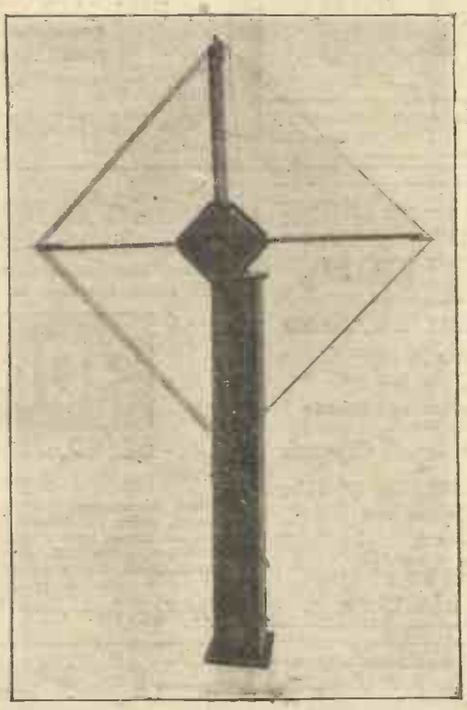
BROADCASTING—DEFINITE NEWS

Amateur Wireless And Electrics

Second Exhibition Number

No. 18 SATURDAY, OCTOBER 7, 1922 Price 3d

CONTENTS



A SIMPLE TYPE OF FRAME AERIAL

CONTENTS

Amateur Wireless and Electrics

No. 18 October 7, 1922

THE MINER'S S.O.S.

How Entombed Miners Can Signal Their Whereabouts :: Wireless in Life-saving

THE use of wireless as a means of saving life in the mine has received little attention yet in the minds of those who are busy developing the science; nevertheless it would be of great value in reducing the appalling death roll in the coal industry of this country.

The catastrophe in a Cumberland colliery recalls an experience in France during the war which was very significant of the possibilities of wireless communication in this direction.

A party of British mining engineers engaged in detecting enemy mining operations suddenly found themselves entombed by the explosion of one of the objects of their quest. The working behind them was blocked by an impenetrable wall of fallen earth. They were hundreds of yards out beneath no-man's land, completely cut off, it seemed, and without hope of rescue.

One of the party had in his possession a portable spark-transmitting set of the army field pattern. It had been used experimentally below the ground, though for what purpose the writer cannot quite remember. As a last resource it was decided to "broadcast" a message on this, and it was done with but little hope of response.

To the intense relief and surprise of the entombed engineers a reply was almost immediately received. The message had been clearly heard and read by an operator in an aeroplane which was passing at a high altitude at the time.

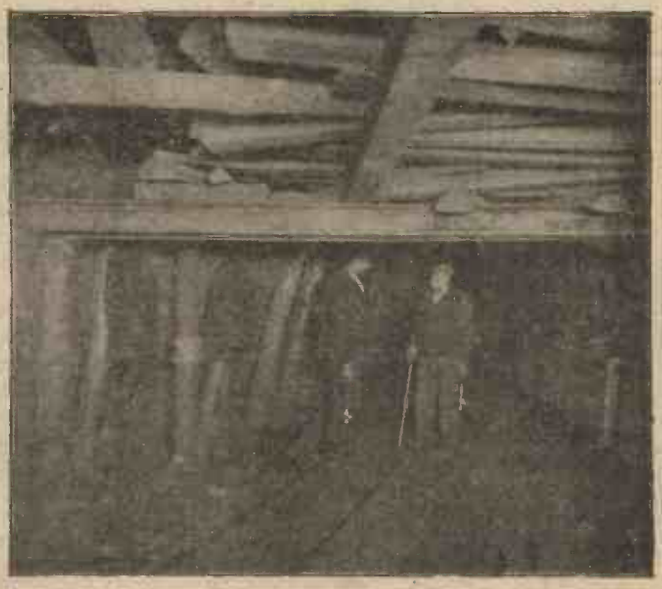
It was re-transmitted from the aeroplane to a land station, whence help was quickly sent to the trapped men, all of whom were rescued.

This remarkable experience was by no means a freak result in wireless reception.

Experiments were carried out a short time ago by a small party of Birmingham amateurs, the results of which suggest that a new and fascinating field for research awaits experimenters in this direction.

The scene of their tests was the Baggeridge Colliery, near Willenhall, South Staffs, and with the assistance of the chief electrical engineer of the pit-head staff the experiments were made of a very comprehensive nature. The Baggeridge Colliery was particularly suitable, for the main shaft is nearly 700 yards deep, one of the deepest in the country. A special permit, by the way, had to be obtained from the Postmaster-General for the underground transmissions.

The apparatus used was quite of the usual type. The receiving set was a 3-valve reaction circuit with one rectifier valve and one low-frequency amplifier. An aerial was made by suspending a 40-ft. length of copper wire from a point on the steel hoisting gear above the shaft, about 100 ft. high, to an adjacent railway bridge. The earth was made by taking a wire to one of the rails in the permanent way and clamping it there. As a preliminary test for the aerial the experimenters listened-in and were gratified to hear Bordeaux, whose signals were so loud as to be audible with the 'phone 6 ft. away.



Photograph that Illustrates the Need of Signalling Arrangements that will not be Affected by Roof Falls and Explosions.

The transmitting set was of the usual portable type and embodied only one feature "out of the ordinary." About this, at present, it is not permissible to write anything. The valves were operated with a plate voltage of 180. The set was installed first in the cage, and it is interesting to note that this was of all-steel construction. An aerial was made by winding copper wire lattice-wise across the roof, care being taken to insulate it well from the steel.

For some considerable distance down the shaft steel supporting-girders had been built in, and it was expected that these, together with the steel of the cage, would have a bad screening effect upon the transmission.

Transmission was commenced while the cage slowly descended from the top, and it was quickly found that there was an appreciable amount of screening, making the signals weak and "chirrupy." Soon, however, they grew stronger, and when the cage was about half-way down and well past the steel girders, signals reached their maximum strength, which was easily readable. This was maintained until the cage approached the bottom, where there was more steel work. Here they commenced rapidly to fade, and when bottom was reached, became practically negligible.

Accordingly the transmitting set was taken out and set up alongside. The aerial was slung between two pit-props, and the earth made by laying a length of cable along the ground. This arrangement led to no improvement, and the set was conveyed for several hundred yards along the workings. It was set up at a point directly beneath the engine-house, which would, of course, have a screening effect, and the distance, measured transversely through solid earth, was nearly three-quarters of a mile from the receiving set. A new aerial was 90 ft. of cable stretched along the ground.

Transmission of Morse code was received with wonderful strength above, every signal being clearly readable. Thus encouraged, the experimenters attempted telephony transmission. This was received fairly loudly, the carrier wave being very strong. Articulation was, however, indistinct, only a few words being distinguishable; and no amount of manipulation in the receiver brought any improvement.

It was particularly noticeable in transmitting that the high-tension current was susceptible to heavy leakage into the surrounding air, a fact which was responsible for deterioration in signal strength. This curious phenomenon was due probably to the presence in the atmosphere of heavy carbon elements, which, like metal, would have an extensive screening effect. Despite this, however, the results were remarkable and proved that wireless communication in the mine presents no insuperable difficulties, and has at least one definite advantage over the ordinary telephone—the absence of intervening wires, which in the event of a disaster are easily destroyed.

It would not be costly to install, and by its means rescuers could be acquainted immediately with the exact position to which their efforts should be directed, and by the saving of time loss of life might be avoided.

What is needed is a cheap, fool-proof set which will transmit telephony efficiently over short ranges without necessitating skilful manipulation. It ought not to be difficult to produce such a set, which could be standardised. L. B. P.

The B.T.H. Portable Receiver

An Advanced Type of Apparatus with Very Long Range

IN the Exhibition pages of last week's issue reference was made to a portable receiver of a most advanced type and for which some special claims are made. We are now enabled to give some constructive details of this receiver which is the production of the British Thomson-Houston Co., Ltd., of Rugby. The photograph (Fig. 1) shows the receiver in conjunction with a 2-valve amplifier and loud speaker, but of course it may be used as an entirely self-contained unit.

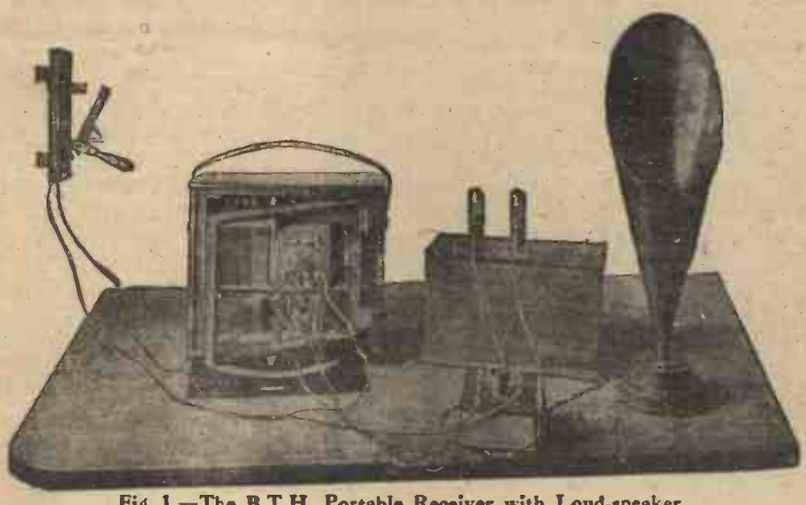


Fig. 1.—The B.T.H. Portable Receiver with Loud-speaker.

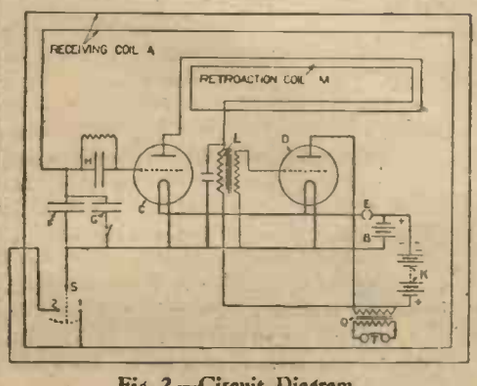


Fig 2.—Circuit Diagram.

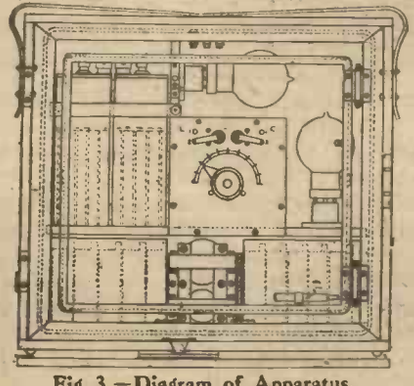


Fig. 3.—Diagram of Apparatus.

The entire apparatus is contained in a polished wood case measuring about 13 in. by 14 in. by 5 in., and weighing under 20 lb. complete. The cover, upon being opened, can be lifted off its hinges, and has fixed to it a central pivot. The case is fitted with a corresponding socket in the base which fits over the pivot and so allows the whole set to be turned round a vertical axis to any desired position. A pointer, hinged to the base of the case, indicates on the circular scale the direction from which the signals come.

