ATWATER KENT RADIO INSTRUCTION BOOK

4th Edition

World Radio History

Warranty

All Atwater Kent Receiving Sets, Radio Speakers and Phonograph Attachments are warranted to be perfect when they leave our plant. A printed warrant and guarantee covering the terms on which we will replace or repair defective equipment accompanies each piece of Atwater Kent Apparatus.

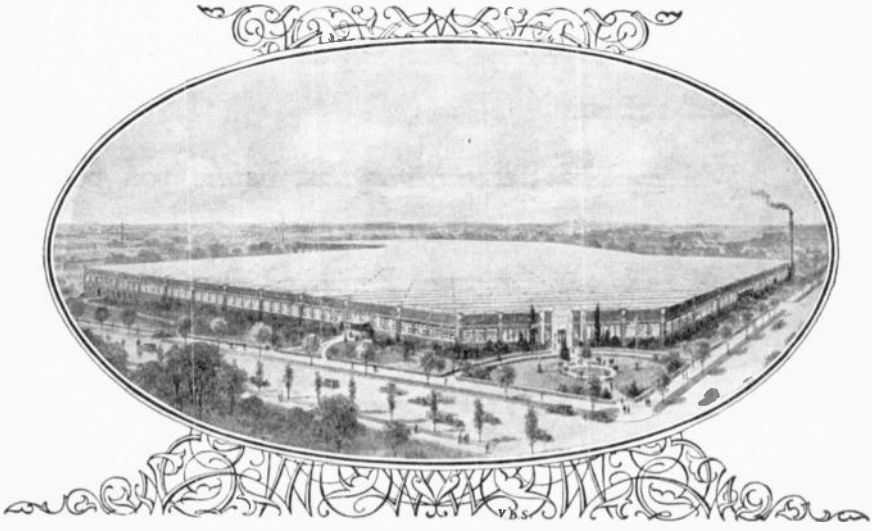
World Radio History

ATWATER KENT RADIO INSTRUCTION BOOK

4th Edition

PART No. 9120

PRICE 50 CENTS



ATWATER KENT MFG. COMPANY

4700 Wissahickon Avenue

Philadelphia

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PREFACE

This book has been prepared with the idea of helping owners of Atwater Kent Receiving Sets to get the most out of their radio installation with the least possible trouble and expense. We have endeavored to answer, before they are asked, most of the questions that arise in the minds of the beginner in Radio and many that might trouble an experienced operator.

We earnestly recommend that before you purchase any additional equipment or attempt to install and operate your Receiving Set, you read over most carefully PARTS I and II of this book.

Atwater Kent Tuned Radio Frequency Receivers are licensed only for Radio Amateur, Experimental and Broadcast Reception.

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Form F637. Printed in U. S. A. June, 1928

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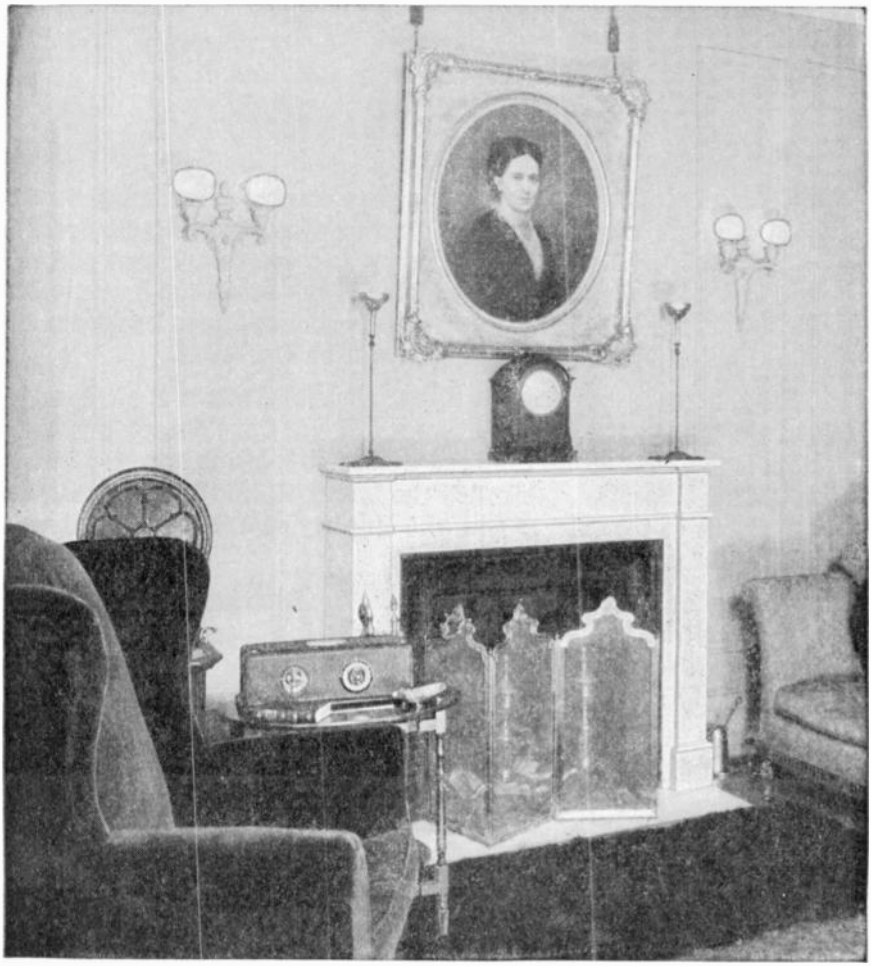

Frederick Palmer has given an excellent setting for his Atwater Kent Receiver and Radio Speaker.

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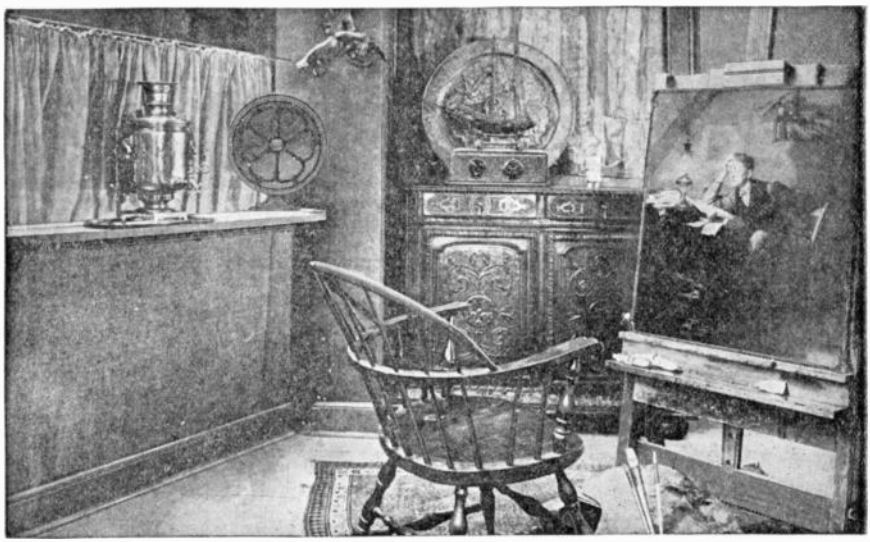
ATWATER KENT
RADIO SPEAKERS

THE apparatus which transforms the electrical impulses, generated in the Receiving Set into audible sound, is called a Radio Speaker. This wonderful piece of mechanism is a most important part of a radio installation, for it must be capable of **re-acting** the music, voices and other sounds **exactly** as they were broadcast, otherwise false notes, distorted voices and noisy vibrations will be the result.

For this reason we particularly recommend Atwater Kent Speakers to owners of Atwater Kent Receivers. If you have already purchased another make, we suggest that you immediately arrange to try out an Atwater Kent Speaker, preferably the Model E, and note the marked improvement in the volume and **the quality of tone** of the Atwater Kent apparatus.

Only after very extensive scientific research and almost endless tests and experiments were Atwater Kent Radio Speakers offered to the public. As a result, their ability to re-create voices, music and other sounds is truly marvelous.



IN THE STUDIO OF NORMAN ROCKWELL

World Radio History

Part I.
INSTALLATION

CHAPTER 1.

Equipment That Should Be Purchased at the Time of Purchasing Receiver

Sec. 1. A HIGH-GRADE Receiving Set is worthy of a high-grade Speaker— in fact, the speaker or phonograph attachment you select will have a great deal to do with the success of your radio installation. (See page opposite.)

Sec. 2. TUBES. Except for use in the last audio amplification socket, all tubes for all models of Atwater Kent Receiving Sets should be 5-volt, ¼ ampere tubes, such as UX 201A or CX 301A type. The type of tube recommended for the last audio socket is a UX 112 or CX 112, or, UX 171 or CX 371 tube. However, a UX 201A or CX 301A tube can be used in the last audio socket if desired and should give very good results. It is recommended that all tubes be tested by the dealer before delivery.

Sec. 3. POWER SUPPLY EQUIPMENT. Three kinds are necessary, viz: "A," "B," and "C." For the "A" current we recommend a first-class 6-volt storage battery of not less than 80 ampere hour capacity, plus a high-grade trickle charger.

For the "B" current a set of dry-cell "B" batteries may be used. If a power tube is used, three (3) 45-volt, heavy duty "B" batteries will be necessary. If a power tube is not used, two (2) 45-volt, heavy duty "B" batteries will be sufficient.

For the "C" voltage, one or more dry-cell "C" batteries should be used. For proper "C" voltage, see instructions packed in carton of tube used in last audio socket.

Sec. 4. FUSE BLOCK. It is recommended that a fuse block having the approval of the Underwriters' Laboratories, and made up of from four to six plugs or cartridge fuses, be inserted between the ends of the power supply cable wire and the power supply equipment. Fuses with two (2) ampere capacity should be used for the "A" battery wires, and Fuses with one (1) ampere capacity should be used for the "B" battery wires. For further details see pages 22 and 23.

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For an Outside Antenna Installation

(See Illustration 9, Page 15)

Sec. 5. ANTENNA WIRE. 100 feet of 7-strand No. 22 gauge, phosphor bronze or copper. Bronze wire is recommended, as it is less liab'e to stretch and sag.

Sec. 6. LEAD-IN AND GROUND WIRE. No. 14 Rubber Covered, stranded, of sufficient length to reach from the antenna to the Receiving Set and from the Receiving Set to the ground, and also from the lightning arrester to its ground. Usually 50 feet is more than sufficient.

Sec. 7. GROUND CLAMPS. Two (2). One used for grounding the set and the other for grounding the lightning arrester.

Sec. 8. LIGHTNING ARRESTER. One that bears the approval of the Underwriters' Laboratories.

Sec. 9. INSULATORS. (Strain Type.) Usually two are sufficient. They should be of the large size and preferably made of porcelain or glass.

Sec. 10. A PORCELAIN TUBE. Usually 10 inches long, to be used for insulating the lead-in wire where it enters the building.

Sec. 11. INSURANCE UNDERWRITERS' CERTIFICATE OF INSPECTION. In order that your radio installation may not affect the validity of your fire insurance policies, it is recommended that when your installation is complete, you secure a certificate of approval from the Insurance Underwriters having jurisdiction in your locality.

For an Inside Antenna Installation

Sec. 12. ANTENNA AND GROUND WIRE. A sufficient length of some light weight insulated wire, either stranded or solid, such as No. 18 Bell Wire.

Sec. 13. GROUND CLAMP. Only one is necessary, as a lightning arrester and its ground, etc., are not required for an inside antenna installation.

Sec. 14. INSURANCE UNDERWRITERS' CERTIFICATE. (See Sec. 11).

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CHAPTER 2.

General Information About Antennas

Sec. 1.

THE function of the antenna is to collect the electrical waves radiated from the various broadcasting stations and carry this electrical energy, via the antenna lead-in wire, to the receiving set.

To quote a homely simile, we might liken the antenna to the gutter on your roof and the lead-in wire to the down spout or rain conductor. A short gutter will collect and deliver to the down spout but a small amount of water—a very long gutter will deliver too much water for the down spout to handle. A radio antenna that is *too short* will not collect enough electrical energy, broadcast from distant stations, to enable you to tune in the signals. An antenna that is *too long* will collect so much electrical energy sent out from nearby broadcasting stations, that you will be unable to tune them out—that is, your set will not be "selective."

Again, referring to our simile, a gutter that drains a roof shaded by trees or other overhanging obstacles will not collect as much rain water as a gutter that drains a roof completely exposed to the elements, therefore your antenna should be raised as far as possible above trees, chimneys, etc., and the walls of your own, or adjoining buildings, so that it may have a chance to collect all the radio waves possible to collect.

Again, if a gutter is filled with leaves, dirt or ice, it will not deliver all the water to the down spout, for varying amounts will spill over the edge and drop to the ground. Likewise your antenna will not deliver all the electrical energy to your receiving set (through the lead-in wire), if it is so placed that it touches, *or is even too near to* (but not touching) other wires, metal roofs, gutters, chimneys, trees and the like, for the electricity will run from the antenna through these conductors to the ground, instead of to the ground through the lead-in wire and your receiving set.

This simile holds good for an inside as well as an outside antenna, for, instead of an inside antenna being affected by overhanging trees, nearby metal gutters, etc., it can be affected by nearby metal girders, metal lath, pipes, wires, etc., concealed in the walls of a building. Some suggestions for overcoming these difficulties are given under the section dealing with the installation of inside antennas.

Models 30 and 35 will function to best advantage when an **outside** antenna is used; while a properly installed **inside** antenna will usually give very satisfactory results when used with the Models 32 and 33, although an outside antenna is to be preferred.

World Radio History

Sec. 2. OUTSIDE ANTENNAS.

An excellent outside antenna for Atwater Kent Receiving Sets is one composed of a single wire 80 feet in length in a straight line, stretched at least 30 feet above the ground and at least 10 feet above all trees, roofs, chimneys, etc., over which it passes, and 10 feet away from all walls, trees and the like. The lead-in wire might be anywhere from 15 to 35 feet in length, or a combined length of antenna and lead-in wire of from 95 to 115 feet.

Unfortunately it is difficult to give definite instructions as to the antenna you should erect, for after all is said and done, the antenna you will install will depend mostly on your location and surroundings.

If you live out in the great open spaces, and at a considerable distance from broadcasting stations, you will no doubt find that an antenna which is considerably *longer* than 80 feet will give you most satisfactory results.

If, on the other hand, you live in a big city with its network of telephone, electric light and electric power wires, numerous local broadcasting stations and its many other forms of local interference, you will very likely get the most satisfactory results with an antenna which is considerably *shorter* than 80 feet in length.

Another determining factor is your physical location. That is to say, if your property is only 20 feet wide by 50 feet deep you cannot very well erect an antenna 80 feet long in a straight line—if the building you live in is only a few stories in height and is surrounded by towering buildings, you cannot be expected to raise your antenna 10 feet above their walls.

On the whole we recommend the installation of an antenna that is too long rather than too short, for, it is much easier to shorten an antenna after it is installed than to lengthen it in a straight line after it is installed. See illustration 31, page 38.

In order to assist you in selecting the type of outside antenna that most nearly fits your requirements, we give on the following pages several diagrammatic pictures of typical antenna installations.

World Radio History

OUTSIDE ANTENNAS

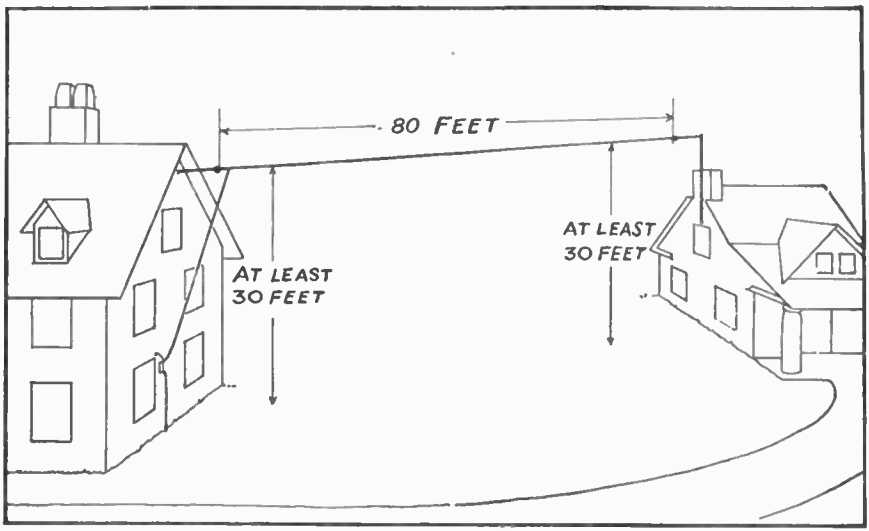

Illustration 1.

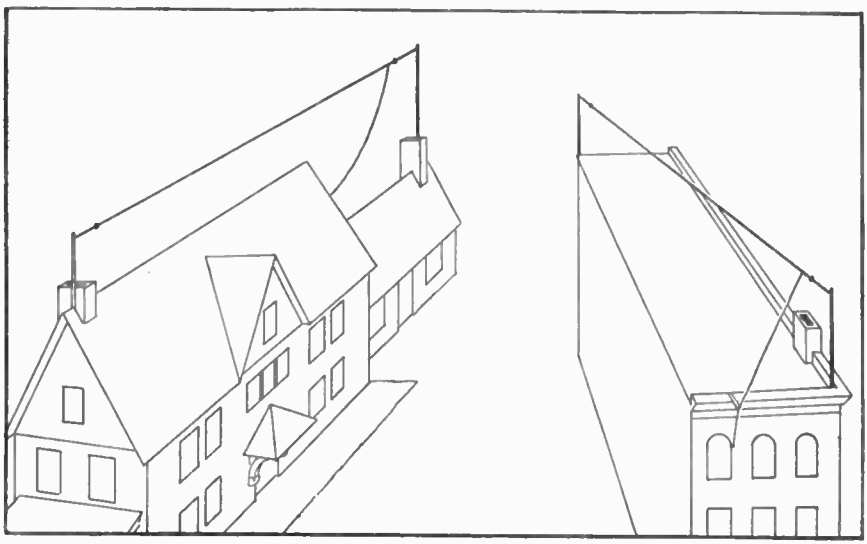

Illustration 2.

World Radio History

OUTSIDE ANTENNAS

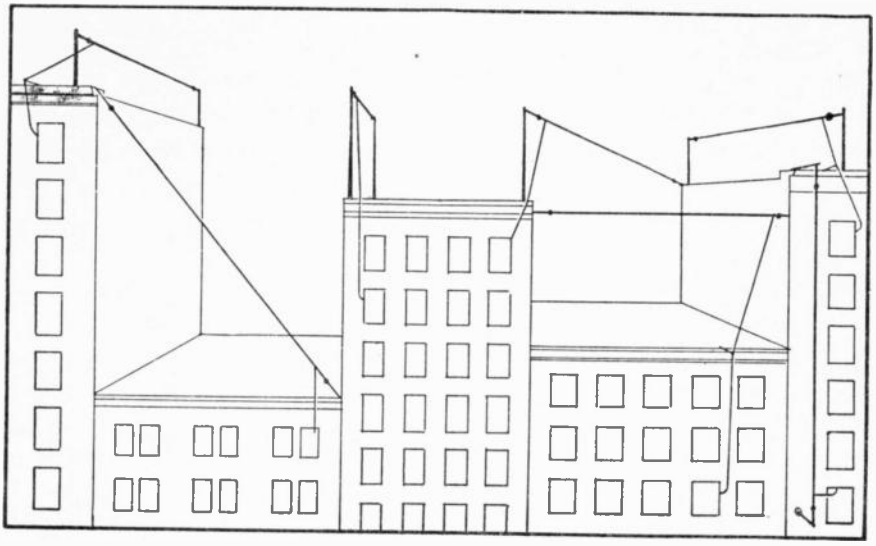

Illustration 3

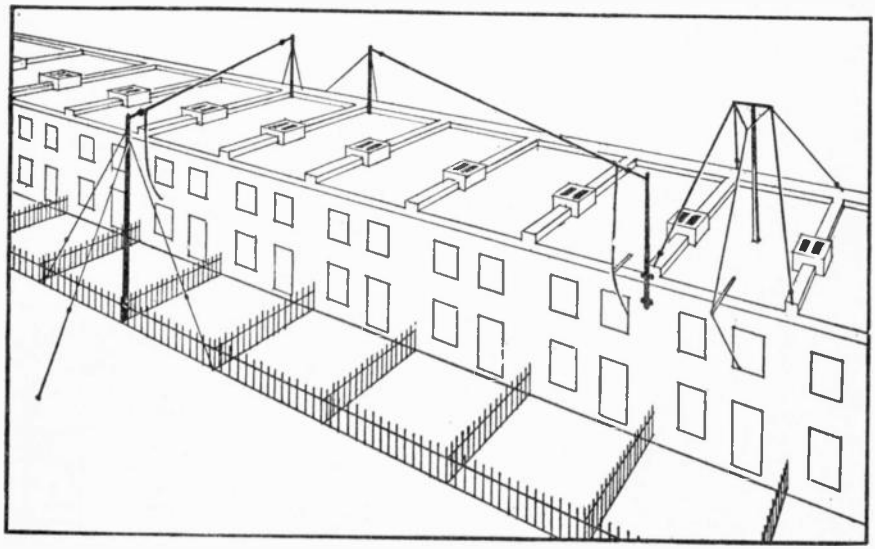

Illustration 4

World Radio History

INSIDE ANTENNAS.

Sec. 3

Whenever possible we recommend a full sized, *outside* antenna but where this is impossible, very good results can be obtained from a properly installed inside antenna. In planning an inside antenna, endeavor to place it as high as possible in the building—in the attic or in a room on the top floor of the building.

Illustrations 5 and 6 show respectively an attic and a top floor room installation, both of which have been quite successful. The type of antenna shown in Illustration 6 is also suitable for an attic installation.

In either case insulated wire is preferable, although not absolutely necessary, and the wires should be strung at least 2 feet 6 inches apart and 3 feet or more apart, if possible. In planning antennas of this character it should be remembered that doubling the number of wires does not double the effectiveness of the antenna. In other words, two wires each 40 feet in length or four wires each 20 feet in length are not the equal of a single wire 80 feet in length in a straight line. Hence it is desirable that the total length of the wires used should amount to considerably more than eighty feet, wherever this is possible.

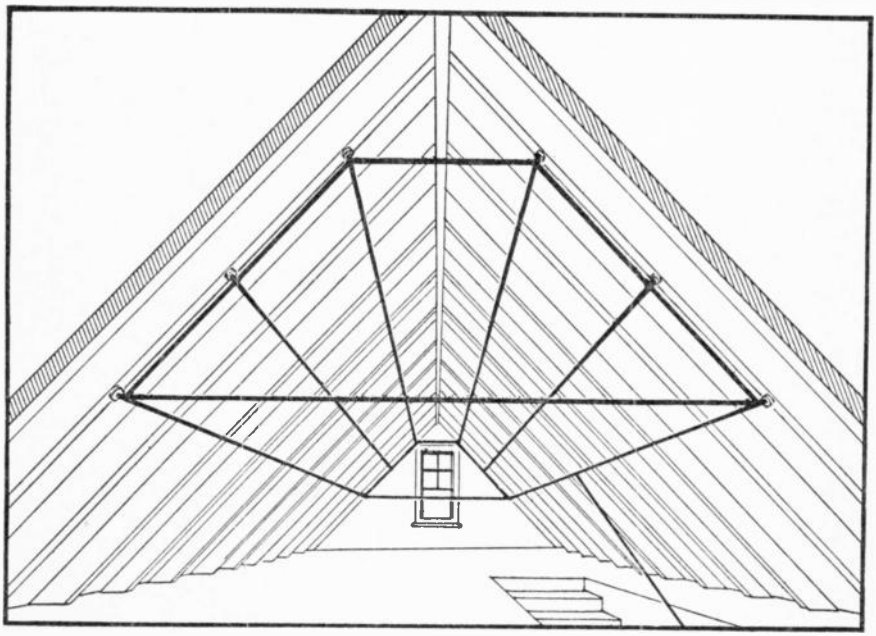

Illustration 5

World Radio History

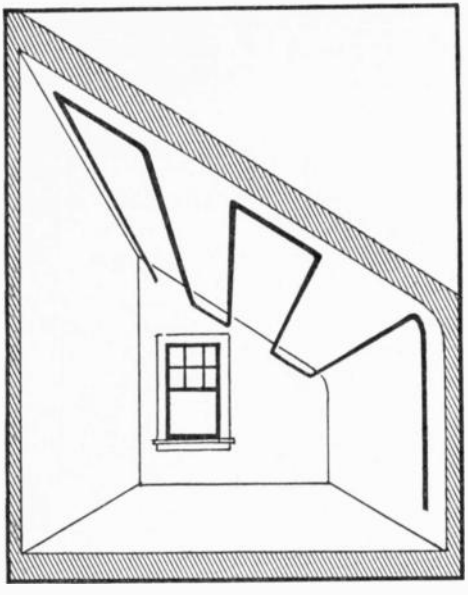

Illustration 6

In installing an antenna in an unfinished attic it is advisable to string the wires on porcelain insulators. *Do not allow the wires to touch electric light wires, and when it is necessary for the antenna wires to pass over or under electric light wires, they should be encased in porcelain tubes or other approved insulating material.*

Illustration 7 shows an excellent type of antenna for use in a Living Room or any other room of fairly large dimensions. Usually the antenna wire is laid along the top of a picture moulding and held in place with glass headed tacks or light wire nails. It may also be tacked to the top of the base board.

