HARD OR SOFT VALVES? (see p. 399)

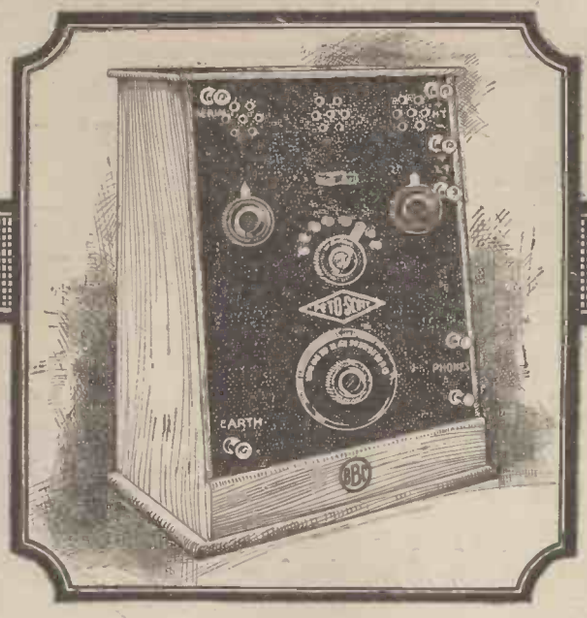
Amateur Wireless And Electrics

COIL WINDING DATA

Vol. II, No. 43 SATURDAY, MARCH 31, 1923 Price 3d.

Four-valve Receiver in a Lacquer Cabinet (*Electric Appliances Co., Ltd.*)

SOME OF OUR CONTENTS



Hear it all over the room on the *Petophone III* and a *Peto-pan*.

The Peto-pan Loud Speaker, fitted with adjustable double size diaphragm. Gives excellent volume free from distortion. **50/-**
Fee to BBC extra, 3/-

A 3-Valve Set—complete with all accessories—in a mahogany Cabinet at a reasonable price.

FOR those who live near a Broadcasting Station, the *Petophone III* will make a special appeal. It has been designed primarily to give a big volume of clear, undistorted sound, and we guarantee it to operate a Loud Speaker up to 20 miles from London, Manchester, Birmingham, Newcastle, Cardiff and Glasgow — the BBC Broadcasting Stations.

We give this Guarantee in the fullest sense of the word — the *Petophone III* and the *Peto-pan* must give you every satisfaction during a seven days' trial in your own home, or your money willingly refunded in full. You are to be the sole judge.

One rotating dial controls the whole of the tuning. It is the simplest possible Instrument to use — even a child could get splendid results from it at once. **Ready for immediate use—absolutely nothing more to buy.**

PETO-SCOTT CO., Ltd.
Featherstone House,
64, HIGH HOLBORN, W.C.2.

Specification

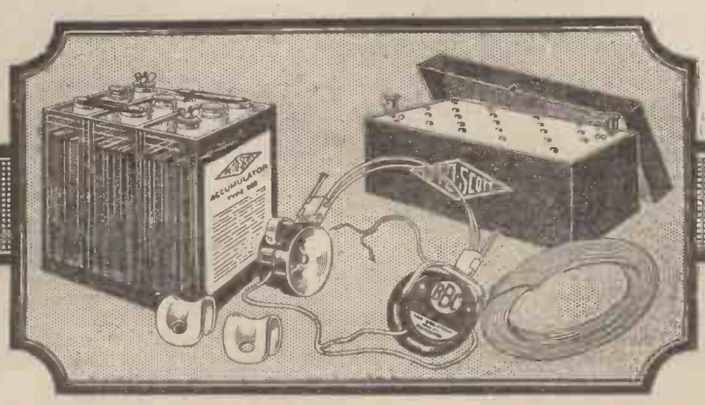
Solid Mahogany Cabinet, hand polished throughout. Valves located in Cabinet away from possible damage. Back-hinged to permit Valves being removed. A six-stud switch gives range from 300 metres to 900 metres, but this can be increased by the addition of suitable loading coils inserted in place of plug shown above switch.
Two rheostats are provided and Valves viewed during operation through holes provided in Panel

Equipment

The following is supplied without extra charge:
One 6-Volt 40 amp. hours Accumulator.
One H.T. Battery 60 Volts.
One pair of Western Electric Headphones.
150 feet of stranded copper Aerial Wire.
Two Shell Insulators.
NOTE.—No Valves are supplied, these should be purchased locally owing to risk of breakage during transit.

£16-16-0

When required for use with Broadcast Licence, this Instrument must be stamped BBC at an extra cost of £3. The royalty to Marconi Co., Ltd., is being paid by us.



Catalogue of Radio Components 32 pp. fully illustrated. **3d.**

6d. Booklet showing how to build your own Multi-Valve Receiving Set in Units.

T. O. BUSS, *Scientific Instrument Maker,*

77, CLERKENWELL ROAD, LONDON, E.C.1.

ESTABLISHED 1850. Exhibition Awards—London, 1862. Sydney, 1879. Melbourne, 1880.

HEADPHONES
Genuine French Telephones, most sensitive obtainable, 6 Tungsten poles in each earpiece. 4,000 ohms with cords (Double Receivers) ... post free **19/6**

French "Brunet" Headphones
4,000 ohms **22/6** POSTAGE 9d.

French "Sidep" Headphones, 21/-
4,000 ohms, postage 9d.

VARIABLE CONDENSERS

CONDENSERS. Complete Sets of Parts.			Assembled Complete for Cabinet Mounting.	
Approx. Capacity Microf'ds.	No. of Plates.	Price.	Approx. Capacity Microf'ds.	Price.
·001	57	7/6	·001	16/-
·00075	43	6/9	·0005	12/6
·0005	29	5/6	·0003	11/6
·0003	19	4 6	·00005	5/6
·0002	13	3/6		
·0001	7	3/-		

Postage 1/- per set extra.

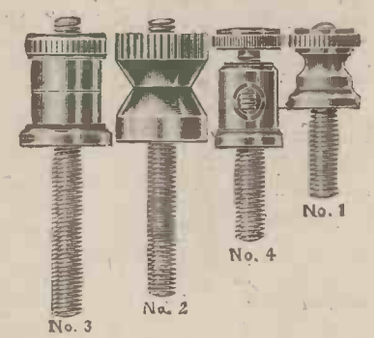
Fixed Condensers, with terminals on ebonite, .0003, .0005, .001, .002, .003, 1/6; by post, 1/9; .004, 1/9; by post, 2/-.
Variable Grid Leak for thermionic valves, 6/- each, composed of a special compound to vary the grid.

WIRELESS PARTS AND ACCESSORIES

Aerial Wire, 7/22 bare copper, stranded. Price per 100 ft., 2/9. By post, 4/3.
Aluminium Vanes, 2 doz., 1/-. By post, 1/6. 5/- gross; by post, 6/-.
Basket Coils, 7 in set, 5/- set. By post, 5/6.
Brass Washers, 2, 3, 4 or 5 B.A. ... ... dozen 2d.
" **Nuts,** 2, 3, 4 or 5 B.A. ... ... dozen 4d.
Brass Rod (screwed)—
2 B.A., in 12-in. lengths ... ... each 5d.
3 B.A., in 12-in. lengths ... ... each 4½d.
4 B.A., in 12-in. lengths ... ... each 4d.
5 B.A., in 12-in. lengths ... ... each 3½d.
Contact Studs, ¼ in. by ¼ in., complete with nut and washer, 6d. doz.
Copper Foil Sheets, uniform thickness, 12 in. by 3 in. ... ... each 3d.
Crystal Detectors on Ebonite. Each 2/6. By post, 3/-. Also 3/3; by post, 3/9.
Crystal Detector, cup enclosed with glass cover, dust proof, 4/6. By post, 5/3.
Ebonite Dials, with engraved scale 0-180, 1/- each. By post, 1/6.
Engraved Ivorine Scales, 0-180 round ends; 4½d.
Filament Resistances. Each 2/6 and 3/6. By post, 3/- and 4/-.
Inductance Coils Wound Enamel Wire, 12 by 4, 3/3. By post, 5/-.
Insulating Sleeving, 5d. yd.; 6 yd. for 2/4. By Post, 2/8.
Insulators, Egg, 4 for 11d.; 2/6 per doz. By post, 3/6 doz.
Insulators, Reel, 2d. each. By post, 2/6 doz.
Intervalve Transformers (low frequency), tested and guaranteed 5-1, 14/- each. By post, 15/-.
Knobs, with brass nut (2 B.A.), 4½d. each. By post, 7d., 6 for 2/- By post, 2/6.
Large Spacer Washers, 3 doz., 9d. By post, 1/-.
Lead-in Tubes, ebonite with brass terminals, 9 in. 1/2. By post, 1/6. 12 in., 1/4. By post, 1/8.
Slider and Plunger, 5d. By post, 7d.
Slider Knob, Plunger and 13 in. rod, 8d. the set. Cannot be sent by post.
Small Spacer Washers, 6 doz. 1/-. By post, 1/4.
Switch Arms, with polished knob, bushed 2 B.A. nut, laminated blade, spring coil washer, nuts and bush, 1/6, 2/- each. By post, 1/9, 2/-.
Tin Foil, free from lead. Sheets, 17 in. by 11 in., each, 4d.
Valve Legs, with nuts and washers. 1d. each.
Valve Holders, turned ebonite, complete with nuts, 1/3; 2nd quality, 1/-.

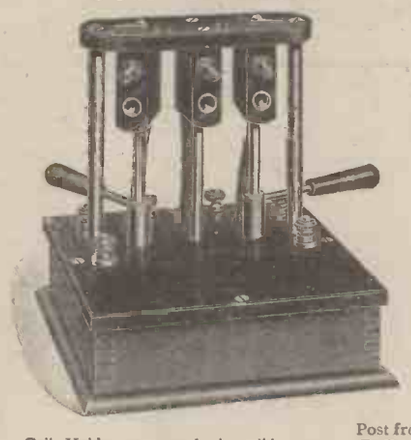
TRADE SUPPLIED
Terms on Application

Terminals



No. 3 Terminals, 2 B.A., with nut and washer, 2/6 doz. By post, 3/-.
No. 2 Terminals, War Office Pattern, with nut and washer, 2/- doz. By post, 2/6.
No. 4 Terminals, telephone, with nut and washer, 2/- doz. By post, 2/6.
No. 1 Terminals, with nut and washer, 1/6 doz. By post, 2/-.
Terminals (large), aerial and earth, complete with 2 nuts and 2 washers (2 B.A.), 2 for 8d. By post, 1/-.

Coil Holders



Our Coil Holders are made in solid Ebonite, matt finish, and are beyond doubt the best on the market ... Post free. **22/-** each

Receiving Sets

(In Polished Mahogany or Oak Boxes.)

1-Valve ...	£4	10	0	plus Tax	£1	0	0
2-Valve ...	£8	8	0	" "	£1	15	0
3-Valve ...	£12	12	0	" "	£2	5	0
4-Valve ...	£18	18	0	" "	£2	15	0

Accessories for the above.

Amplifiers
For 1-Valve Set, £2 15 0. For 2-Valve Set, £5 5 0. For 3-Valve Set, £7 0 0.

High Tension Battery, 60-Volt
For 1-, 2-, 3 or 4-Valve Set £0 12 0

Low Tension Accumulator, 6-Volt
For 1-, 2-, 3 or 4-Valve Set £1 12 0
Valves ... ... 15/- each.

Telephones, complete, per pair, from 18/6 to £3. *Note.*—Any number of Telephones may be used with a Receiver.
Loud Speaker, adaptable to Nos. 2-, 3-, and 4-Valve Sets, £3 2 6 to £6 10 0.

"EBONITE"

Postage Free. Any Size cut.

1" thick	s. d.		£ s. d.
8 × 1	7	12 × 10	7 6
4 × 4	1 3	17½ × 8½	9 6
7 × 5½	2 8	18 × 18	12 10
10 × 6	3 9	36 × 18	1 4 9
17 × 5	5 3	7 lb.	1 4 9

Instrument Wires

British Made Copper Wires.

Prices Per lb.
Other sizes in stock. A charge of 3d. extra is made for reeling off in small quantities.
Postage extra.

S.W.G.	yds. per lb.	ohms per 1,000 yds.	S.C.C.	D.C.C.	S.S.C.	D.S.C.	Enmld.
22	140	39	2/9	3/-	4/-	5/-	2/7
24	230	63	3/-	3/6	4/6	6/-	2/8
26	340	95	3/7	4/1	5/-	8/-	3/2
28	530	140	4/4	4/8	6/-	9/-	3/6
30	716	200	5/-	5/6	7/-	10/-	3/10
32	950	262	6/-	7/3	8/-	12/6	4/2
34	1,300	362	7/-	8/3	9/-	13/6	4/4
36	2,000	530	8/8	10/-	12/-	15/6	4/8

Wireless Crystals

"Hertzite"	1s. 6d	Carborundum	6d
Zincite	1/-	Molybdenite	6d
Silicon	6d	Iron Pyrites	6d
Bornite	6d	Galena	6d
Copper Pyrites	6d	Graphite	6d
Wood's Metal	6d	Dram Tellurium	2s 6d

— Post free —

Intervalve Transformers

Size 3 × 3 × 1½. Ebonite Top and Bottom
Ratio 5 to 1 Post Free, **15/-**
The most suitable transformer for panel mountin

Celluloid Accumulators

We are introducing a new model consisting of individual two volt units. This MODEL to be known as T.9 has an actual capacity of 18 ampere hours, and an intermittent capacity of 34 ampere hours.

PRICE AS FOLLOWS

2 volt	6/- each,	post	9d.
4 volt	11/9 "	"	1/-
6 volt	17/6 "	"	1/6

H.T. Batteries, 30 volt, 6/- (by post, 7/6).
H.T. Batteries, 60 volt, 12/- (by post, 13/6)

Inductance Tubes

Cardboard.

12 x 2½ ... 4d.	12 x 3½ 6d.
12 x 3 ... 5d.	12 x 4 8d. Post 2d.

Mahogany Boxes

Polished			Post
4¼ × 4¼ × 3½ in.	...	3/-	3d.
4½ × 4½ × 5 in.	...	3/6	6d.
6½ × 6½ × 4 in.	...	4/6	1/-
13 × 6½ × 4 in.	...	7/-	1/-

Amateur Wireless
and Electrics
Vol. II, No. 43 March 31, 1923

The Home of the Call Letters

THE amateur starting wireless is naturally only interested in telephony at first, if the Morse code has not been previously mastered; but as time goes on those dots and dashes, which now and again seem so rudely to interrupt, rouse his curiosity. It makes him feel he has only one foot in the stirrups of his hobby-horse, so he decides to learn the code. This is easier said than done, but with the help of an enthusiastic friend for buzzer practice a receiving speed can be obtained which will enable the listener-in to at least read the call signs of telegraphy stations. A means is thus afforded of judging the range of one's set, as well as providing some interesting hours at any time of the day or night. Having arrived at this stage the amateur will no doubt be impressed by the variety of call letters belonging to various ships of different nationalities that pass within his range, and might wonder how it is arranged that every ship or shore station throughout the whole world has its own particular call. The answer can be given briefly: "The Berne Bureau."

Switzerland has always been regarded as an independent and neutral country, and therefore it is not surprising that Berne, its capital, has been selected to be the seat of various international organisations. Wire telegraphy was instituted in 1837, and developed so rapidly that the Bureau of the International Telegraph Union was formed there in 1868. This agency was followed in 1875 by the Postal and in 1886 by the Copyright Union; these, as their names imply, are concerned with securing uniformity of correspondence, etc., between different countries.

The First Conference

When wireless was placed on a commercial basis, about 1903, it was quickly realised by everyone concerned that rules and regulations were absolutely necessary if the ether was to be kept in a fit state for the transmission of messages. The first International Conference formed to decide this matter was held at Berlin in August of that year; but the Powers were not unanimous with the proposals brought forward; Great Britain and Italy declined to agree with the other countries. In 1906 another conference was again held in Berlin, where various agreements were signed. It was not until July, 1912, however, that the regulations, as we know them to-day, were finally drawn up. This was called the Radiotelegraphic Convention of London, and was representative of practically all the countries of the world. Of course amendments and additions have been made from time to time, an important one being the "Safety of Life at Sea," signed at London in January, 1914.