A receiving coil, adjustable condenser, two valves, accumulator for heating the valve filaments, dry cells for the telephone circuits, two small transformers, and a hinged frame which carries a second coil are contained in the case.

In use the case is set upon the pivot and the telephone connections made. A plug is inserted in a socket, when the filaments of the valves light up. The case is then rotated on its pivot until the pointer indicates on the compass scale the direction of the station it is desired to hear. The condenser is then turned until its pointer indicates the wave-length of the desired station as shown on tabulated data supplied, and the hinged coil is moved outwards until the station is heard.

The Apparatus in Use

Diagrams of the parts and connections of the instruments are shown in Figs. 2 and 3. The receiving coil A, which is acted upon by the passing waves, is wound on a frame surrounding the apparatus, there being an air space between the coil and outer case. An accumulator B, of an unspillable type, heats the filaments of the two 3-electrode valves C and D when the plug is inserted at E. A battery K provides an E.M.F. for the plate circuits of these two valves.

The receiving coil is tuned by means of the condensers F and G, the latter being inserted for high wave-lengths, with switch S on contact 2. A small capacity condenser H, shunted with a high resistance, enables the high-frequency E.M.F. generated by the coil A to charge the grid of valve C negatively. The detecting valve C receives pulses of high-frequency E.M.F. from the receiving coil and transforms them into low-frequency pulses passing to transformer L, which in turn transforms this low-frequency E.M.F. up to a suitable value to apply to the amplifying valve D, where it is amplified and transmitted to the telephone transformer Q. The telephone receiver T is connected to the secondary of this transformer.

The hinged reaction coil M enables detector C to maintain self-oscillation by reaction on coil A. By adjusting the amount of this reaction, when moving M in or out, the best conditions of oscillation and loudest signals are obtained.

Rome, Nauen and Lyons can easily be heard without the use of an aerial.

All With a Single Valve!

Unit Cell of the Wet Type

I HAD not attended many meetings of our wireless association before I discovered that whenever there was a lull in the general conversation the chairman would say "Anything new, Mr. Bateman?" And it was generally found that Mr. Bateman had, in the course of his experiments, made a discovery of some sort. He was anything but garrulous, but he was extremely interesting. His reticence arose, too, not from any desire to keep his discoveries to himself, but from a modesty of which he obviously found it hard to divest himself. I began to pay considerable attention to Mr. Bateman. His results with a single valve, be it noted, were remarkable, so remarkable that I felt I should like to see this set in operation. The owner was agreeable, and at six o'clock one windy and rainy Tuesday evening I found my way to Cadman, a little village about nine miles west of Southampton, where Mr. Bateman lives.

The Apparatus

I had scarcely arrived when I was invited to listen to F L's evening weather report and music. The clarity and volume of sound were quite astonishing, every word and note being clearly heard. Between the time that F L broke off till seven p.m., when we were due to hear 2 I L, a local amateur, I was at liberty to examine the apparatus. I may mention here that Mr. Bateman, then serving in the Royal Engineers, lost his right hand in 1914. Knowing this, I was far from being prepared for the really exquisite winding of his basket coils and the generally ingenious way in which he had made commonplace things serve his turn. The coil-holder, working on the hinge principle, was made of stout wood well waxed; the coils were hung on brass nails —in fact, on one of the three coil-holders an old gramophone needle served as the suspending medium!

I noticed, too, a most ingenious method of rapid fixture of various coils. The ends of the wires of each coil were attached to a stout metal washer. The coil-holder was provided with that brass- or copper-type of spring in which the connecting arms of a tumbler switch rest, or those used for fuses. The washers were conveniently inserted, and almost instantaneous attachment was the result.

The method of fine tuning for F L was entirely novel. The normal autodyne circuit was employed, but on the coil-holder arm next the A.T.I. was mounted a circular metal disc about the same size as the basket coil. This disc was merely suspended to the arm, and otherwise had no connections whatsoever. By bringing this metal disc nearer to or farther from the A.T.I. coil remarkably fine tuning was effected. Mr. Bateman attributes this to a species of magnetic refraction, but has a sufficiently open mind to accept other explanation.

Unorthodox Methods

And for the apparatus itself and taken as a whole, there was nothing about it that was ordinary. There was not an inch of ebonite throughout the set. The telephone condenser was made of two pieces of zinc separated by paraffin-waxed paper. The tubular condensers, both A.T.C. and reaction, were made of test tubes and a wooden slider with a maximum capacity of .0003. There were no variable plate condensers at all. The valve was a Dutch one, purchased for 8s. 6d. The H.T. battery consisted of ninepenny dry cells connected in series, and the aerial of twelve strands of 28 d.c.c. stranded together. The far end was 60 ft. high, attached somewhat precariously to a pole sticking out of an oak tree. The height of the lead-in end was about 25 ft., and the earth consisted of a small-gauge wire attached to a metal plate thrown down the well.

The only things one could definitely

A Single-valve Receiver.

associate with wireless telegraphy were the telephones, which were Brown's best, with a total resistance of 8,000 ohms and adjustable diaphragms. Mr. Bateman winds his coils with 28 d.c.c. on bicycle spokes. The coils when complete are placed in the oven, still on the spokes, and baked till the characteristic smell of shellac is noticed. They are then extracted and the spokes removed. The result is a peculiarly effective and substantial type of coil. By the way, Mr. Bateman, when winding these baskets, instead of missing one spoke in the ordinary way, misses two. He is thus able to get twice the amount of winding on the same former, a tip worth mentioning.

2M T.

It was now time for us to listen to the local amateur. He was tuned in punctually on time, and reception was almost incredibly good. And then we passed at eight o'clock to the test of the evening — 2M T. Let me say at once that was so clear that every word of the transmitter's voice was clearly audible. Every word could have been logged with ease, and not a note was missed of the music. Now think of it! Cadman is rather over a hundred miles from Writtle; Mr. Bateman has lost his right hand; his whole apparatus, with the exception of the essentials of 'phones, valve, accumulator and high-tension battery, is home-made; he has but the single valve, and yet he can get these stations, and get them as many with multivalve sets do not. And he *has* got the Dutch concert on Sunday afternoons.

An Amateur

You will perhaps say, "He is an expert." He is; but an amateur expert whose wireless experience is a matter of a few months. Mr. Bateman is employed in Southampton during the day, so he has only his after-work hours and holidays to spend on his hobby. Think where he is; try and conjure up from this very imperfect description of a set lacking in almost everything that the majority of us are wont to regard as essentials; think again of these more than remarkable results.

That's what *can* be done with a single valve!

WALTER MEADE.

SLATE has good insulating qualities, can be cut with a carpenter's saw, and is drilled as easily as iron. It may be secured to a cabinet containing radio instruments in the same way as any of the other panel materials. The common grade school slate that can be purchased cheaply may be used with good results.—*Radio Digest.*

Variometers: Theory and Construction

WHEN receiving either spark, C.W. or telephony on crystals or valves maximum signals result when the capacity across the receiving or aerial coil is as small as possible. Crystals and valves are potential-operated devices, that is, voltage operated. Energy or power = $\frac{1}{2} K V^2$, where K = capacity, V = voltage, therefore the potential across the valve or crystal for a given signal will be three times as large, provided the capacity can be decreased nine times. The signal will be more than three times as strong because the efficiency of rectification increases as the voltage is increased up to a certain point.

To get maximum signals it is necessary to keep the capacity across the tuning coil as low as possible and do without a condenser. There will still be the self-capacity of the windings, but no added capacity.

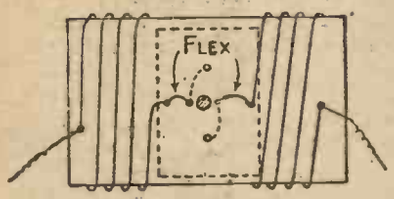


Fig. 1.—Details of Connections.

The most efficient method of varying the wave-length is by a variometer. A variometer consists of two inductance coils connected in series electrically, but they can be magnetically coupled in opposition or in the same direction. The inductance can thus be varied continuously from the difference between the two inductances to twice the sum of the two. If the two inductances are equal, it is from L − L = O to (L + L) × 2 = 4 L, where L stands for inductance.

The variometer about to be described is easy to construct and will give very good results.

Two formers will be required, of sizes to be decided by the wave-lengths it is desired to receive.

If the outside former is 6 in. in diameter and the inside former is 5 in. in diameter, the length of the inside one cannot be longer than $\sqrt{6^2 - 5^2}$, that is $\sqrt{36 - 25} = \sqrt{11}$ = about 3⅓ in., otherwise it will not turn. Any diameter of former can be used if the following be acted upon.

The length of the inside former must be a little less than the square root of the difference between the diameter of the outside former squared minus the squared diameter of the inside former.

The number of turns on either former will depend upon the minimum and maximum wave-lengths it is desired to receive. If the range desired is from 2,000 to 3,000, then the inside former will only have about one-third the length of wire on the outside one. If the range desired is from the natural wave-length of the aerial, say 200 metres up to 500 metres, then the two coils must be equal, so that L − L will equal O.

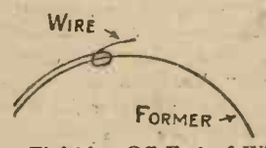


Fig. 2.—Finishing Off End of Winding.

The inductance of the two coils can be made about equal if the length of wire on both formers is equal; the length of wire on the outside former is $\pi d N$, where π = 3.1416, d = diameter of former, and N = number of turns on former.

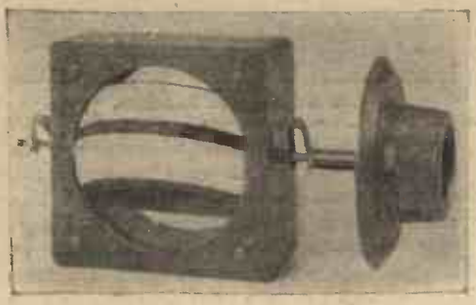
As the inside diameter is small, N must be larger to make the length of wire the same.

The relation between turns outside and turns inside will be $\frac{(\pi d) \text{ outside}}{(\pi d) \text{ inside}} \times$ turns outside = N inside, or $\frac{(\pi dN) \text{ outside}}{(\pi d) \text{ inside}} =$ N inside.

To get more turns inside than outside, either wind with thinner wire inside or have a longer former inside.

A drawback to a simple home-made variometer is that it is often difficult to connect the movable and fixed windings together. This difficulty can be overcome by the method shown in Fig. 1.

The outside former is wound in two halves, sufficient distance being allowed between for the width of the spindle. Finish off the four ends of the outside former and the two ends on the inside one, as shown in Fig. 2, to prevent the coil unwinding. If the holes are slightly larger than the wire and shellac is dropped in the insulation will be sufficient.


Variometer with Shaped Formers.

