Antenna Called Doorstep of Wireless Receiving Apparatus

Aerial Should be Properly Braced and Fitted With Lightning Arrester Equipment So That It Will Not be Menace.—Important Tests Described

BY FRANK C. VOGAN.

An "antenna," according to the dictionary, is "one of the feelers on the head of an insect," or, we might say, "bug." "Bugs" and "antennae" seem to have much in common—antennae on bugs and bugs on antenna!

Why is an antenna? We can catch radio signals in so many different ways that it would be foolish to start any quarrel as to whether an antenna is needed or not. At the same time, we realize that unless we have some sort of a wire strung up to intercept radio waves we must install and maintain quite a few amplifier tubes to bolster up the strength of the incoming signal.

It is to be regretted that we are unable personally to interview a radio wave. It would be a great story if a wave, say, from Chicago, could tell us about its journey through space on its tour to the Eastern seaboard.

Some waves arrive in good shape and are treated with care and consideration when we get them. Others arrive all bent up and battered, and announce themselves in a stuttering sort of way, only to suffer a rather discourteous "shut-out" from our receiving sets.

A third class of visitors to our "radio boxes" are accorded the treatment of a good game post—they play hide and seek with us, we torture them every chance we get, twist them, distort them and then complain about them. Really, none would care how much of this foolish treatment were accorded crippled, straggling signals if the neighboring fisherman didn't so upset and muddy the water for everyone else. It's poor sportsmanship.

With that point made, we got back to the "doorstep" of our radio set—the antenna. This is the place where we meet and greet the radio signal, and there is much to be said about the etiquette we should observe.

Most of us know what an antenna is for, but an antenna on a roof doesn't make a radio set, and a radio set can't make an antenna!

As a rule, builders are careful in "topping off" a house, so as to arrange the skyline that it will not be offensive to the sight. Cornice lines may not always be artistic, but they are at least conventional and acceptable. Is there any reason why our antenna can't be designed along the same lines? These ragged, shapeless radio things on our roofs certainly do detract from the property value of any neighborhood.

Think this over—if the builder of your house had placed such "objects of derision" on your home at the time he was selling it to you your present address would likely be somewhere else! Let's get busy and straighten out this antenna business. A tiny squeak in your motor-car gets all kinds of attention, but these dilapidated things on the roof are neglected day after day.

An antenna properly erected, braced and guyed and fitted with proper lightning arresting equipment, is not a menace and does not "attract lightning." Three years of broadcasting have proved this.

Many persons have a pronounced fear of lightning in connection with antennae. Some persons probably have more reason for this fright than they are aware. An ungrounded or unprotected antenna during a thunderstorm is a serious matter and greatly exposes the structure beneath it and those in its vicinity. Fans should be warned that merely loosening the antenna lead-in wire from the set and throwing it out of the window, or putting this free end otherwise out of sight, in no way decreases the danger during an electrical storm. On the other hand, if the antenna is thoroughly and properly grounded, it serves as a real protection to the house and adjacent structures.

There is little danger from lightning where a grounded antenna is constantly ridding itself of "induced charges." During a storm the grounded antenna acts as an "equalizer" between the cloud above and the earth below. The word "storm" should not be construed as meaning only an atmospheric disturbance, accompanied by rain, as during a severe electrical storm rain may be totally absent. The electrical charges induced in antennae are more or less independent of the rain factor. These charges may become very great long before any rainfall occurs at all.

So we see that the antenna when grounded acts to relieve the "electric strain" between the cloud and the earth. It is only when this electric strain becomes too great between the antenna and the cloud that the lightning affects the antenna.

There are very few cases on record where lightning has made "direct hits" on antennae. In the few cases known there exists an element of doubt, as the destruction which accompanies a direct hit is so terrible that that there usually is little evidence left for investigation.

However, the important thing for us to remember is this: If our antenna is thoroughly grounded there will be little chance of large static charges building up in the aerial system, and that those charges that do collect will rapidly leak off, for, when we ground, the antenna, that is exactly what we are endeavoring to accomplish—to see to it that this static leakage is as great as possible. The leakage from the antenna will be just as good as the ground connection or lightning device used. So this brings us to the matter of "grounds."

Few of us care to take the chance of doing without fire insurance on our homes and their contents. We would be foolish, indeed, to jeopardize these insurances through the careless installation of a radio set. If we do not heed the few simple rules and regulations of the National Electric Code, which, by the way, is a definite part of insurance underwriting, we expose ourselves to constant risk of loss.

Our fire insurance policies cover losses only under certain conditions, as it is primarily assumed that all insurance requirements are complied with. To neglect these requirements is folly.

The National Electric Code regarding antennae specifies that: "Each lead-in conductor shall be provided with an approved protective device (lightning arrester) which will operate at a voltage of 500 volts or less, properly connected and located either inside the building at some point between the entrance and the set which is convenient to the ground or outside the building as near as practicable to the point of entrance. The protector shall not be placed in the immediate vicinity of easily ignitible stuff or where exposed to flying or moving combustible materials.

"If an antenna grounding switch is employed it shall, in its closed position, form a shunt around the protective device. Such a switch shall not be used as a substitute for the protective device. It is recommended that an antenna grounding switch be employed and that, in addition, a switch rated at not less than 30 amperes 250 volts be located between the lead-in conductor and the receiving set."

The cuts which explain in diagram what the rules require are reproduced with this article for the convenience of readers.

We will stop for a moment to consider—when is a ground really a "ground?". This matter is important, for it has been observed in many instances where the lightning ground is made separate from the operating ground, that trusting to the best test is the one with the 110-volt current and the 25-watt lamp.

There is no danger whatever in making this test if the fan makes sure that the 25-watt lamp is firmly connected in the circuit before the free end of the test wire is touched to the ground that is being tested. As attachment is made to only one side of the lighting circuit there is no danger whatever from shock. Of course, if contact is made to the grounded side of the 110-volt line, the lamp will not light at all when the free end of wire is touched to the ground wire being tested.

For that reason, before the test is made and after the lamp has been firmly connected in the test circuit, take the free end of the test wire and touch it to a cold-water pipe. If you have connected the lamp lead to the grounded side of the 110-volt lighting circuit, the lamp will not light. If it is attached to the ungrounded side of the lighting circuit, then the lamp will light at full brilliance and you can proceed with the testing of the protective ground, as illustrated in Fig. 6.

It is just as difficult to make a good mechanical job of the antenna as it is to make it electrically right. The antenna has to withstand high winds and heavy ice loads in the winter. If the structure is not mechanically what it should be, there is the danger of leaking rooms and, worse yet, the possibility some part of the antenna may fall down into the street and injure some one. Injury to persons on the highway or to adjacent property may mean a civil damage suit.

It is useless to believe such things will not occur, and we must remember that most antennae, have only been in operation for a short time and the longer each one is in poor condition. Guy wires and, in fact, the antenna wires themselves must be watched, for, when loose, they may get accidentally tangled up with other wires and cause trouble. There are, however, few cases on record, so far, in which antennae have caused serious trouble.

It's an old and worn bunch of queries—"how high, how long and how many" wires" Physical limitations attend to the "how-long" end of the debate, but the height of the antenna is usually something the constructor can regulate. Ten to 15 feet above the roof usually seems sufficient.