Now it was agreed in 1912 to form a branch of the International Telegraph Union to deal with wireless matters, and this is known to the present day as the Berne Bureau. It must be understood that this section has no power to create, enforce, or delete any of the existing rules, that, of course, can only be done at international conferences; but it does allocate all the call signs required by the various countries.

Work of Wide Scope

In addition to this it gathers information concerning all stations, their geographical position, range, wavelength, hours of transmission, and the nature of the work they perform. The efforts of the bureau do not cease here; it advises the signatories of the convention of any proposed alterations to the existing rules; collects and prepares for discussion any suggestions to be placed before the next conference (arranged to take place about every five years), and generally makes itself useful as an exchange for all matters of international wireless importance.

No doubt the reader will picture to himself a vast building, housing an equally large staff which would be required to carry out the work outlined above, and consequently costing thousands of pounds a year to maintain. That would be a delusion—the cost is only 80,000 francs per annum. This speaks volumes for the economical, efficient, and whole-hearted work of the officials at Berne. When a conference is called, however, the cost of organisation, which includes the supply and printing of all necessary papers, is defrayed by an additional grant contributed by the various countries in proportion to a scale provided by a certain rule; in the same way the annual expenditure of the bureau is met.

On glancing through a current list of the world's call signs (a complete copy, by the way, can be obtained from Berne at 18 francs, cost price), it will be noticed that they consist of three letters each, with the exception of Great Britain and the United States of America and France, who have in addition some four-letter calls.

This illustrates the rapid advance of wireless, for these three countries ran short of the three-letter combinations allotted to them in 1912. In 1917

AN EASTER NOVELTY

This Receiver, made by a London enthusiast, works quite well and the London Broadcasting Station is regularly received on it.

the Berne Bureau set to work, in spite of the war, and circularised to seventy-one administrations a British proposal that the letter "T" precede the call signs of any country when they had exhausted their present stock. The result was that out of twenty-eight replies twenty-three were in favour of the "T." Germany wanted it *after* the three letters, while Holland suggested the letter "P" be substituted as a prefix for the "T." The other replies, namely, from France, Morocco and Tunis, thought the matter had better be postponed until the war was over. As no complete agreement was forthcoming the suggestions were abortive, and the work of the bureau on this particular subject was finished. Nevertheless, it was imperative that some measures be taken, so Great Britain and the U.S.A. decided to adopt temporary four-letter calls until such time as a more satisfactory basis could be obtained. Instead of the "T" Great Britain prefixed "G," the United States K. N or W, and France various letters.

Other Activities

Reverting to more recent activities one finds that several important publications have their origin there. For instance, it issues a radiotelegraphic journal in French, which is considered to be the official organ for every branch of the science. The periodically revised alphabetical list of calls, with its monthly supplements, printed in at least three different languages, is a work which cannot be labelled "obsolete." A map of the world's stations, with particular reference to coastal stations, together with steamship routes and times taken, is published from time to time.

The foregoing brief description will give the reader some idea of the useful work that has been done during the last ten years, and especially during the war, when information was naturally difficult to collect. The efforts of the director, Colonel Dr. E. Frey, and his staff, in "carrying on" during that trying period will, it is hoped, help to link together all the nations in one continuous chain of friendship through the medium of universal wireless. W. G. N.

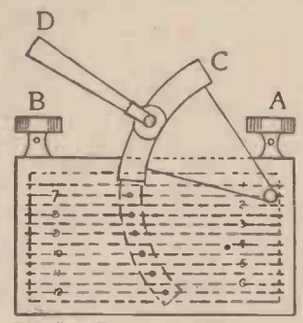


Fig. 5.—Complete Condenser.

A Multi-variable Condenser and Vernier

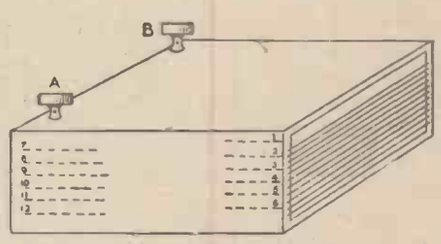


Fig. 3.—Arrangement of Plates.

THIS article describes a simple and efficient variable condenser, reliable and cheap, and of easy construction, calling for no watch-like precision, and well within the constructive ability of any amateur.

For the sake of convenience a condenser of twelve plates, 3 in. by 2 in., will be described.

The box, etc., consists of ⅛ in. ebonite or other like insulator, which, together with the necessary zinc, screws and terminals, should cost about 3s. The insulating material can be purchased in cut pieces, and a piece 6 in. by 6 in. and another of 3 in. by 3 in. will be sufficient. Twelve zinc plates, allowing for waste, will require, say, ¾ ft. super of metal; about 22 S.W.G. will be suitable. Then there will be two terminals, six flat-headed copper or brass screws to form connecting

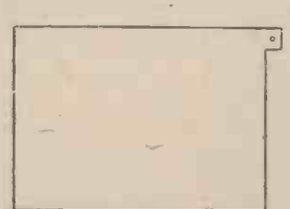


Fig. 1.—Shape of Condenser Plate.

studs, some copper wire, one piece of spring brass $\frac{3}{16}$ in. wide and 3¼ in. long, and a piece of brass, say $\frac{1}{32}$ in. thick, for the switch required.

First of all, proceed to cut out the eleven pieces of zinc to the shape of Fig. 1 and one piece of zinc as Fig. 2. File all the sharp ends and corners and run over the whole with some fine emery-cloth or paper. After this the pieces are to be ironed out between two hot domestic flatirons, which will effectively remove all kinks, bends, etc.; they are then placed between two

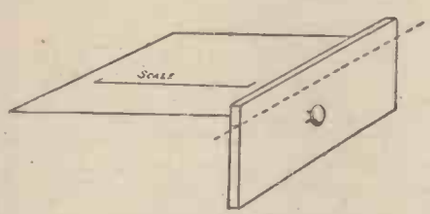


Fig. 2.—Top Plate.

pieces of hard wood, screwed up tight in a cramp, and put on one side until the other parts are ready to receive them.

By means of a small tenon or other saw cut the ebonite to the required shapes and sizes as shown by Figs. 3 and 4. The two side pieces which are to carry the eleven fixed plates and the one moving plate should have in each of them twelve cuts about $\frac{1}{16}$ in. deep, as shown in Fig. 3. These twelve cuts may be made simultaneously by using twelve pieces of old hack-saw blades, each about 2 in. long and each separated from the other by small pieces of zinc, and clamped between hardwood blocks on each side. The assembly is used as a plough along a wooden guide.

The zinc plates 2 to 6 inclusive are connected by means of the projection on the end of the plates, and plates 7 to 12 are inserted in the box with the projecting pieces on the other side of the box. This terminal does not touch plates 7 to 12, but is connected by a wire to the switch arm, whilst plates 7 to 12 are connected one to each of the contact screws (see Fig. 5). It will be seen that the switch arm, C, being connected with terminal A, can be moved to make electrical connection with plates 7, 8, 9, 10, 11 and/or 12, thus varying the maximum capacity of the condenser from $\frac{1}{6}$ to $\frac{6}{6}$.

Plate No. 1 serves as a vernier for fine tuning, and makes its connection with terminal B through a brass spring E connected with B and pressing on the upper side of plate No. 1. A scale may be affixed to the top of plate No. 1. The switch handle, of course, must be made of insulating material.

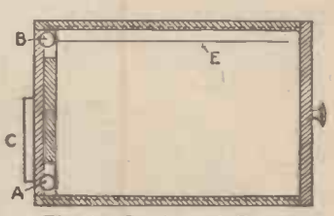
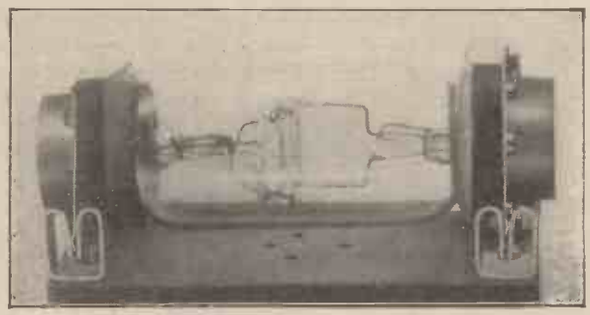


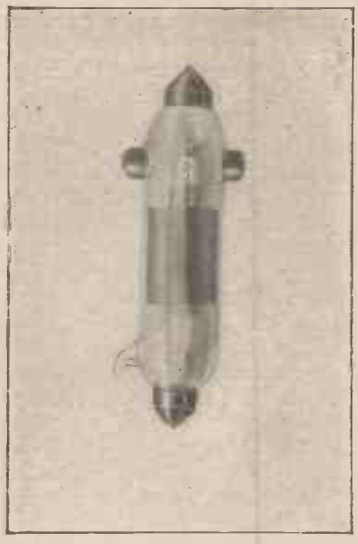
Fig. 4.—Section of Case.

It will be apparent from the foregoing that the rough tuning can be done by means of the contacts, throwing in one plate at a time, and fractions added (or deducted as the case may be) by moving the sliding vernier plate. W. P. A.

Photograph of Dutch Valve.



Photograph of German Siemens-Hälske Valve.



Photograph of M.O. "Q X" Valve.

Finding the Best Valve

V—Hard or Soft Valves?

THE next point to consider is the effect of hardness or softness in the valve. A hard valve is pumped so "dry" that there is practically no residue of air. Hence the electrons as they pass from filament to plate meet with nothing (except the meshes of the grid) on their way. In the soft valve things are quite different. The electron which leaves the grid encounters in its flight a gas atom. Now this atom (Fig. 3) consists of a positive nucleus surrounded by several accompanying negative electrons. Owing to the impact of the electron from the filament one of these is carried away and rushes towards the plate (Fig. 4). Hence, in the soft valve the electron stream from filament to plate is very much denser than in the hard valve, since each electron discharged collects another, or perhaps several from the gas atoms met with on its way.

And what happens to the mutilated gas atoms? Having lost one electron they at once seek a negative source in order to attract a fresh one to replace the deserter. They fly to the filament, whence they obtain the required electron.

Current in Hard Valve

In a hard valve there is only one current to be considered—the flow from the filament to the plate. The bulk of the negative charges reach the anode, a small proportion collects on the grid, and then passes into the outside circuit *via* the grid-leak. In the soft valve there is a flow in both directions; negative electrons fly from filament to grid; mutilated atoms move inside the valve towards the filament to make good their losses. There is no congestion on the grid, therefore a grid-leak is unnecessary.

Owing chiefly to this flow and counter-flow, or ionisation as it is called, it is impossible to take a proper curve of a soft valve. If we try to do so we obtain nothing but a succession of rather meaningless "kinks."

Ideal Rectifying Valves

The ideal valve for rectifying purposes is not easy to obtain, and it cannot be used with the broadcasting licence. It is a little valve with no name of its own made in Holland. In character it is a compromise between the very hard and the very soft, working equally well with or without a grid-leak. On the filament it needs about 3.5 to 4 volts, with a current of rather less than half an ampere. These valves vary considerably; some blueglow if the plate potential is more than 30 volts, others will stand 80 volts. The best results are obtained from those that work with about 60 volts on the anode.

To use one of these valves, either singly or in a muti-valve set, is a revelation. Living thirty miles north-west of London I have no difficulty in getting 2 L O, Croydon, and even Radiola on a Brown loud-speaker on the single valve with sufficient volume to make every note or word audible to all sitting in a small room. If the Dutch valve is used as rectifier in the large (5- or 6-valve) sets the increase in signal strength is quite 50 per cent., and there is no trouble with oscillation. The set is the easiest thing in the world to control. When I say that never in any circumstances do I use more than one stage of low-frequency amplification and that the large set will easily fill a lecture hall, you will realise what the semi-soft valve can do.

Foreign Valves

Another useful rectifier is a captured German valve, the Simens-Hälske, which can be bought for 7s. 6d. from advertisers in AMATEUR WIRELESS. Whilst it is not quite so good as the Dutch valve, the Siemens-Hälske is 20 per cent. better as a rectifier or as a single valve than any of our general-purpose valves—if, and it is a big if, it is used properly. To obtain the best results from it use not more than 4 volts, and tone the current down to .5 ampere. Most of them work most satisfactorily with a grid-leak of 1—2 megohms, but there are individuals that do better when the leak is removed. The plate potential should be from 60—80 volts.

The only British valve that can claim to be a rectifier, so far as I know, is the M.O. "Q X." Its price is rather high, but it gives wonderful results. This valve works with five volts and just under half an ampere on the filament. Its peculiarity is that it needs neither grid-leak nor condenser when used with transformer-coupled H.F. units in front of it.

Curiously enough it is not a soft or even softish valve; it will stand up to 150 volts on the anode. Its excellent rectifying

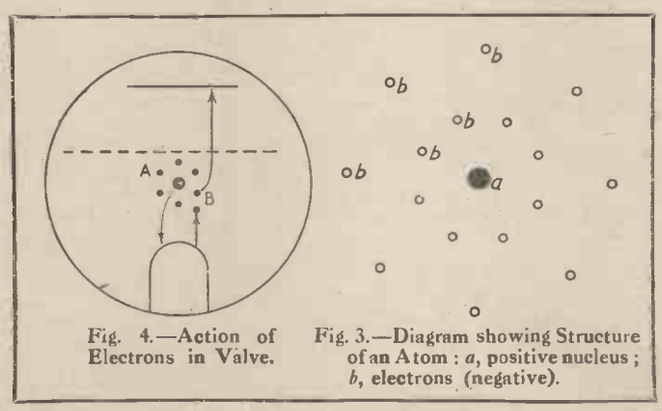


Fig. 4.—Action of Electrons in Valve.

Fig. 3.—Diagram showing Structure of an Atom: *a*, positive nucleus; *b*, electrons (negative).

qualities depend on its peculiar design, which gives it a curve with the nearest approach known to the combination of pronounced curve and steep, straight portion.

We shall see in the next article how foreign manufacturers' ideas of the general valve differ from those of our own. Meantime we may say that though most of the low-priced valves made in this country *will* rectify, they do so only after a fashion. They are excellent as amplifiers, but on the detector unit they give only passable results, their hardness decreasing the volume of sound and making the set liable to howl if couplings are tightened.

Gas-filled Valves

Other countries have realised the value of the soft valve. In America the U V 200, which is argon-filled, is the standard detector on good sets. Australia pins her wireless faith to the soft valve, obtaining with it results that users of the hard valve would find it difficult to believe. Germany sells the soft valve for general purposes, using it, as we shall see later, also for amplifying. Even Japan is turning out a special "Detectron" of soft quality. Like all Japanese goods it is excellently made; there are two independent filaments in case one should burn out. But the true detector valve has yet to make its appearance here, as a British-made article at any rate. Some day (may it be soon!) our makers will awaken to the possibilities of the semi-soft valve. Then we shall use three valves where we now employ five, and the problem of re-radiation will be solved. The single-valve man will get twice the efficiency out of his set, and his more powerfully-equipped brother will find his four or five valves much less of a handful.

It will pay the makers in the long run to introduce such a valve as we have described, for when it is an established fact the crystal will disappear. Also they can count on good sales, for the life of the softish valve is shorter than that of the one that is dead hard.

To sum up. If you intend to use general valves, choose for amplifiers those whose curves are steep and straight, but for the detector unit select a valve with a pronounced lower bend, and if you come across an odd one that is slightly less hard than the majority of its kind, treasure it.

R. W. HALLOWS.

(To be continued)

Notes for the Novice

VIII.—Condensers and Inductances

IT was stated in the last article that there are two general ways of tuning-in to wireless signals, that is, by altering either the capacity or the inductance of the receiving circuit. The inductance is altered by increasing or decreasing the amount of wire in the circuit, whilst the capacity is controlled by means of condensers. It is not necessary, in order that the beginner should understand the practical use of these instruments, that he should also be acquainted with the theory of their functioning. Returning to the analogy of the violin string, it is not necessary that the incipient musician should possess a knowledge of acoustics in order to be able to tune his instrument by adjusting the tension of its strings. A general idea of the part played by the condenser and the inductance is, however, advisable, and may be obtained by pursuing the foregoing analogy a little further.

