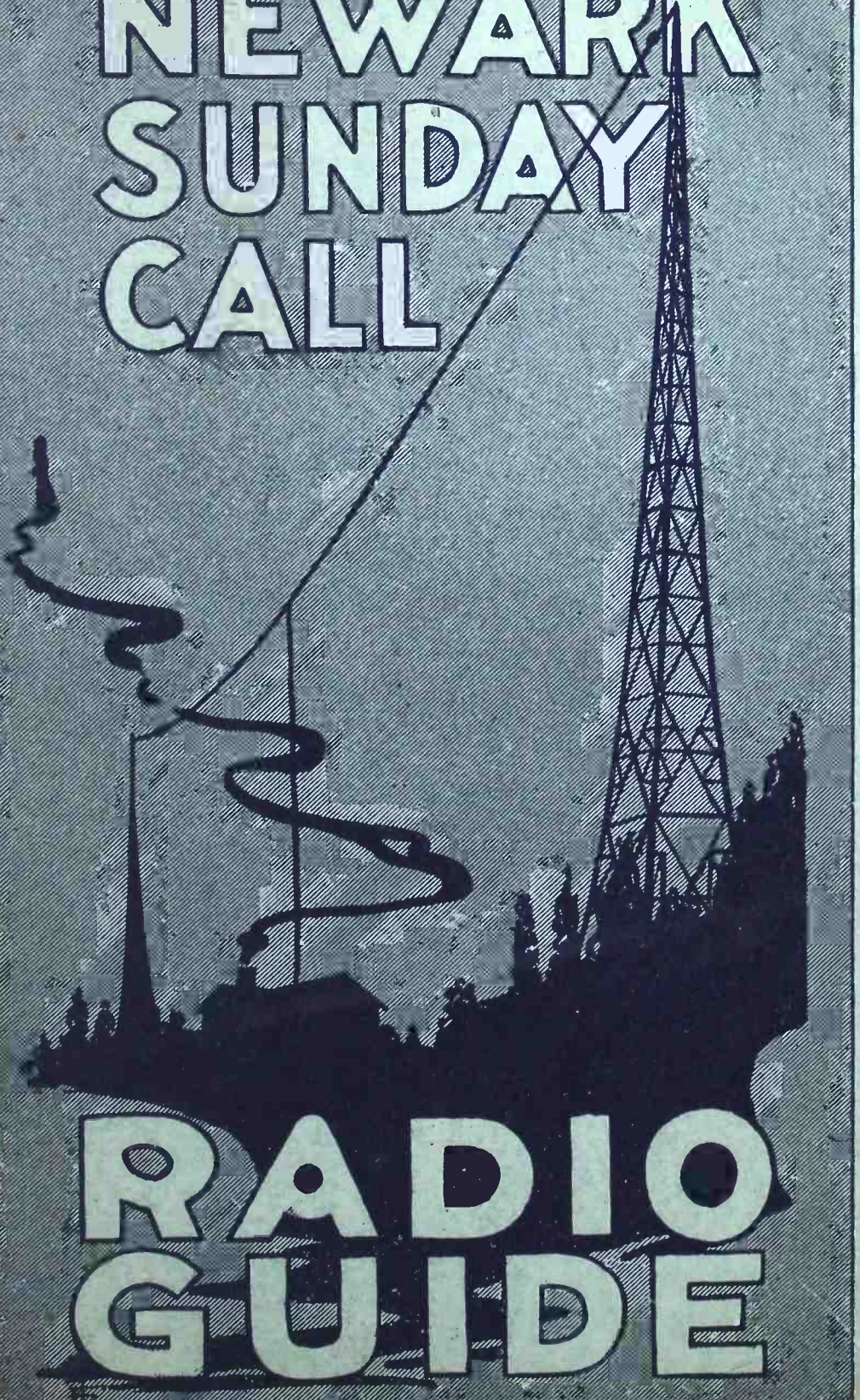
NEWARK SUNDAY CALL



RADIO GUIDE

First in the Field

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For the plain broadcast listener there is advice on buying a receiver and the installation and care of it. For the experimenter there are a number of receiving circuits, B battery eliminators, tube-tester, reactivator, transformer tester and A. C. tube wiring.

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The call letters and wavelengths published in this book are correct, according to the Federal Radio Commission's station assignments up to November 15, 1927. The station log lists all of the stations in the metropolitan district on two pages and following these will be found the other stations in the United States operating on 500 watts or more. These stations are listed according to wavelengths and are the stations one is most likely to hear. Dial-reading spaces are provided and the mileage from Newark is also supplied. There is also a complete list of all the stations in the United States arranged alphabetically.

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Free Advice to Radio Users

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Friday afternoon, 2 to 5 o'clock.
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Your Radio Set--How to Take Care of It

THIS little booklet is intended for two classes of radio enthusiasts, one who buys his set complete and the other who finds enjoyment and interest in "rolling his own" receiver from wiring diagrams. The market affords an assortment of receiving sets ranging from a few dollars up to sets costing as high as a thousand dollars, and the prospective purchaser will find many designs to choose from, while the experimentally inclined person will find many kits of parts as well as a great assortment of apparatus on the shelves of the radio dealers. There is a set to meet every pocketbook and the wise buyer will shop around among the stores to see the various models before making his purchase.

After selecting the set which appeals to you, both from the standpoint of appearance and performance, the next step is to choose good equipment. Pick out the accessories to go with the set carefully and see that every article is well built and of a standard make, so that it will be easily repaired in case trouble should develop. Buy guaranteed apparatus, and only from reliable sources, making sure that serial numbers and other identifications are not scratched out or removed. The manufacturer does not stand back of an article that is sold through unauthorized channels or which is altered so that its source cannot be traced from the maker to the dealer.

Buy Good Accessories

THE day of the three and four-tube set having passed, most manufacturers are devoting their efforts toward receivers having five tubes or more. The market affords an assortment of sets employing more than five tubes. For those who do not want to use an outdoor antenna, there are the six and eight-tube super-heterodyne receivers. The majority of these outfits work with dry-cell tubes and may be operated entirely from the house lighting circuit by means of rectifiers, if desired.

Some of the eight and ten-tube sets are designed with five or more stages of radio frequency, which are extremely sensitive to weak, far-away stations and are also very selective.

The prospective purchaser of a radio set should be careful to watch the accessory line which is supplied with the outfit. It is essential that the storage battery be of a reliable make and have an ampere capacity of at least 100 hours. Batteries having in excess of this are to be desired, as they do not run down so rapidly. Be sure that a battery hydrometer is supplied with the equipment. A battery charger is also worth purchasing at the start.

In selecting tubes for the set make sure that you are getting tubes of a reliable manufacture. The market is flooded with inefficient vacuum tubes and often these are included in the original equipment. Insist on good tubes, even though they will cost more.

Free Radio Guide

SIXTH EDITION

By ALBERT E. SONN, *Sunday Call Technical Editor*

Issued for Free Distribution
by the Newark Sunday Call

First and Foremost
In the Radio Field

THE NEWARK SUNDAY CALL
Newark, New Jersey
1927 1928

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Put Up Efficient Aerial

YOU cannot expect good results from a radio-receiving set unless an efficient aerial and ground are employed. The aerial should be a single wire not more than 100 feet long, well insulated at both ends. It should be fairly high and away from surrounding objects. Any wire will do for an aerial, but best results have been obtained by using No. 12 enameled copper wire, which resists corrosion and is strong.

The lead-in and aerial should be in one piece if possible. At the window sill a flat insulated strip of copper or brass may be used so that the window can be closed tightly.

The ground wire should be fastened to the nearest water or radiator pipe. A copper ground clamp should be used. First the pipe should be filed bright where the clamp is to be attached. No. 14 rubber covered copper wire is satisfactory for the ground wire running to the set. Do not use gas pipes or iron rods driven into the earth outside of the window. Such grounds have a high resistance and will not permit perfect reception.

Care of A Battery

EVERY ONE using a storage battery to operate the set should own a hydrometer of a good make. This instrument should be used frequently, at least once a week. It will tell at a glance the condition of the storage battery. It is well to keep handy the hyrodmeter readings which follow:

Fully charged	1280-1300
Half-charged	1200-1250
Exhausted	1100-1150

No battery should be left until it reads as low as 1150. Old batteries will not show a charge much above 1280. This is not an indication that the battery is not fully charged. When charging a battery it is well to add distilled water after the battery has come off the charge. If the water is added before, the hydrometer may show a low reading even though the battery is fully charged. If the battery is dry add water before charging.

A battery will last longer if given frequent short-time charges. Once a week the battery should be left on the line for about five hours.

Trouble Shooting

WHEN the set goes "dead" suddenly it is a sign that some wire has broken. Examine the battery connections. Make sure that the tubes all light normally. If the trouble is not outside of the set, the

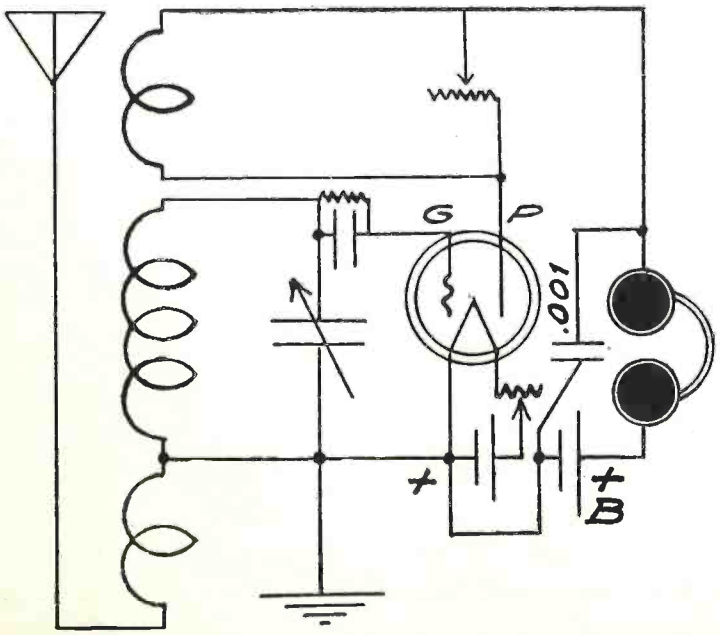
next place to look is at the various wires within the cabinet. An "open-circuited" amplifying transformer will cause the set to cease working.

If the set gradually becomes weak it is a sign that the storage or B batteries are exhausted. In this case use a voltmeter and hydrometer and make a thorough checking of the entire power equipment.

Occasionally tubes may lose their efficiency. The only way to tell this is to have them tested or use a substitute tube in the place of one which may have gone bad.

If the trouble does not seem to lie within the set or the batteries examine the aerial and ground connections. A grounded aerial may be causing the lack of reception. If you have a factory-made set it will not pay to take it apart for examination unless you are familiar with the circuit. Of course you can feel for broken wires throughout the assembly, but do not try to change connections or add apparatus.

Beginners' Receiver



BEGINNERS usually like to start with a one-tube set. Here is one that has proven popular over a number of years and is designed for headphone reception only. Later two stages of audio may be added for loud-speaker work. The circuit can be constructed with any of the three-circuit coils which are sold on the market or the coil may be made at home. The upper coil or tickler is wound with 35 turns of No. 24 DCC wire. The center coil or secondary should have 47 turns of the same wire. The lower coil or primary consists of 12 turns of wire. The secondary and primary may be wound on a three-inch tube,

while the tickler must be mounted near the top of the secondary so that it can be rotated freely within the secondary tube.

The secondary is tuned with a 23-plate .0005 variable condenser. A .00025 grid condenser is used with a 4 to 7 megohm grid leak across it. A .001 fixed by-pass condenser is connected as shown in the diagram.

Still further improvement may be made to this circuit by employing a fixed tickler coil having 40 turns of wire, which is wound on the same tube and about one-quarter of an inch from the secondary. To control regeneration a variable resistance of about 100 to 200,000 ohms is connected across the tickler coil as shown. This permits a smooth control of signal strength and proves excellent for DX reception.

Loud-Speaker Location

IN ORDER that maximum response may be obtained in any one room from the loud speaker it is important to experiment with various positions of the speaker. The results are dependent upon so many factors that set rules cannot be laid down. The characteristics of the speaker, the size of the room and objects within the room are deciding issues. The speaker should not be placed upon the set or upon any object which also carries any glassware or crockery. Such objects often respond to certain frequencies emitted from the speaker and annoying sounds will take place. Keep the speaker lead-wire away from lampcords carrying alternating currents. A "hum" is bound to develop if A. C. is induced into the speaker cords, due to parallel circuits.

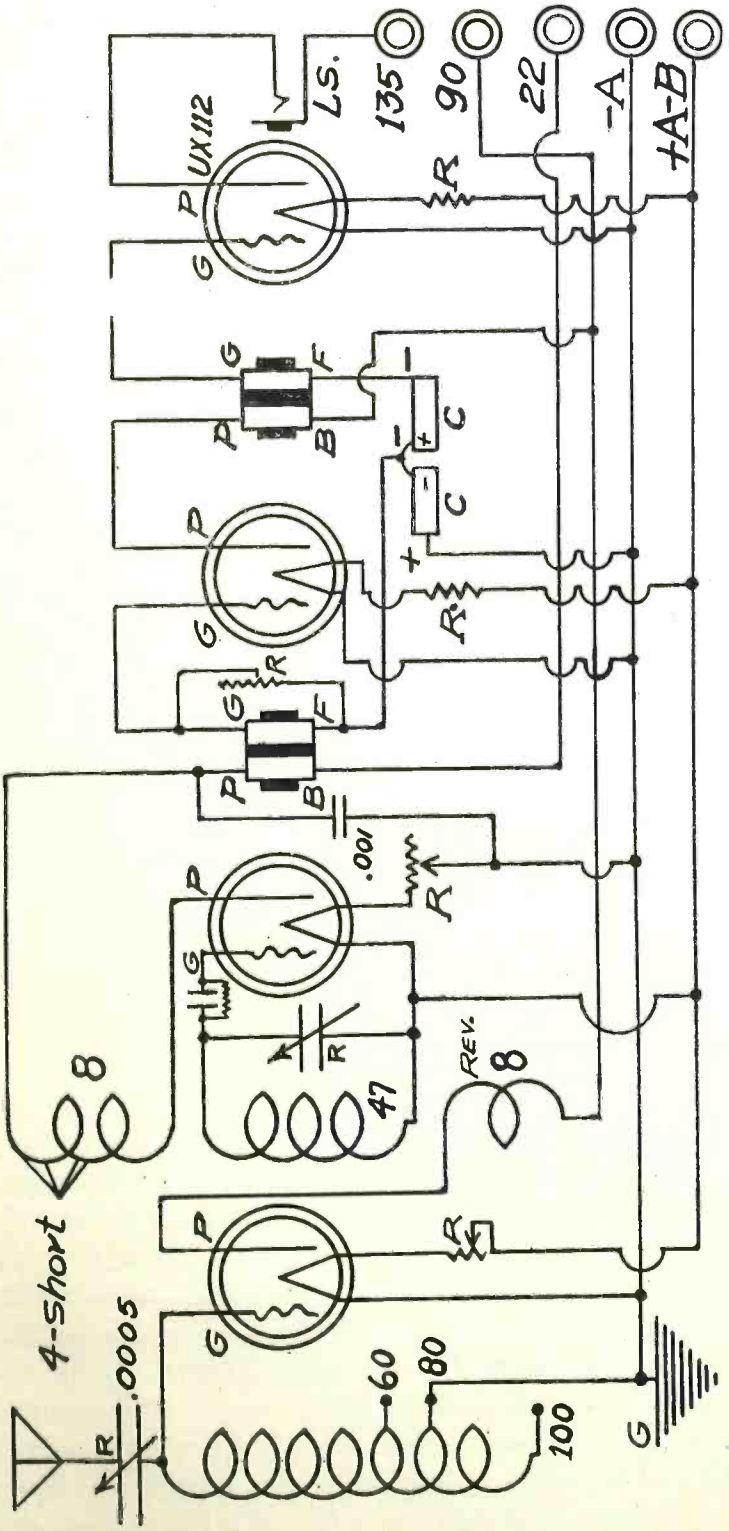
The speaker should not be located where air columns propagated from the speaker are reflected back upon the speaker. Better tone will result if the speaker is placed in the center of an empty room. A drapery to the rear of the speaker will reduce vibrations from the walls back of the speaker. A strong humming or howling tone in the speaker indicates that it is too near the set and causes the tubes to vibrate at low notes. It is well to buy a twenty-foot extension cord for the speaker. The corner of a room is often the best location for the speaker. The walls act as a sound chamber, aiding the sound waves to build up more volume.

