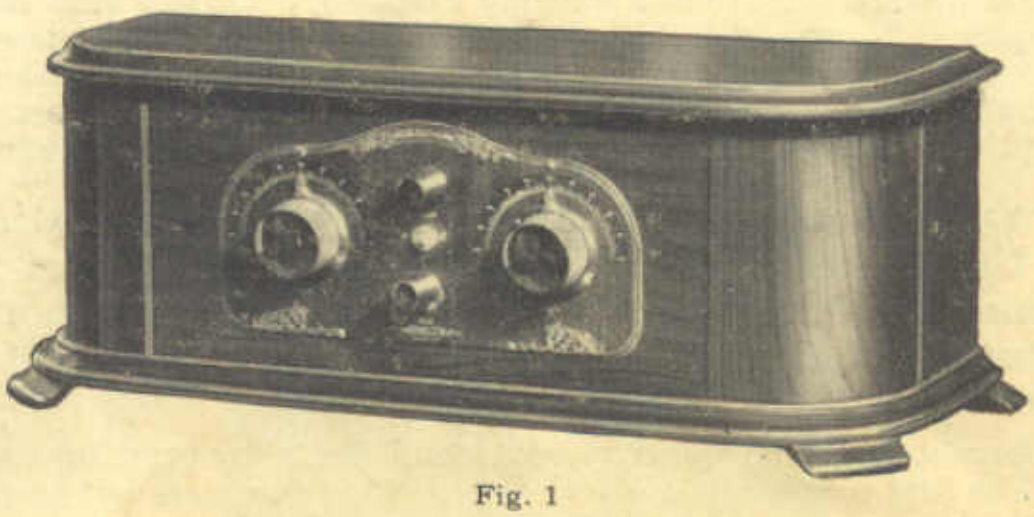

Fig. 1

UNPACKING ARBORPHONE

The Arborphone is shipped from the factory in a solid wood packing case and so protected by excelsior pads and oil paper that there is very little chance of damage in transit. The complete package contains the following:

One Arborphone Radio Receiver
Four wood feet with screws
One Arborphone Radio Log & Directory
One Radio Map with rule for measuring distances
One Hook-up Diagram or Instruction Book
One set of Postal Cards

Be very careful in removing the set from the packing box so that the finish is not scratched. If the set does not polish up properly by use of ordinary furniture polish, any dull spots can be removed by the use of powdered pumice stone and rubbing oil, which can be purchased at any paint store. Simply sprinkle pumice on the top of the set and pour on a little of the rubbing oil, using a piece of burlap and rubbing with sweeping strokes lengthwise—do not rub in circles and do not rub too hard. The rag will soon become filled with pumice and oil so that when the top is rubbed down you can touch up the sides by rubbing up and down and the base by rubbing lengthwise. This will bring out the full finish and make the cabinet a beautiful thing if it is not received in perfect condition, but usually the use of any good furniture polish is all that is necessary.

Locating holes for the foot screws are to be found on each of the corners on the bottom of the cabinet. The complete set ready to install is shown in Figure 1.

Note the REGISTRATION CARD, which is the upper right hand perforated postal card in a set of six cards packed in the envelope with the log book. Let one of the first things you do after unpacking your set be to fill out the card carefully and mail it to the factory.

There are four applause cards included with the set to make it easy for you to express your appreciation of the wonderful broadcasting that is being done gratuitously for your benefit. Remember, the only way the broadcasting stations have of knowing what you like best in the way of programs and who is listening to their programs is for you to take the time to tell them about it. The postal card makes it very easy for you to do this and remember that if everybody would fail to write the broadcasting stations there would not be any broadcasting, so it is up to you to do your share of boosting. Better programs and features will result.

We have made arrangements with the Multivider Manufacturing Company, Kansas City, Missouri, to supply a certain number of Arborphone users with up-to-date information on changes and additions of broadcasting stations. This service can be had by enclosing the postal card provided, with 25c, and

mailing to the Multivider Manufacturing Company. Do not send this card to the Arborphone factory as during the next few months there is going to be so many changes in the stations that it will take a special organization to keep the information correct, so these special arrangements have been made and it is entirely optional whether or not you subscribe to the monthly service.

All Arborphones are given a final test on actual broadcasting reception just before the set is packed for shipment. In fact, the final test is located on one end of the packing bench so that the set is not handled by anyone between the time of making the last test and packing in the wooden case.

The Arborphone receives two separate and distinct operating tests in the factory. The first test is made after the chassis is complete but to make sure that nothing has happened to the set while either in the stock-room or on the benches, an extra test is made just before packing for shipment. For this reason you will know that your Arborphone was in perfect operating condition when shipped from the factory.

INSTALLATION

It is just as important to properly install a radio set as it is for the manufacturer of the set to design and do his part correctly. From our experience we find many radio sets that are not operating at full efficiency because the equipment used and the aerial are not correct for the particular make of set. Many good sets fail just because the maker's instructions were not carried out. This applies to the Arborphone just as much as to any other set.

The Radio World seems to be full of fellows who apparently claim to know more about radio sets than the factory engineers who designed them, or what is just as bad, work on the assumption that all sets should be installed alike. These fellows are doing radio a great deal of harm and, while they could do a splendid job if they were open to suggestions, they prefer to go on their own knowledge and blame the product rather than themselves. Avoid such men in having your Arborphone installed. See that the man who installs your Arborphone has read this instruction book and that he carried out the following instructions.

On the other hand, there are a class of men who have done much towards making radio what it is today. The Radio Amatures and Dealers' Service men are the back-bone of the industry and they have a very good knowledge of radio in general and being trained men realize that the Experimental Department at the factory has tried about everything that they themselves could think of, and are, therefore, ready and willing to see that the recommendations and instructions of the manufacturer are carried out to the very letter. Such men, when called upon to examine a set that is not operating properly, first get the recommendations of the manufacturer and check up and see whether or not they have been carried out.

LOCATION OF SET IN HOME

In selecting the location of the radio in your home bear these facts in mind:

First—The set should be so placed in the room that the aerial lead-in wire will be just as short as possible and led directly to the left hand end of the set. The lead-in should drop straight down from the aerial above without being carried around corners to the point where it is brought inside and kept just as far from the side of the house or walls both inside and outside as possible.

Fig. 2

Second—Do not place set nearer than six feet to any large masses of iron such as radiators, pipes, stoves, or walls with metal lathing. Never place the set on a porcelain or metal top table. Masses of metal in the vicinity of a radio set broaden the tuning and lower the efficiency.

Third—The ground wire can be tacked along the baseboard or molding and, while the shorter and more direct the better, the length is not of consequence. So, in locating the set, favor the aerial, which must not be tacked to the wall.

Fourth—If these conditions can not be had in the room where you want the loud speaker, it is better to make an extension of the loud speaker cord and place the set in another room where the location is favorable with respect to the aerial lead-in.

LOCATION OF BATTERIES

The use of a table having a compartment to house the batteries and charger is recommended. These tables can be secured at all prices. A practical and beautiful one is made to exactly match the Arborphone and is illustrated in Figure 2. The ordinary five-wire battery cables are long enough for table use and consequently get away from a mass of wires.

If you do not provide a special table for the set it is then better to place the batteries in the basement where they can be easily reached for charging and where there will be no danger of acid being spilled and ruining the rugs and floor. A battery shelf can us ally be made in the basement by nailing two or three boards on the bottom of uprights nailed to a pair of rafters. A hole for the wires can be bored in the floor near the baseboard where it is out of sight.

Do not place the batteries open on the floor underneath the table. They gather dirt and are so unsightly that we do not blame the housewives for complaining. All you need in order to put the batteries in the basement is a few feet of five-wire battery cable that can be purchased at any radio store for a few cents a foot. Always try to keep the wires between the batteries and the set as short as possible. If they are too long (over 7 feet) the set will tune broadly.

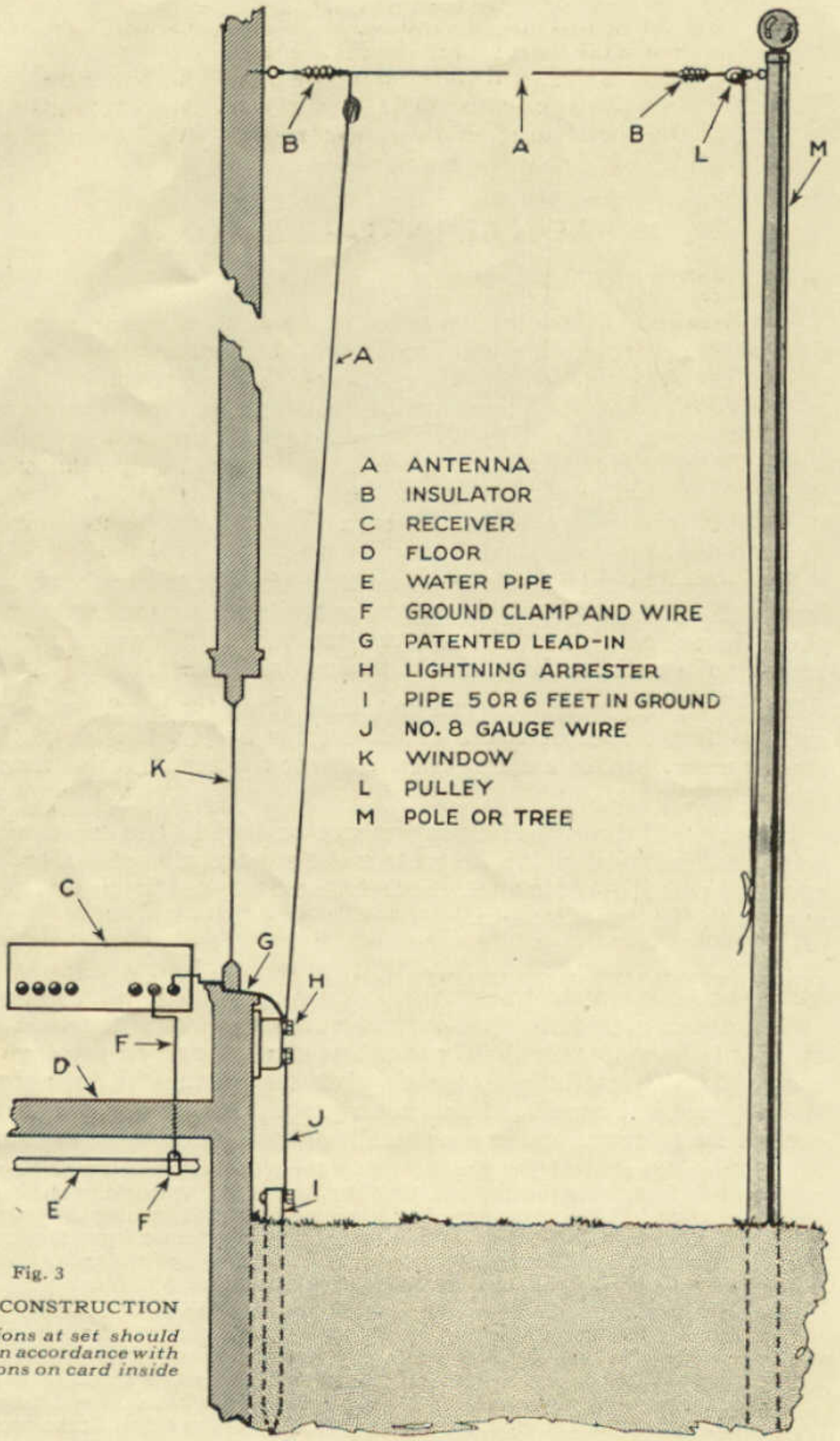

Fig. 3

AERIAL CONSTRUCTION

(Connections at set should be made in accordance with designations on card inside set.)

although this can be overcome by placing a 1.MF fixed condenser between the "B+90 volt" and "A"— binding posts, outside the cabinet but close to the set. This will by-pass the radio frequency currents so that they will not have to pass down in the basement and through the batteries.

