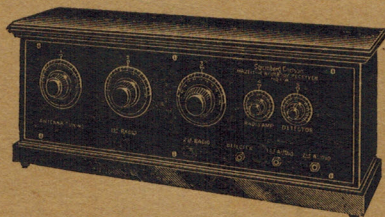


*Instructions for Installing  
and Operating the*

**Stromberg-Carlson**



*No. 1-A*  
**NEUTRODYNE RECEIVER**

*MAY 20, 1924*

**Stromberg-Carlson Telephone Mfg. Co.**

ROCHESTER, N. Y., U. S. A.

CHICAGO, ILLINOIS

KANSAS CITY, MO.

TORONTO, CANADA

15745



INSTRUCTIONS FOR INSTALLING AND  
OPERATING THE

Stromberg-Carlson

No. 1-A NEUTRODYNE RECEIVER

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**Why Detailed Instructions Are Furnished:**

In general, the installation and operation of the Stromberg-Carlson No. 1-A Neutrodyne Receiver follows that of other licensed Neutrodyne sets, therefore, no special instructions are required for the experienced Neutrodyne operator.

This instruction book goes into considerable detail regarding installation and operation, so that persons not acquainted with radio receiving sets, and in particular, the Neutrodyne type of receiver will be able to make a good, reliable installation and get full value from the Stromberg-Carlson No. 1-A Neutrodyne Receiver.

It is suggested that every owner of one of these sets read the whole of this book and in particular the paragraphs on **operation**, **tubes**, and **batteries**, as the continued success of any radio receiver depends on these items.



## **Stromberg-Carlson No. 1-A Receiver Is a Licensed Neutrodyne Type:**

The Stromberg-Carlson No. 1-A Receiver is the straight-away (non-reflexed) five-tube Neutrodyne type, in which two tubes are for the tuned radio frequency circuit, one tube for a detector and the remaining two tubes for audio frequency amplification.

The Stromberg-Carlson Telephone Mfg. Co. is licensed by the Independent Radio Manufacturers, Inc., under the Hazeltine Patents, Nos. 1450080 and 1489228 and other patents pending, to manufacture and market this Neutrodyne Receiver.

The cabinet is designed to contain the receiving apparatus only, thereby allowing the purchaser to select and use any size or type of batteries and loud speaker. (See articles on Battery and Loud Speaker Requirements.) Each No. 1-A Neutrodyne Receiver has attached to the inside of the cabinet (in full view when cabinet cover is raised) a metal license plate bearing a serial number. It is important that this name plate be not removed, as it serves as a means for identifying the particular receiving set and is a part of the maker's guarantee of reliability.

## **Unpacking the Receiver and Cleaning Woodwork and Panels:**

Each packing box for the Stromberg-Carlson No. 1-A Receiver contains the following:

- 1—No. 1-A Neutrodyne Receiver in Mahogany Cabinet.
- 1—Calibration curve attached to inside of cabinet cover.
- 1—No. 2-A Headset complete with cord and plug correctly attached. (Enclosed in carton at end of packing box.)
- 1—Instruction Book (placed inside of cabinet).
- 4—Station Log Cards (placed inside of cabinet).
- 1—Return Postal Card for recording guarantee date at the Stromberg-Carlson Telephone Mfg. Co.'s factory.

The hand rubbed finish of the No. 1-A Receiver Cabinet is protected from damage in shipment by a wrapping of waxed paper. If any of this wax adheres to the finish, it can be removed with dry, soft cheesecloth, rubbing this cloth in the direction of the woodwork grain. Be sure not to rub in a circular motion or across the grain, as this may cause markings to show on the finish.

## **Materials Required for a Permanent Neutrodyne Receiver Installation:**

While the materials actually required for operating the Stromberg-Carlson No. 1-A Neutrodyne Receiver are as few as for any other radio receiving set of equal sensitivity, selectiveness, volume and freedom from distortion effect, the permanent and reliable installation deserves careful consideration. The following list contains all of the accessories required for a good, permanent installation:

- 1—Stromberg-Carlson No. 1-A Neutrodyne Receiver. (A Stromberg-Carlson No. 2-A Head Set is furnished and packed with each Neutrodyne Receiver.)
- 1—Loud Speaker with Cord and Plug attached. (This can be a Stromberg-Carlson No. 1-A Loud Speaker or other reliable make.)
- 5—Radiotron UV-201-A Tubes or Cunningham C-301-A Tubes.



- 1—Antenna Outfit, including wire, insulators and Underwriters' approved arrester. (Arrester required only when outdoor antenna is used.) If antenna is to be temporary and located indoors, it can be 60 feet single conductor Lamp Cord (No. 16, B. & S. gauge) supported on small insulators, such as "Moore" Radio Screw Glass Knobs.
- 30 ft.—Single Conductor Lamp Cord not smaller than No. 16, B. & S. gauge, for connecting batteries to the receiving set.
- 1—Storage "A" Radio Battery, 6 Volts of at least 50 Ampere Hours' capacity. (Select a good, reliable make, such as "Exide" LXL.)
- 1—Glass, Rubber or Lead Tray for Storage Battery.
- 1—Syringe Type Hydrometer for Storage Battery.
- 1—Rectifier for charging Storage Battery. (A "Tungar" Rectifier or equivalent can be used if a 110-volt 60-cycle lighting circuit is available.)
- 2—Blocks of large size Dry Cell "B" Battery of 45 volts each. ("Eveready" No. 767 or equivalent), or:  
 4 Blocks of large size Dry Cell "B" Battery of 22½ volts each. (Eveready No. 766 or equivalent.)

Only the first item in the above list is included in the Stromberg-Carlson No. 1-A Neutrodyne Receiver packing case, thus the remainder of the equipment can be selected to suit the conditions of any particular installation.

### Installation of a No. 1-A Neutrodyne Receiver:

The most orderly way to go about the permanent installation of a radio receiver is to first determine the kind and location of the antenna and then to locate the receiving set in the desired room so as to get the best results from this antenna. The location of the loud speaker and the placing of the "A" and "B" battery should follow.

### Choice of Antenna and Location:

The Stromberg-Carlson No. 1-A Neutrodyne Receiver will give the best results for selectivity and will bring-in distant stations with a comparatively short antenna. The actual choice of antenna varies with the location of the receiving set and the obstructions encountered. Other things being equal, the higher the antenna the greater the distance obtained with it, and the longer the antenna, the greater the volume of signal from it. The following list gives a number of antenna selections for Neutrodyne Receivers, in the order of their distance and volume getting values:

- First**—Outdoor antenna of single horizontal wire not over 60 feet long and between 20 and 40 feet above the earth, stretching from the house where the receiving set is located to a pole or other support at the end of an open lot.
- Second**—Outdoor antenna of single horizontal wire, 40 to 60 feet long, located on supports placed on the roof of a building, with the receiving set in any room directly under one end of the horizontal wire.
- Third**—Indoor antenna of single horizontal wire, 40 or 50 feet long, located in an open attic and with the receiving set in any room directly under one end of the horizontal wire.



**Fourth**—Indoor antenna of two or three horizontal wires, between 25 and 30 feet long, spaced about 2 feet apart and located under the roof in an attic, the receiving set being located in any room directly under one end of the several wires. (Horizontal wires jointed together at the receiving set end and connected to the wire leading to the receiving set.)

**Fifth**—Indoor antenna, consisting of a single conductor lamp cord, supported on small insulators or on picture moulding and running the length of a hall or corridor, 30 feet or longer, with the receiving set located at one end.

**Sixth**—Indoor antenna, consisting of a single conductor lamp cord, running around the picture moulding in the room where the receiving set is installed.

**Seventh**—No antenna wire for reception of a local (5 or 10 miles radius) powerful broadcast station, provided there is no intervening obstruction to the radio waves.

The size or length of an antenna also determines to a certain extent the selectivity of the receiving set, that is, the ability to tune-out a powerful local broadcast station and bring-in without interference another station with a small separation in wave-lengths. The shorter the length of the antenna, the greater the selectivity; the greatest selectivity being obtained when the No. 1-A Neutrodyne Receiver is used without an antenna.

The height of the antenna above the ground or above the grounded metal framework of buildings determines the amount of disturbing noises, usually called "static," that are picked up. The higher the antenna, the stronger will be the received signal from the desired broadcast station, also the louder the static. Reducing the height of the antenna decreases the effect of "static" at a greater rate than the decrease in the signal strength of the distant broadcast station.

