WIRELESS WEEKLY

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SPECIAL FEATURE THIS WEEK: **Simple Crystal Receiver**

OFFICIAL ORGAN OF THE AUSTRALASIAN RADIO RELAY LEAGUE.

Vol 3. November 30, 1923. No. 8

AT LAST!

SETS MAY NOW BE PASSED

After a good deal of delay and incidentally hardship to manufacturers and dealers, arrangements have been made for the testing of sets. The Radio Inspector of each capital city will be responsible for this job.

Manufacturers and traders are now hard at work completing and sealing sets, which will be on sale to the public within the next few days.

Sets to receive broadcasting will be very simple to operate, in fact all that will be necessary after reading the instructions will be to connect up and listen in.

Prices will range from about £7 up to £150.

Those intending to purchase sets are warned against unscrupulous dealers who manufacture and sell sets entirely unsuitable and of poor quality. Buy only from those who are known to turn out good work.

"Wireless Weekly" will always be pleased to recommend dealers to our readers.

"WIRELESS WEEKLY" GUARANTEES ITS ADVERTISERS.

Roster for Week ending 5th December, 1923

	7.30 to 8.0	8.0 to 8.30	8.30 to 9.0	9 to 9.30	9.30 to 10
Thur, Nov. 29		2 FA		2 ZG	
Friday, ...30		2 ZG	2 JM	2 FA	
Sat., Dec. 1	2 ZG	2 FA	2 FA		
	7 to 7.45		7.45 to 9.15	9.15 to 10	
Sunday, ...2		2 GR	2 CM		2 JM
Mon., ...3		2 ZG	2 FA		
Tuesday, ...4				2 GY	
Wednes., ...5		2 FA		2 ZG	

Very few stations are on the Roster this week owing to Trans Pacific Tests.

Miss DOREEN DOUGLAS
The Clever and Popular Violinist, whose sweet toned instrument is often heard by listeners in on 350 metres

WIRED WIRELESS COMMUNICATION.

A publication giving an introduction to wired wireless or line radio communication has recently been prepared under the direction of the chief signal officer with the co-operation of the Bureau of Standards. This pamphlet gives an explanation of how messages are carried to distant points by radio-frequency currents directed over wires such as ordinary telephone lines or power lines. The fundamental principles of radio and its relation to line radio telegraphy and telephony are also discussed. This pamphlet is "Introduction to Line Radio Communication," Signal Corps Radio Communication Pamphlet No. 41, a copy of which may be obtained for 10 cents from the Superintendent of Documents, Government Printing office, Washington, D.C.

Radio Dramas have been broadcasted by the WGY station of the General Electric Company at Schenectady for nearly a year. During that period the little group of WGY Players has had the largest audiences ever before accorded dramatic offerings. There are at least 2,000,000 radio sets in the country, and of that number 1,500,000 are almost nightly within range of WGY. From the very first the radio drama has been a success. Mr. Edward H. Smith, formerly an actor and director on the professional stage, has been handling this feature of the WGY programmes. Mr. Smith and his players have pioneered in the art of the radio drama; they have had to develop a new technique. It has been found necessary to make occasional changes in play manuscripts, especially where a climax depended upon sight for its appreciation. The entrance to or departure from a room by one of the characters has to be indicated by sound, as a closing door. A bell helps somewhat in announcing a newcomer to the invisible stage. Various sound devices have been created to produce atmosphere. A telegraph key and an imitation of an engine whistle have helped in a railway station scene. Storms have been stimulated by devices similar to those used on the stage.

The Acoustics of Loud Speakers are discussed, among other things, by Mr. Nyman in the Journal of the American Institute of Electrical Engineers. "Speech and music are both modified considerably, depending upon the length and shape of the horn, also on volume of the sound," states this authority. "A horn longer than one-quarter wave length of the lowest pitch available gives the best reproduction. However, in practice the length of the horn seldom exceeds 3 feet, approximately one-fourth of wave length of 90 cycles fundamental of the horn. If the horn is shorter than one foot (270 cycles fundamental) the bass and baritone voices are likely to be distorted, since their fundamental which is below 270 cycles, would be reduced. It has been found that a loud speaker with a magnetic balance and a horn about two feet long is capable of very good reproduction of even very low frequencies. Careful study has been made of materials to be used in diaphragm and in the horns in so far as it affects the quality of reproduction. Aluminium or micarta diaphragms apparently give the best results, while a wood horn or horn made of some dead material like hard rubber is least likely to introduce a strange quality."

A Dry Cell Tube Loop Set for Local Reception

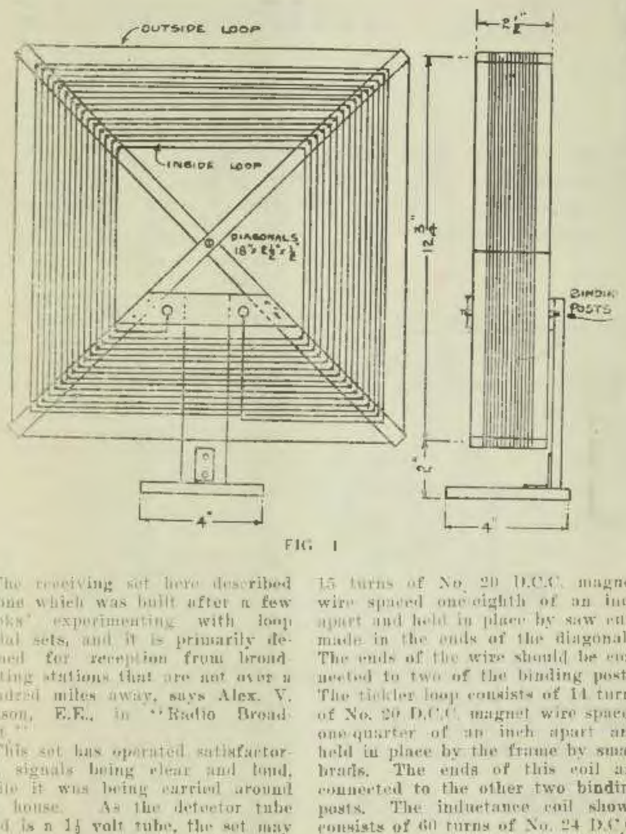


FIG. 1

The receiving set here described is one which was built after a few weeks' experimenting with loop aerial sets, and it is primarily designed for reception from broadcasting stations that are not over a hundred miles away, says Alex. V. Polson, E.E., in "Radio Broadcast."

This set has operated satisfactorily, signals being clear and loud, while it was being carried around the house. As the detector tube used is a 1½ volt tube, the set may be made very compact and may therefore be used as a portable outfit which will prove convenient where a ground connection cannot easily be made.

A feature of this set that is a little unusual is the double loop aerial, one loop being used as a regular loop aerial and the other being used as a tickler coil. The diagonals for the frame consist of two pieces of dry wood 2½ in. x ½ in. x 18 in., mortised at the centre and mounted as shown in the accompanying diagram (Fig. 1). Two sets of binding posts are mounted on the face of the frame as shown. The loop aerial proper consists of 15 turns of No. 20 D.C.C. magnet wire spaced one-eighth of an inch apart and held in place by saw cuts made in the ends of the diagonals. The ends of the wire should be connected to two of the binding posts. The tickler loop consists of 14 turns of No. 20 D.C.C. magnet wire spaced one-quarter of an inch apart and held in place by the frame by small brads. The ends of this coil are connected to the other two binding posts. The inductance coil shown consists of 60 turns of No. 24 D.C.C. magnet wire wound on a cardboard tube 4 inches in diameter and 3½ inches long. Taps are taken off at every tenth turn. The variable condenser is an 11 or 23 plate one, with a vernier for the best results. In mounting the condenser and inductance it was found that considerable space could be saved by puttig the condenser inside the inductance tube. The rheostat should preferably be one with a vernier, as very close regulation of the filament temperature is advisable with the peanut or other 1½ volt tubes. The grid condenser may be of either .0005 or .0002 mfd., and should be used in conjunction with a variable grid leak. The phone condenser may have a capacity of .001 or .002 mfd. The panel used by the writer is of mahogany, one quarter of an inch thick, but any any one of the several radio panel materials may be used satisfactorily. Tin foil was stuck on the rear of the panel and connected to the negative side of the B battery to cut out body capacity effects. Care should be taken that the tin foil does not touch any of the metallic parts such as binding posts or contact points as this may short circuit some of the apparatus. About eighteen or twenty will probably be the best B battery voltage to use.