A soft, flexible rubber-covered flex is then fastened between the two inner ends of the outside former and the two ends of the inner coil, but the holes through the the two formers must be copied as shown in Figs. 1 and 3; the rubber flex passes through both formers.

With this method of connecting there is only about ¼ in. difference between the outside and inside former holes when at right angles or when parallel to each other, therefore the leads do not become entangled or rub on the turns. The two ends of the outside former are now the terminals, as the inside coil has been added in the middle of the outside one.

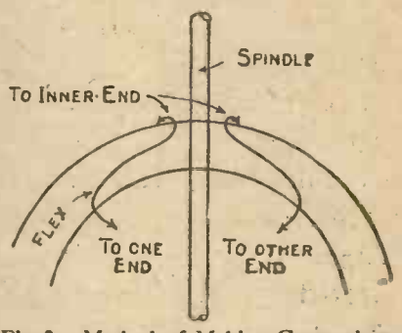


Fig. 3.—Method of Making Connections.

For mounting, secure the outside former to the ebonite or wooden panel as shown in Fig. 4, or else mount it on two wooden supports.

Place a pointer on the spindle so that it cannot pass the supporting terminal heads; this will prevent the inner coil turning through more than 180 deg.

If a wooden panel, the wires should be connected to terminals on an ebonite bush. The spindle can be a piece of thin round wood projecting 6 in. or 7 in. so that the capacity of the hand will not have any effect when tuning. It should move just freely, the inside former being fastened to it with wax or something similar.

For use as a variable inductance in the aerial circuit the wire should be about No. 20 or 22 gauge, particularly for short waves, but on account of bulk it will be necessary to use No. 26 for long waves. The wire can be either enamelled, silk-covered, or, if shellacked afterwards, cotton-covered. Using a variometer as a tuned reactance (without coupling) No. 30 wire can be used. In all cases, if it is possible, space the wires apart a little, say ten turns to an inch instead of twenty; it will decrease the self-capacity and increase the efficiency. The circuits will usually oscillate without coupling if the reaction coil has exactly the same wave-length as the aerial circuit. If fitting a high-frequency valve, good results will be

(Continued on page 391)

The World listens in on MULLARD PHONES

Specially made for the reception of wireless broadcasting, Mullard 'phones are thoroughly well made and fit comfortably to the head, etc.

British Manufacture

The two high resistance ear-pieces (4,000 ohms total) are flexibly attached to the fully adjustable, double head bands.

The set is nicely finished in nickel-plate and supplied complete with standard flexible cords.

Send the coupon to-day to secure immediate delivery.

These telephones are made by the makers of the famous ORA valve and Mullard valve accessories.

MULLARD "ORA" VALVES

We hope to get a greatly increased output of these famous valves at our large new factory

Meanwhile - - - *ORDER AT ONCE*

Mullard Radio Valve Co. Ltd.

45, Nightingale Lane, S.W.12.

Contractors to H.M. Admiralty, War Office, Royal Air Force & Post Office.

Telephone:	Codes:	Telegrams:
Battersea 1068	ABC (5 Ed) Bentley's	'Radiovalve Hammer, Loncen.

Trade Mark: RADIO MULLARD VALVE

Please send me post free

Quantity	Description	Price
.....	Telephone Head Sets	30/- per set
.....	ORA Valves	15/- each
.....	Grid A Resistances	5/- "
.....	Anode A or B Resistances	5/- "
.....	BA Condensers, .0003 mfd.	2/6 "
.....	Combined Resistance and Condenser ...	7/6 "
.....	Valve Bases with Terminals ...	5/- "
.....	Valve Sockets ...	1/3 "
.....	Terminal Clips ...	9d. per pair

Name and Address .....

To the MULLARD RADIO VALVE CO. LTD., 45, Nightingale Lane, London, S.W.12.

I enclose (Cheque, Money Order, P.O.) value ..... to cover the cost.

Name of usual Wireless Dealer .....

SEND THIS TO-DAY

BEAVER

HEADPHONES

4000 Ohms total Resistance. Double Headband, each Receiver Detachable Instantaneously. Guaranteed highly efficient ; Complete with Cord and ready for use.

Every pair tested and guaranteed

25/- POST FREE

COMPLETE SETS

No. 1 "BEAVER" CRYSTAL SET *Unassembled*

Inductance Coil 7 × 3½, wound 24 Enamelled Wire. Blocking Condenser ·0003 between Ebonite Sheets. Crystal Detector, Complete with Special Crystal. 1 Brass Rod Cut and Drilled. Slider and Plunger. 1 Pr. Wooden Ends. Wooden Base 10 × 9. 3 Reel Insulators.

20/- POST FREE

No. 2 "BEAVER" CRYSTAL SET *Unassembled*

Inductance Coil 9× 3½, wound 24 Enamelled Wire. Blocking Condenser, capacity ·0002 between Ebonite Sheets. Crystal Detector. 2 Brass Rods Cut and Drilled to fit. All Necessary Terminals. Two End Boards. Wooden Base 15 × 12. 100 ft. 7/22 Stranded Aerial Wire (Best Quality). 6 Reel Insulators. 2 Sliders and Plungers. Ivorine Tabs, Earth, 'Phone and Aerial.

25/- POST FREE

No. 3 "BEAVER" CRYSTAL SET *Assembled ready for use*

Splendid Crystal Detector fitted with Special Crystal, and mounted on Ebonite Base. Blocking Condenser ·0005, mounted between Ebonite. Inductance Tube 12 in. × 4 in., wound 24 gauge Enamelled Wire, Waxed Interior to prevent sweating. Fitted 2 Brass Rods complete with 2 Sliders and Plungers. All necessary Terminals marked with Ivorine Tabs. The whole mounted on Solid Mahogany.

27/6 POST FREE Complete with Splendid Tested and Guaranteed 4000 ohm 'Phones, **50/-**

No. 4 "BEAVER" CRYSTAL SET *Unassembled*

Inductance Coil, 12 × 4, wound 23 gauge Bronzed Wire, Beaver Variable Condenser ·0005, as sold for 10/-. Crystal Detector complete with Special Crystal. 2 Brass Rods Cut and Drilled to fit. 6 Splendid Terminals. 1 pr. End Pieces of Mahogany, Solid Varnished Mahogany Base. 100 ft. 7/22 Stranded Aerial Wire. 6 Reel Insulators. One 6 in. or 9 in. Leading-in Tube of Solid Ebonite and Brass. Ivorine Tabs for Terminals. 2 Sliders and Plungers.

35/- POST FREE Complete with Splendid Tested and Guaranteed 4000ohm 'Phones **57/6**

Ask your Wireless Dealer for these sets ; if he does not stock them, write direct to :—

BEAVER ELECTRICAL SUPPLY CO.,

Telephone : GERRARD 1900 **109, REGENT STREET, LONDON, W.1.**

Special Terms to Trade. All Cheques and Postal Orders to be crossed London Joint City and Midland Bank.

VARIOMETERS (*continued from page* 388)

obtained with the reactance-capacity coupling, using a variometer as tuned reactance.

To prepare the formers, dry them thoroughly in a moderately warm oven, then shellac them, drying again slowly in the oven; wind and reshellac them, then

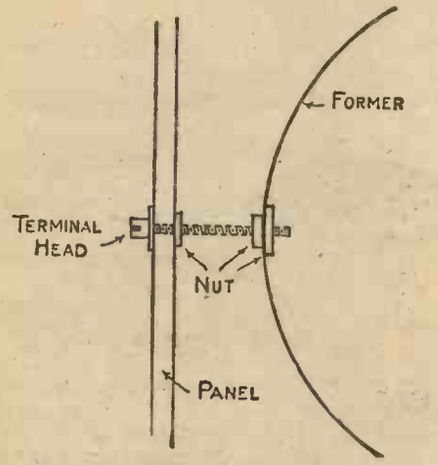


Fig. 4.—Method of Mounting.

dry very slowly so as not to shrink the formers.

The following tables are a rough guide for sizes of former and wire for different wave-lengths.

	FORMER				
	Turns	*Wire*	*Diameter*	*Length*	*Wavelength*
Outside	(spaced) 40	No. 20	4 in.	5 in.	200—700
Inside	40	No. 22	3 in.	2½ in.	
Outside	(spaced 200	No. 26	6 in.	10 in.	2000—2800
Inside	90	No. 26	4½ in.	4 in.	

List of wires and weights in oz. (to nearest oz.) sufficient to fill 6 in. of various size formers.

If Closely Wound	*Enamelled Wire*						
No. of Turns to 6 in.	166	215	288	335	415	485	550
Gauge of Wire ...	20	22	24	25	28	30	32
Diameter of Former 4 in.	7 oz.	7 oz.	6 oz.	5 oz.	5 oz.	4 oz.	3 oz.
5 in.	9 ,,	8 ,,	8 ,,	6 ,,	6 ,,	5 ,,	4 ,,
6 in.	11 ,,	10 ,,	9 ,,	8 ,,	8 ,,	6 ,,	5 ,,
7 in.	13 ,,	11 ,,	11 ,,	9 ,,	9 ,,	7 ,,	5 ,,
8 in.	14 ,,	14 ,,	12 ,,	10 ,,	10 ,,	8 ,,	6 ,,

G. H. W.

"Working Diagrams of Valve Amplifying Receiver Circuits," a very valuable little book already in its fourth edition, has been received from Mr. H. W. Sullivan, Winchester House, Old Broad Street, London, E.C.2, the price being 1s. The book contains about thirty-three diagrams of different circuits, and these circuits can be so modified as to avoid any reactance on coupling direct to the aerial. Diagrams explain how to vary the number of valves in circuit without unduly disturbing the connections, and how to add, at will, a note-magnifying valve to most of the circuits shown. The final plate shows various components in two ways, as they are and in symbolic form.

Meaning of Electrical Units

Some Introductory Remarks

THERE will doubtless be many readers to whom it has occurred to wonder why so many different units are constantly being referred to, why this array of ohms, volts, henrys and farads. A few words on their origin and meaning will therefore be useful.

Indiscrimination

The tendency of the "lay mind" is to regard these units as so many synonymous terms to be used indiscriminately as the memory serves, or as the avoidance of repetition of expression requires. This was well illustrated lately when a daily newspaper announced that a large new power concern in America was to use "the largest current ever—1,000,000 volts"—apparently missing the point that the reason for attempting to use this extremely high voltage for transmission purposes was to reduce the current in the line as much as possible.

When we buy a tennis ball we usually judge it by the price and our knowledge of the previous performance of the brand. If we are particular we may pinch it or bounce it, but beyond that we do not trouble, for we know that the chances are overwhelmingly in favour of it giving satisfaction. After a period of service, depending for length on whether we play at Wimbledon or in a public park, we decide, likewise by its appearance, that its useful life is over. And so it is with most commodities in familiar everyday use. The superficial test of appearance, together with, perhaps, measurement on the household scales or by the foot-rule, will give us a sufficient idea of whether anything is lacking.