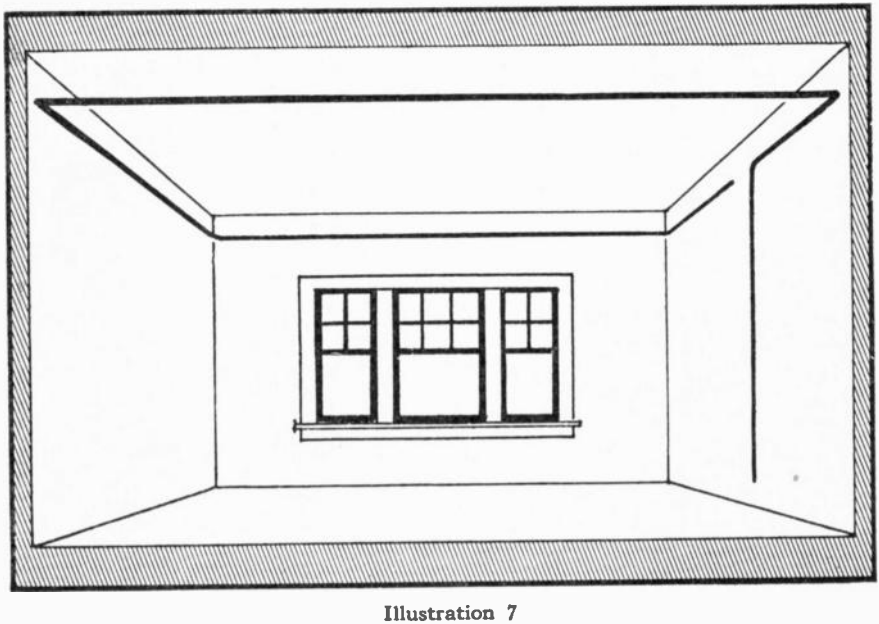

Illustration 7

World Radio History

Where there are several small rooms, it is often found practical to string the wire around the walls of several of the rooms, taking care that the wire does not cross itself at any point nor come closer to itself than the breadth of the average doorway.

Illustration 8 shows two other types of inside antennas, one—a square spiral under a rug and the other encircling the window casing. Both are particularly useful in a building of steel construction as they remove the antenna as far as possible from the steel girders that are built into the wall immediately above the picture moulding or below the base board.

If the spiral antenna is over 80 feet in length, it should give excellent results with all models of Atwater Kent Receiving Sets. If it is less than 80 feet, but longer than 25 feet, it should give satisfactory results with the Models 32 and 33. The antenna encircling the window casing should only be used with the Models 32 and 33. Other short antennas for the Models 32 and 33 will be found satisfactory, provided they are more than 25 feet in length.

The results obtained with all inside antennas and particularly the short ones, will depend to a large degree on the distance it is located above the ground (earth) and the amount of steel construction in the building.

For ground wire installation see Illustration 9, Page 15.

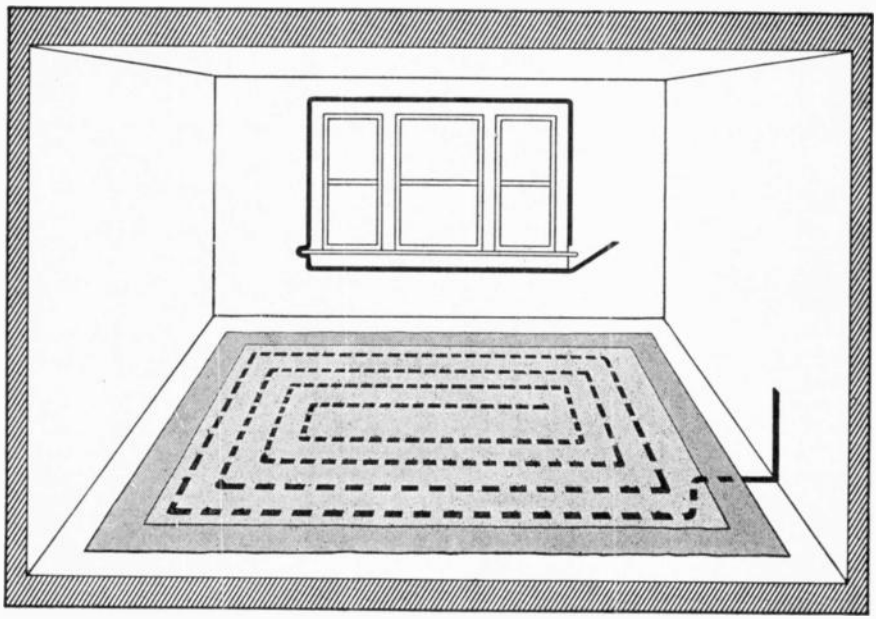

Illustration 8

World Radio History

Sec. 4. ERECTING AN OUTSIDE ANTENNA. (see Illustration 9).

In erecting your antenna, care should be taken to see that the antenna wire is tightly stretched, and that the screw eyes or other terminals be firmly attached to a non-moving surface. Otherwise your antenna will be apt to be broken down by an accumulation of ice or snow, or blown down in a gale.

For this reason trees are not a desirable anchorage for antenna terminals. If a tree is the only possible place to attach one end of your antenna, be sure to use a pulley and counter-weight. If long poles are used to support your antenna, they should be made rigid by the use of guy wires, or a pulley and counter-weight should be used.

The wheel of the pulley (P) should be of large diameter so that the continued movement of the rope over it will not quickly wear the rope through.

Usually the supporting wires CC are composed of pieces cut from the coil of antenna wire. They should be long enough to make the insulators BB at least two feet from the terminal supports DD, or nearby cornices, etc.

When a counter-balanced arrangement is used, the supporting wire C should be *as short as possible,* and the rope R long enough to place insulator B at least two feet beyond all nearby branches. If attached to a tree the supporting wire C should be incased in a piece of garden hose, or otherwise prevented from cutting into the bark.

The lead-in wire E should be soldered firmly to the antenna and the joint bound tightly with electric tape. It should be made to enter the building as far as possible above the ground and *should not be run near to the ground wire F,* nor near and parallel to metal gutters, rain-conductors, electric light and telephone wires, gas, water or heating pipes.

The lightning arrester's ground wire should follow as nearly as possible a straight line from the lightning arrester to its ground.

In most localities it is allowable to ground the lightning arrester on a metal pipe (or other metal object) embedded in the earth or on an exterior or interior water pipe. In order that you may conform to your local requirements, we recommend that you secure a copy of your local "Fire Underwriters' Regulations."

World Radio History

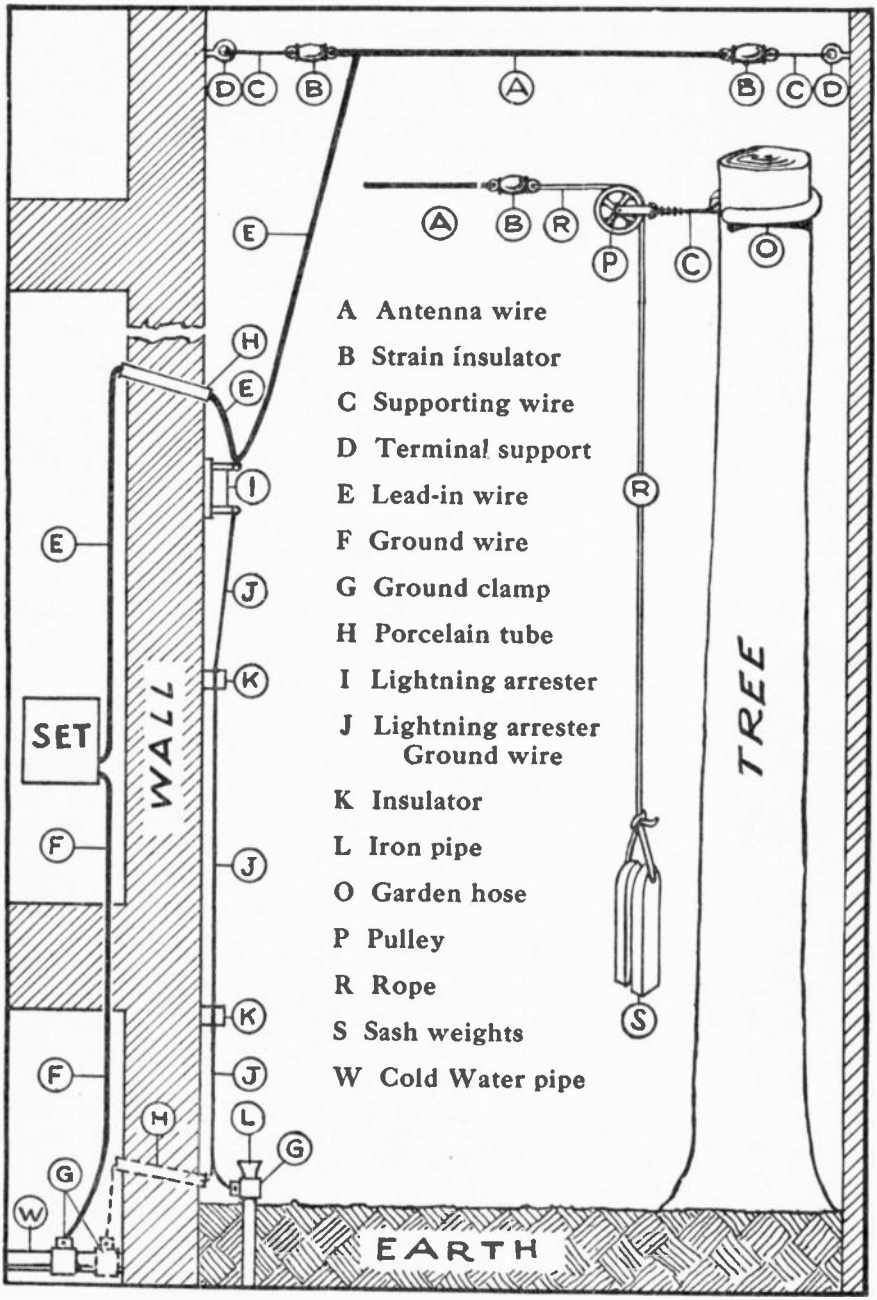

Illustration 9
DETAIL DRAWING OF AN OUTSIDE ANTENNA INSTALLATION

World Radio History

CHAPTER 3.

Installing the Receiving Set

Sec. 1. LOCATING THE RECEIVING SET AND RADIO SPEAKER. In the first place, the Receiving Set and Radio Speaker should be located in that part of the house or apartment where the whole family may have a chance to enjoy it. This usually means the living or sitting room, main hall, enclosed porch or in fact any place where the family and friends congregate.

In the second place, try to place the Receiving Set where it can be reached without the necessity of standing up or leaning over in an uncomfortable position. A small table, book-rack, piano bench, desk or other small piece of furniture will make an excellent place on which to put the Receiver.

Two other things that are well to bear in mind when locating your receiving set, are, the location of your antenna, so that the lead-in wire can be run between the antenna and receiving set in as short a length and in as straight a line as possible, and that the place where you intend to locate the Power Supply Equipment is a convenient distance from the set.

For further information on location of Speaker, see Sec. 6, Part III, Chapt. 3.

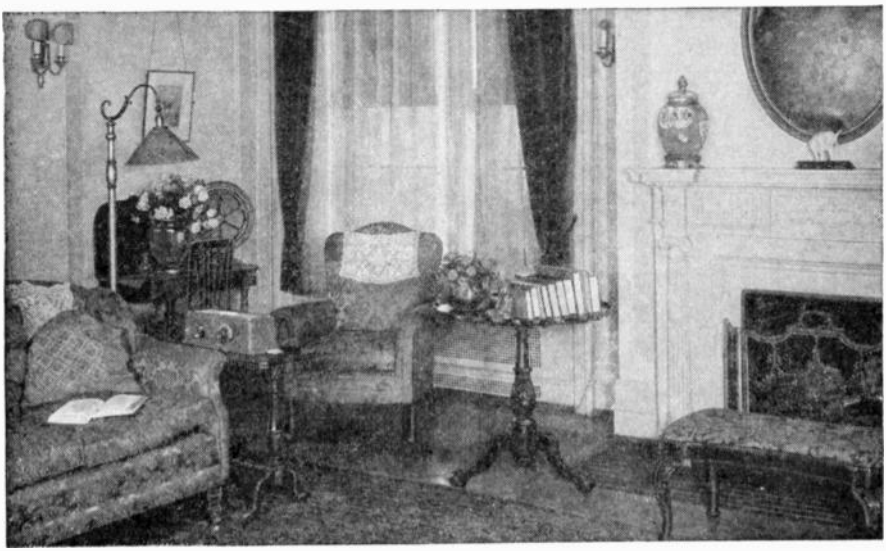

Illustration 10.

IN THE HOME OF PETER B. KYNE, WRITER OF THE "CAPPY RICKS" STORIES

World Radio History

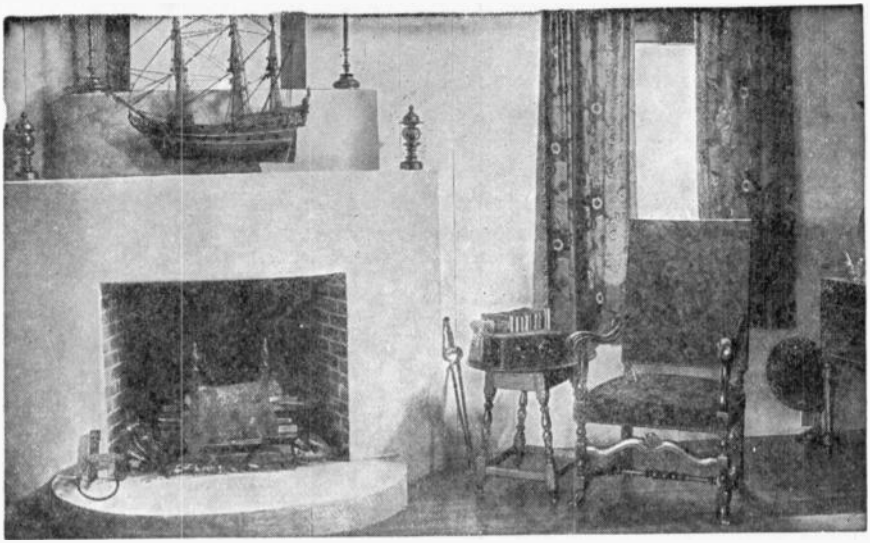

Illustration 11.

ATWATER KENT RADIO
IN THE HOME OF KENNETH L. ROBERTS

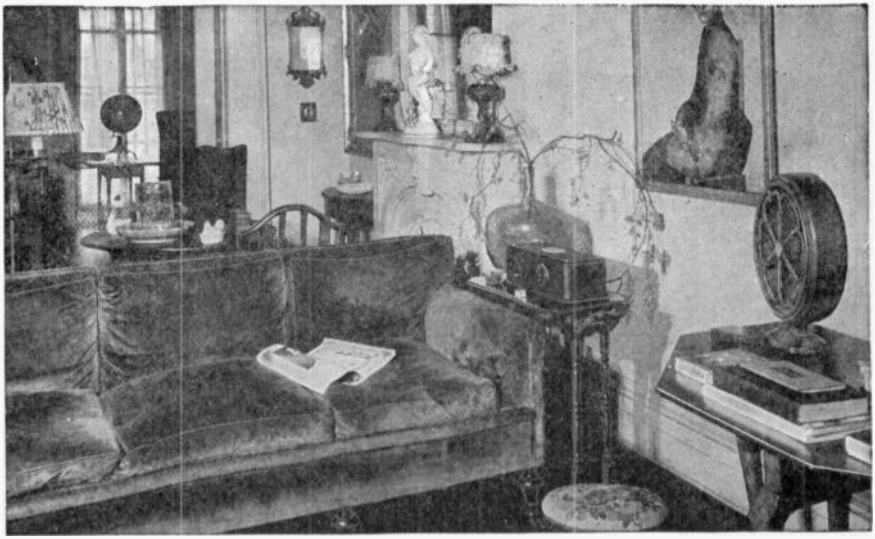

Illustration 12.

AN INSTALLATION WITH AN EYE TO COMFORT AND CONVENIENCE,
IN THE HOME OF WILL IRWIN

World Radio History

Sec. 2. LOCATING THE POWER SUPPLY EQUIPMENT. The best place to put the power equipment is in the cellar or basement, placing it immediately under the receiving set, so that it will be as near to the Receiving Set as possible.

If it is impracticable to locate the power equipment in the cellar or basement, it may be concealed back of a couch, in a closet, bookcase or other convenient place. However, we do not advise the placing of storage batteries in, or near fine furniture, unless special precautions are taken to guard against damage by the acid contained in all storage batteries.

Sec. 3. SPACE OCCUPIED BY "A," "B" AND "C" BATTERIES. "A" batteries must always be placed right side up, and this must be done carefully so that no acid is spilled out. "A" batteries come in a variety of sizes, depending on the make and their ampere hour capacity. The average of the larger sizes are as follows: 9 inches high by 7 inches wide and from 9 to 12 inches long for 80 to 120 ampere hour capacity batteries. "Dry cell" "B" and "C" batteries may be placed in any of the positions shown in illustrations 13 to 17, inclusive. Wiring connections are explained and illustrated on pages 22, 23 and 24.

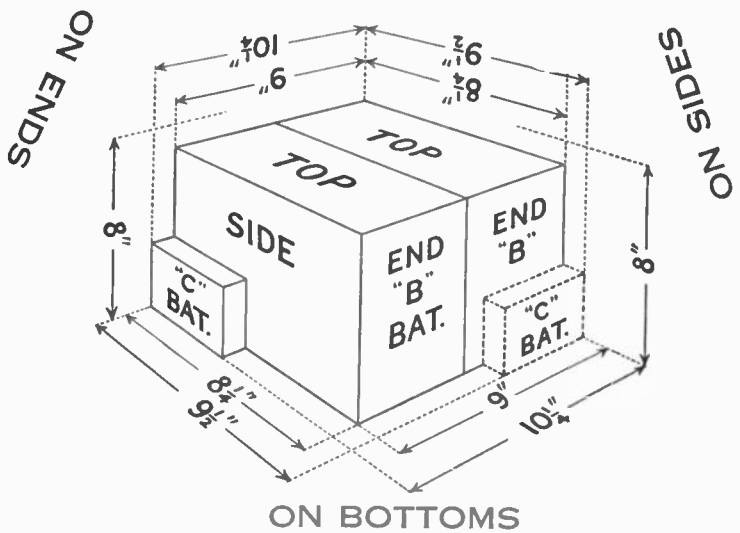

Illustration 13

TWO 45-VOLT, HEAVY DUTY "B" BATTERIES AND ONE 4½-VOLT "C" BATTERY

World Radio History

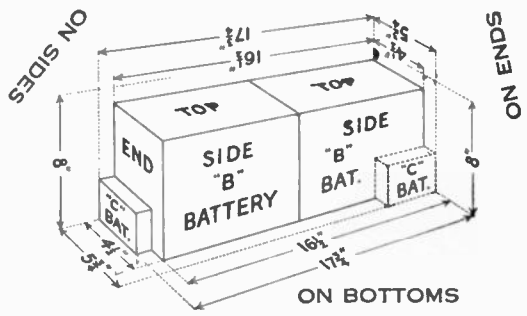

Illustration 14

TWO 45-VOLT, HEAVY DUTY, DRY CELL "B" BATTERIES
ONE 4½-VOLT DRY CELL "C" BATTERY

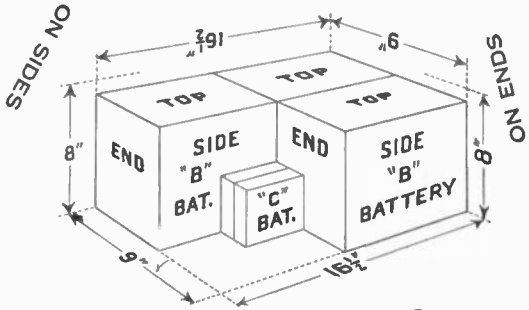

Illustration 15

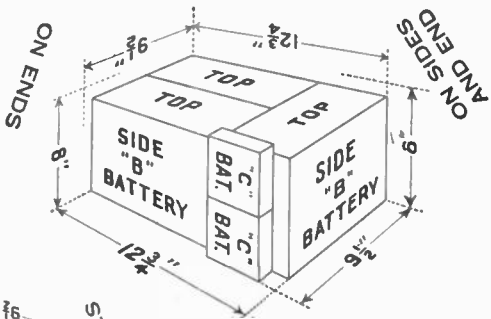

Illustration 16

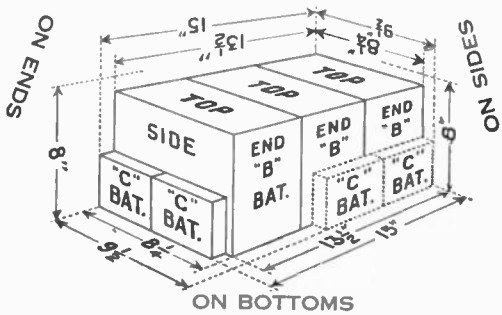

Illustration 17

THREE 45-VOLT, HEAVY DUTY, DRY CELL "B" BATTERIES
AND TWO 4½-VOLT "C" BATTERIES

World Radio History

Sec. 4. Connecting the Speaker or Phonograph Attachment to Receiving Set.

For Special Information Regarding Connecting Speaker Cable and Antenna and Ground Wires to the Model 35, see Pages 26 and 27.

FOR MODELS 30, 32, 33 and 50

This is done by passing the terminals of the speaker cable through the hole in the back of the cabinet marked "Radio Speaker." (See illustration on pages 30, 31, 32 and 33.)

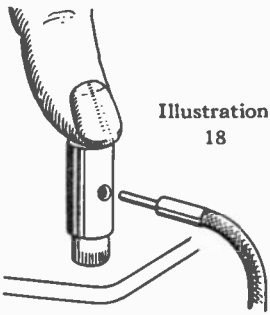

Illustration 18

By pressing down on the top of the binding post, opposite the designation "Red Tracer Lead," a small hole will be opened in the side of the binding post. (Illustration 18.) Insert the end of the **red and black wire** in this hole and remove the pressure from the top of the post. The top will spring up and lock the end of the wire securely in place. (Illustration 19.) Now follow the same method in connecting the "black lead" to its binding post.

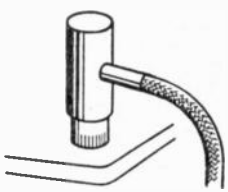

Illustration 19

Sec. 5. CONNECTING THE ANTENNA LEAD-IN TO RECEIVING SET. Next, scrape off about ¼ inch of insulation from the end of the "antenna lead-in wire," **scrape it clean and bright** and insert it in the hole in its binding post. For location of binding posts, see pages 30, 31, 32 and 33.

Sec. 6. CONNECTING ANTENNA LEAD-IN TO MODELS 33 AND 50: Note that your Receiver has two Antenna Binding Posts (See Diagrams, pages 32 and 33) marked, "Long Antenna" and "Short Antenna." We recommend connecting to the "Long Antenna" binding post if the combined length of your Antenna and Lead-in wire is over 75 feet. Otherwise we recommend attaching to the Short Antenna Binding Post.

Under certain conditions, where unusual selectivity is required, best results will be obtained with a *short* antenna by connecting the lead-in to *long* antenna binding post.

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CONNECTING RECEIVING SET TO GROUND. The next step is to attach one end of the ground wire to the binding post marked "GROUND." For location of binding posts, see pages 30, 31, 32 and 33. Sec. 7.

The other end of the ground wire should be attached to a *cold* water pipe *as near as possible to where it enters the building*. See illustration 9 on page 15. If this is impossible, use any convenient hot water or radiator pipe, *but never a gas pipe*. The objection to a hot water or radiator pipe is the fact that the current must flow through the entire heating system to reach the incoming cold water pipe and thence to the ground (earth) outside. The use of a gas pipe for a ground is against the rules of the Fire Underwriters.

To make a proper joint between ground wire and water pipe, file or scrape to shiny brightness, a band completely around the pipe, and clamp the wire, by means of the ground clamp, as tightly as possible on this spot, using screw driver and pliers or wrench.

RUNNING CABLE TO POWER EQUIPMENT. If power equipment is located in the cellar or basement, the power supply cable can be run through the floor by boring a ¾-inch hole through it. If in a closet, book-case or special container, run the cable along the floor close to the base board. The cable may be lengthened by splicing. If this be done all joints should be soldered and carefully protected with adhesive tape. Due to loss of "A" battery current, it is inadvisable to make total length of cable more than 20 feet. Sec. 8.

All excess cable should be coiled up *at the Power Supply end of the installation*, that is, *away* from the Receiving Set. In coiling the cable near storage batteries, care should be taken that it is not laid, or does not pass over the top of storage batteries, otherwise the cable or wire covering is apt to be eaten away by the acid fumes.