It should be remembered, in the first place, that a string can be tuned to emit a certain note by other means than by varying its tension. A similar effect can be produced by varying its length, or by changing its quality. Needless to say, neither of these factors can be interfered with, in the ordinary way, when tuning a stringed instrument. For obvious practical reasons the only satisfactory method of effecting this is by adjusting the tension of the strings. Whilst actually playing, however, the method of shortening the strings in order to produce different notes is also used. This is what happens when the violinist's fingers press the strings at various points along the handle of his instrument; the strings are effectively shortened, the portions that vibrate extending only from the "bridge" of the violin to the points at which his fingers rest. There are thus two main ways of tuning a stringed instrument, namely, by altering either the length or the tension of the strings. (We will omit the question of the quality of the strings for the moment.)

Inductance and Capacity

These two factors may be regarded as similar to those of inductance and capacity in a wireless receiver. The inductance of an electrical circuit corresponds to the length of strings (and, indeed, actually depends upon the quantity of wire used), and the capacity corresponds to the tension of the strings. A condenser, therefore, fulfils a similar function in an electrical circuit to that provided by the tension screws of a stringed instrument. It may be regarded as an instrument for adjusting the electrical tension of circuits, just as lengthening a string has the opposite effect to increasing its tension. Moreover, a condenser tends to produce the opposite effect to an inductance. They are, as it were, the counterparts of one another. The condenser is the thing that enables an electric "kick" to be given to the circuit and so make it vibrate. The inductance is the thing that helps to keep these electrical vibrations from becoming too lively; it steadies and controls them.

A condenser is a device for storing electricity. When it becomes filled with electricity it overflows, as it were, and the charges it has accumulated rush backwards and forwards through the circuit. If there is a lot of inductance in the circuit the overflowing current will be slowed up accordingly and the vibrations will be at comparatively long intervals. This means that the length of the resulting waves will be long. In order to transmit long waves, therefore, we use a good deal of inductance. Again, the greater the capacity of a condenser the longer it will take to be filled with electricity, and the smaller the number of times it will overflow in a given period. We therefore also use a good deal of capacity when we desire to produce long waves. Hence there are always big condensers and big inductances to be seen in long-wave transmitting stations. The same reasoning applies, of course, to the use of condensers and inductances for reception purposes.

"OLD HAND."

Re-radiating Paris Time Signals

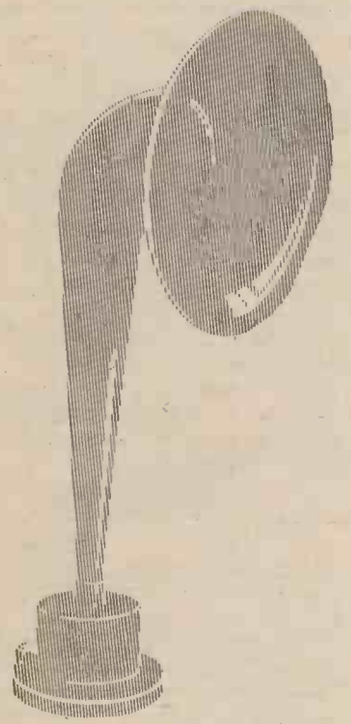
AN innovation in the programme of the Manchester station of the British Broadcasting Company is the re-radiation of the time signals from the Eiffel Tower at 10.44 p.m.

These signals are of great importance to the Mercantile Marine and others, and it has been felt for some time that to re-radiate them on a broadcasting wavelength would be a great convenience to the general public. The Paris station works on a wavelength of 2,600 metres, and the Manchester station receives the messages on that wavelength and re-transmits them on its own wavelength of 385 metres. This is done automatically by the electrical connection of the receiver to the transmitter. The delay introduced is exceedingly minute, as the re-transmitted signal is only 1/300 part of a second behind the original. Paris time signals are, of course, Greenwich mean time.

The successful accomplishment of this feat has been attended with no little difficulty, and it will be of interest to experimenters to know that the aerial used for receiving Paris is a small one running almost directly underneath the main transmitting aerial at Trafford Park. Furthermore, the receiver used is installed only a few yards from the high-power transmitter which is passing on the signals on the broadcasting wavelength.

T.M.C.

Over £100 for a word



T.M.C. research laboratories have produced the perfect loud speaker.

Imagine reproduction so clear, so faithful that involuntarily you turn to see the unseen artiste to express your thanks for the rendering.

Imagine reproduction so full of life that you are compelled to encore the unseen dance band.

Imagine reproduction so true that the unseen speaker stands before you.

Imagine these and you have the new T.M.C. LOUD SPEAKERS.

We seek a name which will convey in one word the perfection of these instruments. You may know it—we invite you to send us your suggestion.

For the accepted name, we shall present and install absolutely free a Superb 100 Guineas T.M.C. Cabinet de Luxe.

For the second best name, we shall present and install absolutely free a magnificent £30 T.M.C. 3-valve set.

Full particulars of these will be sent on request.

You may be the winner, send in your suggestions to-day, with this advertisement.

Competition Rules.—Write your name, address and suggested names on a sheet of notepaper, enclose this advertisement and forward them to us.

You may suggest up to six alternative names. If the winning names are sent in by two or more different persons, the prizes will be awarded to those first sending the suggestion. Write on one side of the paper only. No correspondence can be entered into and the Company's decision is final. No names will be considered after April 22nd.

Address your envelope to :
THE COMPETITION DEPT.,
The TELEPHONE MANUFACTURING CO., Ltd.
Hollingsworth Works, DULWICH, S.E.21.

T·M·C
Makes Wireless
Worth While

HULLO

Come along and see us! We have just what you want!!

COMPLETE SETS *of* PARTS *for making* VARIABLE CONDENSERS

(READY TO ASSEMBLE)

All Parts in the Sets are of the Finest Quality, and absolutely beat anything else offered by any other house. I guarantee that I have always got them in Stock

CALLERS ONLY

NOTE THE PRICES!

CALL AND TEST THE QUALITY!!

Approv. Cap. In Microfarads	No. of Plates	Price
.001	57	6/3
.0005	29	4/3
.0003	19	3/-
.0002	13	2/3
.0001	7	2/-
Vernier	3	1/9

DRILLED EBONITE ENDS 1/- pair

Sold only with Condensers

NO POST ORDERS.

New premises adjoining at 28a have been taken for customers' benefit.

COME EARLY AND AVOID THE CRUSH.

These sets consist of the following articles:

EXTRA QUALITY VANES (Fixed and Moving)
Large and Small Spacers (Ample Supplied)
Scale 0—180
13 Nuts 2BA
13 Washers 2BA
Centre Square Spindle
3 Side Rods
Copper Foil
Pointer
Bronze Spring Washers
Best Knob, Bushed 2BA Nut
Top Bush
Bottom Bush
Flat Bush for Pointer

TESTIMONIAL

H. R. GOODALL, Radio Engineer, Experimental Station, 21L, SOUTHAMPTON
"W. O. R. Bamberger, Broadcast Station Newark, New Jersey, U.S.A., received at my Station very well this morning, using one of your Vernier Condensers. . . ."

RIGHT OPPOSITE DALY'S GALLERY DOOR

M. RAYMOND

27, LISLE STREET, W.C.2

'Phone: - - - - - - - - GERRARD 4637

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

OPEN: 9 a.m. CLOSE: 8 p.m.

OPEN: Saturday, 9 a.m. - - - CLOSE: 7 p.m.
„ Sunday, 11 a.m. „ 2 p.m.
I have two shops, so one is always open.

EVERYBODY

This is an honest advertisement and nothing is offered unless same is a regular stock line.

PLEASE NOTE
No further Post Orders executed at present owing to the impossibility of guaranteeing delivery

Aerial Wire
Genuine 7/22 bare copper stranded, 100 feet 2/6

Condenser Vanes
Extra quality ... ... doz. 5d.

Crystal Detector Parts 1/-

Lead-in Tubes
Ebonite with brass ends, 6 in., 10d.; 9 in., 1/-; 12 in.... ... ... 1/2

Crystal Cups and Screws
each 1½d.; doz. 1/2

Condenser Bushes each 1d.

Reel Insulators each 2d.

Spacer Washers
Large 3d. doz., small doz. 2d.
Cheaper for quantities

Wound Formers
12 x 4 with 24 wire, each 3/3

L.F. Intervalve Transformers
High quality 5-1 ... ... 14/-

TRADE SUPPLIED.

PLEASE NOTE
No further Post Orders executed at present owing to the impossibility of guaranteeing delivery

Valve Holders
4 screwed legs, 8 nuts ... 1/-

Filament Resistances
No cheap rubbish, but value for money ... 2/6 to 3/6

Rheostat
Very special. Positive stops at Zero, full resistance ... 3/6

Switch Arms
Best bushed knob with 4-leaf laminated switch 1/3
(Also another pattern at 1/6)

Oojah Basket Coils
7 in. set 5/-

Contact Studs
Highly finished ... ... doz. 5d.

Nuts
2 BA and 4 BA, 3 doz. 8d.

Telephone Leads, extra long, splendid quality, pair 1/3
Quantities Cheaper

CALLERS ONLY.

PLEASE NOTE
No further Post Orders executed at present owing to the impossibility of guaranteeing delivery

Slider Knob and Plunger 4d.

Terminals
W.O., Telephone, P.O., and other designs, with nut and washer, 2 for 3½d.

Crystal Detectors
Glass covered, dust proof, extra quality 4/6
Perikon Detector 3/9
Detector on Ebonite 2/6
Detector, extra design 2/8
Detector and Crystal 3/-

Fixed Condensers
Mica condensers in ebonite with terminals, all capacities 1/3

Valve pins ... per doz. 7d.

Valve Sockets per doz. 1/-

Scales 0-180 4d. and 5d.

Lead-in Wire for Indoor Aerials, etc., per yd. 3d.
Quantities Cheaper

NO POST ORDERS

HEADPHONES:

TESTIMONIAL

7th March, 1923. Whitechapel Road, E.1.

May I be allowed to express my great satisfaction in connection with the Wireless Goods that I have purchased from you. The quality, together with the most reasonable prices of all your Apparatus, will do great things in making Wireless a most inexpensive and pleasing hobby. I enclose a small order from one of many friends whom I have recommended to you.

Yours faithfully,
FRANK CLIFFORD.

If you require a really Reliable Headphone TRY

"ERICSSON"

(CONTINENTAL)

per **23/6** pair

Stamped B.B.C.

SELLING HUNDREDS DAILY

Double Phones, complete with Headbands and Cords. Very comfortable to Wear.

I USE THEM MYSELF.

FRENCH PHONES

(4,000 OHMS)

Double Receivers complete with Head Bands and Cords from

21/-

RIGHT OPPOSITE
DALY'S
GALLERY DOOR

M. RAYMOND

27, LISLE STREET, W.C.2

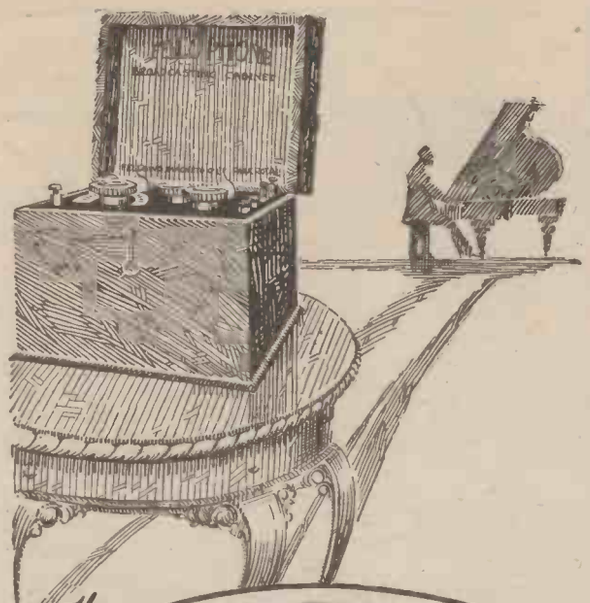
'Phone: - - - - - - - - GERRARD 4637

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

OPEN: 9 a.m. CLOSE: 8 p.m.

OPEN: Saturday, 9 a.m. - - - CLOSE: 7 p.m.
„ Sunday, 11 a.m. - - - CLOSE: 2 p.m.

I have two shops, so one is always open.



The FELLOPHONE

2-Valve Receiving Cabinet.

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

Additional interest and use is secured because it will receive all amateur transmitting stations within a range of 20 miles. The "Fellophone" is mounted in a handsome oak cabinet, and is sent out complete with H.T. battery, 6 volt accumulator, 100 ft. aerial, 2 shell insulators, and one pair of Fellows 4,000 ohms double headphones, but without valves.

British Made Throughout.

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

PRICE COMPLETE **£12**, inclusive of all taxes without valves. Carriage - - - 2/-

EXTRA FOR 2 VALVES - - - - - - - 30/-

EXTRA FOR ADDITIONAL FELLOWS DOUBLE HEADPHONES, 21/6 (Postage 1/-).

FELLOWS MAGNETO Co., Ltd.,
LONDON, N.W.10.

Telephone: *Willesden 1560-1.*

Telegrams: *"Quixmag," 'Phone, London.*

EBS

For they are jolly good Fellows

VARIOMETERS *and* VARIO-COUPLERS

Type HR VARIOMETER

Stator and rotor of hard moulded ebonite. For use on wavelengths from approximately 150 to 600 metres when used in conjunction with the secondary winding of the HR Vario-Coupler.

Type HR VARIO-COUPLER

Stator and rotor of hard ebonite mouldings. Wound with suitable tappings to enable any number of turns up to maximum to be used by means of two multi-way switches. Ratio of coupling 2-3.

Write for Leaflet Z12

149, Queen Victoria St., LONDON

GLASGOW
MANCHESTER
BRADFORD

RADIO IGRANIC ELECTRIC Co. Ltd. WINDING

Works: Elstow Road, BEDFORD

BIRMINGHAM
NEWCASTLE
CARDIFF

6D Weekly

No. 1 out April 11th

PLACE YOUR ORDER WITH YOUR NEWSAGENT NOW

THE enthusiastic welcome which has greeted every issue of *Modern Wireless* has prompted us to enlarge our organisation and to produce a new weekly Wireless Magazine along similar lines.

The Editorial side of *Wireless Weekly* will be in the hands of John Scott-Taggart, F.Inst.P., assisted by E. Redpath, Alan M. Douglas and G. P. Kendal B.Sc—all well-known Radio experimenters.

At this early date it is not possible for us to issue a full list of the Contents of No. 1, but arrangements are being made to incorporate a number of special features—some of which have never appeared in any other Wireless Magazine

RADIO PRESS LTD.
DEVEREUX COURT, STRAND. W.C.2.

Wireless Weekly

On Your Wavelength!

Ex-army Wavemeters

Tracing Troubles

Humour for Children

S O S Calls

The Latest Broadcasting Infant

Variometers

IF you are the proud possessor of an ex-Army heterodyne wavemeter don't forget that the instrument is designed to work with the "R" valve, and that if any other is used the calibration charts supplied will not give correct readings. One can, of course, make use of other valves, provided that they will oscillate on the nine volts supplied by the plate cells, by compiling an error curve. To do this one takes readings on stations of known wavelength and notes the difference between the chart's figures and those obtained. Suppose, for example, that at 600 metres you must add 15 degrees to the reading given, 14½ at 750, 13 at 900, 11 at 1,000, and so on, it is easy to draw on a piece of squared paper a curve showing the additions (or it may be deductions) necessary to obtain correct readings on any wavelength.

* * * *

Funny how often one misses the obvious when something goes wrong with the set. The other night when mine was switched on signals were so feeble that something was certainly amiss. Conections, batteries, valves and all manner of things were unjustly suspected, and it was not until some time had been spent in fruitless investigation that it occurred to me to turn the adjusting screw of the Brown loud-speaker. It must have been jarred out of place, or possibly somebody had been meddling with it. Anyhow, the response was immediate and signals regained their wonted vigour instanter. One seems to suffer at times from a species of temporary insanity. I remember an evening a long time ago when the set's absolute refusal to function was traced after a long hunt to the fact that the plus H.T. plug had been placed in the negative socket, and *vice versa*. I suppose that everyone does similar things on occasions to his no small annoyance and the vast amusement of his friends.

* * * *

Some of the humorists, by the way, who have been selected of late to take part in the children's evening half-hour have not been the happiest of choices. Few kiddies, I believe and hope, can appreciate "drunk" stories, or those of a kind more appropriate to the smoking-room than to drawing-room or nursery. Surely there are plenty of entertainers to be found who can be really funny without being vulgar. And, somehow, what would pass quite well at theatre or music-hall may sound appalling even to grown-ups when it comes through in cold blood on the wireless set.

