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RADIO

Broadcasting Station

DIRECTORY

AND

TROUBLE FINDER

CALL AND LOCATION
OF OVER 650 STATIONS

HOW TO LOCATE TROUBLE

HOW TO GET THE
MOST OUT OF RADIO

ALL ABOUT AERIALS,
AMPLIFIERS, BATTERIES,
LOUD-SPEAKERS, ETC.

A PRACTICAL HANDBOOK

Price, 25 Cents.

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RADIO

Broadcasting Station

DIRECTORY

AND

TROUBLE FINDER

A complete list of Broadcasting Stations in North America and a Guide for the location and elimination of trouble in Radio Receiving Sets.

BERTRAM W. DOWNS

Publisher

2126 Iglehart Ave.

ST. PAUL

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MINNESOTA

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Introductory Note.

RADIO, as a means for entertainment, education and the dissemination of general information, has reached a high degree of development.

Standard radio instruments themselves have reached a degree of excellence comparable to the precision work in fine motor cars.

The "Trouble Finder" portion of the title of this booklet should not be taken as an insinuation that radio sets are continually out of operation; for such is not the case.

The normal condition of a radio set is a healthy one. This booklet is offered as an instructor in the proper operation of a radio set, comparable to the instruction book which every wise owner of a motor car will buy.

Contents.

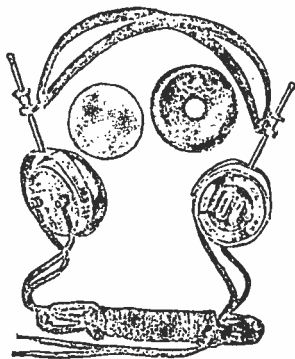
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Facts That Everyone Interested in Radio Should Know.

1. Long distance stations ordinarily can not be heard with a crystal detector set.
2. A vacuum tube regenerative set, using only one tube, will bring in signals from nearly the same distance as a set having an audio-frequency amplifier. The amplifier only serves to increase the strength of signals brought in by the detector tube, for the purpose of operating a loud-speaker or making the signals louder in the phones.
3. The night range of sending and receiving stations is much greater than the daylight range. Do not expect to hear stations a great distance away in the daytime.
4. There are nights, rare in winter, and common in the summer, when it is impossible to bring in distant stations. This is due to atmospheric conditions beyond our control. This condition should be met philosophically as something that can not be avoided, and not used as the basis of a complaint to the radio dealer who sold you your set.
5. A radio set will not work satisfactorily when the storage battery or B batteries are nearly run down. Have the storage battery charged and get new B batteries. B batteries should last six months, and often last several years.
6. Never get impatient with your set. Nine chances out of ten a man familiar with radio can find your trouble in a half minute. If you will take the trouble to familiarize yourself with the principles of radio you can do the same. There is a reason for every radio trouble.
7. Don't talk about the wonders and mysteries of radio, and the scientific and delicate sets that have made it possible, and then condemn the dealer or manufacturer when your set won't work with the aerial disconnected, the vacuum tubes burned out, or the batteries connected with the polarity wrong. A scientific instrument must be treated in an intelligent manner.
8. If you have not learned to tune properly, but manage to tune in one long distance station, don't condemn your set because you do not hear them all. The fact that you heard one distant station shows that the set is all right; all you need is patience and practice, and you will be able to get the same ones as your neighbors.
9. Don't expect to get louder or clearer music when your vacuum tubes are turned up brighter than normal. If anything, the material you receive will be less loud and there will be unpleasant noises introduced. A slight overload on the tubes will make them burn out in a fraction of their normal life.

10. Radio does not change overnight. The set that you buy today will be good a year from today, and probably for many more years. The long-distance receiving sets in thousands of homes at present are practically identical, with a few minor refinements, to the sets that were used by radio-telegraph enthusiasts five years ago. If you have postponed getting a good radio set because you are waiting for a big change in radio, you are missing more enjoyment than the individual who puts off buying an automobile for the same reason. Radio is not new—it is not a fad; popular interest has merely become more widespread in the past year. Radio telephone broadcasting has been conducted on a small scale for years; and radio telegraph broadcasting, for a decade or more.

11. Don't expect your radio set to act like a phonograph. You can't push the button for grand opera or jazz and get it. You will hear many stations better than over a phonograph, but some of them can not be heard over a loud-speaker, for the reason that they are out of your range. When you analyze it, you will realize that this fact lies at the root of the lure of radio. The fascination is in the uncertainty of the thing; always something new, greater distances to cover, and the ever-increasing mystery of the science. If you just had to push the button to bring in anything you wanted to hear, you would discard the set in a month. As it is, the experience of those who have followed radio since its inception decidedly indicates that "once a radio fan, always a radio fan."



On Aerials.

THE aerial is the part of the radio system which "catches" the radio waves and leads them to the receiving instrument, where the waves are transformed into sounds corresponding to those sent out at the broadcasting station.

Aside from underground aerials, condenser aerials, "Beverage wires," and other unusual constructions, there are two popular types which are most in favor at the present time:

1. **The Flat-Top Aerial.** This type is in use in fully 95% of the receiving stations. It consists of one or more wires, from 25 to 50 feet high, suspended by insulators from two supports. For the reception of broadcasting programs, the ideal length is from 100 to 150 feet, with the mean length, 125 feet, probably the best for signal strength.

There is, however, a tendency toward the use of shorter aerials in connection with the highly efficient present-day sets. Two causes contribute to this tendency:

- a. The use of an aerial from 60 to 80 feet in length makes it possible to "tune out" or eliminate undesired stations much better than is possible with an aerial of two times that length. In the face of the rapidly increasing numbers of broadcasting stations, this becomes an advantage of decided importance.
- b. Radio sets have reached a point of efficiency where the energy picked up by short aerials, such as the above, is sufficient to give excellent results over long distances, and the increased selectivity of the short aerial often outweighs the advantage derived from the use of an aerial of greater length.

The length of an aerial for broadcast reception should never exceed 150 feet.

There is absolutely no advantage to be gained by using more than one wire for receiving. The direction in which an aerial of this length points is of practically no importance.

A flat-top aerial should not be parallel to high power electric lines, unless they are 25 feet or more away. An aerial in the open country is ordinarily more effective than one in a congested residence or business district.

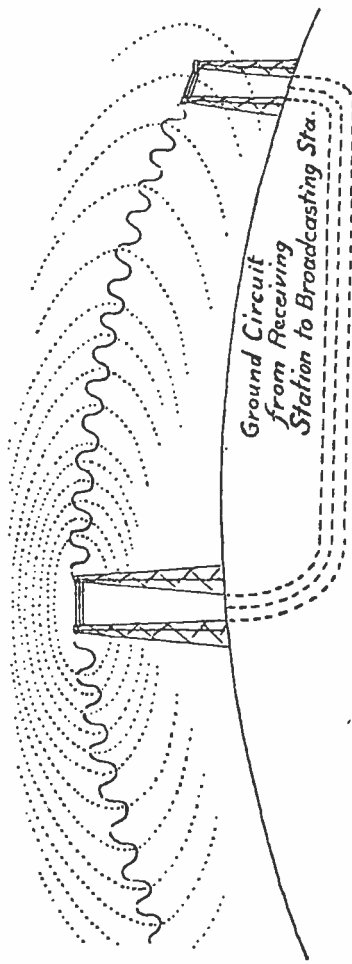
The lead-in wire from a flat-top aerial should be free from obstructions, and well insulated. It should touch as few insulators as possible, so as to eliminate possibility of electrical leakage. The lead-in should make good contact with the flat-top portion, and should, if possible, be soldered. Connection with the overhead wire should be as near to the end of the horizontal

span as possible. If such an arrangement is not practical, the lead-in may be attached near the center of the flat-top portion, and only a slight loss in efficiency will be suffered; probably so slight as to be unnoticed. Refer to diagram for sketch of an aerial.

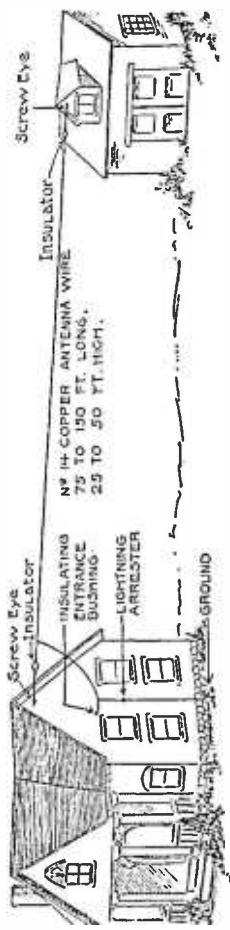
2. **Loop or Coil Aerials.** Loop aerials are coming more or less into favor where it is not possible to erect an outdoor aerial. They are satisfactory for short distance reception with a vacuum tube detector, but only satisfactory for long distance work when used with a radio frequency amplifier of at least two or three stages in addition to the vacuum tube detector and, if desired, audio frequency amplifiers. Loop aerials are supposed to have the advantage of receiving only from the direction in which they are pointed, but this characteristic has been greatly exaggerated in many of the reports in circulation. No ground connection is used with a loop, which is in fact nothing but a tuning coil, enlarged to such proportions that it serves to pick up the waves from the sending station, and pivoted so that it may be pointed in any direction.

Lightning Protection. With a loop or an indoor aerial there is of course no need for lightning protectors. In the case of the outdoor aerial, the condition is somewhat different. During a lightning storm the aerial picks up a considerable amount of static electricity, which should have a fairly easy path to the ground, in order to protect the receiving instruments. The danger is not that the lightning will strike the aerial and then set fire to the house; if lightning strikes an aerial it burns up the wire before it gets to the ground—but the static charges coming from flashes of lightning some distance away are liable to do some harm if not provided for by a grounding switch or protector of some kind. In this connection the vacuum type of protector is most highly recommended. As a means of protection it is highly effective, and it may be employed with the very minimum of loss in efficiency of the receiving system. As far as actual danger to the house is concerned, the metal eave-troughs or gutters present a greater fire hazard than an aerial.

The Ground. Except in cases where a loop aerial is employed, a good ground connection is a necessity. The best ground is usually a water pipe (faucet, radiator, or the like) connecting with a city water-works. A gas pipe makes a good substitute. In the country, a metal plate buried deep in moist earth will serve, or a "counterpoise" may be used. This consists of another aerial only a few feet above the ground, and constructed like the overhead aerial. This gives excellent results, but involves more difficulty in construction than does the direct connection to a water pipe. In every case the connections between the instruments and the ground should be as short as possible.



Radio waves traveling out in all directions from transmitting to receiving stations.



A typical antenna system for a radio receiving station.

On Loud-Speakers and Amplifiers.

A LOUD SPEAKER is not an amplifier. A loud speaker can not be connected directly to a crystal set, or to a vacuum tube set having only one tube. A loud speaker can only transform the electrical energy into an amount of sound-energy of about the same value. That is, the amount of electrical energy received in the aerial is not enough to fill a room with sound, when transformed into sound-energy by the loud speaker. This electrical energy must first be amplified, by an instrument called a "Vacuum Tube Amplifier."

Many receiving sets include a two-stage amplifier; if this is the case with your set, it will operate a loud speaker without any additional equipment. If your set has only one vacuum tube, you must first add a two-stage amplifier before you can have satisfactory results with a loud speaker. Recognition of these facts will prevent disappointment when buying a loud-speaking horn.

