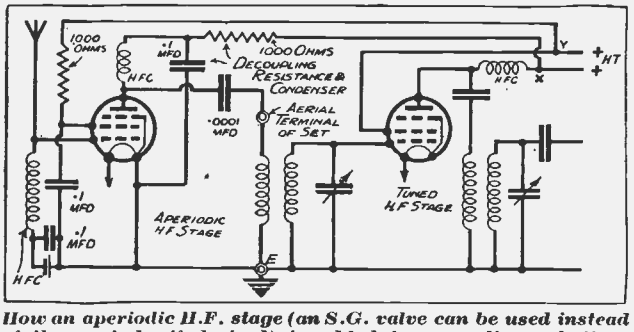
Most mains transformer L.T. windings will stand an extra stage, and in many home-constructed sets the transformer will not be used "fully out" and so will be able to accommodate the extra ampere without in any way being overloaded. If the transformer is not capable of providing the extra current a small L.T. transformer for the purpose can be purchased. The added 6 milliamps of H.T. should not upset any well-regulated set.

Of Great Assistance

I have found the aperiodic H.F. stage particularly useful in connection with a four-valver that I employ. It has increased the long-wave receptive powers. Particularly is the extra stage valuable on Luxembourg and some of the low powered long wavers which do not come in very well on my short aerial during daylight.

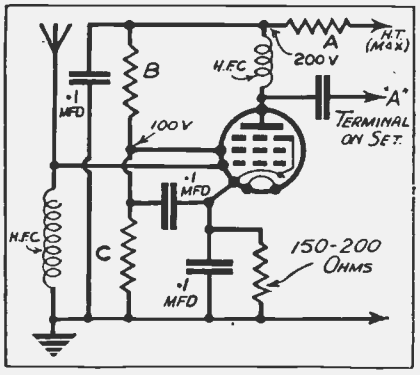
There is one further point I ought to mention. In the foregoing I have described the use of a screen pentode valve but an ordinary screened grid valve will do just as well. If you are going to try the extra stage I should just use whatever valve—S.G. or pentode—you have on hand.

A VERY EASY ADDITION



How an aperiodic H.F. stage (an S.G. valve can be used instead of the pentode, if desired) is added to an ordinary battery receiver.

FOR A.C. MAINS



Where a mains set is concerned, the extra stage should be wired up in accordance with this circuit.

LIST OF PRIZE WINNERS IN THE AVOMINOR COMPETITION

FIRST prize of £1 a week for one year: Awarded to Mr. Peter Bowers, Pages Hill, Whepstead, Bury St. Edmunds.

Instrument supplied by Messrs. Currys Ltd., 22, Buttermarket, Bury St. Edmunds, who are awarded FIRST DEALER'S PRIZE of £10 Cash.

SECOND prize of 10s. a week for one year: Awarded to Mr. Krikor Ghazaros, University College Hall, Queen's Walk, Ealing, W.5.

Instrument supplied by Messrs. Peto-Scott, Co., Ltd., 62, High Holborn, London, W.C.1, who are awarded SECOND DEALER'S PRIZE of £5 Cash.

THIRD prize of £10 Cash: Awarded to Mr. W. H. Stimson, 74A, Miller Road, Bedford.

Instrument supplied by Norman Mickle, Harper Street, Bedford, who is awarded THIRD DEALER'S PRIZE of £2 10s.

CONSOLATION PRIZES TO THE VALUE OF 25s. HAVE BEEN AWARDED TO THE FOLLOWING:

CLASS "A."

Mr. G. A. Harris, 655, Wells Road, Whitchurch, near Bristol; Mr. F. L. Laurence, 24, Baffins Road, Copnor, Portsmouth; Mr. E. H. Griffiths, 50, Hillside Gardens, Barnet, Herts; Mr. A. E. Dunn, 15, Pottington Road, Barnstaple, N. Devon; Mr. W. H. Trott, 53, Fleeming Road, Walthamstow, E.17; Mr. J. P. Tourle, "St. Ives," Leicester Road, Laindon, Essex; Mr. J. Thorley, 9, Florence Street, Moss Side, Manchester; Mr. J. Gordon Gerds, "Dalmuir," 23, Leicester Road, Wanstead, E.11; Mr. L. Norman, 78, Galdervale Ave., Barlow-Moor-Estate, Chorlton-cum-Hardy, Manchester; Mr. H. I. Peel, "St. George's," Tranby Avenue, Barrow Lane, Hessle, E. Yorks; Mr. N. Howarth, 10, Chesterfield Street, Liverpool 8; Mr. P. W. Crouch, 86, Broadlands Avenue, Newton Abbot; Mr. F. Bevan, Beech House, Micle Trafford, Chester, Cheshire; Mr. R. C. Payn, 10, Melbourne Terrace, Saltcoats, Ayrshire; Mr. I. M. Ryalls, 19, Templemore Road, Oxton, Cheshire; Mr. J. H. Rundle, 47, Paternoster Row, E.C.4; Mr. F. G. Ingleton, 22, Cecil Road, Muswell Hill, N.10; Mr. J. Halton, Jun., Bluestone Lane, Mawdesley, near Ormskirk, Lancs.; Mr. W. T. Fellows, 12, Derby Road, North End, Portsmouth; Mr. G. H. Champion, 115, Valdegrave Road, Brighton.