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Sec. 9. CONNECTING POWER SUPPLY CABLE TO POWER SUPPLY EQUIPMENT. The next thing to do is to connect the wires, issuing from the end of the Power Supply Cable attached to the Receiving Set, to the proper binding posts of the Power Supply Equipment. If you are using a storage "A" battery and a set of dry-cell "B" batteries for your "B" power, follow the wiring diagram shown on the opposite page. (Illustration 21.)

If you decide to use any of the various makes of "A" or "B" power units (sometimes designated "'A' or 'B' socket power" or "'A' or 'B' eliminators," etc.) follow the wiring instructions which accompany these pieces of apparatus.

But no matter what type of "A" or "B" power you use, it is recommended that you begin your wiring connections by attaching the *red* and *black* ("A" power) wires first. Following with the *green* wire, then *yellow,* then *brown,* then the "C" battery connections and lastly, the *white* wire.

Be sure that all storage battery binding posts are bright and clean and that nuts are screwed down tightly, using pliers if necessary. If the storage battery does not have binding posts it is suggested that two lead-coated battery "pinch clips" be purchased and soldered to the ends of the battery cable red and black wires.

Sec. 10 FUSE BLOCK. (See Part I, Chapt. I, Sec. 4.) It is recommended that a fuse block be inserted in the Power Supply Circuit for the same reason that fuses are installed in all house electric light and power circuits which are to be approved by the Fire Underwriters. The fuse block should be fixed firmly to a rigid support and as near to Power Supply Equipment as it is conveniently possible to locate it. The wires leading from the fuse block to the terminals of the Power Equipment should be stiff and heavily insulated and as short as possible. No. 14 rubber covered (electric light) wire is recommended.

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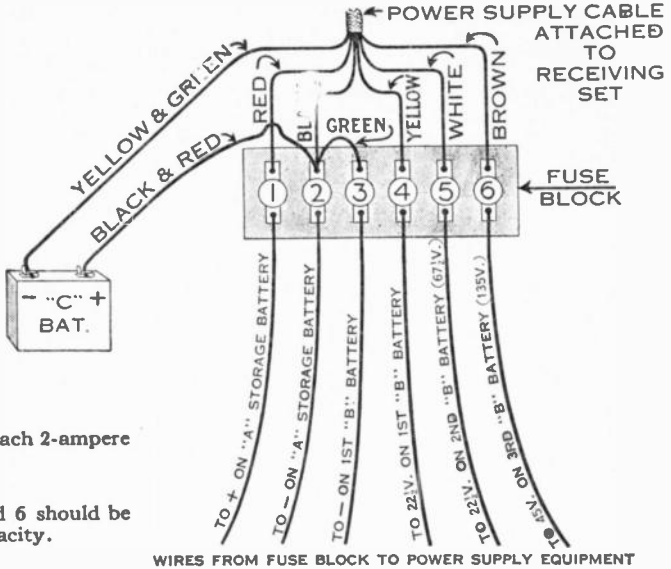
DIAGRAM SHOWING POWER SUPPLY CABLE CONNECTED TO FUSE BLOCK, AND WIRES LEADING FROM FUSE BLOCK TO POWER SUPPLY EQUIPMENT.



Fuses 1 and 2, each 2-ampere capacity.

Fuses 3, 4, 5 and 6 should be 1-ampere capacity.

Illustration 20

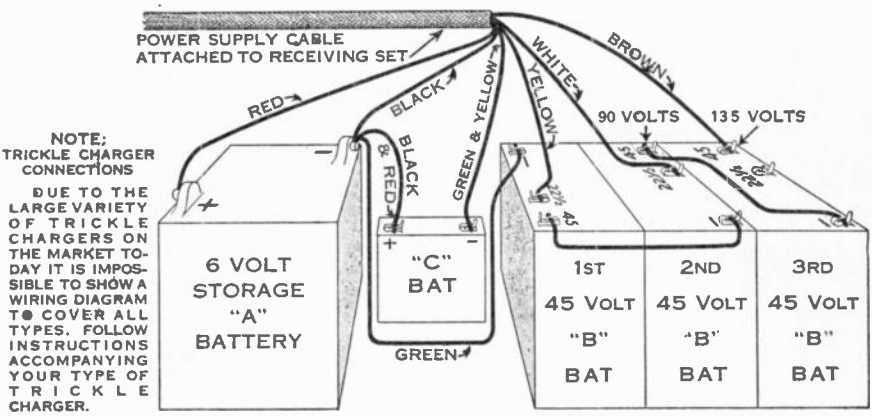


Illustration 21

WIRING DIAGRAM FOR MODELS 30, 32, 33, 35 AND 50

Diagram shows *brown* wire connection, using a 135-volt power tube in the last Audio Socket. If a standard 5-volt, ¼-ampere tube is used in the last Audio Socket, 90 volts (two 45 "B" Batteries) will be sufficient, and the *brown* wire should be connected to the tap marked "90 volts" on the diagram shown above.

The amount of "C" battery voltage necessary will depend on whether or not you decide to use a power tube. The proper "C" battery voltage for the power tube is printed in the instructions packed in each tube carton. For UX 201A or CX 301A tubes a 4½-volt dry cell battery is sufficient.

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Sec. 11. **CONNECTING STORAGE BATTERY TO A HIGH-RATE BATTERY CHARGER.** It is recommended that a two-way switch be used as a means of connecting the storage battery to a high-rate battery charger. Also it is preferable to have the storage battery located at some distance from the charger and switch, as illustrated below.

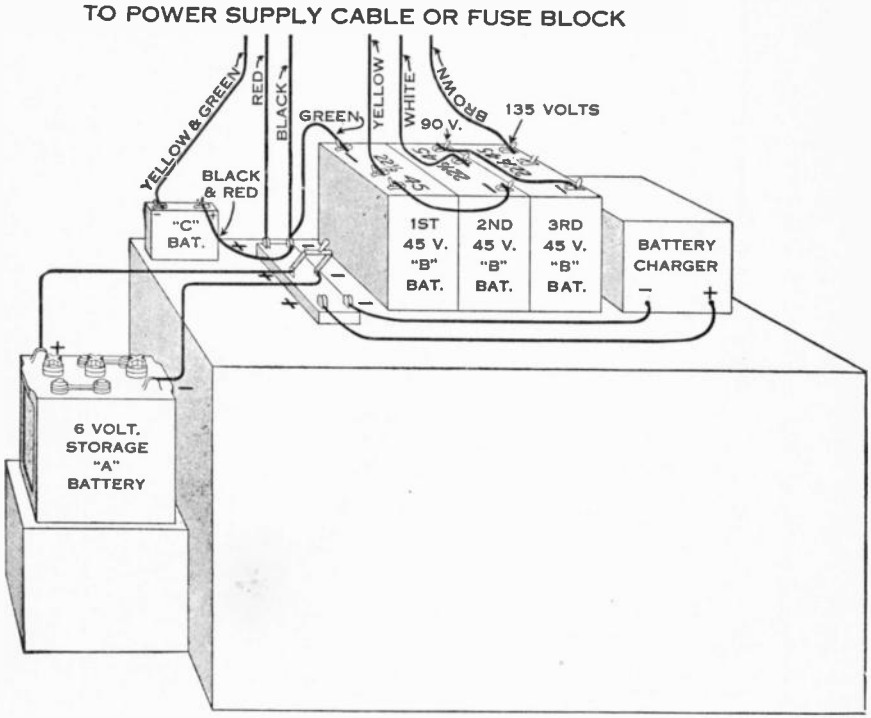

Illustration 22

WIRING DIAGRAMS, SHOWING INSTALLATION OF TWO-WAY SWITCH AND HIGH-RATE BATTERY CHARGER

See Illustration 20 for method of installing Fuse Block.

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CAUTION: Be sure and check most carefully all Power Supply Equipment connections before proceeding further.

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Sec. 12. SPECIAL INFORMATION FOR MAKING WIRING CONNECTIONS, ETC., TO THE MODEL 35.

The Model 35 differs from other Atwater Kent receivers in that the tubes and wiring connections, inside the set, are reached through an opening in the bottom of the set instead of the top.

The first thing to do after placing the Model 35 in a desired spot is to lift it up and turn it over, so that it rests on its top with the "Station Dial" and "Volume Control" pointing towards the back and away from you. (See illustration opposite.)

CONNECTION OF SPEAKER CABLE, ANTENNA LEAD-IN AND GROUND WIRES: This is done by passing the terminals of the speaker cable through the hole in the cabinet marked "Radio Speaker." (See illustration on opposite page.) By pressing down on the top of the binding post, opposite the designation "Red Tracer Lead," a small hole will be opened in the side of the binding post. (See illustrations on page 20.) Insert the end of the **red and black wire** in this hole and remove the pressure from the top of the post. The top will spring up and lock the end of the wire securely in place. Now follow the same method in connecting the "black lead" to its binding post.

Next, scrape off about ¼ inch of insulation from the end of the "antenna lead-in wire" and insert it in the hole in its binding post and then do the same with the "ground wire." For location of these binding posts see page opposite.

Keep the set in its upside down position until all the tubes have been inserted and tested—for method to be followed see pages 28 and 29.

When all tubes are in their place and burning properly, **and before you have turned the set right side up,** reach over and turn the "Station Dial" **slowly** to right and left. If there are any broadcasting stations on the air and within range, you should hear them. If you do, your set is working properly and can now be turned right side up. **Do this by lifting** and turning the front (dial side) up **and towards you.** If your tubes have been properly inserted in their sockets, there will be no danger of their slipping out as the sockets are made to hold tubes firmly in place when upside down.

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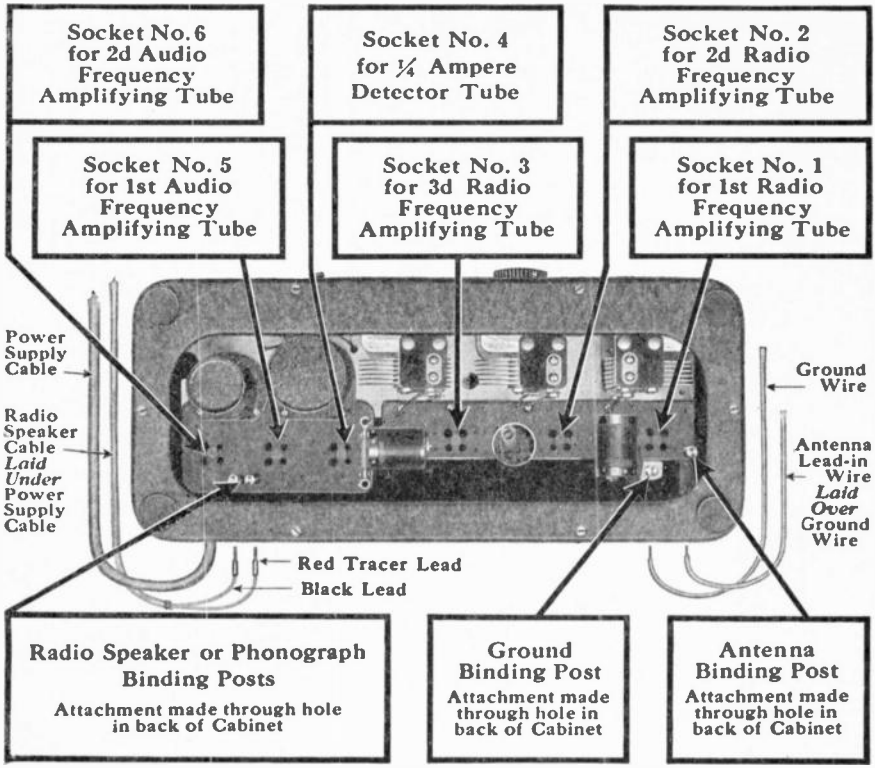

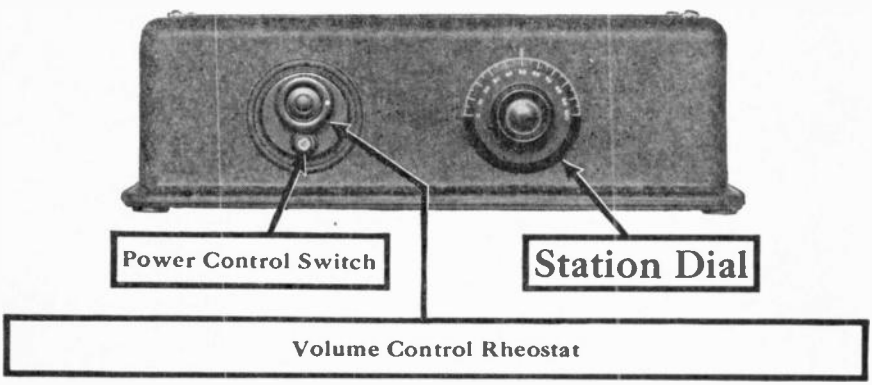

Illustration 23

LOCATION OF CONTROLS, ETC., MODEL 35

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Sec. 13. INSERTING TUBES AND TESTING. (For Location of Sockets, power supply switch, etc., see pages 27 to 33, incl.) After all power equipment connections have been made and checked, insert *one* tube (see Sec. 15), in any one of the tube sockets and pull *out* the power supply switch. Now turn *both* rheostat knobs to the right (clockwise). About three-quarters of their total turning distance should be sufficient. The Model 35 has but *one* rheostat. When lighted, the tube should glow but faintly with a dull golden color, sometimes difficult to see in the day time.

If the tube does *not* light up, *again check all power supply connections,* as it is possible that you have attached an "A" power supply connection to a "B" power supply binding post, thus allowing considerably more than 5 volts to be applied to the tube filament, and have burned out the tube. If the power supply connections are *absolutely correct,* try another tube in the socket, as tubes are sometimes found to be imperfect after purchase.

By inserting one tube and testing, as outlined above, you will be safeguarded against the possibility of burning out all your tubes in case you have made a mistake in your wiring connections.

If the first tube you insert *burns properly,* you can now proceed to insert the rest of the tubes in the remaining sockets.

Sec. 14 INSERTING TUBES IN MODEL 50. To reach the tube sockets in the Model 50, lift up both the wood and the metal lid under it and remove the metal lids from the two oblong metal boxes located in the right hand side of the Receiver. Be sure to replace these small lids after inserting tubes.

PLACING CAP ON DETECTOR TUBE (ALL MODELS). Place the "Detector Cap" (marked by a tag) on the top of the tube that you have placed in the detector socket. This cap is for the purpose of preventing howling of the detector tube due to vibration of its delicate filaments. A Detector Cap is not included with the Model 35.

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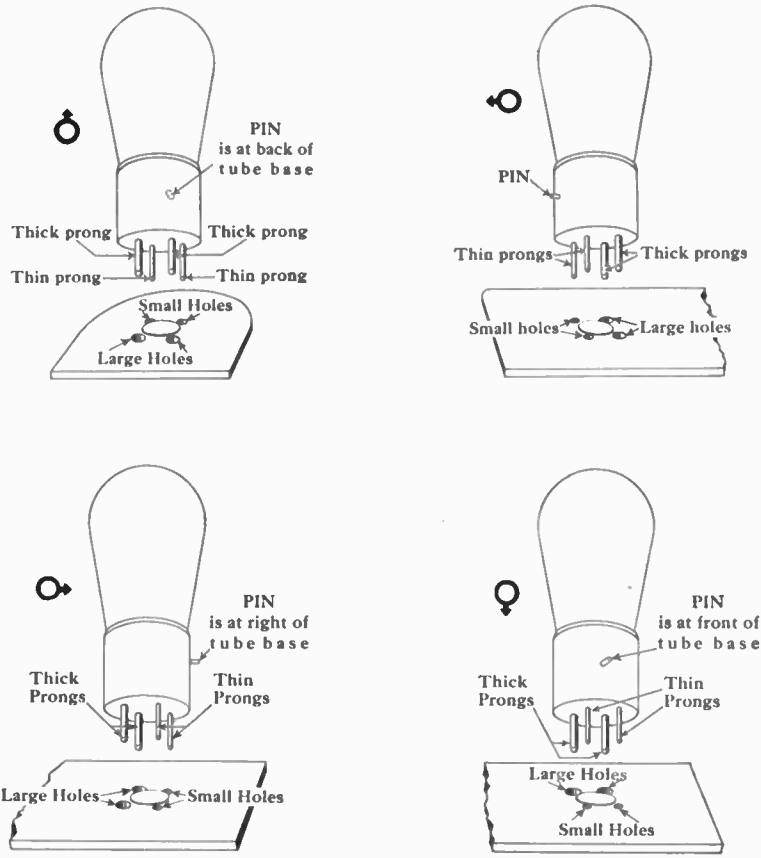

Illustration 24

METHOD OF INSERTING TUBES. The tubes each have two thick and two thin prongs, which must be fitted into the large and small holes which form the tube sockets in the receiving set. The above illustrations show the relative positions of the small and large prongs and small and large holes, before insertion of tubes in sockets. The little arrow, on the side of the small circle, shows the direction the pin should point when inserting a tube in a given socket, as directed in "Location of Controls;" diagrams on pages 27, 30, 31, 32 and 33. Sec. 15.

When prongs are in their proper holes, press down on tube until base rests firmly on socket plate.

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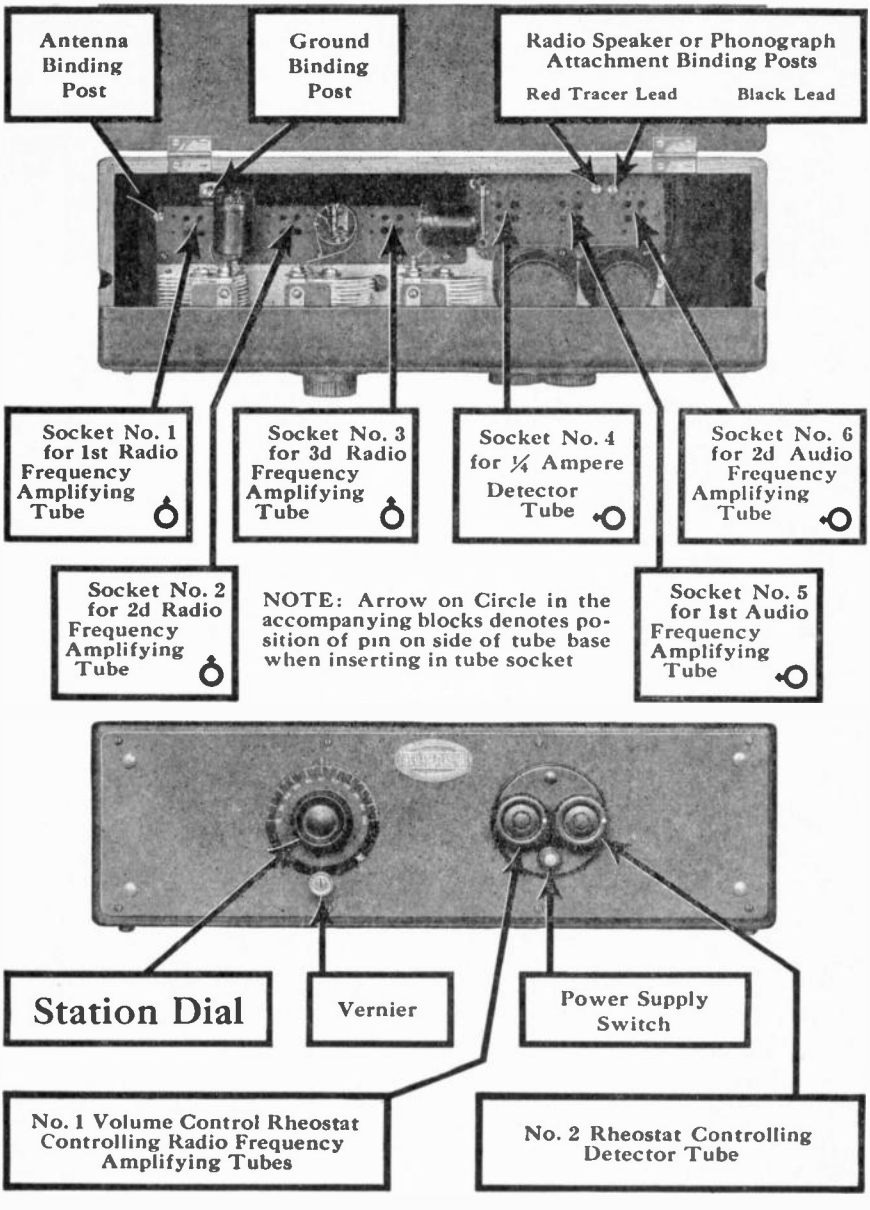

Illustration 25

LOCATION OF CONTROLS, ETC., FOR MODEL 30

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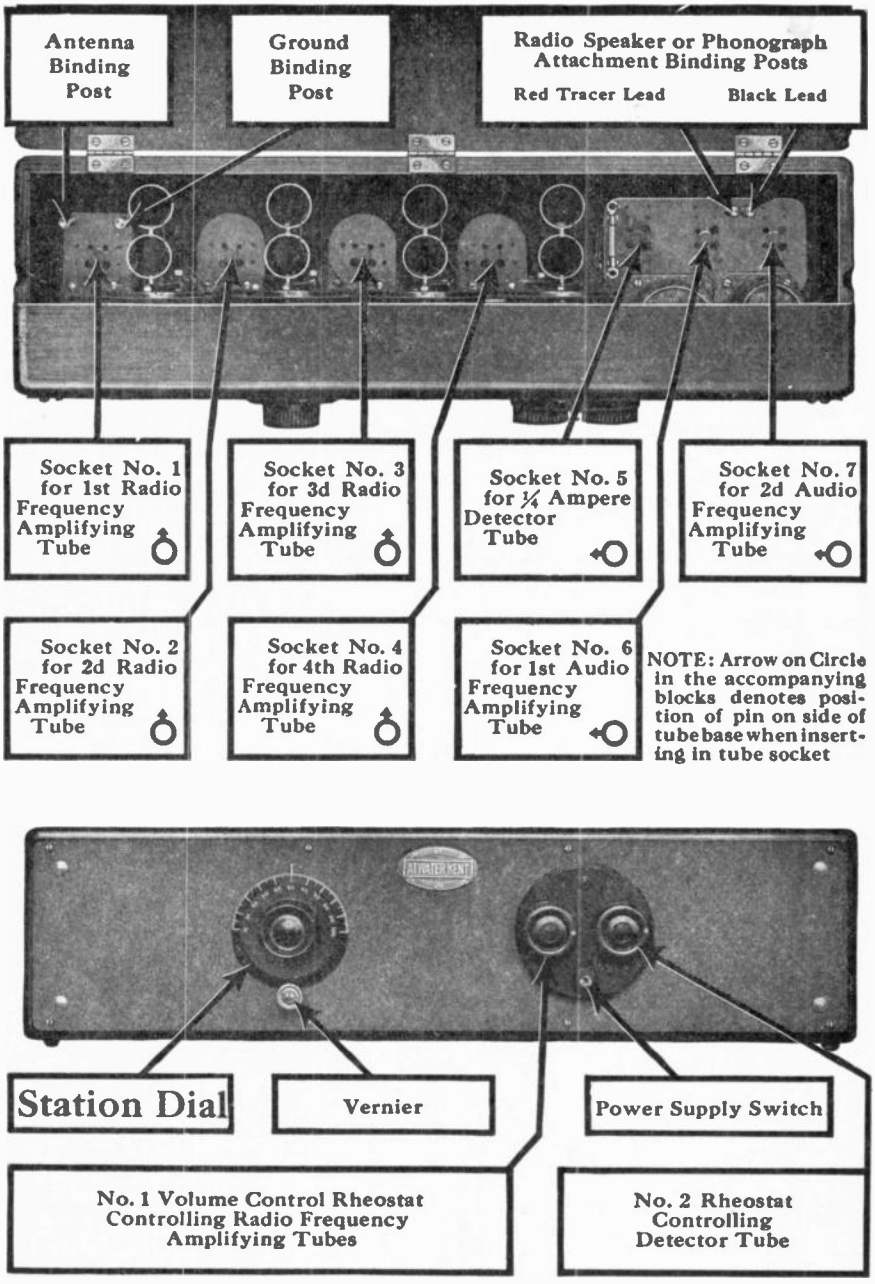