Long single wire antennas (60 feet or longer) have slight directional effects, signals from broadcast stations located directly in line with the open end of the horizontal wire coming-in with less strength than for stations located in the opposite direction. In other words, the end of the antenna nearest the receiving set points to the direction from which radio signals will be received best. Stations located at right angles to the direction of the horizontal wire will receive with still slightly less volume. Thus, if the antenna is a long, horizontal wire, it is advisable to have this wire located so as to be at right angles to the direction of the most powerful local broadcast station and the receiving set end of the wire pointing towards the direction of the most distant stations. This will serve in a slight measure to give more uniform or balanced receiving conditions.

The directional effect of short outdoor or indoor antenna (less than 60 feet long) is not noticeable and such aerials also have the advantage of greater selectivity than for long aerials. Thus, in congested districts the shorter antenna is to be preferred.

If there are no broadcast stations within 40 or more miles from the location of the receiving set, a long antenna (60 to 100 feet from the set to the extreme end of aerial) can be used without endangering the selectivity of the receiver, and greater distance can be expected than from a shorter antenna.



## Choice of Receiving Set Location:

While a suitable antenna can be provided for any desired location of a No. 1-A Neutrodyne Receiver, the best results require that certain rules be followed and for that reason the receiving set should not be placed until the location of the antenna and ground connections are decided.

The first rule to remember in the locating of the receiving set is that the **effective length of an antenna** (which determines the strength of received signal) is the straight line distance from the receiving set location to the extreme end of the single horizontal wire of the antenna. This rule also holds good for an indoor type of antenna, whether the antenna wire is located in an attic, in a long hall or placed around the picture moulding of a room.

In order to get the greatest effective length of antenna, the receiving set should be placed directly under the extreme end of the horizontal antenna wire. On the other hand, if the receiving set is located under the middle of and close to the antenna, so that the lead-in wire is doubled back from one end of the horizontal antenna wire, the **effective length** will be only the distance from the receiver to the farthest end of the horizontal wire.

If the antenna wire is run around the picture moulding of a room, the receiving set should be placed in one corner of the room so that the **effective length** will be maximum, which in this case would be the diagonal line from the receiver to the farthest corner of the room.

Another important consideration in the locating of the No. 1-A Neutrodyne Receiver is to place the receiver cabinet so that the antenna lead-in wire and the ground wire will come in to the binding posts of the receiver from the left hand side when you are facing the front of the instrument. In other words, the aerial and ground connecting wires **should never** run from the right hand side and directly behind the cabinet for the full length of the receiver and should never lie under or over the cabinet. Such a position of these wires will cause an electrical coupling between the aerial and the receiver circuits and result in oscillation noises (high pitched steady vibrations when a station is tuned-in).

The antenna lead-in wire should be separated by a spacing of several inches from the ground wire. If these wires are run tightly together for any distance, there will be an appreciable loss in the signal strength.

The No. 1-A Neutrodyne Receiver can be placed on any convenient table or cabinet so long as the location will satisfy the conditions for best approach of the antenna and ground wires (to the left side of cabinet).

## Choice of Battery Location:

A cabinet of the console type, in which a space is available for the dry cell "B" battery and the storage "A" battery, with small rectifier charger, makes a compact and very neat installation for a complete No. 1-A Neutrodyne Receiving Set.

When locating the Storage "A" battery in a closed cabinet with a charging rectifier, it is **necessary** to provide ample ventilation by vent holes in the cabinet bottom and back. These holes can be made with a  $\frac{3}{4}$  inch bit, boring six or eight of these holes near the front of the bottom and the same number of holes through the back and near the top of the inside space. Vent holes located in this way will allow a natural circulation of air through the cabinet.

If the rectifier used for charging the storage "A" battery is located in the same cabinet with the battery, arrange the handle of the D. P. D. T. charging switch so that it will extend in the path of the cabinet door and prevent



fully closing the door when the battery is on charge. Additional cabinet ventilation thus will be provided, as well as a visual indication that the battery is being charged.

When it is not convenient or advisable to locate the storage "A" battery and charging rectifier in the table cabinet, these items can be placed in a nearby closet or if the receiver is located on the first floor of a residence, the battery can be placed in the basement and directly under the set. In this case a suitable two-pole polarity type receptacle and plug can be used for taking the wiring of the "A" battery through the wall to the closet or basement, the connecting wires being of large size, say not smaller than No. 12 B & S gauge. The total length of wire should not exceed 10 feet from the receiver binding posts to the storage battery binding posts.

Also if it is not convenient to place the "B" battery in the table or cabinet, upon which the No. 1-A Neutrodyne Receiver is located, this battery can be located in a nearby closet or in the basement, adjacent to the "A" battery and a three-pole polarity type receptacle and plug used to take this wiring through the wall of the room. In this case, the connecting wires can be three lengths of single conductor lamp cord, not smaller than No. 16 B & S gauge. Not over 10 foot length of wire should be used for these "B" battery connections.

The storage "A" battery should be placed in a suitable rubber, lead or glass tray, so as to catch any of the electrolyte that might be accidentally spilled. See article on "Charging and Care of Storage 'A' Battery" for additional information on this subject.

### **Location of Loud Speaker with Respect to Receiver:**

Usually the location of a loud speaker with respect to the Neutrodyne Receiver has no effect on the correct operation of the receiver or loud speaker. The loud speaker, however, should not be placed on the top of the No. 1-A Receiver Cabinet and the loud speaker cord should not be carried behind the cabinet or draped over the cabinet top.

These locations of the loud speaker or cord may cause an electrical coupling in the receiving set circuits and result in oscillation noises. A correctly designed loud speaker will operate with no coupling noises when placed on a table or cabinet along side the No. 1-A Neutrodyne Receiver.

For convenience sake, the placing of the loud speaker at the right hand side of the receiver cabinet (facing the set) is to be preferred, as its cord and plug will be adjacent to the receiver jacks.

When some types of loud speakers are located close to a receiving set and operating on a loud signal, the acoustic coupling can be of sufficient magnitude to cause a steady vibrating tone. This is similar to the action of a telephone receiver when held against the mouthpiece of a telephone transmitter. The remedy is to separate the loud speaker from the receiving set a sufficient distance to prevent this action.

### **Use of Short and Long Antenna Binding Posts:**

It will be noted that the No. 1-A Neutrodyne Receiver is provided with two antenna binding posts each marked "ANT" on the post proper, but one with the word "SHORT" and the other with the word "LONG" engraved above it on the panel.

The "Short Ant." post connects directly to the receiver circuit and gives the greatest sensitivity to the receiving set and should always be used when maximum distance is desired, regardless of antenna length.

The "Long Ant." post connects through a small fixed condenser to the



receiving set circuit and should be used when the reading of the large Dial No. 1 is more than 6 or 7 divisions lower than that of large Dials No. 2 and No. 3. In other words, it equalizes the settings of the three large dials when an antenna of high fundamental wave length is employed.

The reason for these differences in dial settings is that the length of the antenna affects the setting of the "Antenna Tuning" Dial No. 1, the shorter the length of the antenna the closer will be the reading of Dial No. 1 with respect to Dials Nos. 2 and 3. When no antenna is used, all three of the large dials will read approximately alike for any particular broadcast station.

### Directions for Installing an Outdoor Antenna on Rigid Supports:

If it is decided that an outdoor antenna is to be used (see article on "Choice of Antenna and Location") there are four important precautions to be observed:

- First**—See that the antenna wire is not placed *over* or *under* any other wires, such as electric light, telephone or telegraph wires. This is to avoid contact between the antenna wire and one of the other wires if a wire should break loose and fall. These other circuit wires may carry dangerous electric voltages.
- Second**—Select firm supports for both ends of the antenna wire and make sure that the fastening of the antenna to the supports is sufficiently secure to withstand high winds and heavy sleet if located in a cold country.
- Third**—Use a protector (lightning arrester) that is approved by the "National Board of Fire Underwriters" and see that it is correctly installed and connected to an approved "ground."
- Fourth**—Be sure that the antenna and lead-in wires are well insulated from the supports and from all foliage or limbs of trees and that these wires do not run close to conducting objects, such as metal pipes, metal roofs, metal water spouts, etc.

