RADIO LORE FOR NOVICE AND EXPERIENCED FAN

Special Superheterodyne Can Be Used at Home or When Travelling

Small Tubes Employed Making Possible Operation with Dry Cells for Both Filament and Plate Current Supply.—Designed for Inside Loop Antenna

BY LESLIE G. BILES

The receiver described herewith was designed especially for the vacationist, but it is also available for home use.

This particular model is for use with small tubes of the 199 type exclusively, and therefore may economically be operated with dry cells for both filament and plate current supply. Although no provision has been made for use with an outside antenna, the only additional apparatus necessary is a small coil or antenna adapter. This coil may be placed either inside or outside the cabinet.

The circuit used is the usual superheterodyne circuit, with a straight Hartley oscillator, although only two intermediate-frequency transformers are used instead of the usual three.

The two-stage intermediate-frequency transformers, which are of the iron-core type, and an air core filter sharply tuned to 50 kilocycles, are incased in a metal container which acts as a shield and thus reduces the tendency of the transformers to pick up strays and other extraneous interference.

The first detector circuit is made slightly regenerative by the use of the Rice split loop. This is a decided advantage, as it increases the sensitivity and amplification as well as sharpening the tuning of the loop condenser.

The operation of the set is not critical, although the tuning is extremely sharp. It is very stable in operation, due to the special design of the amplifier and cannot be made to oscillate even though the grids are run eight to 10 volts negative. The potentiometer used in this set cannot be made to cause the amplifier to oscillate, and operates practically as a true volume control.

The receiver is supplied in kit form (knock-down) or may be constructed from material already in your possession, with the addition of the essential parts such as the 50-kilocycle transformer unit and oscillator coupler.

The following materials were used in the set here described.

Two variable condensers, .0005 mfd. capacity.

One radio-frequency transformer unit (50 kilocycles).

One oscillator coupler.

One double-circuit jack, type 102A.

One single-circuit open jack, type 101.

One rheostat, six ohms.

One potentiometer, 400 ohms.

Three binding-posts.

One socket-rack with five UV199 sockets.

Two sockets, 199 type.

Two audio transformers, ratio 3½ to 1.

Two .5 mfd. capacity by-pass condensers.

Two fixed mica grid condensers, .00025 mfd. capacity, with grid-leak clips.

Two fixed mica condensers, .002 mfd. capacity.

One fixed mica condenser, .0075 mfd. capacity.

One midget condenser, .000045 mfd.

One grid leak, five megohms.

One grid leak, two megohms.

One panel, 7x18x3-16 inches.

Two Univernier four-inch dials.

If a factory-drilled and engraved panel is not used, the first thing to be done of course is to prepare the panel. A template is furnished with the kit and this should be laid directly over the front of the panel and the holes spotted with a scriber or centre punch.

The panel may be grained, after all holes have been drilled and countersunk, by rubbing it in one direction only with fine sandpaper and oil. After graining, the two indicator marks for the condenser dials should be cut with a scriber above the shaft holes and on a line with them. These cuts may be filled with "Chinese white," wax or some other white compound. All oil should of course be wiped from the panel and it can be cleaned off with a cloth saturated with alcohol.

The parts may now be mounted on the panel starting with the two variable condensers and the three binding posts at the right-hand end. Next, mount the radio-frequency transformer unit, the two audio transformers, the jacks, rheostats and potentiometer and gang socket.

All parts should be carefully examined and tested before starting the assembly. This is a very important precaution and whenever a set is being built the instruments should be examined and all parts tightened up before being put in the set as it is difficult to get a screw driver or pair of pliers down through a mass of wires to tighten nuts, screws or springs.

The small baseboard carrying the by-pass condensers, oscillator coupler, and first two sockets should be screwed to the panel in the proper position beneath the variable condensers. The sockets and coupler should be fitted on the baseboard in such a position that they will not strike the condensers no project to far to the rear or the sides. Their position may be marked, after which they may be screwed to the baseboard.

All lugs, which have previously been put on the various binding posts, should be tinned. We are now ready to begin with the wiring. The wiring may be done with either No. 20 magnet wire, with the insulation scrapped off, run in spaghetti, or with No. 18 Okonite flexible wire.