CLASS "B."

Mr. C. Kingston, 52, Hillingdon Road, Gravesend, Kent; Mr. S. Jackman, 6, Elliot Street, Weston Mill Estate, Devonport, Devon; Mr. T. Samson, 16, Prestwick Road, Ayr; Mr. F. Stowell, 1, Frewin Road, Wandsworth Common, S.W.18; Mr. J. Patchton, 67, Eastfield Road, Bordesley Green East, Birmingham 9.

WIRELESS IN THE GREAT WAR

—*continued from page* 200.

of apparatus, the upper box containing the receiver and the lower box the transmitter. The power for the transmitter was supplied from an alternator which, in turn, was run by a small Douglas petrol motor.

Main condensers in the transmitter were of the tube type so that if one happened to break it was easily replaceable, transformer and coils were standard, while the spark gap was of the rotary disc type coupled to the alternator.

The crystal (usually carborundum) was employed in the receiver as a detector, and no feat of imagination is necessary to understand the difficulties of the operator in receiving under such conditions as attained at Gallipoli.

'Phones jammed painfully on the ears, shells exploding, causing the crystal to go off adjustment, snipers bullets pinging against the wireless mast or raising little clouds of dust in the sand.

The erection of the masts and aerial was in itself no light job under such conditions. Normally an aerial could be erected and the pack set put in operation within seven minutes. At Gallipoli, however, so terrible was the confusion and difficulties that it was a matter of hours rather than minutes.

When night fell all five beaches which had been attacked by the British were captured, but out of the 9,000 men who had been landed 3,000 were killed or wounded.

At the same time as the British were attacking at the foot of the Peninsula, the Australians and New Zealand Army Corps were making another landing further up the coast near Gaba Tepe. Twelve thousand men landed here with little loss. This was mainly due to a mistake, for they did not land at the place arranged—and, incidentally, where the enemy expected them to land—but in the darkness just before the dawn the boats conveying these troops missed their way and found themselves in a strange inlet—to be known afterwards as Anzac Cove.

(*Continued on next page.*)

WIRELESS IN THE GREAT WAR

(*Continued from previous page.*)

Here communication was established without difficulty; but although the landing was so successful, the Turks later appeared in such force, led by the redoubtable Mustapha Kemel, that the success of the landing was somewhat neutralised.

It was at this time that Sir Ian Hamilton, on the Queen Elizabeth, picked up a wireless from the officer commanding " Y " Beach :

" We are holding the ridge," it said, " until the wounded are embarked."

Sir Ian Hamilton was greatly concerned with the word " until " in this telegram, as he took the message to mean that the Marines, which had landed there so successfully, intended to re-embark.

This surmise proved to be correct, for when the Queen Elizabeth hove to off " Y " Beach, the men were already re-embarking on the ships there.

No satisfactory reply could be obtained to the urgent wireless of the Commander-in-Chief, and, in fact, all was confusion. It was another case of " someone had blundered," for there was no reason whatsoever why these troops should have returned to their ships, nor was there any order given to that effect.

By the evening of the 27th the British forces were firmly established on the foot of the Peninsula, but matters had reached a deadlock ; for the Turks were now in force and, owing to the great number of British dead and wounded, Sir Ian had not sufficient reserves to overcome the enemy. Thus ended the first landing of Gallipoli.

A second surprise landing was made some time later further up the coast of the Peninsula at Suvla Bay ; here wireless preparations were on a more extensive and developed basis. Arrangements were made for two military pack wireless stations and one R.N. base station. These were used for communicating with a wagon wireless station at the general headquarters on the Island of Imbros.

A Complete Surprise

The landing at Suvla Bay was a startling and complete surprise to the enemy. But it was now midsummer and the heat dreadful, the air seemed to have been boiled ; the sea was like glass and everyone was suffering from thirst. As at the other landings, signals were confused, but a message arrived to say " All landings successful,"

All through the next day and night messages kept coming in. The ether of the Mediterranean was alive with them ; everyone was keyed up. What would be the result ?

But alas ! although the men were of the bravest, and never hesitated to sacrifice life or limb to gain their objective, the landing was a failure. All the torment, death and disease which the troops had undergone—the wireless sections with the others, for they, too, had suffered severely—must go for nothing.

From the wireless point of view, the criticism can be made that wireless was not used to the fullest possible extent.