The following is a list of materials suggested for an outdoor type of antenna, such as will be suitable for use with the No. 1-A Neutrodyne Receiver:

- 100 ft.—No. 14 B. & S. Gauge Hard Drawn Copper Antenna Wire. Copper clad steel or stranded copper or stranded bronze wire will be satisfactory.
- 50 ft.—No. 14 B. & S. Gauge Rubber Covered and Braided Copper Wire for lead-in and ground connection.
- 50 ft.—No. 16 B. & S. Gauge Rubber Covered and Braided Copper Wire (single conductor lamp cord will do) for connecting the Receiving Set to arrester and to the batteries.
- 2 Antenna Strain Insulators of Glazed High Grade Porcelain or other non-absorbitive material.
- 3 Split Porcelain Knobs with screws for fastening lead-in wire to side of building.
- 1 Approved Ground Clamp for attaching the ground wire to a water pipe or other suitable ground connection.
- 1 Porcelain Tube, 8" long by 9/16" outside diameter for insulating the lead-in wire when it passes through wall of building.
- 1 Protector (Lightning Arrester) of "Underwriters" Approved Design.
- 2 Large Screw Eyes for fastening ends of antenna to supports.
- 12 Insulated Staples for attaching inside wire to woodwork.



The installation can proceed in the following order:

If the supports for both ends of the horizontal wire are rigid, such as walls of buildings or substantial poles, the large screw eyes can be screwed into the woodwork so as to give a separation of between 40 and 70 feet. The height of these screw eyes will determine the antenna wire height, which should be ample to clear obstructions, say between 20 to 40 feet above the earth or 10 to 20 feet above the roof of a building.

Now cut two short pieces (about 3 feet long) from the end of the coil of antenna wire for fastening the strain insulators to the screw eye supports. Secure one end of each piece of this wire to an insulator by passing it through the hole or eye in the insulator and then twisting the wire tightly around itself for five or six turns. The other end of each of these wires is inserted through the holes in the screw-eyes and twisted tightly around itself for five or six turns, thus making the insulators secure to the supports. The remaining wire is to be fastened between the two strain insulators so as not to come in contact with the two short supporting wires mentioned in the previous paragraph. This is best done by first passing the end of the antenna wire that is to be farthest from the receiving set, through the unoccupied hole in the strain insulator and then to twist tightly around itself five or six turns. The other end of the antenna wire is passed through the unoccupied hole of the second strain insulator (the one nearest receiving set location) and twisted tightly around itself for five or six turns after the antenna wire is drawn up taut. This should leave a piece of antenna wire already attached to the antenna proper and sufficiently long to serve as a lead-in wire to the protector location.

The lead-in wire (extension of the antenna wire) should be run to the point where it is to enter the building without touching metal work or even the woodwork. Use one or more of the split porcelain knobs for providing this insulation from the building and the 8-inch porcelain tube to insulate the opening through which the wire enters the building. The hole for this porcelain tube can be bored with a  $\frac{5}{8}$ " diameter bit through the woodwork of the wall or window frame. When boring this hole, have the bit slant downward towards the outside of the building. This will prevent rain from entering through the bushing.

Insert the bushing through this slanting hole with the large end of the bushing inside the building to keep it in place. The lead-in wire should be fastened to the outside wall or window frame, a few inches above the outer end of the porcelain tube, with one of the split porcelain knobs. This will allow the lead-in wire to be looped down below the outer end of the porcelain tube and serve as a water "drip loop" and carry rain away from the tube end.

The protector is best located inside the building, immediately below the inner end of the porcelain tube, so that the lead-in wire can be fastened directly to the top binding post of the arrester. The "Underwriters" require that the protector "shall not be placed in the immediate vicinity of easily ignitable stuff, or where exposed to inflammable gases or dust or flyings of combustible materials."

The protector ground connection should be made with the No. 14 B. & S. gauge rubber covered and braided copper wire. (It must not be smaller conductor than the lead-in wire.) Cut and scrape the insulation from one end of this wire and fasten it to the lower (unused) binding post of the protector and run this wire by the most direct and shortest route to a good, reliable ground. If there is a cold water pipe nearby it will serve as a good ground, the connection to the pipe being made with the ground clamp. Be sure to scrape all paint or bronze enamel from the metal of the



pipe at the point where the ground clamp is to be located. Set the clamp screw tight enough so that it will be impossible to twist the clamp on the pipe by hand. Cut the ground wire the right length to just reach the ground clamp and fasten its bared end securely under the nut of the clamp screw.

Other protector grounds permitted by the "Underwriters" are steel frames of buildings or other grounded metal work in the building, and artificial grounds, such as driven pipes, rods, plates, cones, etc., located in moist earth. The use of gas pipe as a ground is prohibited by the "Underwriters."

The connection from the protector to the No. 1-A Neutrodyne Receiver can be made with the No. 16 B. & S. gauge rubber covered and braided copper wire (single conductor lamp cord will do). The distance from the protector to the receiver should be kept as short as possible, as the maximum effective length of the antenna depends on having the receiving set directly under one end of the horizontal antenna wire, see article on "Choice of Receiving Set Location." Remove the insulation from one end of the No. 16 wire and fasten securely to the same binding post of the protector that the lead-in wire is fastened (upper post). Connect the other end of the No. 16 B. & S. gauge wire (insulation removed) to the antenna binding post of the No. 1-A Neutrodyne Receiver. See article on "Use of Short and Long Antenna Binding Posts." Be sure that this antenna connecting wire approaches the Neutrodyne Receiver from the left side (facing the instrument) and that it does not rest behind, under or over the cabinet.

A second piece of the No. 16 B. & S. gauge rubber covered and braided copper wire should be used to connect the ground (GND) binding post of the No. 1-A Neutrodyne Receiver with the binding post of the protector to which the protector ground wire is fastened. This second wire should be kept separated from the first or antenna connecting wire by a distance of several inches for the entire length from receiving set to protector. If a radiator or other grounded metal work is close to the receiving set, it is advisable to run the ground wire by this shorter route to ground, rather than by way of the protector ground wire.

The antenna installation just described has all joints between different wires made at the binding posts on the protector. If the lead-in wire is not a continuation of the antenna wire, it should be securely fastened by wrapping tightly around the antenna wire and soldered.

*Note On Lead-In Wires:* In some cases it is not permissible to drill a hole through the side of a building or window frame for the porcelain tube used for the lead-in wire. Heavily insulated approved "window strips" have been used for this purpose with success. These strips are designed to be placed flat on the window sill and the window closed down, without damaging the insulation of the strip, provided the window fits its frame loosely. However, a tightly fitting window or a window having metal weather strips will interfere with making a good installation.

Another (temporary) scheme is to place a narrow wooden strip between a raised sash and the bottom of the window frame and in this wooden strip to insert the porcelain bushing for the lead-in wire.

### **Directions for Installing an Outdoor Antenna on Flexible Supports:**

If the outdoor antenna is to be attached to a tree or other support that can sway with the wind, the fastening should be made flexible, so as to hold the horizontal wire taut and yet remove undue strain from the wire itself.



One satisfactory way to do this is by means of a counterweighted cord operating over a suitable pulley, the material required being as follows:

- 1 Galvanized Iron or Brass Pulley 2" or 3" diameter with pulley groove of size suitable for a window sash cord.
- 50 ft. hard-woven cotton window sash cord.
- 3 Heavy window sash weights.

The receiving set end of the antenna can be rigidly supported and the lead-in wire run as described in the article, "Directions for Installing An Outdoor Antenna on Rigid Supports."

The open end of the antenna wire (nearest the tree or flexible support) should be attached to the strain insulator by passing it through the opening in the insulator, doubling back and wrapping tightly around itself five or six times.

Now, one end of the sash cord should be passed through the remaining hole in the strain insulator and securely tied, after which this cord can be threaded over the pulley wheel and the pulley frame fastened to the tree or other flexible support, using a piece of the sash cord for this fastening. Several window sash weights should be attached to the free end of this antenna supporting cord, the amount of weight being sufficient to hold the horizontal antenna wire taught.

When a tree is used as a support for an antenna, be sure that none of the limbs of the tree can swing with the wind and touch the horizontal antenna wire. It is best to have the sash cord support extend 8 or 10 feet outside the foliage of the tree in order to assure ample separation between the end of the antenna wire and the leaves or limbs of the tree.

When this arrangement is correctly installed, the swaying of the tree or flexible support will cause the weight to be raised and lowered while the antenna wire will remain practically horizontal and no undue strains be placed on the wire or its supports.

### **Directions for Installing an Indoor Attic Antenna:**

The No. 1-A Neutrodyne Receiver will give excellent results for distance and selectivity with an attic antenna of two or three parallel horizontal wires, between 25 and 30 feet long, spaced about 2 feet apart, providing it is not located under a grounded metal roof. This antenna wire can be regular No. 14 B. & S. gauge bare antenna wire or any copper wire, No. 16 B. & S. gauge, or larger cross section.

All wires in this antenna, as well as the wire running to the No. 1-A Neutrodyne Receiver must be insulated on porcelain or other suitable insulation if best results are to be expected.