A question that seems to puzzle a lot of us is how many wires ought to be used in the horizintal part of the antenna. There is so little difference in the actual capacitance of single-wire and multi-wire antennae of short length that it really doesn't seem right to recommend additional wires.

If the question of using more than one wire really seems important, we can rest assured that putting two wires in the flat top will not double the capacity of the single wire, and putting in three wires will not make the capacitance three times as great as that of one wire.

In some cases real improvement in reception results with the use of a short antenna of several wires. The answer is, "try it!" But remember this: The "more" the antenna, the "more" the static!

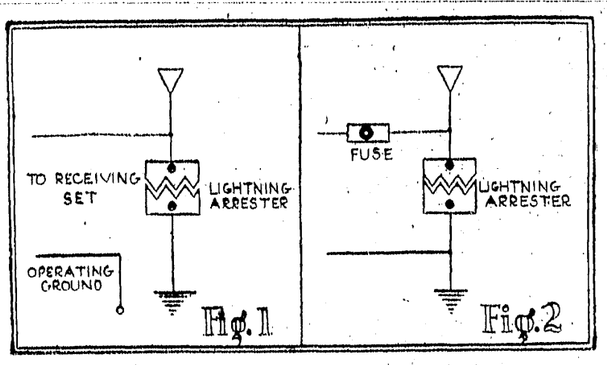
In using multi-wire antenna, don't place the wires much more than 30 inches apart and make a good job of running the lead-in. Tie the free ends of the multi-wire antenna together in any instance. In installing the antenna pay strict attention to the insulation.

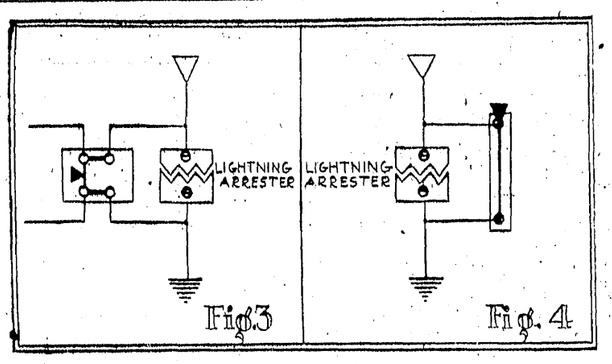
Money invested in the best of insulators and insulation is well spent.

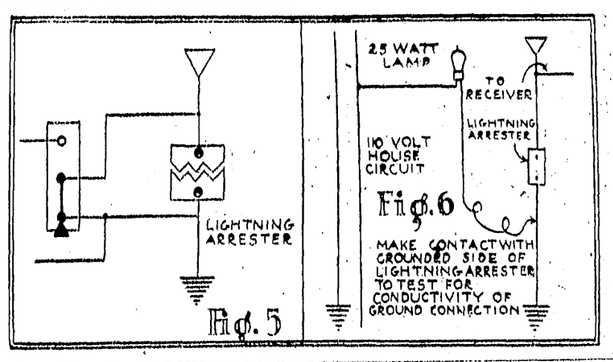
A room big enough to hold the crowd interested in "the kind of wire to use" might require a stadium! After experiments with different kinds of aerials I am of the opinion that probably as good results as may be expected are obtained with the well-known 7-strand No. 22 copper wire. An antenna should be gone over about every 18 months. You will be amazed at the corrosion that has taken place in the antenna wires! It takes about several months for the bright surface of copper wire fully to oxidize, but from then on the dust and smudge pile up rapidly. This is really to be expected, especially in winter when all the chimneys are doing their worst with sulphuric fumes. The dust and dirt that piles on the wires also piles on the insulators. This we must watch, as considerable leakage may occur. Radio currents hop right across this dust deposit and skip down to ground and are lost.

A word about soldering. In an antenna correctly laid out, soldering is not necessary. If in designing the antenna, the wires are made long enough it will be found easy to run the lead in ends through the insulators at the receiving end and twist them back over themselves in a tight joint. Three or four tight twists will make a far better joint than one poorly soldered joint.

The short pieces of wire used for the lead-ins when a multi-wire aerial is being installed should be brought into one of those little fan-shaped pieces of cast brass made for the purpose. They are provided with several holes and set-screws to hold the wires tightly, while in the bottom of the casting will be found one larger hole with a set-screw to take the lead-in wire that runs down into the house. There is always something new in radio—from antenna to electrons. Now science is busied with the hope of prying right into the electron itself, but nothing has been predicted for the fortunate or unfortune person who succeeds in breaking it open. Maybe, when the election is opened up we will no longer need antennae. But in the meantime let us do the best we can with the electrons we have—whole electrons may some day be rare, indeed!







for this fright than they are aware. An ungrounded or unprotected antenna during a thunderstorm is a serious matter and greatly exposes the structure beneath it and those in its vicinity. Fans should be warned that merely loosening the antenna lead-in wire from the set and throwing it out of the window, or putting this free end otherwise out of sight, in no way decreases the danger during an electrical storm. On the other hand, if the antenna is thoroughly and properly grounded, it serves as a real protection to the house and adjacent structures.

There is little danger from lightning where a grounded antenna is constantly ridding itself of "induced charges." During a storm the grounded antenna acts as an "equalizer" between the cloud above and the earth below. The word "storm" should not be construed as meaning only an atmospheric disturbance, accompanied by rain, as during a severe electrical storm rain may be totally absent. The electrical charges induced in antennae are more or less independent of the rain factor. These charges may become very great long before any rainfall occurs at all.

So we see that the antenna when grounded acts to relieve the "electric strain" between the cloud and the earth. It is only when this electric strain becomes too great between the antenna and the cloud that the lightning affects the antenna.

There are very few cases on record where lightning has made "direct hits" on antennae. In the few cases known there exists an element of doubt, as the destruction which accompanies a direct hit is so terrible that that there usually is little evidence left for investigation.