Grid Battery Voltage

The following table gives the approximation of grid potentials necessary with various tubes. B battery voltages are included in the table:

Tube.	Plate Volts.	Grid Bias.
UX-201-A, CX-301-A	90	4 volts
UX-120, CX-220	135	22.5 volts
UX-112, CX-212	135	9 volts
UX-171, CX-271	180	35 to 45 volts
UX-210, CX-310	350	20 to 50 volts

Four-Tube Arkay Set



THIS four-tube set, employing the well-known Arkay or compensated radio frequency circuit, has gained wide popularity during the last four years. It was first published in the Sunday Call Radio section in

1923. Thousands of set-builders have made this type of set and new ones are being put together daily.

It is easy and inexpensive to construct. It does not require costly coils and makes use of two .0005 variable condensers and inductances, which can be constructed at home with two pieces of tubing and a quarter-pound of wire.

The antenna coil has 100 turns tapped at the 60th and 80th turns. These taps are used for various wavelengths. A clip is provided from the ground connection for tapping to the various turns. The coil is tuned with a .0005 variable condenser.

The detector coil has three separate sections. The first eight turns are wound on a three-inch tube about four inches long. Four of these are short-circuited by means of solder. A quarter of an inch away from this coil is the secondary, which has 47 turns of wire. A quarter of an inch below this, on the same tube, is the reversed radio frequency coil. This has eight turns wound in the opposite direction from the secondary.

The secondary is tuned with a .0005 condenser. The first or radio frequency tube is regulated with a variable resistance in the filament circuit. This is also true of the detector tube. Both of these rheostats are of 20 ohms if 201-A tubes are employed and 30 ohms each if UV-199's are used.

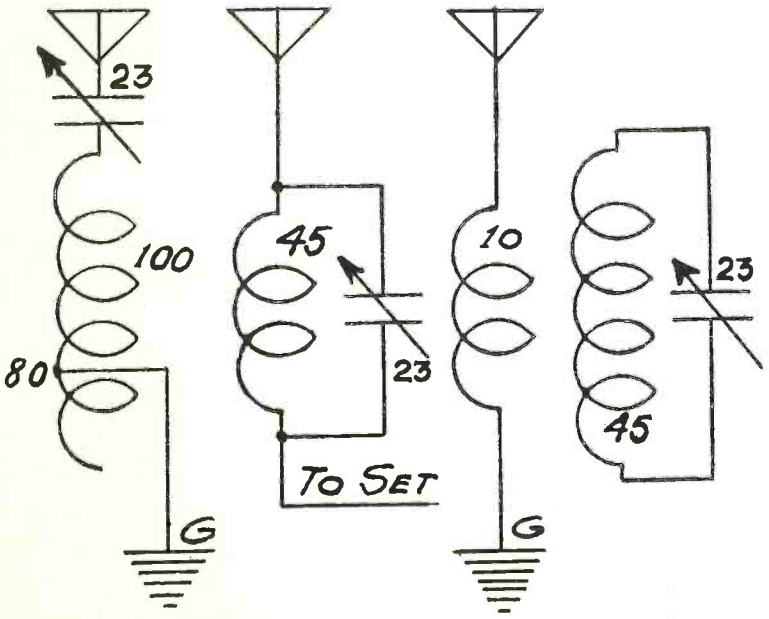
The amplifier filaments may be operated by means of fixed resistances in series, as shown. Provision has been made for the use of a power tube.

If a volume control for the amplifier is required, a high resistance variable rheostat may be placed across the second audio transformer secondary. By adjusting this, distortion can be prevented in the last tube and the volume controlled to a whisper.

Battery Chargers

THOSE having electric lighting current in the house will find it advisable to use a storage battery charger, thus eliminating the irksome necessity of sending the battery to a service station for charging. The charger will last indefinitely and will rejuvenate the battery at a cost of approximately ten cents' worth of electric current. There are three principal types of charger—the mechanical vibrator, the bulb rectifier and the electrolytic rectifier, the latter two being comparatively silent in operation, and from that standpoint, as well as several others, more desirable. The rate of charging, designated in amperes, varies slightly with the type and size of device, but this is not of great importance. Bulb rectifiers come in two sizes, one charging at a rate of 2.5 amperes at 6 volts and the other at the rate of 5 amperes at 6. The electrolytic charger does its work somewhat more slowly, the passage of current being at the rate of .5 to 2 amperes.

Three-Wave Traps



WHEN one encounters interference from nearby stations it is a simple matter to connect a wave-trap in the aerial circuit and thereby reduce the annoyance. It is not necessary to alter the set itself, as any one of the three traps shown have been employed with various sets and produced good results. The circuit to the left consists of a 23-plate .0005 variable condenser in series with a 100-turn coil. The coil is wound on a three-inch tube and No. 24 DCC wire is employed. A tap is taken off at the 80th turn, so as to make the unit useful on the shorter waves below 360 meters.

With this trap no aerial or ground connection is made to the set. The trap is laid alongside of the cabinet and tuned with the incoming signal. It builds up the station's signal, rejecting all others.

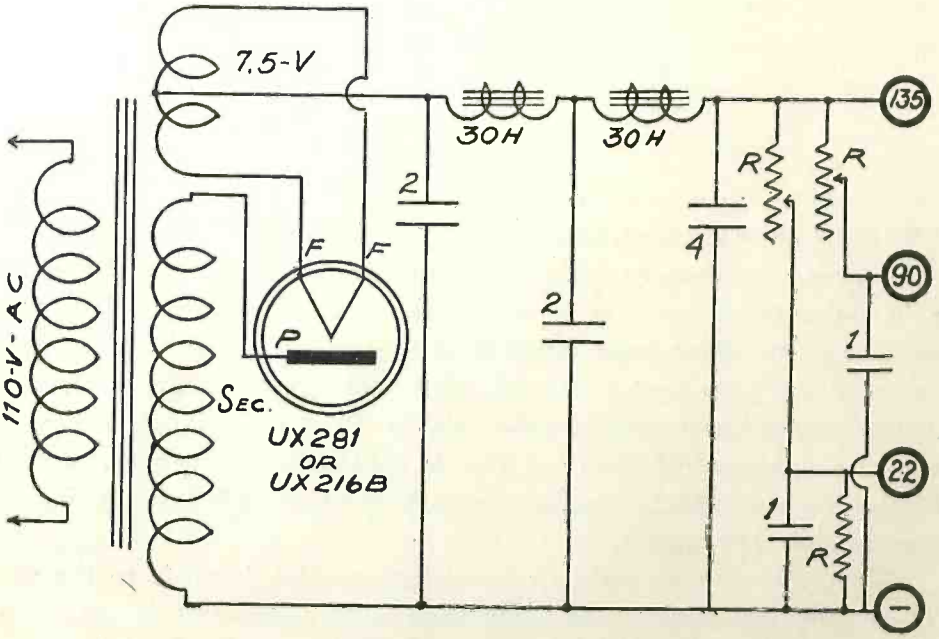
The center circuit shows a modern type of wave-trap of the "rejector" type. This trap, which is wound on a three-inch tube, consists of 45 turns of wire, No. 24 DCC. The coil described is connected across the rotar and stator of a 23-plate .0005 variable condenser. The condenser and coil are connected in series with the aerial and the aerial post on the receiving set. The condenser is tuned slowly until the interfering station is blotted out. Then the set is returned in the usual manner to other stations.

The trap to the right is known as an inductive wave-trap. It has a primary and secondary. The primary has 10 turns of No. 22 DCC wire wound on a three-inch tube. Over this is placed a heavy piece of paper or tape. On top of this insulation is wound the secondary, which consists of 45 turns of No. 24 DCC wire. Across the secondary is connected a

23-plate .0005 variable condenser. This type of trap is said to reduce electrical disturbances which are often present in the ether about a busy factory section.

Light Duty Eliminator

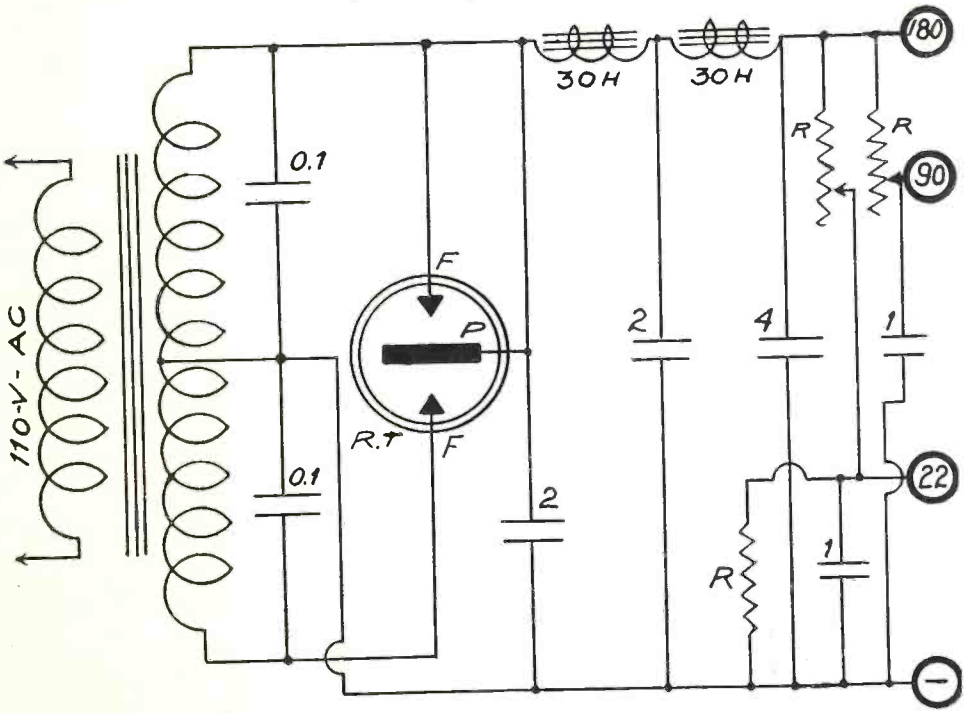
ONE OF the most satisfactory B battery eliminators which can be constructed at home is shown in the hook-up below. This is known as a single-wave rectifier and will furnish up to 150 volts at 50 milliamperes when using a UX-281 or UX-216-B Radiotron rectifier tube. The UX-112 or a UX-201-A may also be employed for lower voltages. A step-up transformer having a 200-volt secondary and a center-tapped filament winding of 7.5 volts is required. Besides this, two 30-henry



choke coils, two 2-mfd., one 4-mfd. and two 1-mfd. filter condensers are necessary. Also provide two variable high resistance units for voltage controls, a standard socket, binding posts and a 10,000-ohm fixed resistance.

One cannot go wrong on the wiring if he is careful, and when finshed the eliminator should provide a good source of direct current without a "hum" and give enough voltage to work a power-tube of the UX-112 type. Of course this circuit will supply greater voltages if a higher voltage transformer is provided. In this case the filter condensers should be selected with care, making sure that they will stand more than the voltage to be delivered at the output. Keep the device at least four feet from the set and bunch the D. C. wires together in the path to the radio receiver.

Heavy Duty Eliminator



WHERE the demands of the set are for 180 volts of more for power-tube operation the above circuit of a double-wave rectifier B eliminator is advised. This circuit employs the well-known Raytheon gaseous rectifier tube, which has no filament to burn out. There are three types of such tubes, each one delivering a certain output, and the BH or BA is recommended for sets having five tubes or more. A special center-tapped step-up transformer is required. The primary connects direct to the 110-volt A. C. circuit. The secondary is shunted with two 0.1 mfd. filter condensers.

The filter system is similar to that employed with the light duty eliminator. However, as more voltage is to be supplied it is essential to take care in selecting the filter condensers. Get the best obtainable, regardless of the cost. They should have at least 100 per cent. overload factor. The working voltage should be over 600, as this is considered a safe margin. The various tubes fit in the standard UX socket, the two F terminals being used for the outside terminals of the transformer and the plate terminal for the condenser and choke connection. R and R, shown with arrows, are high-resistance variable controls, and R, shown between the detector tap and the negative B, is a 10,000-ohm resistance capable of standing at least 15 milliamperes.

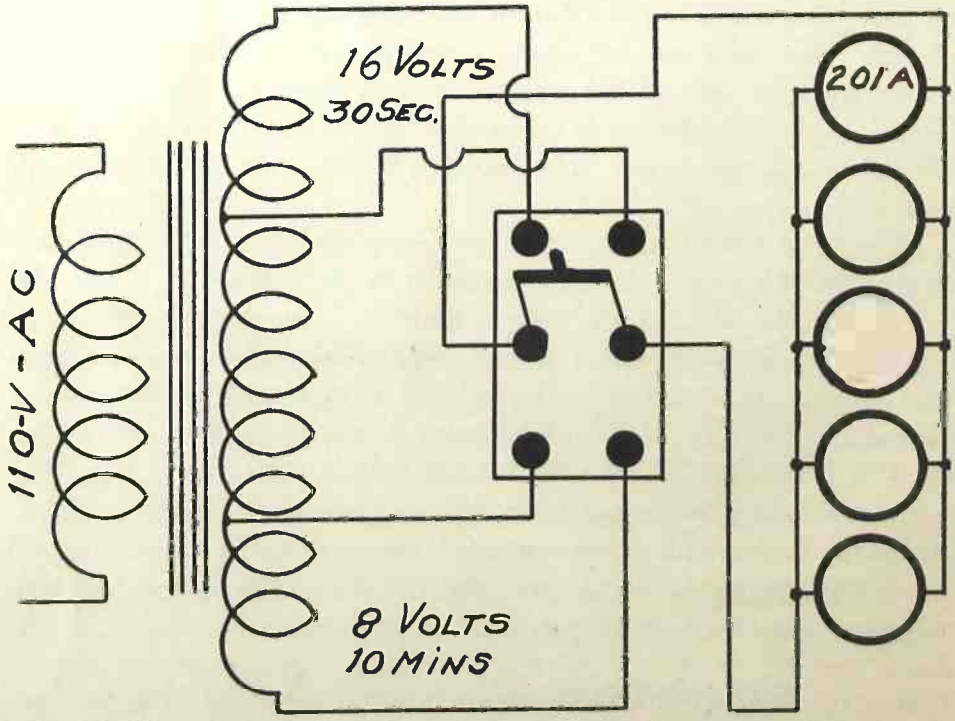
Broadcasting Started in Newark

WHILE radio broadcasting is a comparatively new enterprise, it has actually been used to a more or less degree since the first actual development of the radiophone, which took place in Newark in 1908,

when a few scattered amateurs heard voices of engineers, musical records and news of the day broadcast from a station of the Collins Wireless Telephone Company, located at that time at 54 Clinton street. Later Dr. Lee De Forest took up his radiophone experiments in this city and built a testing station on Boyden place. It was, however, not until after the World War that broadcasting began to develop as an industry of prominence, and now it occupies a place of definite importance in every-day life.