Illustration 26

LOCATION OF CONTROLS, ETC., MODEL 32

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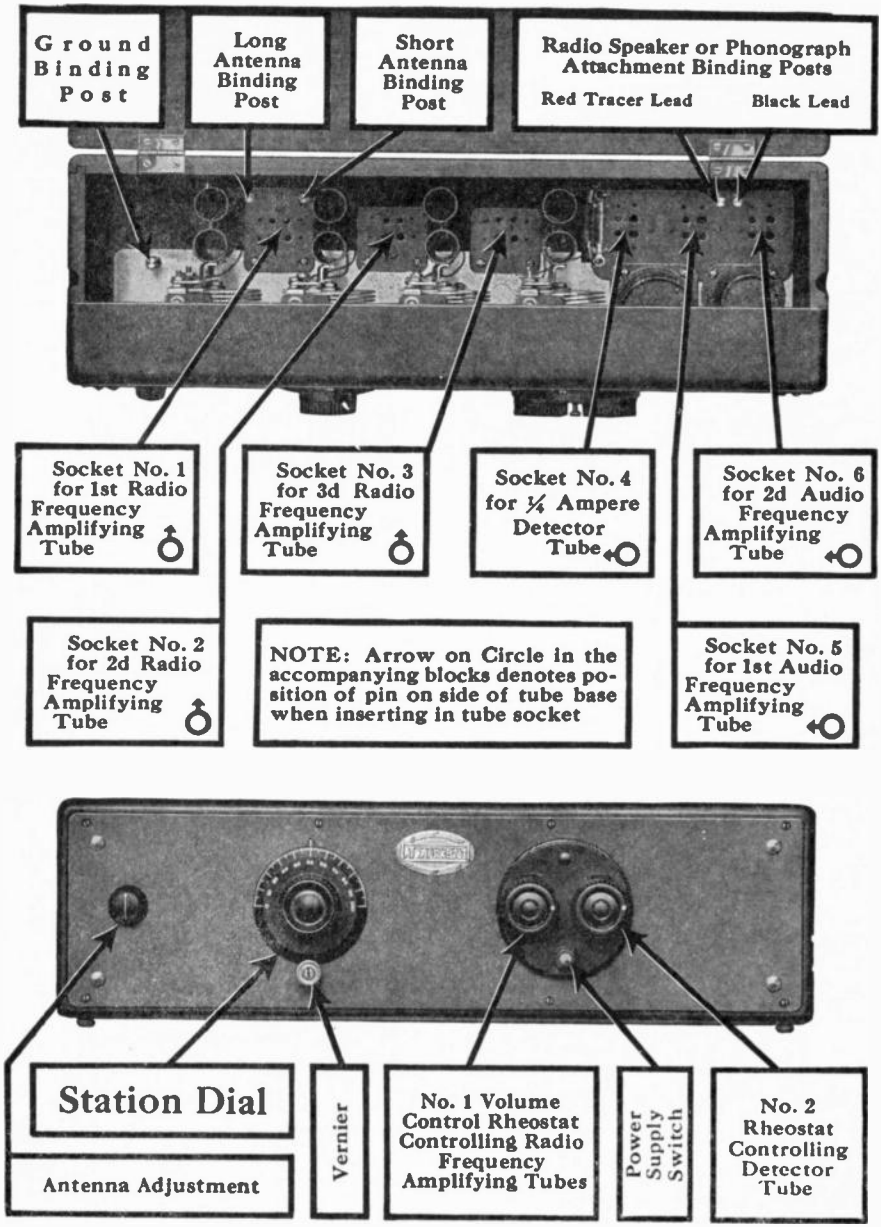

Illustration 27

LOCATION OF CONTROLS, ETC., MODEL 33

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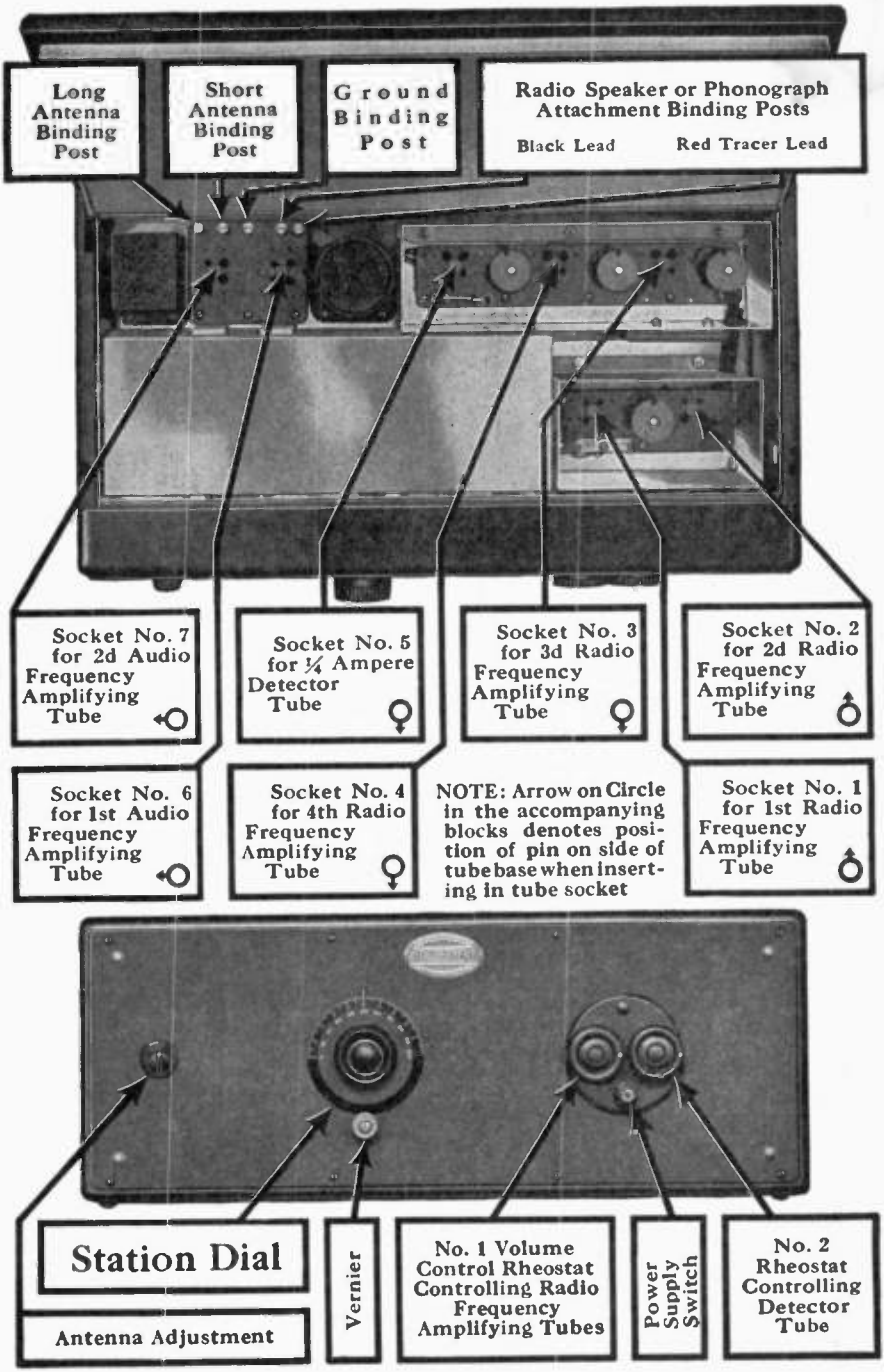

Illustration 28
LOCATION OF CONTROLS, ETC., MODEL 50

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SUMMARY. If you have followed instructions carefully, you now have your RECEIVING SET properly connected to the ANTENNA and GROUND, the SPEAKER or PHONOGRAPH ATTACHMENT and POWER SUPPLY EQUIPMENT. Your TUBES are all in their sockets and BURNING PROPERLY, because the POWER SUPPLY SWITCH is pulled OUT and THE RHEOSTATS are turned about THREE QUARTERS to the RIGHT (clockwise).

You are now ready to RECEIVE BROADCASTING.

Part II.
OPERATION

Illustration 29

Sec. 1. ONE DIAL RECEIVING SETS.* Stations may be brought in with the utmost ease by merely turning the Station Dial to the right or left between 0 and 100. After a signal has been heard, a finer adjustment of the Station Dial will bring in maximum volume. The vernier is for very fine adjustment. To use it, simply press it in and turn.

Volume—that is, loudness—may be regulated by adjusting the Volume Control Rheostat (see pages 27, 30, 31, 32 and 33). For less volume, turn the rheostat to the left—counter clockwise. For more volume, turn to right—clockwise. Do not be alarmed if the rheostat becomes hot after continued operation of the set.

* Licensed under Hogan Patent No. 1,014,002.

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MODELS 33 AND 50. Before attempting to bring in broadcasting, turn the Antenna Adjustment knob (See pages 32 and 33) so that the arrow on it is vertical.

After bringing in a Broadcasting Station with the use of the Station Dial, turn the Antenna Adjustment knob to right or left until the Station comes in with maximum clarity and volume—*for reception from local stations and most distant stations the Antenna Adjustment can be left in this position.*

However, with certain types of Antenna installations, a slight variation of the Antenna Adjustment will give better results for Stations broadcasting on different frequencies (kilocycles). That is, Stations that "come in" on different degrees on the Station Dial will be brought to maximum clarity and volume by a slight turn of Antenna Adjustment knob to right or left. This is especially true of distant Stations. A very little practice will quickly demonstrate how you can secure best results with your particular Antenna installation. Note:—By Antenna Installation, we mean the height, length, shape, etc., of your Antenna, Lead-in and Ground Wires.

Note—Be sure to push IN the Power Supply Switch when you are through operating the set.

LOGGING THE DIALS. When once a station has been brought in, it may again be brought in by turning the Station dial to the same setting, *provided, of course, that the same station is broadcasting and that atmospheric conditions are the same or better than when the station was originally tuned in.* Sec. 2.

IT IS RECOMMENDED that as soon as you feel thoroughly familiar with the operation of your set that you read carefully PART III of this book, dealing with the improvement of reception.

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Part III.
IMPROVING RECEPTION

Sec. 1. DETERMINING WHICH OF YOUR TUBES ARE BEST SUITED FOR THE RADIO FREQUENCY AND DETECTOR TUBE SOCKETS. It is quite usual to find that out of every set of tubes bought for your receiving set, certain of them will give better results when used in certain sockets than when used in any of the other sockets. Hence it is a good plan to take steps to determine which tubes are best suited for these particular sockets.

The test should be made as follows: Tune in a rather distant station, one that does not come in with any great volume. Turn the Volume Control Rheostat all the way on. With all tubes burning, *interchange* tubes from sockets 1 and 2 (see pages 27 to 33 for location of sockets). Note carefully any betterment in reception, then replace the tubes in their original sockets and try the same experiment by interchanging the tubes from sockets 1 and 3. Then interchange 1 and 4. If yours is a six or seven tube set, proceed with the experiment until you have tried out all the tubes you have.

It may be necessary to try the same experiment, with certain tubes, over again several times before you can be sure which one brings in the very best results, when placed in socket No. 1.

When you finally determine which tube is best for Socket No. 1, *leave it there* and proceed to try the same test with the remaining tubes, by placing them alternately in Socket No. 2. If yours is a *six* tube set, proceed with the test *by placing the remaining tubes alternately in Socket No. 4,* the Detector Tube Socket. If it is a seven tube set, proceed trying out the remaining tubes in sockets 3, 4 and 5.

The remaining tubes will doubtless prove satisfactory when placed in the last two sockets—the Audio Amplification Tube Sockets, *however,* if any of your tubes were found to give very weak signals when tested in the Radio Frequency Amplification and Detector Tube Socket, *they should be immediately returned to your dealer to be tested,* so that they may be returned to the manufacturer if found defective.

Note:—If you are using a special detector tube, or a special power tube in the last audio amplification socket, do not include these tubes in the above test. Be sure that the Detector Cap is replaced on the tube that you finally leave in detector tube socket.

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ALTERING THE LENGTH OR HEIGHT OF AN OUTSIDE ANTENNA. Sec. 2 If, after you have made the tests and experiments with your Tubes, you still feel that you are not getting the best possible results in the way of reception, you might find it advantageous to study over your present antenna installation with the idea of bettering it.

The two things that your antenna has most to do with, are volume and selectivity. If you think you should be getting more volume, you might experiment with ways and means of lengthening your antenna, *preferably in a straight line.* If this is impossible and your antenna is very short, that is, under 50 feet in length, you might try placing two or more wires in parallel. This applies only to an outside antenna. Details showing how the wires should be spaced and attached to the "spreaders," etc., are shown in illustration 30. *It should be noted, however, that doubling the number of wires does not double the effectiveness of the antenna.* As an example, two wires each forty feet long, stretched parallel to each other are not twice as effective as one forty foot wire, nor are they equal to a single wire 80 feet long in a straight line.

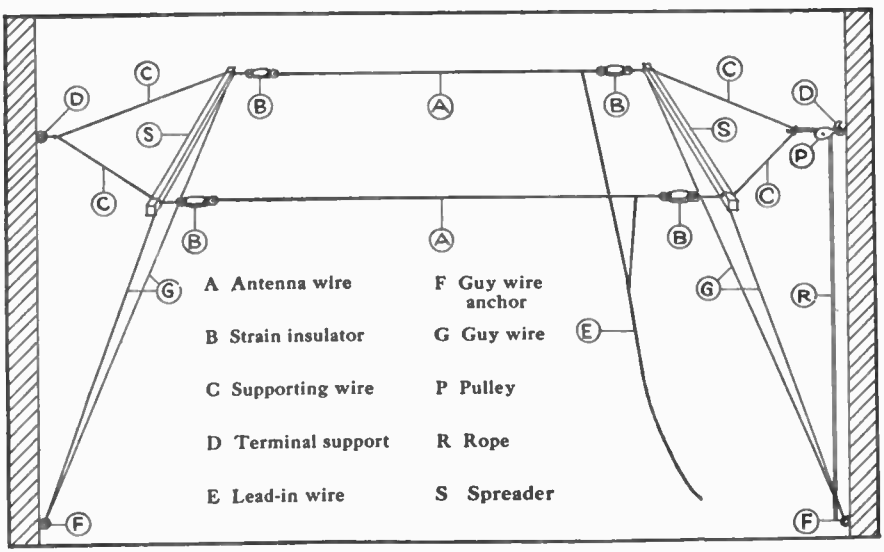

Illustration 30

Note: The minimum width of the "Spreaders" should not be less than 2 ft. 6 in.; 3 ft. or more if possible is recommended.

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If your receiving set has ample volume, but lacks selectivity, it may be that your antenna is *too long*. In this case the remedy should be easy to apply—simply shorten your antenna by cutting off a piece from the end furthest from the lead-in, as illustrated below.

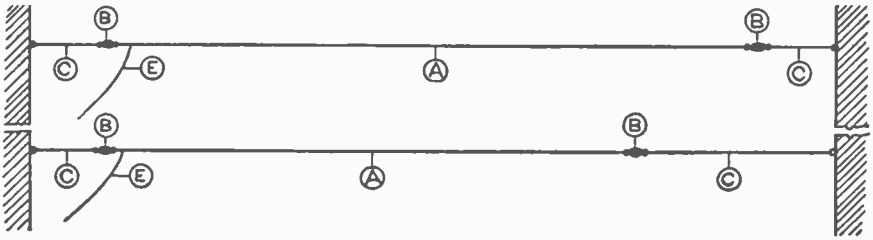

Illustration 31

Showing how an Antenna can be shortened without changing its terminal supports. For meaning of letters shown above, see illustration 30.

Another method of increasing volume is to *raise your antenna higher above the ground*. And by "ground" we do not mean simply the earth, but any surface that may act as a ground, such as a roof, tree, chimney or the like. Speaking generally, an antenna cannot be raised too high, unless by so doing the lead-in wire is increased in length to such an extent as to make the combined length of antenna and lead-in so great as to affect selectivity.

Sec. 3. IMPROVING INSIDE ANTENNAS. If you have an inside antenna and seem to lack volume, try a series of experiments by running a wire in places other than where you now have it. For instance—if your antenna now runs around the picture moulding, try one under a rug, as your room may be surrounded with steel girders or metal lath. Or, better still, try a **short outside antenna**, hung from the roof to your window, or from your window to a point ten or fifteen feet above the ground (see illustration 3, Page 10).

Sec. 4. USING A POWER TUBE. General improvement in tone will be obtained by placing a power tube in the **last** audio amplification socket (See Sec. 2, Chapt. 1, Part I.)

Sec. 5. USING A SPECIAL DETECTOR TUBE. Increased volume can often be secured by the use of a ¼ ampere special detector tube. This is most often true where it is necessary to use **a short inside antenna.**

Note particularly the amount of "B" voltage required for best results. This information will be found in the instruction sheet packed in the carton in which the tube is shipped.

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CHANGING THE LOCATION OF THE RADIO SPEAKER. It will be found that the tone of a speaker varies considerably in various parts of the room, depending upon position of walls and openings. When a speaker is placed in front of an open window or doorway, there naturally is a loss of volume and this loss is greatest in the lower tones, having the effect of slightly raising the pitch. On the contrary, when placed eight to ten inches in front of wall, the volume is built up, particularly on the lower tones; and this effect is generally further increased if the location is also near a corner of the room. For these reasons it is sometimes found advantageous to move the speaker to another part of the room so that the natural acoustical properties of the room can be used to maximum advantage. Sec. 6.

USING ONE OR MORE RADIO SPEAKERS IN ADDITION TO THE ORIGINAL SPEAKER OR PHONOGRAPH ATTACHMENT. If your receiving set is located in an unusually large room and you wish to entertain a goodly number of people, either seated or dancing, it is recommended that you try the effect of using one or two Radio Speakers *in addition* to your original Speaker or Phonograph Attachment. They should be placed in widely separated parts of the room and should be wired in parallel—that is, all red tracer wires should go to one binding post on the receiving set and all black wires to the other. Sec. 7.

Additional Speakers may also be placed in other rooms in your house, such as your bedroom, nursery, or servants' quarters. Any reasonable number of Speakers may be used at the same time, provided they are connected together in a proper series-parallel arrangement.

While the use of more than one Speaker slightly decreases the volume of sound heard from each individual Speaker, the volume of sound, in all parts of the room, is of practically the same intensity.

ADJUSTING ATWATER KENT HORN-TYPE SPEAKERS OR PHONOGRAPH ATTACHMENTS. The adjustment mechanism is not tc be considered as an aid to better tuning, to be constantly changed. All Speakers and Phonograph Attachments are tested for volume and tonal quality, and *are adjusted by experts* before leaving our factory. Under ordinary conditions, and when used with Atwater Kent Receiving Sets, the factory adjustment should prove entirely satisfactory. Sec. 8

If, however, the adjustment has been tampered with or is not just as it should be, due to some other cause, it is very easily readjusted. Simply tip back the Speaker on its base, while a powerful station is tuned in, and turn the knurled cap (located in its base) to right or left until maximum volume and clearness are obtained. Usually, it is best to start *by turning to the right (clockwise) until the music or voices suddenly become muffled,* often accompanied by a rattle and general

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loss in volume. Then, *very slowly and carefully* turn the knurled cap *to the left* (counter clockwise) until the voices or music suddenly come out clear, loud and free from rattle. STOP ADJUSTMENT AT THIS POINT—to turn further only reduces the clarity and volume of tone. The Phonograph Attachment is adjusted in the same manner.

Note: The Model "E" Speaker is not adjustable.

Part IV.
MAINTENANCE

Proper care of your Power Supply Equipment will go further towards assuring continued and successful operation of your receiving set than any other thing you can do. Many times when poor reception is blamed on the receiving set, the fault lies with the operator, who has neglected to keep storage batteries charged or has allowed dry batteries to run down until they are practically worthless.

Sec. 1. CARE OF STORAGE BATTERIES. All first-class manufacturers of storage batteries supply their customers with full information as to the proper care and maintenance of their batteries. *Be sure to get their printed instructions and read them through carefully.*

CAUTION: Never use a lighted match, candle or other flame to see if the battery needs to be filled with water, as the fumes of the acid inside are explosive. If your battery is located in a dark room use a regular electric light or flash light, or disconnect the battery and carry it to the daylight or to a place where an electric light is located.

Sec. 2. CHARGING STORAGE BATTERIES. The ideal method to follow is to install a first-class trickle charger (low-rate charger) with an automatic relay, which will start the charger when your set is turned OFF, and stop the charger when your set is turned ON. If a relay is not included in your installation, a switch should be provided as the majority of trickle chargers *should not be allowed to operate while your set is operated.*

If you prefer to use a high-rate charger, care should be exercised in its installation and use. Always disconnect both the wires (running from the battery to the receiving set) from the storage battery before connecting the battery charger wires to the storage battery and starting the charger.

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A better method is to use a two-way switch (see illustration 22, page 24) in which case all chance for accident is reduced to a minimum.

In either case, always turn off the charger at the house current socket, before reconnecting the battery to receiving set.

The frequency with which it will be necessary for you to charge your battery will depend on the ampere hour capacity of the particular battery you possess, and the amount of time you use your set. To determine this a frequent check should be kept on the condition of charge by use of a "hydrometer" unless some other means is included with the battery. The use of a voltmeter is not recommended for checking the "A" battery as it does not give a true indication of the "A" battery's condition, but *a battery should be charged at least once each month whether the receiving set has been used or not, so the deterioration in the battery will be prevented.*

The length of time your battery should be charged at any one time will depend upon its capacity (in ampere hours) and the rate with which your charger charges, but always check by use of a hydrometer unless some other means is included with your particular battery.

Due to the fact that corrosive fumes are given off from storage battery when it is being charged by a high rate charger, it is recommended that it be removed from any cabinet or other piece of fine furniture while being charged, unless special provision has been made for the escape of the gases generated in the battery during charging. This is not necessary when a "trickle charger" (low rate charger) is used.

It is advisable to allow a short time to intervene between the time that you stop charging your battery and the time you begin to use your set if a high rate charger is used, otherwise you may be bothered with a crackling noise during reception. This will not be the case if a trickle charger is used.

CARE OF DRY "B" BATTERIES. Run down "B" batteries are one Sec. 3. of the most frequent causes of poor reception. *In order to guard against this trouble we recommend that you purchase a high-*

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grade "voltmeter" and test the voltage of your "B" batteries at frequent intervals. A 45-volt "B" battery is practically useless when it registers *less than 34 volts.* A 22½-volt battery when it registers *less than 17 volts.* As one "dead" battery will stop the flow of current through all the rest, it must be removed and replaced with a new one to secure satisfactory results

"C" batteries should function satisfactorily for a long time as no measurable current is drawn from them. For this reason it is difficult to check them with a voltmeter. The only real test of the efficiency of a "C" battery, after continued use, is the absence of noise during reception. The best assurance of proper "C" battery voltage is to renew your "C" once a year.

Sec. 4. TUBES. As all tubes deteriorate in time, it is suggested that at least once a year all tubes be taken to your dealer for testing, or borrow an extra tube (one known to be perfect) and try it out in each socket in turn, thus comparing each of your old tubes with it.

Sec. 5. WIRING CONNECTIONS. Due to jarring and vibration, wiring connections are sometimes loosened, and it is recommended that at least once a month all connections, made to screw binding posts, located on any of your Power Supply Equipment, be gone over and tightened up.

Sec. 6. POWER SUPPLY SWITCH. In some instances dust and dirt find their way to the inside, moving parts, of the Power Supply Switch, thus decreasing its electrical conductivity, with a resultant loss in the power and volume of the set. By turning the little switch knob around and around, while your set is operating, that is with the switch pulled OUT, the dust and dirt will be wiped off. *Try this once a month.*

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Part V.
Some Causes of Poor Reception

DAY AND NIGHT RANGE. Reception of broadcasting is always very much better after night fall. It is considered good reception conditions when a standard six tube set will bring in satisfactory broadcasting from stations located not more than 200, or even 100 miles away, *in the day time*. Whereas, under the same conditions the same set will bring in with volume and clearness, *at night*, stations located more than 1000 miles distant. Sec. 1.

ATMOSPHERIC CONDITIONS. One of the most usual causes of poor reception is due to atmospheric conditions. If you suddenly experience trouble in bringing in more or less distant stations, and your tubes are comparatively new and your batteries seem all right when tested, call up one or more neighbors and find out if they are experiencing the same difficulty—if they are, you can feel pretty sure that your trouble is not due to any part of your radio installation. However, if your neighbors are *not* experiencing the difficulty that you are encountering, you had better go over your complete installation in order to locate the possible cause of the trouble. Some of these possible causes are as follows: Sec. 2.

DUST AND DIRT ON POWER SUPPLY SWITCH. See Part IV, Sec. 6, Chapt. 3. Sec. 3.

LOOSE OR CORRODED WIRING CONNECTIONS. Try tightening all knurled nuts and examine all connections to see that they are bright and clean. Sec. 4.

DEFECTIVE LIGHTNING ARRESTER. Test for this trouble by disconnecting the wire leading from the arrester to its ground, and see if it makes any difference in reception—if it does, put in a new lightning arrester. Sec. 5.

DEFECTIVE OR WORN-OUT TUBES. See PART IV., Sec. 4. Sec. 6.

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Sec. 7. ANTENNA GROUNDED OR BROKEN DOWN. Examine your antenna and make sure it is not broken down, or that it has not sagged down on, or near some object that is grounding it. Or it may be that other wires, branches of a tree or the like, have sagged down or been blown across your antenna. Follow this examination of your antenna by a study of your lead-in, from where it is attached to the antenna to where it is attached to the receiving set. See PART I. Chapt. 2. Sec. 4.

Sec. 8. CABLE FROM RECEIVING SET TO POWER EQUIPMENT IMPROPERLY PLACED. See PART I, Chapt. 3, Sec. 8.

Sec. 9. FUSE BURNT OUT. If you have installed a series of fuses (as recommended in Part I, Chapt. 3, Sec. 10) it may be that one or more of these fuses have been burned out, due to a short circuit in the wires running between the fuse block and the Receiving Set, or in the wiring of the set itself. Or one of your tubes may be defective, which might cause a fuse to burn out.