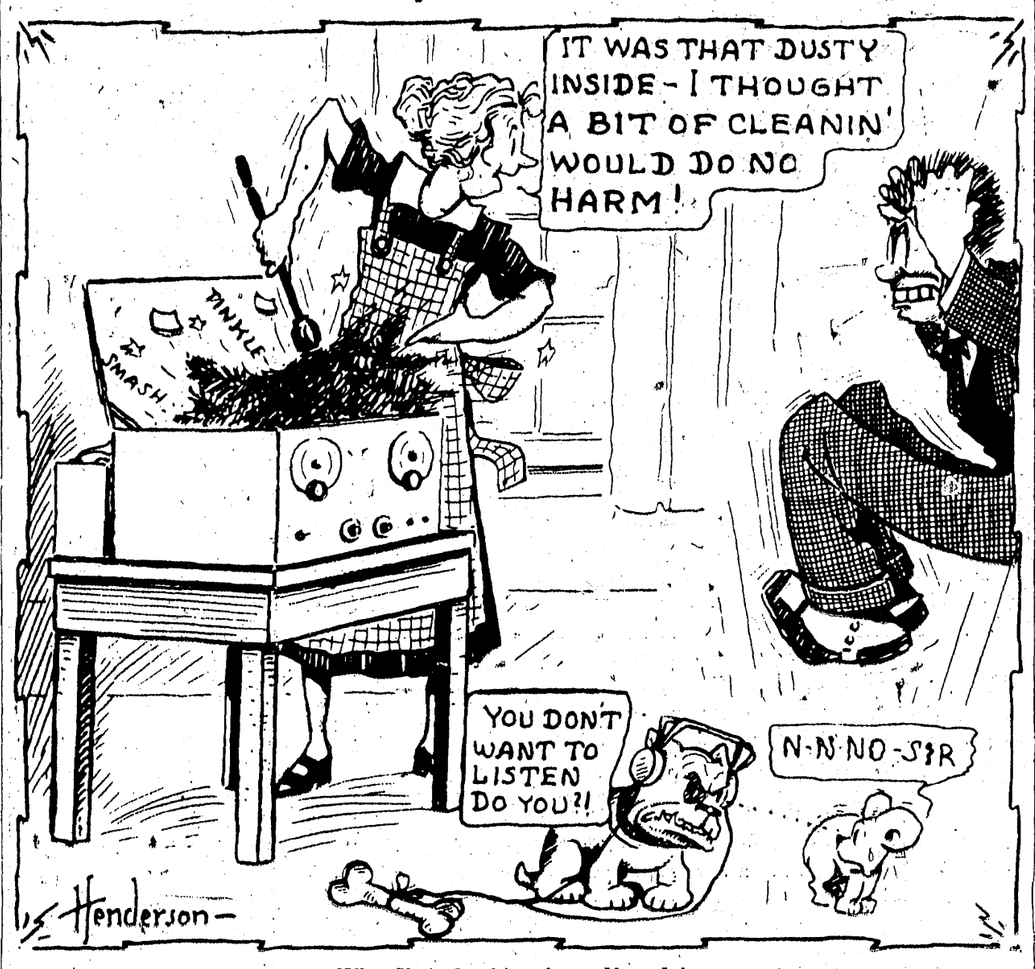
However, the important thing for us to remember is this: If our antenna is thoroughly grounded there will be little chance of large static charges building up in the aerial system, and that those charges that do collect will rapidly leak protective ground is an example of misplaced confidence.

A pipe or rod driven in the earth is not necessarily a good electrical ground. Grounds made in ordinary earth often present very high resistance to the flow of electric current. There is a way of finding out definitely whether the ground is a good one, and that is, test it!

Where 110-volt current is available, a ground may be readily tested by running the ungrounded side of the 110-volt lightning circuit through a 25-watt lamp and touching the grounded side of the protective device (lightning arrester, etc.) with the other wire from the lamp socket. See Fig. 6. If the conductivity of the ground is good the lamp will light up bright, but if the ground is poor and of high resistance the lamp will not light at all or only very dimly.

In case a poor ground is indicated by the test, additional grounding rods or pipes should be driven and then the whole bunch of pipes should be metallically bound together. The conductivity of the protective ground may also be tested by switching over the ground load from the receiver to the ground of the protective device. This test is not very reliable, as in many cases, the connection mentioned will permit reception, a high resistance in the protective ground acting as a capacitance, that is, like a condenser. The

To-day's Hook-Up



Why She's Looking for a New Job

RADIO PREVENTS THEFT OF METAL

High Frequency System Utilized to Guard Materials.

Tube Transmitter Tuned So That Pitch of Audible-Beat Note Changes When Metal Is Taken Through Gate.—Novel Idea Developed by German Scientists.

"The last few years have brought such a rush of inventions in the transmission of wireless signals that it seems normal to hear of some new application of radio waves every day," according to a report to the Department of Commerce from the office of the American commercial attaché at Berlin discussing the radio situation there.

He continues: "Wired wireless, train telephony, the radio compass, long-range control of vehicles, wireless-picture transmissions are just a few of the interesting achievements of radio.

"A new and distinctly novel application of radio-frequency oscillation has now been developed by two German scientists, Dr. Goffcken and Dr. Richter. It provides a quick and easy method of preventing thefts of any metals in factories or mines.

"In post-war years the German factories have suffered considerable loss from constant thefts of steel, copper, brass, tools and other fabricated or raw materials. The method of inspecting the workmen at the factory gate by hand is tedious, slow and disagreeable. A large number of workmen pass through the gates in a short time, and it is only a remote chance that the gate keeper will be able to pick out such men who have concealed metals of some kind on their persons.

"Here the control by radio waves fills the breach. Every workman passes through a small gate. In this gate an electrical field is maintained with a small tube transmitter. The power lines from a coil concealed in the gateway fill the space through which every workman has to pass.

"It is natural that any metallic conductors brought into the magnetic field will react on the generator. The magnetic lines of force will 'crowd together' in any metal within the gate and change the strength of the electrical field.

"The tube transmitter is tuned to an audio-frequency by means of a heterodyne tube. Any metals brought into the magnetic field will immediately change the pitch of the audible-beat note. The device can be adjusted to varying degrees of sensitiveness, according to the amount of metal which can be brought through the gate, without changing the note of the transmitter. This may be necessary to prevent changes in the magnetic field caused by small metal pieces such as keys, watches, garters, buttons, gold teeth fillings and spiked boots, etc.

"Of course, a metal lunch kit or thermos bottle cannot be taken through the gate. A small table is, therefore, provided beside the gate, on which the workman deposits such articles and picks them up as soon as he has passed through the gate. The advantages of this device are obvious. Every workman is inspected without fumbling or unnecessary waste of time. The fact that all are controlled uniformly and not haphazardly warns the habitual thief and prevents loss to the factory. The existence of the gate alone, through its psychological effect on the workmen, is sufficient to greatly reduce theft.

"If desired, however, the gateway may be built right into a door, without the knowledge of the workmen, and the controlling officer kept entirely out of sight of the men. This precaution might be necessary in districts where the labor element would be, to put it mildly, unfavorably inclined toward such inspecting measures.

"The same firm has developed a similar device especially suitable for gold and other precious-metal mines as well as smelting plants, jewelry factories, jewelry stores, etc. The same transmitter as on the 'protection gate' is used, but a small inclosed coil, similar to those used in calibrating wave meters, is applied. This coil is moved rapidly over the pockets and the body of the person to be searched and even very minute quantities of metal are easily detected by a noticeable change in the pitch of the beat note. The small amount of gold contained in gold-tooth fillings is sufficient to change the note so that this device provides a valuable and quick control in above-mentioned plants handling precious metals."

URGES CAUTION

Dangers Connected with Antenna Installation Cited.

The problem of the antenna installation has caused carelessness on the part of a great many fans throughout the country and this faulty installation has been the cause of several fatalities, declares Clarence V. Pursell of the operating division of station WEEI, Boston.

The following "Don'ts" are given by Mr. Pursell for the benefit of those who can profit by the example of fans unfortunate enough to have become involved in some needless mishap:

Don't run an antenna over or under any other wires carrying an electric current of any sort, whether these wires be high tension wires, service wires or telephone lines.

Don't attach an antenna to any pole or tower to which other wires are attached, or climb or attempt to climb such poles or towers for any purpose.

Don't run an antenna over or across any public highway.

Don't attach an antenna to any electric light, telephone or telegraph pole, even though no other wires are attached thereto. If using an outside antenna, always comply with the regulations governing the installation of an approved lightning arrester. Such a device is inexpensive and easily installed.

Don't borrow your neighbor's antenna by attaching your lead-in to the far end of his wire. You don't know what he is doing and besides antenna wire is cheap.

Don't attach your antenna to a kite.

Remember that a high voltage "B" battery can cause considerable damage if carelessly handled. The insulation on the wiring must be sufficient for the voltage used.