Non-apparent Qualities

But when we begin to deal with things electrical we must be prepared to narrow down our ideas of what will and what will not give satisfaction to infinitely smaller limits. So small is the difference between, say, an inductance which will just "tune in" certain signals which we wish to hear and one which is useless to us, that we must be able to adjust its dimensions one turn at a time, and if we wish to convey to others what the amount of inductance actually is we shall have to measure it in millionths of a henry. In addition, of course, we are usually dealing in qualities which are not apparent to the naked eye. For example, one dry cell may look just like another, may have cost as much and may have been made at the same time, yet the electromotive force it is capable of exerting may, through some defect in the manufacture or subsequent ill-use, have dropped till the cell is an actual hindrance in the plate circuit of a valve instead of a useful unit of the battery. Our readiest means of rendering this apparent is to test the cell with a suitable instrument, and in order to compare one cell with another and estimate its value we calibrate that instrument in suitable and mutually understood units. Thus we are enabled to say that it has an electromotive force of so many volts, and immediately to realise from that, by our previous experience, of course, whether it will give satisfactory service or not.

Requirements

The growth of the table of units at present in use in electrical measurements, although it has been so much more rapid, resembles that of the "tables" we learnt to be so fond of in our youth. As the existence of some new property of matter became evident the desirability of comparing it quantitatively became important, and a suitable unit was devised and christened.

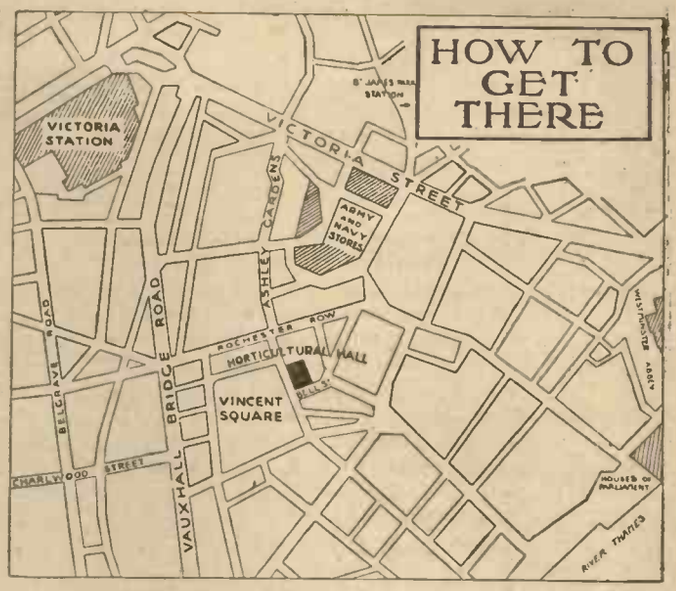
It is related of a certain English king that upon being informed that trade was becoming impossible because of the multitude of different measuring rods which were being used to estimate length, he gave instructions that the length of the royal foot was in future to be the standard. Although somewhat arbitrary, this method for dealing with what has frequently since that day proved to be a knotty point, had in its favour the fact that it was a royal decree and in no way open to question.

The requirements of electrical science have increased so rapidly that in some cases different workers suggested and used different names for the same unit, but the uncertainty which this threatened to create was satisfactorily dealt with by the appointment of an international committee of scientific men who drew up a list of units with their definitions, and instituted a system of symbols to represent them. We propose to discuss those quantities which are of greatest use to the wireless experimenter, to state the units in which they are measured, and to give a list of the accepted symbols. All such units are ultimately based on the standards of length, mass and time, and may be expressed in terms of these fundamental conceptions. In England the fundamental units are the foot, the pound and the second, while on the Continent, and almost universally among scientists, the centimetre, the gramme and the second are used. Much confusion would be avoided if the latter were made the legal standards in England.

SIGMA.

(*To be continued*)

The All-British Wireless Exhibition



Closes on
Saturday, October 7th.

10 a.m. to 10 p.m.

Sir Henry Norman's Opening Speech

THE first All-British Wireless Exhibition and Convention was opened at the Royal Horticultural Hall, Vincent Square, Westminster, London, S.W.1, on Saturday, September 30, by Sir Henry Norman, who, as chairman of the Imperial Wireless Telegraphy Committee, and as a member of the Post Office Telegraph Organisation Committee and of the British Association Committee of Radio Telegraphic Investigation, was able, at the conclusion of the inaugural lunch, to make a speech of first-class importance. We present here its main points which will be found to have especial interest in their relation to broadcasting.

Sir Henry congratulated the organisers on their system of having stands of uniform design which gave the exhibition a neat, businesslike appearance. Wireless-telephony would be an integral part of our social life in the very early future, and he spoke of broadcasting being a commonplace in a month or two.

The hold-up of broadcasting had been blamed to the Postmaster-General and to the companies, but this was a complete misapprehension. There had not been an hour's avoidable delay in bringing broadcasting into being. No less than twenty firms had applied for permission to broadcast—big firms, little firms, old firms, new firms—and it had been a delicate and difficult task to co-ordinate all the interests concerned. What delay there had been was all to the advantage of the public. He thought they had now arranged an admirable scheme. A broadcasting company had been formed on lines approved by the Postmaster-General. Its capital of £100,000 had been guaranteed by six companies (see p. 334 of AMATEUR WIRELESS, dated September 23), and any genuine British firm could join by taking one share and by paying 10 per cent. of its sale price to the company. (In another part of his speech Sir Henry announced that users of Marconi patents would pay the Marconi company a royalty of 10 per cent.)

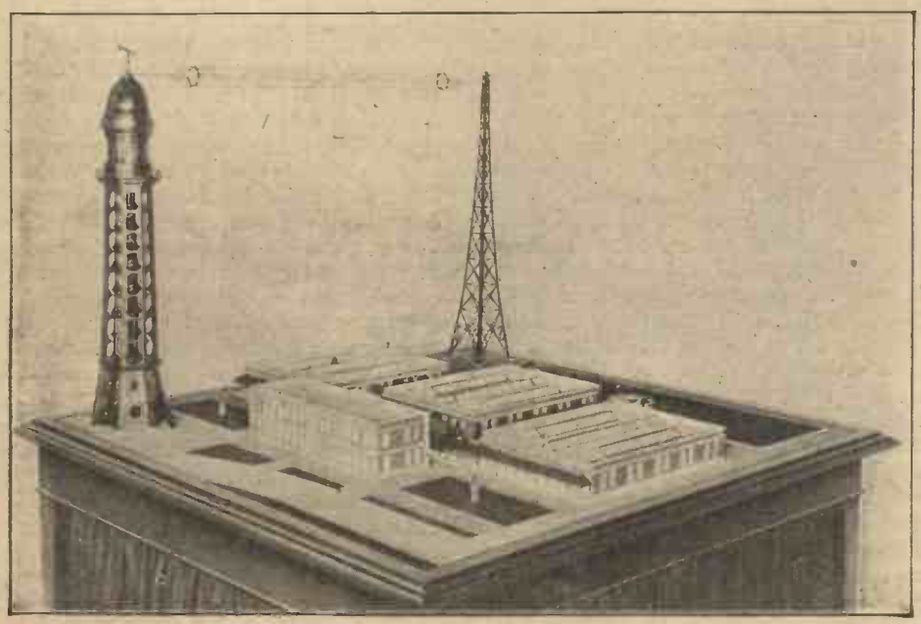
A broadcasting receiving licence would be obtainable in due course at any post office.

The cost of broadcasting was chiefly that of the high-class professional programme—the very best of its kind in the world—which the broadcasting company regarded as the very foundation of success of the whole scheme. Broadcasting would begin within a week or two from Marconi House and Trafford Park, the remaining six broadcasting stations which had been arranged for coming into operation as soon as ready. The desirability of increasing the power of the broadcasting stations from 1½ kilowatts to 2½ and 3 kilowatts was being seriously considered. The broadcasting of news was only possible with amicable accord between the Broadcasting Company and the news agencies and newspapers.

He expected that no less than 500,000 receiving sets would be wanted in this country and that great developments with regard to amplification might be expected.

Sir Henry closed a notable speech with the hope that broadcasting would soon make it possible for His Majesty the King to address simultaneously the Parliaments of the Empire.

Mr. F. Hope-Jones, the chairman of the Wireless Society of London, in moving a vote of thanks to the chairman, said that Sir Henry's statement with regard to broadcasting was definite and authoritative, that it had silenced our doubts and removed our difficulties.



Scale Model of Metropolitan-Vickers Broadcasting Station and Research Department at Trafford Park.

A General Impression of the Exhibition

IN our last issue we gave illustrations and advance particulars of many of the more prominent exhibits. Such a brief interval elapsed between the opening of the exhibition and our going to press that it is impossible for us to present here a complete account of all there is on view, and we propose to content ourselves for this week by giving our readers the result of our impressions gained by a general glance at the exhibition.

We must say at once that the exhibition is good and comprehensive, and it is no exaggeration to say that its chief interest is for the amateur. True, there are a

multitude of sets with prices in the region of a hundred guineas which, from a constructional point of view, the amateur cannot hope to emulate, but there are also studs, knobs, switches, inductances, transformers, condensers and a host of other sundries, and these and the examples of complete apparatus are to the keen amateur the potentials of his receiving set.

For the apparatus shown we have nothing but praise, and it may be said at once that it is distinctly improved compared to that which was on the market within even the last few months. This is particularly the case with those parts which are ordinarily out of sight, and a very cursory examination makes it obvious that makers are now as anxious to show the interiors of their apparatus as the exteriors. This perhaps is the most evident feature of the show.

The next most prominent feature is the elaborateness of the complete receivers combined with the most simple means of control. To-day at the Horticultural Hall there are dozens of receivers of most complicated construction, but which, it is not too much to say, could be efficiently operated by a child. This is all to the good, for it is not to be expected that the average receiver of broadcast will be a wireless expert, though no doubt the amateur will still have his maze of wires.

Feature number three may be said to be the relatively large number of new devices that are exhibited either as component parts or included in the make-up of complete apparatus. It is not proposed to describe any of these here; some have already been described, and others will be featured in later issues. Particular ingenuity is evident in the construction of basket-coil holders.

Mention must be made of one or two exhibits that are a little out of the ordinary run. One of these is the collection of historical apparatus on the Marconi stand, and another is the model of the broadcasting station shortly to start transmitting at Trafford Park, Manchester. The coil machines on the stand of Igranic Electric Co., Ltd., are equally interesting, providing as they do an indication of the progress that the science is making when elaborate constructional plant is being devised. As stated in another column, we are promised broadcasting within the next two weeks, and as an almost continuous programme of concerts has been arranged for the present week, this exhibition may almost be said to mark its inception. Loud-speakers are reproducing the broadcasting in the exhibition hall, but this is a feature in which, frankly, we were most disappointed; we were concerned to think that the impression upon the minds of many thousands of visitors who previously have not heard any broadcasting could not be favourable. We have heard better music and speech, though less noise, on a simple crystal set. The fact is that present-day loud-speakers of the more powerful type leave much to be desired.