If "C" batteries are used they should be placed on the table in back of the set, as these wires must be short. Do not put the "C" battery inside the set, as the metal used in their construction will have a detrimental effect when brought near the coils.

AERIAL INSTALLATION

OUTDOOR AERIAL

The Arborphone requires an aerial in the form of a single-span of wire from 50 to 100 feet long (including the lead-in) perfectly insulated at both ends. The Arborphone will not operate on a loop.

The length of aerial depends upon the height and location with respect to surrounding objects. If erected perfectly in the clear at a height of about 30 or 40 feet above the ground, or building, a straight span of 50 feet with the additional lead-in will be just about right. However, if one end comes near to trees or building roofs or other objects connected to the ground, a longer aerial should be used. A total length of 100 feet is the most that should be used.

If the aerial is too short the reception will be weak and the set will tune so sharply that it will be difficult to handle. On the other hand, if the acrial is too long you will have difficulty in tuning out local stations and you may be surprised to know that the sensitiveness of the set will be ruined due to the overloading of the first stage of amplification, throwing the entire circuit out of balance. For this reason, with the Arborphone, stations will come in louder on a short aerial than on an extremely long one. If you want distance, clearness, and selectivity, use the length of aerial recommended and do not be mis-led into thinking that the longer the aerial the better. This latter is true with crystal sets and some of the insensitive tube sets but it is not true with the Arborphone.

Although the lead-in may be heavily insulated wire, nevertheless, the wire must be kept **at least six inches,** and two feet if possible, from the side of the building, otherwise much of the current needed to operate the set will be dissipated before it reaches the first coil. Another place where losses are apt to occur, especially in wet weather, is in the insulators. Glass or porcelain insulators that will not absorb moisture are the best.

In erecting your aerial remember—Get the wire up high and in the clear to gather the radio waves—insulate perfectly to keep the current after the aerial has gathered it and then conduct the current to the set just as directly as possible before it is lost. It is best to make the aerial and lead-in in one piece. If the lead-in is a separate piece of wire solder every connection and joint with great care.

At best the aerial picks up only a very minute amount of electric current from the air and these feeble high-frequency currents are of such nature that they are hard to insulate, that is, hard to keep on the lead-in wire and conduct down to the set without serious losses.

In bringing the lead-in into the house, the patented lead-in strips that go between the window frame and sill are very convenient although some of the cheap ones are insulated with cotton fabric, that absorbs moisture and leaks current badly when wet. So if you do not want to bore a hole into the window sill and slip in a porcelain tube insulator, use a lead-in strip but buy the very best procurable. Never install the aerial parallel

or close to telephone or light wires as an objectionable induction hum may result. Trouble of this kind can usually be overcome by erecting the aerial at right angles to the interfering wires. Never place the aerial so that it crosses other wires, as it might fall and short-circuit heavy currents into the set. The single wire aerial is not directional to any practical extent. Run your aerial in any direction that will keep it in the clear.

Number 14 stranded, enameled, copper wire is very good for an aerial. Pure, stranded, copper wire is better when first erected but it soon corrodes and the corrosion increases the resistance. The resistance of the enameled wire is a little higher at first but it will not corrode so after a short time of exposure it really has less resistance than the bright wire. The best wire is gold-plated, stranded, copper. The gold plating does not increase the resistance and it will not corrode. The cost of such an aerial is only a dollar or two more and it is well worth while as it will last for years without cleaning or replacement.

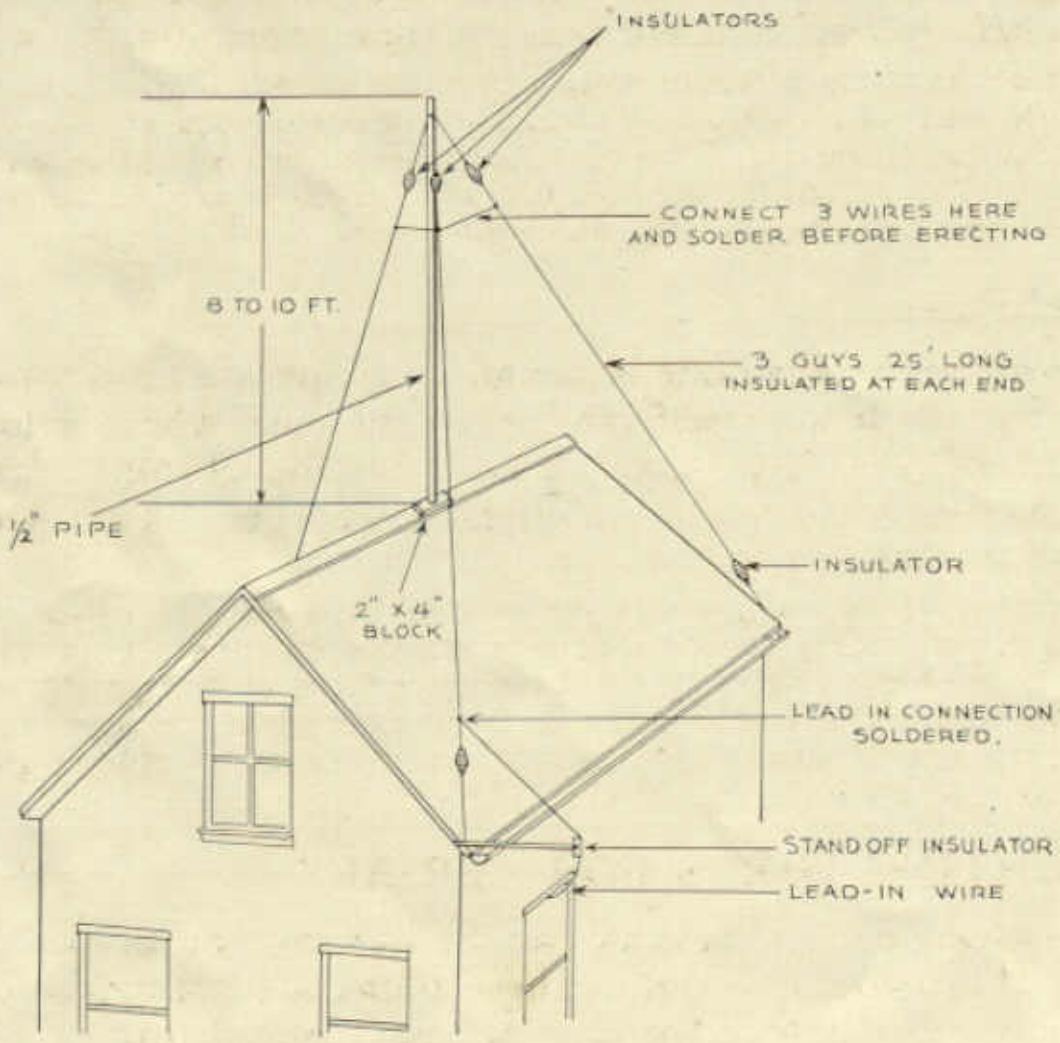

Fig. 4

UMBRELLA TYPE AERIAL

Very good results are being had with the Arborphone by use of the umbrella type aerial shown in Figure 4. This type of aerial lends itself readily to the case where there is no tree or building to support the outer end of the usual horizontal aerial. By using an eight or ten foot length of half-inch electrical conduit pipe, which is black japanned, with glass insulators the appearance of this type aerial is greatly improved. The wires, which act as guys as well as aerials, should be from 20 to 25 feet long. The insulators on the bottom of these wires should be located at least a foot from the roof so that the current gathering part of the aerial does not come too close to the building.

As a base support for the iron pipe use a piece of two-by-four about 8 inches long and nail to the peak of the roof with four nails. The hole or socket for the pipe should be bored at an angle so that the

pipe can stand upright when the block is nailed on the slant. Use a 1¼ inch bit to allow plenty of clearance so that by adjusting the length of the guy wires you can pull the pipe until it stands up perfectly straight. The 3 legs of the aerial must be joined together at the top and it would be well to string the upper insulators and solder these joints before erecting. The lead-in should be soldered to the most convenient leg and carried to an insulator nailed on the end of a stick that will hold the lead-in at least a foot from the eaves and side of the building below.

LIGHTNING ARRESTER

Use a properly grounded lightning arrester. By doing so your aerial then becomes a very good protection against lightning. To get this protection you must use an outside ground (water bib or iron stake) connected to one terminal of the arrester so that any charge from lightning in the aerial can leak off to the ground without harming the set.

While there is really no more danger from an outside aerial than from the electric light and telephone wires, insurance regulations specify the use of an approved lightning arrester. Therefore, use one and be on the safe side. However, if after installation, the set does not work properly try disconnecting the arrester as sometimes they become short-circuited.

INDOOR AERIAL

Inasmuch as the Arborphone is designed to operate on a comparatively short aerial the set lends itself readily to the case where a long outside aerial is impractical. Very good results can be obtained from a wire around the picture molding or underneath a carpet. This wire must be insulated and as long as possible.