Care should be taken in the installation of a high-capacity storage battery. Short circuits should be guarded against by proper wiring and insulation, and the use of protective fuses.

Remember that results can always be obtained from an inside antenna if the necessary precautions cannot be taken in the installation of the usual, outdoor aerial. It is far better to sacrifice a little signal strength and distance reception than to take too much for granted, and not even live to be sorry for it.

Set Watches by Radio Announcements

People are now setting their watches by the time given by radio broadcasting announcers as they sign off. Cut off from the outside world for months by severe storms, inhabitants of a little island off the Alaskan coast near Kodiak no longer find it necessary to set their watches and clocks by the tides, but listen in on their radio receivers for the time announcements made by announcers. By watching the tides closely the inhabitants were formerly able to tell the time within about 20 minutes, according to a guide into the "Valley of Ten Thousand Smokes." It is no longer necessary to use this method of telling time, he explains in a letter to a Pacific coast broadcasting station.

RADIO PROGRAMMES

Special exercises marking the 100th anniversary of the Baptist State convention will be broadcast from the First Baptist Church to-day at 2:50 and at 7:30 o'clock by WEAN. This station will broadcast descriptions of Brown baseball games from Aldrich Field Friday and Saturday afternoons. WJAR and WDWF offer the usual programmes to-day, the former featuring "Roxy" and the latter broadcasting a concert by the Venetian Serenaders.

WEAN, THE SHEPARD STORES
(370 METRES.)

TO-DAY.

11:00 a. m.—Service, broadcast from Grace Church.

1:30 p. m.—Concert Yoeng's Concert Orchestra, Harold E. Sawyer, director.

2:50 p. m.—100th anniversary of Baptist State Convention, broadcast from First Baptist Church, J. Willard Baker, President, presiding: Organ prelude; invocational, Rev. Arthur W. Cleaves, D. D., pastor First Church, Providence; hymn, "O, God, Our Help in Ages Past;" responsive reading, Psalm 97, led by Rev. S. D. Ringrose, pastor Roger Williams Church, Providence; music selection, Union Male Quartet; announcement of services, President Baker; Scripture lesson, Rev. Walter B. Greene; musical selection, Union Male Quartet; prayer, Rev. Clarence M. Gallup, D. D.; centenary sermon, Rev. Edward Holyoke, D. D.; hymn, "Crown Him with Many Crowns;" benediction, Rev. Charles E. Burr; organ postlude, Union Male Quarter, Asa A. Pond, first tenor; John Downes, second tenor; Fred W. H. Cheek, baritone; Albert E. Seal, bass; John B. Archer, organist.

7:30 p. m.—Service from First Baptist Church: Organ prelude; call to worship; doxology, "Praise God From Whom All Blessings Flow;" invocation, Rev. Horace H. Hayes; Lord's Prayer; musical selection, the combined choirs; scripture lesson, Rev. Lewis A. Walker; hymn, "How Firm a Foundation Ye Saints of the Lord;" prayer; response by choirs; announcement, Rev. William Reid, general secretary; "All Hail the Power of Jesus Name;" address, "The Glorious Retrospect of the Hundred Years," Rev. Frank Rector, D. D.; musical selection, the combined choirs; address, "The Moving Appeal of the New Hundred Years," Rev. Frank W. Padelford, D. D.; hymn, "Stand Up, Stand Up for Jesus, Ye Soldiers of the Cross;" benediction, Rev. D. B. Lothrop; organ postlude, combined choirs, First Church, Mrs. Preston F. Arnold, soprano; Walter R. Morris, tenor; Mrs. George F. Hiller, alto; David A. Mitchell, bass.

MONDAY.

11:55 a. m.—Time signals.

12:00 p. m.—Shepard Colonial Orchestra, Harold Sheffers, director.

12:10 p. m.—Weather report.

12:16 p. m.—Continuation of musical programme.

4:00 p. m.—Shepard Colonial Dance Orchestra.

4:30 p. m.—Weather report.

4:35 p. m.—Shepard Colonial Dance Orchestra.

6:30 p. m.—WNAC dinner dance, broadcast from Shepard Colonial Restaurant, Shepard Colonial Orchestra, direction Billy Lossez, relayed from station WNAC.

8:00 p. m.—"The Lumson Entertainers."

9:00 p. m.—Talk by Frank B. Guild.

9:10 p. m.—Orchestra, direction William F. Dodge, relayed from WNAC.

TUESDAY

10:00 a. m.—Message to Housewives by Miss Gladys L. Peckham, Home Service Department, Providence Gas Company.

11:55 a. m.—Time signals.

12:00 p. m.—Colonial Concert Orchestra.

12:10 p. m.—Weather report.

12:15 p. m.—Musical programme.

4:00 p. m.—Colonial Dance Orchestra.

4:10 p. m.—Incidental music by The Emery Theatre Concert Orchestra, William J. Faucher, director.

4:30 p. m.—Weather report.

4:35 p. m.—Conlonial Dance Orchestra.

6:30 p. m.—WEAN dinner dance, Shepard Colonial Orchestra, Harold Sheffers, director.

7:35 p. m.—Health talk, Dr. S. B. Kelliher, relayed from station WNAC.

8:00 p. m.—Broadcast from Mechanics Building, 60th anniversary of the founding of the Boston Missionary and Church Extension Society of the Methodist Episcopal Church, address by Dr. S. Parkes Cadman, relayed from station WNAC.

9:30 p. m.—Ralph Woolf, tenor; Sara Mindes, violinist; Evelyn Borofsky, pianist; relayed from station WNAC.

WEDNESDAY.

11:55 a. m.—Time signals.

12:00 p. m.—Colonial Concert Orchestra.

12:10 p. m.—Weather report.

12:30 p. m.—"Fifteen Minutes of Music Appreciation."

4:00 p. m.—Colonial Dance Orchestra.

4:30 p. m.—Weather report.

4:30 p. m.—Colonial Dance Orchestra.

6:30 p. m.—WEAN dinner dance, Shepard Colonial Orchestra, Harold Sheffers, director.

8:00 p. m.—Salvation Army Band and assisting artists, relayed from WNAC.

9:30 p. m.—Dance music by Rhodes Orchestra, direction Charles W. Culverwell broadcast from Rhodes-on-the-Pawtuxet.

THURSDAY.

10:00 a. m.—Message to Housewives by Miss Gladys L. Peckham, Home Service Department, Providence Gas Company.

11:55 a. m.—Time signals.

12:00 m.—Colonial Concert Orchestra.

12:10 p. m.—Weather report.

12:30 p. m.—Broadcast from Tremont Theatre—Christian Science lecture, John W. Doorly, C. S. B., of London, England, relayed from WNAC.

4:00 p. m.—Shepard Colonial Dance Orchestra.

4:30 p. m.—Weather report.

4:35 p. m.—Colonial Dance Orchestra.

6:30 p. m.—WEAN dinner dance, Shepard Colonial Orchestra, Harold Sheffers, director.

FRIDAY.

11:55 a. m.—Time signals.

12:00 m.—Colonial Concert Orchestra.

12:10 p. m.—Weather report.

12:15 p. m.—WEAN Noonday Club.

3:45 p. m.—Baseball game, Brown vs. Penn State, broadcast from Aldrich Field.

6:30 p. m.—WNAC dinner dance, Billy McBride's Beachcroft Orchestra, relayed from Station WNAC.