The visitors to the show were no less interesting than the exhibits, for they may be deemed to be representative of the present-day wireless enthusiasts. There was the schoolboy and there was the man on the wrong side of sixty, and there were many of the gentler sex too—all apparently very keen on the new science of amateur wireless.

"What to See" *(continued from last week)*

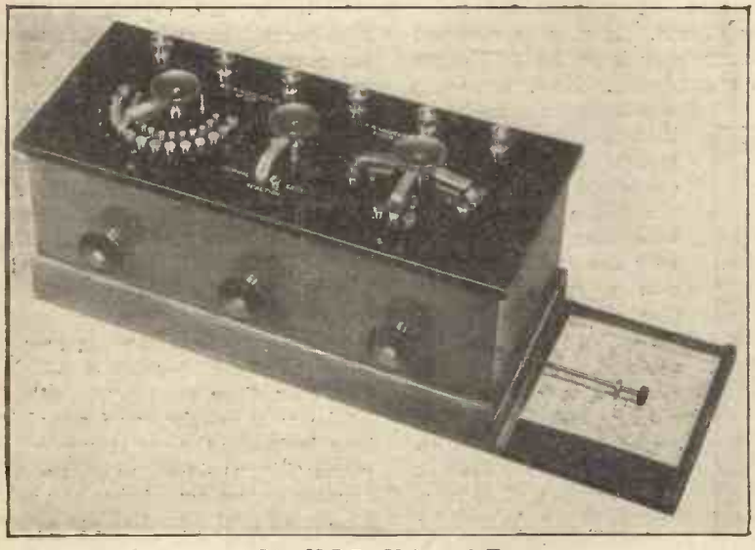
Ex-Government wireless apparatus, a feature on the stand of L. McMichael, Ltd., Providence Place, Kilburn, London, N.W.6. The firm are offering as a prize a B Mark II two-valve detector-amplifier for the best conversion of this particular piece of apparatus. In addition, they are exhibiting a large range of general apparatus. (Stand 38.)

The E.E.C. oscillator, an instrument for reproducing oscillations in a receiving circuit without the use of a reaction coil, a production of the Economic Electric, Ltd., 10, Fitzroy Square, London, W.1. (Stand 51.)

The telephone transmitting set of a capacity of 10-15 watts, on the stand of H. W. Sullivan, of Old Broad Street, London, E.1, which comprises a completely self-contained transmitting set suitable for small range. The exhibits of this firm are of a very varied nature both for transmitting and receiving purposes, and include, of course, the well-known Sullivan patent telephone head-sets. The range of apparatus shown is one of the most extensive on view in the exhibition. (Stand 49.)

The patented inductances, the exhibits of Gambrell Bros., Ltd., Merton Road, London, S.W.18. The special claims made for these inductances are very low effective resistance, low self-capacity, great mechanical strength, and an extensive range of wave-lengths. On this stand are also to be seen a number of broadcast receivers of interesting design. The inductances will be described and illustrated in a later issue. (Stand 47.)

The film entitled "The Audio," which illustrates and describes the operation of the thermionic valve, shown by the Western Electric Co., Ltd., Finsbury Pavement, London, E.C.2. This company is one of the largest engaged in the production of wireless apparatus, in which they have done a vast amount of pioneer work. In this regard it may be mentioned that the experimental apparatus of Dr. Alexander Graham Bell, the inventor of the telephone in the year 1876, was made by them. Their exhibits cover a very wide range, from the simplest crystal receiver to the most elaborate cabinet valve sets, some of which we hope to describe and illustrate in a later issue. Special claims are made for their loud-speaking equipment, in which distortion is said to be a minimum. (Stand 39.)



The H.P.R. Universal Tuner.

Metropolitan-Vickers Crystal Set.

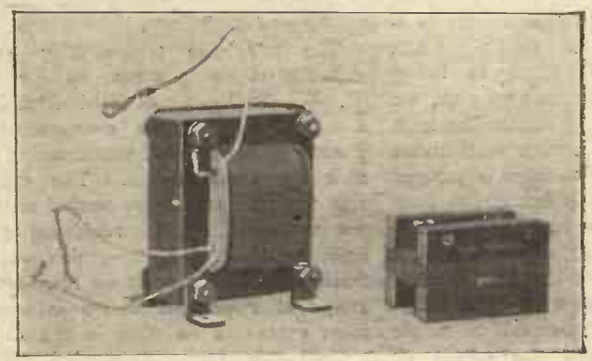


Fig. 1.—Two Patterns of Intervalve Transformer.

Fig. 3.—Method of Bringing Out Wire Between Paper Washers.

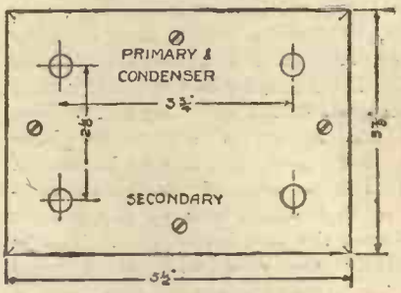


Fig. 5.—Plan of Lid.

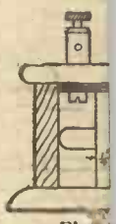


Fig.

THE TELEPHONE TR

IN the single-valve set described in No. 5 of AMATEUR WIRELESS the telephones are connected in series with the high-tension battery in the plate circuit. The negative end of the high-tension battery is connected to the filament which is earthed, as will be observed from the diagram of connections (p. 91). This means that the windings of the telephones are at a potential of about 50 volts above the surrounding objects. It may be assumed that the human body is earthed, although it is a poor conductor. Now, since the windings have to be of high-resistance to get satisfactory results when connected in series with the plate circuit, the wire must necessarily be very fine and the insulation must be thin, so that there is no likelihood of it being strained. The fact that the ears are continually giving off moisture, which finds its way on to the diaphragm, does not assist matters. The telephones being shunted by a condenser does not make any difference.

To overcome the above difficulties a telephone transformer may be used. It consists of an iron core, closed or open, on which is wound two separate coils, well insulated from one another. They may be wound side by side or one over the other. If the telephones are of high-resistance, say 4,000 ohms, the windings may each have the same number of turns, but there is no reason why low-resistance 'phones should not be used, in which case the ratio of the number of turns on primary and secondary should be between 5 and 20 to one.

Of course, in a crystal set there are no high potentials, and therefore no necessity for a transformer except if it is desired to use low-resistance telephones. The amateur should be warned against buying low-resistance telephones simply because they are cheap. The difference in price between new 150-ohm and 4,000-ohm 'phones of a good make will be found to be only about four or five shillings. Of course, if the reader has a good pair of low-resistance 'phones it would certainly pay to make a transformer rather than discard the old ones and get a new pair.

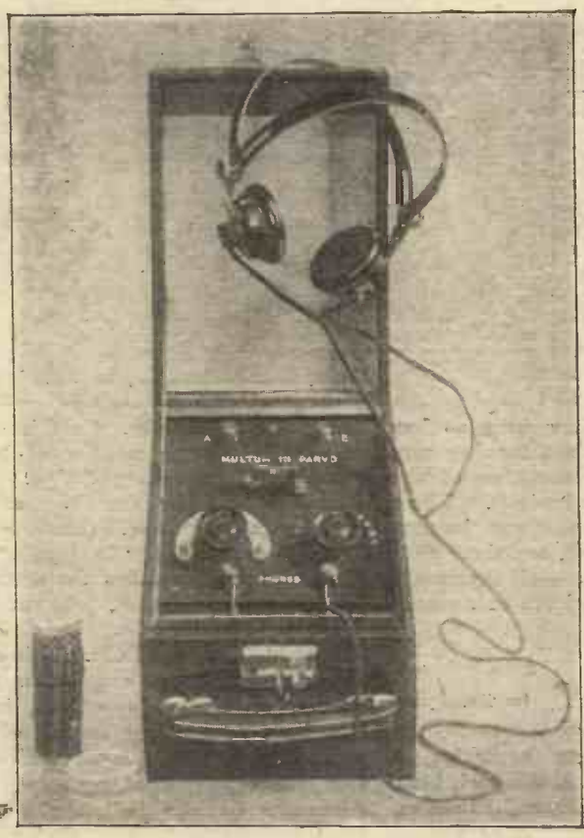
The Iron Core

The most satisfactory form of iron core is undoubtedly the one shown in the photograph (Fig. 1), in which both of the transformers shown are of the intervalve type. The cores of the smaller one are made up from stampings which are difficult to obtain, and not worth the trouble of cutting out.

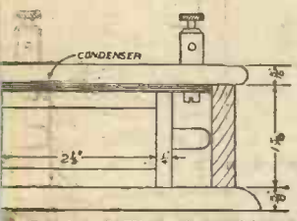
The following notes describe a telephone transformer for a pair of 300-ohm 'phones which was made by the writer. It includes a condenser across the primary, so that there is no need to use an external condenser (see Fig. 2).

The core is made of a bundle of iron wires; about ¼ lb. No. 20 S.W.G. would be ample. The wire is straightened out and cut into 10-in. lengths. The quickest way of straightening it is to cut the wire first into lengths of about 5 ft., grip one end in the vice and the other end in a pair of pliers and jerk it straight, as though one were trying to snap it. This process will take all the bends out. A piece of ½-in. diameter fibre tube 3 in. long should then be obtained and two pieces of ebonite 1½ in. square and ¼ in. thick. Holes ⅛ in. in diameter are to be drilled in the centre of each end, and they are driven over the ends of the tube to make a bobbin. If it is not possible to

PORTABILITY



THE great advantage of the crystal type of receiver is its portability, owing to the fact that no extraneous batteries or accumulators are required, the instrument being complete in itself. The photograph shows the "Multum in parvo" crystal receiver fitted with a leather handle, the whole being no more cumbersome than the average attaché case. The makers are the Consolidated Trading and Manufacturing Co., Ltd., Fulwood Place, London, W.C.2.



—Sectional Elevation of Transformer.

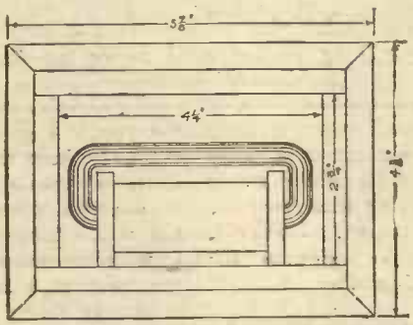


Fig. 6.—Diagram showing Position of Transformer in Case.

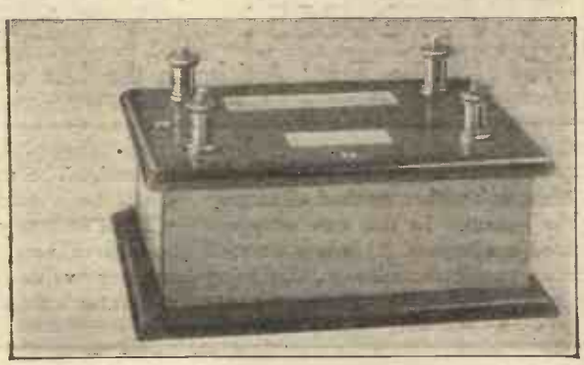


Fig. 2.—A Telephone Transformer Complete.