Wonderful results are sometimes obtained on an aerial of this sort 20 or 25 feet in length. This aerial should always be connected to the "Short Ant" binding post. If you have an attic, the coil spring aerial stretched out 25 or 30 feet works very well. We have records of both coasts being worked from sets located in the middle west on this type of an inside aerial—but a great deal depends upon location.

USING LIGHTING WIRES FOR AERIAL

In many cases excellent results can be had by the use of the Ducon lamp-socket plug type of aerial. These plugs are provided with a condenser that stops any flow of the electric light current into the set and yet uses the wiring system of the house as an aerial. The success of these plugs depends upon whether or not they are plugged into a lighting circuit in such a way as to allow use of a good long span of wire.

The plugs are furnished with a binding post on each side, both of which should be tried and then the plug reversed in the socket and both terminals tried again as there is a different capacity condenser on the two sides. If it happens that the lamp-socket to which you are connecting has only a very short wire, to a switch or another lamp, little results will be had but if you will try other sockets in the room you will strike a connection that will make a good aerial. This is also true in using the base-board connection plugged in for an aerial. These aerial plugs are inexpensive and it is worth while to try one before constructing any inside aerial. They also provide a second aerial to be used when static is too bad to work on the long outside aerial.

GROUND CONNECTION

The binding post marked "Ground" should be connected by a fairly large wire, preferably No. 14 gauge rubber covered, to a grounded water

pipe through a soldered connection and a copper ground clamp. The water pipe should be filed or scraped smooth and clean before applying the ground clamp. Often radiator pipes make a good ground but the resistance, owing to the radiator joints and boiler connections, is usually a little higher than that of a grounded water pipe that goes directly into the ground.

In practically every home a pipe ground is obtainable but in cases where this is impossible the Ducon plug mentioned above may be used for the ground connection and fair results obtained.

In the country where house piping is not so common, the ground connection should be made by burying an old copper boiler or a sheet of copper plate, to which the ground wire has been carefully soldered, a depth of three or four feet in moist ground. Although not as satisfactory as the boiler or plate, an iron stake driven six feet into moist earth makes a good ground connection. If the house is near a stream of water or a well a ground connection may be made by soldering the ground wire to large pieces of metal and thrown into the water. This is a good thing to remember if you take the set on a vacation trip and operate it out-of-doors.

Avoid using gas pipes as they run to the meter and are apt to offer high resistance. If this is the only pipe available, use a copper wire jumper across the gas meter connected to the pipe that enters the ground.

Remember that for a good ground connection the earth must be moist. Plates buried in dry earth or sand are not suitable.

AERIAL SELECTIVITY

It is sometimes quite worth while to install two aerials where greatest flexibility of operation is desired. A short indoor aerial is convenient for local reception when static conditions are bad, while the longer outside aerial may be used when reception conditions are good and extreme distance is required. The short aerial is also helpful in tuning out local stations and often when little or nothing can be done on the long out-door aerial the short aerial brings in distant stations right through the locals. (A fixed grid condenser of .0005 capacity placed in series with the aerial lead-in has the effect of shortening the aerial.)

It is very difficult in some of the large cities, where 15 or 20 stations are on the air at a time, to tune out the local stations and bring in distance. For this work a short antenna must be used and here also the location of the set, with reference to metal objects, is very important. Where stations are very near, the broadcasting wave strikes the receiver wires and tubes with such force that often the stations can be heard even with the first tube removed. In such cases, with the aerial disconnected and all tubes in place, tune in the interfering station and carefully turn the set bodily until the position of weakest reception is found. Often by turning the set half way around greater selectivity is to be had.

The Arborphone is one of the most sensitive sets on the market and many distance records have been made with this set in Chicago and New York where the local stations come in at every point on the dial.

The direction of the aerial wire is of little consequence although if possible it should not be erected so as to point towards a nearby broadcasting station, but really little good can be accomplished through a change of aerial direction and if the directional qualities have not been taken into consideration when installed it is not worth bothering with. See further remarks on selectivity elsewhere.

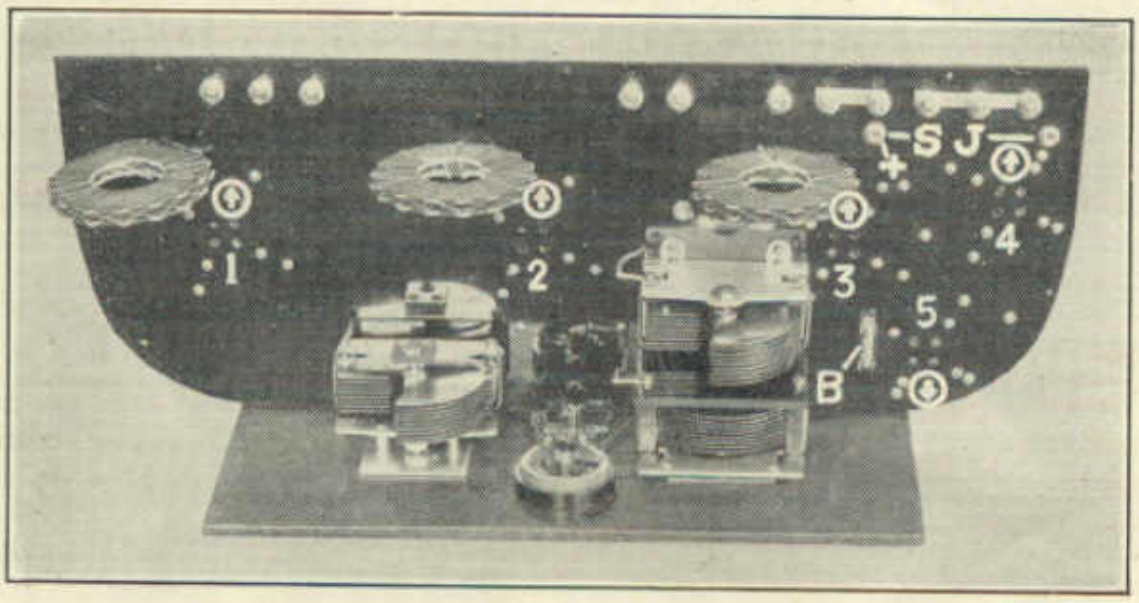

Fig. 5

CAUTION: ***Insert Tubes Correctly.***

TUBE EQUIPMENT

TYPES OF TUBES RECOMMENDED

The Arborphone is designed for use with type 201A or 301A tubes with long prongs. The prongs on the tube are of different sizes so that they can not be inserted incorrectly unless forced into the holes in the sub-panel.

INSTALLING TUBES

The figured arrows in illustration, Figure 5, indicate the correct position of the small lock pins on the tube bases when the tubes are installed. Note and remember—All pins to the back except front tube (5) where pin must point to FRONT. If you have some of the old type of tubes with short prongs, they can be used but great care must be taken to see that they are installed in the sockets in accordance with the foregoing or they will be burned out.

INSPECT KEEPER BARS

Make sure that the two keeper bars on the binding posts are in the correct position, as shown in the illustration covering the type of tube you are using. These bars might be missing or have been changed so as to cause trouble.

MAKES OF TUBES RECOMMENDED

The brands of tubes best suited for the Arborphone are Radiotron, made by the Radio Corporation of America; Cunningham, made by E. T. Cunningham, Inc.; and Sylvania, made by the Sylvania Products Company, Emporium, Pa.

The electrical characteristics of these three makes of tubes are almost identical and they all give full amplification in the Arborphone. While there may be other brands of tubes on the market that will work equally well, from what tests we have made the results do not compare with those that can be had

from the tubes recommended. Some Dealers have tested other brands and found them satisfactory. You can safely follow their recommendations in this respect.

Other brands of tubes may work fine in other designs of radio sets but that does not mean that they are satisfactory for the Arborphone. Too much care can not be taken in selecting the proper tubes as the electrical characteristics in the tubes themselves were considered and incorporated in the Arborphone circuit.

The two most important tubes in the set are those used in socket No. 1 and No. 2, Figure 5. Almost any tube of the UX-201A type will give fairly satisfactory results in sockets No. 3, No. 4 and No. 5, but at least provide yourself with two tubes of the recommended brand for the first two sockets. Your possible reception will be cut down many hundreds of miles if you fail to heed these instructions. For all around use, UX-201A tubes in all sockets with the batteries connected as in Figure 6, give the best results.

CARE OF TUBES

The radio vacuum tube is of very delicate construction and must be handled with care. The lighting filament is as fine as a hair and is easily broken or burned out through abuse. To get the longest service from tubes, always keep the volume control turned to the left as far as possible. If the tubes are burned at the brightest and highest temperature they will soon become paralyzed and will either have to be rejuvenated or replaced.

After a set of tubes has been installed and the set is in operation, tune in a distant station and switch the tubes around in the various sockets until best reception is had. The capacities of each tube are all slightly different and after changing from one socket to another you should re-tune the dials. When the best operating position is found for each tube, mark it with a lead pencil so that you will always install them in the same socket.

When opening the lid of the cabinet be very careful not to let the lid fall down as the jar is apt to break the filament of the tubes. Often jarring tubes this way will cause a plate of one of the tubes to break from its support and strike the filament, shorting the high voltage "B" battery through the filament wires and is apt to burn out the other four tubes. This sometimes occurs when the set is in operation but without any apparent reason. It is one of the things that happen in radio that has not yet been entirely overcome but fortunately only one tube in hundreds will cause this trouble. In such instances where all tubes are burned out due to one tube being defective there is really no one at fault for the same tube will cause the same damage in any radio set regardless of make.

In changing wires or batteries always remove the tubes. Sometimes you may simply flash the "B" battery wire on the filament and while the tubes will burn they have become paralyzed and no reception can be had. These tubes can be rejuvenated, and, while they never will be as good as before, will work fairly well at least in the audio and detector sockets.

Occasionally you will find a tube that is microphonic, that is, very noisy to the slightest vibration or causes howling when the loud speaker is brought near the set. This trouble is usually due to the fine grid wires inside the tube not being welded solidly to the grid support. The vibration of the air from a loud speaker will make such a tube howl badly. A tube of this kind is most objectionable in the detector socket No. 3 and should be placed in socket No. 1 or No. 2.

TUBE CAUTION

The filament controls do not permit the using of any set of tubes which combined draw more than 1.5 amperes. The 201A tubes draw ¼ ampere each, so four of these can be used with one of the power tubes drawing not over ½ ampere. This means that you can not use even one of the old UV-200A tubes which draw 1 ampere each. The use of such tubes will burn out the rheostat and resistance cartridge "B," Figure 5.