* * * *

I thought that I must be mistaken the other night when on looking up the call sign of a station heard on 300 metres I found it to be that of Stonecutters' Island, near Hongkong. However, both a friend and myself have heard it on several occasions since, so there can be no mistake about it. It is worth while to listen for it after broadcasting hours, and you will find little difficulty in identifying the characteristic Admiralty note. On my set the signals are quite as strong as those of many of the Spanish spark stations. The distance is about 7,000 miles, and the waves must pass quite near the North Pole on their way.

* * * *

A good many wireless men probably heard the S O S message that came through on Sunday, March 11, at 8.50 p.m. As relayed on by G.L.D., it stated that the call came from the ss. *Marburn*, ex Tunisia. On the following Tuesday we learnt that the *Marburn* was quite safe, and had sent no call for help. Where the S O S came from is still a mystery. The most striking feature of S O S calls, whenever they occur, is the speed with which the big shore stations obtain silence on the shipping wavelength. "Q R T for S O S," they send, and usually within sixty seconds the normal babel on 600 metres has died away to nothing. On another occasion, some months ago, when an S O S came through I was surprised to notice how many amateurs engaged in transmitting either did not hear or did not heed the request for silence. If you're sending on anything like 600 metres you should shut down at once in the case of an S O S.

* * * *

Glasgow (5 S G), the latest B.B.Co. infant to be ushered, so to speak, into the ether, has made a very good beginning, and there are reports of a wild rush for receiving sets in Scottish towns. Birmingham lies almost in line with 5 S G and my station, and as there are only five metres difference in their wavelengths I can't get Glasgow when both are working. But when 5 I T closes down for a minute or two 5 S G can be tuned in. I can't claim that he is strong, but he is there, and the transmissions are remarkably clear.

* * * *

The variometer is becoming increasingly popular over here, though only a few months ago it was very rarely to be seen. For short wavelengths it is certainly one of the most selective tuning devices imaginable. Its only drawback is its very limited range of wavelengths. You can obtain a variometer effect with ordinary tuning gear with a little ingenuity. One way is to wire the primary and secondary of a loose-coupler in series. Another means of accomplishing the same end is to use a two-coil holder with a pair of inductances connected in series. Either of these devices will work, though they are not so good as the genuine article with a ball-shaped rotor moving inside the stator.

* * * *

May I add one tip to those given in a recent issue of AMATEUR WIRELESS for making up a H.T. battery from flashlamp units? You probably have an old tapped battery amongst your junk, or if you have not, some friend can provide one. Chip off the wax or pitch cover and remove the sockets soldered to the cells. These can then be fixed to the long strips of the flashlamp units. When the job is finished you have a handy affair with wander-plug sockets at 4½-volt intervals.

* * * *

It could have been no one else but our good friend from Writtle who was testing microphones at 2 L O the other morning.

"I want you to pay particular attention to the quality of the modulation," he told Chelmsford. "I want to know if there are any whiskers when it comes through the loud-speaker. In fact, has it any of the characteristics of the Beaver. Right away! We're going to start test No. 1. Don't forget the whiskers! If you find any save 'em, and I'll have 'em stuffed and eat 'em for dinner. Hold tight, the whisker hunt is on!"

Then, a little later:

"Hello; Hello! That's 2 L O. Sorry, we'll have to stop for a bit. The piano-player is tired and wants to re-wind itself. We'll be on again in three minutes; but there is no reason why you shouldn't listen all the time, if you want to. Don't forget those whiskers. I want a report of whiskers when I get home."

He is surely a merry gentleman. And, it should be said, 2 L O's new microphone has very few of the characteristics usually ascribed to the Beaver.

THERMION.

Calibrating Your Set

An explanation of a simple aid to quick and accurate tuning

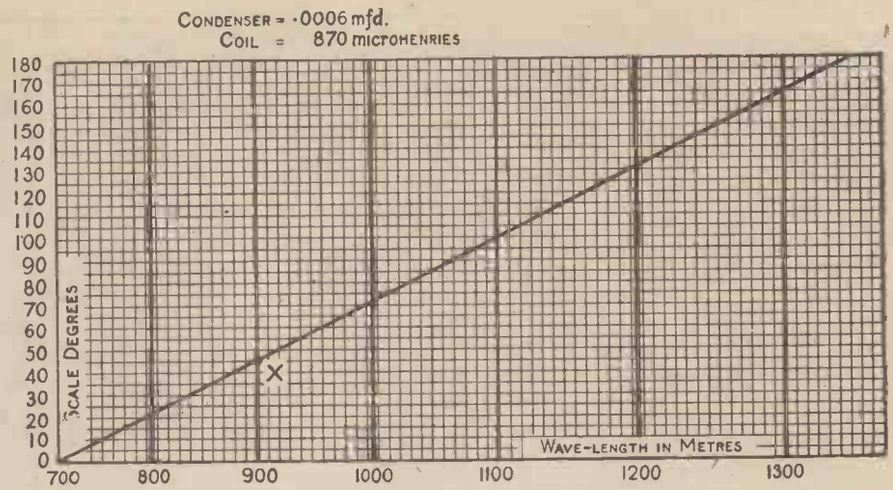


Fig. 2.—Calibration Chart for Inductance Coil.

VERY few wireless sets are sold ready-calibrated. The purchaser is told that the studs or coils give certain ranges of wavelengths, but he is left to find out for himself just what values of inductance and capacity are needed in order to pick up stations to which he wishes to listen. Everyone gets to know his own set instinctively to some extent after a time; the enthusiast can show you that to tune in for 1,000 metres he must place the condenser pointer about here and the inductance switch about there. But this is not a really satisfactory state of affairs. One ought to be able to say exactly what is the adjustment required for any wavelength. It is quite possible to do so, if the set has been calibrated, a process which is far less formidable than it sounds, so long as it is done in a rough way—which in most cases is all that is necessary. Anyone can make in a single evening a calibration of his set that will double his speed in tuning-in. There is a further advantage about a calibration chart: if at any time you wish to dispose of your set in order to buy a larger one, or one that is more up to date, the chart will add greatly to its attractiveness.

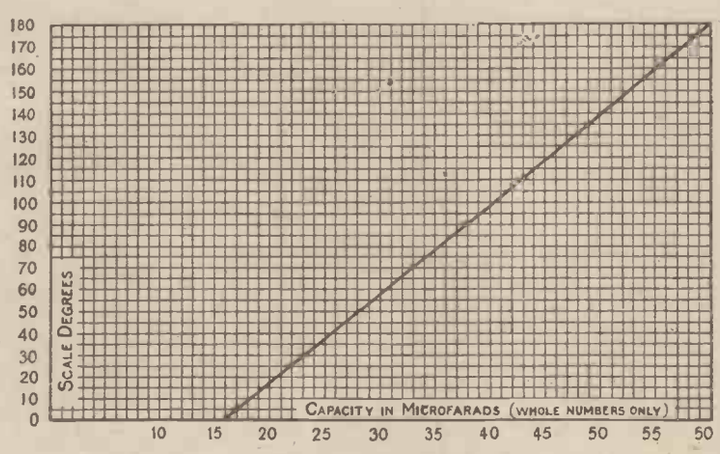


Fig. 1.—Degrees-capacity Chart for ·0006 mfd. Condenser.

Capacity Values

The first step is to ascertain the capacity values of the aerial tuning condenser at both maximum and minimum points of adjustment. When the plates are entirely out of mesh its capacity is very far from being zero. Capacity exists between the centre rod and the plates, between the opposed edges of the plates, and even between the terminals. Moreover, as we wish to discover the values of the condenser when it is in use in the set, that of the aerial must be taken into account as well.

Makers are apt to overstate the *maximum* value of the condenser, so that the figures given for this may usually be taken as approximately correct for working purposes when it is wired up in parallel with the aerial. The writer found that the minimum capacity of a .001 mfd. variable condenser of good quality may be taken as .00019, that of a .0006 about .00016, and that of a .0005 about .000095. For calibration purposes we must ascertain the capacity of the A. T. condenser at any point of adjustment. To do so a chart must be made, as shown in Fig. 1. The diagram given is for an instrument of .0006 mfd. maximum capacity, but any sized condenser can be dealt with by making the horizontal lines of appropriate length.

Making a Chart

On a piece of squared paper draw the left-hand vertical line, making each square correspond to 5 degrees on the condenser. The horizontal line at the bottom is marked off into capacity values. The three zeros are omitted, only the whole numbers being taken into account. Each square thus represents .00001 mfd. For a .0006 mfd. condenser mark off 60 squares, for one of .001, 100 and so on.

Now join the minimum capacity reading on the bottom line (.00016 in this case), and the maximum reading on the top line (.0006) by means of a diagonal line. The capacity value of the condenser can be read off at a glance for any position of the indicator. If, for example, the pointer marks 35 degrees it is just under .00025; at 160 it is .00055.

Next tune the set exactly to a station of known wavelength. This is not usually a difficult business, since even if one cannot read Morse there are quite a number of unmistakable stations, which can be identified if necessary by reference to the time-table of transmissions.

Inductance Calibration

Sets fitted with loose-couplers, or other inductances which work by means of rotary switches and studs, are best calibrated stud by stud. If honeycomb, slab or basket inductances are used deal with each coil separately. In sets which make use of tuning inductances with a sliding adjustment it is best to divide the coil into sections by making a scratch with a file every two inches or so along the slider rod, and to make a chart for each section. Of whatever nature the inductance may be the process is essentially the same; a station whose wavelength is known must be picked up on each stud coil or section, and the exact position of the condenser pointer noted.

Let us suppose that we have tuned in on Croydon (900 metres) upon a basket coil with the condenser showing 45 degrees. A glance at the condenser chart shows that the capacity at this point is .00027 mfd. We can now find the inductance value of the coil by making use of the formula—one of the most useful in wireless: λ (wavelength) = $1885 \times \sqrt{C}$ (capacity in microfarads) $\times \sqrt{L}$ (inductance in microhenries).

We then write down the following:

$$900 = 1885 \times \sqrt{.00027} \times \sqrt{L}$$
$$= 30.537 \times \sqrt{L}$$

Hence $\sqrt{L} = 29.5$, and the inductance value of the coil is 29.5 × 29.5, or 870 microhenries.

We now apply the same formula to the assumed minimum capacity of .00016 mfd. in order to find the wavelength of the coil when the condenser is set at zero. The calculation is:

$$\gamma = 1885 \times \sqrt{.00016} \times \sqrt{870}$$
$$= 1885 \times .0128 \times 29.5$$
$$= 712 \text{ metres.}$$

In order to keep to round figures we will call this 700 metres. Take another sheet of graph paper and mark off on it as before a vertical line (see Fig. 2) corresponding to condenser-scale degrees. The squares on the horizontal lines, which indicate wavelengths, are marked off in logarithmic proportion. Take the whole numbers only of the first two lengths and square them: $7^2 = 49$, $8^2 = 64$. The difference between 64 and 49 is 15; fifteen divisions, therefore, come between 700 and 800 metres. In Fig. 2 the number has been halved throughout to save space. Between 800 and 900, seventeen divisions will be needed, and so on for the other hundreds, two extra divisions being required for each succeeding pair. Rule vertical lines at each 100 metres.

Make a dot (x) at the point where the condenser value of 45 degrees and the 900 metres vertical line cross. Join this dot to the 700-metre corner, and produce the diagonal line until it meets the top horizontal line. We can now read off at a glance the position of the condenser pointer that will be needed to give any required wavelength, and conversely the wavelength of any station that has been tuned in can be found in a moment. For example, if a station is heard when the pointer marks 115 degrees, its wavelength, 1,150 metres, can be read off at once.

Checking Results

In order to prove the correctness of our chart we can compare the maximum wavelength shown by it with that found by calculation:

$$\lambda = 1885 \times \sqrt{.0006} \times \sqrt{870}$$
$$= 1885 \times .0246 \times 29.5$$
$$= 1368$$

As the chart shows about 1,345 we are not far out. The small difference is accounted for by the fact that we have omitted in most cases all but the first two or three places of decimals, and that we started with the round figure 700 metres. It is accurate enough for all practical purposes, and it will enable those who make it to pick up stations in a moment. You cannot perhaps hit them exactly, but you will always be within one or two degrees of them at once.

Even if calibration were carried out with the most minute care tuning would be found to vary slightly on different days. The capacity of the aerial is a variable factor. Unless it is always hauled up to precisely the same height there are bound to be little differences. Aerial capacity, too, is affected by dry weather, which detracts from the quality of the earth, by atmospheric conditions and by a host of other tiny factors.

There is another thing, too, that we have not taken into consideration. In our calculations we have "lumped" the inductance value of the aerial with that of the A.T. coil. The inductance of the aerial varies like its capacity, being affected by the curve of the suspended wire, as well as by the dampness or dryness of the air. In a high wind both the capacity and the inductance of the swaying aerial wire are changing slightly at every instant.

The little charts, however, will well repay by their usefulness the time that is spent in making them; if they are carefully drawn up they will be found to save an immense amount of trouble when quick tuning-in is required.

To save amateurs labour in their calculations the approximate square roots of various usual capacities are given below, as well as the multiples of the constant factor 1885:

The square root of	.0001	is	.01
,, ,,	.0002	,,	.014
,, ,,	.0003	,,	.0174
,, ,,	.0004	,,	.02
,, ,,	.0005	,,	.0225
,, ,,	.0006	,,	.0246
,, ,,	.0007	,,	.0263
,, ,,	.0008	,,	.0282
,, ,,	.0009	,,	.03
,, ,,	.001	,,	.032

1885	× 2 =	3770
,,	× 3 =	5655
,,	× 4 =	7540
,,	× 5 =	9425
,,	× 6 =	11310
,,	× 7 =	13195
,,	× 8 =	15080
,,	× 9 =	16965

W. R.

An Adjustable Detector

EXCELLENT results have been obtained from a very simple form of crystal detector shown in the drawings Figs. 1 to 3.

The crystal cup is in two parts (Fig. 2),

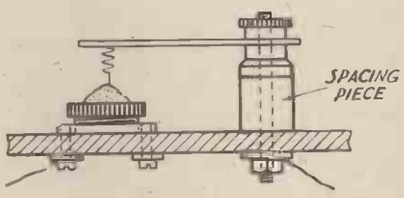


Fig. 1.—Elevation of Detector.

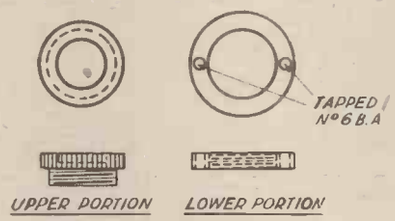


Fig. 2.—Parts of Crystal Cup.

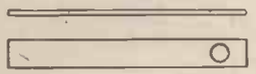


Fig. 3.—Spring Arm.

the upper portion of which is screwed into the lower portion. The contact side consists of an ordinary terminal holding a strip of flat steel (Fig. 3) on to which is soldered a fine spiral spring (the writer uses Hertzite, the spiral spring being of hard copper wire).

It will be seen that the arrangement explained above will allow of a very fine adjustment, the whole surface of the crystal being easily available during the search for a sensitive spot by revolving the upper portion of the crystal cup and movement of the strip of steel sidewise. It will be obvious that a slight modification will enable separate crystals to be used.

A. R. W.

Wireless Material Substitutes

OLD worn-out gramophone records make good tops for panels, also condensers and turn-buttons.

If the record is placed in a dish of very hot water, or warmed in an oven, it becomes soft, and it can then be cut to any shape with a strong pair of scissors. Turn-buttons can be stamped out with round hollow punches. The holes for terminals are easily made with hot skewers or wire.

Bicycle-spoke nipples also make good contact studs for tapping coil switches, as the wire can be pulled through from underneath and secured with solder, thus making a good contact.

H. E. F.

RADIOGRAMS

A HIGH-POWER station for world communication is likely to be built in Lincolnshire.

Scotland Yard is experimenting with a view to fitting the cars of the Flying Squad with wireless transmitting and receiving apparatus.

The wavelength of 320 metres has been allocated for fire service communication.

The Newark, N.J., station, W O R, was the first of the American broadcasting stations to transmit across the Atlantic.