To operate the set, it is only necessary to point the loop so that its edge points toward the broadcasting station, turn on the filament, set the inductance switch to about 50 turns and vary the condenser until signals or a whistling sound is heard. Further adjustment of the rheostat and vernier condenser will then clearly bring the signals in at their best. If it is impossible to get signals at all, the tickler should be reversed at the binding posts, as the tickler must be connected in the proper direction. If the ground connection shown by the dotted lines (Fig. 2) is used in addition to the loop, signals will be much improved in intensity.

FILING SMALL WASHERS

It often happens that a thin washer must be still further reduced in thickness. Difficulty is usually encountered in holding the work so that it can be filed.

A very handy method for doing this is to place the washer to be filed on a small block of wood, over which is then put a piece of flat metal. Squeeze in a vice until the washer (or other similar part is to be filed) is embedded in the block to a depth equal to half its thickness. The block is then put in the vice with the thin metal piece resting in the cavity, where it will remain secure while it is being filed.

E. C. O.

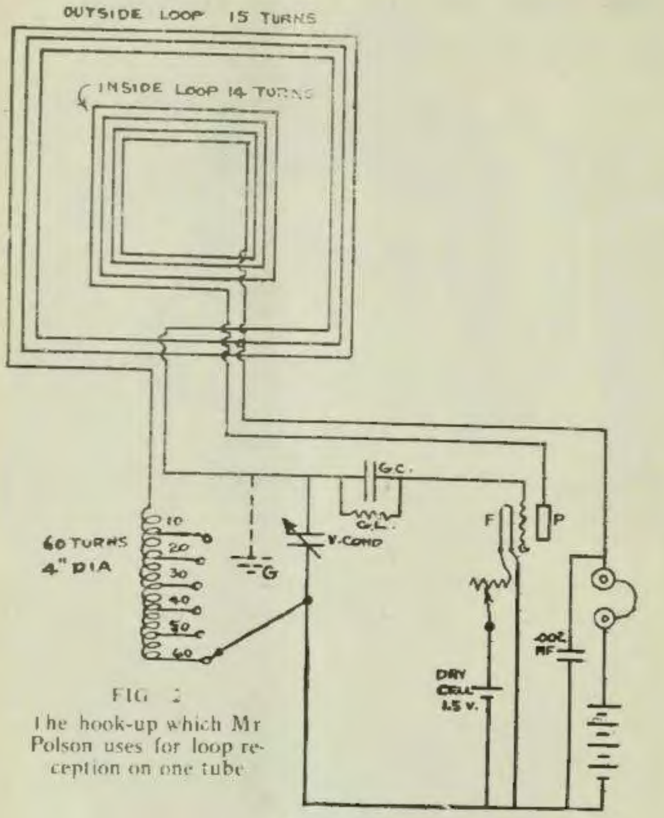


FIG. 2
The hook-up which Mr Polson uses for loop reception on one tube

Hints on Working and Finishing Ebonite

Ebonite, vulcanite, or hard rubber as it is variously called, is one and the same thing; the American name for it being hard rubber. The writer feels that perhaps a short description of the processes employed in the manufacture of ebonite will not be out of place, and will help the worker better to appreciate the nature of the material with which he has to deal. Ebonite is composed of pure plantation rubber, to which have been added various ingredients, the most important of which is the necessary sulphur for its vulcanisation. The best quality ebonite is made of pure Para rubber, while the cheaper grades are made from rubber gums of an inferior quality. The very cheap qualities of ebonite contain but little rubber in their composition, and the writer advises the purchaser to leave these severely alone, as quite apart from their brittle nature, they have in most instances very poor insulating properties.

FIRST STAGES.

The first stage in the manufacture of ebonite is the "grinding" of the rubber between the rollers of the rubber mill. One roller travels at twice the speed of the other and thus pinches and rubs the rubber, generating a considerable amount of heat in the process. When the rubber has attained a smooth plastic state the ingredients are successively added and ground in. This having been completed the rubber dough is taken to another mill and calendered or rolled to an exact thickness (usually about an eighth of an inch for sheet ebonite), sheets, six feet by three feet, are taken, laid one on the other and well rolled together till the thickness of the desired finished sheet has been attained. These sheets are then placed in rectangular iron frames and their top and bottom surfaces covered with single sheets of tinfoil.

ROLLING WITH TINFOIL.

This imparts the gloss to the sheets. The frames are placed in a steam-heated press and subjected to the required degree of heat for a certain period (this varies with the thickness of the sheet) until vulcanisation is complete. The frames are now removed, the tinfoil rolled off and the sheets of ebonite are ready for use.

HOW TO TRIM A PANEL.

We will now consider the working up of a valve panel or other piece of electrical apparatus: First carefully square up all sides and edges by means of a file, or files of two or three grades. If the edges are very rough an 8 inch bastard file is a convenient one to use. This may be followed by an 8 inch smooth file, and in succession, No. 2 and No. 1 emery or carborundum paper, grading down to F. or F.F. finally. Having squared up and finished our edges, proceed to remove the highly glazed surface by means of a rubber. This can conveniently be made of a piece of cork sheet measuring say 3 inches by 2 inches by 1 inch. Take a piece of No. 1 emery cloth, cover the rubber with it, and with a circular motion remove the polish from both sides of the panel or slab. A convenient way to hold the slab is by means of four thin strips of wood tacked to a table or bench by means of panel pins. These strips must of course be thinner than our panel.

TREATING THE SURFACE.

Having removed all the polish we will proceed to finish our panel.

Continued on page 13, col. 1

MAKE YOUR OWN

A Simple Crystal Receiver

THE DESIGN OF THIS INSTRUMENT WILL PLEASE MANY NEW READERS WHO HAVE DECIDED TO BUILD A CRYSTAL SET BUT HAVE HAD SOME DIFFICULTY IN CHOOSING AN EFFICIENT YET SIMPLE METHOD OF CONSTRUCTION.

The crystal receiver described in the present article was designed to fulfil the following requirements:—

(i.) robust construction;
(ii.) simple tuning;
(iii.) cheapness.

The first of these requirements was considered to be the most essential, and robust construction was taken to include the necessity for providing a crystal detector which would give a sensitive setting lasting for weeks without attention or alteration, says E. H. Chapman, in "Modern Wireless."

Experience has shown that the more usual type of crystal detector in which contact is obtained with a wire or, as it is appropriately called, a "catwhisker," was frequently requiring re-adjustment. Some of the "catwhisker" crystals, Hertzite, for example, are very sensitive, and a heavy-footed visitor walking across the floor of a room will put any "catwhisker" off its mark and necessitate a trying search for a sensitive spot. Accordingly, in order to get a firm and lasting contact, a double crystal combination was decided upon for the set now described. It was also a matter of experience that an inductance coil with slider for tuning purposes can be very stubborn at times, and that nothing short of a rolling wheel contact can be considered consistently reliable. Of other methods of tuning, those requiring a variable condenser were, like a rolling wheel contact on an inductance coil, passed over on the grounds of expense.

After a little consideration it appeared to the writer that the best proposition for a cheap and simple method of tuning was a variometer made of inexpensive material.

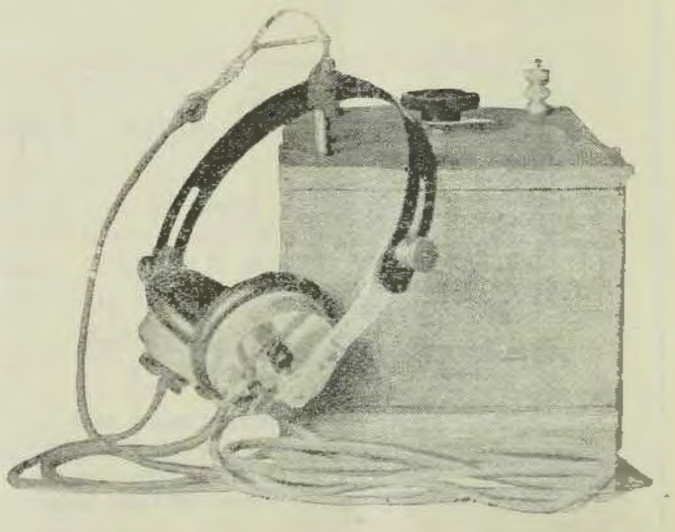


Fig. 1

THE VARIOMETER.

As will be seen from the photograph in Fig. 2, the variometer finally decided upon consisted of a flat cardboard disc rotating inside a cardboard cylinder of slightly larger internal diameter. The actual measurements of the cylinder were:

Outside diameter, $3\frac{3}{4}$ inches.
Inside diameter, $3\frac{1}{2}$ inches.
Length, $2\frac{1}{2}$ inches.

The cardboard disc had a diameter of 3 inches, the central portion free from wire being 1 inch across.