However, although the campaign was a failure, it was undoubtedly one of the most glorious feats of arms which the British forces performed throughout the Great War, and as such will go down in history.

Marconiphone Model "257"

The makers have asked us to point out that the cash price of the above receiver is 12 guineas and not 11 guineas as stated on page 156 of last month's issue.

MY PROBLEM

Mr. Victor King gives below the winning solution to the problem which appeared in his article "Some Curious Radio Effects."

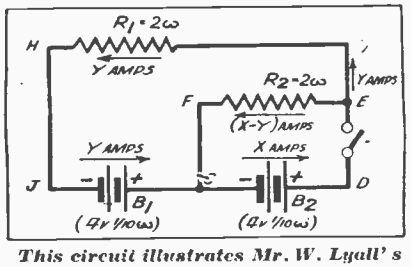
I RECEIVED hundreds of attempts from readers regarding that little problem I described in the February issue. And I found it an extremely difficult job to select the winner.

Difficult to Select

There are clearly so many different approaches to the problem, and after I had read through scores and scores and scores of entries I began to wonder whether it was going to be humanly possible to select an outstanding entry.

Finally, however, I decided to ask the editor to award the guinea to Mr. David W. Lyall, of 4, Droverhall Place, Crossgates, Fife, whose entry appears below. I should perhaps mention that I ruled out several very excellent examples either because they were far too long, because they embodied too much detailed working, or because they failed to summarise their ideas in a few easy-to-understand words.

WHAT HAPPENS



This circuit illustrates Mr. W. Lyall's solution

Mr. Lyall's effort is short and to the point, although I do not quite agree with his figures. The value of x=5·29 amps given by him I make 5·4 amps. Also his value of 1·73 amps I make 1·76. But these are slight discrepancies and they do not detract from his general treatment of the problem.

The Prize-Winner

The shortest entry was something like this: "My answer is that when the switch is closed there is a rush of current which burns out all the connecting leads." The longest was from a professor of mathematics at a foreign university who covered about twenty pages, but seemed to go rather away from the problem in an ecstasy of advanced figures and formula.

However, here is Mr. Lyall's prize-winning explanation:

"In order to determine the current flow in R_2 with the switch closed, we may proceed as follows: Suppose the currents in batteries B_2 and B_1 to be denoted by x and y amps respectively. Then the current in R_2 is (x−y) amps, flowing from E to F. Now, in the circuit CDEF, the 4 volts of battery B_2 is accounted for by the drop of potential across R_2, plus the drop in the battery itself. That is, $4=\frac{1}{10}x-2(x-y)$.

Also, in the circuit CFEH, the 4 volts of Battery B_1 is equal to the sum of the potential drops in that circuit, so that $4=\frac{1}{10}y-2(x-y)+2y$. In this equation we have to remember that the drop of potential from F to E is *negative*—that is, it is a voltage *rise*.

Voltage Variation

"Solving these two equations in the usual way, we find that x=5·29 amps, and y=3·56 amps, so that the current in R_2 is 1·73 amps, from E to F. Thus the effect of battery B_1, with the switch closed, is to make the current from E to F less than it would be if B_1 were absent.

"As to the effect of varying the voltage of B_1, this may readily be examined by writing V for the voltage of B_1, in the second equation above. If we neglect the change of internal resistance which would probably take place in practice (although this may easily be allowed for), we find that the current in R_2 is given by $(x-y)=(8\frac{1}{5}-\frac{1}{10}v)\div 4{\cdot}61$.

"Thus when the voltage V of battery B_1 is increased, the current from E to F diminishes. For instance, when V is 10 volts the current in R_2 is 1·6 amps. The condition V=84 volts is particularly interesting, since then the current in R_2 is zero. The current is then 40 amps in each battery, and the whole E.M.F. of B_2 is employed in overcoming its internal resistance.

Kirchoff's Laws

"If the voltage of B_1 were raised above 84, the current in R_2 would again increase, but the flow would now be in direction FE.

"This interesting problem is one of a type conveniently solved by applying 'Kirchoff's Laws.' The substance of these laws is used in the above solution."

NOTE.—Kirchoff's Laws state (1) The algebraic sum of the currents which meet at any point in a network of conductors is zero. (2) In any closed circuit the algebraic sum of the products of the currents and resistances of each part of the circuit is equal to the E.M.F. in the circuit.

V. K.

THE "ONE-POINT-FIVE"

—continued from page 195.

When using aerial reaction do not have the anode reaction "full out." Experiment with aerial reaction at first with anode reaction at zero (knob full left).

"A Very Good Set"

The "One-Point-Five" is definitely easier to tune than the S.T.400 and after the first hour or so you will be delighted at the terrific sensitivity, and the greatly improved selectivity as regards local interference. In the case of those who suffer no B.B.C. interference at all with the S.T.400 owing to living a long way from B.B.C. stations, the chief advantage of the "One-Point-Five" will be much greater sensitivity.