A wireless series of cigarette cards is the latest to appear.

A wireless receiving set has been installed in Cabras Island, South America's leper colony.

Requests have been made to the Admiralty that they should authorise the fitting of warships with apparatus for the reception of broadcast news and concerts. For the present, however, they have declined to do so.

Ashford's Garages have forwarded us a little fitment which they are placing on the market in the form of an aerial wire clip and down-lead locator.

Bolton Corporation has framed a series of regulations regarding the erection of aerials crossing the public highways.

Mr. Tom Payne, the first director of the Newcastle broadcasting station, has resigned the position.

It is becoming increasingly apparent that an international wireless language is needed, and when the International Conference of Chambers of Commerce is held at Easter in Venice this point will be raised and dealt with. Esperanto has been suggested.

The station at Ridgewood, New York (call W H N) broadcasts exercises every morning at 7.0, 7.30 and 8.0 a.m. They are accompanied by music. Bed-time exercises are also broadcast at 10.30 p.m.

The whole of the annual report read at a meeting of shareholders of the Commonwealth Edison Company was broadcast in America recently.

A small wireless phone has been developed by a German for use in houses or factories. The transmitting part is adjustable in steps of 20 metres and each receiver has a fixed wavelength.

Thieves broke down and removed a 50-ft wireless mast and equipment from the garden of a London house recently.

Loud-speakers in conjunction with amplifiers are being used now for overflow meetings. A League of Nations campaign meeting recently held at Bedford had recourse to this system.

The registered offices of the British Broadcasting Company, Limited, are now permanently situated at 2, Savoy Hill, London, W.C.

A London-Dover Pullman car has been equipped with a receiving set.

A message broadcast from the Birmingham station of the British Broadcasting Company was the means of finding a boy who was missing from his home in Birmingham.

There is no truth in the report that the removal of the London broadcasting station is contemplated owing to its proximity to the Air Ministry. The station is to be removed, but only for reasons of convenience.

President Harding is to ask Great Britain, France, Italy, Japan and the Netherlands to sign an agreement embodying new rules for the use of aircraft and wireless in war-time.

It is reported that each evening between 6.15 and 7.30 some unknown person is broadcasting a concert in Paris. The power appears to equal the Eiffel Tower transmissions, and as yet the authorities have not been able to locate the sender.

Camberwell Guardians have announced their intention of providing wireless entertainments at the infirmary.

The Broadcasting Co. have arranged to transmit official information of the Girl Guide movement each Thursday at 6.45 p.m. from all stations.

The first day the Postmaster-General, Sir William Joynson-Hicks, M.P., entered upon his duties at the General Post Office, he received a deputation from wireless manufacturing firms on the question of the broadcasting agreement.

The capital of the South African Wireless Co. has been fixed at £500,000, which may be increased or reduced with the consent of the Government.

"Why are no concerts transmitted by the B.B.C. before 8.30 on Sunday evenings?" asks the *Referee*.

Arrangements are being made in Newcastle to supply a wireless installation for the inmates of the workhouse.

The Electrical Engineers' Association is considering the possibility of wireless aerials at electricity stations, so that consumers can connect their electric light fittings with wireless receiving apparatus.

According to a decision of the Derby Licensing Bench, licencees of public houses in Derby who wish their patrons to listen in to wireless concerts, etc., must have a special music licence. This licence will not be a general music licence, but will permit of a gramophone being played.

A recommendation has been passed by the Theatrical Managers' Association that none of its members should grant facilities at present for broadcasting plays.

Thousands of acknowledgments have been received by the B.B.Co. reporting on the excellence of the opera transmissions from 5 S C (Glasgow).

A recent advertisement in the *Times* agony column read as follows: "Broadcasting.—Wanted, expert with direction-finder to detect experimenter, probably near Hyde Park, continually interfering; others troubled also."

A London landlord complained to the magistrate recently that owing to a tenant having fastened the earth wire of his receiving set to a gas-pipe the insurance company declined to continue the insurance of the house

Broadcasting: The Situation

Some Extracts from the Chairman's Speech at the General Meeting of the Company

WE print below some of the salient points of Lord Gainford's speech at the general meeting of the above company, held at the Hotel Cecil on March 22:

Membership Agreement

"I know that there have been complaints as to the drafting of the Membership Agreement (and perhaps not without reason). Some of you may know already that Clause 4 'j' gave rise to some difficulty, and subject to the approval of the Postmaster-General it will be deleted, and in its place an addition will be made to Clause 4 'c,' to read as follows:

"'Provided always that the member shall not make any apparatus whatsoever intended for use in connection with the Broadcast Wireless Scheme (other than and except the apparatus specifically mentioned in the schedule hereto) for or to the order of any person, firm or company who is a manufacturer of wireless apparatus, but who is not a member of the company.'"

Allotment of Shares

"Prospectuses have been sent out in reply to some 800 inquirers, and applications for shares have been received from 547 manufacturers. The board, to the date of the Statutory Report, March 12, had allotted 19,340 shares to 268 applicants. Since that report was compiled 843 shares have been allotted to 116 applicants."

Deposits

"I do not think that there need be any objection to the deposit of £50. This will always be a reserve for the company, but actually at any period during a month the member will be owing the company considerably more than £50 in accrued tariff."

Dividends

"We have heard that the restriction of the dividend to 7½ per cent. would enable the board to create a large reserve. We only wish we could already see assured a dividend of any kind. If by any chance there is any reserve over after the payment of dividend, a portion is certain to go direct to improve broadcasting services, but at the present moment we need not consider this, as the loss of revenue from which we are suffering, owing to various causes, is the occasion of most serious concern. We hardly need comment on the statement officially made by the Post Office that at the end of February only about 80,000 licences of both kinds had been issued. All of us may have our different views, but if this figure were multiplied by four or five we should probably be nearer the number of receiving sets in the country. There appears to be a wholesale evasion going on. Many people possessing sets have not yet taken out a licence, whilst others ignore some of the terms of the broadcast licence, this prevents the company improving the quality of programmes which the directors desire."

Licence Evasion

"There are elements in the trouble which we cannot handle ourselves. Dealers are said to be pushing the sale of sets employing reaction to customers who do not hold the experimental licence. We are informed that assistance is given in the procuring of the experimental licences, and that the holders of the broadcast licence are being told that there is no necessity for them to observe strictly the terms of that licence, which stipulates that only a B.B.C. set may be used. Whether arising from ignorance, or carelessness, or sheer maliciousness, and whether on the part of manufacturer, or retailer, or buyer, or general public, there is a widespread infringement of the regulations. A service, which, judging from the voluminous correspondence received at the company's offices, is creating interest and giving satisfaction throughout the country, is being most seriously prejudiced. Not only are thousands of people apparently content to listen-in for nothing, but there are still in many districts people wholly preventing their neighbours, through reaction, from enjoying what is broadcast."

"We are doing our best with the Postmaster-General to secure the efficient carrying out of the Post Office regulations. We must have the co-operation of manufacturers and dealers, and amateurs and the public generally. Evasion of any kind is not only illegal, but a short-sighted and foolhardy procedure."

Future Possibilities

"No one can speak with certainty of the possibilities which are before us. There are difficulties in many directions, apart from those which I have indicated above, and which it is not expedient to discuss or mention at present. We need your support in adequate measure. The officials of the company have been working in small temporary offices, and therefore with a staff inadequate for the demands made on them. I know myself that most of the staff have hardly had one evening free since the inception of the company, and we ask the indulgence of the public if certain matters have not been expeditiously handled."

"The management of the company is fully alive to the possibilities which lie before them, and with adequate revenue and the goodwill of manufacturers, we think, given reasonable time, our shareholders and the public will find us capable of discharging efficiently the service which has been entrusted to us."

Land-line Transmissions

AFTER 2 L O had closed down on March 19 amateurs who were still listening-in were surprised to receive a very good concert from 2 L O, commencing at about 10.45 p.m. This concert was relayed by land line from Birmingham and then "wirelessed" from 2 L O. Captain Eckersley, who was in charge of the operations, said results were better than were expected.

The experiments were carried out, primarily, to see if it would be possible to relay a concert or anything of very general interest by land-line to the various broadcasting stations and then transmit by wireless from these stations. Over 1,000 postcards and letters had been received saying how very well these concerts were received. The same experiments were performed, with rather better results, on the following evening.

A Self-lighting Electric Lamp is described in the current issue of "Work," the journal for amateur mechanics. Other articles include A Welsh Dresser in Oak, Overhauling the Reed Organ, Three-in-one Surface Gauge, Steam-engine Governors, Renewable Lid for Milk Jug, Hints on Staining Floors, Making a Lock for Street Door, Painting a Boat, Making the Rainbow-spinner Toy, Cord Netting for Use as Mattress.

"The Amateurs' Book of Wireless Circuits," by J. H. Haynes (Wireless Press, Limited). This book is a useful compendium of circuits used in wireless work. Symbols and switching arrangements occupy the first few pages, and then the circuits, which total over 100, are given progressively, beginning with the simpler ones. The drawings are clear, and with the accompanying text easily understandable. The price is 2s. 6d. net.

Owing to the great demands upon our space we have been obliged to hold over the instalment of "Building Broadcast Receivers."

Photograph of Portable Single-valve Receiver.

Making a Portable Single-valve Receiver

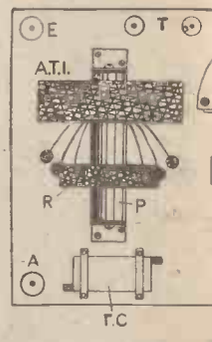


Fig. 2.—Details
Under Side

A SINGLE-VALVE receiver as effective and portable as a self-contained gramophone—this is what is claimed of the portable set described in the following article.

The design is perfectly simple, everything being combined in one attaché case with the exception of the low-tension, 4-volt accumulator.

It is capable of receiving efficiently over a range of 200 to 1,200 metres, and will give speech and music clearly up to a distance of 50 miles from a broadcasting station.

Description

Briefly, the set consists of a single-valve panel fitted with a long-range tuner, variable condenser, reactance coil, filament switch and necessary terminals; to one side of the panel is mounted the valve, and placed along the other side is the 36-volt H.T. battery. The whole instrument with valve and battery is fitted in a polished wooden or composition carrying case, as shown in Fig. 1, which gives a general plan view of the arrangement. The hinged lid has been omitted in order to make the drawing more clear. It will be noticed that in carrying the set about the H.T. battery, which is the heaviest portion of the set, is at the bottom of the case, and if the case is stood on end will serve to keep it steady.

In order to get the set working it is only necessary to connect the accumulator, phones and aerial and earth to their respective terminals. The whole operations of tuning, adjusting the high- and low-tension voltage, etc., may be effected from the front of the instrument. No other connections are required, and the set can therefore be quickly dismantled or erected.

It will be noticed that no measurements are given on any sketch, as the actual dimensions may be modified to suit individual requirements.

Supposing, however, that it is decided to adopt a Mullard valve and a 36-volt H.T. battery of the Hellesen type: the battery will measure 6¾ in. long by 2½ in. wide and 3 in. deep, exclusive of wander plugs, and a containing case designed in proportion will be as shown in Fig. 1, measuring 7¼ in. by 9 in. by 6 in. deep, including the lid, which is 2 in. deep, to clear the tuning knobs, etc. This will form a very compact unit and have the advantage of being entirely self-contained.

With regard to the component parts of the set it will be left to the decision of the reader as to whether he will make these himself or build up from parts supplied by trade advertisers in AMATEUR WIRELESS. Taking into consideration the fact that prices for ready-made parts are very little higher than a private individual would pay for the raw material to make them, the writer would strongly advise the use of ready-made parts. The approximate cost of the set using such parts would work out at something under £3 10s.,

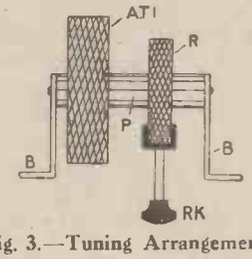


Fig. 3.—Tuning Arrangements.

which is not excessive considering the portability and general performance of the apparatus.

Component Parts

Having decided to build from component parts, the first step will be to make out a list of the material and parts required.

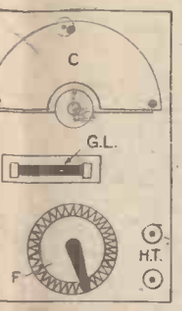
The following list shows the average cost of the material if purchased from advertisers in AMATEUR WIRELESS. The letters refer to those shown on the drawings in Figs. 1, 2 and 3, and will help in identifying the different portions of the apparatus:

Parts.	Description.	Cost. £ s. d.
C.	—Variable condenser	0 5 0 6
A.T.I.	(Fig. 2).—Aerial-tuning inductance (wound)	0 3 0
A.T.I.	(Fig. 1).—Switch-arm complete	0 1 3
F.	—Filament resistance ...	0 4 0
T.C.	—Telephone condenser ...	0 1 6
G.L.	—Grid-leak and condenser	0 2 9
V.H.	—Valve holder	0 1 0
R.	—Reactance (wound)	0 2 0
P.	—Ebonite former	0 0 6
B.	—Brass brackets (2)	0 0 3
V.	—Valve (Mullard)	0 15 0
H.T.B.	—H.T. battery (36-volt Hellesen)	0 8 0
Terminals (8)	... ...	0 1 0 4
Screws, wire, etc.	... ...	0 2 0
Ebonite panel	... ...	0 3 9
Polished wood with carrying strap	... ...	0 10 0
Contact studs, ebonite knobs, etc.	... ...	0 5 0
Total	... ...	£3 6 10

It will be noticed that the prices given are a little on the high side if anything; the reader may therefore take it that for £3 6s. 10d. the highest quality parts may be obtained. The cost of the containing case may vary slightly, some cabinet-makers charging a higher rate in view of the fact that the case has to be specially made.

The ebonite panel having been cut to size, is carefully measured up and the position of the variable condenser, filament switch, aerial tuning switch, reactance adjustment and various terminals marked. After the necessary holes have been drilled in the panel it should be finished off in accordance with instructions which have appeared from time to time in AMATEUR WIRELESS. A dull matt finish is the most effective for this type of medium-sized panel.

The general arrangement of the top of the panel is shown in Fig. 1, while Fig. 2



ittings on
of Panel.

A Compact Device in an Attaché Case

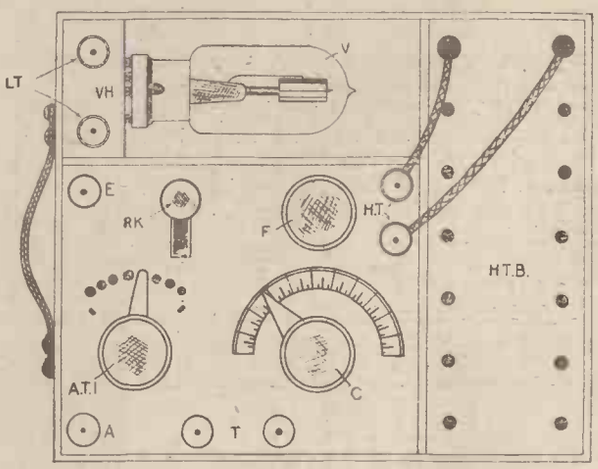


Fig. 1.—General Plan View of Instrument.

gives details of the fittings on the under side of the panel before the wiring is done. The condenser C is assembled from the bought parts and mounted on the panel in the bottom right-hand corner. If great care is taken it will be possible to drill the holes and mount the condenser without breaking through to the front of the panel.

The filament switch F should be mounted in the same way, while the aerial-tuning switch A T I (Fig. 1) will be secured with a nut and spring washer. The position of the studs of the tuning switch should be carefully marked to ensure their being equidistant, while two small stops should be fitted to confine the range of the switch arm. A narrow slot is cut in the panel, as shown in Fig. 1, to allow the reactance knob and plunger to pass through and slide backwards and forwards for a distance of 2 in. or so, the actual length being found by experiment.

On the under side of the panel is mounted the grid-leak and condenser G L, and also the telephone condenser T C. The grid-leak is secured by means of two small screws, the telephone condenser with the aid of two small strips of black fibre.