On the cylinder 30 turns of No. 22 d.c.c. wire were wound, 15 turns on each side of the space 3-8 inch across left for the spindle of the rotating disc (see Figure 2).

The cardboard disc had 7 radial slits cut in it at equal intervals, and altogether there were 42 turns of No. 24 d.c.c. wire on the card, 21 on each side.

The mounting of a disc on a brass rod $2\frac{1}{4}$ inches long was accomplished in a simple manner. Over one end of the rod a piece of thick red rubber tubing 1 inch long was slipped. This rubber tubing fitted the brass rod very tightly. As the wire was wound on the disc, all the turns on one side were taken

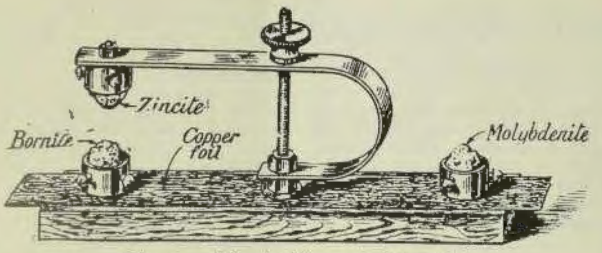


Fig. 3.—The double crystal detector.

over by the rubber-covered brass rod, which was carefully held in position along a radius of the disc. It was found quite easy to pull the wire taut and get a good grip on the rubber. When the winding of the card was complete, it was found that the brass rod could not be rotated without rotating the "spider-web" coil with it.

The two ends of the wire on the flat coil were pushed through the hole made in the cylinder, the brass rod also being pushed through the same hole. So that the leads from the flat coil should have plenty of room to move, the hole in the cardboard cylinder was made much bigger than would have been required for the brass rod alone. One free end of wire from the disc was soldered to one of the free ends of wire on the cylinder.

THE CRYSTAL DETECTOR.

The base is a strip of ebonite 3 inches long and ¾ inch wide. A terminal was mounted on the ebonite and a strip of brass sheeting 4½ inches long, ½ inch wide, with two holes punched through. It is then fitted on the shaft of the terminal as shown in Fig. 3. On the free end of this brass strip, a crystal cup was mounted in an inverted position. Two other crystal cups were mounted on the ebonite strip, one at each end, in positions such that they would come directly under the inverted crystal cup on the brass strip. Under each of the lower crystal cups a small piece of copper foil was placed so that connecting wires could easily be soldered to the foil and contact readily established with the crystals.

In the upper inverted cup a small piece of zincite was screwed. In one of the lower cups a piece of bornite was placed and in the other cup a piece of crystal which is sold under the name of molybdenite.

By turning the brass strip round the terminal shaft the zincite could be made to work with either the bornite or the molybdenite.

THE CONTAINING BOX.

In order to make the set steady and firm in use, the base of the containing box was made of wood an inch thick. This baseboard was 6½ inches long and 5½ inches wide. The two sides and back were nailed securely to the baseboard. It is only necessary to state that the overall height of the box was 5¾ inches, and that the wood used for all except the base was ¼ inch thick, in order to give working measurements for making a similar box. A novel feature was that the front of the box was made to slide in grooves provided in the baseboard and in the top of the box. The reason for the sliding front is apparent from Fig. 2, which shows how the crystal detector was mounted inside the box, so that when the crystal detector has once been set, the box can be shut up and the crystals protected from dust.

The variometer was mounted on the lid of the box, a knob being fitted along the pointer on the brass rod outside the box. Two small screws were sufficient to hold the cardboard cylinder of the variometer in place. On top of the box one terminal was provided for the aerial lead and a second for the earth. The telephone connections consisted in this set of two valve sockets, the telephones used having had their leads soldered to valve pins mounted on a small strip of ebonite. It is perhaps worth mentioning that the terminals and valve sockets on the lid were each fitted with two fibre washers, one on the outside of the lid, and the other on the inside, the holes through the lid being larger than the shafts of the terminals of valve sockets.

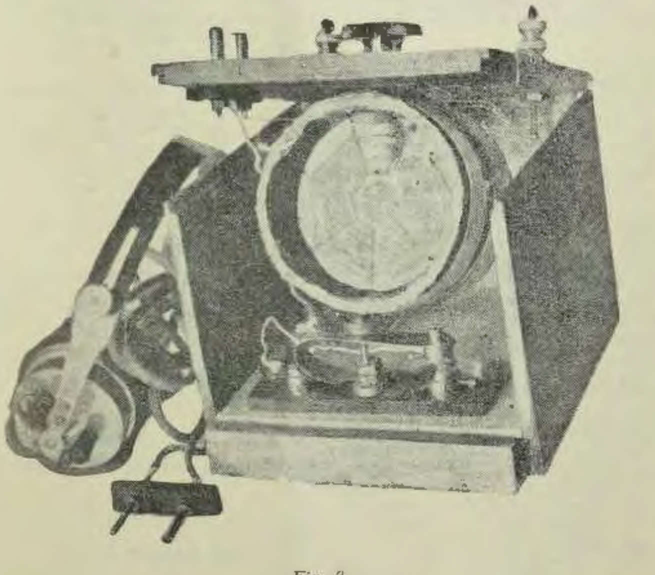


Fig. 2

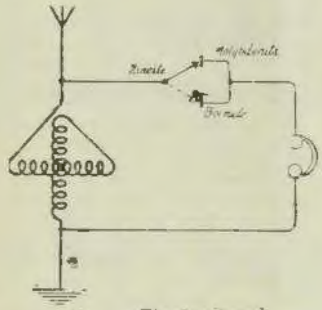


Fig. 4.—The circuit used

CIRCUIT AND WIRING.

The circuit used was similar to that known "Wireless Weekly" Circuit No. 1 the modifications being the substitution of the variometer for the sliding inductance and the two-way crystal detector. Fig. 4 shows the circuit diagram in the usual manner and Fig. 5 is a pictorial representation of the way in which the wiring was done in the box.

RESULTS.

2LO, at a distance of 14 miles, is very clear on the telephones, and the addition of two low-frequency amplifying valves gives good loud-speaker strength.

Perhaps the best thing that can be said about the set is that no fewer than three near neighbours who have seen the set working have promptly borrowed it and made one like it.

FOR STRONG SIGNALS.

Those readers who wish to obtain a greater strength of signal can, of course, add valve magnifiers quite simply. It is only necessary to attach the "input" terminals of the note magnifier to the telephone terminals of the crystal set, and transfer the telephones themselves to the corresponding terminals of the magnifier, to obtain much greater strength. Such magnifiers, however, do not increase the range of the set, but only the strength of the signals.

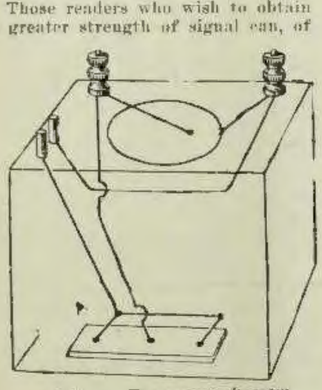
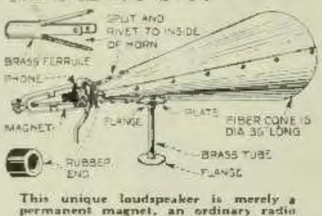


Fig. 5.—The wiring diagram

Magnet Changes Telephone into Sensitive Loud Speaker.

By George A. Luers
Mechanical Engineer



This unique loudspeaker is merely a permanent magnet, an ordinary radio telephone, and a fiber horn combined

By adding a powerful permanent magnet to an ordinary home-made loudspeaker, it can be made sufficiently sensitive to operate even with a crystal set, provided the receiver is quite close to a broadcasting station. The same loudspeaker, with a vacuum tube set or a combination crystal and vacuum tube receiver, gives exceptional results.

Most radio experts will be inclined to challenge the possibility of a crystal set's operating a loud-speaker. If you are interested, however, it will cost you little to make the experiment for yourself.

Music from the Arlington station at Radio, Va., five miles away, came in so well through a crystal set and the loudspeaker illustrated, that it could be heard from any position in a room about 9 ft. square. It was low, but audible. Two local Washington, D.C., broadcasting stations, both nearer than the Arlington station, were also heard. A good quality commercial telephone with a metal diaphragm was used in the loudspeaker, and the set was of an ordinary variocoupler type.

The loudspeaker was also tested with a Baldwin mica diaphragm telephone, and the magnet added considerably to the strength of the signals in both cases. In conjunction with the single tube set, using the same simple variocoupler, the music was clearly and distinctly audible in adjacent rooms, and provided music loud enough for dancing.