RANSFORMER

Its Use and Construction

obtain these materials the tube may be made of good drawing-paper wrapped round the bundle of iron wires and well glued.

The bundle should be ⅜ in. in diameter. Bobbin ends of three-ply wood may be used, but it must be remembered that it is much more difficult to make a good job out of makeshift materials than it is out of the proper stuff.

The Windings

The secondary winding is wound first. It should be noted that in a step-down transformer the high-resistance winding will be the primary and the low-resistance the secondary. It is more convenient to wind the secondary on first, as the wire is thicker and there is not so much likelihood of a breakdown when the outer winding is laid on.

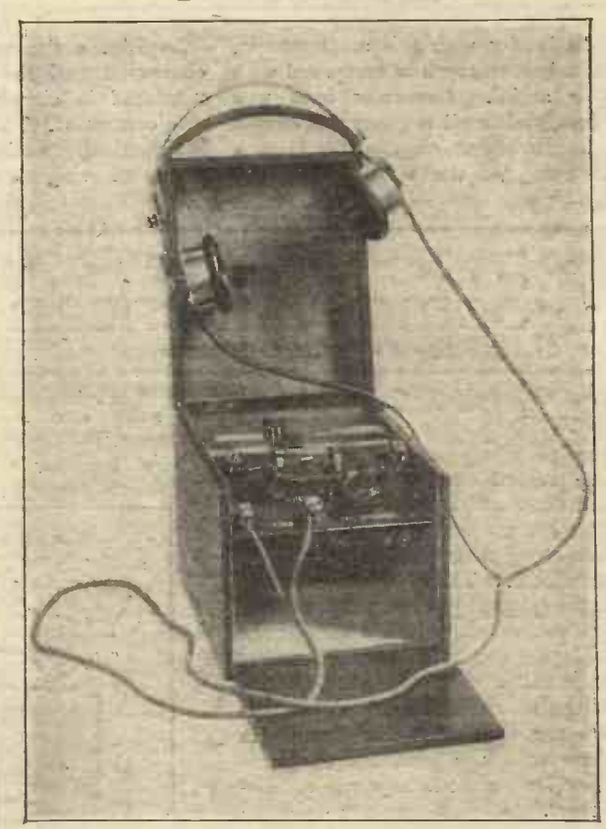
In the writer's case the secondary winding consists of 1 oz. of No. 32 S.W.G. enamelled wire. Single-cotton-covered would do. This makes about 1,000 turns. The ends of the wire are brought out through little holes in the cheeks of the bobbin, and two layers of paraffin-waxed paper are put over the winding. The wax should not be hot enough to smoke, but it should make the paper fizz when it is immersed. The covering round the secondary is well smoothed down with a piece of warm brass strip.

The primary winding consists of about 14,000 turns of No. 42 S.W.G. single-silk-covered wire (weight about 1½ oz.) or 2 oz. of No. 40. The ends of the wire are soldered to pieces of No. 26-gauge wire to make strong leads. About 2 ft. of wire should be used for the inside end. When this has been soldered it should be wound once or twice round the bobbin and then another piece of paper laid on. The end can be brought out through a hole in the cheek of the bobbin or between two cut paper washers, which are slipped on the core and pressed against the cheek as shown in Fig. 3. The wire is then wound on the core evenly and carefully from end to end.

When finished, the end of the wire is joined to a piece of No. 26 as before and the whole covered with a layer of paraffined paper. The coil wires are then placed in position and bent round the sides of the bobbin to overlap. They can either be spread out evenly all round, umbrella fashion, or all kept together; it makes no difference to the final result. If they are bent round all in the same direction, as in the photograph, they can be tied together and bound round with tape to make them tight. The transformer is now complete, and the windings should be tested for continuity. To do this each winding is connected in series with a telephone and a dry cell. When the circuit is made and broken a loud click should be heard in the telephone. Both primary and secondary should be tested this way, and then the insulation between windings is checked. This is done by connecting one lead from the telephone to the cell, the other to an end of the secondary, and the other terminal of the cell to the primary. No noise should now be heard. The condenser, which is connected across the primary, consists of twenty sheets of tinfoil 3 in. by 1½ in. and twenty sheets of thin white paper 2½ in. by 2 in. Typing paper is convenient for this purpose. It is cut up into strips 2 in. wide and soaked in wax. The strips are then hung up to

(*Continued on page* 397)

PORTABILITY



THIS photograph shows another crystal receiver designed for portability, being the well-known "Aerowave" receiver of Henry J. Brewster & Co., 11, Queen Victoria Street, London, E.C.4. The construction is on similar lines to that of the instrument in the opposite illustration. In this case the top and front are made to open as shown, compactness being the keynote.

Wireless: "Wired" and "Piped"—III

The Third Article on the Use of Electric-light Mains and Pipes as Aerials

Other Methods

FIG. 8 shows another method of arranging the circuit. In this case only one of the fixed condensers (L) was connected to the series variable condenser, this being the unearthed side of the main. Signals were much louder with this arrangement, being about half-strength as compared with an outside aerial. Generator hum was slightly less, and in all respects this circuit was an improvement on the last, but a slight lowering of the wave-length was noticed. The variable condenser in series could be operated over its whole range without seriously interfering with reaction, and gave very sharp tuning. However, at any value above its minimum the generator hum increased in strength.

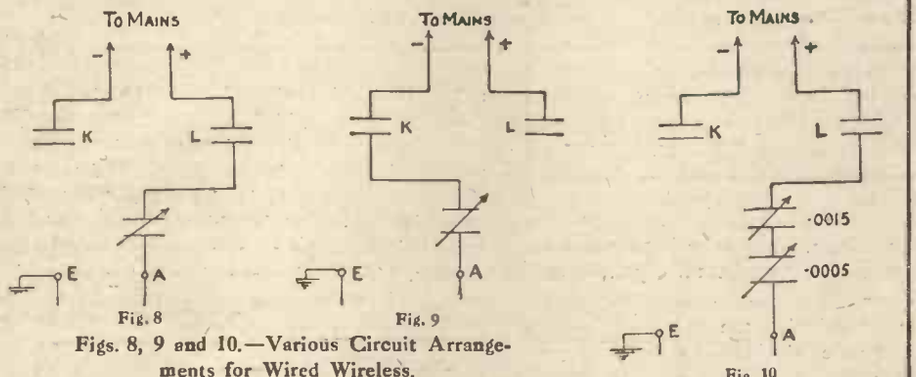


Fig. 8 Fig. 9 Fig. 10

Figs. 8, 9 and 10.—Various Circuit Arrangements for Wired Wireless.

In Fig. 9 the unearthed side was disconnected and the other fixed condenser K placed in circuit with the series variable condenser. This method of connection is practically useless when operating on mains having one side earthed, as generator hum was extremely loud. However, as signals showed a slight increase in strength when compared with Fig. 8, the writer intends to devise some means of reducing generator noises, and to report the result at a later date.

Fig. 10 shows a scheme of connections which produced signals of almost half-strength. In this case the unearthed side of the main was connected through fixed condenser (L) to two series variable condensers of .0015 and .0005 micro-farads, with the usual earth connection to the receiver. Signals were easily tuned in and reaction was easily controlled. In fact, the only way to stop oscillations was to reduce the high tension to about ten volts. The wave-lengths to which given coils would tune were found to be practically the same as with the previous circuits, but it is curious to note that the two series condensers made practically no difference to tuning even when rotated through their whole range. It was found, however, that best reception was obtained when these condensers were set at about their minimum positions; any increase in their value made the generator hum slightly more pronounced and served no useful purpose.

P. T. B.

(To be concluded)

Some American Hints and Tips

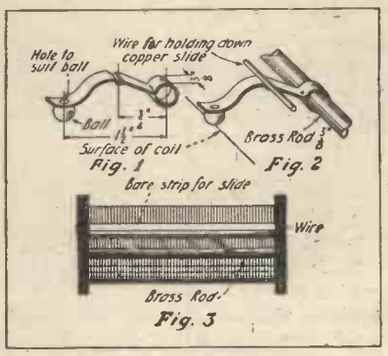
Spider-web Coil Formers

ON the periphery of an old gramophone record find nine equidistant points and draw a line from each point to the centre. With a hack-saw cut slots ¼ in. wide along these lines to about 2 in. from the centre. Then weave the wire between the slotted pieces. By making several coils of varying sizes, a wide range of wave-lengths can be covered. Another way is to mount a multi-tap switch in the centre of the record and bring down taps to it from the winding. The circuits in which these coils are used are the same as those for De Forest honeycomb coils.—*Radio Digest.*

A Tuning Coil Slider

A SIMPLE method of making a tuning coil slider is shown in the accompanying illustrations. The materials required are a round brass rod of any length and about ⅜-in. diameter; one piece of sheet copper 3½ in. by ½ in. of sufficient springiness to suit; one steel ball about ⅜-in. diameter.

First hammer the copper to make it springy, then bend it round the brass rod (see Fig. 1).



Tuning Coil Slider

Fasten a wire along the length of the coil to keep the slider on to the polished surface of the wire, as shown in Fig. 2. Bore a hole in the copper at one end (see Fig. 3) a little smaller than the ball, so that the ball will revolve without slipping through. An insulated handle may be attached to the slide.—*Radio News.*

Insulating Tubing

HAVE you ever been in need of some use for cambric insulating tubing and discovered that there was none at hand? If this happens to you at any time, just hunt up a round shoelace used on ladies' shoes, and you will find that this makes good insulation for small wire. Just push the wire through the centre.—*Radio Digest.*

Fixed Detector Adjustment

IN order to keep a crystal detector in perfect adjustment, drop some hot beeswax around the wire. In practice this has kept the whisker in place for months; it eliminates the necessity of seeking the elusive spot every time the set is used.—*Radio Digest.*

"THE TELEPHONE TRANSFORMER"—(*continued from page* 395)

cool and cut into 3-in. lengths. The condenser is built up to allow ¼ in. space for the paper to overlap the foil. When finished the condenser should be pressed with a hot iron to squeeze out the surplus wax. The iron must not be hot enough to burn the wax or it will lose its insulating properties.

A few words on calculating the capacity of such a condenser may not be out of place here. The effective size of the plates is 2 in. by 1½ in., and there are twenty sheets. This is equivalent to two sheets 2 in. by 15 in., separated by paraffin equal to the thickness of the paper (0.003 in.). Bringing these dimensions to centimetres (2.54 cm. = 1 in.), 30 sq. in. = 60×2.54^2 = 387 sq. cm. Distance apart = $2.54 \times .003 = .0076$ cm.

Now C in micro-farads $= \dfrac{K \times A}{11{,}300{,}000 \times d}$,

where A = area of plate, sq. cm.
d = distance apart.
K = a constant depending on the material.
For air K = 1.
For paraffin K = 2.