Porcelain knobs can be used at each end of these horizontal antenna wires for support, care being taken that these wires do not come close to metal pipes or electric light wires.

The ends of all of these horizontal wires, directly above the place where the Neutrodyne receiver is to be located, should be connected together with a piece of No. 14 B. & S. gauge rubber covered and braided wire (soldered connections are best) and this wire carried directly down to the receiving set.

It is best to keep this antenna connecting wire inside the house, so that no Protector (Lightning Arrester) will be required. An electrician can make a neat installation by carrying this wire down through walls so as to be completely concealed. In no case should the wire be run through a metal pipe or metal conduit, although non-metallic "loom" will serve as extra



insulation and is advisable. A wall receptacle and plug can be used where this antenna connecting wire comes through the wall to the room in which the receiving set is to be located.

The No. 1-A Neutrodyne Receiver should be placed as close as convenient to the point where this antenna connecting wire enters the room. (See Articles on "Choice of Receiving Set Location" and on "Use of Short and Long Antenna Binding Posts.") Also, be sure that the antenna connecting wire approaches the receiving set from the left side, when facing the front of the cabinet.

The ground connection from the "GND" binding post to the Neutrodyne Receiver should be made to the nearest cold water pipe or other grounded metal part of the building as described under the heading, "Directions for Installing An Outdoor Antenna."

If the available attic space is 40 or 50 feet long, a single horizontal wire antenna can be used in place of the two or three parallel wires. Porcelain knob insulators should be used at each end and one in the middle if required to keep the wire from sagging. The remainder of the installation can be as just described for the multiple wire antenna.

### **Directions for Installing Picture Moulding Antenna:**

When the No. 1-A Neutrodyne Receiver installation must be confined to the one room or the several rooms of a small apartment, good results can be obtained by the use of an antenna run around the picture moulding, provided the outer walls of the building are not of metal or metal lathed. Single conductor rubber covered and braided interior telephone wire or single conductor lamp cord, No. 16 or No. 18 B. & S. gauge, will be suitable for this type of antenna.

As stated under the heading, "Choice of Receiving Set Location," the No. 1-A Neutrodyne Receiver should be placed in a corner of the room or at the extreme end of a long hall, in order to get the maximum "effective length" of antenna used in these locations.

The bare end of the single conductor rubber covered wire should be attached to the "Short Ant." binding post of the Neutrodyne Receiver and run away from the receiver cabinet to the left (facing the cabinet) and then up to the picture moulding, where it can be held in place with a staple or a "Moore" glass end push pin or Moore screw type glass radio insulator. This wire can be carried along the picture moulding to the diagonal opposite corner of the room, or carried completely around the four sides of the room. The Moore type pins or knobs can be used to hold the wire at the corners of the room or at other points where it changes direction. In no case should this antenna wire be wrapped completely around the insulating pins, a separate tie with a piece of twine being best from an electrical standpoint.

Avoid running the antenna wire close to other electric wires or close to metal electric lighting fixtures as losses in signal strength or the introduction of interfering noises may result.

The wire for connecting the "GND" binding post of the No. 1-A Neutrodyne Receiver to the nearest cold water pipe or radiator can be the same as used for the picture moulding antenna. Use a good ground clamp for attaching this ground wire to the water or radiator pipe, being sure to scrape all paint, enamel or rust from the pipe before attaching the clamp.



## Battery Requirements:

### (a) Filament or "A" Battery:

The filament or "A" battery required for UV-201-A and C-301-A tubes is a 6-volt Storage "A" Radio Battery of at least 50 ampere-hours capacity and preferably of 80 ampere-hours capacity. It is economy to purchase a reliable battery of some well known make, such as an "Exide LXL."

Always keep the storage battery charged, following the makers' instructions. Also, see "Charging and Care of Storage 'A' Battery" in these instructions for further information.

### (b) Plate or "B" Battery:

The plate or "B" battery required for the UV-201-A and Cunningham C-301-A Tubes is 90 volts for the Radio and Audio Amplifiers and 45 volts for the "Detector."

This can be furnished by two "Eveready" No. 767 "B" batteries (45 volts each) or by four "Eveready" No. 766 "B" batteries (22½ volts each) or equivalent sizes of other reliable makes.

Also, storage type "B" batteries can be used, if desired, as explained under heading "Use of Storage 'B' Battery."

With average use of two hours per day with a "Loud Speaker" plugged into the "2nd Audio" jack, one set of "B" batteries should last about four months. The "B" battery life will be much longer if the "1st Audio" jack or "Detector" jack is used.

Worn out or defective "B" batteries will give weak signals on the loud speaker.

The safe way to test "B" batteries is by a high resistance voltmeter (over 10,000 ohms for 150 volt scale) while the tubes are lighted (with the plug in 2nd Audio jack). The batteries should be replaced with fresh new batteries when the voltmeter readings fall below 17 volts at the 22½ volt tap, for the 22½ volt "B" battery (Eveready No. 766) or below 34 volts at the 45 volt tap of the 45-volt "B" battery (Eveready No. 767) or below 68 volts if the reading is taken across the whole battery.

### (c) Grid or "C" Battery:

This battery is a 4½ volt "Eveready" No. 771 or an equivalent size of other reliable make. It is located in a space provided under the base of the radio cabinet and is held in place by a metal strap. Each No. 1-A Neutrodyne Receiver comes with one of these "C" batteries correctly installed, unless otherwise specified on the packing case. The "C" battery should be replaced about every six months or at any other time that the loud speaker fails to give a good clear tone on the "2nd Audio" jack when the same setting of the tuning dials gives a clear signal with a head set plugged into the "Detector" jack.

## Connecting Batteries to the Receiver:

The correct connection of the "A" and "B" batteries to the Stromberg-Carlson No. 1-A Neutrodyne Receiver is shown in a picture diagram located on the under side of the hinged cover of the cabinet. The "C" battery is regularly furnished with each receiver and is located in a space provided under the base of the cabinet.



Do not insert the vacuum tubes in the sockets of the receiving set until after the battery connections are made and carefully checked with the circuit diagram. A mistake in connection might result in burning out the filaments of one or more of the vacuum tubes.

### Connecting the "A" Battery:

The storage battery for lighting the filaments of the tubes should be connected to the receiving set through a double pole, double-throw knife switch, as shown in the picture diagram (located in cover of cabinet).

The battery is connected to the blades of the switch and the receiving set to one side and the battery charging rectifier to the other side of the switch. Thus, it will be impossible for the rectifier to be connected to the battery when the receiving set also is connected to the battery. This will prevent accidental burning-out of the vacuum tube filaments if the rectifier is of the uninsulated type.

When the storage "A" battery is so located that the length of wire for connecting to the receiving set does not exceed 6 feet, any well insulated (rubber covered and braided) conductor of not less than No. 16 B & S gauge will do. Thus, single conductor No. 16 B & S gauge lamp cord will make a good job, care being taken to twist the fine wire strands together (solder together for best job) before inserting in the binding posts.

If the connecting wires to the "A" battery exceed 6 feet each and are not over 10 feet, then No. 14 B & S gauge or even No. 12 B & S gauge must be used for best results. Use a rubber covered and braided wire, but it need not be a stranded conductor.

Be sure that the wire attached to the receiving set binding post marked "A Bat. +" connects through the switch (Switch thrown to position for connecting the receiving set to the battery) to the storage battery binding post marked "+" or designated by "red" coloring. The second wire should connect the receiving set binding post marked "A Bat —" through the switch to the other outside binding post of the storage battery.

The storage "A" battery should not have a separate ground wire connection and the "+ A" or the "— A" binding posts on the No. 1-A Neutrodyne should never have separate ground wire connections. The only ground should be that made through the "GND" binding post of the Receiving Set. If a rectifier is used, attach the rectifier wire indicated by "red" marking or a "+" marking, to the switch so as to connect to the "+" or "red" terminal of the battery when the switch is thrown to the charging position and the remaining rectifier wire to the remaining terminal on the same end of the switch.

### Connecting the "B" Battery:

The several blocks of "B" battery can be connected together with short lengths of any well insulated wire (No. 18 B & S gauge or larger) and the same kind of wire used to connect these batteries to the binding posts of the receiving set. Single conductor lamp cord has ample insulation and will make a serviceable job. When lamp cord is used, carefully remove the insulation for about  $\frac{1}{2}$  inch at each end of these connecting wires and twist the fine strands of wire tightly together, before inserting in the binding posts of the radio receiver and the batteries. Soldering these fine wire ends together, before inserting in the binding posts will give a more finished and reliable job.