In general there are two types of vacuum tube amplifiers, each serving its particular purpose:

1. The Audio-frequency Amplifier (Tone-frequency amplifier) is used to increase the strength of the signals received by the detector tube, after they have passed through the detector. Where the incoming signals are too weak to operate the detector tube, it is useless to try to increase them with audio frequency amplifiers. A one-stage amplifier strengthens the sound about 7 times; a 2-stage amplifier makes the sound about 50 times as loud. More than 2 stages of audio frequency amplification can not ordinarily be used without producing "howling."
2. The Radio-frequency Amplifier is used to increase the incoming current before it is fed into the detector. Thus signals that would not be strong enough to operate the detector are amplified so that a good response will be made by the detector tube, after which the intensity of the sound may be increased by the use of an audio-frequency amplifier. The tuners used with radio frequency amplifiers are simpler than the ones ordinarily used with sets without the radio-frequency feature. However, the radio-frequency amplifier is somewhat more complex than the audio-frequency type.

If you do not know just what type of set you want, ask your radio dealer; he can tell you just what you can expect from any radio set.

On Tuning.

NINETY-FIVE per cent of radio "troubles" are caused by ignorance or disregard of the rules of tuning. It is surprising to find what a change in one's viewpoint is made when a radio set is purchased. Before we own the set radio is a most mysterious science; wonderful in the extreme. After we get the set, most of us expect to sit down and hear stations thousands of miles away, without paying any attention to the operation of the set according to instructions.

Turning the dials at random is not tuning. You may run into some stations by accident, but the chances are that you will hear nothing but the near-by stations that you can't help but tune in.

Just as the violinist tunes his instrument to the piano that is to accompany him, so you must tune your instrument to resonance with the sending stations. Not only that, but you have several separate circuits that must be in tune with one another as well as with the broadcasting station. The first thing for the beginner to do in starting to tune in a station is to turn on the filament of the vacuum tube. If you have amplifiers, turn on the amplifier tubes first, as they do not need a very careful adjustment. They should be slightly less bright than an ordinary electric light, except in the case of the new dry-cell tubes or those with an oxide-coated filament, which should be dull red. Tubes burned too bright give fainter signals and more harsh noises, and last about one-tenth as long as tubes burned at the proper temperature. The detector tube adjustment is very important, and it should be burned at a temperature lower than the point where a hissing sound can be heard. After regulating the detector, advance the tickler, or plate inductance (this is marked on most sets, and is usually the farthest dial to the right on the tuner), to about one half its capacity or a little more. Now turn the primary condenser and switch (this is usually at the left, and marked "tuner") until a sound is heard like a whistle, or if the dial is moved past very rapidly, a chirp of a bird. Now turn back the dial until this whistle is heard loudest, and then reduce the value of the tickler, meanwhile holding the whistle at its loudest point, until the whistle becomes blurred, finally melting into the voice or music at the sending station. It is possible to tune in stations with the tickler advanced too far; but this will be unstable, and the set is liable to start to howl when the hands are moved. On the other hand, the tickler should be exactly at the place where the whistle disappears, for below this point it will be impossible to hear distant stations. The sum this all up:

1. Advance tickler to half or three quarters position.
2. Turn primary, or tuner adjustments until a whistling sound is heard.

3. Stop at this point, and reduce the tickler until the whistling sound disappears, meanwhile varying the tuner so that the whistle is held at its greatest intensity until it completely disappears. At this point the voice will be heard.

A little practice will make this operation seem very simple; yet if this procedure is not followed, it is probable that no distant stations will be heard at all. These instructions apply only to regenerative sets, but unless your set is regenerative or has a radio frequency amplifier, very few long distance stations will be heard under any conditions.

Note.

When these instructions are followed, that is, picking up the carrier wave of the sending station by advancing the tickler, your own receiving set becomes a source of interference for your immediate neighbors, due to the radiation of energy by your detector tube. Should you have some neighbors with receiving sets, you should learn to tune with the tickler adjusted to the point just below where the detector begins to oscillate, that is, to make the carrier waves audible. It requires much more skill and familiarity with the instrument to do this, but with the increasing numbers of receiving stations, it becomes a duty to your neighbors to learn to keep your set from oscillating. The owner of a radio set should consider the rest of the radio public, and the best way to do this is to learn the fundamentals of radio from a good text book or radio class, and study the principle and operation of his own set conscientiously. A little practice will show you how the set sounds just before it reaches the oscillating point, and you should strive to keep your tickler at this critical adjustment at all times. This will give you the best results, and cause practically no interference to other stations.

Radio Batteries.

EVERY owner or prospective owner of a radio set should know the function and care of radio batteries. The following outline gives a brief explanation of this subject.

The "A" battery. The purpose of this battery is to light the filament of the vacuum tube. In the case of the standard vacuum tubes this is a six-volt storage battery, although some of the newer tubes will operate on a single dry cell. When the dry cell tubes are used, the filament should be lit only to a dull red. Attempts to bring about a white heat, as in an electric light, will result in the destruction of the filament. The large tubes, for use with a storage battery, should be brought to a temperature slightly below that of an electric light. The storage battery should be kept well charged at all times, as the best results are obtained when the battery is fully charged. For this purpose, either use a home charging outfit, or else send the battery to a local garage or battery station. Add distilled water to the storage battery every two weeks. The current drawn from the "B" battery is exceedingly small, and a "B" battery for this reason will last for months, and sometimes for a year or more. When worn out, a "B" battery should be thrown away, as, except in the case of storage B batteries, when discharged, they are useless.

In leaving the set, there is no need to turn off anything but the rheostat, as this automatically disconnects the B batteries. In the case of sets containing an A battery potentiometer (this is rarely found except in the case of a radio frequency amplifier) it is advisable to disconnect one of the wires leading from the storage battery to the set, as the potentiometer causes a slight drain on the A battery.

Never connect the B battery in place of the A battery. The B battery, though small in comparison to the storage battery, will burn out the filament in a flash. The purpose of the B battery is merely to furnish a local current, which somewhat increases the strength of the received signals or music. Vacuum tubes will not operate without a "B" battery.

B batteries are ordinarily composed of a number of small dry cells, moulded in one block. The usual size is 22½ volts, maximum, per block. These 22½ volt batteries can also be had in a number of sizes, all of which will perform the same function, but the larger ones will give a greater number of hours of service.

For use with the ordinary vacuum tube detector, one of these batteries is sufficient. It will be noticed that there are a number of binding posts or taps on a B battery, each one labeled a different voltage. This is because some detector tubes require lower voltages than others. By experimenting with your particular tube you will be able to determine just what voltage is best for your tube. Ordinarily this will be about 18 volts.

For use with an amplifier tube, 45 volts is customary, although as high as 100 volts may be used. The higher voltage may be secured by connecting a number of 22½ volt blocks together, or B batteries may be bought in units of 45 volts or more per block. Although the voltage applied to the detector tube must be carefully selected, this is not the case with amplifiers, which are, in radio parlance, "not critical."

Most Common Radio Questions and Answers.

- Q. Instead of making my aerial a straight wire, can I get the same result by doubling it back and forth, or around corners?
- A. No. The portion which doubles back, unless separated from the rest of the aerial by considerable distance, tends to counteract the effect of the other portion. The simpler your aerial is, the better. If you must have an aerial as short as 20 or 30 feet, some advantage may be obtained by forming it from four or five parallel wires, insulated at each end, and connected together at the lead-in end, and not connected together at the free end. This construction is recommended for aerials built in the attic. If firmly constructed, it may serve as a clothes line in the daytime. Rather good results may be had from such an aerial, in connection with a good regenerative set, or with a stage or two of radio frequency amplification. However, an outdoor aerial is always advisable.
- Q. Can more than one pair of phones be used?
- A. Yes. There is very little loss of efficiency when more than one pair of phones are connected. In all cases the phones should be connected in series, that is, tip to tip, with the two free tips inserted in the "Phones" binding posts or plug.
- Q. Can two radio sets use the same aerial?
- A. As a rule this is decidedly not satisfactory. Re-radiation from each receiving set tends to produce squeals and howls in the other.
- Q. Can the vacuum tubes be operated directly from the house current, or through a small transformer?
- A. A few advanced experimenters have been able to do this, by the use of an elaborate filtering apparatus to remove the hum of the generators. If you wish to avoid the storage battery, use the new dry cell vacuum tubes, which are adaptable to most sets.
- Q. What can I do to tune out nearby stations, and hear the long distance ones?
- A. Some local stations are so strong that they can not be tuned out. A number of things can be done to reduce such interference:
1. Use an aerial of about 60 feet in length, one wire.
 2. If your set has a primary variable condenser, keep the setting near minimum, using a greater amount of inductance in the primary tuning coil. If your set has a fixed primary condenser, such as in the Westinghouse Radiola Senior or a condenser mounted on the same shaft as the tuning coil, such as the RC set of the same manufacturer, you will find

that it is easier to tune out interfering stations with a small variable condenser (3 or 5 plates) connected between the lead-in and the set.

3. Eliminate the ground connection, and in its place connect another aerial (counterpoise). For very best results this should lie under the main aerial, but any other aerial will serve. Results that are obtained from such a combination are fully equal to the results that are obtained from the use of a ground, and the counterpoise is often better. Practically all transmitting stations use a counterpoise in preference to a direct ground connection.
 4. By using a loop aerial and a three-stage radio-frequency amplifier you will obtain somewhat better selectivity. The loop receives best when it is pointed in the general direction of the sending station, and will cut out local or other stations when it points at right angles to the direction of the interfering station. The writer believes that the advantages of loop reception have been somewhat over emphasized, although there are unquestionable advantages to be obtained.
- Q. I try to follow the instructions on tuning, etc., but I can not hear the long distance stations unless the vacuum tube is burning very bright. What is wrong?
- A. One of a number of things may account for this:
1. The tube may actually be defective. Try it out in a friend's set.
 2. Your aerial may be of poor design. An aerial longer than 150 feet will make the set act this way, and so will an aerial that is parallel to other wires which are grounded. If the aerial is very low, say 20 feet above the ground, and over 100 feet long, the same effect may be noticed.
 3. The voltage of the B battery may be too low, due to use, old age, dropping, or other mistreatment. Try another B battery.

NOTE: Don't underestimate the services of a good "radio doctor." Nearly every city has one or more, and there will undoubtedly be many more of these specialists in the near future. A few dollars spent on expert service is much better than burning out tubes and buying a lot of extra "radio patent medicines" that your friends will advise.

- Q. What is the best type of set to build or buy?
- A. All standard sets represent good value for the money. Practically all regenerative sets will give the same results. It is possible to build at least 50 different styles of regenerative sets, all of which will give the same results. If you are not experienced in radio you will be safest in asking your dealer for his advice, when buying a new set. In building a set for your own use, it is a pretty safe rule to avoid the "freak" hook-ups that appear in some of the more sensational radio magazines, and follow the standard designs. The main thing to seek is simplicity of control, so long as efficiency is not sacrificed.

- Q. What about the electric wires for an aerial, with an aerial plug?
- A. The only way to tell if this will be satisfactory is to try it in your own house. Aerial plugs will operate in about 75% of the cases, and it is difficult to predict where they will or will not operate. Ordinarily aerial plugs are not satisfactory in new apartment houses, where the electric wiring is carried in metallic pipes or cables. Where they will work, aerial plugs seem to be as satisfactory as a good aerial, with the additional advantage of simplicity and freedom from protective devices.
- Q. Would you advise the construction of a "super-regenerative" set?
- A. It is entirely possible that in the future the principle of super-regeneration will be adapted to sets that will be fairly dependable and simple to operate. At present these sets are in the laboratory stage, and only experienced radio men can obtain any degree of success with them.
- Q. Can a storage battery from an automobile be used with a radio set?
- A. Yes, providing due care is taken not to use a voltage too high for your vacuum tubes. A six volt battery is right for the standard tubes, and if your car has a 12 volt battery, it will be necessary for you to use only half of the battery at one time.
- Q. Can I use a tree as an aerial support?
- A. Yes, but this is not advised. Place a spring or strip of strong rubber between the tree and the insulator, to prevent the wire from breaking in a wind storm. The greatest disadvantage is the change in wave-length of the aerial so supported, due to swaying in the wind.
- Q. I sometimes hear the whistle of a carrier wave, but on trying to tune it in, there will be a click in the phones, and the wave will disappear entirely.
- A. 1. You may have too much B battery voltage for your detector.
 2. If the carrier wave is very weak, it is probable that the sending station is out of your range entirely.
 3. You may have mistaken a wave from a local receiving set for the carrier wave of a transmitter. You will, of course, not get any music from such a wave.
- Q. Some nights the air seems to be full of subdued howls, whistles, and groaning noises that I can not tune out.
- A. The main cause of this type of interference is radiation from local receiving sets that are improperly operated. This is getting to be a serious matter in the larger cities. The same type of interference comes from a number of broadcasting stations sending at once. In addition to radiating their individual waves, the interaction between the waves of two or more stations produces the whistling that you have noticed. Refer to some text book on radio or physics; subject: heterodyne or "beat" action. Two remedies for this are possible: A material decrease in the number of sending stations, or development of transmission on waves of less than 50 meters.