Aerial-tuning Inductance

The aerial-tuning inductance should now be constructed, a honeycomb coil proving the best and most compact for the purpose. An ebonite former should be roughly put together for winding and for holding the coil when dipping in the paraffin wax. The former may be 2½ in. in diameter with two sides 4 in. in diameter and 1 in. apart. The wire, No. 26 d.c.c., should be wound on the former and tappings taken at the following turns, 18, 25, 35, 50, 75, 100, 150, the tappings being looped back and soldered to the contact studs of the tuning switch. The reaction coil should be wound in a similar fashion, the centre hole being the same diameter as that of the A T coil, to enable them both to be slipped on the ebonite rod P. The arrangement of these coils is clearly shown in Fig. 3, wherein it will be seen that the ebonite rod P is mounted between two brackets B, which are of sufficient length to give clearance for the coils.

The reaction coil R is made to slide freely on the ebonite rod P, while the position of the A T coil is fixed. A small ebonite holder is carefully fitted to the reaction coil with the aid of Chatterton's compound, the ebonite block also carrying a short brass rod terminating in the ebonite knob R K. It will be seen that by the aid of the knob R K the reaction coil may be moved nearer or farther away from the A T coil as required.

Fitting-up the Case

This completes the assembly of the panel, and the next point for attention is the fitting of the battery, valve and panel into the case. It will be noticed on referring to Fig. 1 that the battery, valve

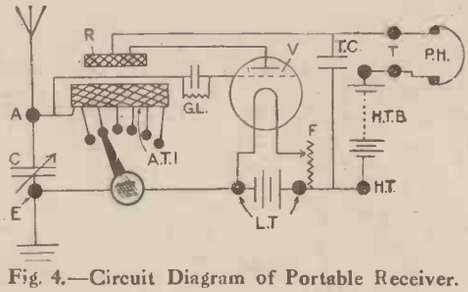


Fig. 4.—Circuit Diagram of Portable Receiver.

and panel are separated from one another by means of partitions fitted in the case. The H.T. battery should first be fitted in the end of the case opposite to the carrying strap, the wooden partition is then inserted and secured in place by means of countersunk wood screws passing through the side of the case.

Care should be taken in fixing this partition not to jam the battery in too tightly, otherwise difficulty will be experienced in replacing or renewing batteries.

The instrument panel, if it has been carefully cut to size, should fit in the remaining space, as shown in Fig. 1, leaving room for the valve in the top right-hand corner. The panel is supported in the case on small angle pieces of wood glued in the corners at such a height that the top surface of the ebonite panel is flush with the edge of the case.

The valve, in its holder, is mounted on a small block of ebonite, which carries, in addition, the terminals for connection to the low-tension supply from the accumulator.

It will be noticed that for convenience of internal connections, this ebonite block is so fitted in the case that when the instrument is being carried about the valve is hanging upside down; the spring of the valve legs will be sufficient to hold it firmly in position, but if desired a small felt pad may be arranged to press lightly against the top of the valve to prevent it working loose under excessive vibration.

Wiring the Panel

The panel should now be wired up, the diagram of connections being given in Fig. 4.

The reference letters in the diagram of connections are the same as those in Fig. 1, A being the aerial terminal, C the tuning condenser, E the earth terminal, A T I aerial tuning coil, R the reactance, G L the grid-leak, V the valve, F the filament resistance, T C the telephone condenser, L T the low-tension terminals leading to the accumulator, H T B the high-tension battery, T the telephone terminals, and P H the phones. All connections should be as short and straight as possible, and must be carefully soldered to avoid trouble through bad contacts.

If it is found necessary to cross any of the wires they should be kept as far apart as possible. Connections to the H.T. battery is made with the aid of wander plugs on flexible leads running from the terminals marked H T on the panel.

The lid of the case, as before mentioned, should be of sufficient depth to accommodate the knobs and other portions of the set which project above the level of the panel. It is a great boon to have the lid

entirely detachable from the case, and special two-piece hinges may be obtained which enable this to be done.

The case itself, with lid, is best made up to instructions by a cabinetmaker, who will stain and polish as required for a very moderate sum. The partitions previously described, which separate the H.T. battery from the panel valve, may be of thin wood, but ebonite or bakelite sheet is much to be preferred, on account of the greatly improved insulation obtained.

Using the Set

With regard to the manipulation of the set: the aerial and earth connections having been made, the accumulator switched on and the phones put on, the A.T. switch is moved in conjunction with the tuning condenser until signals are obtained. For weak signals it will be necessary to tighten the reactance coupling by moving it nearer to the A.T. coil by the use of the sliding knob R K shown in Fig. 1.

Variation in the H.T. voltage will also affect the clearness of speech and music to a considerable extent, and the wander plugs will be found most useful.

When used as a portable set for operation at picnics, etc., a single-wire aerial wound on a reel and uncoiled as required will suit the purpose well. One end may be slung on a tree by means of a short length of cord and an insulator, the earth being a short brass rod to which is sweated a terminal for connecting up to the set. The brass rod is stuck in the ground in a moist position and the set placed on the ground in such a way that the aerial has a straight and uninterrupted path to the aerial terminal.

For indoor use a special length of insulated aerial is required.

A. W. HULBERT.

An Efficient 3-coil Holder and Stand

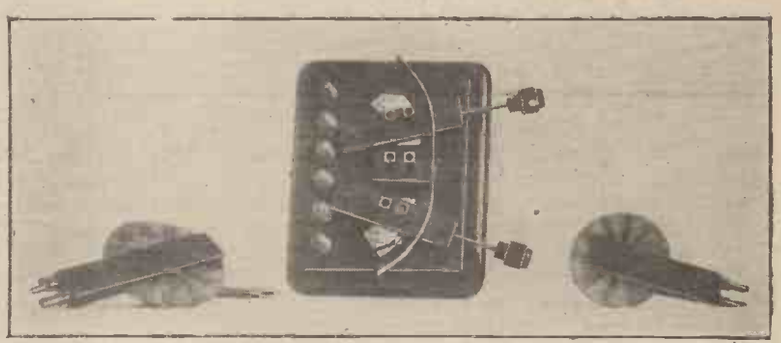


Fig. 1.—Plan View of Stand.

THE construction of a three-coil stand, made up from oddments, will be quite clear from the photographs Figs. 1 and 2

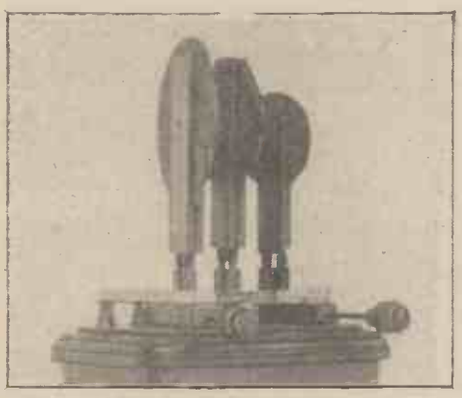


Fig. 2.—Photograph of Stand with Holders and Coils.

The base is made up from walnut wood moulding, the corners being rounded off with a rasp and finished with glass-paper and then polished; the corners could, if preferred, be left square. The top is ebonite, ⅛ in. thick (see Fig. 3), with the slots cut by means of a fret-saw. These slots allow plenty of play for the flex-wire connections to the terminals.

The legs for the plugs (Fig. 4) may be picked up from any electrical store for a few pence. The screws holding the legs are countersunk in the ⅜-in. ebonite, as this prevents all possibility of the wire rubbing on the heads and short-circuiting. The plugs in the coil holders are made to screw in the ebonite, the head of a ¾-in. wood screw being cut off and soldered in, as shown in Fig. 5. The pivot screws should be lock-nutted. The wiring is: front pin inside wire of coil, back pin outside of coil and so to the terminals. The coils are marked on the holders to indicate the back and front.

W. B

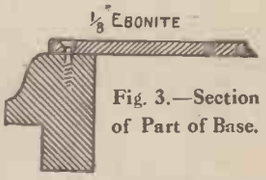


Fig. 3.—Section of Part of Base.

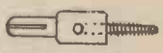


Fig. 5.—Plug.

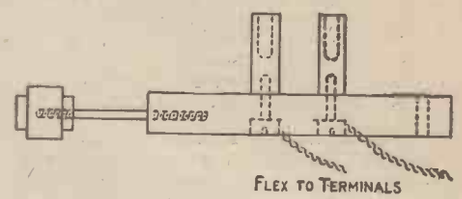


Fig. 4.—Coil Holder.

Modifying the "Amateur Mechanic" Set

THIS set, shown in the photograph, Fig. 1, is well known to many readers as one that has given excellent results on wavelengths between about 600 and 6,000 metres.

From letters received it is evident that the great increase in the number of continuous-wave stations operating now renders the addition of a valve (or valves) very desirable.

The set is inductively coupled, but the secondary coil is mechanically fixed inside the primary, the necessary variation in coupling between the two being effected by means of a specially arranged secondary tuning switch in which two switch-arms move radially over one arc of contact studs, thus altering the position of the active portion of the secondary with regard to the primary.

The circuit arrangements, described and illustrated in No. 23, may also be applied to this long-wave tuner, but on account of the larger dimensions of the coils of this latter set there is a further arrangement possible as shown in Fig. 2.

In view of the decision of the Postmaster-General forbidding the use of receiving sets for broadcast reception having reactance coils coupled to the aerial circuit (and therefore capable, when oscillating, of causing appreciable radiation from the aerial and consequent interference with adjacent receiving stations), the circuit illustrated in Fig. 2 on the next page will no doubt prove acceptable

It will be noted that the reaction coil R is inductively coupled to the secondary coil S, and, provided a comparatively loose coupling is employed between the aerial inductance or primary P and the secondary S, observable radiation from the aerial will be reduced to a minimum and may be entirely prevented.

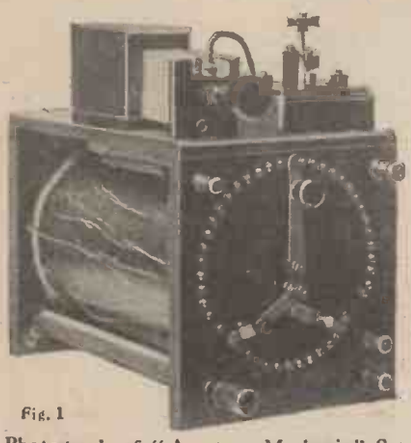


Fig. 1

Photograph of "Amateur Mechanic" Set.

The reactance coil R may consist of a former 7 in. by 3¼ in. (or nearest), closely wound for 6 in. of its length with No. 36 d.c.c. copper wire, and provided with, say, six equal tappings in order to facilitate self-oscillation over the complete range of wave-lengths. Should difficulty be experienced in this direction, the addition of a small variable condenser (.0002 to .0003 mfd.) in parallel across the reactance is recommended.

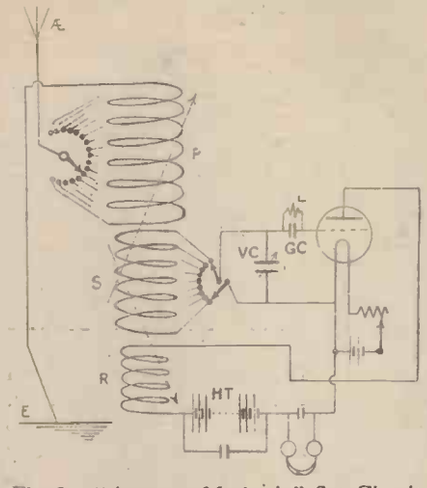


Fig. 2.—"Amateur Mechanic" Set Circuit with Valve and Reactance Coil Added.

If the coil R is being added to a set otherwise complete it will be necessary to cut a 3⅜-in. diameter hole through the back of the box and wooden discs carrying the original primary and secondary coils, so that R may slide inside the secondary coil.

Otherwise provision should be made for this whilst constructing the set.

E. REDPATH.

TABLE OF USEFUL DATA FOR COIL WINDING

Standard Wire Gauge	Diameter in inches	Sectional Area in Square inches	Resistance in Ohms per yard at 60 deg. F.	Resistance in Ohms per lb. at 60 deg. F.	Lb. per Ohm.	Weight in lb. per 1000 yards	Yards per lb.	Turns per inch: Enamel Covered	Single Silk Covered	Double Silk Covered	Single Cotton Covered	Double Cotton Covered	Standard Wire Gauge
10	·128	·012870	·001868	·0120	83·3	148·8	6·67		7·64	7·55	7·35	7·04	10
11	·116	·010570	·002275	·0200	50·0	122·2	8·16		8·41	8·30	8·06	7·69	11
12	·104	·008495	·002831	·0280	35·7	98·22	10·23		9·35	9·22	8·93	8·48	12
13	·092	·006648	·003617	·0550	18·1	76·86	13·00		10·5	10·4	10·0	9·43	13
14	·080	·005027	·004784	·0820	12·2	58·12	17·16		12·1	11·8	11·4	10·6	14
15	·072	·004072	·005904	·1400	7·14	47·08	21·23		13·3	13·1	12·5	11·6	15
16	·064	·003217	·007478	·2021	4·95	37·20	26·86	15·0	14·9	14·6	14·1	13·2	16
17	·056	·002463	·009762	·2423	2·38	28·48	35·00	17·1	16·9	16·5	15·9	14·7	17
18	·048	·001810	·01328	·6351	1·56	20·92	47·66	19·8	20·0	19·4	18·5	17·2	18
19	·040	·001257	·01913	1·315	·757	14·53	68·66	23·7	23·8	23·0	21·7	20·0	19
20	·036	·001018	·02362	2·012	·497	11·77	85·00	26·1	26·3	25·3	23·8	21·7	20
21	·032	·0008042	·02990	3·221	·309	9·299	107·6	29·4	29·4	28·2	26·3	23·8	21
22	·028	·0006158	·03905	5·498	·181	7·120	140·6	33·3	33·3	31·8	29·4	26·3	22
23	·024	·0004521	·05313	10·14	·098	5·231	191·6	38·8	38·5	36·4	33·3	29·4	23
24	·022	·0003801	·06324	14·38	·069	4·395	228·3	42·1	42·1	40·0	35·7	31·3	24
25	·020	·0003142	·07653	21·08	·0471	3·632	275·3	46·0	46·0	43·5	38·5	33·3	25
26	·018	·0002545	·09448	32·21	·0309	2·942	340·0	50·6	50 6	47·6	41·7	36·7	26
27	·0164	·0002112	·01138	46·55	·0215	2·442	410·0	55·0	55·1	51·6	44·6	37·9	27
28	·0148	·0001720	·1398	70·12	·0141	1·989	503·0	61·4	60·4	56·2	48 1	40·2	28
29	·0136	·0001453	·1655	98·65	·0101	1·680	596·6	66·2	65·2	60·2	51 0	42 4	29
30	·0124	·0001208	·1991	142·75	·0069	1·396	716·6	73·3	72·0	67·1	55¼	44·7	30
31	·0116	·0001057	·2275	185·80	·0054	1·222	820·0	77·8	76·3	70·9	56·8	46 3	31
32	·0108	·0000916	·2625	248·20	·0040	1·059	943·3	83·0	81·3	75·2	63 3	50·5	32
33	·0100	·0000785	·3061	337·50	·0029	·9081	1100	88·9	87·0	80·0	66·7	52·6	33
34	·0092	·0000665	·3617	471·00	·0023	·7686	1300	98·0	93·4	85·5	70·4	54 9	34
35	·0084	·0000554	·4338	676·50	·0014	·6408	1556	106	101	91·8	80·6	61·0	35
36	·0076	·0000454	·5300	1009·0	·00098	·5254	1903	116	110	102	86 2	64·1	36
37	·0068	·0000363	·6620	1574·0	·00064	·4199	2380	128	120	110	92·6	67·6	37
38	·0060	·0000283	·8503	2598·0	·000385	·3269	3056	143	133	121	100	71·4	38
39	·0052	·0000212	1·132	4645·0	·000217	·2456	4066	168	149	134	109	75·8	39
40	·0048	·0000181	1·328	6360·0	·000156	·2092	4766	180	159	142	114	78·1	40
41	·0044	·0000152	1·581	9029·0	·000112	·1758	5700	194	169	150			41
42	·0040	·0000126	1·913	13150	·000076	·1453	6366	211	191	167			42
43	·0036	·0000102	2·362	20120	·000050	·1177	7500	230	205	179			43
44	·0032	·0000080	2·989	32210	·000030	·0929	10766	253	225	192			44
45	·0028	·0000062	3·904	54980	·000015	·0712	14066	282	247	208			45

An Auction of Wireless Apparatus

ALTHOUGH there are not many wonderful bargains to be picked up at wireless auction sales at the present time, experimenters can still buy ex-W.D. sets and components at a reasonable figure.