Examination of your fuses will quickly tell whether any of them have been burned out. If this be the case, *do not replace it with a new one until you have located the trouble and have had it corrected.*

Sec. 10. "FADING." The "fading" of signals, which means that the voices or music first come in distinctly, then fade away only to come in strongly after a short period of time, can hardly be classed as poor reception, for, as a rule this condition will be found to exist with only one or two stations on a given evening, while broadcasting will be heard from other and equally distant stations, without intermission or fading of any kind. Fading is attributed to atmospheric conditions that are more or less localized and therefore do not affect all broadcasting reception on any given night.

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Part VI.
Some Causes of Disturbing Noises

Noises that disturb the pleasure of Radio Reception can be divided roughly into two classes: noises generated in some part of your Radio Installation—usually easily remedied, and noises due to conditions outside of your Radio Installation—often difficult or impossible to remedy.

To find out whether the disturbing noise is generated *inside* of your Radio Installation, tune in a station and then disconnect the antenna lead-in and ground wires from the receiving set. *If the noise continues*, it is no doubt due to something *inside* of your installation—most likely your batteries. Look to your "A" battery terminals to be sure they are not corroded, but are bright and clean. Next, test your "B" batteries and note whether each battery registers the required voltage. See PART IV, Sec. 3.

Sec. 1. A CRACKLING, SIZZLING NOISE is usually due to run down "B" batteries, and can be remedied by replacing the exhausted batteries with new ones.

Sec. 2. A SLIGHT WHISTLING NOISE is often due to the fact that the No. 1 "B" battery, which supplies the Detector, as well as the Amplifying Tubes, is run down or exhausted, even though the rest of the batteries are in excellent condition. By replacing the first "B" battery with a new one this trouble should disappear.

Sec. 3. A CONTINUED SINGING OR HOWLING NOISE. Heard while the set is connected to the antenna and ground. Sometimes due to the fact that the Radio Speaker is placed too close to the Receiving Set—try moving it further away from the set and see if the noise stops. *Be sure that the "Detector Cap" is on the detector tube.*

OTHER NOISES, DUE TO CONDITIONS OUTSIDE OF YOUR RADIO INSTALLATION, ARE AS FOLLOWS:

Sec. 4. AN INTERMITTENT BUZZING. A strong, intermittent buzzing is usually caused by a commercial or governmental radio sending station.

Sec. 5. AN INTERMITTENT "PEEPING" NOISE. An intermittent "peeping" noise, varying in intensity and sounding like the chirping of a little bird, is usually caused by an amateur sending station.

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Sec. 6. A CONSTANT, HIGH-PITCHED WHISTLE. This is known as a "heterodyne whistle" and is due to the fact that another station is broadcasting on very nearly the same frequency (kilocycles) as the station you have tuned in. As a rule, it is best to give up attempting to tune in the station you are endeavoring to tune in, until the other station has signed off.

Sec. 7. SCREECHING OR "BOB WHITE CALLS." These noises vary in intensity and are usually due to some other receiver that is being tuned in, in your immediate neighborhood. Nothing can be done to remedy this trouble—it is a case of "grin and bear it." *However,* you should remember that *your Atwater Kent Set does not radiate,* hence it *does not annoy others as your neighbor is annoying you.*

Sec. 8. A CONSTANT CRACKLING, CLATTERING AND CRASHING. Usually due to static electricity generated in the upper atmosphere, which is picked up by your antenna wire and runs through your receiving set to the earth (ground). These noises are known as "static," and while a perfectly harmless phenomena, are at times exceedingly annoying. Nothing can be done to remedy them, but a change in the weather will entirely dispel them and reception will again be "as clear as a bell."

Sec. 9. A CONSTANT HUMMING. Usually due to a dynamo located somewhere in your immediate neighborhood, or even at a distance. In the latter case the hum of the dynamo is transmitted through electric light or power wires, near which you have placed your antenna or lead-in. This is particularly apt to be the case if your antenna *parallels* electric light or power lines. By changing the location, or altering the direction of your antenna, you may be able to eliminate, or at least reduce this trouble.

Sec. 10. A CONTINUED OR INTERMITTENT BUBBLING. Often due to a so-called "leak" in a nearby high powered electric transmission line and most apt to be noticed in wet weather.

OTHER NOISES. There are numerous other conditions that may cause annoying noises, such as certain types of Oil Burners, Electric Refrigerators, Washing Machines, etc., also X-Ray, Moving Picture or Violet Ray machines, located either in the same building that you are in or in your immediate neighborhood. Or near you may be an arc light, flashing electric sign, an electric welder or a similar electric device. Likewise, any piece of apparatus using an electric motor, such as a vacuum cleaner, electric elevator, air pump, vibrator, child's toy, etc., is apt to cause annoyance at various times.

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Trolley lines passing within any reasonable distance of your set will be sure to affect it. Likewise, automobiles passing close by on the street will, at times, affect radio reception.

CONCLUSION. In concluding we should like to impress upon you that Sec. 11. *almost invariably* you will find that poor reception, disturbing noises, and other like troubles are *not* due to any defect in your Atwater Kent Receiving Set, Radio Speaker or Phonograph Attachment, provided they have not been tampered with since leaving our factory.

All parts used for the assembly of Receiving Sets are thoroughly tested, and the completed sets are carefully inspected and tested for actual reception of signals. All Speakers are tested for tonal quality and volume, and are adjusted to give maximum results before they leave our factory.

If you experience trouble of any kind in operating your set, *first* study over your installation, starting with your batteries, then the battery connections, tubes, antenna, lead-in and ground, before you decide that the trouble lies in the receiving set or radio speaker. If, after carefully examining and testing the various parts of the installation, as suggested in the various parts of this book, you are convinced that the receiving set or speaker is at fault, *do not attempt to locate and remedy the trouble yourself, but take the set or speaker to your dealer for examination by experts.*

IDENTIFICATION OF MODEL NUMBER OF RECEIVING SETS. If you find it necessary to write to your dealer, do not fail to mention both the Model and Serial Number of the set or speaker. If you are in doubt as to the Model Number of your set, refer to the serial number name plate. This name plate is located inside the lid of the Wooden Cabinet Sets, and on the back of the Model 35.

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ATWATER KENT

Radio INSTRUCTION BOOK *Vol. 1*

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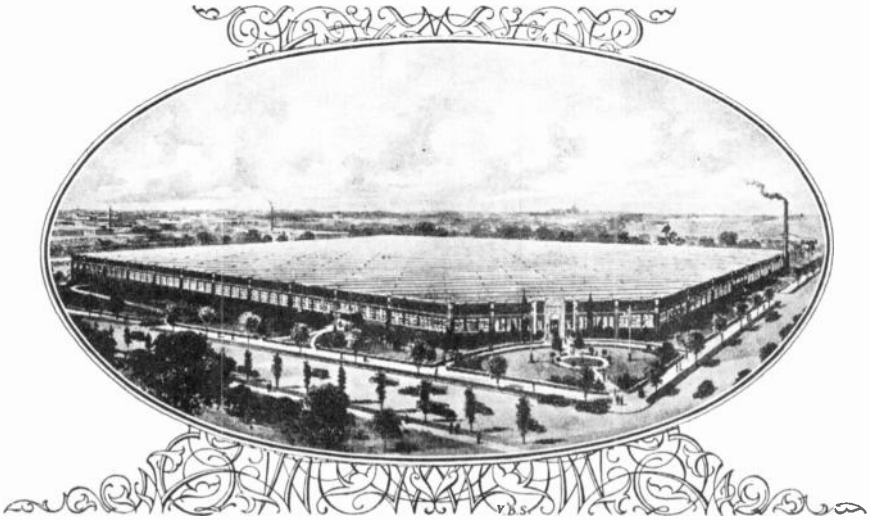
RADIO INSTRUCTION BOOK

Vol. 1.



ATWATER KENT MFG. COMPANY

4700 Wissahickon Avenue

Philadelphia

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PREFACE

This book has been prepared with the idea of helping owners of Atwater Kent Receiving Sets to get the most out of their radio installation with the least possible trouble and expense. We have endeavored to answer, before they are asked, most of the questions that arise in the minds of the beginner in Radio and many that might trouble an experienced operator.

We earnestly recommend that before you purchase any additional equipment or attempt to install and operate your Receiving Set, you read over most carefully PARTS I and II of this book.

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Form 120. Printed in U. S. A., Oct., 1924

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Part I.
INSTALLATION

CHAPTER 1.
Equipment Necessary for Installing any Type of Atwater Kent Radio Receiving Set

LOUD SPEAKER OR PHONOGRAPH ATTACHMENT. A high grade receiving set is worthy of a high grade loud speaker—in fact the loud speaker or phonograph attachment that you select will have a very great deal to do with the success of your radio installation. For this reason we strongly recommend that you use an Atwater Kent Loud Speaker or Phonograph Attachment, with your receiving set. If you have already purchased another make of loud speaker or phonograph attachment, we suggest that you immediately arrange to try out an Atwater Kent, noting the improvement in the volume and quality of tone delivered by the Atwater Kent apparatus. Section 1.

TUBES. 5 volt, ¼ ampere tubes should be used in all models, and it is recommended that all tubes be tested by the dealer before delivery. Sec. 2.

BATTERIES. Two kinds are necessary viz., an "A" battery and a set of "B" batteries. The "A" battery should be of the storage type, 6 volts and 80, 100 or 120 ampere-hour capacity, although a 60 ampere-hour battery is practical. The "B" batteries may be of the "dry" or "storage" type, composed of sufficient cells or units to produce 90 to 100 volts. Sec. 3.

NOTE: An extra 22½ volt, dry cell "B" battery must be used for the Detector Tube with the Model 12 Receiver.

BATTERY CABLE OR WIRE. For connecting the batteries to receiving set. All open models of Atwater Kent Receivers have a complete battery cable attached to them at the factory. For use with the cabinet receivers, we recommend our special Atwater Kent Battery Cable, which comes in two lengths, viz., 6 feet and 10 feet. The advantage of Atwater Kent Cable over ordinary wires lies in the fact that the various strands of the cable are proportioned to the load they must carry; they are of Sec. 4.

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different colors, so that mistakes in making connections are eliminated and the metal terminals, soldered to the ends of the strands, make connections to both receiving set and batteries easy and permanent.

When wire is used instead of the special cable, we suggest the following: for wires leading from receiving set to the "A" battery, No. 14 Rubber Covered, solid or stranded: for wires leading from "B" batteries to receiving set, No. 18 Rubber Covered, solid or stranded. In either case a stranded wire is more flexible.

Sec. 5. ANTENNA WIRE. Not less than 100 feet of 7 strand No. 22 gauge phospher bronze wire, plain or enameled. A few feet more than the minimum 100 will be found to be useful, as described in the section devoted to the installation of the antenna.

Sec. 6. LEAD-IN AND GROUND WIRE. No. 14 Rubber Covered, stranded, of sufficient length to reach from the antenna to the receiving set and from the set to its ground connection, and also from the lightning arrester to its ground connection. Usually 50 feet is more than sufficient.

NOTE: When an inside antenna is to be used the wire recommended in sections 5 and 6 is unnecessary, instead, procure a sufficient length of some lighter wire, either stranded or solid, such as No. 18 Bell Wire, or other insulated wire.

Sec. 7. GROUND CLAMPS. Usually two are necessary—one used for grounding the set and one for grounding the lightning arrester.

Sec. 8. A LIGHTNING ARRESTER. One that bears the approval of the Underwriters' Laboratories.

Sec. 9. INSULATORS. (Strain type) Usually three are sufficient.

Sec. 10. A PORCELAIN TUBE. Usually 10 inches long, should be used for insulating the lead-in wire where it passes through the wall of a building.

NOTE: When an *inside* antenna is to be used there is no necessity for a lightning arrester, hence only one ground clamp will be necessary.

CHAPTER 2.

Section 1. LOCATING AND ERECTING THE ANTENNA AND INSTALLING THE LIGHTNING ARRESTER AND GROUND. The function of the antenna is to collect the electrical waves radiated from the various broadcasting stations and carry this electrical energy, via the antenna lead-in wire to the receiving set.

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To quote a homely simile, we might liken the antenna to the gutter on your roof and the lead-in wire to the down spout or rain conductor. A short gutter will collect and deliver to the down spout but a small amount of water—a very long gutter will deliver too much water for the down spout to handle. A radio antenna that is *too short* will not collect enough electrical energy, broadcast from distant stations, to enable you to tune in the signals. An antenna that is *too long* will collect so much electrical energy sent out from near by broadcasting stations, that you will be unable to tune them out—that is, your set will not be "selective."

Again, referring to our simile, a gutter that drains a roof shaded by trees or other overhanging obstacles will not collect as much rain water as a gutter that drains a roof completely exposed to the elements, therefore your antenna should be raised as far as possible above trees, chimneys, etc., and the walls of your own, or adjoining buildings, so that it may have a chance to collect all the radio waves possible to collect.

Again, if a gutter is filled with leaves, dirt or ice, it will not deliver all the water to the down spout, for varying amounts will spill over the edge and drop to the ground. Likewise your antenna will not deliver all the electrical energy to your receiving set (through the lead-in wire), if it is so placed that it touches, *or is even too near to* other wires, metal roofs, gutters, chimneys, trees and the like, for the electricity will run from the antenna through these conductors to the ground, instead of to the ground through the lead-in wire and your receiving set.

An excellent antenna for Atwater Kent Receiving Sets is one composed of a single wire 100 feet in length in a straight line, stretched at least 30 feet above the ground and at least 10 feet above all trees, roofs, chimneys, etc., and 10 feet away from all walls and the like. The lead-in wire might be anywhere from 15 to 35 feet in length, or a combined length of antenna and lead in wire of from 115 to 135 feet.

Unfortunately it is difficult to give definite instructions as to the antenna you should erect, for after all is said and done, the antenna you will install will depend mostly on your location and surroundings. That is to say, if your property is only 20 feet wide by 50 feet deep you cannot very well erect an antenna 100 feet long in a straight line—if the building you live in is only a few stories in height and is surrounded by towering buildings, you cannot be expected to raise your antenna 10 feet above their walls.

In order to assist you in selecting the type of antenna that most nearly fits your requirements, we give on the following pages several diagrammatic pictures of typical antenna installations.

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OUTSIDE ANTENNAS

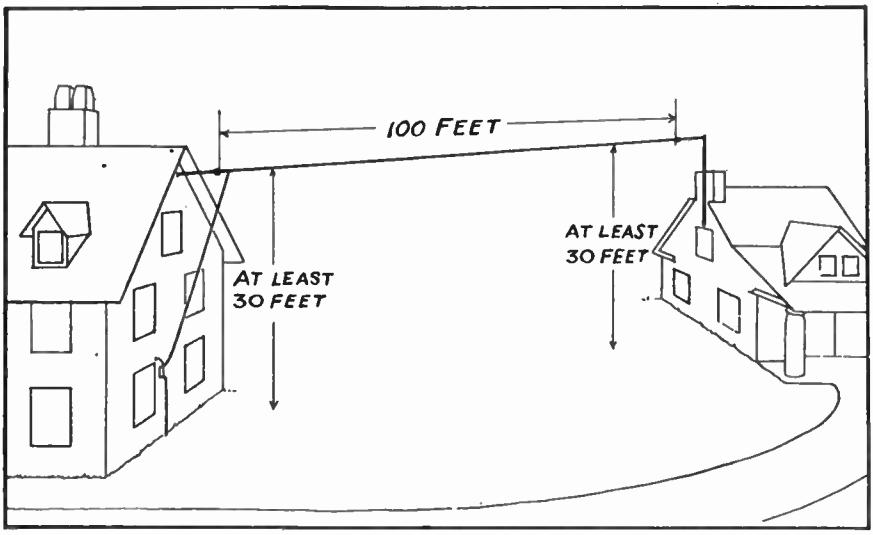

Illustration 1

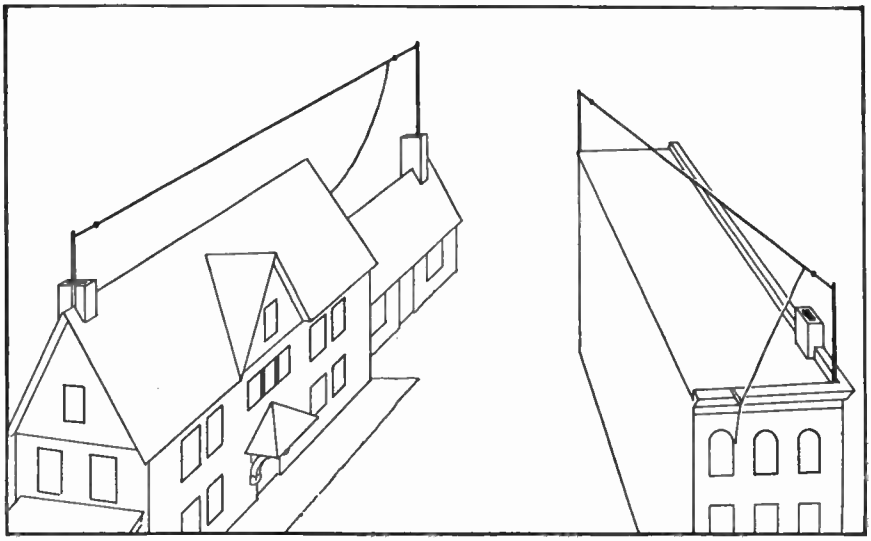

Illustration 2

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OUTSIDE ANTENNAS

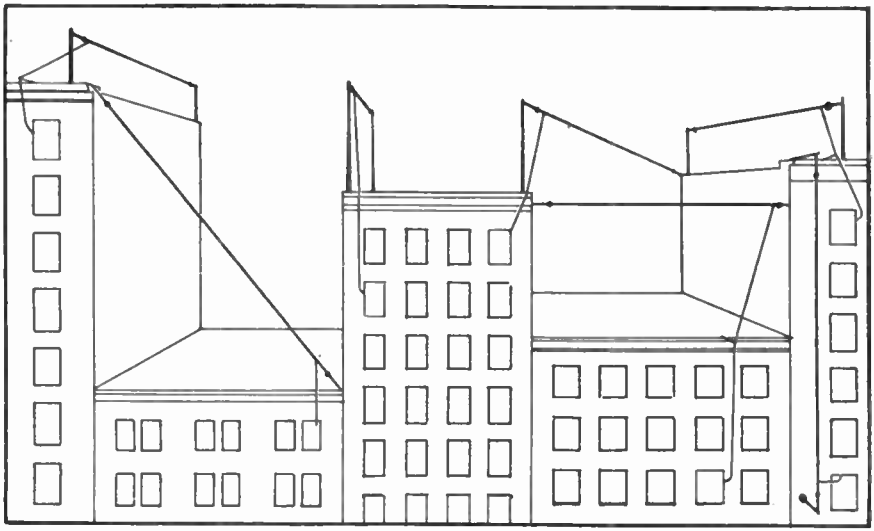

Illustration 3

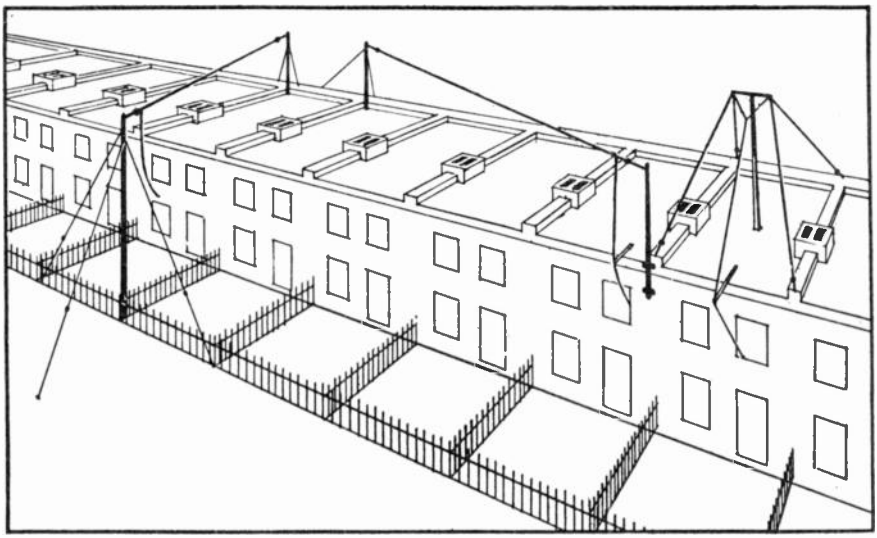

Illustration 4

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Sec. 2. ERECTING AN OUTSIDE ANTENNA.

In erecting your antenna, care should be taken to see that the antenna wire is tightly stretched, and that the screw eyes or other terminals be firmly attached to a non-moving surface. Otherwise your antenna will be apt to be broken down by an accumulation of ice or snow, or blown down in a gale.

For this reason trees are not a desirable anchorage for antenna terminals. If a tree is the only possible place to attach one end of your antenna, be sure to use a pulley and counter-weight. If long poles are used to support your antenna, they should be made rigid by the use of guy wires, or a pulley and counter-weight should be used.

Usually the supporting wires CC (Illustration 5) are composed of pieces cut from the coil of antenna wire. They should be long enough to make the insulators BB at least two feet from the terminal supports DD, or nearby cornices etc.

When a counter-balanced arrangement is used, the supporting wire C should be *as short as possible*, and the rope R long enough to place insulator B at least two feet beyond all nearby branches. If attached to a tree the supporting wire C should be incased in a piece of garden hose, or otherwise prevented from cutting into the bark.

The lead-in wire E should be soldered firmly to the antenna and the joint bound tightly with electric tape. It should be made to enter the building as far as possible above the ground and *should not be run near to the ground wire F,* nor near and parallel to metal gutters, rain-conductors, electric light and telephone wires, gas, water or heating pipes.

The lightning arrester's ground wire should follow as nearly as possible a straight line from the lightning arrester to its ground.

In most localities it is allowable to ground the lightning arrester on a metal pipe (or other metal object) embedded in the earth or on an exterior or interior water pipe. In order that you may conform to your local requirements, we recommend that you secure a copy of your local "Fire Underwriters' Regulations."

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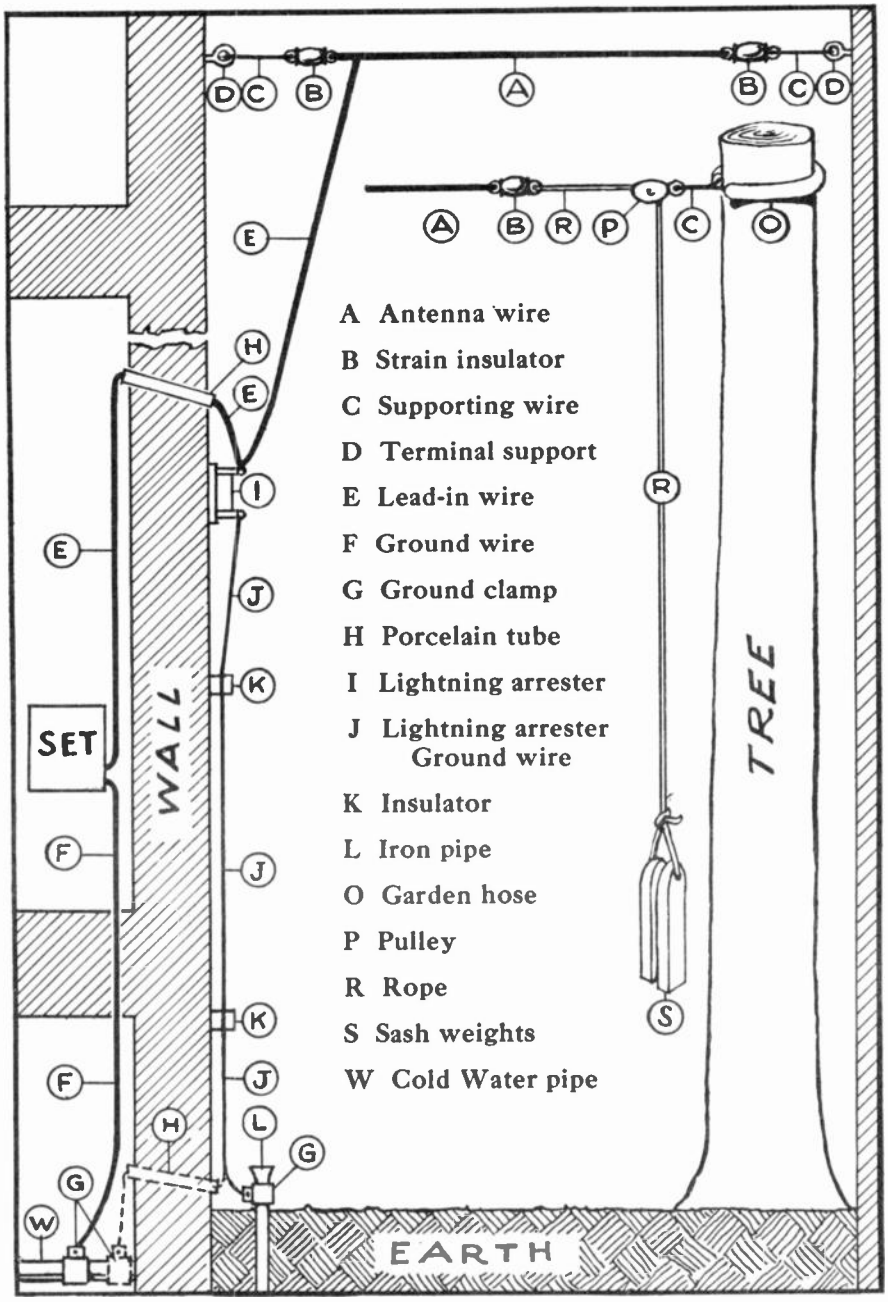

Illustration 5
DETAIL DRAWING OF AN OUTSIDE ANTENNA INSTALLATION

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Sec. 3. INSIDE ANTENNAS.