In Case of Trouble.

DON'T pack up the set and take it back to the dealer. You wouldn't do this with an automobile when it ran out of gasoline. Your batteries may be run down, your vacuum tube burned out, the phone cord broken, or there may be some other minor defect. A careful examination will reveal the trouble.

If the vacuum tube will not light:

1. It may be burned out.
2. The A battery may be dead.
3. There may be a broken connection within the set or in the cord from the battery to the set. If it is factory built the chances are that the trouble is not in the set.
4. If the tubes light only dimly the battery is quite certain to be partly discharged.
5. One of the prongs on the tube socket may be bent, preventing contact.

If rattling noises are heard with the signals:

1. There may be atmospheric electricity in the air (static). This is not the fault of your set, and there is no way to tune it out.
2. There may be a broken-down transformer or arc light in your locality. Disconnect the aerial and ground wires from your set; if the noise ceases, it is due to one of the above causes.
3. A dead, or nearly discharged, A or B battery will cause such a noise. Ordinarily, when this is the trouble, the noise will not begin at the first moment the rheostat is turned on, but will begin after a short period, and get so bad that nothing else can be heard.
4. If rattling noises are heard only when the dials are turned, it is practically certain that there is a loose connection in the set, the exact location of which can be found by finding which dial produces the noise, and then examining the instrument connected with the dial. Sometimes a wire will break inside the insulation, and when the set is jarred it will make and break the circuit, causing a periodic rattling noise.

If you have a regenerative set, a good aerial, and you hear the local stations loud and clear, but can't hear any long distance:

1. You have not learned to tune your set. There is no other explanation. Read the part on "tuning." (Exception: bad atmospheric conditions).

If the set is "paralyzed," and nothing seems to come in:

1. You may have the detector tube in the amplifier socket.
2. You may have too much B battery voltage on the detector.

3. The tickler may be advanced too far.
4. The phone cord may be broken or the phone plug short-circuited.

If the set howls when the hands are moved:

1. Tickler is advanced too far.
2. If a home-made set, you may have neglected to shield the panel with metal.

If signals are louder with one tube than when using the amplifier:

1. The "A" battery connections are reversed, or
2. If a home-made set, you may have reversed one of the amplifying transformers or
3. You may have neglected to make one of the connections to the amplifying transformers.
4. It is possible that one of the amplifier tubes is defective. This may be tested in the detector socket, as an amplifier tube makes a fairly good detector. If signals come thru the amplifier tube fairly strong, it is probably all right.

If there is a continual singing noise when the amplifiers are used:

1. This will not occur in a well designed set. It is caused by the tubes or amplifying transformers being too close together. If available space is limited, place the transformers at right angles. It is not advisable to use more than two stages of audio-frequency amplification.

If your vacuum tube burns out in a short time:

1. You may have burned it at too high a temperature. Don't expect a replacement if this is the case.
2. If it is a standard storage battery tube with an incandescent filament, it may have been burned at too low a temperature. Tungsten filaments will wear out as quickly when burned too low as when they are burned too high. If burned too low the filament crystallizes; if too high, it evaporates rapidly.
3. If you think the burn-out was due to an actual defect, send the tube to your dealer, advising him of the circumstances. He will send the tube to the manufacturer, who will examine the filament under a microscope, and if the tube was defective you will get a replacement without charge. Don't expect the dealer to replace the tube at once. He is put to enough expense in sending in the tube for you, paying the express, and keeping book records of it.

Popular Misconceptions Corrected.

POPULAR credulity has been taken advantage of in many instances by the spreading of propaganda designed to create a demand for certain instruments used in radio. In some cases this has been originated through ignorance, by writers uninformed; in other cases there has been a deliberate attempt to mislead, and create a demand for the supposed "cure-all." Some of the resulting misconceptions are taken up below:

1. Ohmic resistance is not a basis for the sensitivity of radio receivers ('phones). Impedance is the important thing, but this varies with the signals received, so it is impossible to rate the phones by any fixed standard of impedance. The best pair of receivers ever used by the writer had a resistance of 2,200 ohms. Many receivers with a resistance of 3,000 to 6,000 ohms are markedly inferior to low priced receivers of 2,000 ohms. In fact, the writer is favorably impressed toward any manufacturer who omits a statement of the resistance of his phones when advertising them. High resistance looks impressive, but "it doesn't mean anything."
2. There is no radio set that will eliminate static.
3. It is difficult in the extreme to eliminate interference from local broadcasting stations. Don't expect too much from loop aerials, selective tuners, and the like. Local stations usually can not be tuned out, because they "force" themselves in, regardless of whether they are tuned in or out.
4. Do not expect amplifying transformers with a high step-up ratio to always give best results. Many 9-to-1 transformers are inferior to 3½-to-1 types. There are good ones of each style. Remember that the transformer can not add energy; the B batteries do that.
5. Very long aerials will not bring in loud signals from broadcasting stations. Aerials over 150 feet in length make tuning more difficult, give weaker signals, and bring in more static. More than one wire will not increase the effectiveness of your aerial, except in the case of exceedingly short ones—say 20 feet in length.
6. A radio aerial is not so much of a fire hazard as it is sometimes reported to be. This is not meant to indicate that lightning arresters are not worth while, for protection of the radio apparatus, however. If you have a good protector the house and instruments are as safe as if you did not have a radio at all. Without a protector the house is safe, but slight damage might result to the instruments if lightning struck in the back yard.

The Correct Way to Test a Radio Set.

ONE subject that should be understood by every owner of a radio is that of tracing out the trouble in his set. The procedure is as follows:

First, obtain a circuit drawing of your set. Your dealer will supply you with such a drawing of a factory built set, but if you have an instrument made by a reputable manufacturer, the chances are against trouble in the set. To locate trouble in a home-made set, you will of course refer to the diagram by which you made it.

You will need a small dry cell and a pair of phones for testing. First test the phones by touching the tips on the battery terminals. If you do not hear a loud click, the trouble lies in the phones. Connect wires to the battery and touch them to the terminals of each phone. If a response is not given by the phone being tested, there is either an "open circuit" or a "short circuit" within that phone. If both phones test O. K., the trouble lies in the phone cord, and a new one should be purchased.

If the phones are found all right, they will then serve as part of the testing outfit. Connect one of the phone tips to one terminal of the battery. Connect a wire to the other side of the battery, and then connect another wire to the free phone tip. Now, when the tips of these two wires are touched together a click will be heard in the phones.

Now refer to your diagram, and test each instrument for open or short circuit. For testing coils (varlometers, tapped coils, vario-couplers, etc.), touch one of your wires to one end of the coil in question, the other being connected to the opposite end of the coil. A click should be the result.

In testing condensers, it is best to disconnect one wire from the condenser, and this must be done if the condenser is shunted by a conductor of any sort. A condenser that is correct, will not produce a loud click in the phones. When first touched there will be a very faint click, caused by the instrument discharging through the phones, but the second or third time the test is applied, there should be no click in the phones. If the click is heard, the condenser is defective.

After testing the condensers and tuning coils, test out the wiring between these instruments, with the tubes out of their sockets. As an example, this is the way one should proceed in testing out a single circuit tuner, after having tested the condensers and tuning coils:

1. Test from "aerial" binding post to series condenser. This should show a closed circuit, evinced by the click in phones.
2. Test from other side of condenser to primary tuning coil. Should be closed circuit.
3. Test from other side of same coil to ground binding post. Should be closed circuit. This completes the aerial-to-ground circuit.

4. Now test from series condenser to grid condenser. This will show closed circuit, if wiring is correct.
 5. Test from other side of grid condenser to the prong on the detector socket marked "G." Should be closed circuit.
- Follow this scheme of testing until the trouble is located in the instruments or wiring. Due to the differences in sets, it is impossible to give a strict rule for testing all makes. It is a good idea for a beginner to test out his set this way when he first gets it, and thus familiarize himself with the procedure in testing. Let us repeat that the greatest pleasure from radio comes to him who learns the "Why" and "How" of his set, and finds a thrill of achievement when he has located his trouble unaided. The greatest development of radio will only come when every radio owner is educated in the principle and operation of his set. As was pointed out before, an improperly operated receiving set can become a source of annoyance to other listeners, and in order to do the fair thing for the rest of the radio public we must first understand how to operate our instruments. This understanding can come only from study, coupled with practice.

In Closing.

RADIO is here to stay. It will not be many years before the home radio set will be a necessity of the first order. As a source of entertainment it is in a class by itself. As a means of education and a force for better government, its possibilities can not be over-emphasized. It does not require a visionary to foresee the day when country schools will be absolutely dependent on radio stations miles away, for the larger portion of the curriculum. The highest development of democracy will come about through the discussion of national problems and questions before an audience of the nation—possibly the whole civilized world. Let us, then, all "do our bit" to bring about the greatest radio development. Let us encourage the study of radio in schools; let us study it ourselves; learn to operate our sets so as to cause a minimum of annoyance to our neighbors; and feel that we have done our share to bring about a revolution in the methods of education and communication—the bases of civilization.

Radiophone Broadcasting Stations in North America, Classified Alphabetically by Calls.

AGI, Presidio of San Francisco, Cal. Signal Corps, U. S. A.
 AQB, Canton, O., Hdqtrs, 135th F. Artillery O. N. G.
 ASG, San Antonio, Tex. U. S. Army, Camp Travis.
 AV7, St. Paul, Minn. Minnesota National Guard.
 CFAC, Calgary, Alta., Can. Western Radio Co. Ltd.
 CFCA, Toronto, Ont., Can. Toronto Star.
 CFCA, Vancouver, B. C., Can. Marconi Co.
 CFCE, Halifax, N. S., Can. Marconi Co.
 CFCE, Montreal, P. Q., Can. Marconi Co.
 CFCH, Iroquois Falls, Ont., Can. Abitibi Power & Paper Co.,
 Ltd.
 CFCl, Walkerville, Ont., Can. Motor Products Corp.
 CFEN, Calgary, Alta., Can. W. W. Grant Radio Ltd.
 CFEX, London, Ont., Can. The London Advertiser.
 CFPC, Fort Frances, Ont., Can. International Radio De-
 velop. Co.
 CFTE, Toronto, Ont., Can. The Bell Telephone Co.
 CFYC, Vancouver, B. C., Can. Victor Wentworth Odlum.
 CFZC, Montreal, Que., Can. Can. Westinghouse Co., Ltd.
 CHBC, Calgary, Canada. W. W. Grant Radio Ltd. (Morning
 Albertan.)
 CHCA, Vancouver, B. C., Can. Radio Corp. of Vancouver,
 Ltd.
 CHCB, Toronto, Can. Marconi Co.
 CHCC, Edmonton, Alta., Can. Can. Westinghouse Co., Ltd.
 CHCF, Winnipeg, Man., Can. Radio Corp. of Winnipeg, Ltd.
 CHCQ, Calgary, Alta., Can. Western Radio Co., Ltd.
 CHCS, London, Ont., Can. London Radio Shoppe.
 CHCX, Montreal, Que., Can. B. L. Silver.
 CHCZ, Toronto, Ont., Can. Globe Printing Co.
 CHOC, Vancouver, B. C., Can. Can. Westinghouse Co., Ltd.
 CHVC, Toronto, Canada. Metropolitan Motors Co.
 CHXC, Ottawa, Ont., Can. J. R. Booth, Jr.
 CHYC, Montreal, Que., Can. Northern Elec. Co.
 CJBC, Montreal, Que., Can. Dupuis-Freres.
 CJCA, Edmonton, Alta., Can. Edmonton Journal, Ltd.
 CJCB, Nelson, B. C., Can. James Gordon Bennett.
 CJCD, Toronto, Canada. T. Eaton Co.
 CJCE, Vancouver, B. C., Can. Vancouver Sun.
 CJCF, Kitchener, Ont., Can. News Record Limited.
 CJCG, Winnipeg, Canada. Manitoba Free Press.
 CJCH, Toronto, Ont., Can. United Farmers of Ontario.
 CJCI, St. John, N. B., Can. McLean, Holt & Co., Ltd.
 CJCN, Toronto, Ont., Can. Simons, Agnew & Co.
 CJCS, Halifax, N. S., Can. Eastern Telephone & Telegraph
 Co.