This is a very good set indeed—and I ought to know! I believe all S.T.400 owners will sooner or later convert. I hope you will write to me and tell me of your good results.

J. S.-T.

FROM MY ARMCHAIR

—continued from page 212.

tail of it, although every now and then a school-boy of fourteen at Rochdale or Enfield says he listens to it every night!

The "compression" process is to overcome "static" (atmospherics). In ordinary speech there is an enormous variation in strength between different parts corresponding to different frequencies. For example, the loudest parts of speech may be some 70 decibels more intense than the weakest i.e. *ten million times* as strong.

Consequently, the weak bits of speech have a thin time in comparison with atmospherics and background noise. So what they do is to strengthen the weak parts so that the proportion is only about 30 to 1. This is sent out by the transmitter which thus can be worked more economically. At the receiver the speech which would be incomprehensible on this account alone is "expanded" by a distorting amplifier so that the original proportions are restored. Such can be the beneficial fruits of distortion.

J. S.-T.

THE EDITOR'S CHAT

—continued from page 191.

We don't know for certain yet what the position of the constructor will be as regards the building of television viewers; but we have good grounds for stating that we think, despite the many snags which have cropped up and which will doubtless crop up again—that there is a good chance that before the end of the year home constructors will be able to build television cathode-ray instruments themselves—and at less cost than the finished commercial equivalents.

Anyway, we are watching television developments as closely as the proverbial cat watches the proverbial mouse; and if you keep a close eye on our television section in the future months, you will at least be certain of being in the position of being as up-to-date as any member of the public as regards television.

Meanwhile, read Mr. Victor King's article with care, for it will give you a clue to the fascinating possibilities for experimental work in connection with these ultra-short-wave receivers.

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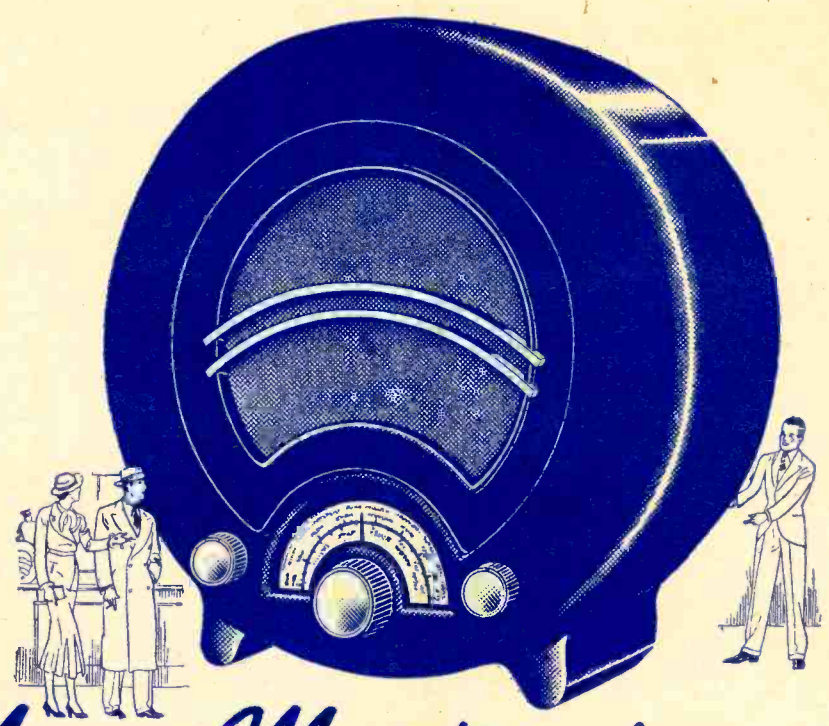
S.S.



A New Masterpiece
— in Price & Performance

Will it operate on A.C. and D.C. mains?	**Certainly. It is a Universal set suitable for mains of 200 to 250 volts**
How many valves?	**Four, including rectifier**
Does it get many foreign stations?	**It is an 'All-Europe' receiver, charted by station-name to give 38 stations. Many others should be received**
Is it easy to tune?	**Simplicity itself—just one-knob station-by-name tuning**
The cabinet is very handsome!	**Yes! It is magnificently moulded, and there are two finishes, figured walnut or black and chromium**
Has it a moving-coil speaker?	**Yes, with a natural tone and very generous output**
Can one purchase on easy terms?	**Certainly. Initial payment of 14/6d and 12 monthly payments of the same amount—or approximately 3/6d per week**

AND THE PRICE? **8 GNS.**

MODEL AD36. Walnut finish 8 gns.
Black and Chromium, as illustrated, 10/6 extra.

EKCO Radio

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