8:15 p. m.—Broadcast from Jordan Hall, New England Conservatory of Music Orchestra, relayed from Station WNAC.

9:30 p. m.—Bits from "Miss Cinderella," relayed from Station WNAC.

10:00 p. m.—Emery Theatre Concert Orchestra.

SATURDAY.

10:00 a. m.—Message to Housewives by Miss Gladys L. Peckham, Home Service Department, Providence Gas Company.

11:55 a. m.—Time signals.

12:00 m.—Colonial Concert Orchestra.

12:10 p. m.—Weather report.

12:30 p. m.—"Fifteen Minutes of Music Appreciation."

2:45 p. m.—Baseball game, Brown vs. R. I. College, broadcast from Aldrich Field.

8:00 p. m.—Concert programme.

8:45 p. m.—Minerva Trio and assisting artists, relayed from WNAC.

10:00 p. m.—Dance music, broadcast from Copley-Plaza Hotel, Copley-Plaza Orchestra, direction W. Edward Boyle; popular songs, George Rogers and Irving Crocker, relayed from WNAC.

WJAR, THE OUTLET CO.
(306 METRES)

TO-DAY.

7:20 p. m.—Musical programme by "Roxy and His Gang," direct from the Capitol Theatre, New York, by courtesy of the Capitol Theatre management and S. L. Rothafel (Roxy). The first part of the programme will be taken direct from the stage of the theatre and will consist of music by featured artists and the Capitol Grand Orchestra. The second part of the programme will consist of a special presentation by Mr. Rothafel of vocal and instarumental artists direct from the broadcasting studio in the theatre.

9:15 p. m.—Organ recital by Maurice Garrabrant direct from the studio of the Skinner Organ Company, New York city, assisted by Theo Karl, American concert tenor and Joy Babcock, violinist.

MONDAY

10:00 a. m.—Housewives' Radio Exchange. A department conducted by Mrs. Wood on all matters of household interest.

1:05 p. m.—Gladys Ballou Brightman, pianist. Mildred Tibbetts, soprano.

7:30 p. m.—Grace Winter Ward, soprano.

7:45 p. m.—"Berry Spring Dance Hour."

9:00 p. m.—A. & P. Gypsy String Ensemble relayed from the New York city studio.

TUESDAY

1:05 p. m.—Providence Biltmore Hotel Orchestra, under the direction of Erwin White relayed from the hotel.

6:00 p. m.—Green Acre Lodge Orchestra.

7:30 p. m.—Premier Kiddie Xylophone Duo; accompanist, Gertrude Greenhalgh Walker.

7:50 p. m.—Charles E. Nolin, baritone.

8:00 p. m.—Speaker from the Providence Safety Council. Subject: "Some Interesting Figures," Ralph L. Hayward.

8:05 p. m.—Msuical programme.

8:30 p. m.—Gold Dust Twins direct from New York studio.

9:00 p. m.—"Everyready Hour."

WEDNESDAY

10:00 a. m.—Housewives' Radio Exchange. A department conducted by Mrs. Wood on all matters of household interest.

1:05 p. m.—Green Acre Lodge Orchestra.

7:30 p. m.—Programme direct from New York. Concert by the United States Army Band, direct from Army Music School Auditorium of the United States War College.

9:00 p. m.—Manhattan Trio, William Durieux, 'cellist; Marian Carley, pianist, and Dorothy Hoyle, violinist, assisted by Easton Kent, tenor, and Raymond O'Brien, baritone.

THURSDAY

1:05 p. m.—Green Acre Lodge Orchestra.

8:00 p. m.—Programme under the direction of Mme. Olive Schleicher.

9:00 p. m.—"Atwater Kent Radio Artists."

10:00 p. m.—"The Silvertown Cord Orchestra," under the direction of Joseph Knecht.

FRIDAY

10:00 a. m.—Housewives' Radio Exchange. A department conducted by Mrs. Wood of the Housewives' Radio Exchange.

1:05 p. m.—The Woodstock Orchestra, under the direction of Martin J. Casey.

7:45 p. m.—Joseph Trainor, baritone.

8:00 p. m.—Miss Marie Pearsall, soprano.

8:15 p. m.—Joint programme by Marie-Jeanne Fauteux and Herve A. Giguere.

9:00 p. m.—"The Maine Creamery Hour."

11:00 p. m.—Providence Biltmore Hotel Dance Orchestra under the direction of Erwin White, relayed from the dining room of the Providence Biltmore Hotel.

SATURDAY.

1:05 p. m.—Green Acre Lodge Orchestra. Silent night.

WDWF, DUTEE W. FLINT, INC.
(441 METRES)

TO-DAY

10:00 a. m.—Chimes and Bible reading.

5:00 p. m.—Venetian Serenaders and Aurele Forest, organist.

THURSDAY.

6:30 p. m.—Narragansett Hotel Orchestra and soloists.

WGBM, T. N. SAATY
(256 METRES)

MONDAY.

10:00 p. m.—Presentation by artist pupils of Henri and Marie B. Faucher; Peter Augustine, violinist, accompanied by Fanny Cohen, playing compositions of Dancla, Leonard, Gounod and Verdi.

FRIDAY.

6:30 p. m.—Violin recital by Leibert Goldowsky, student of Miss Evangeline Larry.

WNAC, BOSTON, MASS.
(180 METRES)

TO-DAY.

10:55 a. m.—Service broadcast from Temple Isreal.

1:30 p. m.—Concert by Yoeng's Concert Orchestra.

Continued on Page Twelve

INEXPERIENCE SPOILS A CONCERT.

With invited guests to listen in on the speechmakers at a prominent banquet, Smith was again on his best behavior as a radio operator, but his best proved to be rather feeble. He blundered from the very beginning by giving his audience a taste of the clarity and volume from a near-by station, thereby putting them in a bad mood for listening to a distant station that naturally would call for closer attention.

His next mistake was to wait until the speeches commenced before tuning in on the desired station. It was not so much that he missed some of the opening remarks, because of the time consumed in dining, but mainly that he doubled his difficulties. There had been several opportunities to tune in on the station before the broadcasters switched the control from the studio to the banquet hall, but each time he dialed for the station and caught a vocal selection he told his audience that he hadn't invited them to hear music and that he would hold off until the real show was on.

Had he used the finale of the vocal programme for tuning in on the station he would not have been so completely upset by a local station that suddenly came on at the appointed time for the banquet addresses. This confused him to a point where it was 10 minutes before he could locate his desired station well enough to know that when he was cutting out the local station he was not also cutting out the banquet.

The chances are that if the set had been all tuned for the banquet the local station would have come in as a sort of obligato. And it would have been relatively easy, with so selective a set as his to have tuned out the local without losing the banquet at the same time. Going at it the way he did was virtually trying to catch the obligato of a distant station through a broadly tuned local one. That is always difficult.

"But my troubles had only begun," Smith told me the next evening. "No sooner had I demonstrated my inability to make a good job of tuning for the distant station than one of the guests sought to help me out by suggesting that we be content with the local programme. I thought that would be easy, but when I brought it in clearly I noticed that some of the people looked annoyed. The tones were harsh and there was a lot of static, but I had to let it go at that.