The horn of the loudspeaker is made of hard red fibre board. For satisfactory results, the material must be quite stiff. It is about 1-16 in. thick, 3 ft. long and 15 in. in diameter at the large end. The joint is fastened with paper fasteners or clinch rivets, preferably the latter. These also are used to fasten the horn to the bracket.

The bracket is a short length of brass tube with flanges at both ends. One flange is fastened to the baseboard or the table, and the other is attached to a thin brass or aluminium plate, which is bent to form a cradle for the horn and riveted to it. The fixture should be free to turn in any direction around its vertical axis.

At the small end of the horn is a brass ferrule or piece of tubing, split, drilled, attached with rivets. Two brass clamps, bent as shown, are also fastened to the horn to hold the receiver in place. A piece of rubber tubing is drawn over the end of the ferrule so as to bear tightly against the telephone when it is in position.

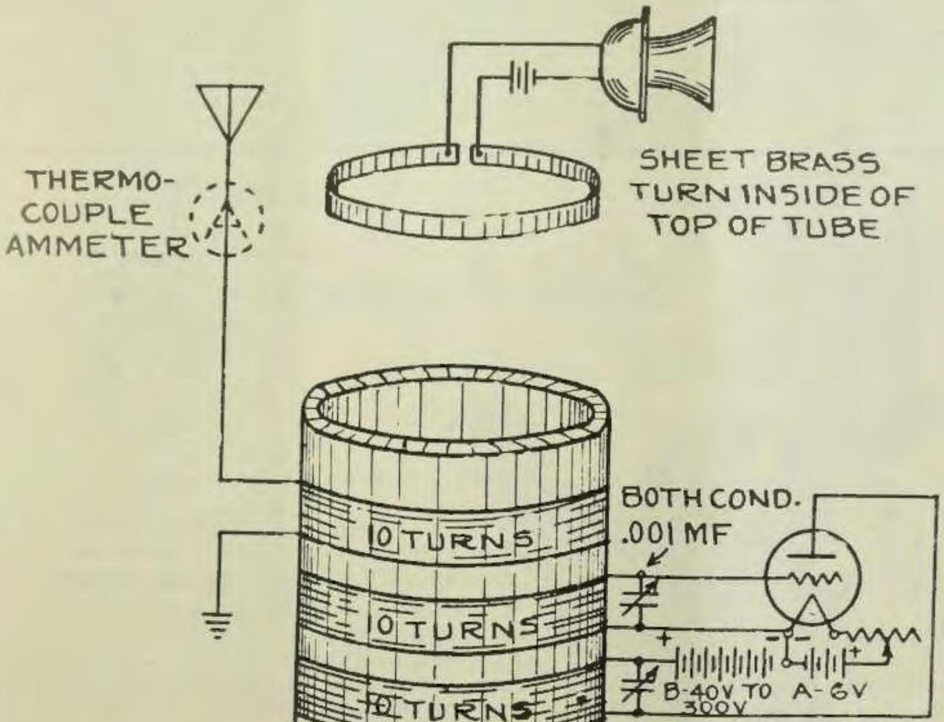
At the rear of the telephone is located the magnet, which is gripped by the brass straps and placed so that the poles are against the back of the phone. The magnet can be one from an old magneto, or of the kind obtainable at any automobile supply store for use on auto flywheels.

A Simple Radio Telephone

There is a larger field for a simple radio telephone transmitter than has yet been occupied, says Samuel G. McMeen, in "American Radio." One wonders why more such instruments are not utilised in construction camps in the inaccessible places of the earth, where parts of the camp are constantly moving about, and where the stringing of wires is not easy. Then, too, there are the cases of temporary need of communication, where the cost of erecting a wire is not warranted by the time it will be used.

One deterrent has been the widespread belief that all radiophones are costly to buy or out of the question to make. Yet thousands of sets of receiving apparatus are made by amateur workers every year, and the skill that can produce the one can do as much for the other. The difficulty perhaps has been a lack of conviction as to how simple a transmitting set really can be, and the unwarranted conclusion that it must be massive and complicated.

The arrangement here described has as its basis the premier of radio telegraphic transmitting circuits, and to it is added an element for the impressment of the voice waves on the radiated energy. It is not an element that can make claim to high efficiency, but certainly it represents nearest to zero in complication. We refer to the simple sheet brass ring or band shown at the top of the figure herewith. It is intended to encircle the inner, upper part of the tube on which are wound the three coils that make up the inductances of the set. The action of this band of sheet brass is most interesting. It is related only inductively to the other turns of the set. It is not even necessary that it be located very close to the other parts of the



Simple Radio Telephone, Utilizing the Meissner Circuit and An Absorption Loop windings. Its purpose is to act like a partially short circuited turn in a transformer, and to waste energy by turning it into heat. Indeed, the arrangement might be called a "waste system," or a "loss system," because the transmitting action is to produce a constant stream of energy and then deliberately to destroy a portion of the energy in the apparatus before its release into space, radiating merely the portion not so destroyed.

This destruction of energy—or, more accurately, its transformation into non-useful heat—goes on at a constant rate when nothing is being spoken into the microphone, but as soon as speech actuates the latter, the amount of loss in the microphone circuit varies, and in consequence there is a corresponding variation in the remainder, which is free to radiate and does so.

The operating merit possessed by the whole device is a consequence of combining the excellent generating qualities of the Meissner circuit with the loss method of modulation, for the virtues of the one offset the shortcomings of the other. And in saying shortcomings we are speaking only of the scientific aspect of the matter.

As shown in the figure, the tube carries three windings, these being each of ten turns. The tube is $4\frac{1}{2}$ in. in diameter. The wire is No. 18 double or single cotton covered. The turns being so few, there would seem to be no reason why enamelled wire would not do as well. These wound bands will thus be each $\frac{3}{4}$ in. wide and are separated about $\frac{1}{4}$ in. The while winding will thus go on a tube little more than 2 in. long and leave free end-space for attachment purposes, if one is striving for compactness.

The exact amount of wire in the antenna coil is a function of the characteristics of the antenna to be used in each installation. Therefore, it is well to tap the coil, so that if the whole amount is not needed it may be cut down to the point where the greatest radiation takes place. It is for the purpose of observing just when the greatest radiation occurs that we suggest in dotted lines the presence of a thermo-couple radiation ammeter. Such a device is inexpensive, and a most satisfactory check on results.

The relation of the windings to the vacuum tube is shown clearly in the drawing, and, as always in the case of any circuit containing a tube, the plate voltage must be poled with the positive side toward the plate. The nature of this source of positive voltage is optional, and may be anywhere from 43 to 300 volts or more depending on what type of tube is employed. The guess is hazarded, however, that the worker who has not explored this exact realm will be surprised at the excellent ranges of the lower voltages that can be had from dry battery blocks. If a motor generator is used for the plate voltage, it can be successfully smoothed out as to communicate noises by means of a small choke coil and an electrolytic condenser. The latter is the equivalent of many condensers of the usual one or two mfd. type.

The condensers for the grid and plate circuits are each .001 mfd. capacitance, though it is recommended that what is at hand be tried if somewhat less than that size, for, as operating with us, both these condensers are standing near the minimum and the radiation meter shows its maximum reading for a wave length of 200 metres. We have also operated the set well with a plate condenser of .0005 mfd. and no grid variable condenser. This shows the leeway.

It should perhaps have been said before this that the set is intended to operate at the wavelength of 200 metres, adjustable by the condensers to a considerable degree. The changes necessary to get a still higher wave length are merely in the grid and plate coils, which must be of more turns when the higher range is desired, say, above 300 metres.

The source of current for the filament in the set under description is a storage battery. It has operated equally well with the filament energised by a small filament transformer, in which method no transformer hum was audible. We can think of no reason why one should not be able to do respectable transmission with the dry-cell type of tube, with consequent freedom from all current annoyances except occasional renewals. Considering the compactness of the set itself, there would seem to be little to be desired in that direction if such a plan were followed.

No grid condenser or grid-leak forms a part of the circuit, though we observe such elements are always prescribed for the Meissner form of transmitting hookup. Very probably these elements would operate properly if chosen of the correct proportions but with the actual apparatus under description better results were had without either.