Whenever possible we recommend a full sized, *outside* antenna but, where this is impossible, very good results can be obtained from a properly installed inside antenna. We do not, however, recommend a "loop antenna" and wherever it might seem desirable or necessary to use one, a carefully planned inside antenna will be found to produce much better results.

In planning an inside antenna, endeavor to place it as high as possible in the building—in the attic or in a room on the top floor of the building.

Illustrations 6 and 7 show respectively an attic and a top floor room installation, both of which have been very successful. The type of antenna shown in Illustration 7 is also suitable for an attic installation.

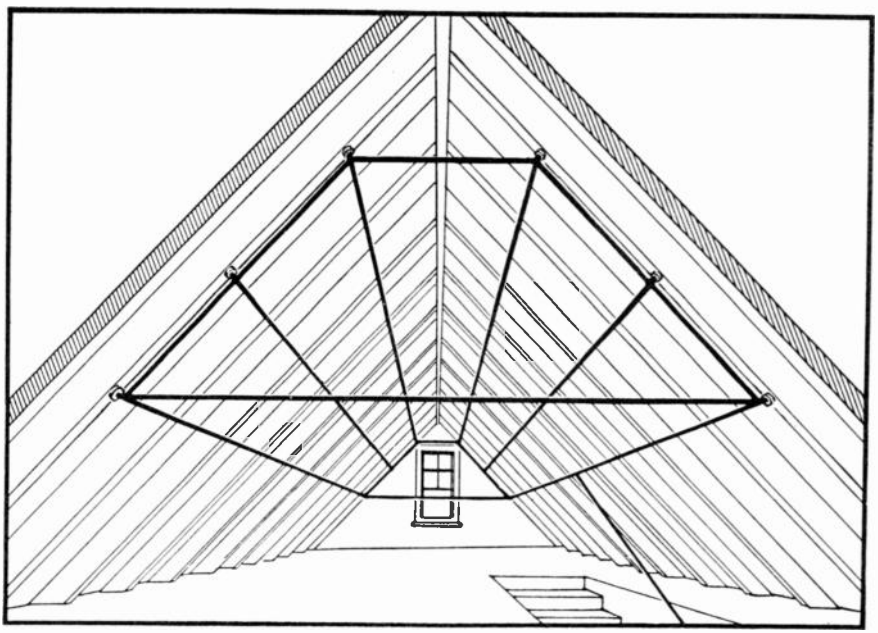

Illustration 6

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In either case insulated wire is preferable, although not absolutely necessary, and the wires should be strung at least 2 feet 6 inches apart and 3 feet or more apart, if possible. In planning antennas of this character it should be remembered that doubling the number of wires does not double the effectiveness of the antenna. In other words, two wires each 50 feet in length or four wires each 25 feet in length are not the equal of a single wire 100 feet in length in a straight line. Hence it is desirable that the total length of the wires used should amount to considerably more than a hundred feet, where ever this is possible.

In installing an antenna in an unfinished attic it is advisable to string the wires on porcelain insulators. *Do not allow the wires to touch electric light wires, and when it is necessary for the antenna wires to pass over or under electric light wires, they should be encased in porcelain tubes or other approved insulating material.*

Poor reception may be experienced if the antenna wires are run near, and parallel to, electric light wires for any appreciable distance.

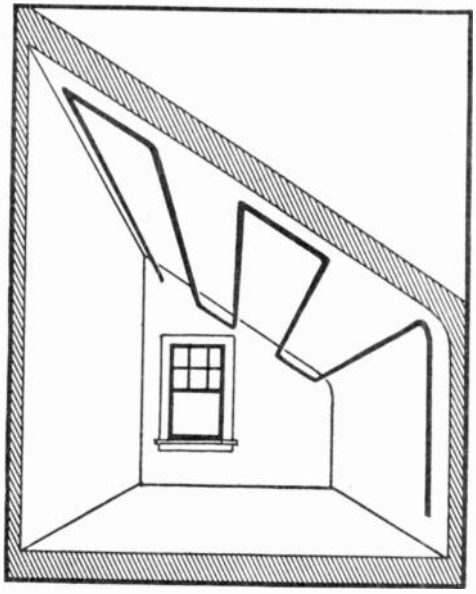

Illustration 7

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Illustration 8 shows an excellent type of antenna for use in a Living Room or any other room of fairly large dimensions.

Usually the antenna wire is laid along the top of a picture moulding and held in place with glass headed tacks or light wire nails.

The results obtained with this type of antenna will depend to a considerable extent on the distance it is located above the ground and the size of the room, which governs the total length of the wire used. Where there are several small rooms, it is often found practical to string the wire around the walls of several of the rooms, although if this be done care should be taken that the wire does not cross itself at any point nor come closer to itself than the breadth of the average doorway—2 feet 8 inches.

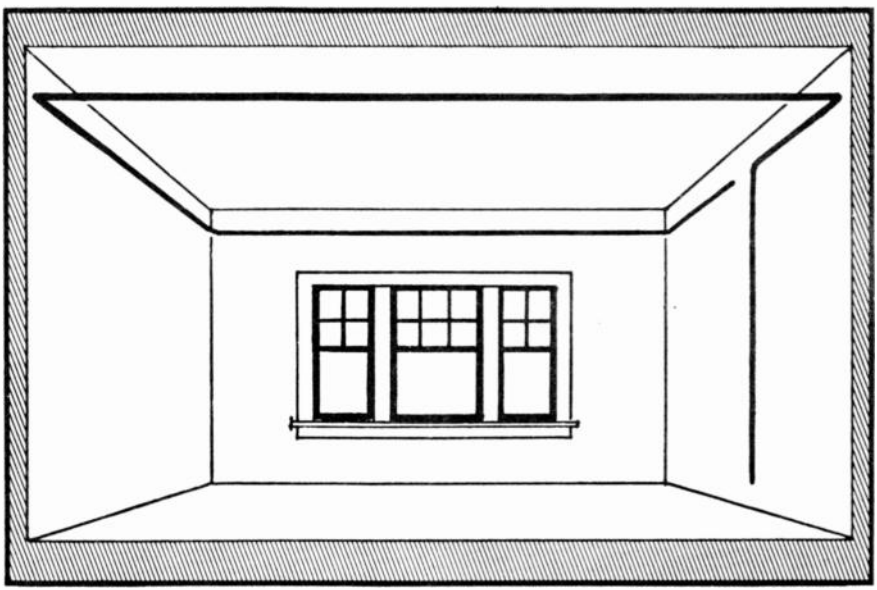

Illustration 8

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CHAPTER 3.

Installing the Receiving Set

LOCATING THE RECEIVING SET AND LOUD SPEAKER. When possible the receiving set should be placed where it will not need to be moved after once being connected to lead-in, ground and batteries. A table, desk or piano bench will make an excellent radio stand, but whatever is used for this purpose should be located as nearly as possible to a point where the antenna lead-in enters the building, and have artificial light for use at night, close at hand. Section 1.

The loud speaker is usually located close to the receiving set, in order to have it near the operator when distant stations are being tuned in, although this is not absolutely necessary. By adding to the length of the cable supplied with the loud speaker or phonograph attachment, either may be placed in any part of the room. For further information see Part III, Sections 6 and 7.

CONNECTING LOUD SPEAKER OR PHONOGRAPH ATTACHMENT TO RECEIVING SET. Sec. 2.

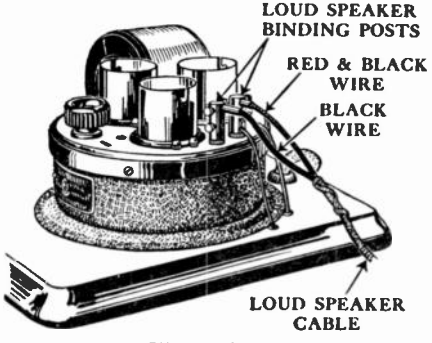

Illustration 9

In the OPEN model receiving sets this is done by inserting the *red and black wire* (issuing from the end of the loud speaker or phonograph cable) into the hole of the plus B binding post on the receiving set, and screwing in the knurled screw. Then attach the black wire to the other binding post. See illustration 9.

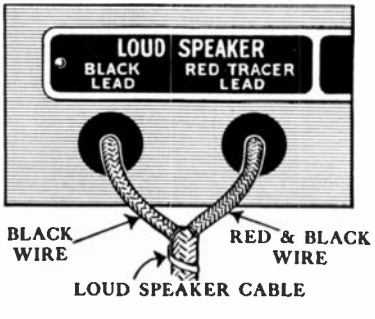

Illustration 10

In the CABINET model receiving sets the connection is made by inserting the red and black wire through the hole in the back of the cabinet marked "red tracer lead" and attaching it to the binding post opposite. The black wire should go through the hole marked "black lead" and thence to its binding post —illustration 10. See illustrations on pages 20, 21 for location of Loud Speaker Binding Posts.

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Sec. 3. Connecting the Antenna Lead-in to Receiving Set

OPEN RECEIVING SET. Unscrew the nut on the binding post (located on the left end of the receiving set) marked "ANT," and, lifting off the small brass washer, wrap the end of the lead-in wire around the binding post screw, place the washer over the wire and screw down tightly (using fingers only) the knurled nut. See illustrations on pages 17, 18 and 19 for location of Antenna Binding Post.

CABINET RECEIVING SETS. Pass the end of the lead-in wire through the hole in the back of the cabinet, marked "ANT" and attach to binding post opposite. See illustrations on pages 20, 21 for location of Antenna Binding Post.

Sec. 4. CONNECTING RECEIVING SET TO GROUND. The next step is to attach one end of the ground wire to the binding post marked "GROUND." On the open receiving set it is located at the left end, and in the cabinet receivers, it is opposite the hole in the back of the cabinet marked "GROUND." See illustrations on pages 17 to 21, inclusive, for location of Ground Binding Post.

The remaining end of the ground wire should be attached to a *cold* water pipe *as near as possible to where it enters the building.* If this is impossible, use any convenient hot water or radiator pipe, *but never a gas pipe.* The objection to a hot water or radiator pipe is the fact that the current must flow through the entire heating system to reach the incoming cold water pipe and thence to the ground (earth) outside. See illustration 5 on page 9.

To make a proper joint between ground wire and water pipe, file or scrape to shiny brightness, a band completely around the pipe and clamp the wire by means of the ground clamp, as tightly as possible on this spot, using screw driver and pliers or wrench.

Sec. 5. LOCATING THE BATTERIES. The best place to put both the "A" and "B" batteries is in the cellar or basement, placing them immediately under the receiving set, so that they will be as near to it as possible.

If it is impracticable to locate the batteries in the cellar or basement, they may be concealed by placing them back of a couch, in a closet, bookcase or other convenient place. However we do not advise the placing of storage batteries in, or near fine furniture, unless special precautions are taken to guard against damage by the acid contained in all storage batteries.

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CONNECTING CABLE OR WIRE TO RECEIVING SET. (Cabinet Models only) We suggest that cable or wires be attached to receiving set before being connected to the batteries. If *cable* is used, first make the connections to the receiving set. If *wires* are used it will be safest to make but *one* connection at a time, that is, place *one* wire in the binding post of the receiving set and connect *that* wire to the proper terminal on the battery. Sec. 6.

NOTE: The tag attached to Atwater Kent Battery Cable is affixed to the end of the cable that is to be connected to the battery.

RUNNING CABLE TO BATTERIES. If batteries are located in the cellar or basement, the battery cable or wires can be run through the floor by boring a ½-inch hole through it. By raising the metal ring which covers the hole (where radiator or other pipes come up through the floor) it is frequently found that this hole is large enough to allow the cable or wires to be slipped down along side of the pipe. Sec. 7.

All excess cable should be coiled up *at the battery end of the installation,* that is, *away* from the Receiving Set. In coiling the cable near storage batteries, care should be taken that it is not laid, or does not pass over the top of storage batteries, otherwise the cable or wire covering is apt to be eaten away by the acid fumes.

CONNECTING CABLE OR WIRE TO "A" AND "B" BATTERIES. On pages 22, 23 and 24 are wiring diagrams showing the proper connections of cable or wire leading from the receiving set to the batteries. Note that four diagrams are given: two for the Open Models, one for Cabinet Models when Atwater Kent Battery Cable is used, and one when wires are used with the Cabinet Models. *Follow your diagram carefully in making your battery connections.* Sec. 8.

Be sure that all storage battery binding posts are bright and clean and that nuts are screwed down tightly, using pliers if necessary. If the storage battery does not have binding posts it is suggested that two lead coated battery "pinch clips" be purchased and soldered to the ends of the battery cable or wires.

CAUTION: Be sure and check most carefully all battery connections before proceeding further.

INSERTING TUBES AND TESTING. (Refer to illustrations on pages 17 to 21 incl.) After all battery connections have been made and checked, insert *one* tube in any one of the tube sockets and pull *out* the battery switch. Now turn *both* rheostat knobs to the right (clockwise). About three-quarters of their total turning distance should be sufficient. When lighted, the tube should glow but faintly with a dull golden color, some- Sec. 9.

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times difficult to see in the day time. If the tube does *not* light up, *again check all battery connections*, as it is possible that you have attached an "A" battery connection to a "B" battery binding post, thus allowing considerably more than 5 volts to be applied to the tube filament, and have burned out the tube. If the battery connections are *absolutely correct,* try another tube in the socket, as tubes are sometimes found to be imperfect after purchase.

By inserting one tube and testing, as outlined above, you will be safeguarded against the possibility of burning out all your tubes in case you have made a mistake in your wiring connections.

If the first tube you insert *burns properly*, you can now proceed to insert the rest of the tubes in the remaining sockets.

NOTE: The Six tube Receivers have *two* rheostats and a switch (see illustration on page 19), all of which must be turned on to light up all six tubes. The knob for switching this last stage of audio amplification on and off is located directly in front of the last two tubes. Turning this to the left (or counter clockwise) cuts out the 3rd audio amplifying tube.

Sec. 10. ADJUSTING THE ANTENNA TAP SWITCH. On the Open Models the ANTENNA TAP SWITCH is placed on the top of the first transformer which is located at the left end of the set. On the Cabinet Models it is located between the first and second dials on the metal panel that forms the front of the cabinet. (See illustrations on pages 17 to 21).

Turn the switch so that the contact spring rests on tap 2, the center tap. This is usually found to be the most satisfactory tap for the average antenna installation, and will no doubt give you excellent results, at least for the initial operation of your set. For further information regarding the functions and uses of the Antenna Tap Switch see PART III, Section 1.

Sec. 11. SUMMARY. If you have followed instructions carefully, you now have your RECEIVING SET properly connected to the ANTENNA and GROUND, the LOUD SPEAKER or PHONOGRAPH ATTACHMENT and the "A" and "B" BATTERIES. Your TUBES are all in their sockets and BURNING PROPERLY, because the BATTERY SWITCH is pulled OUT and BOTH RHEOSTATS are turned about THREE QUARTERS to the RIGHT (clockwise). And lastly, your ANTENNA TAP SWITCH is placed on the SECOND OR MIDDLE TAP.

You are now ready to TUNE your RECEIVING SET to RECEIVE BROADCASTING.

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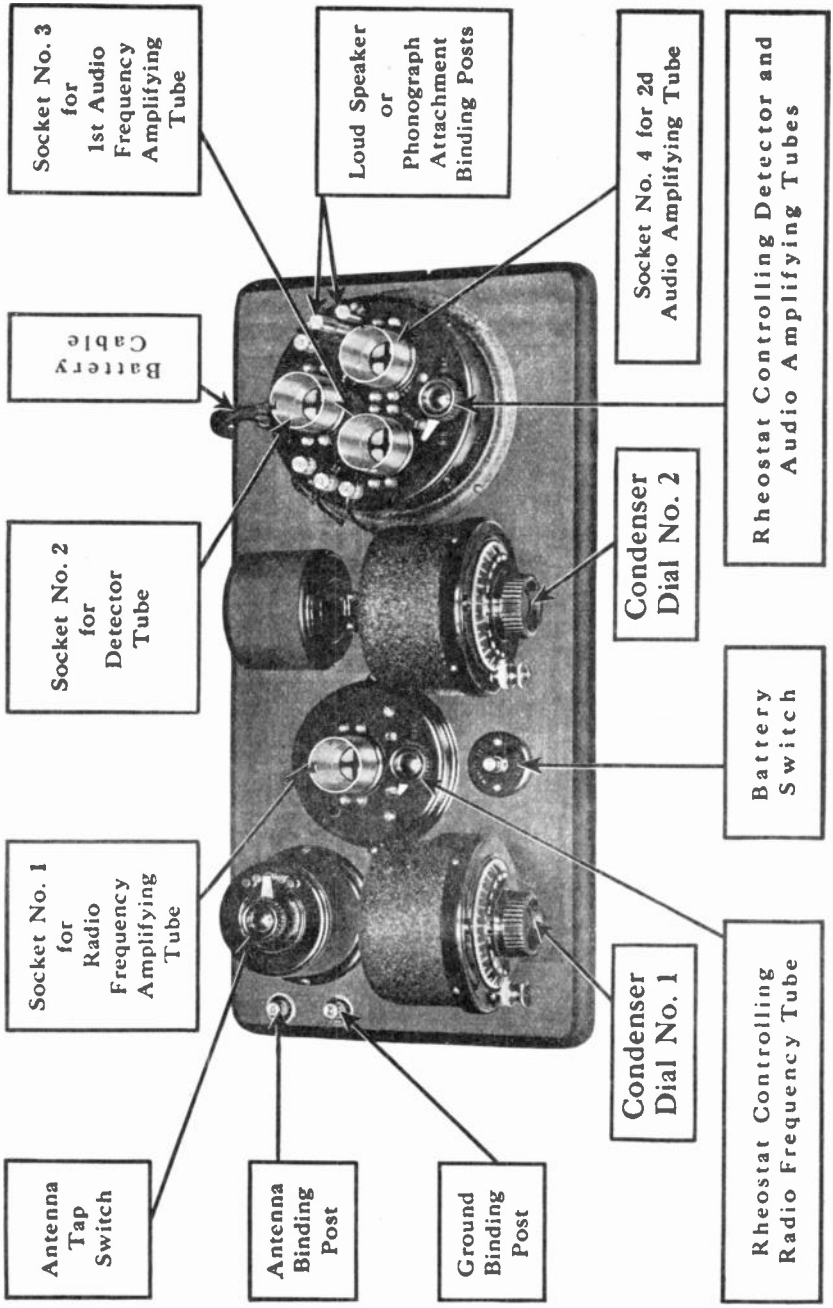

Illustration 11
LOCATION OF CONTROLS, ETC. MODEL 9 RECEIVER

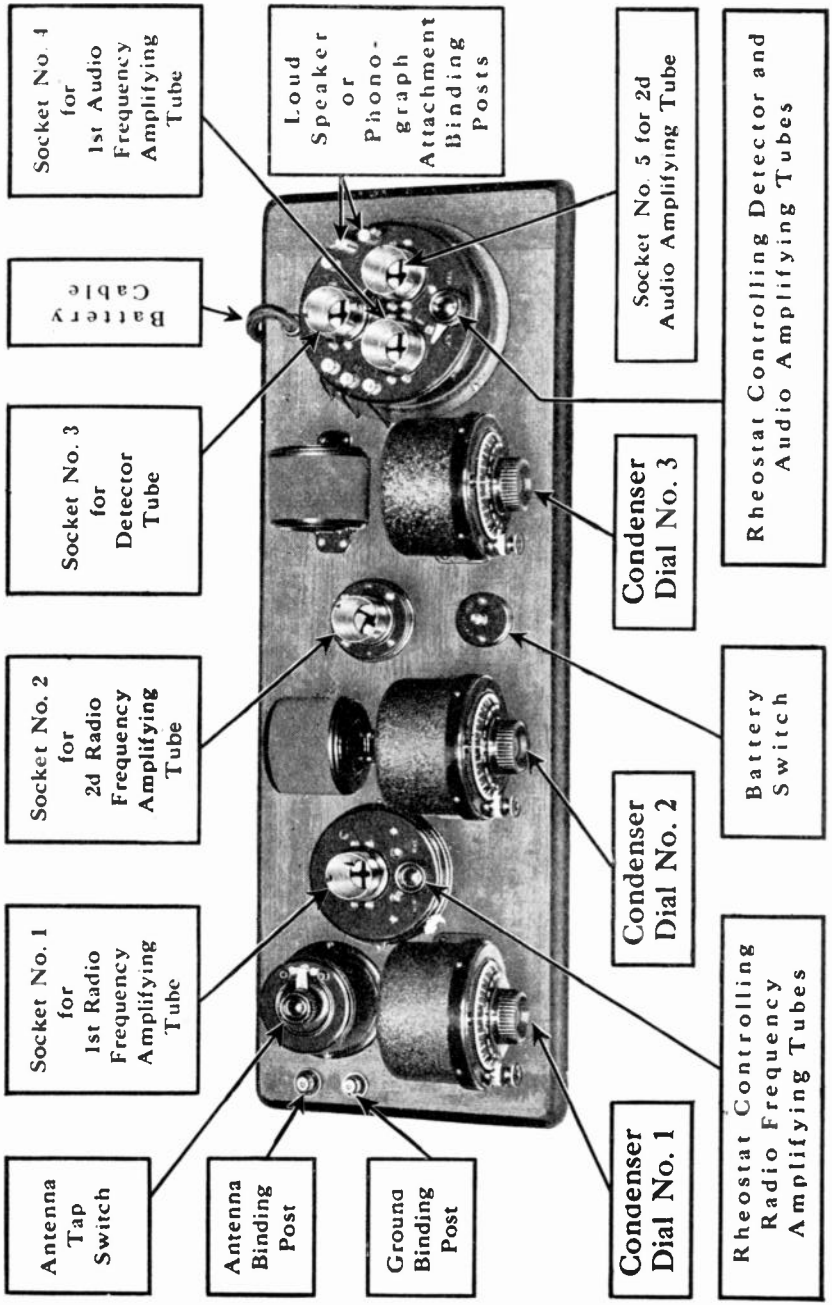

Illustration 12

LOCATION OF CONTROLS, ETC. MODEL 10 RECEIVER

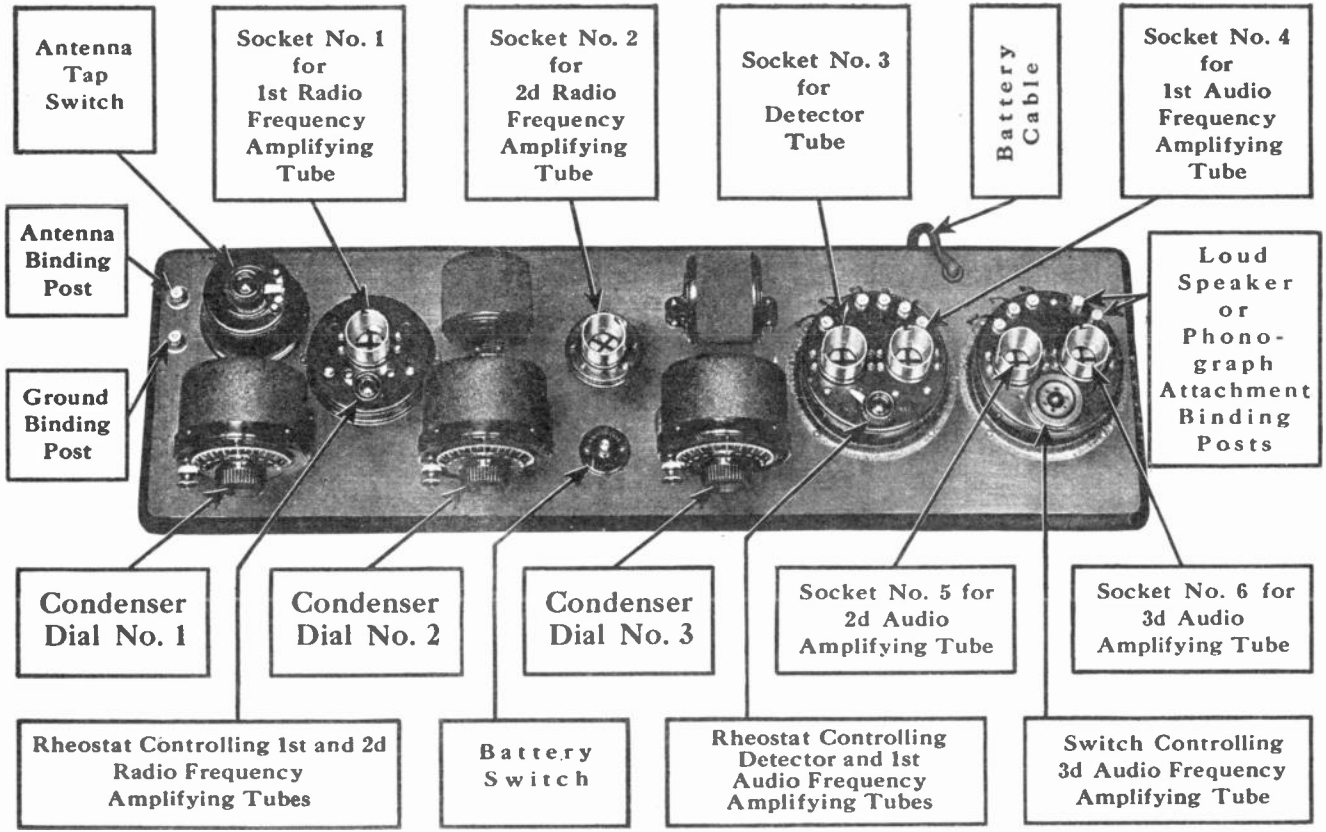

Illustration 13

NOTE: The current supplied to the 2nd and 3rd Audio tubes is automatically regulated, hence no Rheostats are necessary.