"Of course I tried plugging in so as to cut out one of the amplifier tubes, but while that eliminated the noise it also eliminated the detail. One of the women present insisted upon hearing the words of her favorite song, so I went back to the full number of tubes and turned down the rheostats as much as I could without spoiling it altogether. I know they didn't like it, but what else could I do?"

"You could have been a little more experienced," I told him frankly. "Perhaps you think that you're wasting time some evenings when you tune in on nothing in particular, but by now you probably realize that this gives you practice so that when you have company and want to show them what a good set you have you need not get off that old story about the radio being like a bashful child. In this particular case, if you had been a little more experienced you would have solved your tuning and volume problem with the local station by first tuning it in sharply on all the tubes and then throwing one of the dials off a little. By detuning, so to speak, instead of reducing amplification or current, you could have had volume with clarity."

Smith, however, had two or three other troubles on his mind, and we had to run along to these. They, too, involved experience, but he decided to try a little intensive radioing while he was on the subject. It explains why he was game enough to admit that he finally spoiled the evening by dropping a radio amplifier tube when he had removed it for inspection of the contacts.

"This was my spare tube that I had installed just a few days ago," he explained, "so I was up against it."

"For what?" I startled him.

"For a tube, of course."

"Are you sure it was not for a little resourcefulness?" I asked. "There was a time when you had to send the family home by train just because the engine stalled, but those days have passed. Nowadays you use a little gray matter and get home on your wits. You'll soon be doing the same with your radio set. You could have used one of the audio amplifier tubes in place of the burned out radio amplifier, and then given them an earful with a little less amplification. There's always something on the air that you can get even if your set isn't tuned up for what you would prefer."

When Smith bought a new tube the next day he felt as if he were buying a ticket to new opportunities in radio pleasure and instruction.

(Copyright, 1925, by the Ullman Feature Service.)

SUPPRESS HARMONICS

Warning Issued to Class B Stations by Government.

Warning has been issued by the Department of Commerce to Class B broadcasting stations that immediate action must be taken to eliminate the emission of harmonics wherever they may exist.

The specifications governing Class B broadcasting stations, as formulated by the Third National Radio Conference, prohibit harmonic emissions.

Here is the notice that has been sent to Class B stations and to radio supervisors:

"Immediate action must be taken to eliminate the emission of harmonics. Supervisors will bring this to the attention of owners of stations failing to correct this source of interference.

"Interference from harmonics results from the emission of power on one or usually several frequencies higher than the fundamental. Any transmitting set, including the transmitters, is subject to this fault if oscillating directly in the antenna circuit, and tube transmitters also show the same tendency when pushed to maximum output.

"The trouble can be virtually overcome by the use of master oscillator-power amplifier systems and greatly improved by the use of loose coupling between oscillating and radiating systems. An effective remedy is comparatively simple and inexpensive.

"If the principle of licensing a station to use only one frequency per complete transmitting station were rigidly applied, stations radiating harmonics could be dealt with severely because they are actually radiating appreciably lower power on frequencies other than that for which the station is licensed.

"Harmonics of the carrier wave of stations operating in the lower frequency range of the broadcast frequency band and under certain conditions will prove to be a serious cause of interference. It is recommended that all possible steps be taken to minimize this trouble by technical means well known to the art and by careful supervision on the part of radio supervisors."

RADIO PROGRAMMES

Continued from Page Twelve.

3:30 p. m.—International Youth Rally broadcast from Parkman band stand.
6:00 p. m.—Concert by Yoong's Concert Orchestra.
6:15 p. m.—Service broadcast from Park Street Congregational Church.

WCTS, WORCESTER, MASS.
(268 METRES)

TO-DAY

7:20 p. m.—"Roxy and His Gang."
9:15 p. m.—Organ recital.

WBZ, SPRINGFIELD, MASS.
(333 METRES)

TO-DAY

10:55 a. m.—Church services from the South Congregational Church, Rev. James Gordon Gilkey, pastor. Music by Prof. Wilson P. Hoog, organist, and choir of 20 voices. The quartet is as follows: Mrs. Grace R. Donovan, soprano; Mrs. Nora Gladden Winton, contralto; William L. Spittal, tenor, and Albert D. Edwards, bass.
9:00 p. m.—Concert broadcast direct from the Estey Organ studio, by Marian Elizabeth Connor, soprano, accompanied by Miss B. Lewis.
9:30 p. m.—Concert by the Troubadour Quartet, broadcast direct from the Estey Organ studio.

WHN, NEW YORK CITY
(361 METRES.)

TO-DAY.

1:00 p. m.—Loew's Lexington Theatre organ recital.
3:00 p. m.—Queens County Christian Endeavor programme: Talk on "Young People and the Christian Endeavor Programmes," by C. Manley Debevoise, President of Queens County Christian Endeavor Union.
4:00 p. m.—Recital of sacred and popular chorus music by St. Paul's Choristers of Brooklyn, N. Y.; organist and choirmaster, Ralph A. Harris; soloists, Masters Daniel Newlands, Harold Ostergren, Donald Swan and George Dale, tenor.
4:30 p. m.—Programme by the Music Lovers' Association.
5:00 p. m.—Roseland Dance Orchestra.
5:30 p. m.—Olcott Vail and his String Trio.
10:00 p. m.—Gem Entertainers.
10:45 p. m.—Janssen's Hofbrau Orchestra.
11:15 p. m.—Signing off for DX fans.

WMCA, NEW YORK CITY.
(341 METRES.)

TO-DAY.

11:00 a. m.—Services, Second Christ Church of Scientist.
3:00 p. m.—Mme. Ida Haggerty Snell and pupils and Nancy Riley, soprano.
4:00 p. m.—Entertainment by Young Folks League for Aid to Hebrew Infants.
4:15 p. m.—Anni Caras, concert soprano.
4:30 p. m.—Erno Balogh, Hungarian pianist and composer.
4:45 p. m.—Anton Civoru, Russian basso.
7:00 p. m.—Ernie Golden and his Hotel McAlpin Orchestra.
8:15 p. m.—Talk, House of Health.

WFI, PHILADELPHIA, PA.
(394 METRES)

TO-DAY.

10:20 a. m.—Services from Arch Street Methodist Church, Rev. Milton Harold Nichols, D. D., pastor.
4:30 p. m.—Chapel service given under auspices of Church Federation of Philadelphia conducted by Rev. Herbert B. Benton, pastor of Universalist Church of the Messiah. Music furnished by the church quartet.

KDKA, EAST PITTSBURGH, PA.
(309 METRES)

TO-DAY.

10:15 a. m.—Services in the Sixth Presbyterian Church, Pittsburgh, Rev. B. F. Farber, pastor.
4:00 p. m.—Organ recital by Dr. Charles Heinroth, director of music of Carnegie Institute, Pittsburgh, broadcast directly from Carnegie Music Hall, Pittsburgh.
4:45 p. m.—Vesper services of the Shadyside Presbyterian Church, Pittsburgh, Rev. Hugh Thomson Kerr, pastor.
7:30 p. m.—Services of the Calvary Episcopal Church, Pittsburgh, Rev. E. J. Van Etten, pastor.
9:10 p. m.—Open forum from the East End Christian Church, Pittsburgh, Rev. John Ray Ewers, pastor.

WSAI, CINCINNATI, OHIO.
(326 METRES)

TO-DAY.

3:00 p. m.—Sermonette and sacred chime concert.
3:20 p. m.—Christian Endeavor programme.