POWER TUBES

The Arborphone is so wired and binding posts are provided for the use of any of the new types of tubes. But for the ordinary, small cone, or horn speaker the above recommended 201A tubes throughout is best.

If you wish to operate two or more loud speakers in series or one of the large three-foot cones, or a loud speaker which requires a power amplifier, you can use a type UX-112 power tube in the last stage of audio connected with proper "C" batteries and additional "B" batteries as shown in Figure 8.

We do not recommend the use of the type UX-171 or UV-210 tubes because they will overload the coils in practically all of the presentday loud speakers, except those made especially to work with these tubes. All the volume that is ordinarily required can be had by the use of the UX-112 in the last stage, using 135 volts on the plate and 9 volts of "C" battery.

NEW TYPE DETECTOR TUBE

The new UX-200A Detector Tube, which is a little more sensitive than the UX-201A, may be used in the detector socket (No. 3). However, this tube is usually more noisy and makes a hissing sound that in some instances is objectionable. It is a fact, however, that distant stations can be brought in with greater volume but on the other hand it also causes broader tuning and should not be used when greater selectivity is required. A special binding post is provided for the Detector "B" battery so that the 45 volts required on the plate of this tube may be had by changing the lead at the battery to the 45-volt tap instead of the 22½-volt tap.

In installing any of these special tubes, note hook-up diagrams very carefully and especially note position of keeper bar on the binding posts. A wrong connection may burn out all the tubes.

DRY CELL TUBES

In cases where a storage battery or battery eliminators can not be used, the Arborphone can be operated by the use of Type UX-199 dry cell tubes. When using these tubes it is suggested that the UX-120 Amplifier Tube be used in the last stage of audio and hooked up as shown in Figure 9.

While, naturally, you can not get as much volume or work as great distances with these tubes, operated by 3 dry cells in series, you will be able to receive the principal stations within a radius of 500 miles with plenty of loud speaker volume. The resistance cartridge "B" is just right for the use of these tubes and does not have to be changed.

BATTERY EQUIPMENT

"A" BATTERY

Unless dry cell tubes are used, the Arborphone requires a six-volt storage battery for lighting the filaments of the tubes. The battery should have a capacity of from 80 to 120 ampere hours, depending upon how frequently you will want to recharge the battery. A 100-ampere-hour battery is just about the right size for ordinary use but if the battery has to be taken outside for charging get the largest battery available.

Beware of cheap radio batteries. They will give good service for a short while, but for two or three dollars more you can usually buy a high grade battery that will last for several years if kept charged.

The Positive and Negative terminals can be easily recognized. The positive being marked "P," "+," "Pos," or painted red. The negative terminal is marked either "N," "Neg," or in the minus (-) sign.

CARE OF STORAGE BATTERIES

Before trying to operate the set make sure that the "A" battery is fully charged. This can be determined only by the use of a hydrometer and every set owner should purchase a hydrometer and test the battery frequently, recharging when the test shows "Half-discharged."

It is very harmful to storage batteries to let them become completely discharged and the reception drops off as the voltage of the battery lowers.

Keep the battery terminals well coated with vasoline since if they once start to corrode you will have to continually scrape the connections to provide a good contact. But if you clean the terminals well and coat them, corrosion will not take place.

Occasionally examine the level of the electrolyte or solution in the battery. This should cover the plates at all times. As the solution evaporates it should be replaced by filling the cells one-half inch or so above the plates with pure distilled water. Never add acid. Do not use city water or wellwater that contains chemicals as this is apt to ruin the battery. Do not use water that has been allowed to stand in metal vessels or rain water from a metal roof. Procure a bottle of distilled water from the battery station. It would be well to read the directions on the care of the storage battery, which are furnished with all batteries.

The frequency at which batteries require charging depends upon the number of hours the set is used and the size of the battery. With 201-A tubes throughout the Arborphone draws 1.25 amperes per hour. At this rate theoretically a 100 ampere hour battery would give 80 hours of operation, but storage batteries are not 100% efficient and the reception starts to drop off after the battery is half discharged, so you can not expect this theoretical amount of service from one charge. Small storage batteries, like 80 ampere hour capacity, require more frequent charging than the large batteries, but are all right if used with a trickle charger.

BATTERY CHARGERS

A battery charger is one of the most important accessories and if such a thing is possible you should provide yourself with a charger which can be connected to the battery and switched on at any time, making it easy to keep the battery fully charged and get the best results.

Any of the standard chargers are satisfactory but always remember to disconnect the battery leads to the set when charging as many chargers will blow

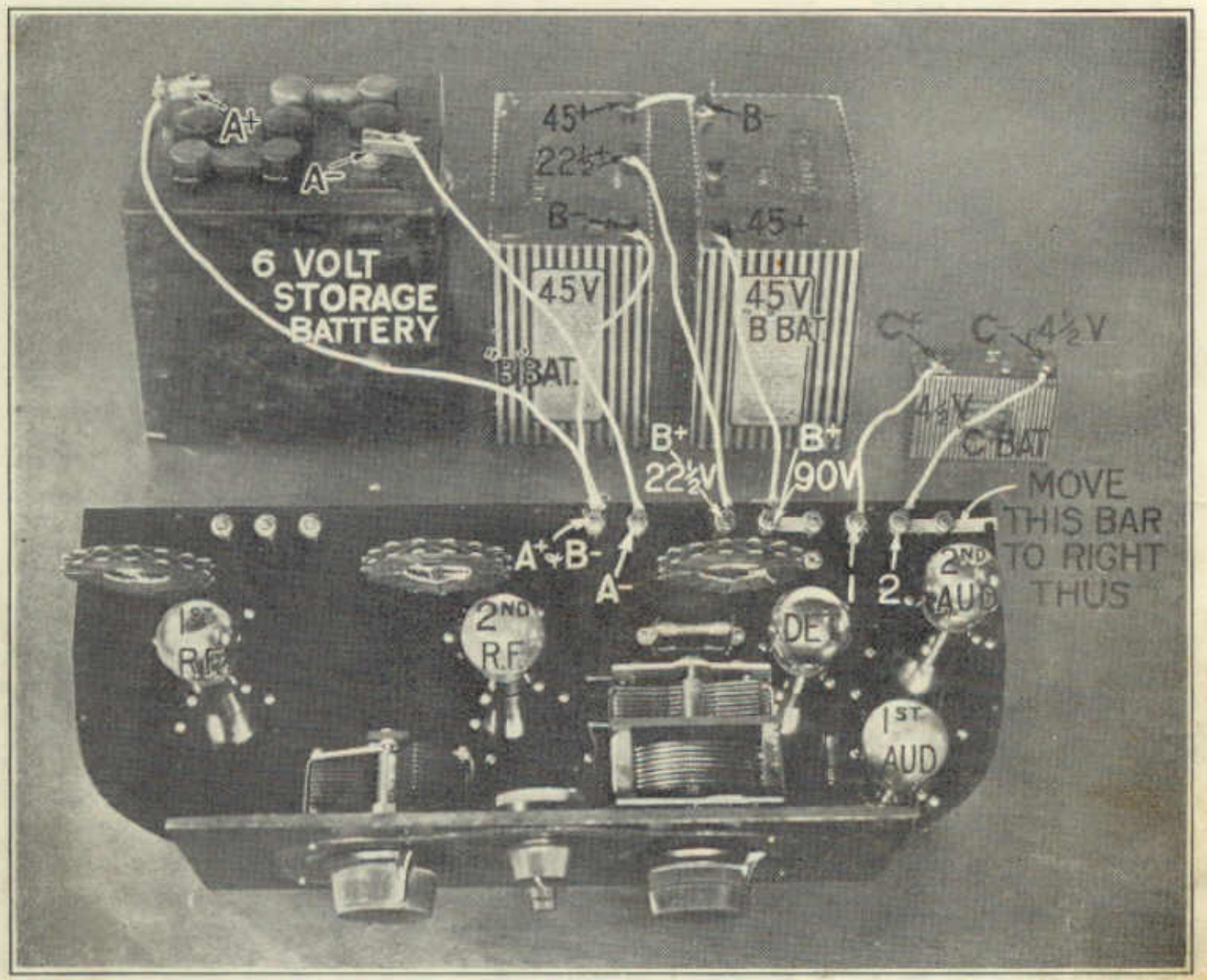

Fig. 6

Battery connections used with UX-201A tubes in all sockets. Note that to use "C" battery the keeper bar connects binding posts Nos. 2 and 3 only, and not all three posts as sets are shipped. For all around use this is the best hook-up. See pages 14, 15 and 16 for other hook-ups.

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out the tubes in the set regardless of the position of the "A" battery switch. It is not enough to just disconnect one of the battery wires. **B oth battery wires must be disconnected before charging.**

Trickle chargers, which charge the battery constantly when the set is not in use, draw very little current and are very satisfactory although you must be sure to get a charger that has a high enough charging rate to keep the battery charged. This depends, of course, on the number of hours per day you use the set. If you only use the set for two or three hours in the evening the small trickle charger is allright, but if the set is used more than this you should buy one of the trickle chargers that is also equipt with a rectifying tube for charging the battery quickly when it becomes run down. Your radio dealer will advise you correctly in the matter of chargers.

"B" BATTERIES

For a five-tube set the largest 45-volt "B" batteries are the most economical in the long run. The drain on the small batteries is excessive and they do not last only a few weeks. If a "C" battery is used the life of the "B" battery will be greatly prolonged. Of course, here again the life of the battery depends upon the number of hours of steady use.