CJCY, Calgary, Alta., Can. Edmund Taylor.
CJGC, London, Ont., Can. London Free Press.
CJNC, Winnipeg, Man., Can. Tribune Newspaper Co.
CJSC, Toronto, Ont., Can. Evening Telegram.
CKAC, Montreal, Can. La Presse.
CKCB, Winnipeg, Man., Can. T. Eaton Co., Ltd.
CKCD, Vancouver, B. C., Can. Vancouver Daily Province.
CKCE, Toronto, Ont., Can. Can. Ind. Telephone Co.
CKCK, Regina, Sask., Can. Leader Pub. Co.
CKCR, St. John, N. B., Can. Jones Elec. Radio Co., Ltd.
CKCS, Montreal, Que., Can. The Bell Telephone Co.
CKCZ, Toronto, Ont., Can. Westinghouse Co., Ltd.
CKKC, Toronto, Ont., Can. Radio Equipment & Supply Co.,
 Ltd.
CKOC, Hamilton, Ont., Can. Wentworth Radio Supply Co.,
 Ltd.
CKQC, London, Ont., Can. Radio Supply Co.
CKZC, Winnipeg, Man., Can. Salton Radio Eng. Co.
DD5, Denver, Colo. Fitzsimmons General Hospital.
DM4, San Antonio, Tex. U. S. Army, Kelly Field.
DM7, San Antonio, Tex. U. S. Army, Brooks Field.
DN4, Denver, Colo. Colorado National Guard.
KDBZ, Bakersfield, Calif. Frank Seifert.
KDKA, E. Pittsburgh, Pa. Westinghouse Elec. & Mfg. Co.
KDN, San Francisco, Calif. Leo J. Meyberg Co.
KDOW, New York, N. Y. S.S. America.
KDPM, Cleveland, O. Westinghouse Elec. & Mfg. Co.
KDPT, San Diego, Calif. Southern Elec. Co.
KDYI, Salt Lake City, Utah. Salt Lake Telegram.
KDYM, San Diego, Calif. Savoy Theater.
KDYO, San Diego, Calif. Carlson & Simpson.
KDYR, Portland, Ore. Oregon Inst. of Technology.
KDYR, Pasadena, Calif. Pasadena Star-News Pub. Co.
KDYS, Great Falls, Mont. Great Falls Tribune.
KDYV, Salt Lake City, Utah. Cope & Cornwell Co.
KDYW, Phoenix, Ariz. Smith Hughes & Co.
KDYX, Honolulu, T. H., Hawaii. Honolulu Star-Bulletin Co.
 Ltd.
KDZA, Tucson, Ariz. Arizona Daily Star.
KDZB, Bakersfield, Calif. Frank E. Siefert.
KDZE, Seattle, Wash. The Rhodes Co.
KDZF, Los Angeles, Calif. Automobile Club of Southern
 California.
KDZG, San Francisco, Calif. Cyrus Pierce & Co.
KDZH, Fresno, Calif. The Herald-Buford Co.
KDZI, Seattle, Wash. Seattle Radio Assn.
KDZK, Reno, Nev. Nev. Mchy. & Elec. Co.
KDZL, Ogden, Utah. Rocky Mountain Radio Corp.
KDZM, Centralia, Wash. Hollingworth Hdwe. & Radio Sup-
 ply Store.
KDZP, Los Angeles, Calif. Newberry Elec. Corp.
KDZQ, Denver, Colo. Win. D. Pyle.
KDZR, Bellingham, Wash. Bellingham Pub. Co.
KDZT, Seattle, Wash. Seattle Radio Assn.
KDZW, San Francisco, Calif. Claude W. Gerdes.
KDZZ, Everett, Wash. Kinney Bros. & Seppell.
KFAC, Glendale, Calif. Daily Press.
KFAD, Phoenix, Ariz.
KFAE, Pullman, Wash. State College of Washington.
KFAF, Denver, Colo. Western Radio Corp.
KFAJ, Boulder, Colo. Univ. of Colo.

KFAN, Moscow, Idaho. The Elec. Shop.
 KFAP, Butte, Mont. Standard Pub. Co.
 KFAQ, San Jose, Calif. City of San Jose.
 KFAR, Hollywood, Calif. Studio Lighting Service Co.
 KFAS, Reno, Nev. Reno Motor Supply Co.
 KFAT, Eugene, Ore. Pac. Radio Co.
 KFAU, Boise, Ida. Boise H. S.
 KFAW, Santa Ana, Calif. Radio Den.
 KFAY, Medford, Ore. Virgin Radio Service.
 KFBA, Lewiston, Ida. Ramey & Bryant Radio Co.
 KFBB, Havre, Mont. F. A. Buttery & Co.
 KFBC, San Diego, Calif. W. K. Azbill.
 KFBD, Hanford, Calif. Calif. Radio Lab.
 KFBE, San Luis Obispo, Calif. R. H. Horn.
 KFBG, Tacoma, Wash. First Presbyterian Church.
 KFBH, Marshfield, Ore. Thomas Musical Co.
 KFBJ, Boise, Ida. Boise Radio Supply Co.
 KFBK, Sacramento, Calif. Kimball-Upson Co.
 KFBL, Everett, Wash. Leese Bros.
 KFBM, Astoria, Ore. Cook & Foster.
 KFBN, Oakland, Calif. Borch Radio Corp.
 KFBQ, Prescott, Ariz. Savage Elec. Co.
 KFBS, Trinidad, Colo. Chronicle News & Gas & Elec. Supply
 Co.
 KFBV, Laramie, Wyo. Bishop N. S. Thomas.
 KFBV, Colorado Springs, Colo. Clarence O. Ford.
 KFC, Seattle, Wash. Northern Radio & Electric Co.
 KFCD, Phoenix, Ariz. Nielsen Radio Supply Co.
 KFCC, Wallace, Ida. Auto Supply Co.
 KFCD, Salem, Ore. F. S. Barton.
 KFCE, Walla Walla, Wash. Frank A Moore.
 KFCH, Billings, Mont. Electric Service Station, Inc.
 KFCK, Colorado Springs, Colo. Colorado Springs Radio Co.
 KFCL, Los Angeles, Calif. Los Angeles Union Stock Yards.
 KFCC, Casper, Wyo. Motor Service Sta.
 KFDA, Baker, Ore. Adler's Music Store.
 KFDB, San Francisco, Calif. Mercantile Trust Co.
 KFDC, Spokane, Wash. Radio Supply Co.
 KFDD, Boise, Idaho. St. Michael's Cathedral.
 KFDF, Casper, Wyo. Wyo. Radio Corp.
 KFDS, San Francisco, Calif. John D. McKee.
 KFEB, Taft, Calif. City of Taft.
 KFEC, Portland, Ore. Meier & Frank Co.
 KFED, Polytechnic, Mont. Billings Polytechnic Institute.
 KFEG, Tacoma, Wash. Guy Greason.
 KFFA, San Diego, Calif. Dr. R. C. Shelton.
 KFFE, Pendleton, Ore. Eastern Oregon Radio Co.
 KFGG, Astoria, Ore. Astoria Budget.
 KFGH, Stanford Univ., Calif. Leland Stanford Jr. Univ.
 KFI, Los Angeles, Calif. Earle C. Anthony, Inc.
 KFV, Yakima, Wash. Foster-Bradbury Radio Store.
 KFZ, Spokane, Wash. Doerr Mitchell Elec. Co.
 KGB, Tacoma, Wash. Tacoma Daily Ledger-William A Mul-
 lins Elec. Co.
 KGG, Portland, Ore. Hallock & Watson Radio Service.
 KGN, Portland, Ore. Northwestern Radio Mfg. Co.
 KGO, Altadena, Calif. Altadena Radio Lab.
 KGU, Honolulu, Hawaii. The Honolulu Advertiser.
 KGW, Portland, Ore. Ship Owners Radio Service Inc.
 (Daily Oregonian.)
 KGY, Lacey, Wash. St. Martins College.

KHD, Colorado Springs, Colo.
 KHJ, Los Angeles, Calif. Los Angeles Times.
 KHQ, Seattle, Wash. Louis Wasmer.
 KJJ, Sunnyvale, Calif. Radio Shop.
 KJQ, Stockton, Calif. C. O. Gould.
 KJR, Seattle, Wash. Northwest Radio Service Co.
 KJS, Los Angeles, Calif. Bible Inst. of Los Angeles.
 KLB, Pasadena, Calif. J. J. Dunn Co.
 KLN, Del Monte, Calif. Monterey Elec. Shop.
 KLP, San Francisco, Calif. Colin B. Kennedy Corp.
 KLS, San Francisco, Calif. Warner Bros. Radio Supply Co.
 KLX, Oakland, Calif. Oakland Tribune.
 KIZ, Denver, Colo. Reynolds Radio Co.
 KMC, Reedley, Calif. Lindsay-Weatherill & Co.
 KMJ, Fresno, Calif. San Joaquin Lt. & Pr. Co.
 KMO, Tacoma, Wash. Tacoma Times. (Love Electric Co.)
 KNI, Eureka, Calif. T. W. Smith.
 KNJ, Roswell, New Mex. Roswell Public Service Co.
 KNN, Los Angeles, Calif. Bullock's.
 KNT, Aberdeen, Wash. Grays Harbor Radio Co.
 KNV, Los Angeles, Calif. Radio Supply Co.
 KOB, State College, N. M. N. M. College Agri. & Mech. Arts.
 KOG, Los Angeles, Calif. Western Radio Elec. Co.
 KON, San Diego, Calif. Holzwasser Inc.
 KOP, Detroit, Mich. Detroit Police Dept.
 KPO, San Francisco, Calif. Hale Bros., Inc.
 KQI, Berkeley, Calif. Univ. of Calif.
 KQP, Hood River, Ore. Hood River News.
 KQV, Pittsburg, Pa. Doubleday-Hill Elec. Co.
 KQW, San Jose, Calif. Chas. D. Herrold.
 KQY, Portland, Ore. Stubbs Elec. Co.
 KRE, Berkeley, Calif. Maxwell Elec. Co.
 KSD, St. Louis, Mo. St. Louis Post-Dispatch.
 KSL, San Francisco, Calif. The Emporium.
 KSS, Long Beach, Calif. Prest & Dean Radio Co.
 KTW, Seattle, Wash. First Presbyterian Church.
 KUO, San Francisco, Calif. San Fran. Examiner.
 KUS, Los Angeles, Calif. City Dye Works & Laundry Co.
 KUY, El Monte, Calif. Coast Radio Co.
 KVQ, Sacramento, Calif. Sacramento Bee.
 KWG, Stockton, Calif. Portable Wireless Telephone Co.
 KWH, Los Angeles, Calif. Examiner. Daily ex Sun.
 KXD, Modeste, Calif. Herald Pub. Co.
 KXS, Los Angeles, Calif. Braun Corp.
 KYF, San Diego, Calif. Thearle Music Co.
 KYG, Portland, Ore. Radio Service Bureau.
 KYI, Bakersfield, Calif. Bakersfield Californian.
 KYJ, Los Angeles, Calif. Leo J. Meyberg Co. (Hamburgers.)
 KYQ, Honolulu, Hawaii. Electric Shop.
 KYW, Chicago, Ill. Westinghouse Elec. & Mfg. Co.
 KYY, San Francisco, Calif. The Radio Telephone Shop.
 KZC, Seattle, Wash. Public Market & Department Store Co.
 KZM, Oakland, Calif. Western Radio Institute (Hotel Oakland).
 KZN, Salt Lake City, Utah. Deseret News.
 KZV, Wenatchee, Wash. Wenatchee Battery & Motor Co.
 KZY, San Francisco, Calif. Atlantic-Pacific Radio Supplies Co.
 NOF, Anacostia, D. C. U. S. Navy Dept.
 PWX, Havana, Cuba. Cuban Telephone Co.
 WAI, Dayton, O. McCook Field, U. S. Army.