The latter is preferable as it is easier to handle and makes a neater looking job. But bar wiring would be extremely difficult, making many of the connections because there is less than one inch space between the connecting lugs on top of the transformer unit and the terminals of the sockets. Some of the transformer units are furnished with the terminals on the side of the transformer's case; this simplifies the wiring, but makes longer leads.

Rubber cushions are placed beneath the gang socket to reduce "microphonic" tube noises. If bus wire were used for the connection to the terminals of this gang socket it would make the assembly so rigid as to render the rubber cushion useless.

The screws holding the gang socket to the supporting brackets should be temporarily removed to permit making the necessary connections. Soldering lugs should be placed on each filament terminal of the sockets and the lugs turned so as to permit a piece of bus wire to be run through the holes. Then make all necessary connections to the transformer unit and the audio transformers before the gang socket is permanently fastened in place.

One side of the grid condenser is soldered direct to the grid terminal of the detector tube and the other terminal connected, using a piece of Okonite wire, to terminal No. 10 of the transformer unit. The filter tuning condenser is held in place by a piece of bus wire soldered to terminal No. 7; the remaining terminal is connected with flexible wire to terminal No. 8.

Battery leads are brought out directly from the wiring itself, which eliminates the use of battery binding posts and a certain amount of additional wiring if binding posts had been used. These connecting leads may consist of No. 18 lamp cord, soldered to the wiring at some point where it terminates in an instrument binding post so that any strain on them will be taken up by the instruments in the set.

The leads may be braided and tagged for their proper connections and should be about three to four feet long if they are for external connections, and about one foot long if the batteries are inside the cabinet.

Assuming the set to be completely wired, it is now ready to be connected to the batteries and tested.

The accessories required will be a single four-and-one-half-volt "C" battery, three dry cells, ninety volts "B" battery, seven Schickerling S600 tubes. True Blue power-plus, UV199 or similar tubes, and a Fiat tapped loop.

If an antenna is to be used with the set, a coupling coil can be made by winding 50 turns of No. 24 disc wire on a three-inch tube, topped at the centre. The three leads from this coil go directly to the set in place of the loop. A ten-turn primary coil of the same size wire is wound either at the centre of the tube or toward the grid end of the 50-turn coil, or if desired, may be placed directly on top of it.

In the preliminary test of the set the centre tap feature of the loop should be ignored. This may be done by short-circuiting the two bottom binding posts of the set and connecting them directly to one side of the loop. This will render the loop tuning control rather broad and simplify the preliminary testing of the outfit.

The batteries and loop having been connected, a single tube should be inserted in the audio socket at the right-hand end of the set, and the rheostat just barely turned on, and no more, at first. The phone plug being inserted, a slight click should be heard as the plug enters the last jack.

The second detector and first audio tubes should now be inserted in their sockets and the rheostat adjustment left unchanged. A click or squeal should be heard when the grid terminals of these tubes, or their sockets are touched. The two radio-frequency tubes may now be inserted, and the potentiometer moved from its positive to its negative end, with one and one-half volts "C" battery on the radio-frequency tubes.

A scraping noise should be heard as the arm is moved over the resistance sector, getting slightly louder as the negative end is reached. If the grid terminals of the radio-frequency sockets are touched, a squeal or click as before should be heard.

The oscillator tube, at the left end, and the first detector should now be inserted in their sockets, making all seven tubes in place. The oscillator coupler should be set full in, and the midget, or balancing condenser, all "out of mesh." The loop condenser should be set at about 20 or 30 degrees, and the oscillator condenser adjusted.

At some point a sharp click should be heard, indicating that the oscillator is in resonance with the loop circuit. At this point no signal can be heard, but if an outdoor antenna is used, the set is probably radiating slightly. This "click adjustment" is the only setting of the set where radiation is likely to occur, and it is virtuall negligible, especially where the loop is used.

An oscillator adjustment about five to 10 degrees either side of this click is proper for a given loop condenser setting, and is where a station can be heard. These two points, one either side of the click, will hold over the entire wave-length range of the set, which is from 200 to 600 metres. This means that each station may be heard at two oscillator adjustments, which sometimes is convenient, as, if interference is noticed at one point, the other adjustment may be used.