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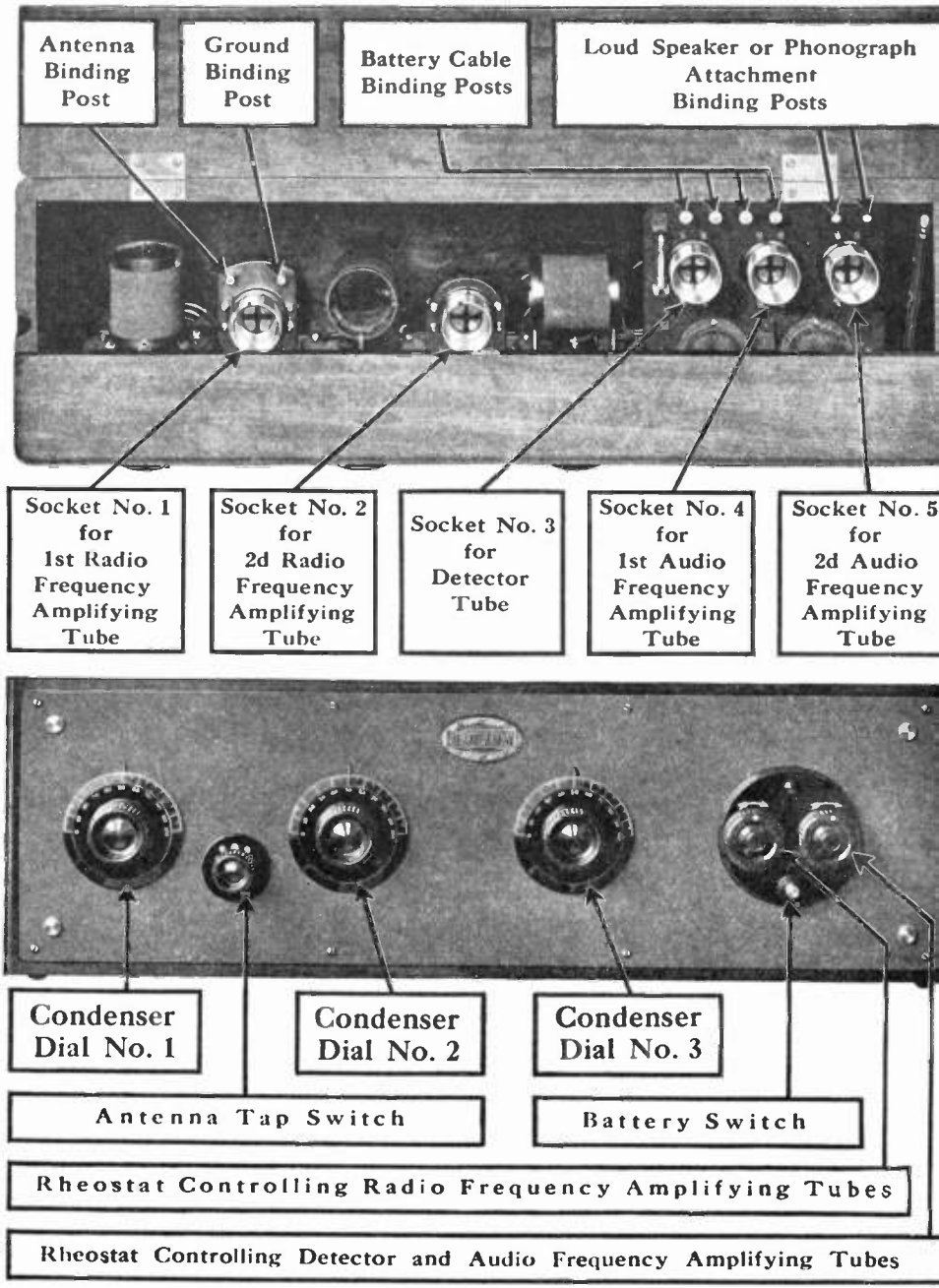

Illustration 14
LOCATION OF CONTROLS, ETC. MODEL 20 AND DE LUXE RECEIVERS

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ATWATER KENT RADIO LOG

1540	1330	1140	950	840	750	690	640	600	570	550	KILO-CYCLES
0	10	20	30	40	50	60	70	80	90	100	DIAL FIGURES

CITY	CALL LETTERS	KILO-CYCLES	DIAL SETTING	REMARKS

FORM F 171

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Atwater Kent Radio Log

KILO-CYCLES	1540	1330	1140	950	840	750	690	640	600	570	550
DIAL FIGURES	0	10	20	30	40	50	60	70	80	90	100

CITY	CALL LETTERS	KILO-CYCLES	DIAL SETTING	REMARKS
FORM F 171				

World Radio History

Atwater Kent Radio Log

KILO-CYCLES	1540	1330	1140	950	840	750	690	640	600	570	550
DIAL FIGURES	0	10	20	30	40	50	60	70	80	90	100

CITY	CALL LETTERS	KILO-CYCLES	DIAL SETTING	REMARKS
FORM F 171				

ATWATER KENT RADIO LOG

KILO-CYCLES	1540	1330	1140	950	840	750	690	640	600	570	550
DIAL FIGURES	0	10	20	30	40	50	60	70	80	90	100

CITY	CALL LETTERS	KILO-CYCLES	DIAL SETTING	REMARKS

FORM F 171

World Radio History

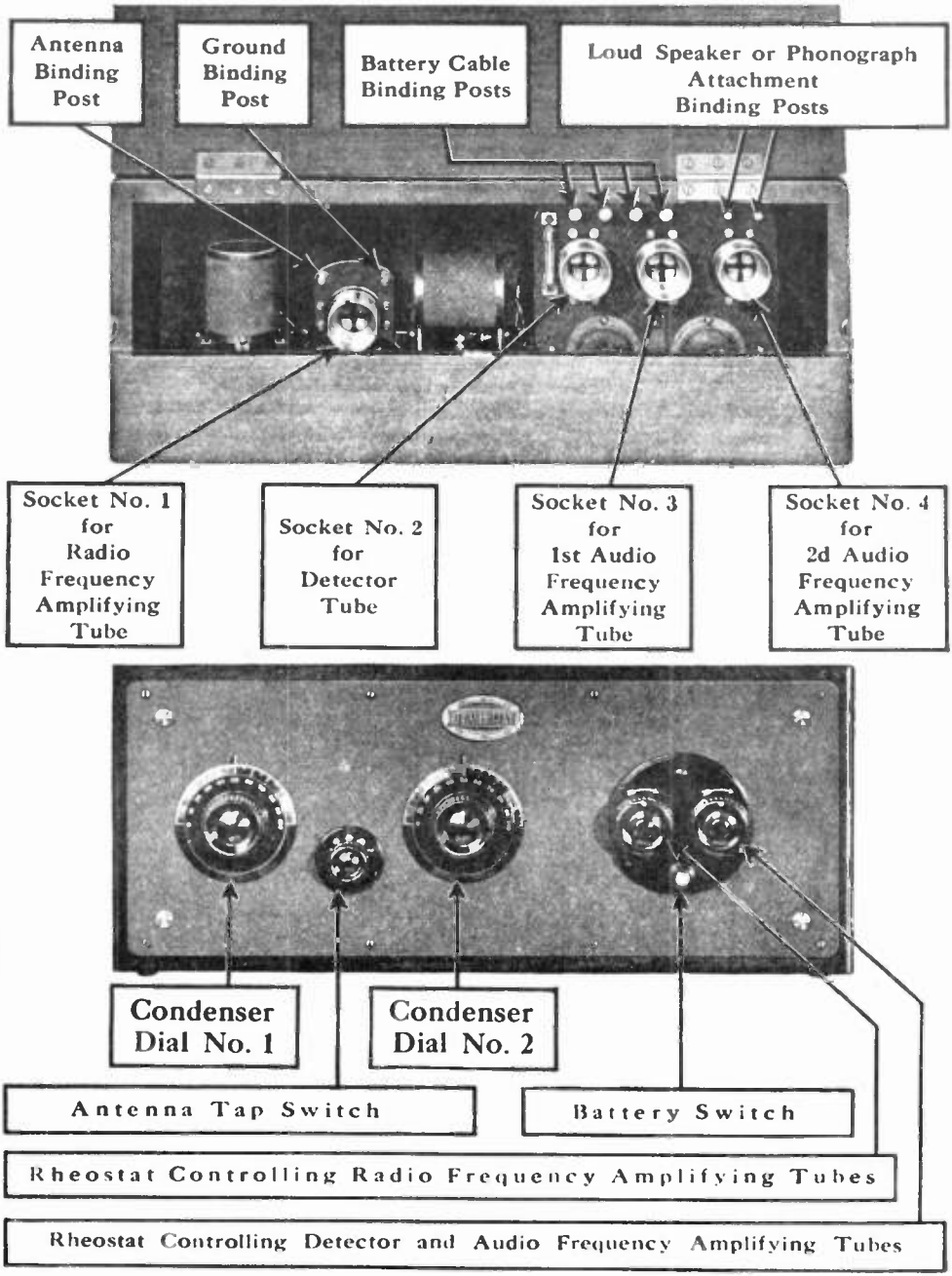

Illustration 15
LOCATION OF CONTROLS, ETC. MODEL 19 RECEIVER

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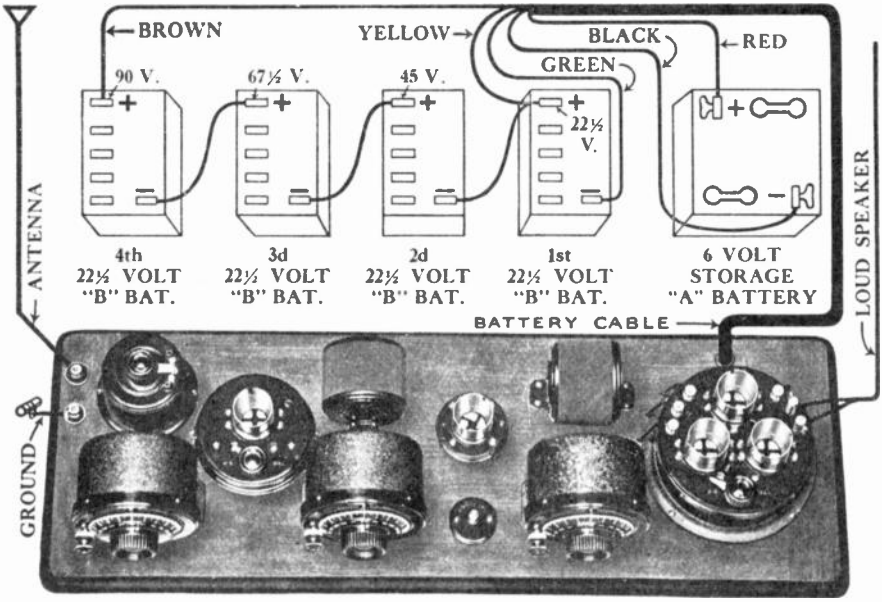

Illustration 16—FOR MODELS 9 AND 10

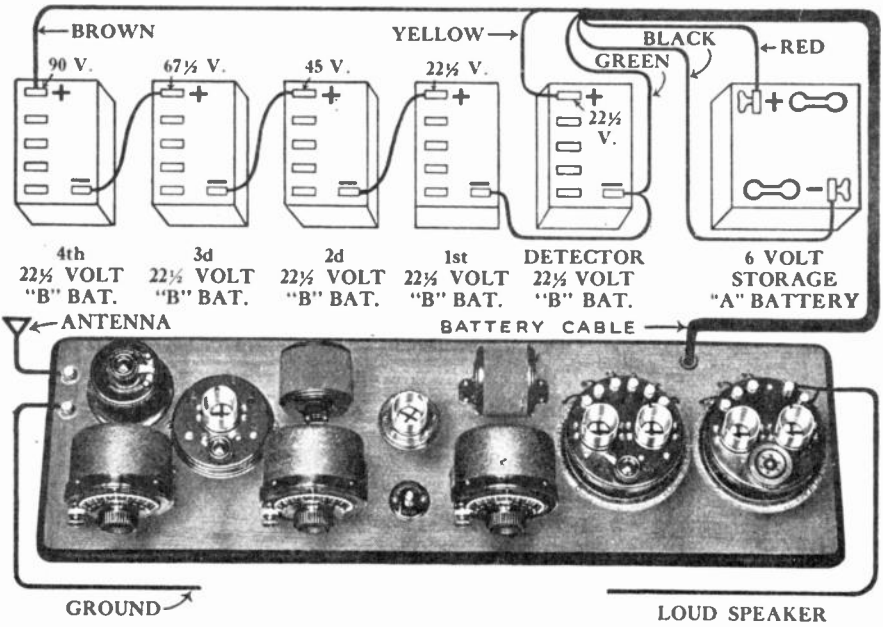

Illustration 17—FOR MODEL 12

NOTE:—A separate 22½ Volt, dry cell "B" battery must be used for the Detector Tube, with the Model 12 Receiver.

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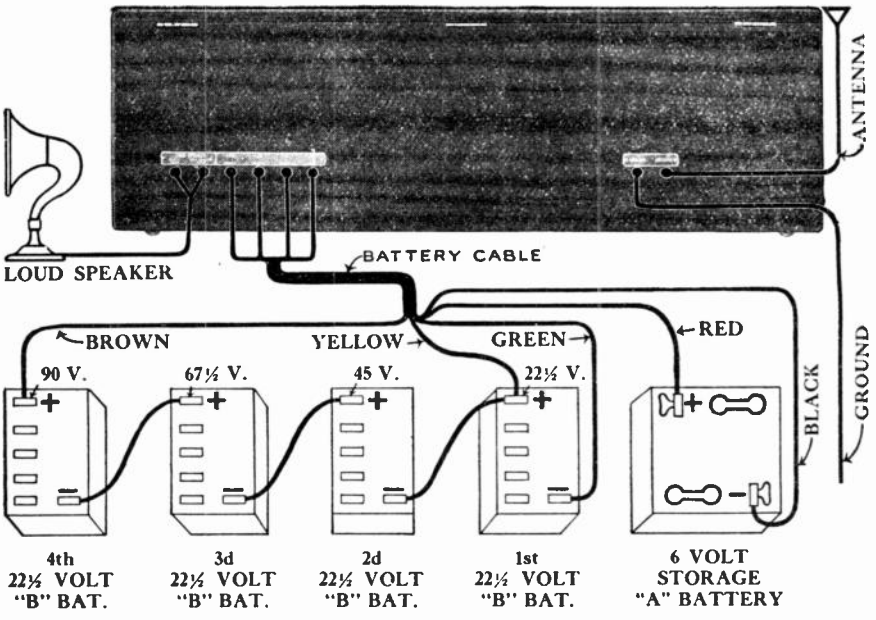

Illustration 18—FOR MODELS 19, 20 AND DE LUXE, USING ATWATER KENT BATTERY CABLE

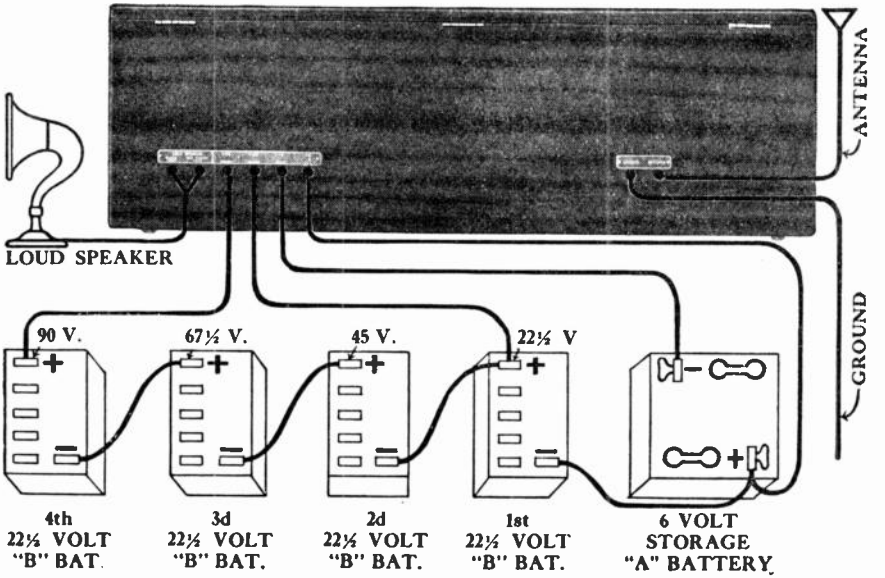

Illustration 19—FOR MODELS 19, 20 AND DE LUXE, USING YOUR OWN WIRES

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Part II.
OPERATION

Section 1. TUNING THE SET TO RECEIVE BROADCASTING. Due to the difference in "day and night range" (see PART V, Section 1 for further information), the best results in radio reception will be obtained after night fall, although even a beginner should experience no difficulty in tuning in a "local broadcasting station" (one that is located within a few miles radius) in daylight hours.

In order to select the broadcasting stations nearest to you, refer to your local newspaper and see what stations are broadcasting at the particular time you are ready to start tuning. Your paper should not only give you the nearest stations broadcasting, but also their respective WAVE-LENGTHS.

Tables on page 27 and 28 give the Wave Lengths of a number of well known broadcasting stations with the DIAL SETTINGS that brought in their broadcasting, using various models of Atwater Kent Receiving Sets. Refer to the table which lists the dial settings for your set, *and pick out from it the Wave Length most nearly corresponding to the Wave Length of the station you wish to try to tune in.* Now turn the dials of *your* receiving set so that the numbers (or divisions) engraved on their outer rims, corresponding to the numbers given in the table, *come directly under the little white line engraved on the receiving set* as shown in illustration 20.

As your particular receiving set may vary slightly from the one used to secure the dial settings given in the tables, or if you are endeavoring to tune in a station with a slightly *longer* or *shorter* wave length than any given in the column headed "WAVE LENGTH," your first setting of the dials may not bring the desired results. In this case the dial to the right (dial No. 3) should be turned a *division* or so to the *right*. Then dial No. 2 should be turned a *division* or so to the *right* and dial No. 1 should be revolved *slowly several divisions to right and left of the number given in the table.*

If no results are obtained continue the operation outlined above by turning dial No. 2 a division or so *to the right*, then dial No. 3 a division

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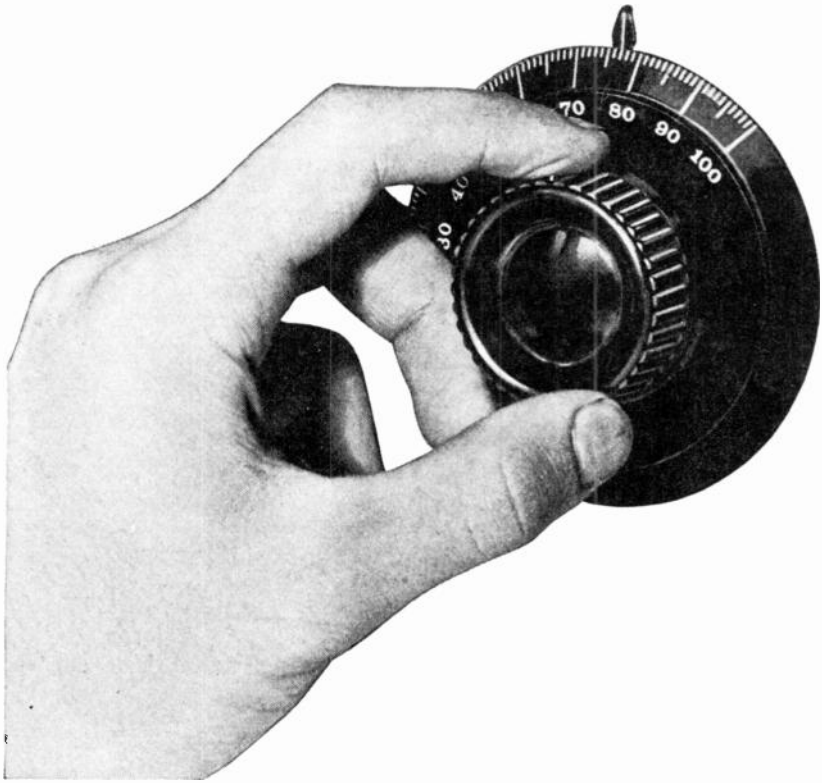

Illustration 20

or so *to the right*, and revolve dial No. 1 *to right and left several divisions*. Continue this operation until all the dials have been turned so that they are five or six divisions to the right of the numbers given in the table.

If, after turning the dials to the right as outlined above, you do not hear signals, *return your dials to the original setting* (the numbers given in the table) and proceed to follow the instructions given in the above paragraphs, only *this time turn the dials to the left.*

When voices or music are once heard, the dials should *each be very slowly* turned to right and left, until maximum volume and clearness are obtained.

Experience will soon show you whether *your* settings should be lower or higher than those given in the accompanying table. The reason that you are instructed to turn dial No. 1 *several divisions* to right *and*

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left instead of but a division or so in one direction, is that your setting for dial No. 1 will practically never correspond to the setting given in our table, as the setting of your dial No. 1 depends on the size of the antenna you have installed.

Do not be discouraged if your first attempts at tuning bring more or less disappointing results; practice makes perfect, and in a very short time you should be able to tune in practically any desired station with rapidity and sureness.

LOGGING THE DIALS. When once a station has been tuned in, it can again be tuned in by turning the dials to the same setting, *provided, of course, that the same station is broadcasting and that atmospheric conditions are the same or better than when the station was originally tuned in.*

It is therefore a good plan to start immediately to keep a "log" of the various stations you have tuned in, writing down the State, City, Call Letters and Dial readings on the log cards supplied with your receiving set. By logging the dials in this way you will soon have a list of stations with accurate dial settings, for ready reference.

IT IS RECOMMENDED that as soon as you feel thoroughly familiar with the operation of your set that you read carefully PART III of this book, dealing with the improvement of reception.