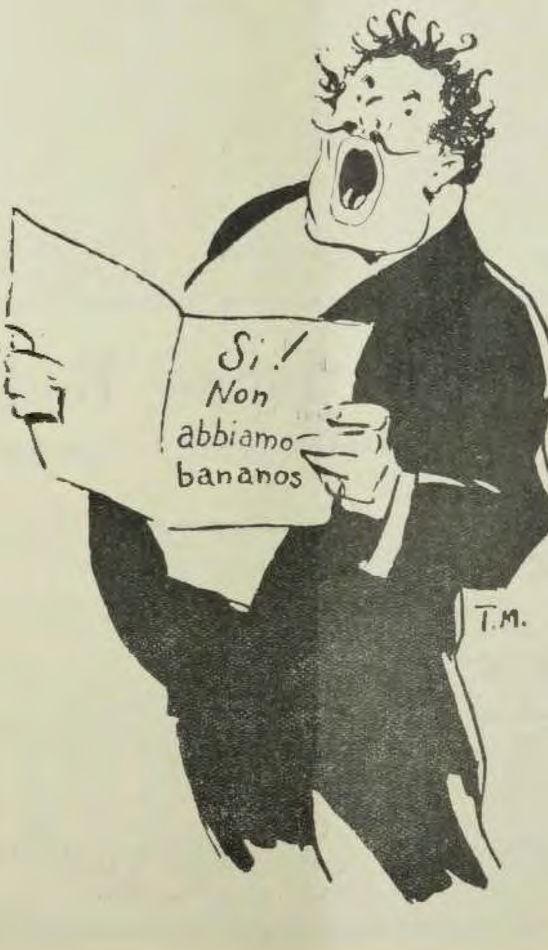
The microphone is of the type made especially for use with a local battery, i.e., it is of low resistance. Care should be taken as to this point if the device is bought especially for this purpose. If, however, a trial of the circuit is all that is wanted, and there is a microphone at hand and it is of high resistance, say, 100 ohms or more, use it anyway, substituting several turns of No. 18 wire for the sheet brass turn inside the tube. The reason is that there should not be, for the best efficiency, too great a disparity between the resistance of the transmitter button and that of the absorption loop.

The inductance of the windings on a 4½ in. tube is almost exactly 20 microhenries each. If it is preferred to use a 4 in. tube the inductance will be about five per cent. less with the same size of wire and the same ten turns. The condensers have ample range to care for the lessened inductance. If a 3½ in. tube is used, the inductance of ten turns will be about 15 microhenries, and it will be well to make 12 turns per winding, the inductance in such case being a little under 20 microhenries.

If the set does not oscillate at the first trial, when the connections have been checked, it may be necessary to reverse the grid and filament connections from the middle winding. This is because those connections may have been made originally in such a way that the influences of the grid and plate circuits are opposed with relation to the antenna winding. It is well, therefore, to leave the grid and filament leads from the winding long enough to allow this transposition if needed.

We remind ourself that at one point herein we spoke of the pres-

Not at B. S. L.



ence of the absorption loop changing the radiation from unity to four-tenths of unity. This was with no speech into the microphone. If speech is agitating the microphone carbon granules, the average resistance of that mass may be much higher than when they are at rest, varying considerably above and below the average with the vibrations of the speech. The ammeter reading, therefore, may not give more than an approximation to the actual radiation loss, but is nevertheless a valuable check on the results one is attaining.

For certain purposes a transmitting set may well be compact. In this regard it would be hard to outdo this arrangement. As we have used it the entire outfit is mounted on a base 6 by 9 ins., and 7 in. high. This includes the microphone, which in this case is mounted on a post at one corner of the base. The batteries are the only portions of the set that are not included in these dimensions.

The vacuum tube is a Western Electric VT2, which is of the amplifier-oscillator-modulator type. It is probably the equivalent, for the purposes of this use, of a five watt transmitting tube, and the latter can be used with good results. But if neither is at hand, try for results with a regular amplifier tube, using the plate voltage specified by the maker. It is surprising how much energy can be transformed into useful oscillations with the smaller tubes. We have regularly produced strong lighting of a wavemeter lamp wih less than 100 volts plate voltage on an amplifier tube when used in the circuit covered by these notes.

BRITISH EMPIRE WIRELESS PLANS.

Recent statements of the British Postmaster General indicate that a solution has been found to the problems connected with the establishment of the British Empire wireless chain. Not all points connected with the issuance of wireless licences have been disposed of, but there is every indication that the Government has adopted a policy which will permit private radio companies to establish high-power stations both in the United Kingdom and in the colonies. At the same time the post office will proceed with its own plans for a high-power station in England. The new post office station will be located near Rugby, a site with an area of 800 acres.

HIGH POWER RADIO STATION FOR BELGRADE.

Work has been started on a new 100-kilowatt radio station at Rakovica, about four kilometres from the Serbian capital, and on a receiving station at Laudon Trench, a suburb of that city. The station is being built by the French Wireless Telegraph Company, and the total expense is estimated at about 402,800 dollars. On its completion the entire installation will be taken over by the State. The operating personnel will become employees of the Department of Posts and Telegraphs, the company maintaining one engineer as a technical adviser. This particular station will be the first high-power radio installation in the Balkans, and because of the greatly increased facilities which it will afford for the dissemination of news and the rapid despatch of information, it should soon become well known internationally.

Hints on Working and Finishing Ebonite

Continued from page 4

Take a piece of grade F paper, and use as before, but keep the panel and paper well wetted with paraffin oil. Having worked up a good smooth surface, free from scratches again go over the panel, this time with F.F. grade paper. This will leave a nice smooth matt surface. The slab or panel may be washed over with paraffin oil and rubbed dry with a soft piece of rag. Care must be taken not to rub too hard or a semi-polished surface will be the result. If a polished surface is desired, finer grades of paper must be used in succession down to, say, No. 0, "blue back." Follow this by the application of pure whiting and a soft chamois pad or rubber.

A FINAL POLISH.

A final finish may be given by rubbing with the ball of the thumb. These last stages are dry ones of course. The reason that we removed our first polished surface was because, strange as it may seem, this surface has not a high insulation resistance. Probably this is due to sulphur in the rubber combining to a slight extent with the tinfoil during the process of vulcanisation. We now have our panel with one finished surface and edges. The underside need not of course be treated any further. It only now remains to mark out and drill our holes, and this last operation is one that is by no means easy to do very accurately and without chipping the panel, unless the correct method for doing so be applied.

HINTS ON DRILLING.

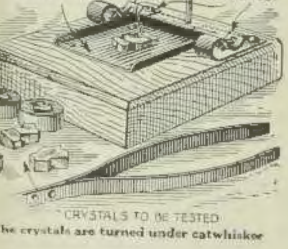
First take a square, and with a sharp-pointed scriber scribe a line on the underside of the panel from top to bottom and side to side exactly at the respective centres of the sides and ends. From these two bisecting lines all our measurements are to be taken. Let us suppose we wish to fit a rotating switch arm and contact studs. First ascertain the exact position of the hole for the pin of the switcharm, and by means of a pair of sharp-pointed dividers make small marks or intersection lines, and make a small centre dot. Drill this about 1-16 inch deep with a small drill. From this centre, with the dividers set at the radius of the switch-arm contact, scribe a semi-circle, or circle as the case may be, and from the centre line carefully space out the positions of the studs by means of the dividers. When the exact position of these has been satisfactorily ascertained, the centres are marked by means of the drill as before. Proceed in this way till all the positions have been ascertained and marked. Having done this continue all these holes through from the back to the front face. The reason for continuing the holes through to the face is to guard against the tendency of breaking pieces out when a larger drill is used. The writer always uses a "pilot drill" for accurate work whatever the material to be worked.

OPENING OUT THE HOLES.

All our holes having been drilled, it only remains to open them out to size. In the case of holes up to, say inch diam., the drill can be fed through from the front face to the back without much fear of serious damage to the underside of the panel, if care is taken in the direction of not putting too much pressure on the drill, and of supporting the back of the panel on a piece of hard wood. For larger holes the writer advises that the holes should be first drilled half-way through the panel from the front, the remainder of the hole being drilled from the back. In this way no fear of damage need be anticipated. For drilling ebonite fluted or spear point drills should be used, as these have not so great a tendency to seize up or worm themselves in where a pilot hole has first been drilled.

TESTING RADIO CRYSTALS QUICKLY.

To save time in testing the relative merits of a number of mounted and unmounted radio crystals, I use the simple detector stand illustrated in place of the regular glass-covered detector on my set. Each crystal to be tested is placed on the copper tray with the tweezers, pushed under the catwhisker, and manipulated until the surfaces have been thoroughly tried out. Either the signals of a broadcasting station or a buzzer can be used for the test.



The crystals are turned under catwhisker

The base is a block of wood ½ by 2½ by 2½ in. A piece of thin copper or brass is bent up on three sides to form a tiny, shallow tray, fastened to the wood with escutcheon pins, and connected with one binding post. The catwhisker, with its end clipped to a sharp point, is mounted as shown and connected with the other post.—S. L. P.

MICROMETER VARIABLE CONDENSER MADE FOR A FEW CENTS

For a few cents a radio fan can make a micrometer variable condenser that will give exceptionally sharp tuning in connection with a large condenser or used aloe where critical adjustment of capacity is required in a hook-up.