WAAB, New Orleans, La. Valdemar Jensen.
 WAAC, New Orleans, La. Tulane Univ.
 WAAD, Cincinnati, O. Ohio Mechanics Inst.
 WAAF, Chicago, Ill. Chicago Daily Drivers Journal.
 WAAG, St. Paul, Minn. Commonwealth Elec. Co.
 WAAJ, Boston, Mass. Eastern Radio Inst.
 WAAK, Milwaukee, Wis. Gimbel Bros.
 WAAM, Newark, N. J. I. R. Nelson Co.
 WAAN, Columbia, Mo. Univ. of Mo.
 WAAO, Charleston, W. Va. Radio Service Co.
 WAAP, Wichita, Kan. United Elec. Co.
 WAAQ, Greenwich, Conn. New England Motor Sales Co.
 WAAR, Huntington, W. Va. Groves-Thornton Hdw. Co.
 WAAS, Decatur, Ga. Georgia Radio Co.
 WAAT, Jersey City, N. J. Jersey Review.
 WAAV, Athens, O. Athens Radio Co.
 WAAW, Omaha, Neb. 500 Omaha Grain Exchange.
 WAAX, Crafton, Pa. Radio Service Corp.
 WAAY, Youngstown, O. Yohrling Rayner Music Co.
 WAAZ, Emporia, Kans. Hollister-Miller Motor Co.
 WAH, Eldorado, Kans. The Midland Refining Co.
 WAJT, Marshall, Mo. Kelly-Vawter Jewelry Co.
 WAJU, Yankton, S. D. Yankton College.
 WBAA, W. Lafayette, Ind. Purdue University.
 WBAB, Syracuse, N. Y. Syracuse Radio Tel. Co.
 WBAD, Minneapolis, Minn. Sterling Electric Co.
 WBAF, Moorestown, N. J. Fred M. Middleton.
 WBAG, Bridgeport, Pa. Diamond St. Fibre Co.
 WBAH, Minneapolis, Minn. The Dayton Co.
 WBAJ, Toledo, O. Marshall-Gerken Co.
 WBAN, Paterson, N. J. Wireless Phone Corporation.
 WBAO, Decatur, Ill. James Millikin Univ.
 WBAQ, Mishawaka, Ind. Lyradion Mfg. Co.
 WBAP, Fort Worth, Texas. Fort Worth Star Telegram.
 WBAU, Hamilton, O. Republican Pub. Co.
 WBAY, Columbus, O. The Ernor Hopkins Co.
 WBAW, Marietta, O. Marietta College.
 WBAX, Wilkes-Barre, Pa. John H. Stenger, Jr.
 WBBY, New York, N. Y. A. T. & T. Co.
 WBL, Anthony, Kans. T & H Radio Co.
 WBS, Newark, N. J. D. W. May, Inc.
 WBT, Charlotte, N. C. Southern Radio Corp.
 WBU, Chicago, Ill. City of Chicago.
 WBZ, Springfield, Mass. Westinghouse Elec. & Mfg. Co.
 WCAB, Newburgh, N. Y. Newburgh Daily News.
 WCAC, Fort Smith Ark. John Fink Jewelry Co.
 WCAD, Canton, N. Y. St. Lawrence Univ.
 WCAE, Pittsburgh, Pa. Kaufman & Baer Co.
 WCAG, New Orleans, La. Clyde R. Randall.
 WCAH, Columbus, O. Entrekin Elec. Co.
 WCAI, San Antonio, Tex. Southern Equipment Co.
 WCAJ, Univ. Place, Neb. Wesleyan Univ.
 WCAK, Houston, Tex. Alfred P. Daniel.
 WCAL, Northfield, Minn. St. Olaf College.
 WCAM, Villanova, Pa. Villanova College.
 WCAO, Baltimore, Md. Sanders & Stayman Co.
 WCAP, Kalamazoo, Mich. Kalamazoo College.
 WCAP, Decatur, Ill. Central Radio Service.
 WCAQ, Defiance, O. Tri-State Radio Mfg. Co.
 WCAR, San Antonio, Tex. Alamo Radio Elec. Co.
 WCAS, Minneapolis, Minn. Wm. H. Dunwoody Industrial
 Inst.

WOAT, Rapid City, S. D. S. D. State School of Mines.
 WCAU, Philadelphia, Pa. Philadelphia Radiophone Co.
 WCAV, Little Rock, Ark. J. C. Dice Elec. Co.
 WCAW, Quincy, Ill. Quincy Elec. Supply Co. (Quincy Herald).
 WCAX, Burlington, Vt. Univ. of Vt.
 WCAY, Milwaukee, Wis. Kesselman-O'Driscoll Music House.
 WCAZ, Quincy, Ill. Whig-General.
 WCE, Minneapolis, Minn. Findley Elec. Co.
 WCJ, New Haven, Conn. A. C. Gilbert Co.
 WCK, St. Louis, Mo. Stix Baer & Fuller (Grand Leader).
 WCM, Austin, Tex. Univ. of Tex.
 WCN, Worcester, Mass. Clark Univ. Daily.
 WCX, Detroit, Mich. The Detroit Free Press.
 WDA, Nashville, Tenn. Ward Belmont School.
 WDAA, Nashville, Tenn. Ward Belmont School.
 WDAC, Springfield, Ill. Illinois Watch Co.
 WDAE, Tampa, Fla. Tampa Daily Times.
 WDAF, Kansas City, Mo. Kansas City Star.
 WDAG, Amarillo, Tex. J. Laurance Martin.
 WDAH, El Paso, Tex. Mine & Smelter Supply Co.
 WDAI, Syracuse, N. Y. Hughes Radio Corp.
 WDAJ, College Park, Ga. A. & W. P. R. R. Co.
 WDAK, Hartford, Conn. Hartford Courant.
 WDAL, Jacksonville, Fla. Florida Times Union.
 WDAN, Shreveport, La. Centenary College and Glenwood Radio Corp.
 WDAO, Dallas, Tex. Automotive Elec. Co.
 WDAP, Chicago, Ill. Thorne Donnelly and J. Elliott Jenkins. Drake Hotel.
 WDAQ, Brownsville, Pa. Hartman-Riker Elec. & Mach. Co.
 WDAR, Philadelphia, Pa. Lit Bros.
 WDAS, Worcester, Mass. Samuel A. Waite.
 WDAU, New Bedford, Mass. A. H. Smith.
 WDAV, Muskogee, Okla. Daily Phoenix.
 WDAX, Centerville, Iowa. First Nat'l Bank.
 WDAY, Fargo, N. D.
 WDM, Washington, D. C. Church of the Covenant.
 WDT, New York, N. Y. Ship Owners Radio Service.
 WDV, Omaha, Neb. John O. Yeiser, Jr.
 WDY, Roselle Park, N. J. Radio Corp. of America.
 WDZ, Tuscola, Ill. James L. Bush.
 WEEA, Flint, Mich. Fallain & Lathrop.
 WEAB, Fort Dodge, Iowa. Standard Radio Equip. Co.
 WEAC, Terre Haute, Ind. Baines Elec. Service Co.
 WEAD, Atwood, Kans. N. W. Kansas Radio Supply Co.
 WEAE, Blacksburg, Va. Polytechnic Inst.
 WEAF, New York City, N. Y. Am. Tel. & Telg. Co.
 WEAG, Edgewood, R. I. Nichols-Hineline-Bassett Lab.
 WEAH, Wichita, Kans. Lander Radio Co.
 WEAI, Ithaca, N. Y. Cornell Univ.
 WEAJ, Vermillion, S. D. Univ. of S. D.
 WEAJ, Grove City, Pa. Grove City College.
 WEAK, St. Joseph, Mo. Julius B. Abercomble.
 WEAM, North Plainfield, N. J. Borough of N. Plainfield.
 WEAN, Providence, R. I. The Shepard Co.
 WEAO, Columbus, O. Ohio State Univ.
 WEAP, Mobile, Ala. Mobile Radio Co.
 WEAR, Baltimore, Md. News & American Pub. Co.
 WEAS, Washington, D. C. The Hecht Co.
 WEAT, Tampa, Fla. John J. Fogarty.
 WEAU, Sioux City, Iowa. Davidson Bros. Co.
 WEAV, Rushville, Neb. Sheridan Elec. Service Co.

WEAW, Anderson, Ind. Arrow Radio Lab.
WEAX, Little Rock, Ark. T. J. M. Daly.
WEAY, Houston, Tex. Will Horwitz, Jr.
WEB, St. Louis, Mo. The Benwood Co., Inc.
WEH, Tulsa, Okla. (300 S. Main St., Eldorado, Kans.)
 Midland Refining Co.
WEV, Houston, Tex. Hurlburt-Still Elec. Co.
WEW, St. Louis, Mo. St. Louis Univ.
WEY, Wichita, Kans. Cosradio Co. (Wichita Beacon.)
WFAA, Dallas, Texas. Dallas News and Dallas Journal.
WFAB, Syracuse, N. Y. C. F. Woese.
WFAC, Superior, Wis. Superior Radio Co.
WFAD, Salina, Kans. Watson Weldon Motor Supply Co.
WFAF, Foughkeepsie, N. Y. H. C. Spratley Radio Co.
WFAG, Waterford, N. Y. Radio Engineering Lab.
WFAH, Port Arthur, Tex. Elec. Supply Co.
WFAJ, Asheville, N. C. Hi-Grade Wireless Instrument Co.
WFAM, St. Cloud, Minn. Granite City Elec. Co.
WFAN, Hutchinson, Minn. Hutchinson Elec. Service Co.
WFAQ, Cameron, Mo. Cameron Radio Co. and Mo. Wesleyan
 College.
WFAR, Sanford, Me. Hall & Stubbs.
WFAS, Fort Wayne, Ind. United Radio Corp.
WFAT, Sioux Falls, S. D. Argus Leader.
WFAU, Boston, Mass. Edwin C. Lewis.
WFAV, Lincoln, Neb. Univ. of Neb.
WFAW, Miami, Fla. Daily Metropolis.
WFAY, Independence, Kan. Daniels Radio Supply Co.
WFAZ, Charleston, S. C. S. C. Radio Shop.
WFI, Philadelphia, Pa. Strawbridge & Clothier.
WFO, Dayton, O. Rike-Kumler Co.
WGAB, Houston, Tex. QRV Radio Co.
WGAD, Ensenada, Porto Rico. Escuela Hispano Americana
 de Radio Telegrafia, Inc.
WGAI, New Haven, Conn. New Haven Elec. Co.
WGAJ, Shenandoah, Ia. W. H. Gass.
WGAK, Macon, Ga. Macon Elec. Co.
WGAL, Lancaster, Pa. Lancaster Elec. Supply and Construc-
 tion Co.
WGL, Philadelphia, Pa. Thos. F. J. Howlett.
WGAM, Orangeburg, S. C. Orangeburg Radio Equipment
 Co.
WGAN, Pensacola, Fla. Cecil E. Lloyd.
WGAQ, Shreveport, La. Glenwood Radio Corp.
WGAR, Fort Smith, Ark. Southwest American.
WGAS, Chicago, Ill. Ray-di-ee Organization, Inc.
WGAT, Lincoln, Neb. Am. Legion, Dept. of Neb.
WGAU, Wooster, O. Marcus G. Limb.
WGAW, Altoona, Pa. Ernest C. Albright.
WGAX, Washington C. H., O. Radio Elec. Co.
WGAY, Madison, Wis. North Western Radio Co.
WGAZ, South Bend, Ind. South Bend Tribune.
WGF, Des Moines, Iowa. Register and Tribune.
WGI, Medford Hillside, Mass. Am. Radio and Research Corp.
WGM, Atlanta, Ga. Atlanta Constitution.
WGR, Buffalo, N. Y. Federal Tel. & Telg. Co.
WGV, New Orleans, La. Interstate Elec. Co.
WGY, Schenectady, N. Y. General Elec. Co.
WHA, Madison, Wis. Univ. of Wis.
WHAA, Iowa City, Ia. State Univ. of Ia.
WHAB, Galveston, Tex. Clark W. Thompson Co.
WHAC, Waterloo, Ia. Cole Bros. Elec. Co.