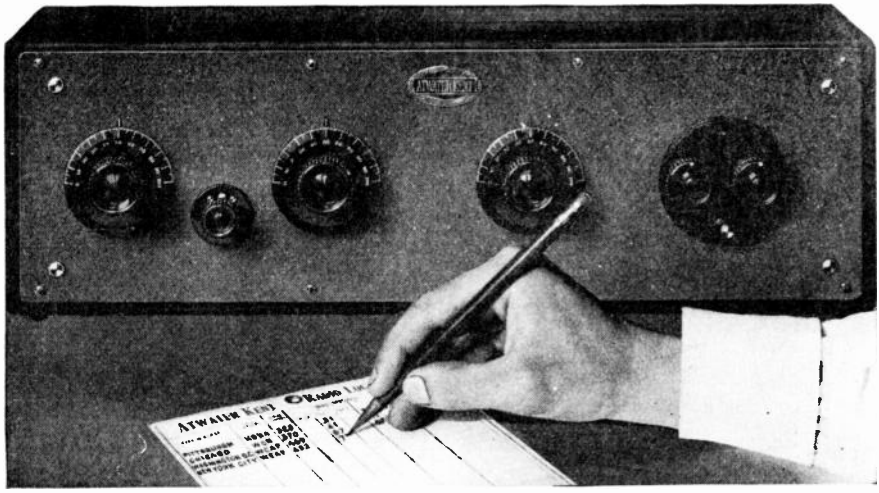

Illustration 21

LOGGING THE DIALS

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Dial Settings for Model 19 Receiver

CITY	CALL LETTER	WAVE LENGTH	DIAL SETTINGS 1 Tap 1	1 Tap 2	1 Tap 3	2
Boston	WNAC	278		19		26
Cincinnati	WSAI	309		24		31
Pittsburgh	KDKA	326		27		33
Springfield	WBZ	337		29		35
Providence	WJAR	360		33		39
Schenectady	WGY	380		38		43
Cleveland	WJAX	390		40		46
Havana	PWX	400		43		48
Newark	WOR	405		44		50
Kansas City	WHB	411		45		51
Atlanta	WSB	429		50		56
Chicago	WMAQ	448		55		61
New York	WJZ	455		56		62
Washington, D. C.	WCAP	469		61		66
Davenport	WOC	484		65		70
New York	WEAF	492		67		72
Philadelphia	WIP	509		73		79
Detroit	WWJ	517		74		80
Chicago	KYW	536		79		85

Dial Settings for Models 20 and De Luxe Receivers

CITY	CALL LETTER	WAVE LENGTH	DIAL SETTINGS 1 Tap 1	1 Tap 2	1 Tap 3	2	3
Boston	WNAC	278		18		22	22
Cincinnati	WSAI	309		24		28	28
Pittsburgh	KDKA	326		27		31	31
Springfield	WBZ	337		30		34	34
Providence	WJAR	360		36		40	40
Schenectady	WGY	380		41		45	45
Cleveland	WJAX	390		43		47	47
Havana	PWX	400		45		49	49
Newark	WOR	405		47		50	50
Kansas City	WHB	411		49		52	52
Atlanta	WSB	429		52		56	56
Chicago	WMAQ	448		57		61	61
New York	WJZ	455		59		63	63
Washington, D. C.	WCAP	469		64		68	68
Davenport	WOC	484		68		72	72
New York	WEAF	492		70		74	74
Philadelphia	WIP	509		76		80	80
Detroit	WWJ	517		78		82	82
Chicago	KYW	536		84		88	88

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Dial Settings for Model 9 Receiver

CITY	CALL LETTER	WAVE LENGTH	DIAL SETTINGS 1 Tap 1	1 Tap 2	1 Tap 3	2
Boston	WNAC	278		17		18
Cincinnati	WSAI	309		23		24
Pittsburgh	KDKA	326		25		26
Zion City	WCBD	345		29		30
Providence	WJAR	360		32		33
Schenectady	WGY	380		36		37
Philadelphia	WFI	395		40		41
Kansas City	WHB	411		44		45
Minneapolis	WLAG	417		46		47
Atlanta	WSB	429		50		51
New York	WJZ	455		57		58
Washington	WCAP	469		61		62
Davenport	WOC	484		66		67
New York	WEAF	492		68		69
Philadelphia	WIP	509		74		75
Detroit	WWJ	517		76		77
Chicago	KYW	536		82		83
St. Louis	KSD	546		85		86

Dial Settings for Models 10 and 12 Receivers

CITY	CALL LETTER	WAVE LENGTH	DIAL SETTINGS 1 Tap 1	1 Tap 2	1 Tap 3	2	3
Boston	WNAC	278		15		16	16
Cincinnati	WSAI	309		21		22	22
Pittsburgh	KDKA	326		24		25	25
Springfield	WBZ	337		26		26	26
Providence	WJAR	360		31		31	31
Schenectady	WGY	380		36		36	36
Cleveland	WJAX	390		38		38	38
Havana	PWX	400		40		40	40
Newark	WOR	405		41		41	41
Kansas City	WHB	411		42		42	42
Atlanta	WSB	429		48		47	47
Chicago	WMAQ	448		53		52	52
New York	WJZ	455		55		54	54
Washington, D. C.	WCAP	469		59		58	58
Davenport	WOC	484		64		63	63
New York	WEAF	492		65		64	64
Philadelphia	WIP	509		71		69	69
Detroit	WWJ	517		73		71	71
Chicago	KYW	536		79		77	77

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Part III.
IMPROVING RECEPTION

Section 1.

CHANGING THE ANTENNA TAP SWITCH. In PART I, under the heading "LOCATING AND ERECTING THE ANTENNA," we explained to you how too *short* an antenna will not collect enough electrical energy to enable you to tune in distant broadcasts, and how too *long* an antenna will collect so much electrical energy from nearby stations that you will be unable to tune them out—that is your set will not be "selective." The Antenna Tap Switch is for the purpose of overcoming these difficulties. When placed on Tap 1 (see illustrations below) it has the effect of *shortening* your antenna, thereby *increasing the selectivity* of your set. When placed on Tap 3 it has the effect of *lengthening* your antenna, thereby *increasing volume*. It was because of this difference in the results obtained, when the first and third taps are used, that we directed you to use Tap 2 when you made your first attempt to tune your set.

If the combined length of your antenna and lead-in are unusually *long* you will no doubt secure best results by using the first or second tap. If the combined length of your antenna and lead-in is comparatively *short*, best results should be secured with the second or third tap. A few experiments will soon show you which tap is best suited to the particular antenna you have installed.

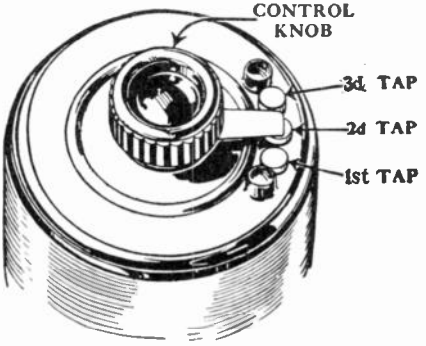

Illustration 22

ANTENNA TAP SWITCH OPEN MODELS

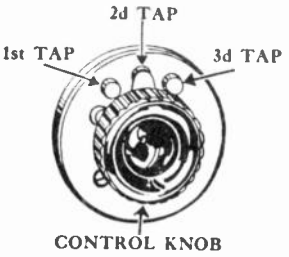

Illustration 23

ANTENNA TAP SWITCH CABINET MODELS

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Sec. 2. ADJUSTING THE RHEOSTATS. Originally you were instructed to turn the rheostat knobs to the right about three-quarters of their total turning distance, but a slight variation of this position for one or both of the rheostats often improves reception. In order to determine the best setting for your rheostats, tune in a distant station, one that comes in with *very little volume* and slowly turn the rheostats to right and left. When the best position for them has been once determined, it is seldom necessary to readjust them, as the operation of the set can be started and stopped by means of the battery switch. However, it is not a bad idea to occasionally check up their setting, as others who use your receiving set are apt to tamper with them.

It should be remembered that the less distance the rheostats are turned on the longer your tubes should last, because the less they are turned on, the less current flows through their delicate filaments. For the same reason, the less the rheostats are turned on, *the less drain there will be on your batteries—hence the longer they will remain efficient and give satisfactory results.*

FOR LOCAL RECEPTION. Often it is found that broadcasts received from local stations are too loud. This may be overcome by de-tuning, or, by turning the rheostats almost all the way off. The latter has the added advantage of saving battery current and tubes.

Sec. 3. DETERMINING WHICH OF YOUR TUBES ARE BEST SUITED FOR SOCKETS 1, 2 and 3. It is quite usual to find that out of every set of tubes bought for your receiving set, certain of them will give better results when used in sockets 1, 2 and 3 than when used in any of the other sockets. Hence it is a good plan to take steps to determine which tubes are best suited for these particular sockets. (See illustrations on pages 17 to 21).

The test should be made as follows: Tune in a rather distant station, one that does not come in with any great volume. With all tubes burning, *interchange* tubes from sockets 1 and 2, and adjust the first rheostat so as to secure maximum volume. Note carefully any betterment in reception, then replace the tubes in their original sockets and try the same experiment by interchanging the tubes from sockets 1 and 3. Then interchange 1 and 4. *In each case be sure to adjust the first rheostat to secure maximum volume and note carefully any improvement in reception.* If yours is a five or six tube set, proceed with the experiment until you have tried out all the tubes you have.

It may be necessary to try the same experiment with certain tubes over again several times before you can be sure which one brings in the very best results, when placed in socket No. 1.

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When you finally determine which tube is best for Socket No. 1, *leave it there* and proceed to try the same test with the remaining tubes, by placing them alternately in Socket No. 2. If yours is a five or six tube set, proceed with the test *by placing the remaining tubes alternately in Socket No. 3,* the Detector Tube Socket.

The remaining tubes will doubtless prove satisfactory when placed in the remaining sockets—the Audio Amplification Tube Sockets, *however,* if any of your tubes were found to give very weak signals when tested in Sockets 1, 2 or 3 (the Radio Frequency Amplification and Detector Tube Sockets) *they should be immediately returned to your dealer to be tested,* so that they may be returned to the manufacturer if found defective.

Sec. 4. USING A SEPARATE "B" BATTERY FOR THE DETECTOR TUBE. Often a slight whistling noise occurs after the "B" batteries have been used for some time, caused by the fact that the No. 1 battery supplies current to the Detector as well as the Amplifying Tubes, thus weakening the first "B" battery before the others are affected. When this whistling occurs the first "B" battery should be replaced. In order to guard against this possible trouble, some owners use a separate "B" battery to supply current to the Detector Tube, altering their wiring connections as shown in illustration 17, page 22.

Sec. 5. ALTERING THE LENGTH OR HEIGHT OF AN ANTENNA OR CHANGING ITS SHAPE. If after you have made the tests and experiments with your Antenna Taps, Rheostats and Tubes, you still feel that you are not getting the best possible results in the way of reception, you might find it advantageous to study over your present antenna installation with the idea of bettering it.

The two things that your antenna has most to do with, are volume and selectivity. If you think you should be getting more volume, you might experiment with ways and means of lengthening your antenna, *preferably in a straight line.* If this is impossible and your antenna is very short, that is, under 50 feet in length, you might try placing two or more wires in parallel. Details showing how the wires should be spaced and attached to the "spreaders," etc., are shown on page 32. *It should be noted, however, that doubling the number of wires does not double the effectiveness of the antenna.* As an example, two wires each fifty feet long, stretched parallel to each other are not twice as effective as one fifty foot wire, nor are they equal to a single wire 100 feet long in a straight line.

Another method of increasing volume is to *raise your antenna higher above the ground.* And by "ground" we do not mean simply the earth,

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but any surface that may act as a ground, such as a roof, tree, chimney or the like. Speaking generally, an antenna cannot be raised too high, unless by so doing the lead-in wire is increased in length to such an extent as to make the combined length of antenna and lead-in so great as to affect selectivity.

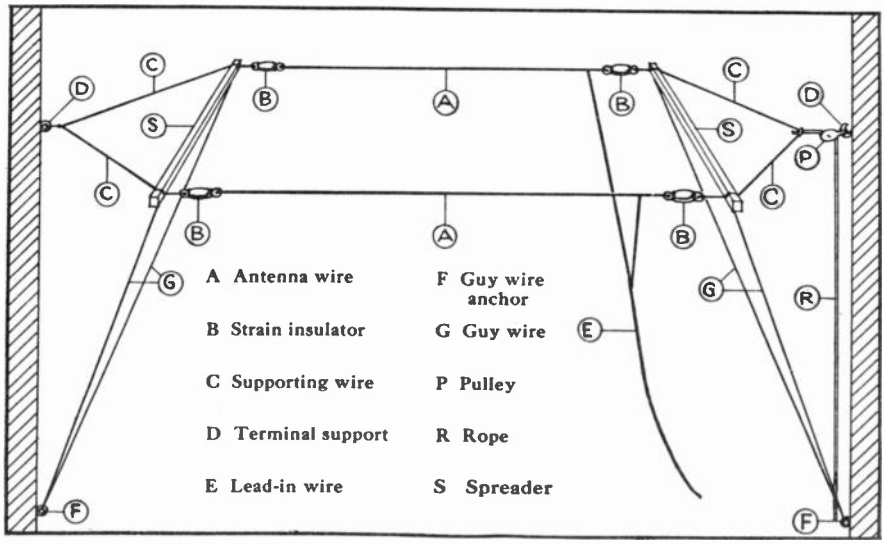

Illustration 24

Note: The minimum width of the "Spreaders" should not be less than 2 ft. 6 in. and 3 ft. or more if possible.

If you have ample volume but lack selectivity, it may be that your antenna is *too long*. In this case the remedy should be easy to apply—simply shorten your antenna by cutting off a piece from the end furthest from the lead-in, as illustrated below.

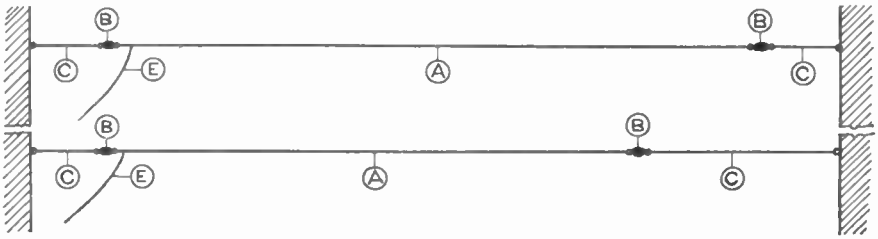

Illustration 25

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CHANGING THE LOCATION OF THE LOUD SPEAKER OR PHONOGRAPH ATTACHMENT. Sec. 6. While it is usually desirable to have the Loud Speaker located *close to the Receiving Set,* so that it is easily heard when tuning in a distant station, it is sometimes found advantageous to move it to another part of the room so that the natural acoustical properties of the room can be used to maximum advantage.

USING ONE OR MORE LOUD SPEAKERS IN ADDITION TO THE ORIGINAL LOUD SPEAKER OR PHONOGRAPH ATTACHMENT. Sec. 7. If your receiving set is located in an unusually large room and you wish to entertain a goodly number of people, either seated or dancing, it is recommended that you try the effect of using one or two Loud Speakers *in addition* to your original Loud Speaker or Phonograph Attachment. They should be placed in widely separated parts of the room and should be wired in parallel—that is, all red tracer wires should go to one binding post on the receiving set and all black wires to the other.

It is claimed that the use of more than one Loud Speaker assures that the volume of sound, heard in all parts of the room, is of practically the same intensity.

ADJUSTING ATWATER KENT LOUD SPEAKERS OR PHONOGRAPH ATTACHMENTS. Sec. 8. The adjustment mechanism is not to be considered as an aid to better tuning, to be constantly changed. All Loud Speakers and Phonograph Attachments are tested for volume and tonal quality, and *are adjusted by experts,* before leaving our factory. Under ordinary conditions, and when used with Atwater Kent Receiving Sets, the factory adjustment should prove entirely satisfactory. If, however, the adjustment has been tampered with or is not just as it should be, due to some other cause, it is very easily readjusted. Simply tip back the Loud Speaker on its base, while a powerful station is tuned in, and turn the knurled cap (located in its base) to right or left until maximum volume and clearness are obtained. Usually, it is best to start *by turning to the right (clockwise) until the music or voices suddenly become muffled,* often accompanied by a rattle and general loss in volume. Then, *very slowly and carefully* turn the knurled cap *to the left* (counter clockwise) until the voices or music suddenly come out clear, loud and free from rattle. STOP ADJUSTMENT AT THIS POINT—to turn further only reduces the clarity and volume of tone. The Phonograph Attachment is adjusted in the same manner.

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Part IV.
MAINTENANCE

Proper care of your batteries will go further towards assuring continued and successful operation of your receiving set than any other thing you can do. Many times when poor reception is blamed on the receiving set, the fault lies with the operator, who has neglected to keep storage batteries charged or has allowed dry batteries to run down until they are practically worthless.

Section 1. CARE OF STORAGE BATTERIES. All first-class manufacturers of storage batteries supply their customers with full information as to the proper care and maintenance of their batteries. *Be sure to get their printed instructions and read them through carefully.*

CAUTION: Never use a lighted match, candle or other flame to see if the battery needs to be filled with water, as the fumes of the acid inside are explosive. If your battery is located in a dark room use a regular electric light or flash light, or disconnect the battery and carry it to the daylight or to a place where an electric light is located.

Sec. 2. CHARGING STORAGE BATTERIES. To possess your own battery charging apparatus is an advantage, but care should be exercised in its use. Always disconnect *both* the wires (running from the battery to the receiving set) from the storage battery before connecting the battery charger wires to the storage battery and starting the charger.

A better method is to use a two-way switch (see illustration below) in which case all chance for accident is eliminated.

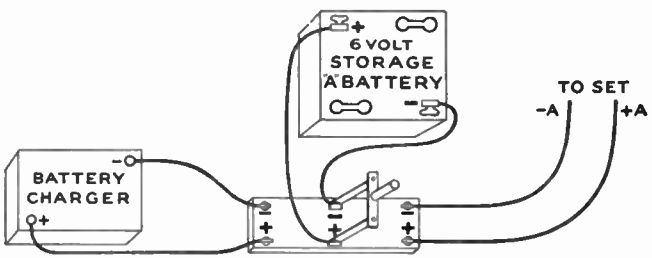

Illustration 26

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The frequency with which it will be necessary for you to charge your battery will depend on the ampere hour capacity of the particular battery you possess, and the length of time you use your set between charges; to determine this a frequent check should be kept on charging by use of a "hydrometer" unless some other means is included with the battery. The use of a voltmeter is not recommended for checking the "A" battery as it does not give a true indication of the "A" battery's condition, but *a battery should be charged at least once each month whether the receiving set has been used or not, so that deterioration in the battery will be prevented.*

The length of time your battery should be charged at any one time will depend upon its capacity (in ampere hours) and the rate with which your charger charges, but always check by use of a hydrometer unless some other means is included with your particular battery.

Due to the fact that corrosive fumes are given off from storage battery when it is being charged, it is recommended that it be removed from any cabinet or other piece of fine furniture while being charged.

It is advisable to allow an hour's time to intervene between the time that you stop charging a *storage "B"* battery and the time you begin to use your set, otherwise you may be bothered with a crackling noise during reception. This is not the case with storage "A" batteries, which may be used immediately after charging is discontinued.

CARE OF DRY "B" BATTERIES. Run down "B" batteries are one of the most frequent causes of poor reception. *In order to guard against this trouble we recommend that you purchase a high-grade "voltmeter" and test the voltage of your "B" batteries at frequent intervals.* A 22½ volt "B" battery is practically useless when it registers *less than 17 volts.* As one "dead" cell or battery will stop the flow of current through all the rest, it must be removed and replaced with a new one to secure satisfactory results. Sec. 3.

TUBES. As all tubes deteriorate in time, it is suggested that at least once a year all tubes be taken to your dealer for testing, or borrow an extra tube (one known to be perfect) and try it out in each socket in turn, thus comparing each of your old tubes with it. Sec. 4.

WIRING CONNECTIONS. Due to jarring and vibration, wiring connections are sometimes loosened, and it is recommended that at least once a month *all binding posts on both the receiving set and batteries* be gone over and all knurled nuts screwed down as tightly as possible, *using the fingers only.* Sec. 5.

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Part V.
Some Causes of Poor Reception

Section 1. DAY AND NIGHT RANGE. Reception of broadcasting is always very much better after night fall. It is considered good reception conditions when a standard five tube set will bring in satisfactory broadcasting from stations located not more than 200, or even 100 miles away, *in the day time.* Whereas, under the same conditions the same set will bring in with volume and clearness, *at night,* stations located more than 1000 miles distant.

Sec. 2. ATMOSPHERIC CONDITIONS. One of the most usual causes of poor reception is due to atmospheric conditions. If you suddenly experience trouble in bringing in more or less distant stations, and your tubes are comparatively new and your batteries seem all right when tested, call up one or more neighbors and find out if they are experiencing the same difficulty—if they are, you can feel pretty sure that your trouble is not due to any part of your radio installation. However, if your neighbors are *not* experiencing the difficulty that you are encountering, you had better go over your complete installation in order to locate the possible cause of the trouble. Some of these possible causes are as follows:

Sec. 3. LOOSE OR CORRODED WIRING CONNECTIONS. Try tightening all knurled nuts and examine all connections to see that they are bright and clean.

Sec. 4. DEFECTIVE LIGHTNING ARRESTER. Test for this trouble by disconnecting the wire leading from the arrester to its ground, and see if it makes any difference in reception—if it does, put in a new lightning arrester.

Sec. 5. DEFECTIVE OR WORN OUT TUBES. See PART IV., Sec. 4.

Sec. 6. ANTENNA GROUNDED OR BROKEN DOWN. Examine your antenna and make sure it is not broken down, or that it has not sagged down on, or near some object that is grounding it. Or it may be that other wires, branches of a tree or the like, have sagged down or been blown across your antenna. Follow this examination of your antenna by a study of your lead-in, from where it is attached to the antenna to where it is attached to the receiving set. See PART I. Chapt. 2. Sec. 2.

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CABLE FROM RECEIVING SET TO BATTERIES IMPROPERLY PLACED. See PART I, Chapt. 3, Sec. 7. Sec. 7.

"FADING." The "fading" of signals, which means that the voices or music first come in distinctly, then fade away only to come in strongly after a short period of time, can hardly be classed as poor reception, for, as a rule this condition will be found to exist with only one or two stations on a given evening, while broadcasting will be heard from other and equally distant stations, without intermission or fading of any kind. Fading is attributed to atmospheric conditions that are more or less localized and therefore do not affect all broadcasting reception on any given night. Sec. 8.

Part VI.
Some Causes of Disturbing Noises

Noises that disturb the pleasure of Radio Reception can be divided roughly into two classes: noises generated in some part of your Radio Installation—usually easily remedied, and noises due to conditions outside of your Radio Installation—often difficult or impossible to remedy.

To find out whether the disturbing noise is generated *inside* of your Radio Installation, tune in a station and then disconnect the antenna lead-in and ground wires from the receiving set. *If the noise continues* it is no doubt, due to something *inside* of your installation—most likely your batteries. Look to your "A" battery terminals to be sure they are not corroded, but are bright and clean. Next, test your "B" batteries and note whether all cells register the required voltage. See PART IV, Sec. 3. and the voltages required as noted on the "WIRING DIAGRAMS." Pages 22 and 23.

A CRACKLING, SIZZLING NOISE is usually due to run down "B" batteries, and can be remedied by replacing the exhausted batteries with new ones. Sec. 1.

A SLIGHT WHISTLING NOISE is often due to the fact that the No. 1 "B" battery, which supplies the Detector, as well as the Amplifying Tubes, is run down or exhausted, even though the rest of the batteries (or cells) are in excellent condition. By replacing the first "B" battery with a new one this trouble should disappear. See PART III, Sec. 4. Sec. 2.

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Sec. 3. A CONTINUED SINGING NOISE. Heard while the set is connected to the antenna and ground. Sometimes due to the fact that the Loud Speaker is placed too close to the Receiving Set—try moving it further away from the set and see if the noise stops.

Some other noises, usually due to conditions *outside* of your radio installation, are as follows:

Sec. 4. A CONSTANT, HIGH PITCHED WHISTLE. This is known as a "hetrodyne whistle" and is due to the fact that another station is broadcasting on the same, or very nearly the same, wave length as the station you have tuned in. Very fine tuning will sometimes better the condition but as a rule, it is best to give up attempting to tune in the station you are endeavoring to tune in, until the other station has signed off.

Sec. 5. SCREECHING OR "BOB WHITE CALLS." These noises vary in intensity and are usually due to some other receiver that is being tuned in, in your immediate neighborhood. Nothing can be done to remedy this trouble—it is a case of "grin and bear it." *However,* you should remember that *your Atwater Kent Set does not radiate,* hence it *does not annoy others as your neighbor is annoying you.*

Sec. 6. A CONSTANT CRACKLING, CLATTERING AND CRASHING. Usually due to static electricity generated in the upper atmosphere, which is picked up by your antenna wire and runs through your receiving set to the earth (ground). These noises are known as "static," and while a perfectly harmless phenomena, are at times exceedingly annoying. Nothing can be done to remedy them, but a change in the weather will entirely dispel them and reception will again be "as clear as a bell."

Sec. 7. A CONSTANT HUMMING. Usually due to a dynamo located somewhere in your immediate neighborhood, or even at a distance, in which latter case the hum of the dynamo is transmitted through electric light or power wires, near which you have placed your antenna or lead-in. This is particularly apt to be the case if your antenna *parallels* electric light or power lines. By changing the location, or altering the direction of your antenna, you may be able to eliminate, or at least reduce this trouble.

Sec. 8. A CONTINUED OR INTERMITTENT BUBBLING. Often due to a so-called "leak" in a nearby high powered electric transmission line and most apt to be noticed in wet weather.

Sec. 9. OTHER NOISES. There are numerous other conditions that may cause annoying noises, such as X-Ray, Moving Picture or Violet Ray machines, located either in the same building that you are in or in

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your immediate neighborhood. Or near you may be an arc light, flashing electric sign, an electric welder or a similar electrical device. Likewise any piece of apparatus using an electric motor, such as a vacuum cleaner, air pump, vibrator, etc., is apt to cause annoyance at various times.

❦ ❦ ❦ ❦

In concluding we would like to impress upon you that *almost invariably* you will find that poor reception, disturbing noises and other like troubles are *not* due to any defect in your Atwater Kent Receiving Set, Loud Speaker or Phonograph Attachment, provided they have not been tampered with since leaving our factory.

All parts used for the assembly of Receiving Sets are thoroughly tested, and the completed sets are carefully inspected and tested for actual receipt of signals. All Loud Speakers are tested for tonal quality and volume, and are adjusted to give maximum results.

If you experience trouble of any kind in operating your set, *first* study over your installation, starting with your batteries, then the wiring, tubes, antenna, lead-in and ground, before you decide that the trouble lies in the receiving set or loud speaker. If, after carefully examining and testing the various parts of the installation, as suggested in the various parts of this book, you are convinced that the receiving set or loud speaker is at fault, *do not attempt to locate and remedy the trouble yourself, but take the set or loud speaker to your dealer for examination by his experts.*

Warranty

All Atwater Kent Receiving Sets, Loud Speakers and Phonograph Attachments are warranted to be perfect when they leave our plant. A printed warrant and guarantee covering the terms on which we will replace or repair defective equipment accompanies each piece of Atwater Kent Apparatus.

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