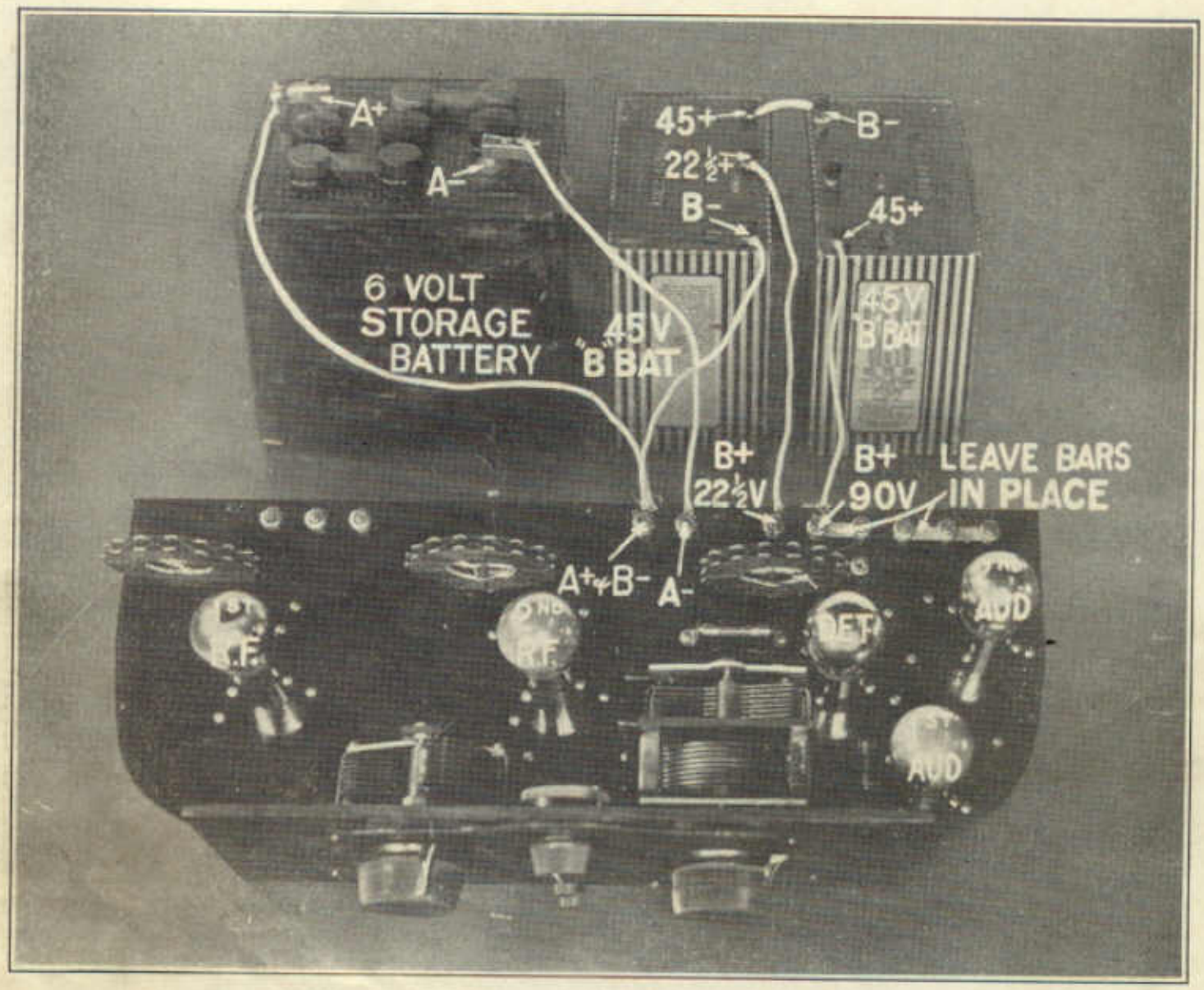

Fig. 7

Battery connections used with UX-201A tubes, without "C" battery. Keeper bars are in same position as when sets are shipped. The results obtained with this hook-up are the same as with Fig. 1, except more "B" battery current is used; therefore connections shown in Fig. 1 are preferable.

CONNECTING BATTERIES

CAUTION—When connecting "B" batteries, remove all tubes from the sockets and after the batteries are connected check the wiring over to make sure that it is correct, then try one tube in each socket to prevent burning out the whole set of tubes in case an error has been made.

The Arborphone is very simple to hook up. The connectlons depend upon the types of tubes used. Be sure to refer to the correct illustration, Figure 6, 7, 8, 9. In each instance note position of keeper bars. All sets are shipped with the keeper bars in the position shown in fiigure 7. However, sometimes these bars are removed or lost. In such an instance a piece of bare copper wire can be used to connect the proper binding posts instead of the bar.

If the operation of an Arborphone is intermittent and seems to load up and then work perfectly for a few seconds the,rrouble is usually due to the absence of keeper bar, or one incorrectly placed.

Note that the A+ and B— battery wires are connected to the same binding post. This connection can be made either at the binding post or between the battery terminals, whichever is most convenient.

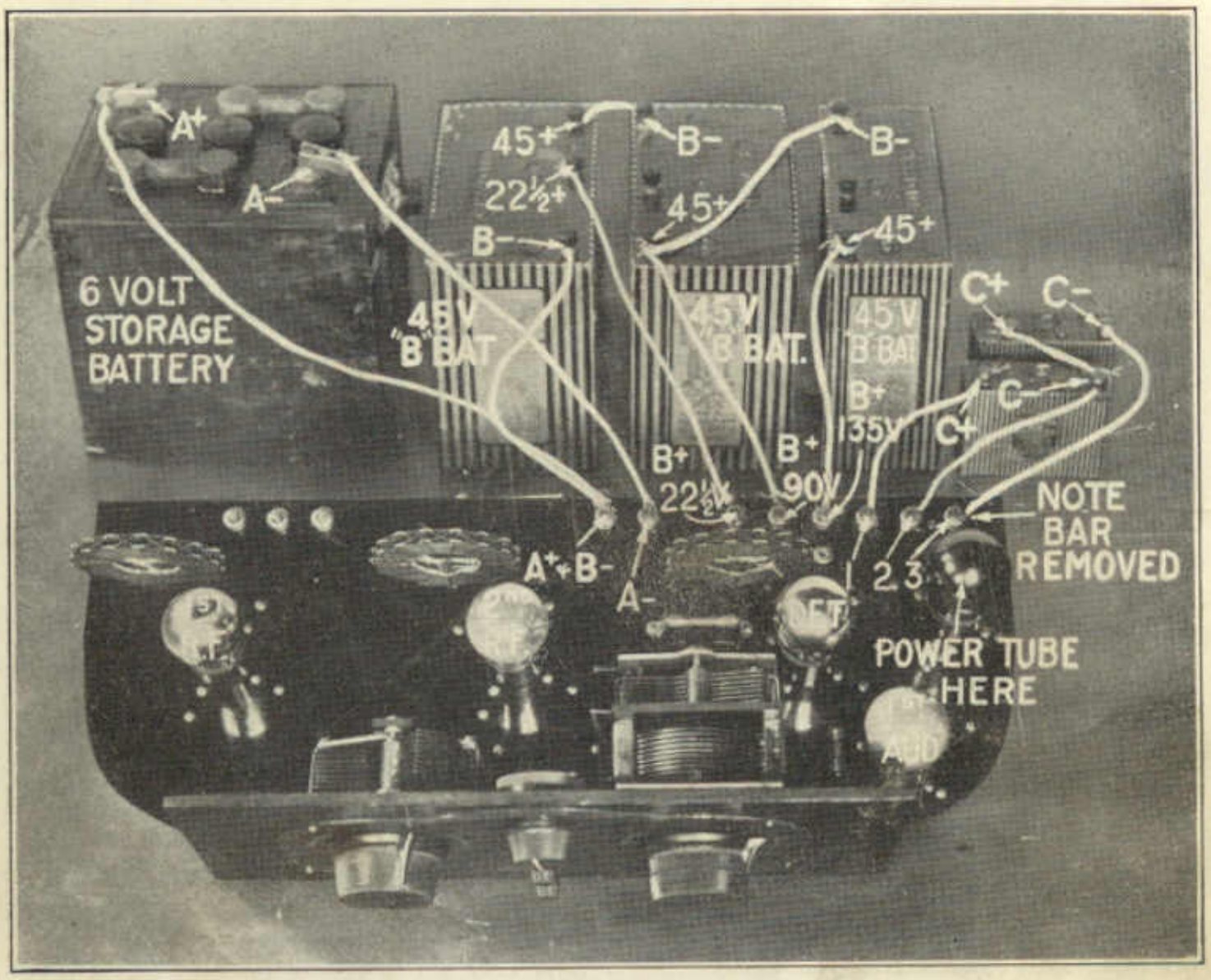

Fig. 8

Battery connections used with UX-201A tubes with UX-112 power tube in last stage of audio. Note that both keeper bars are removed and an additional 45 volt "B" battery is connected in place of the short keeper. Also 9 volts of "C" battery are now connected to post No. 3. Use this hook-up for greatest possible volume with large loud speakers.

If you are not acquainted with hooking up a radio set do not attempt it yourself. A wrong connection might cause not only the burning out of the tubes but burning out the coils and transformers.

LOUD SPEAKER EQUIPMENT

The only recommendation we can make to you regarding the loud speaker is—Buy a good one.

No radio set, regardless how carefully designed, will overcome imperfections in a cheap loud speaker. As far as quality of tone is concerned, the Arborphone is no better than the loud speaker it is required to work. In buying a loud speaker remember that all of the good things that Radio has to offer necessarily come to you through the medium of the loud speaker and buy a speaker that sounds so good to your ears that you will be willing to live with it for years to come.

No two people hear alike. One person may condemn a particular loud speaker while another may commend it simply because their own senses of hearing do not balance the same way with the reproduction properties of the speaker. Obviously, if one desires the greatest amount of satisfaction he must select a loud speaker that matches his own ears.