WHAD, Milwaukee, Wis. Marquette Univ.
WHAE, Sioux City, Ia. Automotive Elec. Service Co.
WHAF, Pittsburgh, Pa. Radio Elec. Co.
WHAG, Cincinnati, O. Univ. of Cincinnati.
WHAI, Joplin, Mo. John T. Griffn.
WHAI, Davenport, Ia. Radio Equip. & Mfg. Co.
WHAK, Clarksburg, W. Va. Roberts Hdw. Co.
WHAL, Lansing, Mich. The Capital News.
WHAM, Rochester, N. Y. Univ. of Rochester.
WHAO, Savannah, Ga. Frederick A. Hill.
WHAP, Decatur, Ill. Dewey L. Otta.
WHAQ, Washington, D. C. Semmes Motor Co.
WHAR, Atlantic City, N. J. Paramount Radio & Elec. Co.
WHAS, Louisville, Ky. Courier Journal and Louisville Times Co.
WHAV, Wilmington, Del. Wilmington Elec. Spec. Co.
WHAW, Tampa, Fla. Pierce Elec. Co.
WHAY, Huntington, Ind. Huntington Pub. Co.
WHAZ, Troy, N. Y. Rensselaer Polytechnic Inst.
WHB, Kansas City, Mo. Sweeney Auto & Tractor School.
WHD, Morgantown, W. Va. W. Va. University.
WHK, Cleveland, O. Warren R. Cox.
WHN, Ridgewood, N. Y. Times Printing & Pub. Co.
WHX, Des Moines, Iowa. Iowa Radio Corp.
WIAA, Waupaca, Wis. Waupaca Civic & Commerce Assn.
WIAB, Rockford, Ill. Joslyn Automobile Co.
WIAC, Galveston, Tex. Galveston Tribune.
WIAD, Ocean City, N. J. Ocean City Yacht Club.
WIAE, Vinton, Ia. Zimmerman Radio Co.
WIAF, New Orleans, La. Nola Radio Co.
WIAH, Newton, Ia. Continental Radio & Mfg. Co.
WIAI, Springfield, Mo. Heer Stores Co.
WIAJ, Neenah, Wis. Fox River Valley Radio Supply Co.
WIAK, Omaha, Neb. Daily Journal-Stockman.
WIAO, Milwaukee, Wis. School of Engineering.
WIAQ, Marion, Ind. Chronicle Pub. Co.
WIAR, Paducah, Ky. J. A. Rudy & Sons.
WIAS, Burlington, Ia. Hawk-Eye Home Elec. Co.
WIAT, Tarkio, Mo. Leon T. Noel.
WIAU, Le Mars, Ia. Am. Trust & Savings Bank.
WIAV, Binghamton, N. Y. N. Y. Radio Lab.
WIAW, Saginaw, Mich. Saginaw Radio & Elec. Co.
WIAX, Lincoln, Neb. Capital Radio Co.
WIAY, Washington, D. C. Woodward & Lothrop.
WIAZ, Miami, Fla. Flager St., Elec. Supply Sales Co.
WIK, McKeesport, Pa. K. & L. Elec. Co.
WIL, Washington, D. C. Continental Elec. Supply Co.
WIP, Philadelphia, Pa. Gimbel Bros.
WIZ, Cincinnati, O. Cino Radio Mfg. Co.
WJAB, Lincoln, Neb. American Radio Co.
WJAC, Joplin, Mo. Redell Co.
WJAD, Waco, Tex. Jackson's Radio Engrng. Lab.
WJAE, San Antonio, Tex. Texas Radio Syndicate (Evening News).
WJAF, Muncie, Ind. Muncie Press and Smith Elec. Co.
WJAG, Norfolk, Neb. Norfolk Daily News.
WJAH, Rockford, Ill. Central Park Amusement Co.
WJAJ, Dayton, O. Y. M. C. A.
WJAK, Stockdale, O. White Radio Lab.
WJAL, Portland, Me. Victor Radio Corp.
WJAM, Cedar Rapids, Ia. D. M. Perham.
WJAN, Peoria, Ill. Peoria Star and Peoria Radio Sales Co.

WJAP, Duluth, Minn. Kelley Duluth Co.
WJAO, Topeka, Kans. Capper Publications.
WJAR, Providence, R. I. The Outlet Co.
WJAS, Pittsburgh, Pa. Pittsburgh Radio Supply House
(Pittsburgh Leader).
WJAT, Marshall, Mo. Kelley-Vawter Jewelry Co.
WJAX, Cleveland, O. Union Trust Co.
WJAZ, Chicago, Ill. Chicago Radio Lab.
WJD, Granville, O. Dennison University.
WJH, Washington, D. C. White & Boyer Co.
WJK, Toledo, O. Service Radio Equipment Co.
WJX, New York, N. Y. De Forest Radio Telephone & Tele-
graph Co.
WJZ, Newark, N. J. Westinghouse Elec. & Mfg. Co.
WKAA, Cedar Rapids, Ia. H. F. Paar.
WKAC, Lincoln, Neb. Star Pub. Co.
WKAD, East Providence, R. I. Charles Loeff.
WKAF, Wichita Falls, Tex. W. S. Radio Supply Co.
WKAG, Louisville, Ky. Edwin T. Bruce.
WKAI, West Palm Beach, Fla. Planet Radio Co.
WKAK, Okemah, Okla. Okfuskee County News.
WKAL, Orange, Tex. Gray & Gray.
WKAM, Hastings, Neb. Daily News.
WKAN, Montgomery, Ala. Alabama Radio Mfg. Co.
WKAP, Granston, R. I. Wilcox Flint.
WKAQ, San Juan, Porto Rico. Radio Corp. of Porto Rico.
WKAR, East Lansing, Mich. Mich. Agril. College,
WKAS, Springfield, Mo. L. E. Lines Music Co.
WKAU, Laconia, N. H. Laconia Radio Club.
WKAW, Beloit, Wis. L. M. Turner.
WKAX, Bridgeport, Conn. Wm. A. Macfarlane.
WKAY, Gainesville, Ga. Brenau College.
WKAZ, Wilkes-Barre, Pa. Landau's Music Co.
WKC, Baltimore, Md. Jos. M. Zamolski Co.
WKN, Memphis, Tenn. Riechman-Crosby Co.
WKY, Oklahoma City, Okla. Oklahoma Radio Shop. (Daily
Oklahoman.)
WL2, Fairfield, O. U. S. Army.
WLAB, Carrollton, Mo. George F. Grossman.
WLAC, Raleigh, N. C. N. C. State College.
WLAD, Hastings, Neb. Arvanette Radio Supply Co.
WLAF, Lincoln, Neb. Johnson Radio Co.
WLAG, Minneapolis, Minn. Operated by Cutting & Washing-
ton Radio Corp for: L. S. Donaldson Co., Findley Elec-
tric Co., N. W. National Bank, N. W. Farmstead, Powers
Merc. Co. Sterling Elec. Co., E. E. Atkinson Co.
WLAH, Syracuse, N. Y. Samuel Woodworth.
WLAJ, Waco, Tex. Waco Elec. Supply Co.
WLAK, Bellows Falls, Vt. Vermont Farm Machine Co.
WLAL, Tulsa Radio Co. Tulsa, Okla.
WLAM, Springfield, O. Morrow Radio Co.
WLAN, Houlton, Me. Putnam Hdw. Co.
WLAO, Scranton, Pa. R. C. Ehrhardt and J. H. Jones.
WLAP, Louisville, Ky. W. V. Jordan.
WLAQ, Kalamazoo, Mich. A. E. Schilling.
WLAR, Marshalltown, Ia. Melkel Music Co.
WLAS, Hutchinson, Kans. Hutchinson Grain Radio Co.
WLAV, Pensacola, Fla. Elec. Shop, Inc.
WLAW, New York, N. Y. New York Police Dept.
WLAX, Greencastle, Ind. Greencastle Community Broadcast-
ing Station. (Putnam Elec. Co.)
WLAY, Fairbanks, Alaska. Northern Commercial Co.