Most ex-W.D. apparatus is well made and worth paying a good price for if in fair condition. The auctioneers offer no kind of guarantee whatever, and as the condition of sets varies considerably, it is a good plan to inspect the lots carefully beforehand. As most of the sets were used for short wave work they are suitable for receiving broadcasting without any alteration, and for that reason are in demand.

At a recent sale, held at Stevens's Auction Rooms, 38, King Street, Covent Garden, London, Mark 3 short wave receivers, complete with two variable air condensers, carborundum and zincite-bornite detectors, buzzer, etc., were bought for £8 (prices quoted are the average for instruments in good condition); 50-watt trench sets, combining transmitter and receiver, complete with platinum-pointed Morse key and sliding inductances, suitable for broadcast reception, fetched £4 10s.

B. Mark 2 receivers, two-valve detector amplifiers, containing intervalve and telephone transformers, realised £2 15s., and 65-metre rear transmitters were bought for 9s. Skeleton L.F. amplifiers, containing filament resistances, studs and other accessories, fetched 12s., while three-valve L.F. amplifiers in polished mahogany boxes, complete with intervalve and telephone transformers, went for £4 5s.

Power buzzer amplifiers containing a 10-volt power buzzer, three 2-mfd. condensers, Morse key, etc., were sold at 10s., and 60-watt C.W. transmitters, with ebonite formers and ball reaction, suitable for 160-2,000 metres, realised £2 5s. B. Mark 1 two-valve detector amplifiers, with resistances, switches and formers, went for £1 5s.

C.W. Mark 3 L.F. amplifiers fetched £3 15s., and a seven-valve R.A.F.-type amplifier was bought for £5 15s. Townsend wavemeters, 350-4,000 metres, could be obtained for £2. A three-valve set in polished wood case went for £4, and boxes of accessories, broken parts, leads, etc., fetched 18s.

Of accessories, phones and loud-speakers fetched the best prices. Brown's 8,000-ohm A-type were bought for £2 2s., and £1 17s. 6d. was paid for 1,500-ohm phones; 120-ohm phones, also A type, realised £1 2s. 6d. Other makes, 4,000 ohms, were bought for £1 12s. 6d. Stalloy loud-speakers fetched £1.

Lots of four R-valves, with two wooden valve boxes, went for £1 7s. 6d. G.P.O. and Navy buzzers, with platinum contacts and Morse keys, fetched 5s. and 6s. respectively. Boxes of about four dozen white reel-type aerial insulators were bought for 7s., and lots of a dozen small green porcelain egg-type insulators realised as much as 6s.

RADION.

Wireless in Parliament

MEMBERS of Parliament are not to have the pleasure of "listening-in" when a dull debate is taking place in the House of Commons. Mr. Moore-Brabazon asked the Postmaster-General whether he would take steps to have a listening-in station installed in a committee-room of the House of Commons in order that members might keep themselves advised as to the quality of the broadcasting sent out under the auspices of his Department? Sir W. Joynson-Hicks humorously replied that he did not think it was for him to provide a counter-attraction to listening-in in the House of Commons itself.

Two other questions concerning broadcasting were also put by Mr. Moore-Brabazon last week. The first was to ask the Postmaster-General if he had any control over the quality and selection of the items that were broadcast; if he was aware that the French stations were better than the English; and what steps he intended to take to see that we were not left behind in this direction?—Sir W. Joynson-Hicks replied: "The licence issued to the British Broadcasting Company provides that satisfactory programmes of broadcast matter shall be maintained. I am not aware that they are inadequate or that they are inferior to those transmitted from French stations, but perhaps my hon. friend will give me any particulars of French superiority in this matter."

The remaining question had reference to the North Foreland wireless station. Mr. Moore-Brabazon asked the Postmaster-General whether he was aware that this station sent out untuned wireless waves, and prohibited everyone in East Kent from hearing London broadcasting; and what steps he intended to take to stop this nuisance?—Sir W. Joynson-Hicks said he thought Mr. Moore-Brabazon was mistaken. The North Foreland wireless station did not send out untuned wireless waves. It worked on a tuned wave of 600 metres; its power was not excessive for the services which it had to perform; and it was equipped with all suitable apparatus for minimising interference. Its maintenance was important from the point of view of international obligations in regard to communication with ships and in the interests of the safety of life at sea. He regretted that when North Foreland was communicating with ships in the Channel interference was inevitable in the neighbourhood of East Kent.

A device for connecting phones in series, termed the "Warmar," has been put on the market by Messrs. Markes, Ward and Co., Ltd., of 30, High Street, Islington. This connecter consists of an insulating tube containing a powerful spring contact. It is only necessary to push in the two terminal pins which it is desired to connect and a firm connection is obtained.

School lessons are being broadcast to three schools in Sheffield.

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 418.

Making a Transformer

Q.—Will you kindly give me the design and windings for an auto-transformer to work from a 50-volt 50-cycle main, giving from 1 to 4 amperes and from 5 volts to 50 volts on steps of 5 volts at a time?—F. W. (Sutton).

A.—The core of this transformer should consist of stalloy strips 0·018 in. thick by 1⅛ in. wide, a sufficient quantity being required to make a depth of 6 in. when pressed up closely. Of these strips a depth of 3 in. will be needed 5⅛ in. long, and a 3 in. depth, 3⅛ in. long. They will assemble into a rectangular core 7 in. by 5 in. by 1½ in. deep, giving a sectional area of 2⅛ sq. in. for the web and a central opening 4 in. by 2 in. The joints at the corners must be staggered, and the whole held together by ¼ in. insulated bolts. The total number of turns in the whole coil will consist of 200 No. 18 S.W.G. d.c.c. copper, that is 4 turns per volt or 20 turns to each tapping point. The best way to arrange the windings will be to wind each 20 turns separately and assemble on one of the limbs, joining up afterwards.—A. H. A.

CORRESPONDENCE

Crystal Reception

SIR,—I think the following results which I have obtained will be of interest to other readers. I am using an aerial 75 ft. long (single), 30 ft. high, the set being a home-made one described in No. 1 of AMATEUR WIRELESS, the crystal being silicon with brass contact. I can hear 2 L O's broadcasting very often, also 2 Z Y, the music on several occasions being exceptionally clear. Among the code stations which I hear are: F F S (S. Maries de la Mer), F F U (Ouessant), F F H (Havre), F F X (Bordeaux), O X B (Blaavands), K A V (Norddeich). These are quite readable.—D. D. (Llandudno).

French Transmissions

SIR,—The station your correspondent E. W. W. (Coventry) has recently heard is the Technical Laboratory, L'Ecole Supérieure des Postes Télègraphs et Télèphones de Paris. They are working on a wavelength of 450 metres, and they transmit every Tuesday and Thursday evening from 7.45 to 10 p.m., and Saturdays from 4.30 to 7.30 p.m. Their object is the testing of various transmitters on a power of 500 watts.

At Croydon (Surrey) I receive this station slightly louder than Birmingham, their transmissions being of a very excellent quality.—R. H. (5 G I) (Thornton Heath).

[We are obliged to R. H. and other correspondents who have written on the above matter.—ED.].

BROADCAST TELEPHONY

Some of these transmissions are commercial or official. Wavelengths and times are liable to alteration without notice.

London B.B.C. Station (2 L O), 369 metres. Daily, 11.30 a.m. to 12.30 p.m., concert; 5 p.m. to 5.45 p.m., children's stories; 7 p.m. to 10.30 p.m., concert and news.

Manchester B.B.C. Station (2 Z Y), 385 metres. Daily, 11.30 a.m. to 12.30 p.m., concert; 4.30 p.m. to 5 p.m., concert; 6 p.m. and 6.15 p.m., kiddies' corner; 6.30 p.m. to 7 p.m., reproducing-piano recital; 7 p.m., news bulletin; 8 p.m. to 9.10 p.m., concert; 9.15 p.m., second news bulletin; 9.30 p.m. to 10 p.m., miscellaneous concert.

Birmingham B.B.C. Station (5 I T), 420 metres. Weekdays: 11.30 a.m. to 12.30 p.m., concert; 6.30 p.m., children's stories; 7 p.m., concert; 7.30 p.m., news bulletin; 8.30 p.m. to 9 p.m., interval; 9 p.m., concert; 9.45 p.m., second news bulletin; 10 p.m., final announcements. Sundays: 8 p.m., news bulletin; 8.10 p.m. to 9.45 p.m., concert; 9.45 p.m., second news bulletin; 10 p.m., final announcements.

Newcastle B.B.C. Station (5 N O), 400 metres. Daily, 11.30 a.m. to 12.30 p.m., concert; 7 p.m. to 10 p.m., concert and news.

Cardiff B.B.C. Station (5 W. A), 353 metres. Daily, 11.30 a.m. to 12.30 p.m., concert; 5 p.m. to 5.45 p.m., children's stories; 7 p.m. to 10.30 p.m., concert and news.

Glasgow B.B.C. Station (5 S C), 415 metres. Daily, 11.30 a.m. to 12.30 p.m., concert; 7 p.m. to 9.30 p.m., concert and news.

Croydon (G E D), 900 metres. Daily.

Eiffel Tower (F L), 2,600 metres. Daily, 6.20 p.m. to 7 p.m., concert, and 10.10 p.m. to 10.20 p.m., concert (weekdays only).

The Hague (P C G G), 1,085 metres. Sundays, 3 p.m. to 5 p.m.

Paris. Concerts Radiola. 1,565 metres. Daily, 5.5 p.m. to 6 p.m., concert; 8.45 p.m. to 9.55 p.m., concert; also concert from 2 p.m. to 3 p.m. on Sundays.

Rome (I C D), 3,200 metres. Daily, 10 a.m.

Königswusterhausen (L P), 2,800 metres. Daily, 4 p.m. to 5.30 p.m.

Amsterdam (P C A), 1,800 metres. Daily, 1.10 p.m.

Haren (O P V H), 900 metres. Daily, every hour from 11.20 a.m. to 4.20 p.m.; 12 noon and 4.50 p.m., weather report on 1,100 metres.

CLUB DOINGS

Birmingham Experimental Wireless Club.
Hon. Sec.—A. L. LANCASTER, c/o Lancaster Bros. & Co., Shadwell Street, Birmingham.

ON Feb. 23 a lecture was given by Mr. Abbott on the subject of "Wireless Procedure." The lecturer traced the origin of many of the call signs in regular use with both ship and shore stations, and how they have been changed from time to time to meet the new regulations and requirements of rapidly growing wireless traffic. A considerable part of the lecture was devoted to explaining the various short cuts and wireless "slang" signals in regular use by operators in the mercantile marine, and this was of especial interest to members who had listened-in for years on the 600-metre wavelength, but did not understand the meaning of these unofficial signals. A graphic description of the wireless chaos experienced by operators when nearing the American coast before the U.S. Government took control of the traffic was given, the lecturer giving it as his experience that even S.O.S. signals were often got through with difficulty owing to the excessive jamming from U.S. amateur stations.

Proposed Addiscombe and District Radio Club.
IT is proposed to form a radio club in the above district. Will enthusiasts interested please communicate with Mr. L. S. Davies, 156, Cherry Orchard Road, Addiscombe, Croydon.

Stratford-on-Avon and District Radio Society.
Hon. Sec.—E. W. KNIGHT, 17, Park Road, Stratford-on-Avon.

ON Feb. 19 the secretary explained the construction of a variometer and its use, various parts of the instrument being passed round for inspection. The

(*Continued on page* 418)

CLUB DOINGS (*continued from preceding page*)

next item consisted of the winding of "honeycomb" inductances, both by hand and machine. A receiving set made by one of the members was brought along for inspection and test, and after a brief explanation of the apparatus, it was coupled to the aerial and good results obtained.

Exeter and District Wireless Society.

Hon. Sec.—F. S. VALENTINE, 10, College Avenue, Exeter.

AT a meeting of the above society on Feb. 19 a very interesting lecture and demonstration on "Bridge and Megger Testing" was given by Mr. Parkhouse. After a brief description of the Wheatstone bridge and its uses, Mr. Parkhouse went on to describe the megger with regard to the testing of insulation and conductivity. By means of the megger which the lecturer had brought with him the insulation of the society's aerial was tested.

Trafalgar (Greenwich) Wireless Society.

Hon. Sec.—F. A. L. ROBERTS, 43, Adelaide Road, Brockley, S.E.4.

GENTLEMEN desiring to become members of this society should apply to the secretary.

St. Bride Radio and Experimental Society.

BRIDE LANE, Fleet Street, E.C.4.

VISITORS and prospective members will be cordially welcomed at any of the meetings of the above society.

The Radio Society of Highgate.

Hon. Sec.—J. F. STANLEY, 49, Cholmeley Park, Highgate, N.6.

OF the three or four British amateur transmitting stations received in America during the recent Transatlantic tests it is with pleasure that we are able to report that one of these stations is owned and worked by a member of this society. The station referred to is 2 S H, owned by Mr. F. L. Hogg, who is therefore one of the very few British amateurs who have been received on the other side of the Atlantic.

North Middlesex Wireless Club.

Hon. Sec.—E. M. SAVAGE, "Nithsdale," Eversley Park Road, Winchmore Hill, N.21.

ON Feb. 7 Mr. Dixon delivered a lecture on "Various Instruments Used in Wireless Work." The lecturer commenced by stating the need there was for an amateur to have an instrument reading either high or low voltages, and explained how, by adding a suitable resistance in series with the voltmeter, the ordinary moving iron and moving coil types could be calibrated and converted when necessary into high-range voltmeters. Ammeters were then dealt with, and many useful hints were given by Mr. Dixon in connection with their use and conversion.

Portsmouth and District Wireless Association.

AT a meeting of this association held on Feb. 21 a lecture was given by Mr. J. H. C. Harrold on "Direction Finding." Owing to shortness of time only the "receiving" part of direction finding was dealt with. Mr. Harrold explained the different types of aerials used and the method adopted in locating stations was briefly explained. Upon request Mr. Harrold explained how amateurs who allowed their valves to oscillate were detected, which proved very interesting.

Hackney and District Radio Society.

Hon. Sec.—C. PHILLIPS, 247, Evering Rd., Clapton, E.5.

"THE Care of Accumulators" was the title of the lecture given to the members of the above society on March 8. Mr. Wall, a member of the society, delivered the lecture, which dealt in a lucid and elementary manner with the subject of accumulators. His lecture was full of useful advice regarding the charging of cells, testing with hydrometer the specific gravity of the acid, charging from electric mains, etc. He advised everybody owning an accumulator to purchase a hydrometer, as this was practically the only means of testing whether a full charge had been given to the accumulator. A voltmeter placed across the terminals was practically useless, as even when a battery was almost run down it would momentarily register its full voltage. In case no hydrometer was handy, he advised running the battery through a lamp for some 10 minutes and then testing with a voltmeter; this would give a more reliable reading.

Oldham Wireless Society.

Hon. Sec.—G. HULBERT, 16, South Hill Street, Oldham.

THE secretary of the above society will be pleased to hear from prospective members.

Coventry and District Wireless Association.

BEFORE the above association on Feb. 28 a lecture was delivered by Mr. T. Wadsworth, head of the electrical and physics department of the Coventry Technical Institute, his subject being "The Thermionic Valve." The lecturer, in dealing with the fundamental principles underlying the action of a thermionic valve, impressed upon the audience the necessity of clearly understanding what factors had to be considered with regard to it. It was shown how matter in every form comprises molecules, which again can be divided into atoms of the minutest size, and which, until recent years, were considered the limit of the disintegration of matter. However, the "electron" theory was expounded and proved, showing that atoms in their turn could be broken up into inconceivably small proportions, and are known as "electrons" and "protons," and whose marvellous behaviour determines and underlies the peculiar functions of the valve as a detector, amplifier, and a generator of continuous waves. From this explanation it was clearly understood just what an "electron emission" from the filament of an ordinary electric lamp was, and how, by the addition of a plate, or anode, and a grid, such a lamp constituted a valve and rendered wireless transmission and reception possible.

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.