Although other cities have claimed title to the first original broadcasts, Newark is entitled to full credit for having started the broadcasting boom, which began in the fall of 1921, when the Sunday Call began its daily broadcasting schedule of news, sporting events, children's stories and music from the former WJZ station, which was located in the Westinghouse Building on Plane and Orange streets. The Sunday Call's radio plans were put into effect in October 1921, with the play-by-play description of the World Series. This was the first time in history that the Series was broadcast. Following this broadcast details of the principal college football games were put on the air. From this date the news of broadcasting spread throughout this country and the world, and other cities and commercial institutions, seeing the great advantages of this service, took steps to establish similar stations.

Tube Reactivator

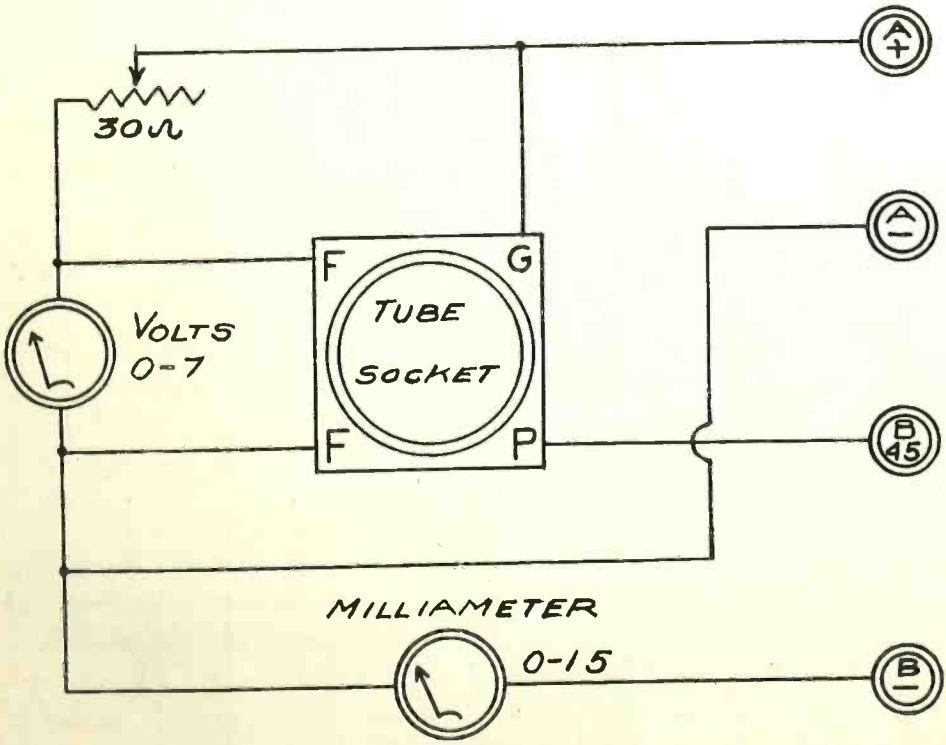


VACUUM tubes of the UX-201-A, CX-301-A, UX-199 and C-299 types which have lost their usefulness but still light and are not defective may be put through a process known as reactivating and

brought back to normal operation. This treatment can be administered at home by means of a small inexpensive outfit comprising a step-down A. C. transformer, a double pole, double-pole switch and a few standard sockets. The circuit accompanying shows how the switch and transformer are connected. In order to reactivate a UX-201-A or CX-301-A tube the switch should be thrown in one direction so that the transformer delivers 16 volts. The tubes in the sockets are subject to this voltage for a period of 30 seconds. The switch is then pulled forward and 8 volts is put on the filaments for 10 minutes. After this the tubes should be in good operating condition. The UX-199 or C-299 is treated in the same manner, except that the transformer voltage is set at 10 volts for 30 seconds and then the switch is thrown back and 4 volts is left on the filaments for 10 minutes.

Tube Test Circuit

EXPERIMENTERS desiring to know more about the characteristics of vacuum tubes and to be able to tell a good tube from a poor one should own a tube-tester. The circuit below shows one of the simplest forms of tube-testing circuits. It employs a voltmeter reading



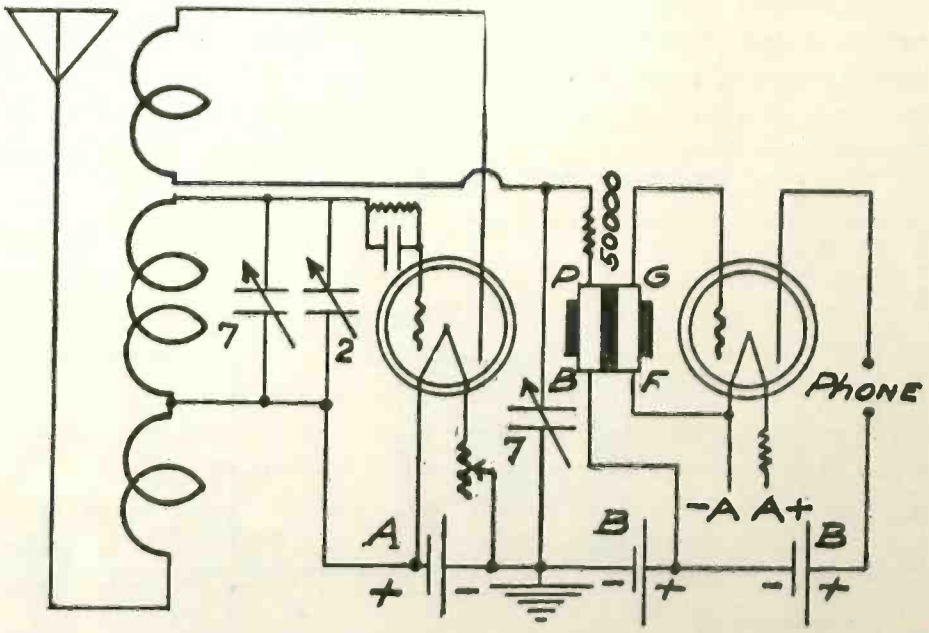
from 0 to 10 volts and a milliammeter reading from 0 to 15. Only the best of meters should be employed. Besides the meters the hook-up calls for a 30-ohm rheostat, a universal tube-socket, four binding posts, a sheet of bakelite about 7 by 9 inches. Bus-bar wire may be employed

in wiring the circuit. In testing a UX-201-A tube place it in the socket and turn up the filament rheostat until the voltmeter reads about 5 volts. A good tube should read more than 5 milliamperes. The same test is conducted for UX-199 tubes, except that the filament voltage is set as 3.5 volts. A lower reading will be shown on the milliammeter. A good tube should be up to 4 milliamperes. Power tubes can also be tested. The readings will be higher than the UX-201-A.

Short-Wave Tuner

LITTLE is known about the mysteries of short wavelengths, yet amateurs and commercial as well as government stations for some time have used the lower meter channels. Many broadcasters are experimenting on wavelengths in the neighborhood of from 10 to 100 meters.

The diagram shows how to build a set to take in the lower bands. A set of plug-in coils is suggested. The coils should have spaced windings and are tuned by low capacity variable condensers. While it is not neces-



sary to connect two condensers in parallel as shown, the second condenser, consisting of but two plates, will enable the operator to follow up and control any signal better than if the condenser was not employed.

One stage of audio is all that is necessary, as most all short-wave reception is done with earphones. A second 7-plate variable condenser is employed to control the oscillation. This is connected between the plate coil and the ground as shown. Be sure to connect the rotars of the condensers on the battery or grounded side of the circuit to keep body capacity at a minimum. For 20 meters the aerial coil should have three turns, the secondary three turns and the tickler about two turns.

For 40 meters, the antenna coil should have four turns, the secondary six turns and the tickler four turns. For 80 meters, the aerial coil should have about six turns, the secondary 12 turns and the tickler coil 8 turns.

In place of the usual radio frequency choke coil in the transformer plate lead a 50,000-ohm resistance can be employed with good results.

Special Duty Tubes

IT IS the custom of the radio manufacturers to furnish with every radio tube sold for receiving a statement of what is known as the tube's "characteristics." This statement has become increasingly important as the manufacturers have already come out with what are called "special purpose" tubes—tubes, in short, which perform a special function in a certain part of the circuit and which are comparatively useless when used elsewhere.

Examine carefully the manufacturer's statement concerning the tubes you use, noting the amount of filament current, plate and grid voltages required and the "special purpose" of the tube. Conform accurately with the voltage specifications and thereby prolong the life of the tube, and at the same time obtain the best quality of reproduction from your set.

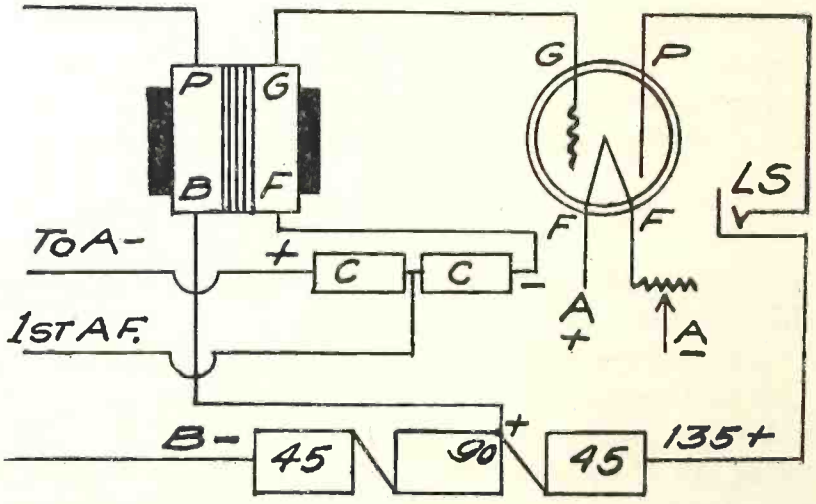
Use Good Jacks

TELEPHONE jacks are a constant source of trouble if poor or cheap ones are used. Weak springs and dirty, corroded contacts cause nine-tenths of the failures. These jacks fail to properly pass the amplified currents along to the next stage. The springs on a jack should be strong, so that when the plug is removed a good electrical contact is made. The better the insulating material between the leaves of the jack, the less leakages and short-circuits. Builders should never solder their jacks with soldering paste. In nine cases out of ten a very sloppy job is made by using too much paste. Solder should be applied with rosin.

Care of Power Sets

AS A RULE, power-receivers are complicated pieces of apparatus and when they get out of order it never pays to try to fix them yourself. In case of a break-down always call up the dealer or get a reliable service man to look over the job. Most of the defects appear to take place in the B eliminator circuit. The modern set is designed so that it is practically foolproof as far as the wiring is concerned. Of course transformers will break down or open-circuit. Owners of power-receivers operated from the light socket should not tamper with the interior of the set.

Power Tube Wiring



POWER tubes may be employed with any type of set. Their use results in greater volume and ideal tone quality. Slight charges are necessary in the receiving set. These are shown in the accompanying circuit. It is essential to employ higher B battery voltage and an additional C battery.

Three of the most popular types of power tubes are the UX-120 or CX-220, UX-112 or CX-212, and the UX-171 or CX-271. The UX-120 and the UX-112, CX-220 and CX-212 require 135 volts of B battery. In every case addition of another 45-volt battery is necessary if the receiver has been working with 90, making a total of 135 volts. The results obtained are worthy of the extra expense and extra battery. Besides the usual 4.5-volt C battery, another 4.5-volt unit is required. This is connected in series with the first battery, a tap being taken from the connection between the two for the first stage audio transformer F negative.

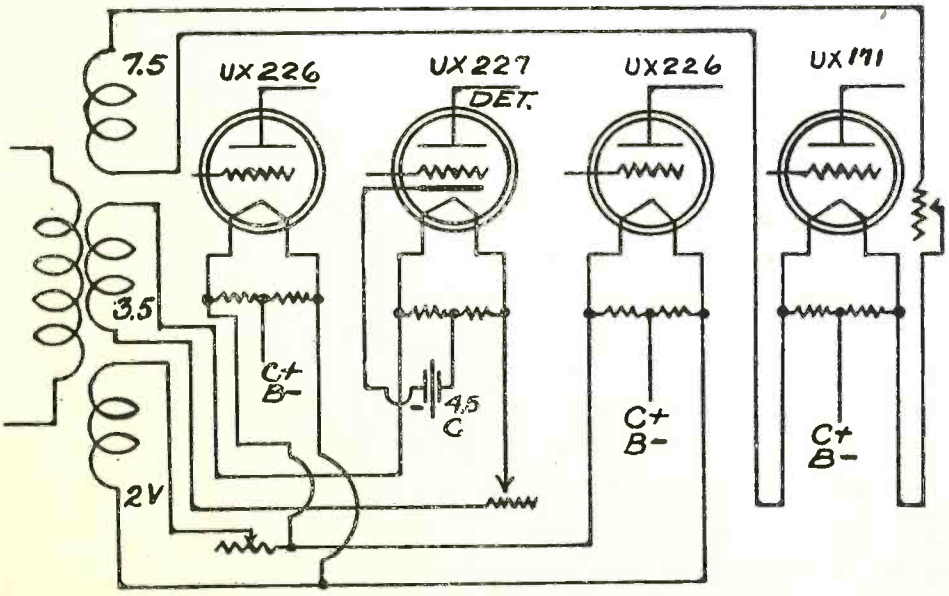
Note that the loud-speaker wire formerly connected to the 90-volt B battery is now connected to the 135-volt positive terminal of the new battery. The rest of the audio circuit remains as before and in no way should it be altered. This circuit holds standard for all types of power tubes. The UX-171 or CX-271 is used with 180 volts of B battery and about 40 volts of C battery. It is employed where greater volume is required.

Open Circuit Test

TRANSFORMER primary windings are generally first to open-circuit and when such a thing happens the loud-speaker becomes noisy or else no reception comes through at all. A simple way to test a transformer winding for an open-circuit is to use a 45-volt B battery, con-

necting one terminal of it direct to the transformer postmarked P and the other wire of the battery should be brushed against the B terminal. If the transformer winding is perfect a small spark will occur when the contact is made. The secondary may be tested in the same manner. No spark, of course, indicates that the winding is open. A larger spark will take place if 90 volts of B battery is employed in the test.

Wiring for A.C. Tubes



FOR SEVERAL years there has been a tendency on the part of manufacturers to build receiving sets to operate direct from the house lighting service. A number of such sets have already been put on the market and have been successful. Owners of receivers which require the use of a storage battery can now convert the filament wiring so as to accommodate the new UX-226 or CX-326 and UY-227 or C-327 alternating current Radiotrons.

By the use of a step-down transformer for filament lighting one can do away with the storage battery entirely. The circuit for these tubes is seen in the accompanying diagram. The diagram calls for a special audio transformer with four separate secondary windings. The tubes are controlled by means of 2-ohm rheostats capable of handling over an ampere of current. Each tube filament is shunted with a fixed resistance of about 65-ohms, having a center tap which provides the point of connection for the positive grid and negative plate potential sources. The resistance should fit directly across the socket. A five-contact socket is required for the detector.