WLAZ, Warren, O. Hutton & Jones Elec. Co.
WLB, Minneapolis, Minn. Univ. of Minn.
WLK, Indianapolis, Ind. Hamilton Mfg. Co.
WLW, Cincinnati, O. Crosley Mfg. Co.
WMA, Anderson, Ind. Arrow Radio Lab.
WMAB, Oklahoma City, Okla. Radio Supply Co.
WMAC, Cazenovia, N. Y. C. B. Mercedith.
WMAD, Rock Port, Mo. Atchinson County Mall.
WMAF, Dartmouth, Mass. Round Hills Radio Corp.
WMAG, Liberal, Kans. Tucker Elec. Co.
WMAH, Lincoln, Neb. General Supply Co.
WMAJ, Kansas City, Mo. Daily Drivers Telegram.
WMAK, Lockport, N. Y. Norton Labs.
WMAL, Trenton, N. J. Trenton Hdw. Co.
WMAN, Beaumont, Tex. Beaumont Radio Equipment Co.
WMAN, Columbus, O. First Baptist Church.
WMAP, Easton, Pa. Utility Battery Service.
WMAQ, Chicago, Ill. Chicago Daily News.
WMAR, Waterloo, Iowa. Waterloo Electrical Supply Co.
WMAT, Duluth, Minn. Paramount Radio Corp.
WMAV, Auburn, Ala. Ala. Polytechnic Inst.
WMAW, Wahpeton, N. D. Wahpeton Elec. Co.
WMAX, Ann Arbor, Mich. K. & K. Radio Supply Co.
WMAY, St. Louis, Mo. Kingshighway Presbyterian Church.
WMAZ, Macon, Ga. Mercer University.
WMB, Auburn, Me. Auburn Elec. Co.
WMC, Youngstown, O. Columbia Radio Co.
WMH, Cincinnati, O. Precision Equipment Co.
WMU, Washington, D. C. Doubleday-Hill Elec. Co.
WNAB, Bowling Green, Ky. W. H. Riley.
WNAC, Boston, Mass. Shepard Stores.
WNAD, Norman, Okla. Okla. Radio Engineering Co.
WNAF, Enid, Okla. Enid Radio Dist. Co.
WNAG, Cresco, Ia. Rothert Radio and Electric Shop.
WNAH, Wilkes-Barre, Pa. Wilkes-Barre Radio Repair Shop.
WNAJ, Chicago, Ill. Benson Co.
WNAK, Manhattan, Kans. Manhattan Radio Supply Co.
WNAL, Omaha, Neb. R. J. Rockwell.
WNAM, Evansville, Ind. Ideal Apparatus Co.
WNAN, Syracuse, N. Y. Syracuse Radio Telephone Co.
WNAQ, Charleston, S. C. Charleston Radio Elec. Co.
WNAF, Springfield, O. Wittenberg College.
WNAR, Butler, Mo. C. C. Rhodes.
WNAS, Austin, Tex. Tex. Radio Corp. (Austin Statesman.)
WNAT, Philadelphia, Pa. Lennig Bros. Co.
WNAV, Knoxville, Tenn. People's Tel. & Telg. Co.
WNAW, Fortress Monroe, Va. Henry Kunzmann.
WNAX, Yankton, S. D. Dakota Radio Apparatus Co.
WNAZ, Baltimore, Md. Shipowners Radio Service.
WNJ, Albany, N. Y. Shotton Radio Mfg. Co., Inc.
WNO, Jersey City, N. J. Wireless Telephone Co. of Hudson Co., N. J.
WOAA, Ardmore, Okla. Dr. Walter Hardy.
WOAB, Grand Forks, No. Dak. Valley Radio.
WOAC, Lima, O. Maus Radio Co.
WOAD, Sigourney, Ia. Friday Battery & Elec. Co.
WOAE, Fremont, Neb. Mediand College.
WOAF, Tyler, Tex. Tyler Commercial College.
WOAG, Belvidere, Ill. Apollo Theatre.
WOAH, Charleston, S. C. Palmetto Radio Corp.
WOAI, San Antonio, Tex. Southern Equip. Co.
WOAJ, Pansons, Kans. Ervin's Elec. Co.

WOAK, Frankfort, Ky. Collins Hardware Co.
 WOAL, Webster Grove, Mo. William E. Woods.
 WOAN, Lawrenceburg, Tenn. J. D. Vaughan.
 WOAQ, Portsmouth, Va. Portsmouth Radio Assn.
 WOAR, Kenosha, Wis. H. P. Lundskow.
 WOAS, Middletown, Conn. Bailey's Radio Shop.
 WOAT, Wilmington, Del. Boyd Martell Hamp.
 WOAU, Evansville, Ind. Sowder Bowling Plano Co.
 WOAV, Erie, Pa. Pa. National Guard.
 WOAX, Trenton, N. J. Franklin J. Wolff.
 WOAY, Birmingham, Ala. John W. Wilder.
 WOAZ, Stanford, Tex. Penick Hughes Co.
 WOC, Davenport, Ia. Palmer School of Chiropractic.
 WOE, Akron, O. Buckeye Radio Service Co.
 WOII, Indianapolis, Ind. Hatfield Elec. Co. (Indianapolis
 Star.)
 WOI, Ames, Ia. Iowa State College.
 WOK, Pine Bluff, Ark. Ark. Light & Power Co.
 WOO, Philadelphia, Pa. John Wanamaker.
 WOQ, Kansas City, Mo. Western Radio Co.
 WOR, Newark, N. J. L. Bamberger & Co.
 WOS, Jefferson City, Mo.
 WOV, Omaha, Neb. R. B. Howell.
 WOU, Omaha, Neb. Metropolitan Utilities Dist.
 WOZ, Richmond, Ind. Palladium Printing Co.
 WPA, Fort Worth, Tex. Fort Worth Record.
 WPAA, Waco, Neb. Anderson & Webster Elec. Co.
 WPAC, Okmuigee, Okla. Donaldson Radio Co.
 WPAB, State College, Pa. Pa. State College.
 WPAD, Chicago, Ill. W. A. Wieboldt & Co.
 WPAF, Council Bluffs, Ia. Peterson's Radio Co.
 WPAG, Independence, Mo. Central Radio Co. Inc.
 WPAH, Waupaca, Wis. Wis. Dept. of Markets.
 WPAJ, New Haven, Conn. Doolittle Radio Corp.
 WPAK, Fargo, N. D. N. D. Agricultural College.
 WPAL, Columbus, O. Superior Radio & Tel. Equip. Co.
 WPAM, Topeka, Kans. Awerbach & Guettel.
 WPAN, Houston, Tex. Levy Bros. Dry Goods Co.
 WPAR, Beloit, Kans. R. A. Ward.
 WPAT, El Paso, Tex. St. Patrick's Cathedral.
 WPE, Kansas City, Mo. Central Radio Co.
 WPG, New Lebanon, Ohio. Nushawg Poultry Farm.
 WPI, Clearfield, Pa. Elec. Supply Co.
 WPJ, Philadelphia, Pa. St. Joseph's College.
 WPM, Washington, D. C. Thos. J. Williams, Inc. (Washing-
 ton Daily News.)
 WPO, Memphis, Tenn. United Equip. Co.
 WQAA, Parkesburg, Pa. Horace A. Beale, Jr.
 WQAL, Mattoon, Ill. Cole Tel. & Telg. Co.
 WQAB, Springfield, Mo. Southwest Missouri State Teachers
 College.
 WQAK, Dubuque, Ia. Appel-Higley Elec. Co.
 WQAP, Lincoln, Neb. Am. Radio Co.
 WQAQ, Abilene, Ark. West Tex. Radio Co.
 WQX, Chicago, Ill. Riverview Park, Walter A. Kuehl.
 WRAA, Houston, Tex. Rice Institute.
 WRAN, Waterloo, Ia. Black Hawk Elec. Co.
 WRAR, David City, Neb. Jacob Carl Thomas.
 WRAU, Amarillo, Tex. Daily News.
 WRAY, Scranton, Pa. Radio Sales Corp.
 WRK, Hamilton, O. Doron Bros. Elec. Co.
 WRL, Schenectady, N. Y. Union College Radio Club.

WRM, Urbana, Ill. Univ. of Ill.
 WRP, Camden, N. J. Federal Inst. of Radio Telg.
 WRH, Dallas, Tex. City of Dallas.
 WRW, Tarrytown, N. Y. Koenig Bros.
 WSAJ, Grove City, Pa. Grove City College.
 WSAS, Lincoln, Neb. Neb Dept. of Agriculture.
 WSAV, Houston, Tex. C. W. Vick Radio Const'n Co.
 WSB, Atlanta, Ga. Atlanta Journal.
 WSL, Utica, N. Y. J. & M. Elec. Co.
 WSN, Norfolk, Va. Shipowners Radio Service, Inc.
 WSX, Erie, Pa. Erie Radio Co.
 WSY, Birmingham, Ala. Alabama Power Co.
 WTAC, Johnston, Pa. Penn Traffic Co.
 WTAU, Tecumseh, Neb. Ruegy Battery & Elec. Co.
 WTAW, College Station, Tex. Agricultural and Mechanical
 College of Tex.
 WTG, Manhattan, Kans. Kansas State Agricultural College.
 WTP, Bay City, Mich. Ra-Do Corp.
 WWAC, Waco, Tex. Sanger Bros.
 WWAX, Laredo, Tex. Wormer Bros.
 WWB, Canton, O. Daily News Printing Co.
 WWI, Dearborn, Mich. Ford Motor Co.
 WWJ, Detroit, Mich. Evening News.
 WWL, New Orleans, La. Loyola Univ.
 WWT, Buffalo, N. Y. McCarthy Bros. & Ford.
 WWX, Washington, D. C. Post Office Dept.
 WWZ, New York City, John Wanamaker.
 IXAD, Pawtucket, R. I. Standard Radio & Elec. Co.
 2XAI, Newark, N. J. Westinghouse Elec. & Mfg. Co.
 2XI, Schenectady, N. Y. General Elec. Co. Test Call.
 2XJ, Deal Beach, N. J. Am. Tel. & Telg. Co.
 3XW, Parkesburg, Pa. Horace A. Beale, Jr.
 3YN, Washington, D. C. Nat'l Radio Inst.
 9ARU, Louisville, Ky. Darrell A. Downard.

Radiophone Broadcasting Stations in North America, Classified Alphabetically by States and Cities.

State, City, Call	State, City, Call
Alabama:	KDZX, KFDB, KLP, KLS, KPO, KSL, KUO, KZY
Auburn, WMAV	San Jose, KFAQ, KQW
Birmingham, WOAY, WSY	San Luis Obispo, KFBE
Mobile, WEAP	Santa Ana, KFAW
Montgomery, WKAN	Stanford Univ., KFGH
Arizona:	Stockton, KJQ, KWG
Phoenix, KDYW, KFAD, KFCB	Sunnyvale, KJJ
Tucson, KDZA, KFDH	Taft, KFEB
Arkansas:	Colorado:
Fort Smith, WCAC, WGAR	Boulder, KFAJ
Little Rock, WCAV, WEAX	Colorado Springs, KFBV, KFCK, KHD
Pine Bluff, WOK	Denver, DD5, DN4, KDZQ, KFAF, KFDL, KLZ
California:	Trinidad, KFBS
Altadena, KGO	Connecticut:
Bakersfield, KDZB, KYI	Bridgeport, WKAX
Berkeley, KQI, KRE	Greenwich, WAAQ
Del Monte, KLN	Hartford, WDAK
El Monte, KUY	Middleton, WOAS
Eureka, KNI	New Haven, WCJ, WGAH, WPAJ
Fresno, KDZH, KMJ	Delaware:
Glendale, KFAC	Wilmington, WHAV, WOAT
Hanford, KFBD	District of Columbia:
Hollywood, KFAR	Anacostia, NOF
Long Beach, KSS	Washington, WDM, WEAS, WHAQ, WIL, WIAV, WJH, WMU, WPM, WWX, 3YN
Los Angeles, KDZF, KDZP, KFCL, KFI, KHJ, KJS, KNN, KNV, KOG, KUS, KWH, KXS, KYJ	Florida:
Modesto, KXD	Jacksonville, WDAL
Oakland, KFBN, KLX KZM	Miami, WFAW, WIAZ
Pasadena, KDYR, KLB	Pensacola, WGAN, WLAV
Reedley, KMC	Tampa, WDAE, WEAT, WHAW
Sacramento, KFBK, KVQ	West Palm Beach, WKAH
San Diego, KDPT, KDYM, KDYO, KFBC, KFFA, KON, KYF	
San Francisco, AG1, KDN, KDZG, KDZW,	

State, City, Call**Georgia:**

Atlanta, WGM, WSB
 College Park, WDAJ
 Decatur, WAAS
 Gainesville, WKAY
 Macon, WGAK, WMAZ
 Savannah, WHAO

Idaho:

Boise, KFAU, KFBJ,
 KFDD
 Lewiston, KFBA
 Moscow, KFAN
 Wallace, KFCC

Illinois:

Belvidere, WOAG
 Chicago, KYW, WAAF,
 WBU, WDAP, WGAS,
 WJAZ, WMAQ, WNAJ,
 WPAD, WQX
 Decatur, WBAO, WCAP,
 WHAP
 Mattoon, WQAL
 Peoria, WJAN
 Quincy, WCAW, WCAZ
 Rockford, WIAB, WJAH
 Springfield, WDAC
 Tuscola, WDZ
 Urbana, WRM

Indiana:

Anderson, WEAW
 Evansville, WNAM,
 WOZU
 Fort Wayne, WFAS
 Greencastle, WLAX
 Huntington, WHAY
 Indianapolis, WLK, WOH
 Marion, WIAQ
 Mishawaka, WBAQ
 Muncie, WJAF
 Richmond, WOZ
 South Bend, WGAZ
 Terre Haute, WEAC
 West Lafayette, WBAA