If four blocks of 22½ volt "B" battery are used, wire exactly as shown in the picture diagram (located in cabinet cover)—

- First**—Connect a long insulated wire from the receiving set binding post marked "B Bat. —" to a binding post (spring clip on some batteries) marked "—" of one of these battery blocks.
- Second**—Connect a short insulated wire (about 8 inches long) to the binding post marked "+ 22½" on this first battery block to a binding post marked "—" on the second "B" battery block.
- Third**—Another short wire should be connected to the post marked "+ 22½" of the second "B" battery block to a binding post marked "—" on the third "B" battery block.
- Fourth**—A long wire from the receiving set binding post marked "B Det. +" should be connected also to the "—" binding post of the third "B" battery block.
- Fifth**—A third short wire should connect the "+ 22½" binding post of the third "B" battery block to the "—" binding post of the fourth "B" battery block.
- Sixth**—Another long wire should be attached to the receiving set binding post marked "B Bat +" and connect to the "+ 22½" binding post of the fourth "B" battery block.

Following this sequence of connecting the wires will avoid any accidental short circuiting of the battery leads when inserting the "B" battery.

If two blocks of 45 volt "B" battery are used, the wiring is simplified as only one short connecting wire is required, that between the two blocks. Proceed in the following order:

- First**—Connect a long insulated wire from the receiving set binding post marked "B Bat —" to the "—" binding post (or spring clip) of one of the "B" battery blocks.
- Second**—Connect a short insulated wire (about 10 inches long) from the "+ 45" binding post of the same "B" battery block to the "—" binding post of the second "B" battery block.
- Third**—A long wire should connect the receiving set binding post marked "B Det. +" to the "—" binding post of the second "B" battery blocks (same post used for short wire).
- Fourth**—A third long wire should connect the receiving set binding post marked "B Amp. +" to the "+ 45" binding post of the second "B" battery block.

## Connecting the "C" Battery:

The connecting or replacing of a "C" battery is a simple operation:

- First**—Tip the No. 1-A radio receiver back so as to expose the bottom of the cabinet.
- Second**—Remove the cord tips from the battery clips.
- Third**—Loosen the two battery strap holding screws about six turns. (These are machine screws, and thread into metal plates so as to provide a reliable fastening.)
- Fourth**—Slide the battery out of the clamp and insert the new battery.
- Fifth**—Tighten the Battery Strap Screws.
- Sixth**—Insert the cord tip of the "Red" wire into the battery spring clip marked "+" and the cord tip of the "Green" wire into the spring clip marked "— 4½" volts.



## Charging and Care of Storage "A" Battery:

The storage "A" battery has the advantage that once it is correctly installed it will give uniform operation of the vacuum tubes with practically no adjusting of the tube rheostats to compensate for drop in voltage.

The storage battery should be kept charged and never allowed to fully run down, the frequency of recharging being dependent on the hours of use of the receiving set and on the number of tubes in use (position of plug in the receiving set jacks).

If the storage "A" battery is of the 50-ampere hour size and fully charged it will operate the receiving set for about 40 hours without requiring recharging. At about 2 hours per day, this is the equivalent of twenty days of service.

If the recharging of the Storage Battery is done with a Rectifier having a 2-ampere charging rate it will take at least 25 hours of continuous charging to fully charge the battery. Thus, it is advisable to not let the battery discharge to its lowest point and in this way to reduce the time of each recharge. Such a program will require that the charging be done every week, or more often if necessary.

If a rectifier is used for recharging the storage battery and the wiring is made as recommended in the picture diagram contained in the receiver cabinet, then the charging operations are very simple. Throw the knife switch to the side towards the rectifier and plug the rectifier cord into any convenient lamp socket or receptacle which connects to a 60-cycle, 110-volt, alternating current lighting or power circuit. If the battery and rectifier are located in a closed cabinet, see that ventilation is provided when the charging is taking place.

Other methods for charging the battery, as well as for the care of the battery, are given in special instructions furnished by the maker of the storage "A" battery selected.

Never attempt to operate the receiving set when charging the storage battery, as the life of the tubes might be shortened by high voltage, or the filaments completely burnt out.

If no facilities are available for charging the storage battery and the battery must be taken to a charging station, then a large capacity battery should be used, such as a 100- or 150-ampere-hour size. The 100-ampere-hour size will give about 80 hours of service for each full charge or the equivalent of 40 days at 2 hours per day. The 150-ampere-hour size will give about 120 hours of service for each charge or the equivalent of one month of service at 4 hours per day.

Replace evaporation of the liquid in the storage battery with distilled water, so as to keep it above the tops of the plates. Never add acid. Always add this water after the battery is fully charged, not before charging, as the expansion in the cells during charging might cause the liquid to overflow if the cells were filled before charging. Keep this distilled water in a glass or crockery container and never in a metallic vessel.

Use a hydrometer for determining the condition of charge and discharge of the battery, following the battery maker's instructions for the interpretation of the hydrometer readings. When using a hydrometer be careful not to allow any of the battery liquid to get on the hands or clothes.



## Use of Storage "B" Battery:

Storage type "B" batteries can be used in place of the dry cell "B" battery, if electric light circuits and a suitable rectifier are available for charging. This battery should have 48 cells and give a normal voltage of 96.

The "B Bat +" Receiving Set binding post connection for a "hard" type detector tube (UV-201A or C-301-A) should be taken between the 24th and 25th cells so as to give 48 volts.

If a "soft" type detector tube is used (UV-200 or C-300) the connection from the Receiving Set binding post marked "B Det +" should go to the "+" terminal of the 11th or 12th cell counting from the "-" end of the battery.

The storage "B" battery has the advantage of uniform operating voltage, as it should never fall below 90 volts when discharged or run over 110 volts when fully charged. This will maintain good, loud speaker volume at all times.

## Vacuum Tube Requirements:

The Stromberg-Carlson No. 1-A Neutrodyne Receiver is designed and electrically balanced for the Radiotron UV-201-A Tubes or the Cunningham C-301-A Tubes for all five sockets. It is necessary that the two radio amplifier tubes be of these types ("1st Radio" and "2nd Radio" Sockets), although a "soft" detector tube and any reliable audio amplifier tubes can be used in the "Detector" and the "1st Audio" and "2nd Audio" Sockets.

Separate filament rheostats are provided for the "Detector" tube, the "1st Audio" tube and the "2nd Audio" tube so that other types of 5- or 6-volt receiving set tubes can be employed for the three left hand sockets.

In no case, however, should these three tubes take more than 1 ampere each.

The two radio amplifier tubes are served with one rheostat marked "Radio Amp" and in no case should these tubes take more than one-half ampere each.

For battery current economy and for uniform results, the UV-201-A or C-301-A tubes should be used in all five sockets, the total "A" battery current then being only  $1\frac{1}{4}$  ampere, when all five tubes are lighted.

## Inserting Tubes in Sockets:

Before inserting the vacuum tubes into the sockets of the No. 1-A Neutrodyne Receiver, examine the ends of the four contact pins on the base of the tubes and see that no large lumps of solder are present. If so, remove the solder from the *sides only* of the contact pins with a knife before inserting the tubes into the sockets. This will insure that the double side acting contact springs of these sockets will make positive electrical connection to the tube contact pins.

It is not necessary or advisable to press down on the tubes when inserting into the sockets of the No. 1-A Neutrodyne Receiver. Simply allow the side pin on the tube base to drop into the socket slot and turn the tube "clockwise" with a light twist until the contact pins engage the contact springs.



## Selecting Non-Microphonic Detector Tube:

Select a "non-microphonic" tube for the "Detector" socket as follows: After the tubes are in place and lighted, with the loud speaker plugged into the "2nd Audio" jack, lightly tap the tube in the "Detector" socket with the nail of one of your fingers and notice the resulting sound in the loud speaker. If it is a prolonged vibrating note, the tube is too microphonic for a good, quiet detector. On the other hand, if the resulting note sounds like a "klink" or a vibration that quickly dies out, then the tube will be acceptable for detector purposes.

It is a good plan to try all five of the tubes in turn by shifting from socket to socket until the least microphonic tube is selected for the detector. In changing tubes from socket to socket, it is advisable to pull out the Loud Speaker plug from the "2nd Audio" jack before a tube is removed and not to insert this plug until after the tubes are replaced in all sockets. This disconnects the "A" battery current while the transfer of tubes is being made.

## Selecting Good Radio Amplifier Tubes:

For best results, good sensitive tubes should be used in the "1st Radio" and the "2nd Radio" sockets and a selection of these tubes should follow the picking of a non-microphonic detector tube. The selection of the tubes for these two sockets can be made by having tubes in the three left hand sockets (detector tube previously selected remaining in "Detector" socket) and tuning-in a fairly weak station, using the No. 2-A head set plugged into the "Detector" jack.