The above, therefore, is:

$$\frac{2 \times 387}{11{,}300{,}000 \times .0076} = .009 \text{ micro-farads.}$$

The box for the transformer measures 4¼ in. by 2¾ in. by 1⅝ in. internally. It should preferably be made of mahogany or teak, but soft wood will do. The top, if made of soft wood, should be thoroughly dried and soaked in paraffin wax. The transformer, after it has been tested, may be fixed in place in the box by pouring wax in to a depth of about ¼ in.

The connecting wires are cut to about 4 in. long, and pieces of rubber tubing are slipped over them for protection against short circuiting. This can be stripped off rubber-covered cable. The condenser is fastened under the lid of the box and clamped down with the primary terminals as shown in the drawing, Fig. 4. The rest of the wires can then be connected up, and after the complete transformer has been tested the connections may with advantage be soldered to the terminals. The diagram (Figs. 5 and 6) showing details of construction is self-explanatory.

J. F. S.

ANNOUNCEMENTS

"Amateur Wireless and Electrics." Edited by Bernard E. Jones. Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. It will be sent post free to any part of the world—3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to the Proprietors, Cassell & Co. Ltd.

General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets.

Contributions are always welcome, will be promptly considered, and if used will be paid for.

Communications should be addressed, according to their nature, to The Editor, The Advertisement Manager or The Publisher, "Amateur Wireless," La Belle Sauvage, London, E.C.4.

Broadcasting: The Situation

The Wireless Society Sends a Deputation to the P.M.G.

IMPORTANT announcements were made at the last meeting of the Wireless Society of London. By the way, the committee has decided, subject to the approval of the annual meeting, to alter the title of the society to the "Radio Society of Great Britain"—in our opinion a very proper change.

Admiral of the Fleet Sir Henry B. Jackson, the society's president, accompanied by Mr. F. Hope-Jones and other officials of the society, had formed a deputation to the Postmaster-General, on whose behalf they were received by the Secretary of the General Post Office, by Capt. F. G. Loring, R.N., and by Mr. E. H. Shaughnessy, the interchange of opinion being on very amicable and courteous lines. Messrs. Loring and Shaughnessy were present at the meeting of the Wireless Society, and in their speeches made clear the difficulties involved in the question of broadcasting.

From the statements made at the meeting we gather that the licence position, in its essence, is as follows: In the past licences have been granted freely to all serious experimenters, and the same will apply in future, but every possible care must be taken to prevent amateur experimenters interfering with the pleasure and convenience of other people. Apparently the broadcasting receiving licence will cost 10s., of which the Broadcasting Company will take half. The holder of such a licence will purchase his set, and this must be of British manufacture. Any company will be able to join the Broadcasting Company and to make and sell apparatus; according to Capt. Phillips, a member of the new Broadcasting Company, a genuine applicant could not be refused. The fact that a broadcasting licensee must buy his set does not rule out amateur-made sets. Licences will be granted to amateurs who make their own sets, but the General Post Office will more or less assume that anyone capable of building his own set can be regarded as a true amateur as distinct from a mere broadcast "listener-in"; and it is therefore felt that, as he would enjoy an entertainment for which he had not paid anything, he should pay a little more for his licence, so that the fifty per cent. paid over to the Broadcasting Company should realise a little more than in the case of the 10s. licence of the "listener-in." The proposal, therefore, is to charge the amateur 15s., and he will be free to use apparatus that has been bought, made from bought components, or made at home.

Broadcasting: The Situation
Readers should see also Sir Henry Norman's speech, reported on p. 392

Of course, certain regulations made by the P.M.G. would have to be observed. Mr. Shaughnessy said that if the state of affairs now existing among many skilled amateurs continued, broadcasting would be a failure because of the interference which the amateur sets give rise to. The Post Office intended to test every type of broadcast receiver sold, and only the harmless (that is, non-re-radiating) types would be licensed. According to the *Times* report Mr. Shaughnessy proceeded:

"In future the Post Office would stipulate that during broadcasting hours and between the wave-lengths of 300 and 500 metres no valve with an adjustable reaction on to the aerial should be used. If the condition were loyally observed by the amateur experimenters, the authorities would not be inclined to say that no reaction whatever might be used at any wavelength. The authorities wanted to give serious experimenters every opportunity of experimenting with the view of improving the listening-in conditions. The authorities were compelled to examine all applications for licences, but their attitude was not one of opposition to the experimenters. They had always taken a very generous view of applications for receiving licences, and there had been no change in that attitude. Personally, he felt that those people who were earning their living by the art of wireless telegraphy often had not time to trouble about the inventive side of the question. It frequently happened that the man of leisure, who took up an art as a hobby, was able to pursue some particular point which might yield very valuable results."

The P.M.G. on Amateur-made Receivers

THE P.M.G. has addressed the following letter to Colonel L'Estrange Malone, F.R.Ae.S., M.P. It appears to be slightly at variance with the statements (as reported elsewhere on this page) made at last week's meeting of the Wireless Society of London:

September 26, 1922.

DEAR MR. MALONE,

In reply to your letter of the 8th instant, in regard to the position, under the broadcasting scheme, of persons who desire to make their own receiving sets, I would refer you to the answer which I gave in the House of Commons on the 27th July last, in which I stated *inter alia*, that provision would be made under which amateurs who construct their own

receiving sets would be allowed to use them. To this statement I adhere.

The question, however, is not without difficulty. The proposed Broadcasting Company (of which every *bona-fide* British manufacturer of wireless apparatus may become a member on fair and easy terms) will be put to heavy expense in erecting transmitting stations and providing suitable and regular programmes of broadcast matter. It is proposed that half of the annual fees collected for licences in respect of receiving sets should be handed over to the funds of the company. But, so far as can be judged, this will only go a little way towards meeting their expenditure. The greater part will have to be met by means of a contribution by the manufacturers to the company upon each set sold to them—a contribution which has been fixed at 10 per cent. of the price. The person who makes his own set will, under these arrangements, contribute half his licence fee towards the funds of the company, but he will be relieved of the other and more important contribution, and it hardly seems fair that he should have the same facility to listen to the broadcast programmes as the person who buys his set from a manufacturer who is a member of the Broadcasting Company.

In these circumstances suggestions have been made in the Press and otherwise that persons who make their own receiving sets, or obtain them from other sources than firms who are members of the Broadcasting Company, should pay a somewhat higher licence fee, with a view to a larger contribution being made out of the licence fee to the funds of the Broadcasting Company. It would, however, be difficult to distinguish this class of persons from *bona-fide* experimenters who may have no wish to receive the broadcast programmes; and if the fees paid by the latter were increased as well as those paid by the former class, this might be regarded as putting a financial handicap upon experimentation and research. In these circumstances I am disposed to retain in all cases the present fee of 10s. for a receiving licence, and to require from the person who does not propose to buy his set from a member of the Broadcasting Company some evidence that he has a sufficient knowledge of the subject to justify his being granted an experimental licence. The term "experimenter" will be interpreted in a liberal sense, and will, I think, adequately cover the class of persons whom you have in mind. You must not, however, regard me as pledging myself against a higher fee should experience show that the end in view can be better reached in that way than on the lines which I propose to adopt in the first instance.

Yours faithfully,
(Signed) F. KELLAWAY.

The Newly-formed Radio Association

AT the inaugural meeting held at the Hotel Cecil, Strand, London, W.C.2, on Wednesday evening, September 27, the chair was taken by Prof. Low, and a message of good wishes came from Sir Oliver Lodge expressing his belief that the work of so many amateurs must lead to important developments in wireless. The secretary spoke on the objects of the association. These are adequately explained by reproducing here the list of the aims which the association has issued:

1. To further the development of radio-telephony and other forms of radio science. 2. (a) To co-operate with the authorities to secure the utilisation of the facilities afforded in conformity with the regulations; (b) To protect the interests of licence-holders from onerous or restrictive legislation and to make recommendations to the competent authorities whenever necessary for this purpose. 3. To protect the interests of licence-holders and manufacturers of radio instruments and component parts. 4. To provide expert technical advice for members. 5. To establish a Fellowship of the Radio Association and to elect as fellows duly qualified members of the association. 6. To protect members by the provision of expert legal and technical advice on questions of patents, infringements and licences. 7. To establish relations and to co-operate with kindred associations in this and other countries. 8. To disseminate by means of lectures and publications information regarding all forms of radio science. 9. To act as a bureau and a central source of information, and to establish a library dealing with all aspects of radio science.

Colonel L'Estrange Malone, F.R.Ae.S., M.P., moved the following resolution (ultimately carried unanimously): "This meeting, realising the need for organisation among the radio licence-holders, manufacturers, operators, and others interested in the development of radio science, welcomes the formation of the Radio Association."

Colonel Malone announced that there would shortly be called a general meeting to draw up the constitution, and expressed his own view that broadcasting must ultimately include far more than music and mere entertainment. It would have to embrace a full news service—politics, Stock Exchange, racing, etc. etc. There would be a broadcast receiver in every home, in a sense the poor man's tape machine.

The resolution was seconded by Major Phillips, who gave some interesting information—gleaned from the P.M.G.—with regard to the use of wireless-controlled toy mechanisms. These, if officially approved and marked to that effect (the General Post Office would require particulars and diagrams to be submitted to them before approval would be granted), could be used without licence, providing the wireless range did not exceed fifty yards. In the discussion which followed, the difficulty of one association attending to the needs of both amateur and trader were referred to, the chairman replying to the effect that he thought the association might become a go-between to link up the two classes.

Major Beaumont spoke on the present very curious patent position, and said that wireless telephony was "the youngest sister of all the daughters of science, and should be the handmaiden of every householder."

Colonel Malone submitted a further resolution, deploring the delay in concluding the broadcasting arrangements and expressing regret that the negotiations have been conducted in secrecy. This was carried unanimously, the meeting closing with a vote of thanks to the chairman, proposed by Mr. William Le Queux.

A NEW crystal detector, in which the known properties of galena are employed in a novel manner, has been patented in France. The device consists of a container partly filled with mercury and hermetically closed by a plug of insulating material through which pass two terminals on the inner ends of which are carried galena crystals, which dip into the mercury.

OUR INFORMATION BUREAU

Expert Replies to Readers' Questions. Hundreds of Replies are sent by Post.

TO ENSURE A PROMPT REPLY PLEASE OBSERVE THE FOLLOWING RULES

Write distinctly, give all necessary details and keep to the point. Ask one Question at a time—never more than two. Send a Stamped and Addressed Envelope. Send the Coupon cut from page 400.

Radiograms

A COMPANY of interested persons assembled at Selfridge's, Oxford Street, London, W., last Sunday morning at 5.30, to await a wireless-telephony message from Sir Thomas Lipton, who would be sending a message from New Jersey, U.S.A., between 6 and 7 o'clock. As we go to press we do not know whether Sir Thomas Lipton actually sent his message, but we do know that it was not received, and that the little company at Selfridge's cheerfully contented itself with a very good breakfast but no message.