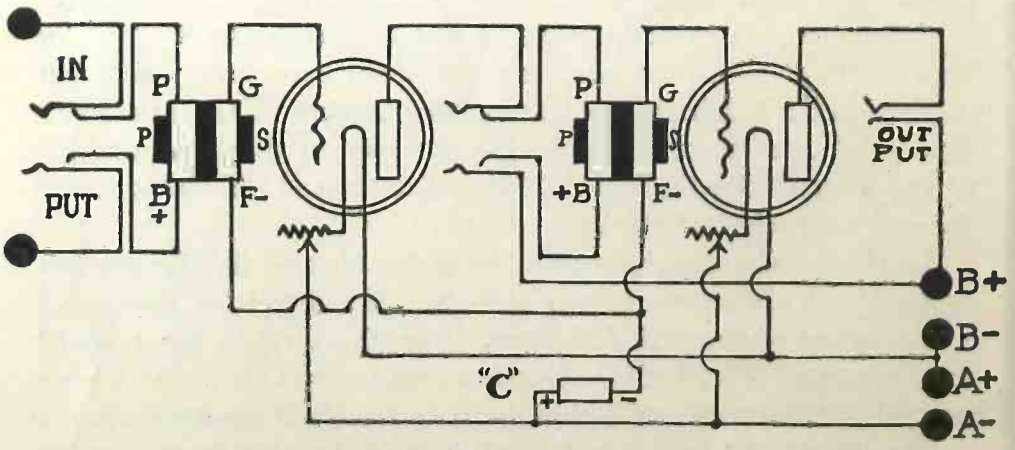
Dial Settings

ALTHOUGH no two sets of different make tune exactly alike, it is possible to set the dials of the average receiver to approximately a certain wavelength by means of the following table:

Wavelengths.	Dial Settings.
550	95
525	90
500	85
475	80
450	75
425	65
400	50
375	45
350	40
325	35
300	30
275	20
250	15
225	10
200	5

Two-Step Audio Amplifier

WITH the exception of the inclusion of a C battery to preserve a negative grid bias on the amplifier tubes, there has been no change in the two-stage audio circuit since the beginning of broadcasting. It has been demonstrated that transformers of slightly different ratio are



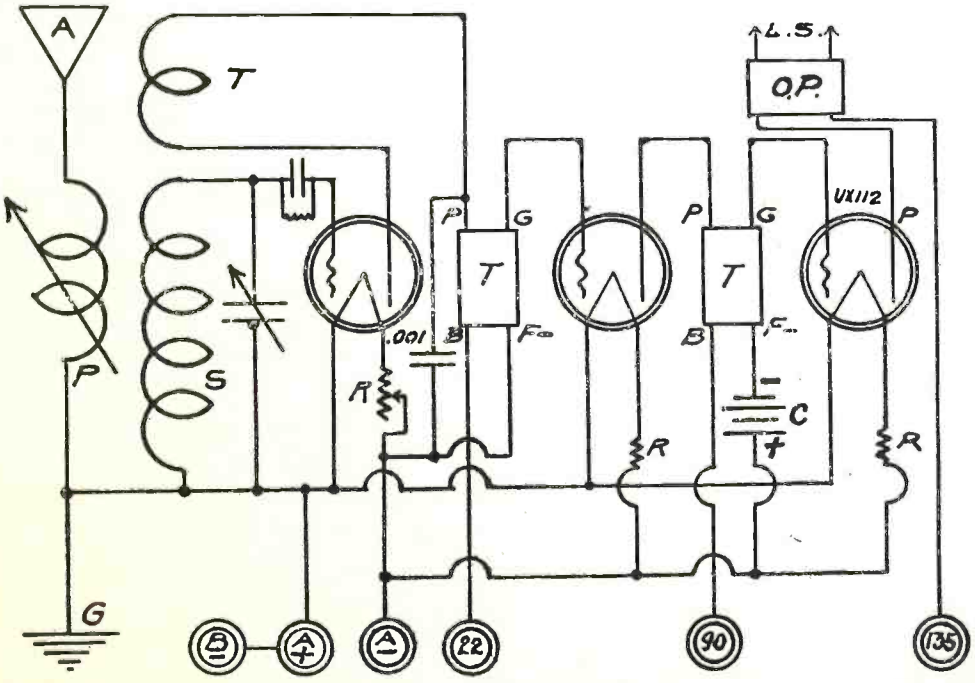
desirable in the first and second stage, and most manufacturers now mark transformers "first" and "second" stages to meet this requirement.

The circuit shows two double-circuit jacks for plugging in on the detector or the first stage audio and a single jack for the output. This

permits the use of earphones in the circuit at any point desired. The circuit shown shows where the C battery is put.

The "input" shown at the left is for the detector tube. The upper part of the first jack connects to the plate of the detector tube, while the lower leaf of the jack connects to the B battery 22 volts. A fixed condenser of .001 is often connected across the primary terminals of the first transformers. This is a by-pass for the radio frequency currents in this circuit and assists in strengthening signals.

Three Circuit Set



OUTSTANDING among the many circuits for the home constructor is the three-tube, three-circuit regenerative hook-up. The above diagram shows how a three-circuit coil is wired, including a detector and two-stage audio amplifier employing transformers. The hook-up is of the latest type, with power-tube and output transformer included in the last stage. The coil to the left is the primary winding of the coupler. The arrow indicates that it is variable, that is, it may be rotated at will to increase or decrease the selectivity of the set. There are several coils of this type on the market. The coil to the right of the primary is the secondary winding shunted with a .0005 variable condenser. Above it is the "tickler" or plate feedback coil, which is employed as a volume control. This is also free to rotate within the top of the secondary coil tube. T and T are two audio transformers and O. P. is the output transformer, which is employed to protect the loud-speaker unit against injury from high voltages or wrong polarity. The circuit may be used with a

UX-120, UX-112 or UX-171, or similar Cunningham tubes, in the last step. No C battery is required on the first stage of audio. A 9-volt C battery should be used for the last stage transformer. Tuning is all done with the secondary condenser and volume controlled by the tickler coil.

Audio Frequency Transformers

VERY little can be told about the working qualities of an audio frequency amplifying transformer from its outward appearances and therefore the purchaser must rely largely upon the data supplied by the manufacturer. This data will usually be found in the instruction sheet accompanying the transformer and if the transformer is to be used in connection with the standard R. C. A. or Cunningham tubes the measurements should be approximately the same as are advised below.

Greatest amplification without distortion will be had if the transformer used in the first stage has a ratio between the secondary and primary windings of not greater than 1 to 5 and not less than 1 to 4. In the second stage the ratio should not be greater than 1 to 4 nor less than 1 to 3½. The allowable current on each winding should not be less than 10 milliamperes and the voltage breakdown tests should show the transformer capable of standing a potential of at least 300 volts. The useful frequency range of the transformer should be from 30 to 10,000 cycles and if an amplification curve is supplied with the transformer it should indicate that there were no sharp resonant peaks between the frequencies already mentioned.

Safe Tube Protector

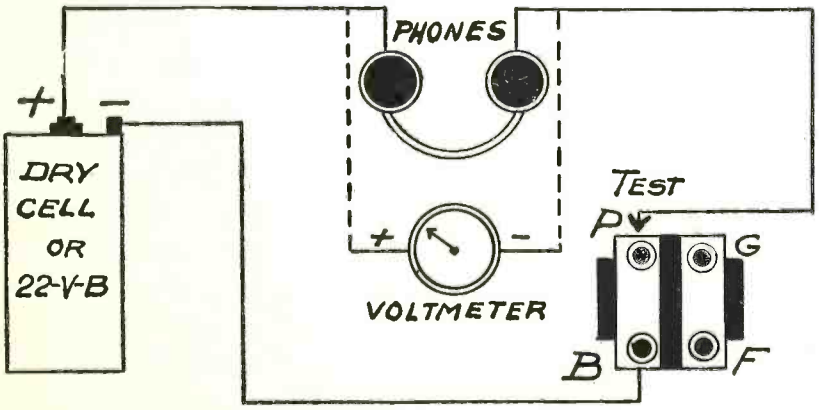
THOUSANDS of radio tubes are burned out yearly through carelessness or by short circuits due to poor wiring in the receiving set. By means of a small 5-watt electric light bulb in series with the negative B battery connection to the set, the filaments of the tubes can be protected against voltage overloads. The lamp may be fastened to the back of the set or near the B batteries. Some experimenters employ a small flash-light bulb for the purpose, which acts as a fuse, burning out when excessive voltage from the B batteries happens to cross the filament circuit.

Test for Shorted Condenser

FILTER and by-pass condensers employed in B eliminators and receiving sets frequently short or break down due to excessive voltage. There are two good ways to test for a shorted condenser. First, take the condenser out of its position in the unit and apply a voltage of about 135 across the two terminals. There should be a spark or snap indicating

that the condenser is taking a charge. In a few moments place a piece of metal across the two terminals. There should be a bright blue spark. The larger the condenser the greater the size of the spark. Another method of testing for a short is to connect a voltmeter of 0 to 50 volts in series with the condenser and a 45-volt B battery. If the meter shows a reading this indicates a short-circuit. No reading, of course, means a perfect condenser.

Transformer Tester



IN TESTING a transformer primary, it is best to have it out of the set. Wire a battery in series with a pair of earphones as shown. To one side of the transformer make a permanent connection to the battery as shown. The test clip from the earphones should be brushed against the other transformer primary terminal. If a click is heard it indicates that the transformer winding is not open.

Output Devices

THE cone-type speaker contains a delicately balanced unit and when subject to excessive voltages from a power-tube may be damaged or demagnetized. The unit may be protected from harm by means of an out-put transformer which is connected to the loud-speaker from the out-put jack of the set. Many receivers are now equipped with such a device. The transformer is connected to the plate and B battery of the last tube. Its secondary terminals connect to the loud-speaker tips. When the unit is in operation it permits only alternating current to flow through the speaker coils, and the polarity of the voltage through the speaker is constantly changing. That is, the speaker cords do not have to be connected in a certain direction for proper results. The out-put device also prevents saturation of the speaker unit, thereby improving tone quality to a certain extent.

Types of Tubes

Style.	Purpose.	Voltage. A.	Voltage. B.
UX-199	Det., R. F., A. F.	3.3	22-90
CX-299	Det., R. F., A. F.	3.3	22-90
UX-120	Power tube	3.3	90-135
CX-220	Power tube	3.3	90-135
UX-200-A	Detector	5.	22-45
CX-300-A	Detector	5.	22-45
UX-201-A	Det., R. F., A. F.	5.	22-90
CX-301-A	Det., R. F., A. F.	5.	22-90
UX-240	Det., R. C.	5.	90-135
CX-340	Det., R. C.	5.	90-135
UX-112	Power tube	5.	90-135
CX-212	Power tube	5.	90-135
UX-171	Extra power	5.	90-180
CX-371	Extra power	5.	90-180
UX-210	Heavy power	7.5	200-350
CX-310	Heavy power	7.5	200-350
WD-11, 12	Det., A. F.	1.5	22-90
WX-12	Det., A. F.	1.5	22-90
CX-11, 12	Det., A. F.	1.5	22-90

Special Duty Tubes

UX-216-B	Rect., half-wave	200-500
CX-316-B	Rect., half-wave	220-500
UX-213	Rect., full-wave	200-400
CX-313	Rect., full-wave	200-400
UX-852	Transmitter, 75-W.	2,000
UX-280	Rect., full-wave	500
UX-281	Rect., half-wave	650
UX-874	Voltage regulator	
CX-374	Voltage regulator	
UV-876	Ballast tube	
C-376	Ballast tube	
UV-886	Ballast tube	
UV-877	Protective tube	
C-377	Protective tube	
UV-203-A	Transmitter, 50-W.	1,000
UX-226	A. F. & R. F., A. C. tube	135
UY-227	Det. and Amp., A. C.	180

C Battery Important

EVERY radio set employing more than 45 volts of B battery should be equipped with a C battery. A C battery not alone conserves B battery current, but improves the tone quality. The present-day receiver equipped with a power-tube requires a C battery voltage ranging from 4.5 to 40 volts. Some changes must be made in the receiver to connect up such a battery. It cannot be accomplished from the A and B battery binding-posts outside of the set. As a rule, the C battery is connected in series with the F terminal of the audio transformer and the negative A battery. The negative C connects to the transformer and the positive C to the A negative. The first audio transformer does not need a C battery unless the second-stage transformer is supplied with 90 volts of B battery.

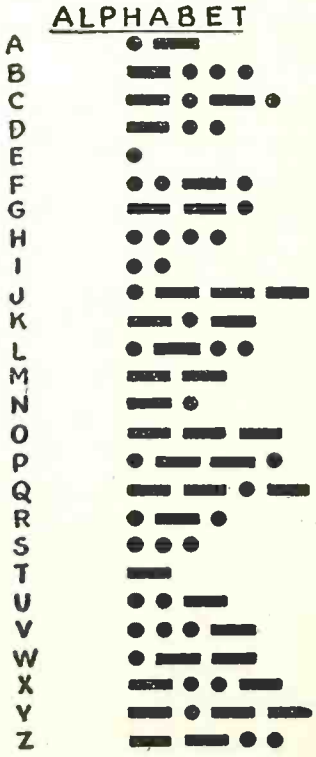
Care of Eliminator

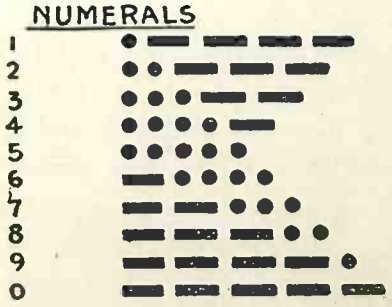
THE B battery eliminator requires little care and may be considered the same as a B battery when hooked up to the set. However, the eliminator with its large filter condenser may damage the tubes in the set if certain precautions are not taken when turning on and off the filaments. It is always well to remember to turn on the filament switch first before snapping on the B eliminator switch. In turning off the power supply to the set always turn off the eliminator first before extinguishing the filament. By remembering this simple rule the tubes in the set will never be damaged by sudden voltages built up by the eliminator condensers. Automatic cut-off switches should be arranged to cut off the circuit as described above. If they cut off the A and B circuits together the tubes will have a short life and lose their sensitiveness in a short while.

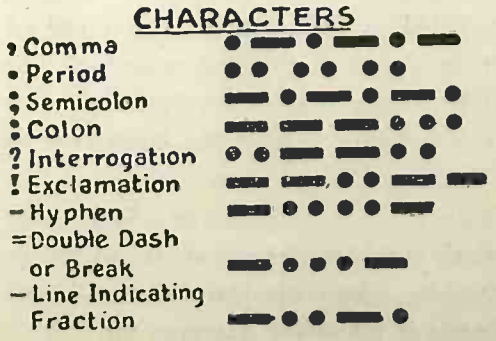
Test Batteries Often

A VOLTMETER reading from 0 to 50 should be kept handy for measuring the B battery voltage occasionally. B batteries reading lower than 38 volts should be discarded as they are on the verge of becoming noisy and causing the set to have a high-pitch whistle. The 22-volt units should be discarded when they show a reading as low as 17 volts. It is not a good plan to connect new B batteries in series with old ones. As a temporary relief from a high-pitched whistle in the speaker try reversing the B batteries. That is, intercharge them. The connections will remain as before when the batteries are switched about. Sometimes a 1-mfd fixed condenser across the entire 90 volts will stop noisy reception and whistles in the speaker when the batteries are low.