After getting the signal with best adjustment of the tuning Dials Nos. 1, 2 and 3 and the best setting of "Radio Amp" Dial No. 4, remove the head set plug from the jack and substitute one of the spare tubes, for the "1st Radio" tube. Be sure to re-adjust all four of the dials Nos. 1, 2, 3 and 4 to get maximum volume of signal in the head set each time another tube is tried out. By trying all extra tubes in the "1st Radio" socket, any defective as well as any noisy tubes can be eliminated and new tubes substituted.

Once the tubes have been selected, it is a good plan to always leave them in the selected positions. Numbering the tubes with small figures, from 1 to 5 inclusive, reading from left to right, will insure that the tubes can be replaced in the same sockets, without going through the selecting operations.

## Useful Life of Vacuum Tubes:

The life of the tubes recommended for this receiver is from 1000 to 2000 hours constant use, if not abused by rough handling and by using more than the rated current through the filament. Therefore, it is economy not to turn up the rheostats more than necessary to give a good volume of signal. Excessive current through the tube filaments will not increase the signal strength any appreciable amount above the signal obtained when the tubes are worked with current at the safe limit.

The end of the useful life of these vacuum tubes is indicated by lack of sensitiveness, rather than failure of the filament to light. When making a test for sensitiveness, be sure that the storage battery is fully charged and that the "B" and "C" batteries are new and correctly connected to the receiving set. Then repeat the tests, previously given, for selecting tubes for a new receiver.



## Use of "Soft" Type Detector Tube:

This instruction book calls for the use of the "hard" or high vacuum type of tubes for all five sockets of the No. 1-A Neutrodyne Receiver in order to give maximum stability of operation and greatest economy of "A" battery current.

Some owners of this receiving set may wish to use a very sensitive "soft" type (low vacuum) tube, such as a "UV-200 Radiotron" or "C-300 Cunningham." This type of tube can be used in the No. 1-A Neutrodyne Receiver by merely connecting the receiving set binding post marked "B Det. +" to "+ 22½" volt terminal of the particular "B" battery block that also connects to the "B Bat —" binding post of the Receiving Set. This change in battery wiring gives the required 22½ plate voltage for the soft type detector tube, instead of 45 volts for the hard type detector tube.

When operating the No. 1-A Neutrodyne Receiver with a "soft" type detector tube adjust the rheostats as described under the heading "Rheostat Settings," with the exception of the "Detector" rheostat. Turn this dial No. 5 to the right (towards high number markings) until a "hissing" or rushing noise is heard in the loud speaker or head set. Now, back off rheostat dial No. 5 until the hissing sound just disappears. This is the best adjustment for operating the "soft" UV-200 or C-300 detector tube. When using the "hard" (UV-201-A or C-301-A) tube for a detector, this hissing noise is not present, the tube not being critical to the filament rheostat setting.

In addition to requiring critical "B" battery voltage and critical adjustment of filament rheostat (No. 5) the "soft" type detector tubes (UV-200 and C-300) also require about four times the "A" battery current than the "hard" type detector tubes (UV-201-A and C-301-A). Also "soft" type tubes can be used only for detectors while the "hard" tubes can be used for both detector and amplifier purposes.

## Renewing Electron Emission of Old Vacuum Tubes:

The UV-201-A Radiotron and the C-301-A Cunningham tubes use a metal called "thorium" in the filaments in order to obtain maximum electron emission with small "A" battery current. If these tubes are operated with too much current (turning rheostats too close to the "100" division) for any length of time this thorium is practically all thrown off from the surface of the filament and while the tube may light, it will fail to give satisfactory operation.

Tubes in this run-down condition can be brought back to nearly the original activity by the following method:

**First**—Connect the filament terminals of the tube to a battery of about 15 volts (10 No. 6 Dry Cells connected in series will do) for about 30 seconds, thereby highly heating the filament so as to force some of the thorium contained inside the body of the filament to the surface.

**Second**—Now insert the tube in the No. 1-A Neutrodyne Receiver with the "B" battery disconnected but the regular 6-volt storage "A" battery connected and the rheostats set at about "75" for No. 4 rheostat, and 40 for No. 5 rheostat and for the two rheostats on the back of the cabinet. The head set or loud speaker plug must be left in the 2nd Audio jack to close the "A" battery circuit through the tube filaments.



**Third**—Allow the tubes to remain lighted under the condition of the previous paragraph for a time equivalent to that for which the tubes were incorrectly operated. This time may vary from 10 to 30 hours. After this period of treatment, the thorium is considered to be uniformly distributed on the surface of the filament and the tube sufficiently renewed for satisfactory use.

**Fourth**—Replace the "B" battery connections on the No. 1-A Neutrodyne Receiver and be sure that the Storage "A" Battery is fully charged before testing the operating efficiency of the renewed tubes.

This renewal of tubes is more or less of a laboratory job and it is not expected that the average receiving set owner will be required to do this work. Also, if the tube has served its useful life this treatment will be of little help in renewing the filament activity and may result in burning-out the filament itself.

## Tuning the No. 1-A Neutrodyne Receiver:

Tuning the "Neutrodyne" radio receiver is extremely simple, as the three condenser dials act independently and any change in one dial does not require a compensating change in the setting of the other dials.

This allows a log to be made of dial settings corresponding to stations heard and at any later time to pick up these stations by merely resetting the dials to the recorded markings.

The tuning is different than for other types of radio receivers, as no whistle or oscillation is heard when the dials are rotated, therefore, it is impossible for you to disturb your neighbor when tuning your set.

When the set is first installed and before a log of stations is available it is necessary to tune the set as follows:

### 1—Rheostat Settings:

See that the Rheostats are correctly set before plugging into the jacks. For UV-201-A Radiotron Tubes or C-301-A Cunningham Tubes, all four Rheostat Dials on No. 1-A Receivers above Serial No. 500 can be set at the following markings at the time this receiver is installed and need not be disturbed unless the "A" battery voltage drops below the safe limit:

Rheostat	Location	Setting
"Radio Amp."	Front Panel	60
"Detector"	Front Panel	40
"1st Audio"	Rear Panel	30
"2nd Audio"	Rear Panel	30

It is not necessary to turn off or otherwise disturb the adjustment of these rheostats when shutting off the Receiving Set. The act of removing the Loud Speaker or Head Set Plug from the jacks disconnects the filament ("A Battery") current from the tubes.

Adjusting the "Radio Amp" rheostat towards the "O" setting reduces the volume of the received signal without causing distortion, so this dial, No. 4, can be used as a volume control.

The "Detector" rheostat serves as a control on the sensitiveness of the detector tube action (see article on "Use of Soft Type Detector Tube"), but in no case should it be turned so close to the "O" setting as to make the receiving set unstable and allow self-oscillation of the audio amplifier.



## 2—Lighting the Tubes:

Insert head set or loud speaker plug into the "Detector" Jack and see that the three left hand tubes are lighted, or in the "1st Audio" jack and see that the four left hand tubes are lighted, or in the "2nd Audio" and see that all five tubes are lighted. Always remove the plug from the Receiving Set Jacks when through receiving so as to cut off the current from the tubes. No other switch is provided.

## 3—Selecting Stations by "Calibration Curve":

The No. 1-A Neutrodyne Receiver is provided with an accurate "Calibration Curve" which simplifies the locating of new stations. Take the published wave length of any desired station, say 380 meters for station "WGY" (General Electric Co. at Schenectady), and by referring to the calibration curve attached to inside of the receiving set cover, find the dial settings as follows:

- (a) Follow the horizontal line from the left hand marking of the diagram corresponding to the desired station, say "380" for "WGY," to the point where this line intersects or meets the diagonal "red" line.
- (b) From this intersection point follow a vertical line downward until the marking at the bottom of the diagram is reached, say "136."
- (c) Now set dials, Nos. 2 and 3, at this reading, say 36th division, and slowly rotate dial No. 1 from a point about 10 below that of Dials, No. 2 and 3, say 26th division, to a point a few divisions above the settings of Dials, Nos. 2 and 3, to determine whether there is any broadcasting on the desired wave length. Rotate Dial, No. 1, slowly so as not to pass by the point at which the distant tunes.
- (d) When the signals from the broadcast station are heard it is advisable to slightly readjust all three of these large dials, so as to increase the intensity of the signals to the maximum response (loudest signal) for each dial setting. The action of the large dials are independent of each other, so a change in one dial will not disturb the tuning of the other two large dials.