■ ■ ■ ■ ■

The Mullard-Radio Valve Co., Ltd., inform us that they are just removing to their large new works, which is fully equipped with the most up-to-date plant for producing their well-known specialities. These new works, covering many thousand square feet, will enable a much greater output of the famous Mullard "Ora" valves to be maintained. At the same time facilities will be available to cope with the enormous demand for other Mullard products such as valve sockets and bases, grid leaks, telephones, etc.

■ ■ ■ ■ ■

Scotland is still in ignorance as to whether Glasgow or Edinburgh is to get preference as the site of a broadcasting station. The latest rumour is to the effect that the station will not be located in either city, but in a town about midway between them.

■ ■ ■ ■ ■

Employees of the electricity department of Glasgow Corporation are setting up a powerful installation in their club premises. It is hoped to interest the members of the Town Council in broadcasting by inviting them to the demonstrations.

■ ■ ■ ■ ■

The Reparations Commission having ratified the Austrian Government's concession to Marconi's Wireless Telegraph Company, the final documents relating to that concession have been signed and are now in London. By this concession the Marconi Company is given the sole right to erect, and to work for thirty years, wireless stations for public traffic between Austria and all other countries.

FORTHCOMING EVENTS

Glasgow and District Radio Club. Oct. 5. First ordinary meeting of winter session.

Hounslow and District Wireless Society. Oct. 5, 8 p.m. Lecture by Mr. S. H. Nayler on "Wireless for the Man in the Street."

Borough of Tynemouth Y.M.C.A. Radio and Scientific Society. Oct. 9, 8 p.m. Lecture by W. G. Dixon, Esq., on "Short Wave Receivers." Buzzer practice at 7.30 p.m.

Ilkley and District Wireless Society. Oct. 9, 7.30 p.m. General meeting, and lecture by Mr. E. Stanley Dobson on "Capacity and Condensers."

Redhill and District Y.M.C.A. Wireless Society. Oct. 11. Lecture by Mr. Edwards on "Condensers."

Portsmouth and District Wireless Association. Oct. 11. Lecture by Mr. R. Cole on "Charging Accumulators by the Noden Valve off A.C. Mains."

Stockton and District Wireless Society. Oct. 11, 7 p.m. General meeting.

TELEPHONY TRANSMISSIONS

Eiffel Tower (F L), 2,600 metres. Each afternoon (Saturdays excepted).

The Hague, Holland (P C G G), 1,085 metres, B.S.T. Oct. 5, 8, 12, 8-9 p.m.

Marconi House (2 L O), 360 metres. The Prince of Wales to the Boy Scouts of Great Britain. Oct. 7, 7.30-8 p.m.

Writtle (2 M T), 400 metres. Oct. 10, 8 p.m.

CLUB DOINGS

Huddersfield Radio Society

Hon. Sec.—C. DYSON, 14, Y.M.C.A. Buildings, John William Street, Huddersfield.

A SOCIETY has been formed with headquarters at the above address. The secretary will be glad to hear from persons desiring to become members.

Rhyl and District Amateur Wireless Society

Hon. Sec.—C. MITCHELL, 24, East Parade.

A DEMONSTRATION was very recently given on a two-valve receiving set. The instructions on putting a small receiving set together for practical use were of great interest. Each part was shown in detail, and advice given on every point possible.

Owing to very great pressure on our space we are compelled to hold over many reports.—ED.

CORRESPONDENCE

Telephony Reception on a Single Valve Set

SIR,—The tests referred to in my article in the issue of AMATEUR WIRELESS for September 23 were carried out some time ago. In order to bring the last paragraph up to date I recently made some further tests with one valve and should like to say that I received the Paris telephony very much better. Croydon and Writtle were good when the set was very carefully adjusted, but it was only under favourable conditions that I could get P C G G. The type of circuit described is not now allowed by the P.M.G., but with a "loose-coupler" added the remarks about the adjustments still apply.—HERBERT H. DYER.

HULLO EVERYBODY!

Call Here and SAVE 10/- in the £

HEADPHONES. Very special offer of French Headphones. Highly sensitive, very light, tested and guaranteed. All complete with double headband and cords. All 4,000 ohms

21/- 22/6 25/- 30/-

NOTHING BETTER OBTAINABLE

COMPLETE SETS OF PARTS FOR MAKING VARIABLE CONDENSERS

Approx. Capacity in Micro-farads	*No. of Plates*	*Price*
·001	57	7/6
·00075	43	6/9
·0005	29	5/6
·0003	19	3/6
·0002	13	2/6
·0001	7	2/3
Vernier	3	1/9

These sets are complete ready for assembling and consist of the following parts: Necessary Aluminium Vanes (fixed and moving), all standard size, large and small Spacer Washers, Centre Square Spindle with Knob screwed 2 BA, 3 round screwed Rods for sides, necessary Nuts and Washers, Brass Pointer, Engraved Scale, 2 Terminals, Lock Nuts, bush and 2 bronze coil Spring Washers. Every part guaranteed best workmanship and quality.

Postage and packing 1/3 per set.

Contact Studs, ¼ × ¼, complete with nut, 8d. doz.; 3 doz., 1/8.

Intervalve Transformers, 18/6, 21/-.

Insulated Sleeving, all colours, 5d. piece (1 yard) 4/9 doz.

Aluminium Vanes, best quality, fixed or moving, 1 doz. 8d.; 6 doz. 3/-.

Large Spacer Washers, 2 doz. 8d., 6 doz. 1/10. Small ditto, 3 doz. 8d. 6 doz. 1/3.

Knobs, 1½ in. diameter, 4d., 5d., 6d. (latter with 2 BA nut in centre). All best quality.

'Phone Condensers, extra quality, 1/6, 1/8.

Aerial Wire, 7/22 stranded copper, 100 ft. hanks, 3/6. Postage and packing, 1/3.

Centre Spindles for Condensers, ¼ square, screwed both ends 2 BA, 3d., 4d., 5d. and 6d.

Valve Holders, 11d. each, with 4 nuts.

Screwed Rod, 2 BA, 4 in., 2d.; 6 in., 3d. each.

Switch Arms, complete with laminated blade, knob, collar, nuts, pointer, marvellous value, 1/-, 1/3, 1/8, and 2/- each.

Filament Resistances, with knob and pointer, 2/9, 3/6 each. Also "Thor," 4/6 each.

Terminals, 4 BA, 1/4 doz. W.O. pattern for panel mounting, large size, 1/10 doz. Various other kinds, 1/6, 1/8, 1/10 doz. All complete with nut and washer.

Telephone Terminals, complete, 2d. each, 1/10, 2/- doz. with nut and washer.

Slider Knob and Plunger, best quality, 6d. each; with 13 in. brass rod, 9d. (post 1/-).

Switches, Single Pole, 2-way on ebonite base; high class types, 1/10 and 2/6 each.

Inductance Coils, wound, Nos. 22 or 24 enamel wire, correct wave-length, 3/6 to callers. Postage 1/3 extra.

Please include sufficient for packing and postage. The above prices are too low to admit of being sent otherwise. Trade Supplied.

For Special Bargains see Windows. Always Something at Attractive Prices.

M. RAYMOND,

27, LISLE STREET, W.C.2.

Right Opposite Daly's Gallery Door.

To avoid mistakes, this address is close to Charing X Road and Leicester Square Tube

'Phone: Gerrard 4637.

ELECTRADIX RADIOS.

IMMEDIATE DELIVERY FROM OUR HUGE STOCKS

Everything from a Recorder to an Earth Clip.

The best equipped City depot.

COME AND SEE US

9, COLONIAL AVENUE is first opening on left in the Minories, nr. Aldgate Station, Metropolitan Railway.

LESLIE DIXON & CO., *Tel: Avenue 4166.*

9, COLONIAL AVENUE, MINORIES, E.1

FELLOWS HEADPHONES, 4,000 ohms, 30s.; "Ora" valves, 15s. **Fellophone** 2 valve set, £9, complete. **Fellows Crystal Set,** £3 7s. 6d., complete. **Grid Leaks, "Mullard,"** 5s.; Valve holders, panels, aerials, condenser vanes, washers, tops and bottoms, sealed tops, switch arms, headphone cords, resistances, etc. Everything for amateurs. Trade supplied.

F. N. COUVY & CO., Ltd., 31, Upper Brook Mews, Craven Rd., W.2. Nr. Padd. Station. Padd. 5743

HIGH CONDUCTIVITY SOFT COPPER INSTRUMENT WIRES.

PRICES AT PER LB.

S.W.G.	S.C.C.	D.C.C.	S.S.C.	D.S.C.	ENAM'D
	s. d.	s. d.	s. d.	s. d.	s. d.
18	2 0	2 2	2 7	2 10	2 2
20	2 2	2 3	2 10	3 7	2 3
22	2 5	2 8	3 4	4 3	2 5
24	2 11	3 1	3 7	4 6	2 8
26	3 4	3 8	4 5	5 6	3 0
28	3 10	4 2	5 0	6 6	3 3
30	4 6	5 0	6 3	7 0	3 6
32	—	—	7 3	8 0	3 11
34	—	—	8 3	9 6	4 2
36	—	—	9 9	11 9	4 6
38	—	—	13 0	15 6	5 0
40	—	—	15 6	19 0	6 6
42	—	—	20 0	25 6	8 0
44	—	—	40 0	57 6	12 6
46	—	—	85 0	132 6	19 6
47	—	—	115 0	169 0	30 0

H.D. COPPER AERIALS

	7/22	7/20	
PLAIN	4/-	5/-	per 100 ft. coil.
ENAM'D.	5/-	6/6	" " "

ENAMELLED AND D.C.C. BELL WIRE.

20s SINGLE 1d. per yd.

20s TWIN 2d. " "

Terms: Cash with Order. Postage Extra. Special Prices to Trade for Quantities.

HORROCKS AND ASPIN,

12, SCHWABE ST., RHODES, MANCHESTER.

SCIENTIFIC APPLIANCES (Dale & Hollins). Electrical, Magnetic, Optical and **ALL RADIO WIRELESS PARTS** and Materials at Lowest Prices. Call and see our immense stock or write for Information and Prices. *In Centre of London, Top of Kingsway.*

SCIENTIFIC APPLIANCES, 11 and 29, Sicilian Avenue, London, W.C.1.

VARIABLE CONDENSERS

Complete with Knob, Scale and Pointer.

	Unassembled or panels.	Assembled for panels.	In Celluloid Cases.
·001	16/-	19/-	25 6
·00075	13/6	15/6	21/-
·0005	10/-	12/-	17/-]
·0003	8/6	10,6	15,6
·0002	6,6	8/6	—
·0001	5/6	7/6	—
·00075	—	4/6	—
·00005	—	4/3	—

Trade supplied with above.

CONDENSER VANES, Aluminium, 20G, 7d. dozen, 6/- gross.

Large Spacers, 4½d. " 4/- "

Small " 2½d. " 2/- "

R. DOUGHTY & SON,

COOKE STREET, WOLVERHAMPTON.

Ask "A.W." for list of Technical Books

Printed and Published in England by CASSELL & COMPANY, LIMITED, Ludgate Hill, London, E.C.4. Sole Agent for South Africa, CENTRAL NEWS