Continental Morse Code







The Continental Morse code is employed for radio telegraphy in every country with the exception of Japan. The code is made up of dots and dashes, and in sending a dash has three times the duration of a dot. Any one who has owned a radio-receiving set has at some time or other heard characters of this sort sent by ship or shore radio stations. These mean very little to the person who cannot read the code, but one who can read what is said often finds fascination exceeding that of listening to broadcasting programs.

The same code is employed by amateur radio telegraph operators who chat nightly with their friends in all corners of the earth. The best way to learn the code is to get a small buzzer which gives a high-pitched note. Connect the instrument in series with one or two dry cells and telegraph key. Then proceed to learn the letters by sending them over and over. After a time short words such as "the, and, etc.," can be practiced. If two persons practice at the same time by sending one to the other the code can be learned more quickly. It is sometimes good practice to keep repeating the letters over and over in the mind without the buzzer. After a few weeks' practice try tuning in a ship or shore station on the high wavelength setting of the receiver dials.

Grid Leak Governs Tone

THE importance of the right value grid leak should be considered when building a receiving set. Most set-makers put a 2-megohm leak in the grid circuit and let it go at that. However, it is well to try out leaks of higher resistance, especially if one has a three-circuit regenerative receiver. In this case a leak measuring as high as 8 or 10 megohms is often better than one of lower resistance. The builder should have on hand leaks in the following ranges, 2, 4, 6, 8 and 10. If the set is designed for UX-199 tubes, then the leak resistance is in the neighborhood of from 6 to 10 megohms. Variable grid leaks are not recommended because they require adjustments from time to time and are not always reliable. The grid leak generally fits across the grid-condenser between two upright supports.

Locating the Receiver

THE best location for the receiving set is near a window through which the lead-in wire enters. It is not a good plan to run the aerial lead-in wire through several rooms. If the set is to be placed in one corner of the room arrange so that the aerial wire will run to the window nearest the set. Running the aerial to the cellar and then up again to the room through the floor is poor practice. This is as bad as decreasing the height of the aerial to a few feet from the ground. In passing the aerial wire into the house use a window weather lead-in connection so that the window may be shut down tight. Of course, one may use a porcelain tube through the window sill, but this requires the boring of a hole and makes it inconvenient when the window is raised.

Ground Important

IT HAS frequently been said that ground wires should be attached to the cold-water pipe. This provides an excellent ground connection. Sometimes the set is located in the front room and away from the cold-water pipes. In this case it is better to fasten the wire to the steam radiator, which provides a good ground. Always use a copper or tinned copper ground clamp. First file the pipe connection in several places to insure a good contact. Then wrap the clamp around it and pull it up tightly. The ground wire may be fastened under the nut of the clamp. Use No. 14 rubber-covered wire for the connection. The wire may be tacked to the side of the wall or baseboard by means of double pointed staples.

A good volume control and distortion preventer can be added to the audio amplifier circuit by connecting a variable high-resistance unit across the G and F posts of the second-stage audio transformer.

Local Stations

Wave Length		Dial Readings 1	2	3
526	WNYC, New York City	89		
492	WEAF, New York (Bellmore, L. I.)	82		
455	WJZ, New York (Bound Brook)	75		
422	WOR, Newark (Kearny)	68		
395	WHN, New York City	63		
395	WQAO, New York City	63		
395	WPAP, Cliffside, N. J			
370	WMCA, New York (Hoboken)			
370	WLWL, New York (Kearny)	58		
349	WAAM, Newark	31		
349	WGBS, New York (Astoria, L. I.)	52		
326	WABC, New York (Rich. Hill, L. I.)	42		
326	WBOQ, New York (Rich. Hill, L. I.)			
309	WRNY, New York (Coytesville, N. J.)			
309	WPCH, Hoboken			
294	WODA, Paterson	38		
294	WGL, New York City			
280	WGCP, Newark	30		
280	WNJ, Newark	30		
268	WBMS, Union City	8		
268	WBKN, Brooklyn			
268	WWRL, Woodside			
256	WBBR, Rossville, Staten Island			
256	WEBJ, New York City	26		
256	WLTH, Brooklyn			
246	WAAT, Jersey City			
246	WEVD, Woodhaven, N. Y.			
240	WDWM, Asbury Park			

Local Stations

Wave Length		Dial Readings 1	2	3
236	WHAP, N. Y. City (Carlstadt, N. J.)			
236	WBNY, New York City			
236	WMSG, New York City	20		
227	WARS, Brooklyn			
227	WBBC, Brooklyn			
227	WSDA, New York City			
219	WCGU, Coney Island	9		
219	WKBQ, New York City			
219	WKBO, Jersey City	15		
211	WRST, Bay Shore, L. I			
211	WCDA, Cliffside, N. J			
211	WBRS, Brooklyn			
207	WHPP, Bronx, N. Y			
207	WMRJ, Jamaica, N. Y			
207	WTRL, Midland Park, N. J			
201	WGMU, Portable (Rich. Hill, N. Y.)			
201	WRMU, Portable (Rich. Hill, N. Y.)			

Distant Stations

500 Watts or More.

Wave Length		Miles from Newark	Dial Readings 1	2	3
548	KSD, St. Louis Mo	852			
545	KFUO, St. Louis, Mo	852			
545	WMAK, Lockport, N. Y	280			
535	WTIC, Hartford, Conn	40			
535	WCAC, Mansfield, Conn	40			
535	WHO, De Moines, Ia	970			
526	KYW, Chicago, Ill	700			
526	KFKX, Chicago, Ill	700			
526	KMTR, Hollywood, Cal	2,400			
517	WTAG, Worcester, Mass	185			
517	WCAE, Pittsburgh, Pa	372			
517	WMC, Memphis, Tenn	900			
508	KLX, Oakland, Cal	2,528			
508	WIP, Philadelphia, Pa	80	82		
508	WOW, Omaha, Neb	1,115			
500	WBAP, Forth Worth, Texas	1,392			
500	WFAA, Dallas, Texas	1,350			
491	KGW, Portland, Ore	2,420			
484	WJAR, Providence, R. I	158			
484	WCSH, Portland, Me	275			
476	WSB, Atlanta, Ga	825			
469	WRC, Washington, D. C	210			
461	WBRL, Tilton, N. H	225			
461	KFNF, Shenandoah, Ia	1,152			
461	WHAS, Louisville, Ky	622			
461	WNAC, Boston, Mass	212			
454	KFRC, San Francisco, Cal	2,542			

Distant Stations

Wave Length		Miles from Newark	Dial Readings 1	2	3
448	WQJ, Chicago, Ill	700			
448	WMAQ, Chicago, Ill	700			
448	KFOA, Seattle, Wash	2,400			
447	WJAD, Waco, Texas	1,650			
441	WCX, Pontiac, Mich	575			
441	WJR, Pontiac, Mich	575			
441	KFDY, Brooklings, S. Da	1,300			
440	KFSD, San Diego, Cal	2,402			
428	KFBU, Loramie, Wyo	1,915			
428	WLW, Cincinnati, O	550			
428	WMAF, So. Dartmouth, Mass	180			
423	KPO, San Francisco, Cal	2,542			
422	WSUI, Iowa City, Ia	1,140			
416	KHJ, Los Angeles, Cal	2,412			
416	WHT, Chicago, Ill	700			
416	WIB0, Chicago, Ill	700			
416	WHAZ, Troy, N. Y	165			
405	WCCO, Minneapolis, Minn	1,012			
405	WFI, Philadelphia, Pa	80			
405	WLIT, Philadelphia, Pa	80			
400	WEAR, Cleveland, O	390			
400	WTAM, Cleveland, O	390			
395	KWKH, Shreveport, La	1,180			
394	KMA, Shenandoah, Ia	1,152			
394	KTW, Seattle, Wash	2,400			
394	KOB, State College, N. M	1,872			
390	WAAF, Chicago, Ill	700			
389	WBBM, Chicago, Ill	700			

Distant Stations

Wave Length		Miles from Newark	Dial Readings 1	2	3
389	WJBT, Chicago, Ill.	700			
384	KTHS, Hot Springs, Ark.	1,228			
384	KGO, Oakland, Cal.	2,526			
384	WMBF, Miami Beach, Fla.	1,120			
380	WGY, Schenectady, N. Y.	160			
380	KMMJ, Clay Center, Neb.	1,260			
380	WCAJ, Lincoln, Neb.	1,260			
375	WOC, Davenport, Ia.	820			
370	WDAF, Kansas City, Mo.	1,060			
370	KHQ, Spokane, Wash.	2,180			
366	WJJD, Mooseheart, Ill.	715			
366	WEBH, Chicago, Ill.	700			
366	WEEI, Boston, Mass.	212			
361	WSAI, Cincinnati, O.	550			
361	KFWB, Los Angeles, Cal.	2,422			
357	WFLA, Clearwater, Fla.	1,125			
353	WEW, St. Louis, Mo.	852			
353	KWCR, Cedar Rapids, Ia.	900			
353	WWJ, Detroit, Mich.	470			
349	KVOO, Bristow, Okla.	1,450			
348	KJR, Seattle, Wash.	2,400			
345	WCBD, Zion, Ill.	698			
345	WLS, Chicago, Ill.	700			
341	WKAQ, San Juan, P. R.	1,500			
341	WSM, Nashville, Tenn.	725			
337	WJAX, Jacksonville, Fla.	990			
337	WHB, Kansas City, Mo.	925			
337	WCAU, Philadelphia, Pa.	82			

Distant Stations

Wave Length		Miles from Newark	Dial Readings 1	2	3
336	KNX, Los Angeles, Cal	2,420			
333	KSAC, Manhattan, Kan	1,268			
333	WBZ, Springfield, Mass	98			
333	WHA, Madison, Wis	740			
333	WLBL, Stevens Point, Wis	920			
331	WKRC, Cincinnati, O	550			
326	KFQB, Fort Worth, Texas	1,400			
325	KOA, Denver, Col	1,608			
322	WQAM, Miami, Fla	1,120			
319	WEAN, Providence, R. I	158			
319	WAPI, Auburn, Ala	785			
319	KOIN, Portland, Ore	2,420			
319	WGHP, Mt. Clemens, Mich.	480			
316	KDKA, Pittsburgh, Pa	372			
316	KPSN, Pasadena, Cal	2,400			
309	KFAB, Lincoln, Neb	1,168			
306	KOMO, Seattle, Wash	2,400			
306	WGN, Chicago, Ill	700			
306	WLIB, Chicago, Ill	700			
303	WOAI, San Antonio, Texas	1,580			
303	WGR, Buffalo, N. Y	295			
302	KSL, Salt Lake City, Utah	1,952			
300	WBAK, Harrisburg, Pa	250			
300	WPSC, State College, Pa	360			
299	KMOX, St. Louis, Mo	852			
297	WWNC, Asheville, N. C	700			
297	WADC, Akron, Ohio	410			
294	WTMC, Brookfield, Wis	905			

Distant Stations

Wave Length		Miles from Newark	Dial Readings 1	2	3
288	WENR, Chicago, Ill	700			
288	WDBO, Orlando, Fla	1,100			
286	WKAR, East Lansing, Mich	580			
286	WBAL, Baltimore, Md	175			
285	KFAU, Boise, Idaho	2,122			
285	WOAX, Trenton, N. J	50			
283	WEAO, Columbus, Ohio	440			
283	KFXF, Denver, Col.	1,632			
283	WAIU, Columbus, Ohio	380			
283	WDRC, New Haven, Conn	40			
278	KOIK, Council Bluffs, Iowa	970			
278	WHAM, Rochester, N. Y	280			
278	WABO, Rochester, N. Y	280			
275	WTAS, Elgin, Ill	690			
275	WDWF, Cranston, R. I	150			
275	WORD, Batavia, Ill	685			
275	WFBM, Indianapolis, Ind.	625			
273	WPG, Atlantic City, N. J	110			
273	WBAA, Lafayette, Ind	630			
272	KFAD, Phoenix, Ariz	1,980			
272	KFJF, Oklahoma City, Okla	1,400			
272	WHAR, Atlantic City, N. J	110			
272	WRM, Urbana, Ill	730			
270	KLDS, Independence, Mo	1,070			
270	KGU, Honolulu, Hawaii	3,650			
270	KQV, Pittsburgh, Pa	372			
270	WJAS, Pittsburgh, Pa	372			
270	WMAZ, Macon, Ga	860			

Distant Stations

Wave Length		Miles from Newark	Dial Readings 1	2	3
268	WDAE, Tampa, Fla	1,140			
268	KSBA, Shreveport, La	1,180			
267	KFWJ, San Francisco, Cal	2,542			
265	WOI, Ames, Iowa	915			
265	WNOX, Knoxville, Tenn	690			
265	WHK, Cleveland, Ohio	390			
265	KTSA, San Antonio, Texas	1,550			
263	WSEA, Virginia Beach, Va	280			
263	WJAZ, Mt. Prospect, Ill	710			
263	KGEF, Los Angeles, Cal	2,412			
263	WEAM, No. Plainfield, N. J.	20			
261	KGA, Spokane, Wash	2,700			
261	WABQ, Philadelphia, Pa	82			
261	WDGY, Minneapolis, Minn	1,010			
259	WFBL, Syracuse, N. Y	259			
259	WBT, Charlotte, N. C	700			
258	KFUL, Galveston, Texas	1,412			
256	WCSO, Springfield, Ohio	690			
256	KTNT, Muscatine, Iowa	1,123			
254	WRVA, Richmond, Va	275			
254	KFKU, Lawrence Kan.	1,268			
252	WOK, Homewood, Ill	725			
252	WMBB, Chicago, Ill	700			
250	KFRU, Columbia, Miss	1,100			
250	WCOA, Pensacola, Fla	1,200			
249	WIOD, Miami Beach, Fla	1,120			
246	WHDI, Minneapolis, Minn	1,212			
246	WDOD, Chattanooga, Tenn	775			

Distant Stations

Wave Length		Miles from Newark	Dial Readings 1	2	3
246	WLB, Minneapolis, Minn	1,212			
245	KFIO, Spokane, Wash	2,700			
245	KFH, Wichita, Kan	1,242			
244	KSCJ, Sioux City, Iowa	970			
244	KWUC, Lemars, Iowa	1,160			
244	WCAD, Canton, N. Y	250			
242	KFKB, Milford, Kan	1,180			
242	WEDC, Chicago, Ill	700			
241	KFON, Long Beach, Cal	2,418			
240	KEX, Portland, Ore	2,420			
240	KFYR. Bismarck, N. D.	1,175			
239	WFKB, Chicago, Ill	700			
236	KFMX, Northfield, Minn	1,010			
236	WTAR, Norfolk, Va	300			
236	WCAL, Northfield, Minn	1,010			
236	KFWM, Oakland, Cal	2,528			
235	WDAD, Nashville, Tenn	775			
234	KFVE, St. Louis, Mo	852			
232	WJKS, Gary, Ind	650			
230	KFEQ, St. Joseph, Mo	970			
229	WOWO, Fort Wayne, Ind	600			
228	WNRC, Greensboro, N. C	650			
227	WJAX, Cleveland, Ohio	390			
225	WAMD, Minneapolis, Minn	1,212			
224	WCAM, Camden, N. J	80			
224	WCRW, Chicago, Ill	700			
220	WKBH, La Crosse, Wis	900			
217	WKBW, Buffalo, N. Y	295			