KYW, CHICAGO, ILL.
(536 METRES)

TO-DAY.

12:00 noon—Central Church service from Orchestra Hall, Chicago, Rev. Dr. F. F. Shannon, pastor; musical programme under the direction of Daniel Protheroe.
5:00 p. m.—Studio concert.
8:00 p. m.—Chicago Sunday Evening Club service from Orchestra Hall, Chicago. The musical programme will be arranged by Edgar Nelson. The speaker of the evening will be Dr. W. L. Speery, Harvard University.

KFI, LOS ANGELES, CAL.
(467 METRES)
TO-DAY

2:00 p. m.—Morning services, under the direction of the L. A. Church Federation. Speaker will be Rev. M. H. Fagan, pastor of the Wilshire Boulevard Christian Church. Music will be furnished by the choir of the church, under the direction of Harold Shugart.
3:00 p. m.—Services of the Temple Baptist Church, with sermon by Dr. J. Whitcomb Brougher.
8:00 p. m.—Vesper service, under the direction of the Federated Church Musicians. Programme arranged by Annie Mottram Craig.
10:30 p. m.—MacDaniel's Nightly Doings.
10:45 p. m.—Father Ricard's Sun Spot Weather Forecast.
11:00 p. m.—Programme presented by Albert Kaufman for the stage and studio of the Metropolitan Theatre.
12:00 midnight—Classic Hour, featuring Andre Delfaff, French tenor; Franz Hoffman, Dutch basso, and Myranna Richards, Welsh contralto.
1:00 a. m.—Programme presented by the Los Angeles Examiner.
2:00 a. m.—Bill Hennessy and his Packard Eight Orchestra in an hour of popular dance music, with Starr Russell, soloist.

KGO, OAKLAND, CAL.
(361 METRES)
TO-DAY

3:00 p. m.—Service, First Church of Christ, Scientist, San Francisco.
7:30 p. m.—Concert, KGO Little Symphony Orchestra, Carl Rhodehamel, conductor; Arthur S. Garbett, musical interpretative writer; guest artist.
12:00 midnight—Service, First Church of Christ, Scientist, San Francisco.

KGW, PORTLAND, OR.
(491 METRES)
TO-DAY

2:30 p. m.—Service from First Presbyterian Church, Dr. Harold Leonard Bowman, pastor.
10:00 p. m.—Church services provided by Portland Council of Churches.
11:00 p. m.—Dinner concert by Coburn Concert Orchestra of Hotel Portland; intermission solos.

KOA, DENVER, COL.
(322 METRES)
TO-DAY

1:50 p. m.—Service of the First Church of Christ, Scientist, Denver.
6:30 p. m.—Sunday afternoon music hour: studio concert by the Tuesday Musical Club String Orchestra (15 pieces), Edith Sindlinger Wible, director.
10:50 p. m.—Service of the First Church of Christ, Scientist, Denver.

KNX, LOS ANGELES, CAL.
(337 METRES)
TO-DAY

2:00 p. m.—First Presbyterian Church of Hollywood.
9:00 p. m.—Sunset service, conducted by Rev. Charles E. Asked, D. D., LL.D., and Rev. Frank Dyer, D. D., of Wilshire Congregational Church.
11:00 p. m.—First Presbyterian Church of Hollywood.
12:00 midnight—Ambassador Concert Orchestra, Josef Rosenfeld leader.
1:00 a. m.—Courtesy programme by R. C. Durant.

WBCN, CHICAGO, ILL.
(266 METRES)
TO-DAY

12:30 p. m.—Morning service from People's Liberal Church, Sixty-fifth street and Stewart avenue, with talk by Rev. Rufus A. White.

To-day's Programmes in Brief

For the convenience of radio fans, the following hourly schedule of broadcasting to-day is given in brief form, the complete programme being given under the regular listing of announcements.

The hours are based on Eastern Daylight Saving Time.

LOCAL STATIONS
10:00—Chimes, WDWF.
11:00—Church, WEAN.
1:30—Concert, WEAN.
2:50—Church, WEAN.
5:00—Recital, WDWF.
7:30—Roxy, WJAR.
7:30—Church, WEAN.
9:15—Organ recital, WJAR.

OUT-OF-TOWN STATIONS
9:00—Children's hour, WJZ.
10:20—Church, WFI.
10:30—Sunday school, WLW.
10:40—Chimes, WJZ.
10:45—Church, WIP.
Church, KDKA.
10:55—Church, WBZ.
Church, WNAC.
11:00—Church, WGY.
Church, WMCA.
Church, KDKA.
Chimes, WREO.
Church, WJZ.
Church, WWJ.
11:30—Church, WREO.
12:00—Church, KYW.
Church, WCCO.
Church, WHAS.
Church, WLW.
Church, WOAW.
12:30—Church, WBCN.
1:00—Organ recital, WHN.
1:30—Concert, WNAC.
1:50—Church, KOA.
2:00—Church, KNX.
Church, KFI.
Orchestra, WWJ.
2:30—Concert, WOO.
Church, KGW.
Concert, WGBS.
Forum, WJZ.
3:00—Concert, WLIT.
Church, KFI.
Vespers, WGR.
Church, KGO.
Recital, WMCA.
Church, WCAE.
Songs, WEAF.
Sermon, WSAI.
Religious service, WHN.
3:30—Music, WJZ.
Rally, WNAC.
3:35—Orchestra, WGY.
3:55—Vespers, WJZ.
4:00—Recital, WCAE.
Church, WEAF.
Organ recital, KDKA.
Organ recital, WGR.
Concert, WHN.
4:30—Concert, WHN.
Chapel, WFI.
4:45—Vespers, KDKA.
5:00—Orchestra, WHN.
Concert, KYW.
5:10—Church, WCCO.
5:15—Concert, WOAW.
5:30—Stringed Trio, WHN.
Songs, WJZ.
6:00—Concert, WBCN.
Concert, WNAC.
Vespers, WHAS.
Organ recital, WOO.
6:30—Concert, WCAE.
Concert, KOA.
6:45—Church, WNAC.
7:00—Concert, WLIT.
Orchestra, WJZ.
Orchestra, WMCA.
7:15—Organ recital, WGR.
7:20—Roxy, WEAF, WCAP, WEEI, WWJ, WCTS.
7:30—Concert, KGO.
Church, WGR.
Church, WOO.
Church, KDKA.
7:45—Church, WKRC.
8:00—Recital, WJZ.
Church, WGY.
Religious service, KYW.
Vespers, KFI.
8:15—Orchestra, WJY.
Talk, WMCA.
8:20—Church, WCCO.
8:30—Recital, WJZ.
Church, WLW.
Church, WREO.
Organ recital, WLS.
8:45—Orchestra, WGY.
9:00—Concert, WBZ.
Orchestra, WJZ.
Church, KNX.
Concert, WBCN.
9:10—Forum, KDKA.
9:15—Organ recital, WEAF, WCAP, WEEI, WWJ, WCTS.
9:30—Concert, WGBS.
Concert, WLW.
10:00—Recital, WJY.
Violin recital, WGY.
Church, KGW.
Violinist, WJZ.
Concert, WBCN.
Weather report, WCCO.
Specialty, WHN.
10:15—Concert, WCCO.
10:30—Talk, KFI.
10:45—Orchestra, WHN.
10:50—Church, KOA.
11:00—Church, KNX.
Concert, KGW.
Concert, WKRC.
11:15—DX signals, WHN.
12:00—Concert, KNX.
Church, KGO.
Recital, KFI.
Orchestra, WKRC.
Chapel, WOAW.
1:00—Specialty, KNX.
2:00—Orchestra, KFI.
0:00 p. m.—Lain & Son classical concert; Vocal and instrumental artists, with pipe organ accompaniment.
9:00 p. m.—Classical concert: Lulu Raben, violinist; Irene Zinter, pianist; Edna Gribnitz, soprano.
10:00 p. m.—Popular programme.