The condenser plates are two brass or zinc disks. One is soldered to a brass support as shown, and the other is soldered to the head of a 6/32 brass machine screw 3 in. long. A 6/32 nut is soldered opposite a hole in another brass support and the machine screw turned into it. The two supports are then screwed to a 1-8 in. fibre or composition base. A thin piece of mica is shellacked to the stationary disc to prevent the plates from causing a short circuit.

Drill holes for the binding posts and solder a wire from each to one of the supports. A dial and knob are fastened to the machine screw, a brass shim being soldered to the screw, if necessary, to make them fit. Turning the knob moves the plates nearer or farther apart by very fine degrees.—Edwin G. Gettins, Los Angeles, California.

OUR JAPANESE RADIO LINK.

The radio telegraph circuit between the United States and Japan is operated continuously, carrying a large portion of the trans-Pacific telegraph traffic. When the recent disastrous earthquake devastated Takio and Yokohama, the radio service was not interrupted. The first news of disaster came to the United States over this radio circuit, and for several days thereafter the most complete dispatches describing the extent of the losses and damage came via the Radio Corporation service. There are several Japanese stations working with America. First, there is the Iwaki radio system, owned and operated by the Japanese Government, comprising a transmitting station at Haranomachi and a receiving station at Tomioka. The general location of these stations was determined by the comparative freedom of the district from seismic disturbances. The transmitting aerial at Haranomachi is of the umbrella type, supported by a self-supporting central tower and an outer ring of 18 spliced, guyed wooden masts at a radius of 1300 feet. The central tower is a reinforced concrete tube 660 feet high, 57 feet in outside diameter at the base and 14 feet outside diameter at the top. The wooden masts in the outer ring are 250 feet high and consist of three sections.

LEICHHARDT AND DISTRICT RADIO SOCIETY.

On Tuesday, November 20th, a party of members of the Leichhardt and District Radio Society, visited the Rooms of the Sydney Branch of the I.C.S., for the purpose of hearing a lecture entitled, "Wireless Telegraphy," by Mr. A. Perrett, of that institution. This visit was made in lieu of the usual weekly meeting at the club-room, and members spent a very pleasant evening. The lecturer gave a resume of the progress of radio communication, after which a practical demonstration of wireless transmission and reception was given by Messrs. R. McIntosh and F. Lett—the latter a member of the Society. At the conclusion of the meeting a very hearty vote of thanks by acclamation was accorded both lecturer and demonstrators.

The next meeting of the Society will be held in the Club-room, 176 Johnston Street, Annandale, on Tuesday next.

All inquiries relative to the activities of the Society should be addressed to the Hon. Secretary, Mr. W. J. Zech, 145 Booth Street, An[illegible]dale.

WIRELESS AND ELECTRICAL EXHIBITION.

The Wireless Institute is conducting an Exhibition in the basement of the Sydney Town Hall from the 3rd, to the 8th December, 1923, and all branches of wireless in Australia and its possibilities will be demonstrated.

The object of the exhibition is to educate the public as to the wonderful opportunities there are for improving our means of communication and social enjoyment in this branch of electrical science, and also to provide funds to establish a laboratory for the Institute to carry out extensive experiments.

Already the Institute has received remarkable support from general commercial as well as electrical firms in and around Sydney and those who are exhibiting will demonstrate numerous subjects in the most recent developments of wireless communication. And in fact speaking about the Exhibtion as a whole, this thing has been so strongly supported in its earlier stages, that almost the full quota of stands were taken up in rapid succession, and at the present time the few that are left will be filled within the next few days, so any more firms who desire to show, should immediately communicate with Mr. F. H. Daniell, 56 Hunter Street, Sydney, the official organiser.

CONCORD AMATEUR RADIO CLUB.

The usual meeting of the above club was held at the club-rooms on Thursday, November 15th and was well attended by all members.

After the usual business a new member was admitted. Keen interest was displayed by all present in the activity of the club, which is about to apply for a transmitting license. Many generous offers were made towards attaining this object, and it was decided to arrange with Mr. Crawford to have the 20 word per minute code test carried out as soon as possible. A lecture for the next meeting was decided upon, the subject being "Club organisation and administration."

On Tuesday, November 19th (by courtesy of Mr. Maclurcan) the club paid a visit to his station at Strathfield where an interesting and enjoyable evening was spent. This visit was very much appreciated by every member, and the Club acknowledges with thanks the courtesy with which they were received by Mr. Maclurcan, and for the ready and willing manner in which all points of interest were explained. Mr. Stephenson, on behalf of the Concord Radio Club, thanked Mr. Maclurcan for the privilege extended to them and wished him success in the forthcoming tests to be made on board the S.S. Tahiti. Mr. Maclurcan suitably responded in his usual humorous manner.

Keener interest has been a noticeable feature of this club lately, and it is hoped that all who are interested in wireless wor kin this district will avail themselves of the opportunity of becoming a member.

Intending members are requested to get in touch with Mr. Barker, "Euripides," Wallace St., Concord.

The club meets at the above address every Thursday night at 7.45 and appeals to all local experimenters for their support.

The Secretary will be very pleased to hear from any intending members who have not yet joined up with the club and will be delighted to supply all particulars concerning the same.

KILLARA RADIO CLUB.

The last meeting of the Killara Radio Club was held on the 9th instant.

A lecture on the S.T. 100 circuit was given by Dr. Greenwell, and was very much appreciated; he also had a set employing this circuit on show for purposes of explanation.

Two other short talks were given on Electrolytic Rectifiers and Condensers, the meeting then adjourned.

The next meeting will be held on 23rd, when business of much interest to all experimenters will be dealt with, and a lecture on the neutrodyne circuit has been arranged.

CROYDON RADIO CLUB.

On Saturday, November 17th, the Croydon Radio Club met at "Rockleigh," Lang Street, Croydon, at 7.30 p.m.

It was decided to build a club room, and Mr. C. W. Slade has kindly permitted it to be erected at "Rockleigh."

Members appreciate greatly the kindness Mr. Slade has shown the Club since its formation.

A social and wireless demonstration will be held in December, and proceeds will be towards the new club room.

On Tuesday, November 20th, members of the club were present at the I.C.S. Electrical Association, where a lecture and demonstration on wireless was given.

All communications should be addressed to the Hon. Secretary, G. Maxwell Cutts, "Carwell," Highbury St., Croydon.

WAVERLEY RADIO CLUB.

Mr. E. Bowman occupied the chair at the meeting of the Waverley Radio Club, held on the 20th November. Letters were received from the State Radio Inspector, the Melbourne authorities, and the Committee of the Wireless Exhibition. When these were dealt with it was moved and seconded, after discussion, that a letter be drafted by the Secretary (Mr. R. Howell) and the President (Mr. M. Perry), challenging any, or all, radio clubs to debates, to be held in the club's conditions. This letter will be submitted to the wireless press for publication. The sentiment was expressed that the matter of the inter-club debates is a subject that should be fostered as far as possible. It should bring a new interest and enthusiasm to club meetings, which is sometimes lacking. The Waverley Club was the inaugurator of the idea; and it intends to press the matter still further.

Accounts were then passed, a new member proposed, and other formal business dealt with. The club intends to enter its three-valve set in the Wireless Exhibition.

A Potentiometer of Quality

The potentiometer to be described in this note is intended to be made by those who wish to construct a really sound instrument at home. To make it up properly one must have some skill in accurate fitting, but there is nothing really difficult to anyone who is used to doing work of good amateur standard. It is designed with a view to efficiency and long life rather than compactness. Hence it is a fairly large instrument, more suited to the experimenter's table than to the panels of a "boxed in" set.

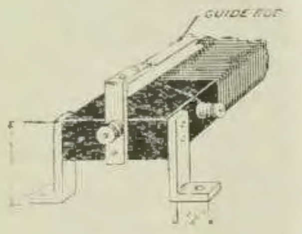


Fig. 1.—The potentiometer, former and supporting legs.

The constructor can make it up to any desired resistance without altering the dimensions given. The windings occupy 4 in. on a former measuring 2 in. in width by ½ in. thick. The following table shows some of the maximum resistances that can be obtained by using wire of different gauges. The values given are for Eureka wire. They will be very much higher if Nichrome is used.

No.	S.W. Gauge.	Turns.	Max. Resistance.
1	20	106	11 ohms.
2	22	133	19 "
3	30	292	230 "
4	32	355	330 "
5	34	392	500 "

Of these, No. 1, which has a carrying capacity of 3 ampres, is especially useful as a rheostat for controlling the filaments of any number of the valves up to four. It can also be employed to "tone down" the output of a six volt battery to suit dull emitter valves. No. 2 has similar uses, its carrying capacity being 2.3 ampres. No. 3 will act as a series resistance for controlling tuned anodes. No. 4 is excellent as a grid potentiometer, and No. 5 is suitable for placing a dry battery to regulate the potential required by carborundum and other crystals of the same type.