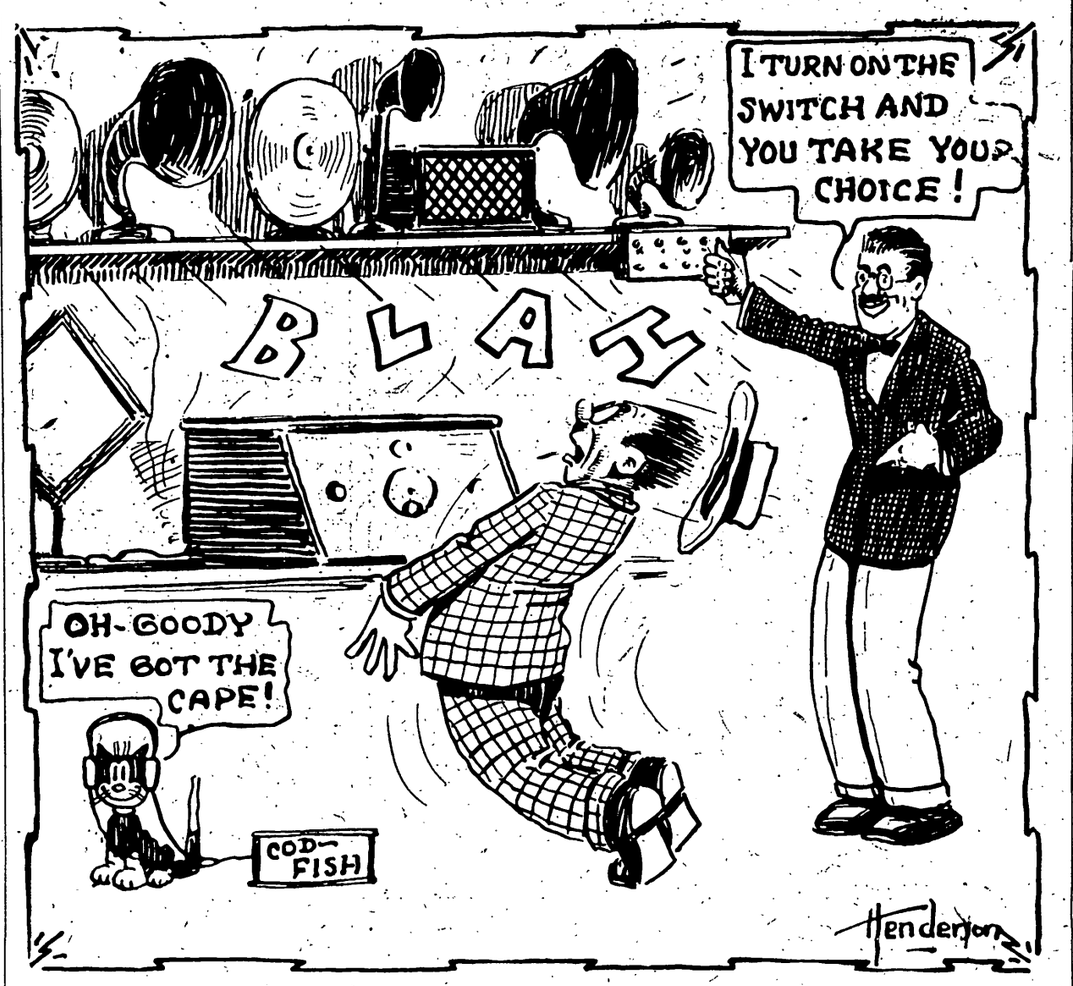
This click may be reduced in strength or eliminated, by loosening the oscillator coupling. This should be done on a weak signal, resetting both loop, oscillator and possibly balancing condensers for each adjustment of the oscillator coupler. The coupling should be as loose as possible for good signal strength, and when once adjusted should be left permanently set, as any change in its setting throws off the loop and oscillator condenser logging for stations heard.

After a weak station has been heard, the potentiometer arm should be moved from its positive to the negative end. The signal will increase in strength until the amplifier goes into oscillation with a thud or until it squeals. If oscillating, signals will be heard as a squeal, as on a regenerative set, although the same is true if the balancing condenser is set too far in. If the signal is strongest at the negative end, increase the radio-frequency "C" battery to three or four and one-half volts, and adjust the potentiometer for best signals.