Stations in United States

KDKA..315.6..E. Pittsburgh, Pa.
KDLR..230.6..Devil's Lake, N. D.
KDYL...258.5..Salt Lake City, Utah
KEJW..228.9..Burbank, Cal.
KEX....239.9..Portland, Ore.
KFAB...309.1..Lincoln, Neb.
KFAD...272.6..Phoenix, Ariz.
KFAU...285.5..Boise, Idaho
KFBB..275.1..Havre, Mont.
KFBC...247.8..San Diego, Cal.
KFBK..535.4..Sacramento, Cal.
KFBL...223.7..Everett, Wash.
KFBU...428.3..Laramie, Wyo.
KFCB...243.8..Phoenix, Ariz.
KFCR...211.1..Santa Barbara, Cal.
KFDM..483.6..Beaumont, Texas
KFDX..236.1..Shreveport, La.
KFDY...441....Brookings, S. D.
KFDZ...215.7..Minneapolis, Minn.
KFEC...214.2..Portland, Ore.
KFEL...247.8..Denver, Col.
KFEQ...230.6..St. Joseph, Mo.
KFEY...232.4..Kellogg, Idaho
KFGQ...209.7..Boone, Iowa
KFH....245.8..Wichita, Kan.
KFHA..254.1..Gunnison, Col.
KFHL...212.6..Oskaloosa, Iowa
KFI.....468.5..Los Angeles, Cal.
KFIF...214.2..Portland, Ore.
KFIO...245.8..Spokane, Wash.
KFIU...225.4..Juneau, Alaska
KFIZ...267.7..Fond du Lac, Wis.
KFJB...247.8..Marshalltown, Iowa
KFJF...272.6..Oklahoma City, Okla.
KFJI....249.9..Astoria, Ore.
KFJM...333.1..Grand Forks, N. D.
KFJR...282.8..Portland, Ore.
KFJY...232....Fort Dodge, Iowa
KFJZ...249.9..Fort Worth, Texas
KFKA..545....Greeley, Col.
KFKB..241.8..Milford, Kan.
KFKU..254.1..Lawrence, Kan.
KFKX..526.....Chicago, Ill.
KFKZ...225.4..Kirksville, Mo.
KFLV...267.7..Rockford, Ill.
KFLX..270.1..Galveston, Texas
KFMR..232....Sioux City, Iowa
KFMX..236.1..Northfield, Minn.
KFNF...461.3..Shenandoah, Iowa
KFOA...447.5..Seattle, Wash.
KFON...241.8..Long Beach, Cal.
KFOR...217.3..Lincoln, Neb.
KFOX..258.5..Omaha, Neb.
KFOY...285.5..St. Paul, Minn.
KFPL...275.1..Dublin, Texas
KFPM..230.6..Greenville, Texas
KFPR...232.4..Los Angeles, Cal.
KFPW..263....Cartersville, Mo.
KFPY...245.8..Spokane, Wash.
KFQA...247.8..St. Louis, Mo.
KFQB...333....Ft. Worth, Texas
KFQD...344.6..Anchorage, Alaska
KFQU...249.9..Holy City, Cal.
KFQW..217.3..Seattle, Wash.
KFQZ...232.4..Hollywood, Cal.
KFRC...454.3..San Francisco, Cal.
KFRU...249.9..Columbia, Mo.
KFSD...440.9..San Diego, Cal.
KFSG...275.1..Los Angeles, Cal.
KFUL...258.5..Galveston, Texas
KFUM..283....Colorado Springs, Col.
KFUO...234....St. Louis, Mo.
KFUP...227.1..Denver, Col.
KFUR...225.4..Ogden, Utah
KFUS...256.3..Oakland, Cal.
KFUT...499.7..Salt Lake City, Utah
KFVD...208.2..Venice, Cal.
KFVE...234.2..St. Louis, Mo.
KFVG...225.4..Independence, Kan.
KFVI...238....Houston, Texas
KFVS...223.7..Cape Girardeau, Mo.
KFWB..361.2..Los Angeles, Cal.
KFWC..222.1..San Bernardino, Cal.
KFWF..214.2..St. Louis, Mo.
KFWI...267.7..San Francisco, Cal.
KFWM..236.1..Oakland, Cal.
KFWO..299.8..Avalon, Cal.
KFXD..204....Jerome, Idaho
KFXF...282.8..Denver, Col.
KFXJ...215.7..Edgewater, Col.
KFXR..223.7..Oklahoma City, Okla.
KFXY..205.4..Flagstaff, Arizona
KFYO...211.1..Breckenridge, Texas
KFYR...250....Bismarck, N. D.
KGA....260.7..Spokane, Wash.
KGAR..234.2..Tucson, Arizona
KGBS...202.6..Seattle, Wash.
KGBU..228.9..Ketchikan, Alaska
KGBX..288.3..St. Joseph, Mo.
KGBY...202.6..Columbus, Neb.
KGBZ...212.6..York, Neb.
KGCA...247.8..Decorah, Iowa
KGCB...215.7..Oklahoma, Okla.
KGCH...293.9..Wayne, Neb.
KGCI...220.4..San Antonio, Texas
KGCL...230.6..Seattle, Wash.
KGCN...208.2..Concordia, Kan.
KGCR...208.2..Brookings, S. D.
KGCU...240....Mandan, N. D.
KGCX...243.8..Vida, Mont.
KGDA...254.1..Dell Rapids, S. D.
KGDE...205.4..Barrett, Minn.
KGDJ...202.6..Cresco, Iowa
KGDM..217.3..Stockton, Cal.
KGDP...223.7..Pueblo, Col.
KGDR...202.6..San Antonio, Texas
KGDW..206.8..Humboldt, Neb.
KGDX..212.6..Shreveport, La.
KGDY...206.8..Oldham, S. D.
KGEF...263....Los Angeles, Cal.
KGEH..201.2..Eugene, Ore.
KGEK..263....Yuma, Col.
KGEN...225.4..El Centro, Cal.
KGEO...205.4..Grand Island, Neb.
KGEQ...202.6..Minneapolis, Minn.
KGER...215.7..Long Beach, Cal.
KGES...204....Central City, Neb.
KGEU...227.1..Lower Lake, Cal.
KGEW..218.8..Fort Morgan, Col.
KGEY...201.6..Denver, Col.
KGEZ...294....Kalispell, Mont.
KGFB...223.7..Iowa City, Iowa
KGFF...205.4..Alva, Okla.

Stations in United States

KGFG...215.7..Oklahoma City, Okla.
KGFH..223.7..La Crescenta, Cal.
KGFI...220.4..San Angelo, Texas
KGFJ...208.2..Los Angeles, Cal.
KGFK..223.7..Hallock, Minn.
KGFL...222.1..Trinidad, Col.
KGFM..211.1..Yuba City, Cal.
KGFN..199.9..Aneta, N. D.
KGFO...204....Portable.
KGFP...212.6..Mitchell, S. D.
KGFW..297....Ravenna, Neb.
KGFX...254.1..Pierre, S. D.
KGGF...206.8..Picher, Okla.
KGGH..212.6..Cedar Grove, La.
KGGM..204....Inglewood, Cal.
KGHC..209.7..Slayton, Minn.
KGHP..263...,Hardin, Mont.
KGO....384.4..Oakland, Cal.
KGRC...220.4..San Antonio, Texas
KGRS...243.8..Amarillo, Texas
KGTT...206.8..San Francisco, Cal.
KGU....270.1..Honolulu, Hawaii
KGW....491.5..Portland, Ore.
KGY....243.8..Lacey, Wash.
KHJ....416.5..Los Angeles, Cal.
KHMC..236.1..Harlingen, Texas
KHQ....370.2..Spokane, Wash.
KHZ....400....Denver, Col.
KICK...322.4..Red Oak, Iowa.
KJBS...220.4..San Francisco, Cal.
KJR....348.6..Seattle, Wash.
KKP....265.3..Seattle, Wash.
KLCN...285.5..Blytheville, Ark.
KLDS...270.1..Independence, Mo.
KLIT...206.8..Portland, Ore.
KLS....245.8..Oakland, Cal.
KLX....508.2..Oakland, Cal.
KLZ....400....Dupont, Col.
KMA....394.5..Shenandoah, Iowa
KMED..249.9..Medford, Ore.
KMIC...223.7..Inglewood, Cal.
KMJ....365.6..Fresno, Cal.
KMMJ..285.7..Clay Center, Neb.
KMO....254.1..Tacoma, Wash.
KMOX..299.8..St. Louis, Mo.
KMTR..526....Hollywood, Cal.
KNRC...374.8..Santa Monica, Cal.
KNX....336.9..Los Angeles, Cal.
KOA....325.9..Denver, Col.
KOAC...270.1..Corvallis, Ore.
KOB....394.5..State College, N. Mex.
KOCH...258.5..Omaha, Neb.
KOCW..252....Chickasha, Okla.
KOIL...277.6..Council Bluffs, Iowa
KOIN...319....Portland, Ore.
KOMO..305.9..Seattle, Wash.
KOW....247....Denver, Col.
KOWW.299.8..Walla Walla, Wash.
KPCB...230.6..Seattle, Wash.
KPJM...214.2..Prescott, Arizona
KPLA...252....Los Angeles, Cal.
KPNP...211.1..Muscatine, Iowa
KPO....422.3..San Francisco, Cal.
KPPC...228.9..Pasadena, Cal.
KPRC...293.9..Houston, Texas
KPSN...315.6..Pasadena, Cal.
KQV....270.1..Pittsburgh, Pa.
KQW....296.9..San Jose, Cal.
KRAC...220.4..Shreveport, La.
KRE....256.3..Berkeley, Cal.
KRLD..461.3..Dallas, Texas
KRLO..215.7..Los Angeles, Cal.
KRSC...211.1..Seattle, Wash.
KSAC...333.1..Manhattan, Kan.
KSBA...267.7..Shreveport, La.
KSCJ...243.8..Sioux City, Iowa
KSD....545.1..St. Louis, Mo.
KSEI...333.1..Pocatello, Idaho
KSL....302.8..Salt Lake City, Utah
KSMR..272.6..Santa Maria, Cal.
KSO....227.1..Clarinda, Iowa
KSOO...209.7..Sioux Falls, S. D.
KTAB...280.2..Oakland, Cal.
KTAP...228.9..San Antonio, Texas
KTBI...288.3..Los Angeles, Cal.
KTBR..282.8..Portland, Ore.
KTCL...277.6..Seattle, Wash.
KTHS...384.4..Hot Springs, Ark.
KTNT...256.3..Muscatine, Iowa
KTSA...265.3..San Antonio, Texas
KTUE...212.6..Houston, Texas
KTW....394.5..Seattle, Wash.
KUJ....199.9..Seattle, Wash.
KUOA...296.9..Fayetteville, Ark.
KUOM..461.5..Missoula, Mont.
KUSD..483.6..Vermillion, S. D.
KUT....232.4..Austin, Texas.
KVI....234.2..Tacoma, Wash.
KVOO..348.6..Bristow, Okla.
KVOS..209.7..Bellingham, Wash.
KWBS..199.9..Portland, Ore.
KWCR..240....Cedar Rapids, Iowa.
KWG....344.6..Stockton, Cal.
KWJJ..228.9..Portland, Ore.
KWKC..222.1..Kansas City, Mo.
KWKH..394.5..Shreveport, La.
KWLC..247.8..Decorah, Iowa.
KWSC..394.5..Pullman, Wash.
KWTC..352.7..Santa Ana, Cal.
KWUC..243.8..Le Mars, Iowa.
KWWG.277.6..Brownsville, Texas
KXA....349....Seattle, Wash.
KXL....220.4..Portland, Ore.
KXRO..227.1..Aberdeen, Wash.
KYA....309.1..San Francisco, Cal.
KYW....526....Chicago, Ill.
KZM....245.8..Oakland, Cal.
WAAD..267.7..Cincinnati, Ohio
WAAF..389.4..Chicago, Ill.
WAAM..348.6—Newark, N. J.
WAAT..245.8..Jersey City, N. J.
WAAW.440.9..Omaha, Neb.
WABC..325.9..Richmond Hill, N. Y.
WABF..205.4..Kingston, Pa.
WABI..389.4..Bangor, Me.
WABQ..223.7..Philadelphia, Pa.
WABW.247.8..Wooster, Ohio
WABY..247.8..Philadelphia, Pa.
WABZ..247.8..New Orleans, La.
WADC..296.9..Akron, Ohio
WABO..277.6..Rochester, N. Y.
WAFD..230....Detroit, Mich.
WAGM..225.4..Royal Oak, Mich.
WAIT..214.2..Taunton, Mass.
WAIU..282.8..Columbus, Ohio
WAIZ...227...,Appleton, Wis.