The former, which is 6 in. in length and has the width and depth already mentioned, is of ebonite.

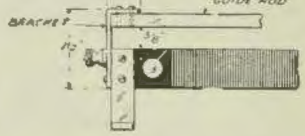


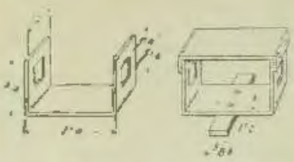
Fig. 2.—Details of the supporting legs.

The long edges should be rounded off for the four inches occupied by the windings. If this is not done it will be impossible to get the wire as tight as it is desirable that it should be. Quite close to either end of one of these edges a 4BA hole is drilled and tapped. A terminal is screwed into each.

Enamelled wire should be used, since it is much easier to wind than bare (which has to be spaced) and occupies less room. The gauge of wire chosen is now wound on, its ends being secured to the terminals. As it is necessary to put it on under considerable tension an old leather glove should be worn on the hand through which it is fed.

The former is provided with two pairs of feet (see Fig. 1) made of angle brass, each of which is secured by a pair of 4BA screws. The guide-rod for the traveller is a 6 in. length of ¼ in. square brass rod, which must be perfectly straight. It is supported by two brackets (Figs. 1 and 2), made, like the feet, of angle brass.

The most difficult part to make is the traveller, which is seen in Figs. 3, 4, 5 and 6. The body of it (Fig. 3) is made from stout sheet brass, bent as shown. A hole ¼ in. square is cut in each of its ends, and it is provided with a kind of lid (Fig. 4) made of the same metal and fixed in place either by rivets or small screws.



Figs. 3 and 4.—Dimensions of the "traveller."

At right angles to the traveller, and fixed to it by a couple of small screws, is the bridge (Figs. 4 and 5) cut from 3-16 in. brass, and measuring 1½ in. in length by ⅜ in. in breadth. To its middle point is fixed, by means of a 4BA bolt, a triple laminated contact, made of thin phosphor bronze, whose arms are 1¼ in. apart. Two 6BA screws passing through the bridge provide a means of adjusting the pressure of the contacts upon the windings (Fig. 5).

To the "lid" of the traveller is attached a disc of ⅛ in. ebonite, 1¾ in. in diameter, which serves to prevent the fingers from coming into contact with the metal when adjustments are being made. Above this is an oval knob, which can be made by cutting out a piece of ebonite measuring ¾ in. by ½ in. thick, and rounding off the ½ in. edges. Both knob and disc are kept in place by two 4BA screws, which are allowed to protrude a little way below the "lid" of the traveller.

The reason why they are made to protrude is that they are wanted to act as retainers for a short length of stiff phosphor bronze or clock-spring, which is inserted between the "lid" and the guide-rod (Fig. 6) in order to take up any play between it and the traveller, and to ensure that contact shall always be good.

The whole instrument may now be assembled. The traveller is run up and down two or three times on

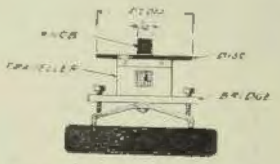


Fig. 5.—Cross section of the potentiometer.

its rod, and where the contact arms make scratches the enamel is carefully cleaned off the windings with a piece of fine emery cloth folded round a strip of wood. When this process is finished the windings are given a good rub with an old tooth brush in order to remove any small fragments of metal that might pack between them and cause short circuits.

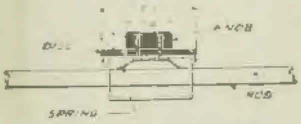


Fig. 6.—Illustrating the method of contact between "traveller" and rod.

So long as care is taken to get all the parts true the potentiometer will be found to work perfectly, the action of the traveller being delightfully smooth owing to its being balanced between two springs. When pressure on the laminated arms has been properly adjusted by means of the screws provided, the contact will be all that could be desired, and there will be none of the unevenness that occurs sometimes in potentiometers of faulty design.

R. W. H.

Loop Antennae for Transmission

Loop antennae are practical for transmission purposes in many instances, especially when it is impossible to erect an outdoor aerial, or where the directive properties of the loop merit its use. As when used for reception, the loop is a very inefficient device, and only under the best of conditions will the effectiveness of the loop approach other types of antennae, says A. R. Kenworthy, in "Radio News."

In general, the effectiveness of the loop antenna will depend upon its design and construction, but minor factors, such as its location with respect to imperfect dielectries in its fields, the wave length at which it is operated, and, indirectly, the antenna and receiving equipment used at the receiving station, must be considered if maximum results are to be obtained in loop transmission. These factors will be discussed in subsequent paragraphs.

A very practical loop antenna for indoor use is illustrated in Fig. 1, Detail A. The loop consists of two to four turns of ½ in. copper tubing wound on a frame from 3 ft. to 6 ft. square. If copper tubing of the size required cannot be procured, copper strip of 1 in. and 2 in. wide may be used. The spacing between turns should be at least 3 in., and the strips of material which space the conductors should be hard rubber or bakelite.

In constructing the frame, use hard wood, glueing the pieces together in preference to using nails or screws. It is absolutely necessary, if the full efficiency of the loop is to be realised, that the metal in the field of the loop be kept at a minimum. If desired, the loop may be arranged so that it can be swung in different directions, or it may be suspended from the ceiling of the operating room from insulators or mounted in a vertical plane on the operating table. While it is not absolutely necessary that the loop point in the direction in which it is desired to transmit unless the distance to be covered is very great, it is desirable to have the loop point approximately toward the receiving station. Under ordinary conditions there will be more or less radiation at a point 90 degrees away from the direction of maximum radiation being less than one-tenth the maximum radiation. It should be observed that in many instances large metal bodies in the vicinity of the loop will greatly distort the directivity of the antenna.

The loop described, used in con-

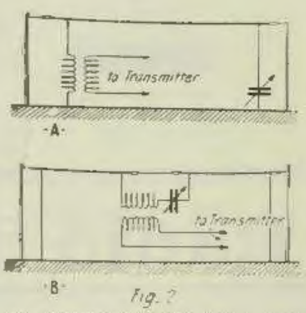


Fig. 2

Two Types of Outdoor Loop Antennae Which Should Prove Quite Efficient. That of "A" is an Inverted "L" Antenna Grounded at One End Through an Inductance and at the Other End Through a Variable Capacity. That of "B" is the Type Used Primarily on Submarines.

nection with a 10-watt transmitter, should have a range of from 25 to 100 miles, depending upon the size of the loop and the conditions under which it is operated. With a loop of the size described greater powers than 100 watts should not be used, and very little increase in range will be observed in using greater powers.

If comparatively great distances are to be covered with a loop antenna, and the circumstances will permit, an outdoor loop should be erected. Fig. 2 illustrates two suggested designs for such a structure. The loop shown in Detail A can easily be made by bringing leads from each end of an ordinary inverted "L" type antenna and placing a coupling inductance and tuning condenser as indicated in the sketch, with the coupling inductance in the end of the antenna from which the greatest radiation is desired.

The sketch of Fig. 2, Detail B, shows a modification of the Lowell-Willoughby loop designed for use on submarines. This type, too, can be made from the "remains" of an inverted "L" or "T" type antenna, and the claims are made that usually better results will be obtained with the loop than with the original antenna. With this type of antenna the coupling inductance and tuning condensers used with a loop antenna of any type should have very low losses and be capable of withstanding very high voltages.

Practically any circuit or transmitter can be used with loop antennae; in many cases it is necessary only to make connections to the loop from the antenna and ground connections of the transmitter. Two circuits recommended for

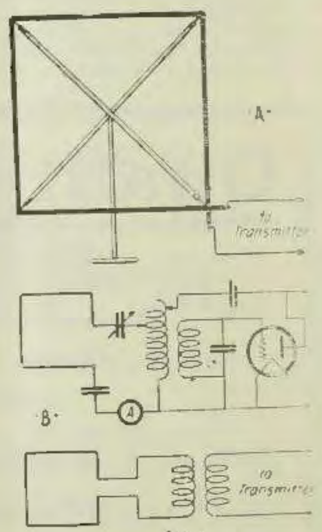


Fig. 1

A General Idea as to the Constructional Details of an Indoor Loop Antenna is Given in "A." Either Copper Tubing or Stripping Should be Used so as to Keep the High Frequency Resistance Low. "B" Shows Two Methods of Coupling the Loop to the Transmitter.

use with loops are shown in Fig. 1, Detail B. As a rule, the direct connected loops will give better results than transformer connected, but the latter give a more flexible arrangement and are sometimes necessary if the directional properties of the loop are to be fully realised.