## 4—Log of Stations Heard:

As soon as a station is tuned-in at the most satisfactory settings of the three dials—maximum response—then make a record of the dial markings on the "Station Log Sheet," putting the dial readings down in their correct columns.

When observing the dial divisions, always face each dial in turn and thereby obtain an accurate reading, which would not be possible if these dials were viewed from either side. If the pointer comes half-way between two markings on a dial it will be advisable to so record the reading on the "Station Log Sheet," say "24½," when the pointer comes half-way between "24 and 25" on the dial.

Other "Station Log" records as to whether the signal was received on a loud speaker or head set, the jack used, and the strength of signal, are of value when it is desired to tune in at some future time on one



of these recorded stations. This information can be recorded in the column-under "Remarks," using abbreviations as suggested below:

Name	Abbreviation
Head Set	H
Loud Speaker	L
Detector Jack	D
1st Stage Jack	1
2nd Stage Jack	2
Weak Signal Strength	W
Medium Signal Strength	M
Strong Signal Strength	S

For example: If the signal was received on a loud speaker plugged into the 1st Audio Jack and came in with medium volume, all of this information can be expressed by "L1M." This will leave space for the date when the station was first tuned-in (abbreviated by figure), say "5-15-24," for May 15, 1924.

## 5—Locating Stations of Unknown Wave-Lengths:

When it is desired to select a station of unknown wave length for the first time, the "Calibration Curve" will be of no assistance.

Under these circumstances, the quickest and most accurate way to proceed is to first set Dials, Nos. 1, 2 and 3, for any station already recorded on the "Station Log" and which you believe to be close to the wave length of the desired station. Next, turn all three dials in the same direction, exactly two divisions, and listen. Repeat this operation, making observations at the two division intervals until the desired station is located.

Note that in going from one station to another, all three dials move about the same distance and that Dials, Nos. 2 and 3, usually are on the same setting, while Dial No. 1 is a few divisions below settings for the other two dials.

Many new stations can be located in this manner and added to the Station Log. Before recording a new station, be sure to adjust each of the three large dials to maximum response.

## 6—Selecting Stations by "Station Log" Sheet:

One of the greatest recent contributions to the radio art was the introduction of the log method for selecting broadcast station programs by the Neutrodyne Type of Receiver.

Once a broadcast station is accurately listed on the Station Log (see article on "Log of Stations Heard") anybody can bring-in this same station at any future time by merely setting the three large dials, Nos. 1, 2 and 3, to the recorded markings and plugging the loud speaker into the "1st Audio" or "2nd Audio" Jack.

The Stromberg-Carlson No. 1-A Neutrodyne Receiver has specially designed variable condensers and all of the apparatus rigidly mounted so as to maintain the accuracy of the dial settings and insure picking-up of a station on the exact markings recorded on the Station Log.

After setting Dials Nos. 1, 2 and 3 in accordance with the Station Log, it is always advisable to slightly sharpen the tuning of each dial (Set each dial to maximum response) if the station does not come-in with full volume or without absence of interference. The reason for this



precaution is that some of the broadcast stations fail to keep accurately on their wave lengths at all times and this deviation may be the equivalent of several divisions on the dials away from the settings recorded on the Station Log.

If the antenna or ground connections are changed in any way, the records of No. 1 dial settings on the Station Log must be changed to correspond to the new conditions. However, No. 2 and No. 3 dial settings are not affected by changes in the antenna and ground, and the records of these two dials will always hold good regardless of where the particular No. 1-A Neutrodyne Receiver is located.

Thus, if the receiving set is moved to a new location or the antenna or ground is changed, a recorded station can be quickly re-selected as follows:

First, adjust Dials No. 2 and No. 3 to correspond to the settings listed on the Station Log. Then, rotate Dial No. 1 slowly above and below the setting originally recorded on the Station Log for that dial, until the station is heard in the loud speaker or head set. It is advisable to start a new Station Log Card for these new conditions and then maintain an accurate record of all three dial settings.

When it is desired to maintain extreme accuracy of the Station Log recordings, the two radio amplifier tubes (two left hand tubes) should always be used in the same tube sockets. Numbering these tubes as suggested under the heading "Selecting Good Radio Amplifier Tubes" will insure getting the tubes back in the same sockets, if removed for any reason. When replacing worn out tubes, it is advisable to check the Station Log for some of the important class "B" stations, such as KDKA, WGY, WJZ, WEAf, KYW and KSD, and see if these stations come-in on the same dial settings for the new tubes as recorded for the old tubes. If not, and the variations are more than one division, it may be advisable to start a new set of log sheets.

## 7—To Obtain Full Selectivity:

The Stromberg-Carlson No. 1-A Neutrodyne Receiver is designed to be as selective as it is possible to make a receiver and still maintain the "side-band frequencies" that give the speech and music its full quality and richness. No operating skill is required to obtain this selectivity when the receiver is correctly installed, (see "Choice of Antenna and Location") as the mere setting of each of the three large dials, Nos. 1, 2 and 3 to maximum response (loudest signal), is the only requirement.

When "maximum response" is obtained for each of the three large dials, it will be found that dials Nos. 2 and 3 are at approximately the same markings and that dial No. 1 is slightly below. The settings of dial No. 1 are influenced by the antenna used, the longer the antenna the greater the separation between the setting of dial No. 1 and the other two large dials. If no antenna is used, all three large dials should read approximately alike.

It will be noticed that in carelessly turning the three large dials, a powerful local broadcast station can be picked up when each of these dials is not set to maximum response and this may lead you to believe that the receiver lacks selectivity. The tuning system controlled by these three large dials, however, acts like three wave traps connected in series, so that when all three dials are set for "maximum response" the greatest selectivity is obtained.



Now if your Stromberg-Carlson No. 1-A Neutrodyne Receiver is installed in New York City or vicinity, and it is desired to tune-out the local station "WHN" (operating on 360 meters) and bring-in WGY, Schenectady, N. Y. (operating on 380 meters) refer to your log sheets and find the dial settings for "WGY," say 30, 36 and 36 respectively for dials Nos. 1, 2 and 3, and set these dials accordingly. If "WGY" is broadcasting, its signal will be heard and the local station "WHN" will disappear. Slightly readjust each of these three large dials, if necessary to give maximum response for "WGY." The closer all three dials are set for the loudest signal from the desired station "WGY," the sharper the tuning and the less the interference from the local station "WHN."

The same principle applies when it is desired to tune-out any local station and tune-in another local station. The wave lengths of local broadcast stations are arranged with sufficient separation so that no difficulty will be encountered in bringing-in any one station while the other stations are inoperative. (When two local stations use the same allotted wave lengths, the programs are arranged so as not to overlap.)

The separation of two distant broadcast stations, working on wave-lengths of only a few meters apart is a simple matter. The only precaution is to move all three dials the same number of divisions (or fractions of one division) to cut-out the one station and bring-in the other station.

When there is likely to be interference between powerful local stations, it is advisable to tune-in and log these stations, when only one is working at a time. This record will simplify your subsequent tuning operations and allow any one of the powerful local stations to be tuned-in without interference from the other stations.

## 8—Determining Wave Length of a Station:

The calibration curve (located on the under side of the cabinet cover of the No. 1-A Neutrodyne Receiver), together with the reading of the large *Dial No. 2*, allow the wave length in "meters" of any station tuned-in to be closely determined.

**First**—Be sure that Dial No. 2 is tuned to maximum response (loudest signal) for the station in question.

**Second**—Select the vertical line on the calibration curve corresponding to the dial reading, say "70," and follow this line to the point where it intersects or meets the diagonal "red" line.

**Third**—From this intersection point, follow a horizontal line until the marking at the left hand side of the diagram is reached, say "500." This is the wave length in "meters" of the station tuned-in.

This information will serve as a check on the identification of a station when the announcer's voice comes through indistinct. For example, a program received at dial setting "70" on No. 2 Dial and found by the above method to be 500 meters can be identified as station "WMC," Memphis, Tenn., by referring to a printed list of Broadcast Stations.

It will be noticed that the right hand side of the calibration curve diagram is marked "Frequency in Kilocycles," this being another and more scientific way of designating the radio frequency allotted to a broadcast station. The "frequency" of a station tuned-in can be found by using the above method, but instead of following the horizontal



line to the left as given in "third" paragraph to follow this horizontal line to the right and read the "kilocycles."

Thus the Stromberg-Carlson No. 1-A Neutrodyne Receiver is a fairly accurate wavemeter when used as above described.

### **Use of Head Set for Tuning and Receiving:**

The Stromberg-Carlson No. 2-A Head Set supplied and packed with each Stromberg-Carlson No. 1-A Neutrodyne Receiver comes complete with a cord and plug attached, ready for use. This head set is correctly "poled" so that the flow of "B" battery current through its windings will not decrease the operating efficiency, and therefore it can be plugged into any of the three jacks without damage.