WBNR

Stations in United States

WALK. 201.2..Willow Grove, Pa.
WAMD. 225.4..Minneapolis, Minn.
WAPI.. 326....Auburn, Ala.
WARS..227.1..Brooklyn, N. Y.
WASH..256.3..Grand Rapids, Mich.
WATT..201.2..Portable
WBAA. 272.6..Lafayette, Ind.
WBAK. 299.8..Harrisburg, Pa.
WBAL..285.5..Baltimore, Md.
WBAO..267.7..Decatur, Ill.
WBAP..499.7..Fort Worth, Texas
WBAW.247.8..Nashville, Tenn.
WBAX. 249.9..Wilkes-Barre, Pa.
WBBC..227.1..Brooklyn, N. Y.
WBBL..247.8..Richmond, Va.
WBBM.389.4..Chicago, Ill.
WBBP..239.9..Petoskey, Mich.
WBBR. 256.3..Rossville, N. Y.
WBBW.236.1..Norfolk, Va.
WBBY..499.7..Charleston, S. C.
WBBZ..204....Portable
WBCN..288.3..Chicago, Ill.
WBES..265.4..Takoma Park, Md.
WBET..288....Medford, Mass.
WBIS..302.8..Boston, Mass.
WBKN. 267.7..Brooklyn, N. Y.
WBMH.211.1..Detroit, Mich.
WBMS..267.7..Union City, N. J.
WBNY..236.1..New York, N. Y.
WBOQ..325.9..Richmond Hill, N. Y.
WBRC..243.8..Birmingham, Ala.
WBRE. 249.9..Wilkes-Barre, Pa.
WBRL..232.5..Tilton, N. H.
WBRS..211.1..Brooklyn, N. Y.
WBSO..384.4..Wellesley Hills, Mass.
WBT... 258.5..Charlotte, N. C.
WBZ... 333.1..East Springfield, Mass.
WBZA..333.1..Boston, Mass.
WCAC..535.4..Mansfield, Conn.
WCAD..244...,Canton, N. Y.
WCAE..516.9..Pittsburgh, Pa.
WCAH..242....Columbus, Ohio
WCAJ..379.5..Lincoln, Neb.
WCAL..236.1..Northfield, Minn.
WCAM. 223.7..Camden, N. J.
WCAO..384.4..Baltimore, Md.
WCAT..247.8..Rapid City, S. D.
WCAU..260.7..Philadelphia, Pa.
WCAX..254.1..Burlington, Vt.
WCAZ..340.7..Carthage, Ill.
WCBA..222.1..Allentown, Pa.
WCBD..344.6..Zion, Ill.
WCBE..227.1..New Orleans, La.
WCBM. 384.4..Baltimore, Md.
WCBR..201.2..Portable
WCBS..209.7..Springfield, Ill.
WCCO..405.2..Minneapolis, Minn.
WCDA..211.1..Cliffside, N. J.
WCFL..483.6..Chicago, Ill.
WCGU..218.8..Coney Island, N. Y.
WCLO..227.1..Camp Lake, Wis.
WCLS.. 215.7..Joliet, Ill.
WCMA..258.5..Culver, Ind.
WCOA..249.9..Pensacola. Fla.
WCOC..230.6..Columbus, Miss.
WCOT..225.4..Providence, R. I.
WCRW. 223.7..Chicago, Ill.
WCSH..484....Portland, Me.
WCSO.. 256.3..Springfield, Ohio
WCWK. 214.2..Fort Wayne, Ind.
WCWS. 265....Danbury, Conn.
WCX... 440.9..Pontiac, Mich.
WDAD. 225.4..Nashville, Tenn.
WDAE. 267.7..Tampa, Fla.
WDAF..370.2..Kansas City, Mo.
WDAG. 263....Amarillo, Texas
WDAH. 234.2..El Paso, Texas
WDAY..361.2..Fargo, N. D.
WDBJ..230.6..Roanoke, Va.
WDBO..288.3..Orlando, Fla.
WDEL..297....Wilmington, Del.
WDGY..260.7..Minneapolis, Minn.
WDOD..245.8..Chattanooga, Tenn.
WDRC..282.8..New Haven, Conn.
WDWF.275....Cranston, R. I.
WDWM.286....Asbury Park, N. J.
WDZ... 277.6..Tuscola, Ill.
WEAF..491.5..New York, N. Y.
WEAM. 263....North Plainfield, N. J.
WEAN. 319....Providence, R. I.
WEAO..282.8..Columbus, Ohio
WEAR. 399.8..Cleveland, Ohio
WEBC..241.8..Superior, Wis.
WEBE. 247.8..Cambridge, Ohio
WEBH. 365.6..Chicago, Ill.
WEBJ..256.3..New York, N. Y.
WEBQ..223.7..Harrisburg, Ill.
WEBR. 241.8..Buffalo, N. Y.
WEBW.258.5..Beloit, Wis.
WEDC..241.8..Chicago, Ill.
WEEI.. 366....Boston, Mass.
WEHS..215.7..Evanston, Ill.
WEMC. 483.6..Berrien Springs, Mich.
WENR. 288.3..Chicago, Ill.
WEPS..296.9..Gloucester, Mass.
WEVD..245.8..Woodhaven, N. Y.
WEW...352.7..St. Louis, Mo.
WFAA..499.7..Dallas, Texas
WFAM. 252...St. Cloud, Minn.
WFBC..234.2..Knoxville, Tenn.
WFBE..245.8..Cincinnati, Ohio
WFBG..280.2..Altoona, Pa.
WFBJ..272.6..Collegeville, Minn.
WFBL..258.5..Syracuse, N. Y.
WFBM. 275.1..Indianapolis, Ind.
WFBR..225.4..Baltimore, Md.
WFBZ..247.8..Galesburg, Ill.
WFCI.. 225.4..Pawtucket, R. I.
WFDF..272....Flint, Mich.
WFI....405.2..Philadelphia, Pa.
WFIW..280.2..Hopkinsville, Ky.
WFKB. 223.7..Chicago, Ill.
WFKD. 247.8..Frankford, Pa.
WFLA..288....Clearwater, Fla.
WGAL..252....Lancaster, Pa.
WGBB..245.8..Freeport, N. Y.
WGBC..277.6..Memphis, Tenn.
WGBF..236.1..Evansville, Ind.
WGBI.. 230.6..Scranton, Pa.
WGBS..348.6..Astoria (L. I.), N. Y.
WGCP..280.2..Newark, N. J.
WGES..241.8..Chicago. Ill.
WGHP. 319....Mt. Clemens, Mich.
WGL... 293.9..New York, N. Y.
WGM...208.2..Jeannette, Pa.
WGMU. 201.2..Portable

Stations in United States

WGN...305.9..Chicago, Ill.
WGR...302.8..Buffalo, N. Y.
WGST..270.1..Atlanta, Ga.
WGWB.218.8..Milwaukee, Wis.
WGY...379.5..So. Schenectady, N. Y.
WHA...331.1..Madison, Wis.
WHAD.270.1..Milwaukee, Wis.
WHAM.277.6..Rochester, N. Y.
WHAP.236.1..Carlstadt, N. J.
WHAR.272....Atlantic City, N. J.
WHAS..461.3..Louisville, Ky.
WHAZ.416....Troy, N. Y.
WHB...336.9..Kansas City, Mo.
WHBA.260.7..Oil City, Pa.
WHBC.236.1..Canton, Ohio
WHBD.222.1..Bellefontaine, Ohio
WHBF.222.1..Rock Island, Ill.
WHBL.204....Portable
WHBM.201.2..Portable
WHBN.296.9..Gainesville, Fla.
WHBP.228.9..Johnstown, Pa.
WHBQ.232.4..Memphis, Tenn.
WHBU.220.4..Anderson, Ind.
WHBW.220.4..Philadelphia, Pa.
WHBY.249.9..West De Pere, Wis.
WHDI..245.8..Minneapolis, Minn.
WHFC..215.7..Chicago, Ill.
WHK...265.3..Cleveland, Ohio
WHN...394.5..New York, N. Y.
WHO...535.4..Des Moines, Iowa
WHPP..206.8..New York, N. Y.
WHT...416.4..Chicago, Ill.
WIAD..288.3..Philadelphia, Pa.
WIAS..441....Burlington, Iowa
WIBA..239.9..Madison, Wis.
WIBG..440.9..Elkins Park, Pa.
WIBI...267.7..Flushing, N. Y.
WIBJ...201.2..Portable
WIBM..201.2..Portable
WIBO..416.4..Chicago, Ill.
WIBR..249.9..Steubenville, Ohio
WIBS..204....Elizabeth, N. J.
WIBU..217.3..Poynette, Wis.
WIBW.204....Portable
WIBX..238....Utica, N. Y.
WIBZ..230.6..Montgomery, Ala.
WICC...265....Bridgeport, Conn.
WIL....258.5..St. Louis, Mo.
WIOD..247.8..Miami Beach, Fla.
WIP....508.2..Philadelphia, Pa.
WJAD..333.3..Waco, Texas.
WJAG..285.5..Norfolk, Neb.
WJAK..234.2..Kokomo, Ind.
WJAM..240....Cedar Rapids, Iowa
WJAR..375....Providence, R. I.
WJAS...270.1..Pittsburgh, Pa.
WJAX..336.9..Jacksonville, Fla.
WJAY..227.1..Cleveland, Ohio.
WJAZ..263....Mt. Prospect, Ill.
WJBA..322.4..Joliet, Ill.
WJBB..344.6..Tampa, Fla.
WJBC..277.1..La Salle, Ill.
WJBI...263....Red Bank, N. J.
WJBK..220.4..Ypsilanti, Mich.
WJBL..212.6..Decatur, Ill.
WJBO...263....New Orleans, La.
WJBT..389.4..Chicago, Ill.
WJBU..214.2..Lewisburg, Pa.
WJBW..238....New Orleans, La.
WJBY..234.2..Gadsden, Ala.
WJBZ..208.2..Chicago Heights, Ill.
WJJD...365.6..Mooseheart, Ill.
WJKS..232.4..Gary, Ind.
WJPW..208.2..Ashtabula, Ohio
WJR....440.9..Pontiac, Mich.
WJZ....454.3..Bound Brook, N. J.
WKAQ..340.7..San Juan, P. R.
WKAR..285.5..East Lansing, Mich.
WKAV..223.7..Laconia, N. H.
WKBB.215.7..Joliet, Ill.
WKBC..218.8..Birmingham, Ala.
WKBE..228.9..Webster, Mass.
WKBF..252....Indianapolis, Ind.
WKBG..201.2..Portable
WKBH.220.4..La Crosse, Wis.
WKBI..322.4..Chicago, Ill.
WKBL..205.4..Monroe, Mich.
WKBN..214.2..Youngstown, Ohio
WKBO..218.8..Jersey City, N. J.
WKBP..212.6..Battle Creek, Mich.
WKBQ.218.8..New York, N. Y.
WKBS..217.3..Galesburg, Ill.
WKBT..252....New Orleans, La.
WKBV..217.3..Brookville, Ind.
WKBW.217.3..Buffalo, N. Y.
WKBZ..199.9..Ludington, Mich.
WKDR..322.4..S. Kenosha, Wis.
WKEN..204....Kenmore, N. Y.
WKJC..252....Lancaster, Pa.
WKRC..245....Cincinnati, Ohio
WKY...288.3..Oklahoma City, Okla.
WLAP..267.7..Louisville, Ky.
WLB...245.8..Minneapolis, Minn.
WLBC..209.7..Muncie, Ind.
WLBF..209.7..Kansas City, Miss.
WLBG..214.2..Petersburg, Va.
WLBH..232.4..Farmingdale, N. Y.
WLBI...238....Wenona, Ill.
WLBL..333.1..Stevens Point, Wis.
WLBM..230.6..Boston, Mass.
WLBN..204....Portable
WLBO..217.3..Galesburg, Ill.
WLBQ..202.6..Atwood, Ill.
WLBR..322.4..Rockford, Ill.
WLBT..322.4..Crown Point, Ind.
WLBV..206.8..Mansfield, Ohio
WLBW.293.9..Oil City, Pa.
WLBX..204....L. I. City, N. Y.
WLBY..209.7..Iron Mountain, Mich.
WLBZ..208.2..Dover-Foxcroft, Me.
WLCI...247.8..Ithaca, N. Y.
WLEX..215.7..Lexington, Mass.
WLIB...305.9..Elgin, Ill.
WLIT...405.2..Philadelphia, Pa.
WLS....344.6..Chicago, Ill.
WLSI...275....Craston, R. I.
WLTH..256.3..Brooklyn, N. Y.
WLTS...483.6..Chicago, Ill.
WLW...428.3..Harrison, Ohio
WLW...428.3..Cincinnati, Ohio
WLWL..370.2..New York, N. Y.
WMAC..225.4..Casenovia, N. Y.
WMAF.428.3..S. Dartmouth, Mass.
WMAK.545.1..Lockport, N. Y.

Stations in United States

WMAL. 241.9..Washington, D. C.
WMAN. 234.2..Columbus, Ohio
WMAQ. 447.5..Chicago, Ill.
WMAY. 247.8..St. Louis, Mo.
WMAZ. 270.1..Macon, Ga.
WMBA. 204....Portable
WMBB. 252....Chicago, Ill.
WMBC. 243.8..Detroit, Mich.
WMBD. 205.4..Peoria Hts., Ill.
WMBE. 208.2..St. Paul, Minn.
WMBF. 384.4..Miami Beach, Fla.
WMBG. 220.4..Richmond, Va.
WMBH. 204....Joplin, Mo.
WMBI. 263....Chicago, Ill.
WMBJ. 232.4..Monessen, Pa.
WMBL. 228.9..Lakeland, Fla.
WMBM. 209.7..Memphis, Tenn.
WMBO. 220.4..Auburn, N. Y.
WMBQ. 204....Brooklyn, N. Y.
WMBR. 252....Tampa, Fla.
WMBS. 234.2..Lemoyne, Pa.
WMBW. 214.2..Youngstown, Ohio
WMC... 516.9..Memphis, Tenn.
WMCA. 370.2..Hoboken, N. J.
WMES. 211.1..Boston, Mass.
WMPC. 234.2..Lapeer, Mich.
WMRJ. 206.8..Jamaica, N. Y.
WMSG. 236.1..New York, N. Y.
WNAC. 461....Boston, Mass.
WNAD. 239.9..Norman, Okla.
WNAL. 258.5..Omaha, Neb.
WNAT. 288.3..Philadelphia, Pa.
WNAX. 302.8..Yankton, S. D.
WNBA. 208.2..Forest Park, Ill.
WNBF. 206.8..Endicott, N. Y.
WNBH. 260.7..New Bedford, Mass.
WNBJ. 206.8..Knoxville, Tenn.
WNBL. 199.9..Bloomington, Ill.
WNBO. 211.1..Washington, Pa.
WNBQ. 202.6..Rochester, N. Y.
WNBR. 228.9..Memphis, Tenn.
WNBX. 241.8..Springfield, Vt.
WNJ.... 280.2..Newark, N. J.
WNOX. 265.3..Knoxville, Tenn.
WNRC. 223.7..Greensboro, N. C.
WNYC. 526..New York, N. Y.
WOAI. 319....San Antonio, Texas
WOAN. 285.5..Lawrenceburg, Tenn.
WOAX. 286....Trenton, N. J.
WOBR. 204....Portable
WOBU. 267.7..Charleston, W. Va.
WOC.... 374.8..Davenport, Iowa
WOCL. 223.7..Jamestown, N. Y.
WODA. 293.9..Paterson, N. J.
WOI.... 265.3..Ames, Iowa
WOK.... 252....Homewood, Ill.
WOKO. 215.7..Peekskill, N. Y.
WOKT. 209.7..Rochester, N. Y.
WOMT. 222.1..Manitowoc, Wis.
WOO.... 508.2..Philadelphia, Pa.
WOOD. 260.7..Grand Rapids, Mich.
WOQ.... 336.9..Kansas City, Mo.
WOR.... 422.3..Newark, N. J.
WORD. 275.1..Batavia, Ill.
WOS.... 422.5..Jefferson City, Mo.
WOW.... 508.2..Omaha, Neb.
WOWO. 228.9..Ft. Wayne, Ind.
WPAP. 395....Cliffside, N. J.
WPCC. 223.7..Chicago, Ill.
WPCH. 309.1..Hoboken, N. J.
WPEP. 215.7..Waukegan, Ill.
WPG.... 272.6..Atlantic City, N. J.
WPRC. 209.7..Harrisburg, Pa.
WPSC. 299.8..State College, Pa.
WPSW. 202.6..Philadelphia, Pa.
WQAA. 215.7..Parkesburg, Pa.
WQAM. 322.4..Miami, Fla.
WQAN. 230.6..Scranton, Pa.
WQAO. 394.5..Cliffside, N. J.
WQBC. 215.7..Utica, Miss.
WQJ.... 447.5..Chicago, Ill.
WRAF. 208.2..La Porte, Indiana
WRAH. 199.9..Providence, R. I.
WRAK. 282.8..Escanaba, Mich.
WRAM. 247.8..Galesburg, Ill.
WRAW. 238....Reading, Pa.
WRAX. 212.6..Philadelphia, Pa.
WRBC. 238....Valparaiso, Ind.
WRC.... 468.5..Washington, D. C.
WRCO. 217.3..Raleigh, N. C.
WRCV. 209.7..Norfolk, Va.
WREC. 254.1..Memphis, Tenn.
WREN. 254.1..Lawrence, Kan.
WRES. 217.3..Quincy, Mass.
WRHF. 322.4..Washington, D. C.
WRHM. 260.7..Fridley, Minn.
WRK.... 205.4..Hamilton, Ohio
WRM.... 272.6..Urbana, Ill.
WRMU. 201.2..Portable
WRNY. 309.1..Coytesville, N. J.
WRPI.. 208.2..Terre Haute, Ind.
WRR.... 352.7..Dallas, Texas
WRRS. 322.4..Racine, Wis.
WRSC. 211.1..Chelsea, Mass.
WRST. 211.1..Bay Shore, N. Y.
WRVA. 254.1..Richmond, Va.
WSAI.. 361.2..Cincinnati, Ohio
WSAJ.. 223.7..Grove City, Pa.
WSAN. 222.1..Allentown, Pa.
WSAR. 252....Fall River, Mass.
WSAX. 204....Chicago, Ill.
WSAZ. 241.8..Huntington, W. Va.
WSB.... 475.9..Atlanta, Ga.
WSBC. 232.4..Chicago, Ill.
WSBF. 258.5..St. Louis, Mo.
WSBT. 238....South Bend, Ind.
WSDA. 227.1..New York, N. Y.
WSEA. 263....Virginia Beach, Va.
WSIX.. 212.6..Springfield, Tenn.
WSKC. 272....Bay City, Mich.
WSM.... 340.7..Nashville, Tenn.
WSMB. 322.4..New Orleans, La.
WSMK. 296.9..Dayton, Ohio
WSOE. 270.1..Milwaukee, Wis.
WSRO. 384.4..Middletown, Ohio
WSSH. 288....Boston, Mass.
WSUI.. 441.1..Iowa City, Iowa
WSVS.. 205.4..Buffalo, N. Y.
WSYR. 225.4..Syracuse, N. Y.
WTAD. 236.1..Quincy, Ill.
WTAG. 516.9..Worcester, Mass.
WTAL. 280.2..Toledo, Ohio
WTAM. 399.8..Cleveland, Ohio
WTAQ. 254.1..Eau Claire, Wis.