Amateur Wireless And Electrics

Querist's Coupon Available until Saturday, April 7, 1923

Miss Ellis Jeffreys and Miss Margaret Bannerman (Principals in "Decameron Nights" at Drury Lane Theatre) obviously enjoying the pleasures of Broadcasting on a GECOPHONE Set.

GECOPHONE

"LISTENING-IN" SETS

for best possible results

No innovation has received so instant a response from the Public as Broadcasting, which brings right to one's fireside the very latest speech, song and music.

A discriminate selection of the "Listening-in" Set is, however, of paramount importance, and if you will be guided by the experience of thousands of already satisfied users, you will purchase a GECOPHONE without further delay.

GECOPHONES are the outcome of the vast research and manufacturing experience of their makers—The G.E.C. (The General Electric Co., Ltd.)—in many years' Telephone and Wireless practice, and positively ensure the most perfect reception of speech and music. They are *universally acknowledged* The World's Best Broadcasting Sets.

Volumes of unsolicited testimony from satisfied users.

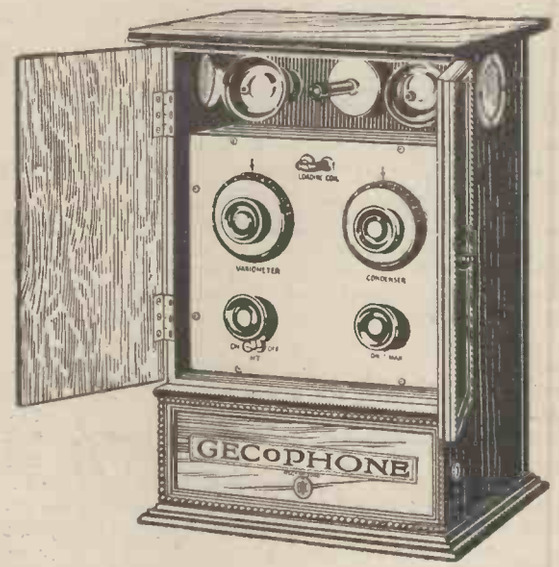
Fully approved by H.M. Postmaster-General.

Sold by PRINCIPAL ELECTRICIANS, STORES AND WIRELESS DEALERS.

Sole Selling Agents for the Music Trades in Great Britain & Ireland—
Columbia Gramophone Co., Ltd.,
102-108 Clerkenwell Road, London, E.C.1.

Manufacturers & Wholesale Only—

The General Electric Co., Ld., Magnet House, Kingsway, London, W.C.2.



GECOPHONE 2-Valve Set in highly-polished mahogany cabinet of handsome appearance, complete with valves, all batteries, and one pair double head-phones (2,000 ohms).
Approx. range (with Standard P.O. Aerial), 100 miles.

Price complete, **£25 0 0**

GECOPHONE CRYSTAL SETS.

No. 1 TYPE.—Single Circuit Crystal Receiving Set complete with one pair double head-phones and aerial equipment. Approx. range (with Standard P.O. Aerial), 25 miles.

Price complete **£5 10 0**

No. 2 TYPE.—For more selective tuning than set No. 1. Complete with one pair double head-phones and aerial equipment. Approx. range (with Standard P.O. Aerial), 30 miles.

Price complete **£9 15 0**

"Set the wave-length for 7 o'clock!"

TO adjust your receiving set so that it will wake you in the morning, or enable you to receive either news or music only, is a possibility of the future described in the April "BROADCASTER," now on sale, in an article entitled "Radio—the 'Knocker-Up.'"

Detailed descriptions and diagrams accompanying the article, which reveals yet another far-reaching development of wireless. Don't miss it.

The Broadcaster

THE RADIOPHONE MONTHLY FOR LISTENERS—IN

ONE SHILLING

Get your copy of the April number to-day.

Other Features of the April "BROADCASTER."

A WIRELESS WIZARD,—Professor A. M. Low contributes "Seeing by Wireless." Radio kinemas are a certain development of the future, he says.

"AMPLIFYING WITHOUT VALVES."—Can you work a loud-speaker without valve amplifiers? Yes—this article shows you how.

BUILDING A RADIO RECEIVER. — "THE BROADCASTER" is teaching thousands how to build radio receivers. Every month the making of part of a radio set is described and fully illustrated.

EXPERT ADVICE FREE. — "BROADCASTER" readers have the privilege of corresponding with a wireless expert on any question they may care to ask.

HALL'S

WIRELESS ACCESSORIES with the "HALL MARK" of QUALITY.

All Previous Prices Cancelled

French "Brunet" Headphones
22/6 Postage 9d.

French "Sidep" Headphones
21/- Postage 9d.

BRITISH HEADPHONES

1,000 ohms. Very Light. Beautifully finished. Stalloy Diaphragms. Complete with Cords. Adjustable Earpieces.

19/6 Postage 9d.

VARIABLE CONDENSERS, complete with Knob, Pointer and Scale.

Capacity.	Parts Complete.	Assembled for Panel Mounting.
.001	6/2	12/6
.0075	5/3	12/-
.0005	4/1	10/6
.0003	2/11	8/-
.0002	2/2	7/-
.0001	1/10	6/-

Top and Bottom Drilled Ebonite Plates 1/3 extra. Vernier 3/-.

Intervalve Transformers, Ratio 3½ to 1, finest manufacture ... 12/9; 5 to 1 14/-
Crystal Sets in Cabinets from ... 22/6 to £3 10
Aluminium Condenser Vanes, fixed and moving, 22/24 gauge ... doz. 5d.
Spacers, true to .001. Small, doz. 2d.; large doz. ... 3d.
Ebonite Knobs, tapped 2 B.A. with brass nut—1st quality, 3½d.; 2nd quality 2½d.
Aerial Wire, 7/22 hard drawn copper, in 100 ft. lengths ... 2/6
Valve Legs, with nuts and washers, 1d. each; doz. ... 9d.
Two Coil Holders, solid ebonite, 6/9; mounted on mahogany ... 4/9
Three Coil Holders, solid ebonite, with long arms to avoid capacity effects ... 9/6
Crystal Detectors, adjustable in every way ... 2/3
ditto, ditto, enclosed in glass case ... 4/-
Engraved Ivorine Scales, 0—180, round or square ends ... 4d.
Filament Resistances, extraordinary value, velvet action ... 2/3, 3/6, and 5/-
Switch Arms, complete with knob, collar, washers, bush nuts, etc. 1st quality, 1/3; 2nd quality ... 1/-
Valve Holders, turned ebonite, complete with nuts, 1/3, 2nd quality ... 10d.
Crystal Cups. Plain 1d.; one, two, or three screw ... 3d.
Terminals, complete with nut and washer 1½d., 2d. and 3d.
Basket Coils, set of 7 ... 4/3
Contact Studs, ¼ in. by ¼ in., 4d. per doz.; complete with nut and washer ... doz. 5½d.
Insulators, white egg, 3d.; green egg, 4d.; green shell ... each 4d.
Stop Pins ... 7d. doz., each 1d.
Valve Pins, 1d. each; with nut and washer, each 1½d.
Brass Nuts, 2, 3, 4, B.A., doz. 3d.; 5 and 6 B.A., doz. ... 2½d.
Ebonite Sheet, 3/32, ¼, ⅜ (cut to any size) lb. 3/6
Fixed Condensers, any capacity ... each 1/2
Grid Leak and Condensers Combined ... each 3/3
Slider Plunger, complete ... each 4d.
Slider Rods, 12-in. or 13-in. ¼-in. square brass, drilled both ends ... 4d.
Hertzite, 1/6. **Bornite, Carborundum, Galena** 4d.
Screwed Brass Lengths, 12-in. 2 or 4 B.A. each 4d.
Inductances, wound 22/24 enamelled wire each 3/2
Leading-in Tubes (Ebonite), 6-in. 10d.; 9-in 1/-; 12-in. ... each 1/2

Orders under £2 kindly remit ample postage. *Balance refunded if excess sent.*

Send for Free Catalogue

TRADE **HALL'S** SUPPLIED

'PHONE: REGENT 1282

71, Beak St., Regent St., London, W.1

Our only address. We have no Branches.
Hours: 8.30 a.m.—8 p.m.; 1 p.m. Saturdays.

Between Piccadilly Circus and Oxford Circus
'Buses 3, 6, 12, 13, 15, 32, 51, 53, 59 and 88 pass

Wireless for Paddington and Elsewhere

	£	s	d.
FELLOPHONE 2 Valve Receiver, absolutely complete, B.B.C., including valves	13	10	0
FELLOPHONE 2 Valve Amplifier, including valves ...	7	10	0
FELLOCRYST, Super, with H'phones, B.B.C.	4	15	0
HEADPHONES, Fellows, 4,000, B.B.C., postage 1/- ...	1	1	0
" Ericsson, B.B.C., super sensitive, postage 1/- ...	1	3	6
" Ericsson, supersensitive... postage 1/- ...	1	2	6
" French, 4,000, 6 ft. cords, postage 1/- ...	1	0	0
Variable Condensers, .001, 10'9; .0005, 8/9; (Round tops and bottoms), .0003 postage 6d.		7	0
Shell Insulators, postage 2d., each ...		0	6
Aerials (bare copper), 100 ft., 7/22 ... 2/6 and postage 1/6		3	6
Tinned Copper Wire, 18 gauge, 1 lb. bobbin		3	0
Valve Holders, nuts and washers, best quality, postage 3d. each		1	3
" **Condenser Dials**, with knobs, postage 3d. each		1	9
Filament Resistances, British, smooth movement, postage 4d. each ... 2/6 and		3	6
Switch Arms, knobs pinned on, post. 3d ea.		1	6
Lead-in Tubes, complete, 6 in. 1/-, 9 in. 1/2, 12 in. 1/4, postage 4d.			
L.T. Transformers, 5-1, postage 1/- each		14	0
Accumulators, 4 v. 20 a. 13/6, 6 v. 40 a.		33	6
H.T. Batteries, 36 v., tapped		8	0
Valves, Cossor, Ora, Ediswan, not by post		15	0
" Dutch, not by post		9	6
Amplion Loud Speakers	2	12	6

TRADE SUPPLIED — *Telephone PADD. 5743*

F. N. GOUVY & Co., Ltd.
36, CRAVEN ROAD, W.2
(Close to Padd. Station).

JOIN THE THRONG

OF DAILY VISITORS TO

SPENCER'S STORES

4-5, MASON'S AVENUE
BASINGHALL STREET,
LONDON, E.C.2.

CHEAPEST HOUSE IN CITY FOR WIRELESS PARTS AND SETS

PRICE LIST POST FREE

KIRKWOOD

Electrical Engineers

108, Rose Street, EDINBURGH.

Terms Cash with Order. Postage extra.

30 ft., Steel Masts, complete with stays, etc.	70/-
100 ft. 7/22 Enamelled Copper Wire	5/-
Pair 6-ft. Pitch Pine Spreaders, varnished, ends bushed	6/6
Pair Spreaders, as above, with bridles and 6 shell insulators wired up ready for erection	16/-
Shell Insulators, large	1/-
Down-lead Locaters	6d.
Galvanised Pulleys, 1¼ in. wheel	9d.
Strong Eye Fixing Screws, 3 in. by ¾ in. ...	9d.
Galvanised "D" Shackles, ¾ in. 9d.; ½ in. shackles	6d.
Galvanised Heart Thimbles, large, 3d.; small	2d.
Galvanised ¼ in. Stranded Wire Rope, 50 ft.	1/9
Flexible Steel Wire Rope, 50 ft.	4/3
Best "Yacht" Manila ¾ in. rope, 60 ft. ...	4/6
Fine Yarn Manila ¾ in. rope, 60 ft.	3/3
¼ in. Sheet Ebonite, 36 in. by 18 in. mat, polished or plain	26/3
Small pieces, 2d. sq. in., per sq. ft.	7/-
3/16 in. Sheet Ebonite, 36 in. by 18 in. mat, polished or plain	24/-
Small pieces, ½d. sq. in., per sq. ft.	5/3
Shellac Varnish, 16s. gal.; gill bottles	1/-
Paraffin Wax, 9 lb., per cake	2½d.
Brass Rod, round, square or screwed, 3/16 in. and ¼ in.	
Instrument Wires, Ebonite lead-in Terminals,	1/3, 1/6, 2/9

Engraving on Ebonite, etc., 1d. per letter.
Valves. Accessories.

ADVERTISEMENT INSTRUCTIONS for "Amateur Wireless" are accepted up to **first post on Friday morning** for following week's issue, providing space is available.

PREPAID ADVERTISEMENTS.

B.A. Screws, Nuts and Washers, assorted gross, 2s. List, 2d. Trade supplied.—J. H. Bennett, Station Road, Willesden Junction. [8 r

Wireless.—Wireless parts and raw materials for amateurs and the trade at the right price direct from the factory.—The Newtonia Wireless Factory, 13/15, Whitcomb Street, London, near Trafalgar Square.

Telephone Receivers Rewound up to 1,000 ohms, 5s.; 2,000 ohms, 7s. 6d.; cash with order.—M. E. Hampshire, 139, Sydenham Road, S.E.26. [19 r

Accumulators recharged, collected and delivered at moderate rates. Write or phone for tariff.—The Battery Service Co., 174, Estcourt Road, S.W.6. [14 r

Polished Mahogany or Teak Cabinets.—Quotations per return.—Lancasters, 87, Parade, Birmingham. [18 r

Sets Adjusted and faults detected for users lacking technical knowledge.—Wireless Aid, 21, Birkbeck Road, South Ealing. [3 s

Bargains in Wireless.—Write to-day for price list to Blake & Co., 41, Willow Street, Bermondsey, London, S.E.1.

Headphones, French (Picard), 4,000 ohms, double strap, adjustable, 21s. 6d.; single, complete with cords, 2,000 ohms, 8s. 6d.; (Thomson-Houston) 4,000 ohms, imitation tortoiseshell straps, 27s. 6d.—Agency, 87, Beresford Road, London, N.8. [1 s

Working Drawings of Wireless Apparatus supplied, also apparatus and parts.—Puckle, 26, Beresford Road, N.5. [12 s

Mail Order.—Send stamped addressed envelope for list of parts.—Standidge & Co., 47, Rossington Street, E.5. [12 s

Transfers.—Name, design, 14s. 6d. gross.—W. Transfer Company, 9, Churchmead Road, Willesden. Samples, 6d. [4 s

Wireless.—Smart youths with previous commercial knowledge required. Knowledge of gramophones, photography and sports an advantage but not essential. Quick promotion and good prospects if ambitious, energetic, tactful. Apply stating previous experience, enclosing copy references, and stating commencing wage required.—Chas. H. Rodwell, London Bridge, S.E.1.

Zincite-Tellurium for sensitive permanent adjustment. Selected tested crystals, 2s. pair, post free. Used by Admiralty and in Elwell and Western Electric receivers.—Wallace, 113, St. James's Road, Tooting. [6 s

Townsend Wavemeters, ex-disposal; a limited number carefully calibrated, price £4 15s. each, post free.—Omega Lampworks, Ltd., 83, Merton Road, London, S.W.19. [5 s

Experimenter's Surplus.—Bargains in accumulators, valves, wire, sundries. Stamp for list.—Hodges, Lauderdale, Dawlish. [2 s

TERMINAL TAGS
4 B.A. Clearing. 6d. doz. Post Free.
Good Discounts to Dealers
FREEMAN & CO., Wholesale Radio Supplies, 14, Surrey Street, Croydon.

Turn your Wireless knowledge into cash

£

For our various Publications we are always ready to receive interesting Articles—with and without diagrams and photographs. Good rates paid. Constructional Articles must describe apparatus which has *actually* worked.
RADIO PRESS, LTD., Devereux Court, Strand, London, W.C.2

WILSON'S EES, E, PUT
The Wired Wireless

A necessity and a Practical Unit
Made in Ebonite, Price 2/6 Post Free

J. E. WILSON, 3, Lord Place, Hunslet.
Mail Order Dept. **Leeds.** *Est. 26 years*

ELECTRADIX RADIOS.

IMMEDIATE DELIVERY FROM OUR HUGE STOCKS

Everything from a Wave Meter 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 4155*
9, COLONIAL AVENUE, MINORIES, E.1.

Printed and Published in England by CASSELL & COMPANY, LIMITED, Ludgate Hill, London, E.C.4. Sole Agent for South Africa, CENTRAL NEWS AGENCY, LIMITED. Saturday, March 31, 1923.