WCAE, PITTSBURGH, PA.
(461 METRES)
TO-DAY

3:00 p. m.—People's Radio church services.
4:00 p. m.—Concert.
6:30 p. m.—Dinner concert transmitted from William Penn Hotel.

WCCO, MINNEAPOLIS-ST. PAUL
(416 METRES)
TO-DAY

12:00 noon—Westminster Presbyterian Church, Minneapolis, Rev. J. E. Bushnell, D. D., pastor.
5:10 p. m.—House of Hope Presbyterian Church, St. Paul, Rev. H. C. Swearingen, D. D., pastor.
8:20 p. m.—Second Church of Christ, Scientist, Minneapolis.
10:00 p. m.—Weather report and baseball scores.
10:15 p. m.—Classical programme: Mrs. Ethel Adams Sherman, soprano; Miss Elsa Jache, pianist; Mrs. James Bliss, accompanist; Harry Phillips, baritone.

WEAF, NEW YORK CITY
(492 METRES)
TO-DAY

3:00 p. m.—"Sunday Hymn Sing," auspices Greater New York Federation of Churches, Dr. William B. Millar, presiding officer.
4:00 p. m.—Interdenominational services, auspices Greater New York Federation of Churches. Address by Rev. Percy E. Schoemaker, D. D., pastor of Jamaica Methodist Episcopal Church, Queens, New York city. Music by the Alda Brass Quartet, consisting of Clara Haven, Elenor Betts, Helen Batchelder and Cora Sauter; Federation Radio Ensemble with Lotta Madden, soprano; Mildred Bryars, contralto; Louis Caton, tenor, and Arthur Billings Hunt, baritone and musical director.
7:20 p. m.—"Roxy and His Gang."
9:15 p. m.—Organ recital.

WEEI, BOSTON, MASS.
(476 METRES)
TO-DAY

7:20 p. m.—"Roxy and his gang."
9:15 p. m.—Organ recital.

WJZ, NEW YORK CITY
(455 METRES)
TO-DAY

9:00 a. m.—Children's Hour: Original stories by the authors, music by the composers; comic stories by the originators of famous comedies.
10:40 a. m.—Chimes from Grace Church.
11:00 a. m.—West End Presbyterian Church services; sermon by Dr. A. E. Kiegwin.
2:30 p. m.—Sunday Radio Forum; Dr. Raymond L. Forman.
3:30 p. m.—Joint recital; Cameron Eustlee, pianist, and Doris Sheldon, contralto.
3:55 p. m.—St. George's Episcopal Church vesper services; Sixteenth street and Stuyvesant square; rector, Dr. Karl Reiland; George W. Kemmer, organist and choirmaster; Mozelle Bennett, violinist.
5:30 p. m.—Dextra Male Chorus, jubilee singers.
7:00 p. m.—Nathan Abas's Hotel Pennsylvania Concert Orchestra.
8:00 p. m.—Eunice Maxwell Howard, pianist.
8:30 p. m.—Walker Moore, baritone; Keith McLeod, accompanist.
9:00 p. m.—Joseph Knecht's Lakewood Farm Inn Orchestra; Jan Weber, director.
10:00 p. m.—Godfrey Ludlow, violinist.

WGBS, NEW YORK CITY
(316 METRES)
TO-DAY.

2:30 p. m.—Day at the Actors' Fund Home, Staten Island. Entertainment by stars of yesterday and to-day.
9:30 p. m.—"Faust," Verdi's opera, with professional cast, chorus, full orchestra.

WGR, BUFFALO, N. Y.
(319 METRES)
TO-DAY.

3:00 p. m.—Vesper services by Rev. H. Boettger of Grace Lutheran Church.
4:00 p. m.—Organ recital by John F. Gunderman, Jr.
7:15 p. m.—Pre-service organ recital by William Wall Whiddit.
7:30 p. m.—Evening service, Central Presbyterian Church, Dr. R. J. McAlpine, minister.

WGY, SCHENECTADY, N. Y.
(379 METRES)
TO-DAY

11:60 a. m.—Service of First Unitarian Society, All Souls Church, Schenectady, Rev. Ernest Caldecott, pastor.
3:35 p. m.—WGY Symphony Orchestra, Leo Kilwen, conductor; Marietta White, soprano, soloist.
8:00 p. m.—Service of All Souls Unitarian Church, Schenectady, N. Y.
8:45 p. m.—Hotel Commodore Orchestra of New York, Bernhard Levitow, conductor.
10:00 p. m.—Violin recital by Godfrey Ludlow.

WHAS, LOUISVILLE, KY.
(400 METRES)
TO-DAY.

11:57 a. m.—Organ music.
12:00 noon—Church service under the auspices of the First Christian Church; the Rev. Dr. E. L. Powell, pastor.
6:00 p. m.—Vesper song service under the auspices of the First Unitarian Church; the Rev. Dr. Lon R. Call, minister. Soprano soloist, Mrs. Neal Loomis; contralto soloist, Miss Caroline Gauld; baritone soloist and accompanist, Reginald W. Billin.

WIP, PHILADELPHIA, PA.
(508 METRES.)
TO-DAY.

10:45 a. m.—Morning serice, broadcast direct from the Holy Trinity Church, Philadelphia; Rev. Floyd W. Tomkins, D. D., rector.
3:30 p. m.—Programme to be announced.

WJY, NEW YORK CITY
(405 METRES.)
TO-DAY.

8:15 p. m.—Bernhard Levitow's Hotel Commodore Concert Orchestra.
10:00 p. m.—Grace Divine, contralto; Evelyn Smith, accompanist.

WKRC, CINCINNATI, OHIO.
(326 METRES.)
TO-DAY.

7:45 p. m.—Church services, Walnut Hill Christian Church, Rev. J. J. Castleberry.
11:00 p. m.—Classic programme of instrumental and vocal selections.
12:00 midnight—Murray Horton's Hotel Alms Orchestra.

WLIT, PHILADELPHIA, PA.
(394 METRES)
TO-DAY

3:00 p. m.—Concert by the Florentine quartet.
7:00 p. m.—Benjamin Franklin Hotel Concert Orchestra, W. Irving Oppenheim, director.

WLS, CHICAGO, ILL.
(345 METRES)
TO-DAY

8:30 p. m.—Ralph Emerson at Barton organ; WLS Little Brown Church in the Vale.

WOO, PHILADELPHIA, PA.
(508 METRES.)
TO-DAY.

2:30 p. m.—Musical exercises opening Bethany Sunday school.
6:00 p. m.—Sacred recital on grand organ, Clarence K. Bawden.
7:30 p. m.—Evening services from Bethany Presbyterian Church. Broadcasting will include an organ recital from 7:30 to 7:45 by Miss Caroline Quigg; sermon by the pastor, Rev. Dr. A. Gordon MacLennan.