Iowa:

Ames, WOI
 Burlington, WIAS
 Cedar Rapids, WJAM,
 WKAA
 Centerville, WDAX
 Council Bluffs, WPAF
 Cresco, WNAG
 Davenport, WHAI, WOC
 Des Moines, WGF, WHX
 Dubuque, WQAK
 Fort Dodge, WEAB
 Iowa City, WHAA

State, City, Call

Le Mars, WIAU
 Marshalltown, WLAR
 Newton, WIAH
 Shenandoah, WGJ
 Sigourney, WOAD
 Sioux City, WEAU,
 WHAE
 Vinton, WIAE
 Waterloo, WHAC,
 WMAR, WRAN

Kansas:

Anthony, WBL
 Atwood, WEAD
 Beloit, WPAR
 Eldorado, WAH
 Emporia, WAAZ
 Hutchinson, WLAS
 Independence, WFAY
 Liberal, WMAG
 Manhattan, WNAK, WTG
 Parsons, WOAJ
 Salina, WFAD
 Topeka, WJAQ, WPAM
 Wichita, WAAP, WEAH,
 WEY

Kentucky:

Bowling Green, WNAB
 Frankfort, WOAK
 Louisville, WHAS,
 WKAG, WLAP, 9ARU
 Paducah, WIAR
 Waco, WPAA

Louisiana:

New Orleans, WAAB,
 WAAC, WCAQ, WGV,
 WIAF, WWL
 Shreveport, WDAN,
 WGAQ

Maine:

Auburn, WMB
 Houlton, WLAN
 Portland, WJAL
 Sanford, WFAR

Maryland:

Baltimore, WCAO,
 WEAR, WKC, WNAV

Massachusetts:

Boston, WAAJ, WFAU,
 WNAC
 Dartmouth, WMAF
 Medford Hillside, WGI
 New Bedford, WDAU
 Springfield, WBZ
 Worcester, WCN, WDAS

State, City, Call**Michigan:**

Ann Arbor, WMAX
 Bay City, WTP
 Dearborn, WWI
 Detroit, KOP, WCX,
 WWJ
 East Lansing, WKAR
 Flint, WEAA
 Kalamazoo, WCAP,
 WLAQ
 Lansing, WHAL
 Saginaw, WIAW

Minnesota:

Duluth, WJAP, WMAT
 Hutchinson, WFAN
 Minneapolis, WBAH,
 WBAD.
 WCAS, WLAG, WLB,
 Northfield, WCAL
 St. Cloud, WFAM
 St. Paul, WAAH, AV7.

Missouri:

Butler, WNAR
 Cameron, WFAQ
 Columbia, WAAN
 Independence, WPAG
 Jefferson City, WOS
 Joplin, WHAH, WJAC
 Kansas City, WDAF,
 WHB, WMAJ, WOQ.
 WPE
 Marshall, WJAT
 Rockport, WMAD
 St. Joseph, WEAK
 St. Louis, KSD, WCK,
 WEB, WEW, WMAY
 Springfield, WIAI,
 WKAS, WQAB
 Tarkio, WIAT
 Webster Grove, WOAL

Montana:

Billings, KFCH
 Butte, KFAP
 Great Falls, KDYS
 Havre, KFBB
 Polytechnic, KFED

Nebraska:

David City, WRAR
 Fremont, WOAE
 Hastings, WKAM,
 WLDJ
 Lincoln, WFAV, WGAT,
 WIAX, WJAB, WKAC,
 WLAJ, WMAH,
 WQAP, WSAS
 Norfolk, WJAG

State, City, Call

Omaha, WAAW, WCAW,
 WDV, WIAK, WNAL,
 WOU, WOV
 Rushville, WEAV
 Tecumseh, WTAU
 University Place, WCAJ
 Waco, WPAW

Nevada:

Reno, KDZK, KFAS

New Hampshire:

Laconia, WKAV

New Jersey:

Atlantic City, WHAR
 Camden, WRP
 Deal Beach, 2XJ
 Jersey City, WAAT,
 WNO
 Moorestown, WBAF
 Newark, WAAM, WBS,
 WJZ, WOR, 2XAI
 N. Plainfield, WEAM
 Ocean City, WIAD
 Paterson, WBAN
 Roselle Park, WDY
 Trenton, WMAL, WOAX

New Mexico:

Roswell, KNJ
 State College, KOB

New York:

Albany, WNJ
 Binghamton, WIAV
 Buffalo, WGR, WWT
 Canton, WCAD
 Cazenovia, WMAC
 Ithaca, WEAI
 Lockport, WMAK
 Newburgh, WCAB
 New York, KDOW,
 WBAY, WDT, WFAF,
 WJX, WLAW, WWZ
 Poughkeepsie, WFAF
 Rochester, WHAM
 Ridgewood, WHN
 Schenectady, WGY, WRL,
 2XI
 Syracuse, WBAB, WDAI,
 WFAB, WLAH, WNAN
 Tarrytown, WRW
 Troy, WHAZ
 Utica, WSL
 Waterford, WFAQ

North Carolina:

Asheville, WFAJ
 Charlotte, WBT
 Raleigh, WLAC

State, City, Call**North Dakota:**

Fargo, WDAY, WPAK
 Grand Forks, WOAB
 Wahpeton, WMAW

Ohio:

Akron, WOE
 Athens, WAAV
 Canton, WWB
 Cincinnati, WAAD,
 WHAG, WIZ, WLW,
 WMH
 Cleveland, KDPM, WHK,
 WJAX
 Columbus, WBAV,
 WCAH, WEAO,
 WMAN, WPAL
 Dayton, WAI, WFO,
 WJAJ
 Defiance, WCAQ
 Fairfield, WL-2
 Granville, WJD
 Hamilton, WBAU, WRK
 Lebanon, WPG
 Lima, WOAC
 Marietta, WBAW
 Springfield, WLAM,
 WNAP
 Stockdale, WJAK
 Toledo, WBAJ, WJK
 Warren, WLAZ
 Washington C. O., WGAX
 Wooster, WGAU
 Youngstown, WAAY,
 WMC

Oklahoma:

Ardmore, WOAA
 Enid, WNAF
 Muskogee, WDAV
 Norman, WNAD
 Okemah, WKAK
 Oklahoma City, WKY,
 WMAB
 Okmulgee, WPAC
 Tulsa, WEH, WLAL

Oregon:

Astoria, KFBM, KFGG
 Corvallis, KFDJ
 Eugene, KFAT
 Hood River, KQP
 Marshfield, KFBH
 Medford, KFAY
 Pendleton, KFFE
 Portland, KDYQ, KFEC,
 KGG, KGN, KGW,
 KQY
 Salem, KFCD

State, City, Call**Pennsylvania:**

Altoona, WGAW
 Bridgeport, WBAG
 Brownsville, WDAQ
 Clearfield, WPI
 Crafton, WAAX
 Easton, WMAP
 Erie, WOAV, WSX
 Grove City, WSAJ
 Johnstown, WTAC
 Lancaster, WGAL
 McKeesport, WIK
 Parkesburg, WQAA
 Philadelphia, WCAU,
 WDAR, WFI, WGL,
 WIP, WNAT, WOO,
 WPJ
 Pittsburgh, KDKA,
 KQV, WCAE, WHAF,
 WJAS
 Scranton, WLAO, WRAY
 State College, WPAB
 Villanova, WCAM
 Wilkes-Barre, WBAX,
 WKAZ, WNAH

Rhode Island:

Cranston, WKAP
 Edgewood, WEAG
 East Providence, WKAD
 Providence, WEAN,
 WJAR

South Carolina:

Charleston, WFAZ,
 WNAQ, WOAH
 Orangeburg, WGAM

South Dakota:

Rapid City, WCAT
 Sioux Falls, WFAT
 Vermillion, WEAJ
 Yankton, WAJU, WNAX

Tennessee:

Knoxville, WNAV
 Lawrenceburg, WOAN
 Memphis, WKN, WPO

Texas:

Abilene, WQAO
 Amarillo, WDAG, WRAU
 Austin, WCM, WNAS
 Beaumont, WMAM
 College Station, WTAW
 Dallas, WDAO, WFAA,
 WRR
 El Paso, WDAH, WPAT
 Fort Worth, WBAP,
 WPA

State, City, Call

Galveston, WHAR,
 WIAC
 Houston, WCAK, WEAY,
 WEV, WGAB, WPAN,
 WRAA, WSAV
 Laredo, WWAX
 Orange, WKAL
 Port Arthur, WFAH
 San Antonio, AS6, DM7,
 WCAR, WJAE, WOAI
 Stanford, WOAZ
 Tyler, WOAF
 Waco, WJAD, WLAJ,
 WWAC
 Wichita Falls, WKAF

Utah:

Ogden, KDZL
 Salt Lake City, KDYL,
 KDYV, KZN

Vermont:

Bellows Falls, WLAJ
 Burlington, WCAX

Virginia:

Blacksburg, WEAE
 Fortress Monroe, WNAW
 Portsmouth, WOAQ

Washington:

Aberdeen, KNT
 Bellingham, KDZR
 Centralia, KDZM
 Everett, KDZZ, KFBL
 Lacey, KGY
 Pullman, KFAE
 Seattle, KDZE, KDZT,
 KFC, KHQ, KJR,
 KTW, KZC
 Spokane, KFDC, KFZ
 Tacoma, KFBG, KFEJ,
 KGB, KMO
 Walla Walla, KFCE
 Wenatchee, KDZI, KZV
 Yakima, KFV

West Virginia:

Charleston, WAAO
 Clarksburg, WHAK
 Huntington, WAAR
 Morgantown, WHD

State, City, Call**Wisconsin:**

Beloit, WKAW
 Kenosha, WOAR
 Madison, WGAY, WHA
 Milwaukee, WAAK,
 WCAY, WHAD, WIAO
 Neenah, WIAJ
 Superior, WFAC
 Waupaca, WIAA, WPAH

Wyoming:

Casper, KFCQ, KFDF
 Laramie, KFBU

Alaska:

Fairbanks, WLAY

Hawaii:

Honolulu, KDYX, KGU,
 KYQ

Porto Rico:

Ensenada, WGAD
 San Juan, WKAQ

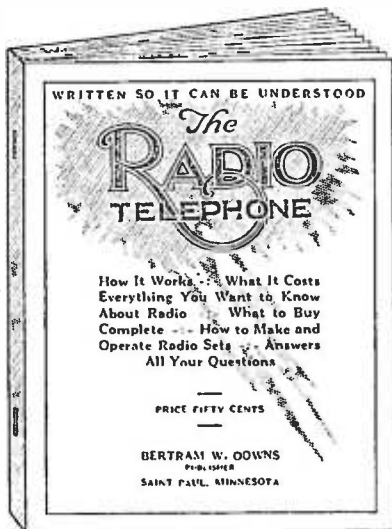
Canada:

Calgary, CHBC, CHCQ,
 CFAC, CFCN, CJCY
 Edmonton, CHCC, CJCA
 Fort Frances, CFPC
 Halifax, CFCE, CJCS
 Hamilton, CKOC
 Iroquois Falls, CFCH
 Kitchener, CJCF
 London, CFCX, CHCS,
 CJGC, CKQC
 Montreal, CFCF, CFZC,
 CHCX, CHYC, CJBC,
 CKAC, CKCS
 Nelson, CJCB
 Ottawa, CHXC
 Regina, CKCK
 St. John, CJCI, CKCR
 Toronto, CFCA, CFTC,
 CHCB, CHCZ, CHVC,
 CJCD, CJCH, CJCN,
 CJSC, CKCE, CKCZ,
 CKKC
 Vancouver, CFCB, CFYC,
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