In locating a loop antenna, if it is a small indoor structure it should be kept as far away from walls and masses of metal as possible; if the antenna is an outdoor structure, keep it away from trees, buildings, etc. Imperfect dielectrics in the field of the antenna tend to lower its efficiency by absorbing a certain amount of the radiated energy, this effect becoming more pronounced at short wave lengths.

HINTS ON MOUNTING CRYSTALS.

Upon the way in which a crystal is mounted depends very largely the efficiency of the set of which it forms a part. If the contact which it makes with its cup is poor or of varying quality reception will not be good; but if it is firmly seated in a mounting which does not allow it to move, then signals will come in at their full strength, provided always that the cat whisker or the crystal is properly adjusted.

The most usual method of mounting a crystal is to seat it in molten metal, which on cooling sets hard and keeps it securely in position. The disadvantage of fixing the crystal in this way is that the sensitivity of many kinds—particularly the various types of fused galena, such as Hertzite, permanite and others of that class—is adversely affected by heat. The older text-books recommend the use of solder, whose

Figs. 2 and 3.—Illustrating methods of mounting crystals.

melting point is far too high to be good for most crystals. To-day Wood's metal is commonly used. This has a much lower melting point, but at the same time it is rather too high to agree with delicate crystals.

An alloy with a melting point so low that it can do little harm is easily made. The constituents are:

Tin .. .. 2 parts
Lead .. .. 3 parts
Bismuth .. .. 5 parts

As this combination flows at a temperature of 15 degrees Fahr. be-

Continued on page 29.

Amateur Wireless Licenses

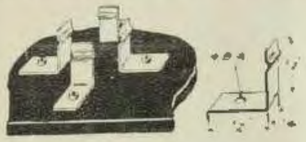
NEW SOUTH WALES.

Nature of Licence. Call Sign.	Name.	Address.
V	Calver, H. E.	"Orvieto," Hope St., Blaxland. R.
V	Crank, G. P.	"Hansworth," Regatta Rd., Five Dock. R.
V	Cross, A. J.	"Awa," Boyce Rd., South Randwick. R.
C	Crabbe, J. W.	40 Agar St., Marrickville. R.
V	Cunningham, D. C.	161 Victoria St., Ashfield. R.
V	D'Arg, J. B.	Warraguburra, Bega. R.
C	Davis, H.	104 Bay Rd., North Sydney.
C	Doorey, C. V.	"Olive," Regatta Rd., Five Dock. R.
V	Dunne, L. A.	28 George St., Enfield. R.
C	Edwards, C. F.	63 Queen St., Ashfield. R.
C	Evans, A. B.	Edenholme Rd., Abbotsford. R.
C	Eagles, J. P.	"Carvanza," Noble St., Concord. R.
C	Fraser, R. H. W.	2 Wolseley Rd., Sydney. R.
C	Ferguson, C.	54 Rowntree St., Balmain. R.
V	Ferguson, A. C.	45 Brady St., Croydon. R.
V	Field, G.	"Barnesdale," Edith St., Waratah. R.
V	Fisher, E. S.	"Lee Roi," King St., Mascot. R.
V	Francis, J.	75 Rosa St., Oatley. R.
C	Firth, B. J. W.	15 Redmyre Rd., Strathfield. R.
C	Face, G. J.	63 Bay St., Double Bay. R.
V	Gladstone-Hawke, A. C. B.	"Newstead," Aird St., Parramatta. R.
V	Goddard, A. H.	2 Aida St., Concord. R.
C	Godley, W. P.	85 Hardy St., Canterbury. R.
V	Goninan, A.	Albert St., Wickham. R.
C	Goodman, R. W.	Harbord Rd., Manly. R.
V	Goode, L. E.	82 Cameron St., Rockdale. R.
V	Hattersly, S. G.	12 Herbert St., Rockdale. R.
V	Harrison, E. W.	"Selsmore," Moppett St., Hay. R.
C	Harcourt, R. G.	"Bradestone," McKenzie St., Lindfield. R.
V	Henry, C. J.	Bridge St., Uralla. R.
C	Heyde, P.	1 Ronald St., Balmain. R.
C	Hill, N. E.	Brent St., Five Dock. R.
V	Host, H.	29 Bailey St., Adamstown. R.
C	Horsfield, G. R.	Oxford Rd., Strathfield. R.
V	Hoy, H. J.	Glen Innes Rd., Armidale. R.
V	Hodgson, R. V.	560 Old South Head Rd., Waverley. R.
C	Hughes, L. K.	53 William St., Double Bay. R.
C	Huxter, W. J.	11 Wattle St., Haberfield. R.
C	Inmon, A. G.	Post Office, Kangaroo Valley. R.
C	Jackling, S. W. R.	Hume St., Albury. R.
C	Job, H. N.	"Hillcrest," Boulevarde, Strathfield. R.
C	Jones, P. S.	Burrough House, Clapton Place, Darlinghurst. R.
C	Kennedy, J. McL.	62 Dalton Rd., Mosman. R.
C	Kerr, H. A.	26 Nicholson St., Balmain. R.
C	Knibb, G.	Stephen St., Balmain. R.
C	Larkin, A. J.	35 Harrow Rd., Bexley. R.
V	Lawton, E. M.	Hampton Court, Sydney. R.
V	Love, E. J.	"The Cottage," Mulgoa Rd., Penrith. R.
C	Luckeuck, L. K.	"Owalia," York St., Five Dock. R.
C	Lucre, C. W.	"Ethelville," Browning St., Campsie. R.
V	Martin, B. C.	Westmead Farm, Medlow Bath. R.
C	Martin, S. G.	1 Devon St., Islington, West Newcastle. R.
V	Magee, E. F.	"Pevensey," Hincks St., South Kensington. R.
C	Mathew, E. C.	20 Francis St., Manly. R.
V	Martin, W. B.	42 Lake Avenue, Burwood. R.
V	McKenzie, B. R.	Queen's Rd., New Lambton, Newcastle. R.
V	McLean, J. M.	Goan St., Trangie. R.
V	McGrady, S. R.	Honda Flats, Shell Cove Rd., Neutral Bay. R.
C	McKay, T. A.	"Leppington," Kissing Pt. Rd., Turramurra. R.
C	McKenzie, H.	12 Jersey Rd., Strathfield. R.

Continued from page 19

low that of boiling water, it is not likely to harm even the most delicate of crystals. If one part of mercury is added, the alloy does not solidify until it has cooled to something less than 150 degrees Fahr. It can be made to run quite easily by immersing the cup in hot water.

Another common method of fixing the crystal is to use a cup pro-



Figs. 9 and 10.—The four clip holder and dimension of clips

vided with set screws. There is no fault to find with this, provided that the crystal can be firmly fixed. This, however, is difficult with many of the cups now on the market, since they have only three screws. If cups designed on the lines of that shown in Fig. 7 are made, the four screws render the task of securing an irregularly shaped crystal far easier.

One can make quite sure that the contact is all that it should be in a very simple way. Procure a few pence worth of mercury and after the crystal has been secured by the set screws pour it into the cup by means of a folded paper, as shown in Fig. 8. If this method, which gives excellent results, is adopted, care must be taken that the detector is always kept with its right side uppermost.

Another good tip which makes cups, molten metal, mercury or set screws unnecessary and at the same time allows crystals to be changed with the utmost ease, is to make a mounting consisting of four spring clips, as shown in Fig. 9. The clips, whose dimensions are given in Fig. 10, are made of German silver or phosphor bronze. They should be mounted on the detector so that their tops are about one-eighth inch apart.

R. W. H.

To Club Secretaries

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Send along reports of your club meetings and experiments.

Remember, Publicity will help your club.

Contributions should reach "Wireless Weekly" not later than the Friday preceding the issue.

THE EDITOR.

Amateur Wireless Licenses (Continued)

C	Mead, A. J.	13 Hampden St., Ashfield. R.
V	Minich, R. A. S.	"Burrawong," Arabella St., Longueville. R.
C	Mitchell, J. A.	493 New South Head Rd., Rose Bay. R.
V	Moloney, J. F.	Green Hills, Narrabeen. R.
V	Moloney, F. T. H.	97 The Boulevarde, Dulwich Hill. R.
C	Muston, A. G.	84 Bradley's Head Rd., North Sydney. R.
C	Nichol, J. F.	7 Australian St., Croydon. R.
C	O'Leary, H. T. N.	106 King St., Newtown. R.
C	Pace, H. K.	8 Arthursleigh St., Burwood.

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