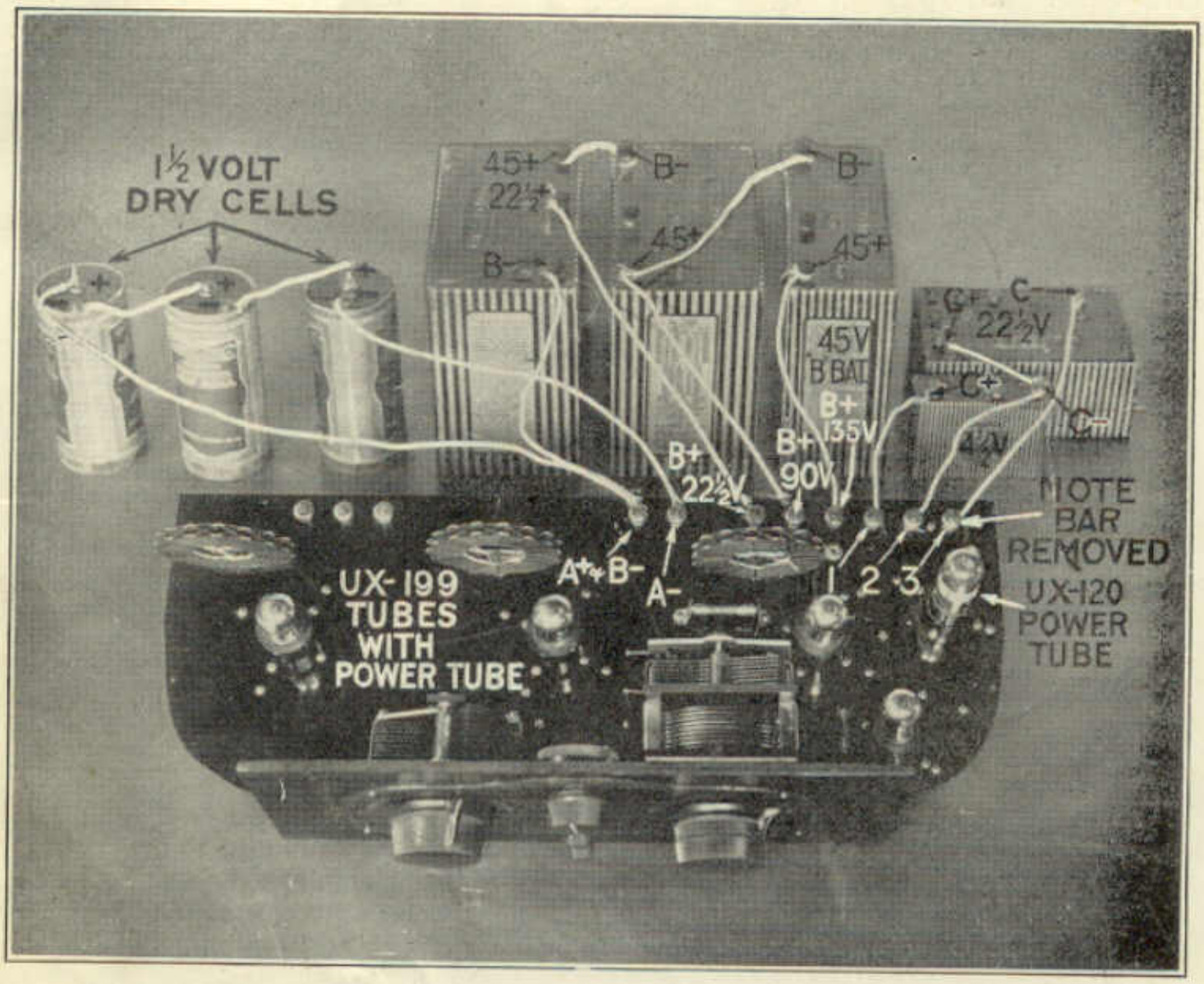

Fig. 9

Battery connections used with UX-199 tubes with UX-120 power tube in last stage of audio. This is the recommended hook-up for those who wish to use dry cell operated tubes. The smallest size of 22½ volt "B" batteries may be used for the "C" battery connected to post No. 3, but the large size with taps allows varying the voltage and is preferred

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A person who hears the low frequencies unusually well prefers a loud speaker that to the normal ear is high pitched. On the other hand, and as is most usually the case, the ear may not be responsive to the low frequencies and therefore a low pitched loud speaker would be preferable.

The Arborphone will operate satisfactorily with either the horn or the cone type speaker. Usually the cone type speaker has a lower pitch, although horn speakers can and are built that will amplify the low notes just as well as any cone speaker. In chosing between the horn and the cone simply depend upon your ear, which ever sounds the best is the one for you.

If it is your intention to use a power tube in the last stage have the loud speaker demonstrated with this tube and the additional "B" and "C" batteries as very often there is considerable difference in loud speaker reproduction with the different tubes.

CONNECTING LOUD SPEAKER

Insert the tips of the loud speaker cord in small jacks on sub-panel marked "SJ" in Figure 5. Usually the cord with the colored braid should be inserted in the jack marked +, as this is the positive battery connection.

As some loud speaker units are very directional it is best to try switching the cord tips when the loud speaker is in operation, using the connection which gives the best and loudest results.

While in this day and age there is very little use for a headset, in case you wish to use one the cord tips should be inserted in the loud speaker jacks.

A hole is provided in the back of the cabinet at the extreme end for the loud speaker cord.

Place the loud speaker as far away from the set as convenient. Although, if all of the tubes are perfect, the vibration from the loud speaker will not cause any trouble even when the speaker is placed on top of the cabinet. However, if a howl develops and you can not correct the trouble by switching the tubes around in the sockets you will have to move the loud speaker away as it is feeding back into the set or vibrating the tubes.

In cases where a set howls, due to the effect of air vibration, the trouble can often be overcome by placing a weight on the detector tube. Coil up a length of round, soft solder into the form of a cap and try it. Lead and rubber caps are made for this purpose and should be used in stubborn cases.

To get the correct tone quality, if you are using a "C" battery, try various voltages. With the UX-112 power tube very often better quality can be had by using 12 volts of "C" battery, hooking three of the 4½ volt batteries in series, making the minus connection to the Number 3 post. Also try both the 3 volt and 4½ volt taps of the first "C" battery on the Number 2 post, but 4½ volts is about all that the first audio tube will require. Remember at all times that the "C" battery voltage used depends upon the amount of "B" battery voltage. If the "B" battery voltage drops, to maintain quality you will have to lower the "C" battery voltage as well. Failing to do this often results in shrill reception of high notes when the "B" batteries become partly discharged. Note, however, that this shrillness, which has a very penetrating effect on the ears, may also be caused by deterioration of any of the tubes and can then only be overcome by installing a new tube.

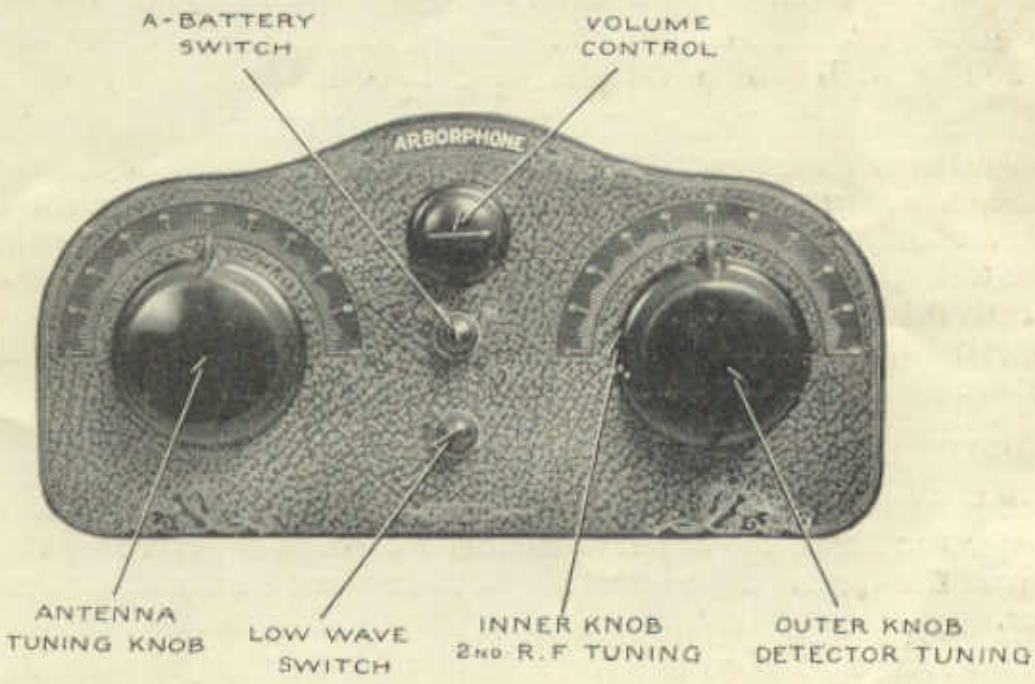


Fig. 10

ARBORPHONE OPERATION

Having observed the foregoing instructions as to construction of aerial and ground and with all the tubes in the sockets and batteries connected, plug in the loud speaker and the set is ready to operate.

Throw the "A" battery switch, Figure 10, into the "ON" position,

turn the "VOLUME" control knob until the arrow points straight up. In putting a new set in operation it would now be well to lift the lid of the cabinet and see if all of the tubes are lighted. If any of them do not light try another tube in the socket or move the tube slightly so that it makes contact. After the tubes are all lighted, to learn to tune, place the pointers of the two tuning knobs on about "50" and when the indicating line on the outer knob at the right coincides with the pointer you should hear some noise from the loud speaker. If atmospheric noise is heard you may feel sure that everything is connected right and the set is ready to tune. Start with both dials at "50" and move them a point or two in the same direction, grasping the split knob so that both sections are moving together and the indicating line always coincides. If any stations are on the air they should be heard in the loud speaker. If the signals are too faint turn the "Volume" control knob to the right. If nothing is heard turn the "Volume" control way up and go over the settings once again with the lower wave length switch turned to the "HIGH" position. The two dials will read approximately alike when the station is tuned properly, although the setting of the left hand dial depends upon the capacity of the aerial. If this dial runs consistantly ahead or behind the other, tune in a station sharply and loosen the set screw on the knob and re-set so that the pointer reads the same as that on the other knob. This will make it easy to tune in other stations. The dials are set to read alike at the factory but they will vary slightly, depending upon location of the set.

LOW WAVE SWITCH

In tuning stations below "35" on the dial turn the lower switch to "Low" position at the left. This will overcome any difficulty in adjusting the "Volume" control and give best reception on the lower wave lengths.

While the set may be operated on the low wave lengths with the switch in the "High" position and the performance will be about the same as that can be had with other makes of sets, you will find that the adjustment of the "Volume" control is very critical and that before the volume is built up to full efficiency the tubes are liable to go into oscillation and choke the reception. However, by throwing the switch to the left the circuit is changed to one which, although highly efficient on low wave lengths, is nevertheless easily controlled and the set in most cases will not oscillate in the least or only do so when the filaments are turned up to their fullest brilliancy.

If a station is tuned in and is perfectly clear but the set goes into oscillation when one of the knobs is moved, the indications are that the set is not actually tuned to the station and that the "Volume" control is too far to the right, so turn the knob to the left slightly and re-adjust the dials. The station will then come in much louder and clearer.

Remember that if you hear a loud whistle that rises and falls with the movement of either dial you must throw the lower switch to the "Low" position or turn the "Volume" control back to the left. In some instances, however, two stations are so close together that their waves heterodyne, that is, the clashing of the waves creates a whistling sound which can not be remedied by adjustment of the set and it will persist until one of the two stations signs off. This sort of whistle is steady and at a single pitch that can not be varied by turning the dials. No radio set will separate stations which interfer in this way.