Stations in United States

WTAR..236.1..Norfolk, Va.
WTAS..275.1..Elgin, Ill.
WTAW..483....College Station, Texas
WTAX..322.4..Streator, Ill.
WTIC...535.4..Hartford, Conn.
WTMJ..293.9..Brookfield, Wis.
WTFF..204....Mt. Vernon, Hills, Va.
WTFI...209.7..Taccoa, Ga.
WTRL..206.8..Midland, Park, N. J.
WWAE.227.1..Chicago, Ill.
WWJ...352.7..Detroit, Mich.
WWL...275.1..New Orleans, La.
WWNC.296.9..Asheville, N. C.
WWRL.267.7..Woodside, N. Y.
WWVA.337....Wheeling, W. Va.

Canadian Stations

CFAC...434..Calgary, Alta.
CFCA...411..Montreal, Que.
CFCF...500..Iroquois Falls, Ont.
CFCH...517..Edmonton, Alta.
CFCK...434..Calgary, Alta.
CFCN...357..Toronto, Ont.
CFCQ...411..Vancouver, B. C.
CFCT...329..Victoria, B. C.
CFCU...341..Hamilton, Ont.
CFCY...312..Charlottetown, P. E. I.
CFDC...411..Vancouver, B. C.
CFKC...248..Thorold, Ont.
CFMC...268..Kingston, Ont.
CFQC...329..Saskatoon, Sask.
CFRC...268..Kingston, Ont.
CFXC...291..Westminster, B. C.
CFYC...411..Burnbay, B. C.
CHCS...341..Hamilton, Ont.
CHIC...357..Toronto, Ont.
CHNC...357..Toronto, Ont.
CHSC...357..Unity, Sask.
CHUC...329..Saskatoon, Sask.
CHXC...435..Ottawa, Ont.
CHYC...411..Montreal, Que.
CJBC...357..Toronto, Ont.
CJCA...517..Edmonton, Alta.
CJCD...357..Toronto, Ont.
CJGC...326..London, Ont.
CJKC...411..Burnbay, B. C.
CJSC....357..Toronto, Ont.
CJWC...330..Saskatoon, Ont.
CJYC...291..Scarford Sta., Ont.
CKAC...411..Montreal, Que.
CKCD...411..Vancouver, B. C.
CKCK...312..Regina, Sask.
CKCL...357..Toronto, Ont.
CKCO...435..Ottawa, Ont.
CKCW..330..Burlington Junc., Ont.
CKFC...411..Vancouver, B. C.
CKNC...357..Vancouver, B. C.
CKOC...341..Hamilton, Ont.
CKY....384..Winnipeg, Man.
CNRA...322..Moncton, N. B.
CNRC...434..Calgary, Alta.
CNRE...517..Edmonton, Alta.
CNRM...411..Montreal, Que.
CNRO...435..Ottawa, Ont.
CNRR...312..Regina, Sask.
CNRS...330..Saskatoon, Sask.
CNRT...357..Toronto, Ont.
CNRV...291..Lulu Island, B. C.
CNRW..384..Winnipeg, Man.

Foreign Stations

AAA-AMZ.....Germany.
ANA-APZ.....Dutch Indies.
AQA-AWZ.....Norway.
AXA-AXZ.....Poland.
AYA-AYZ.....Venezuela.
AZA-AZZ.....Esthonia.
B.....Great Britain.
CAA-CEZ.....Chile.
CFA-CKZ.....Great Britain (protectorates).
CLA-CMZ.....Spain.
CNA-CNZ.....Morocco.
COA-COZ.....Great Britain.
CPA-CPZ.....Bolivia.
CQA-COZ.....Monaco.
CRA-CRZ.....Portugal (colonies).
CSA-CUZ.....Portugal.
CVA-CVZ.....Rumania.
CWA-CWZ.....Uruguay.
CXA-CXZ.....Spain.
CYA-CZZ.....Mexico.
DAA-DSZ.....Germany.
IQB.....Fiume.
IQC-IZZ.....Italy (colonies).
J.....Japan.
KAA-KAY.....Germany.
KAZ.....Danzig (Free State).
KBA-KBZ.....Germany.
KCA-CKZ.....Lettonia.
KDA-KZZ.....United States.
LAA-LHZ.....Norway.
LIA-LRZ.....Argentina.
LSA-LUZ.....Great Britain.
LVA-LVZ.....Guatemala.
LWA-LWZ.....Norway.
LXA-LZZ.....Bulgaria.
M.....Great Britain.
N.....United States.
OAA-OBZ.....Peru.
OCA-OFZ.....Great Britain.
OGA-OIZ.....Denmark.
OJA-OJZ.....Finland.
OKA-IKZ.....Czechoslovakia.
OLA-OMZ.....Netherlands.
ONA-OTZ.....Belgium (colonies).
OUA-OZZ.....Denmark.
PAA-PIZ.....Netherlands.
PJA-PJM.....Curacao.
PJN-PJZ.....Dutch Guiana.
PKA-PMZ.....Dutch Indies.
PNA-PPZ.....Brazil.
PQA-PSZ.....Portugal.

Foreign Stations

PTA-PVZ.....Brazil.
PWA-PWZ.....Cuba.
PXA-PZZ.....Netherlands.
Q.....Reserved for abbre.
RAA-RQZ.....Russia.
RRA-RWZ.....
DTA-DTZ.....Danzig (Free State).
DUA-DZZ.....Germany.
EAA-EHZ.....Spain (colonies).
EIA-EZZ.....Great Britain.
F.....France (colonies and protectorates).
GAAA-GWBB..Great Britain.
GWBC-GWJZ..Free State of Ireland.
GWKA-GZZZ..Great Britain.
HAA-HAZ.....Hungary.
HBA-HBZ.....Switzerland.
HCA-HCZ.....Ecuador.
HDA-HEZ.....Netherlands.
HFA-HFZ.....Kingdom of Siberia.
HGA-HHZ.....Siam.
HIA-HIZ.....Dominican Republic.
HJA-HKZ.....Colombia.
HLA-HNU.....Spain.
HNV-HNZ.....New Hebrides.
HOA-HZZ.....France (colonies and protectorates).
IAA-IQA.....Italy (colonies).
RXA-RXZ.....Panama.
RYA-RYZ.....Territory of Memel.
RZA-RZZ.....
SAA-SMZ.....Sweden.
SMA-STZ.....Brazil.
SUA-SUZ.....Egypt.
SVA-SZZ.....Greece.
TAA-TEZ.....Turkey.
TEA-TEZ.....Iceland.
TGA-THZ.....Greece.
TIA-TOZ.....Spain.
TPA-TUZ.....Norway.
TVA-TZZ.....Netherlands.
UAA-UMZ.....France (colonies and protectorates).
UNA-UNZ.....Kingdom of Serbia.
UOA-UOZ.....Austria.
UPA-UZZ.....Italy.
VAA-VGZ.....Canada.
VHA-VKZ.....Australia.
VLA-VMZ.....New Zealand.
VNA-VNZ.....Africa.
VOA-VOZ.....Newfoundland.
VPA-VSZ.....Great Britain (colonies and protectorates, autonomous).
VTA-VWZ.....British Indies (Persian Gulf).
VXA-VZZ.....Great Britain (colonies and protectorates).
W.....United States.
XAA-XDZ.....Mexico.
XEA-XMZ.....Great Britain.
XNA-XSZ.....China.
XTA-XZZ.....Great Britain.

Don'ts for Listeners

Don't allow your set to "squeal," annoying neighbors.
Don't use run-down B batteries or use old ones with new units.
Don't allow the storage battery to run down.
Don't try to force your set to get enormous volume.
Don't run your 5-tube set without a C battery.
Don't forget to turn off the B eliminator before the tubes.
Don't use an aerial over 100 feet long.
Don't neglect to clean the springs in the tube sockets now and then.
Don't use four good tubes and one poor one in the set.
Don't expect good tone with old-style transformers and a horn.

The voltmeter should not be left connected across the B battery for any length of time, as it will cause a short circuit between the terminals and run the battery down. Take a reading of the battery in as short a time as possible.

A C battery should be replaced about as often as new B batteries are installed in the set. Although supplying little current to the set, the C battery dries out rapidly.

Short Wave Broadcasters

The list of stations experimenting on short-waves grows daily, and below are some of the stations already licensed to carry on broadcast experiments on the higher frequencies. Owners of short-wave receivers will be able to hear some of these stations, although it is difficult to hear such stations unless several thousand miles away. This is due to the "skip distance" effect of the waves of the stations.

KDKA,	8 XK 8 XP	Westinghouse Elec. & Mfg. Co., Pittsburgh, Pa.
WGY,	2 XAC 2 XAD 2 XAE 2 XAF 2 XAG 2 XAH 2 XAK 2 XAW	General Electric Co., Schenectady, N. Y.
WBZ,	1 XAE	Westinghouse Co., Springfield, Mass.
WHAM,	8 XAC	Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y.
WABC,	2 XE	Atlantic Broadcasting Co., Richmond Hill, N. Y.
WEEI,	1 XAF 1 XAG	Edison Electric Illuminating Co., Boston, Mass.
WJZ,		Radio Corporation of America, Bound Brook, N. J.
WRAH,	1 XY	Booth Radio Labs., Tilton, N. H.
WRNY,	2 XAL	Experimenter Pub. Co., Coatesville, N. J.
WOR.	2 XAQ	Bamberger Co., Newark, N. J.
WRMU,	2 XAG	Yacht "Mu 1," Grebe Co., of New York.
WAAM,	2 XBA	WAAM, Inc., Newark, N. J.
KJBS,	6 XAR	J. Brunton & Sons Co., San Francisco, Cal.
KFWB	6 XBR	Warner Bros. Motion Picture Studios, Portable, Los Angeles, Cal.
KNX,	6 XA	Los Angeles Express, Los Angeles, Cal.
KFSG,	6 XBA	Air Fan Radio Corp., Los Angeles, Cal.
KHJ,	6 XAU	Times-Mirror Co., Los Angeles, Cal.
KFWH,	6 XAK	F. W. Morse, Chico, Cal.
KFQZ,	6 XAL	L. E. Taft, Hollywood, Cal., Portable.
KFVD,	6 XBX	McWhinnie Elec. Co., Venice, Cal.
KNRC,	6 XAF	Clarence B. Juneau, Portable.
KGGM,	6 XAI	Los Angeles Radio Club, Los Angeles, Cal.
KFQV,	6 XBH	W. E. Riker, Holy City, Cal., Portable.
WRAH,	1 XAA	Stanley N. Read, Portable, Providence, R. I.
KFBC,	6 XBE	W. K. Azbill, San Diego, Cal.
KRLO,	6 XAN	Freeman Lan, Los Angeles, Cal.
KJR,	7 XC 7 XO	Northwest Radio Service, Seattle, Wash., Portable.
KWJJ,	7 XAO	Wilbur Jerman, Inc., Portland, Ore.
KFPY,	7 XAB	Symons Investment Co., Spokane, Wash., Portable.
WEAO,	8 XJ	Ohio State University, Columbus, Ohio.
WLW,	8 XAL	Crosley Radio Corp., Harrison, Ohio.
WHK,	8 XF	The Radio Air Service Corp., Cleveland, Ohio. Portable.
WNAL,	9 XAB	R. J. Boswell, Omaha, Neb., Portable.
KOIL,	9 XU	Mona Motor Oil Co., Council Bluffs, Iowa.

3 XK is the experimental call of the C. Francis Jenkins Radio Laboratories at Washington, D. C.

3 XN is the Bell Telephone Laboratory call at Whippany, N. J.

If the B battery eliminator does not supply sufficient voltage to operate a power-tube, a 45-volt B battery may be placed in series with the 90-volt terminal of the eliminator to raise its voltage to 135.

In the Heart of Newark—Just East of the "Four Corners"

City Radio Stores

MAIN STORE **183 MARKET ST.** MAIN STORE

Set Department Annex: 189 Market Street

4 NEW YORK STORES	63 Cortlandt St.	110 West 42d St.
	224 East Fordham Rd.	42 Cortlandt St.

Free Tube Testing Service

When your set fails to give maximum volume—your tubes may be at fault. Bring your radio tubes in—we will test them for you free of charge on our specially equipped tube-testing meter.

Your Radio set deserves *the best* tubes

Sonatron—Type 201-A Amplifier and Detector

This is radio's all-purpose tube. Known for its rugged dependability, mellow-clear tone and ability to give uniformly excellent results under all conditions.

SONATRON

Choose from 33 Sonatrons

. . . and get the superior results of tubes carefully adapted to their particular work. Dry Cell, Storage Battery and Hi-Mu Tubes, Power Detectors and Amplifiers . . . tubes for "B" Eliminator operation. All known for their uniform high quality, splendid performance and dependability.

SONATRON

The World's Largest Radio Tube Line

In the Heart of Newark—Just East of the "Four Corners"

City Radio Stores

MAIN STORE **183 MARKET ST.** MAIN STORE

Set Department Annex: 189 Market Street

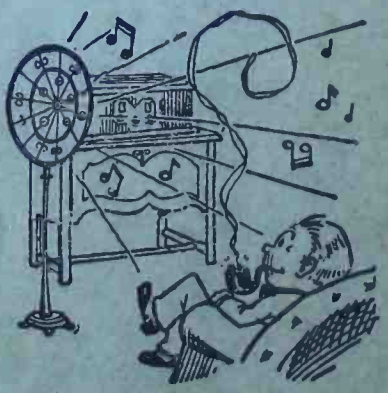
4 NEW YORK STORES	63 Cortlandt St.	110 West 42d St.
	224 East Fordham Rd.	42 Cortlandt St.

TRADE-IN

Your Out-of-Date Radio Set or Phonograph for a New 1928 Model Receiver.

VERY LIBERAL ALLOWANCE

Mail your name and address telling us which radio set you are interested in. Our appraiser will call to give you an estimated trade-in value for your old radio set or phonograph.



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TERMS
AS LOW AS
$1.50
WEEKLY

A SMALL DEPOSIT
Delivers Your Radio Set
Free Delivery
Free Installation
One Year Free Service
NO INTEREST CHARGES

FOR THE SET BUILDER

Here at City Radio you'll find the largest supply of standard radio parts in the State of New Jersey. In practically all cases the prices are the lowest.

Your name and address will bring you by return mail circulars and information on the latest circuits and hook-ups.