When using a head set for tuning always plug into the "Detector" jack first and if the desired station does not come in with sufficient volume after setting dials, Nos. 1, 2 and 3, to positions of maximum response, then change the plug to the "1st Audio" Jack.

The head set should never be used in the "2nd Audio" Jack unless you are sure that the signal is very weak, otherwise the resulting volume will be too great for comfort.

When using a loud speaker for tuning and you are in doubt as to whether the signal is being distorted by too much audio amplification, listen with the No. 2-A Head Set plugged into the "Detector" Jack.

The audio amplification magnifies the noise or static more than the desired signal, so that the head set, plugged into the "Detector" Jack, can be used under very adverse receiving conditions, where the loud speaker would not give good results.

### **Use of Loud Speaker for Tuning and Receiving:**

A loud speaker for use with the Stromberg-Carlson No. 1-A Neutrodyne Receiver should be selected with care, so as to preserve the excellent signal qualities incorporated in the receiving set design. Also, the volume possibilities of the Neutrodyne Receiver often are greatly limited by using a loud speaker of small size.

A safe way to know whether a loud speaker is suited to this Neutrodyne Receiver is to listen to *both* speech and music and on *both* weak (distant broadcast station) and loud local signals. Be sure that the loud speaker will reproduce the low bass notes (low frequencies) as well as the high pitch notes (high frequencies) with fidelity. The No. 1-A Neutrodyne Receiver is designed to give uniformity in the amplification of all the frequencies from the lowest notes of orchestral instruments to the highest musical notes.

Most loud speakers are so constructed that the best results are obtained only when connected to the radio receiving set in a certain way, that is, so that the flow of "B" battery current through the windings of the loud speaker will assist, rather than weaken the sound reproducing action.

For the No. 1-A Neutrodyne Receiver, the correct connection is made when the terminal of the loud speaker, marked "+" (usually designated by a solid "red" or by a red thread tracer in the braiding of one of the cord conductors), is connected to the body of the radio plug and the other conductor to the "tip" or ball end of the plug. (The Stromberg-Carlson No. 1-A Loud Speaker comes correctly connected to the plug for use with the No. 1-A Neutrodyne Receiver.)



Another way to make the correct "polarity" connection to a loud speaker is by test. Insert the loud speaker plug into one of the "Audio" jacks of the No. 1-A Receiving Set and tune-in on a broadcast program that comes through with good, uniform volume. Then disconnect the two cord conductors at the loud speaker base or at the plug (whichever is most accessible) and listen to the reproduction with the cords connected direct and then reversed, reversing enough times to be sure which way gives the loudest signal. (If the loud speaker is adjustable it may be necessary to readjust to prevent the louder signal from distorting or "rattling.") The connection that gives the loudest signals is the correct one, and the loud speaker cord terminals should be permanently connected in that way.

When using a loud speaker for tuning or selecting a new station it is advisable to plug into the "2nd Audio" Jack as the signal will be amplified to the maximum and thus more readily detected when the dials approach the correct settings for the desired station. Then if the signal comes in with too much volume it is best to use less amplification by plugging into the "1st Audio" Jack, before "sharpening" the tuning and recording the dial settings on the log card.

## **Interference and Disturbances:**

The Stromberg-Carlson No. 1-A Neutrodyne Receiver is so designed as to eliminate or minimize the majority of extraneous noises that usually disturb the broadcast listener. A list of these disturbances and the remedies follow:

### **(a) Interference Between Broadcast Station Programs:**

The "selectivity" of the No. 1-A Neutrodyne Receiver is ample to prevent this kind of interference provided the antenna is not too long. (See instructions covering "Choice of Antenna and Location.")

### **(b) Interference Due to Broadcast Stations on Close Wave-lengths:**

When the broadcast stations are operating on wave lengths that are so close together that the inaudible radio-frequency carrier waves combine to cause audible beat notes, the result is a steady squeal or howl of unvarying pitch. This seldom occurs unless one or both of the broadcast stations are operating on an incorrect wave length, or when a very distant broadcast station has an assigned wave length the same as or close to that of a local broadcast station.

There is no remedy in the hands of the broadcast listener to entirely overcome this kind of a disturbance, other than to listen to the station that comes in with the loudest signal and reduce the amplification (tuning rheostat number "4" back towards zero) to the point where the interfering note is practically eliminated.

If both stations come-in with the same volume, there is no way to eliminate the steady squeal, although the programs may be separated by careful setting of the three large tuning dials to "maximum response" for the station desired.



### (c) Radiation From Local Receiving Sets:

Practically all receiving sets, using the "regenerative" principle, and sets not provided with means to prevent "oscillation" act as miniature broadcast stations and radiate tuning and receiving noises when incorrectly operated. These noises usually vary in pitch and sound like chirping of birds, howling and low pitched groans and can be picked up from a receiving set located many miles away. The louder noises of this character come from a neighboring receiving set, however.

A correctly balanced "Neutrodyne" type of receiver will not radiate this kind of disturbance, regardless of how the dials are turned, so that when all of the receiving sets in use are of the Neutrodyne type, no disturbance of this kind will be possible. The Stromberg-Carlson No. 1-A Neutrodyne Receiver does not oscillate or radiate when installed in accordance with these instructions, therefore, will not cause disturbance to your nearest neighboring receiving set.

The only remedy for this kind of disturbance is to suppress it at the source of the noise. A campaign of education has been inaugurated by radio clubs and various national radio associations to minimize and eventually eliminate this receiving set radiating disturbance.

### (d) Interference Due to Telegraph Code Signals:

Telegraph code signals, sounding like continuous dots and dashes, usually come from so-called "spark sets" and can be local amateur stations or local or distant commercial stations. Nearly all of the commercial stations are without the broadcast range and the amateur stations are gradually eliminating the "spark sets" or are working these sets on a schedule that avoids interference with evening broadcast programs.

The great selectivity of the Stromberg-Carlson No. 1-A Neutrodyne Receiver reduces this kind of disturbance to a minimum.

### (e) Interference Due to Static:

All noises due to atmospheric electricity and local man-controlled electricity is commonly called static. This disturbance sounds like a continuous roaring noise with occasional crashes and other varying or steady superimposed noises.

The atmospheric static is greater in summer than in winter and usually is more noticeable at night than in day time.

Other noises, included under the heading of "Static" are caused by one or more of the following:

- 1—Direct Current Motors operating in same building.
- 2—Electric Elevator Systems in same building.
- 3—Electric Sign Flashers, if close by.
- 4—Violet Ray and X-Ray apparatus in same or nearby buildings
- 5—Imperfect Insulation of nearby electric lighting and power lines.
- 6—Electric Door Bells (when operating) in same building.
- 7—Electric Arc Lights, if nearby.
- 8—Electric Railways and Trolley Cars—when passing nearby.
- 9—Electric Welding Apparatus, if operated nearby.
- 10—Battery chargers in nearby service stations and garages.
- 11—Electric Smoke Precipitators.



Fortunately, practically none of the above listed disturbances are picked up by a receiving set located in a residence or apartment building, although they may be encountered to a more or less extent in stores and factory buildings. Thus, a satisfactory demonstration of a sensitive and powerful radio receiving set is best made in the ultimate location, rather than in a store or other salesroom.

The most satisfactory way to minimize or eliminate "static" disturbances is to keep the antenna short in length and fairly close to the ground. (See article on "Choice of Antenna and Location.") Also, this kind of disturbance is reduced in respect to the broadcast signals by using less audio amplification, or none at all. For example, if a loud speaker is to be employed, plug it into the "1st Audio" Jack instead of the "2nd Audio" Jack, or if the static is too loud, try the head set plugged into the "Detector" Jack.

**(f) Interference Due to Battery Noises:**

Any noise that continues after the antenna and ground is disconnected from the receiver binding posts usually is due to loose battery connections or run down "B" or "C" batteries. First, see that all battery wires are securely fastened at the battery binding posts or spring clips of the various batteries (A, B and C batteries) also at the D. P. D. T. switch (see diagram) and at the No. 1-A Neutrodyne Receiver "Battery Taps" binding posts. Then if the noise continues when the "A" battery is fully charged, replace the "B" and "C" batteries with fresh, new batteries.



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Independent Radio Manufacturers, Inc.  
**NEUTRODYNE**  
Pat. March 27, 1923, and April 1, 1924  
Hazeltine Pats. Nos. 1450080 and 1489228  
Other Patents Pending