HINTS ON OPERATION

While the Arborphone is very easy to tune, in attempting to receive weak stations from great distances, you will have to learn to set the "Volume" control correctly. Tune in a station at about "40" on the dials and starting with the "Volume" control arrow pointing to the left, where nothing is heard, turn the knob slowly to the right and note its action. Just the moment some life is heard in the loud speaker, tune in a station around "40" and note that the signal becomes louder and louder until a point is reached where there is a plopping noise caused by tubes going into oscillation and nothing can be received but the whistling of the station. This indicates that the "Volume" control has been turned up (to the right) too far, so turn back (to the left) and the station will be heard again clearly. If you try this around "70" on the dial you will find that the "Volume" control has to be turned further to the right to bring the station in with the same volume, and in working below "40" on the dial the set goes into oscillation a little quicker. Having the circuit arranged so that it ceases to operate when the tubes are turned up above the proper brilliancy forces the user to conserve battery current and makes the Arborphone very economical on battery consumption as the moment the tubes are allowed to draw more current than required for loudest reception the reception cuts off entirely and the only place where anything like the entire battery current is used is when working stations above "80" on the dial. But even in such instances the "Volume" control should not be turned up any more than necessary for the loudest reception as burning the tubes brightly at all times shortens their life and discharges the batteries.

While the Arborphone can be made to oscillate it does not necessarily follow that the set is re-broadcasting and interfering with your neighbor, although to a certain degree every radio set re-radiates. The arrangement of the circuit is such that the first tube connected to the aerial acts as a blocking tube, which prevents re-radiation almost entirely, and further, the operator can not receive stations on the Arborphone when set is in oscillation, while the regenerative sets that cause so much interference in the neighborhood are being operated unnecessarily in an oscillating condition and are not provided with any means to prevent the re-radiation such as in the Arborphone.

No set can operate at maximum efficiency which is so loaded down with resistance that it can not be made to oscillate. In the Arborphone you are able to get the full power of amplification from all of the tubes without disturbing your neighbors and great distances are being worked by carefully adjusting the dials and "Volume" control so that the tubes are operated at the point of their greatest efficiency, that is, just before they go into oscillation or make the plopping sound previously described.

The lower switch is connected to the "B" batteries and while it is thoroughly insulated from the rest of the set in some instances you may feel a little current when the switch is being thrown. This would be particularly noticeable if one hand is placed on the filament switch at the same time, but in practice this naturally would not be done. Should you get a shock from the lower switch do not figure that something is wrong with the set as this can easily be overcome by simply coating the metal parts with some radio insulating varnish and allowing it to dry thoroughly so that the fingers cannot come in contact with any of the metal.

If the "Volume" control becomes noisy so that an objectionable scraping noise is heard, simply rub the finger over the winding of the rheostat and by thus cleaning off the path of the contact arm the trouble will be instantly overcome.

If the two indicating lines on the split dial do not come together when a station is tuned correctly, simply re-set the outer knob, although as this outer knob is used as a vernier it will not exactly coincide on every station but it should not vary more than a sixteenth of an inch one way or the other.

STATIC AND OTHER DISTURBANCES

In going over the full setting of the dials on any radio set there may be points in the broadcasting band where reception is very noisy and objectionable. If some stations are perfectly clear you will know instantly that the trouble is not in the set but is due to causes beyond your control.

If you hear a jumbled group of stations that whistle badly the trouble is that the Government has been forced to assign as many as fourteen stations to one wave length. The whistling noise is caused by their interference and unless one of the stations is very close so that it can be received with very little power, thus, dimming the other interfering stations into the background, you will not be able to receive any of these stations. The only thing you can do is to move on to some other station that can be heard clearly. It is hoped that laws will soon be passed to remedy this situation, but in the meantime you will have to grin and bear it. Fortunately there are plenty of stations at all times that will come in clearly and supply you with any variety of entertainment that you may desire.

If two stations are heard at one time but do not heterodyne or whistle the trouble can usually be overcome by using a shorter aerial or your batteries are discharged so that the tuning is too broad.

Static is responsible for most of the cracking sounds that are so objecttionable. Static is simply electrical disturbances in the atmosphere that set up radio waves the same as the broadcasting station, although they are so broad that they can not be tuned out at any position of the dials. Radio reception depends almost entirely upon static conditions and there is no telling when the static will be bad nor how long a bad static condition will last. You can always test whether or not the noise heard is static by simply tuning in a station and then turning the left hand dial off the setting. If the noise stops and everything is quiet you are then sure that the noise is being brought in by the aerial and that it is not originating in the set itself.

When the static is louder than the station you are trying to receive it is useless to try to get clear reception. It is not the fault of the receiver and there is nothing you can do to overcome it. Under bad static conditions it is best to tune only the local stations which usually can be received pleasantly, unless a very violent local thunder shower is in process.

Owing to these uncontrollable atmospheric disturbances do not try to judge your radio set by one night's trial. Tune in the next night and everything may be perfectly clear. Usually these disturbances are very short in the winter time and of longer duration in the summer, although occasionally we will have a summer when the static is very light.

MAN-MADE STATIC

Very often noise which sounds like static is human made. Interference is caused by any electrical device which produces an electrical spark. Vacuum cleaners, motors attached to washing machines, oil burners, elevators, street cars, X-Ray machines—all are apt to cause very loud and objectionable disturbances. Noises from electric motors can be overcome by installing large capacity condensers across the brushes but this work should be done by an electrician.

Sharp clicks in the receiver are caused by telephones, electric door bells, the switching on and off of house lamps, in fact the throwing of any switch in the neighborhood is apt to cause a clicking noise.

Usually disturbances of this kind can be located and remedied by a competent service man. In some instances power lines cause a humming noise. Faulty electric light transformers, leakage of power lines—all can ruin radio reception for miles around. In such instances the Electric Company appreciates the calling of such cases to their attention as they can locate the leak and save the electricity that is being wasted.

A loose electric bulb in a lamp socket will often set up an intermittent noise that is very difficult to locate. If you are having trouble of this kind one of the first things to do is to tune the set so that the noise is coming in loudly and then have someone pull the master lighting switch to cut off the house current entirely. If the noise stops when the switch is pulled you will know that the interference is right in your house. You can then pull the separate circuit switches and get closer to the cause. Sometimes you will find that it is an electric toaster, heater, or an electric iron. Noises of this kind do not vary with the weather but are constant as long as the current is on the interfering device. People who live in the downtown sections are subjected to a great deal more interference of this kind than those who live out in the less congested districts. There are many locations where a radio set should not be installed as it is simply impossible even for the best equipped service man to overcome all interference. But in a residential section if you are bothered from noises of this kind get the service man and he will find a way to remedy the trouble for you.

WHISTLING NOISES

Sometimes when you are listening to very clear reception you will hear a whistling noise that rises and falls on a musical scale and comes and goes. This whistling is due to interference from regenerative sets in the neighborhood. A small boy with a one tube regenerative radio set can simply ruin radio reception for everyone miles around. It is simply ignorance on the part of the set operator and the only thing that can be done is to locate the set and instruct the owner as to the disturbance which he is causing. Sometimes two or three regenerative sets will tune in on the station to which you are listening and reception will be blurred and fade, ruining reception as long as the other fellows stay on the wave. Fortunately modern sets do not cause this trouble and those using old sets do not listen to a station for any great length of time but move on and interfere with someone else after a few moments.

FADING

Fading is a phenomena not understood by the engineers at the present time. You will hear a station loud and clear for a few moments and then it will completely or almost completely die out and in a few moments

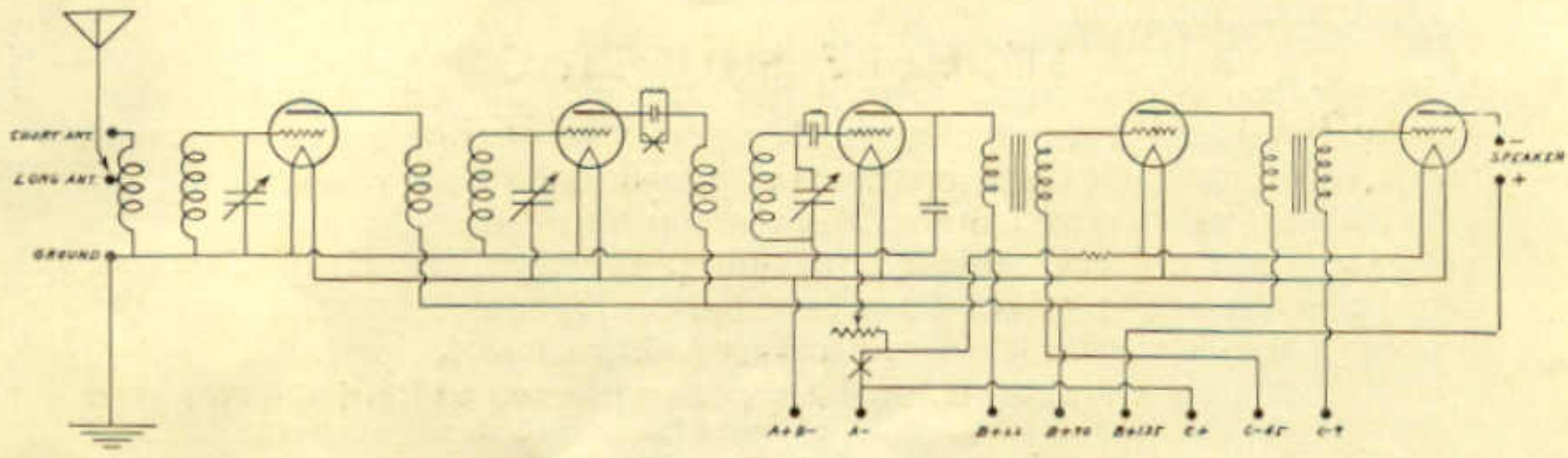


Fig. 11
Arborphone Wiring Diagram

or so will come in again loud and clear. This is undoubtedly due to certain atmospheric conditions and can not be overcome by adjusting the set.

DAYLIGHT RECEPTION

All in all, remember that radio reception varies greatly from time to time. Stations that are heard clearly at night very often can not be heard in the day time. In fact day-light reception has only about 1/5 the range of that which can be had after the sun has set. This is due to the absorbing of the radio waves by sunlight. Reception differs from hour to hour, day to day, and season to season but there is no time when plenty of stations can not be heard with wonderful clarity and volume, although of course this may not be just the station you particularly want to hear. You will have to compromise with radio in this respect.

SET NOISES

If noises are heard when the aerial is disconnected or the dials thrown out of tune it is then quite evident that some part of the radio equipment is at fault.

To trace noises of this kind, with the set turned on, disconnect both aerial and ground. A cracking noise is usually due to a faulty battery connection, so clean the battery terminals of all corrosion and be sure of metal to metal contact. Go over the wires where they are connected to the binding posts on the set. If the noise still persists, move the tubes slightly in their sockets as corrosion may have taken place on the tube prongs or there might be a faulty contact at the base. Corroded connections inside of "B" batteries will sometimes make the set noisy. If the batteries are practically discharged this is undoubtedly the cause of the trouble. A tube that is just in its last gasps will often be very noisy. You should have a spare tube, so remove one tube and try the spare. Do this with each socket and you can thus locate a noisy tube. If all connections are clean and the batteries are fully charged and the set is still noisy the next thing would be to replace the grid leak as sometimes after a time grid leaks become noisy.

If the foregoing does not locate the noise the trouble must be in one of the set connections, although usually this noise only shows itself when the set is jarred. As a last resort have a service man go over the connections in the set very carefully and this should locate the trouble. With the Arborphone, however, most of the connections are solidly riveted in place so they will never come loose of their own accord.

TROUBLE SHOOTING

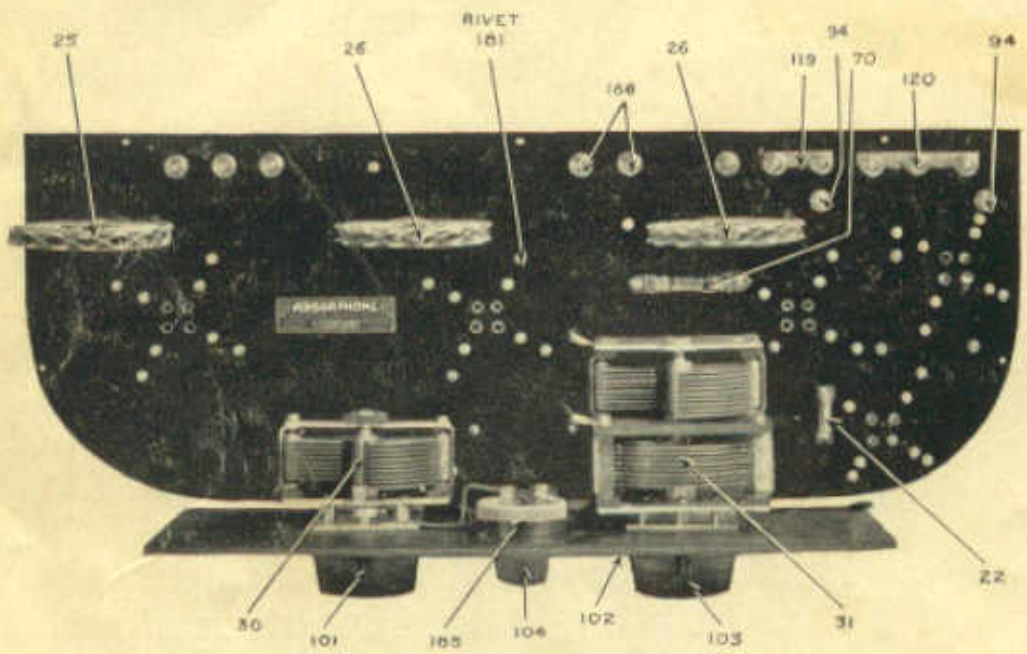
TROUBLE	CAUSES
No Reception	1. Disconnected or broken battery wires. 2. Corroded battery terminals. 3. Batteries discharged. 4. Burned out tube. 5. Tube not making contact in socket. 6. Loud speaker not connected or loud speaker cord broken. 7. Defective "A" Battery switch so tubes do not light. 8. Audio tubes not lighted account of burned out cartridge resistance.
Weak Reception	1. Discharged "A" or "B" batteries. 2. Aerial blown down. 3. Aerial or ground wire disconnected. 4. Corroded ground connection. 5. Defective or worn out tube. 6. Tubes paralyzed by excessive voltage (Can be rejuvenated). 7. Loud speaker connections reversed. 8. Battery connections reversed. 9. Keeper bars not in proper position. 10. Knob slips so condensers are out of tune. 11. Trying to tune high wave length stations with switch in "Low" position. 12. Aerial too long. 13. Not using brand of tubes recommended.

APPROXIMATE DIAL SETTINGS BY WAVE LENGTH

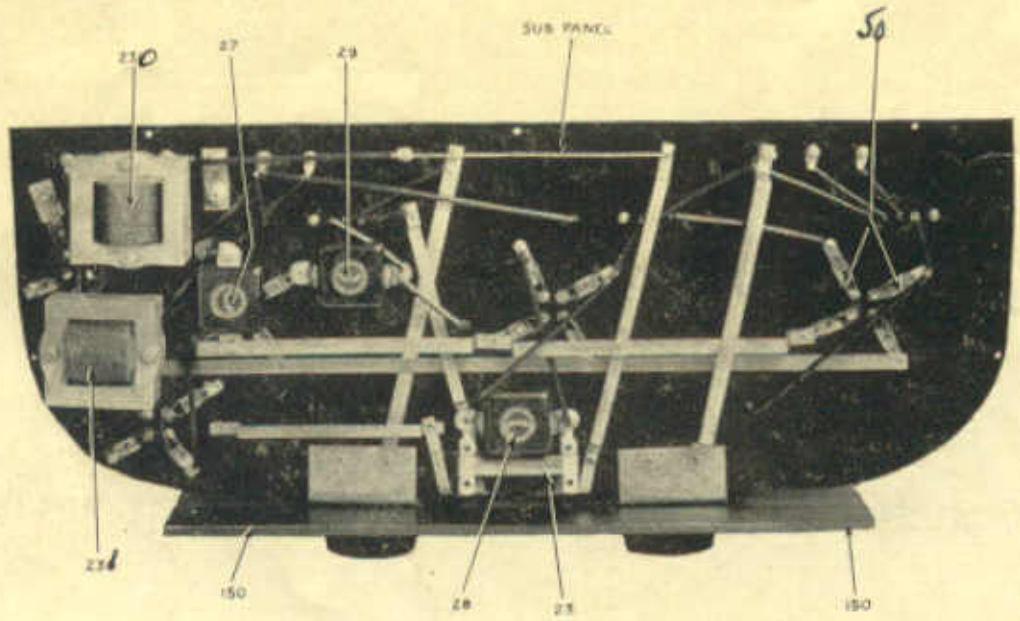
The following dial settings are only an average as the tuning of each set will vary two or three degrees on the dials, depending upon the particular tubes used and location of the set and aerial. By referring to the Arborphone Log you can ascertain the wave length of the station you wish to hear and by use of the following table learn the approximate dial setting for the station. You should start immediately, however, to fill in the settings in your log book so that after a station is once heard you can listen to it again at will. Always record the reading of both dials and in tuning set the two dials on these figures and swing the outer knob back and forth to position of best reception.

Wave Length	Call Letters	Location	Dial Setting	Wave Length	Call Letters	Location	Dial Setting
214	WCLS	Joliet, Ill.	8	300	WPG	Atlantic City, N. J.	27
226	WBBM	Chicago, Ill.	10	309	KDKA	Pittsburg, Pa.	29
232	WJBK	Ypsilanti, Mich.	13	319	WSMB	New Orleans, La.	31½
250	WMBB	Chicago, Ill.	16	322	KOA	Denver, Colo.	32
256	WRVA	Richmond, Va.	17½	333	WBZ	Springfield, Mass.	34
266	KFNF	Shenandoah, Ia.	20	337	KNX	Los Angeles, Cal.	35½
270	WGHP	Detroit, Mich.	21	341	KFAB	Lincoln, Nebr.	36
286	WREO	Lansing, Mich.	25	345	WLS	Chicago, Ill.	37

Wave Length	Call Letters	Location	Dial Setting	Wave Length	Call Letters	Location	Dial Setting
350	CZE	Mexico City, Mexico	38½	448	WQJ	Chicago, Ill.	63
353	WWJ	Detroit, Mich.	39	454	WJZ	New York, N. Y.	65
361	KGO	Oakland, Cal.	44	469	KFI	Los Angeles, Cal.	68½
380	WGY	Schenectady, N. Y.	45	476	WPAB	Fort Worth, Tex.	71
389	WTAM	Cleveland, O.	46	484	WOC	Davenport, Ia.	73
395	WFI	Philadelphia, Penna.	47½	492	WEAF	New York, N. Y.	75
400	PWX	Havana, Cuba	49½	500	WMC	Memphis, Tenn.	78
416	WCCO	Minneapolis, Minn.	54	508	KLX	Oakland, Cal.	80
422	WLW	Cincinnati, O.	56	517	WJR	Detroit, Mich.	83
428	WSB	Atlanta, Ga.	57	526	WOAW	Omaha, Nebr.	86
434	CFCN	Calgary, Alta.	58½	535	KYW	Chicago, Ill.	91
441	WOS	Jefferson City, Mo.	60	545	KSD	St. Louis, Mo.	93



Top View



Bottom View

Repair Part Numbers

REPAIR PARTS LIST

The following is a list of the most important parts of the Arborphone. All Arborphone Distributors carry a stock of service parts and are in a position to furnish your Dealer with anything needed for repairs at the list prices given. When ordering always use the part number. BE SURE TO GIVE SERIAL NUMBER OF SET.

Part No.	Part Name	List Price Each
30	Single Tuning Condenser	$ 3.25
31	Dual Tuning Condenser	6.75
25	Antenna Coil	1.00
26	R. F. Transformer Coil	1.00
209	Switch with Knob Complete	.65
230	Audio Transformer 2 to 1 (2nd Stage)	3.50
231	Audio Transformer 4 to 1 (1st State)	3.50
22	Audio Resistance Cartridge (2 Ohm)	.25
70	Grid Leak (2 Megohm)	.25
27	Fixed Condenser .002 Mf	.40
28	Fixed Condenser .005 Mf	.35
29	Fixed Condenser .00025 Mf	.35
101	Single Tuning Knob with Set Screw	.50
102	Inner Tuning Knob with Set Screw	.50
103	Outer Tuning Knob with Set Screw	.50
104	Rheostat Knob	.20
94	Speaker Tip Jack	.15
166	Binding Post	.05
185	Rheostat Complete	.85
50	Contact Spring	.02
181	Contact Spring Rivet	.01
119	"B" Battery Jumper Bar	.02
120	"C" Battery Jumper Bar	.02
23	1000 Ohm Ballast Resistance	.55
150	Front Panel—Wood	2.50
20	Cabinet Complete with No. 150	19.00
	Cabinet Lid	4.50

Part numbers shown on illustrations on page 24