If the set is now working properly and signals have been received, the loop should be disconnected from the set and reconnected using its centre tap. Starting with the balancing condenser all out, a signal should be tuned in. Some difficulty may be experienced unless the oscillator dial reading for some station has been recorded since the loop condenser will be very sharp, probably sharper than the oscillator condenser.

After the station has been found the balancing condenser should be moved in very slightly and the loop and oscillator retuned for best signals. This procedure should be continued until the balancing condenser has been so far increased as to cause instability or bad hand capacity in the set. It should always be kept at a point low enough to prevent hand-capacity effect and instability of the set, which will be evidenced by oscillation of the first detector on the lower waves or bad clicking at certain dial adjustments.

To-day's Hook-Up



The Dealer Demonstrates a Few Horns

MAKE COIL TESTS

Standards Bureau to Give Report on Types of Inductances.

During the last year the Bureau of Standards has carried on an investigation of the radio-frequency resistance and other properties of various types of coils suitable for use in radio receiving sets at broadcast frequencies.

Typical coils were constructed at the bureau and were adjusted to have the same inductance at a low frequency of one kilocycle. Measurements were made of the resistance and inductance at frequencies covering the broadcast band from 500 to 1500 kilocycles.

The coils included several types made up of solid and Litz wire, single and multiple layer coils of several types of winding, single-layer coils of various sizes of wire, and single-layer coils covered with different kinds of insulating binder. The voluminous results obtained have been summarized by means of curves and will soon be made public.

In order to improve the sharpness of resonance of some of the bureau's standard frequency meters, especially at frequencies above 1000 kilocycles, a study is also being made of the radio-frequency resistance of inductance coils used for this purpose.

Coils have been made of various types of conductors, including solid copper wire, copper tubing and Litz wire of various sizes and resistance measurements made at varying frequencies. It appears from the preliminary results that in the design of a standard frequency meter no single size or type of wire is suitable for all inductors, but that in order to obtain the best results different kinds of wire must be used on the coils for different frequency ranges.

Insulation of Masts.

When stretching an aerial between pipe masts, it is wise to rest the poles on a large glass insulator and pack the end of the mast in concrete. All guy wires should also be broken up by insulators. If the antenna wire is well insulated from the masts there will be no leakage from the wire to the earth through the masts. The mast will absorb energy from the passing waves and if they were grounded that energy will be conducted to the earth. It will be like having another aerial next to this one. The masts should be insulated as well as possible.

THE LIFE OF A TUBE

The next time Smith had occasion to inquire about a new radio accessory he took advantage of the dealer's offer to explain how to make tubes last longer.

"I know that tubes should be handled carefully so as not to break the filament," Smith began, but, aside from restricting the use of a set, I don't see how I can lengthen the life of a tube materially."

"That is probably because you do not know exactly what goes on inside one of these tubes," the dealer suggested.

"Oh, yes I do!" Smith assured him. "I've had all that explained to me. Negative electrons are attracted from the lighted filament to the positively charged plate. The antenna current impressed upon the grid in the tube controls the electronic flow and thus gives the same values, but on a magnified scale, in the stronger circuit."

"All very good," the dealer agreed. "That is popularly accepted theory, but how does the filament of the tube give up negative electrons indefinitely, and what is to prevent one from seeking some way of reversing the flow and of restoring the tube to normal condition when the set is not being operated?"

Smith thought this out while the dealer administered to the needs of a new radio fan who insisted upon asking for a grid condenser. Condensers, as the dealer explained, take their name from the places where they are used, but that in buying them they are merely "fixed condensers" or "variable condensers."

That settled, Smith told the dealer of a scheme suggested to him by a friend.

"He said," Smith explained, "that if I would reverse the current to the tubes, or something on that order, the tube would run backwards for a while and bring itself up to par again."

"Your friend was trying to give you some trouble," the dealer replied. "My advice would be to leave the wires alone; that is, until you are a little more experienced. The binding posts on your set are rather close together, if I remember rightly, and that means that you would be running the risk of touching a 'B' battery wire to the post for the tube filaments. It wouldn't be a case of coming in here for information then but of coming in to buy a new set of tubes. You should get a tube rejuvenator and do the job properly. The right instrument for this work is insurance against spoiling fair tubes in trying to make them better.

"But we're talking merely about bringing back a tube after it is pretty well worn out. I don't want you to think this covers the whole subject. Before you need a rejuvenator you need some hints on how to be kind to your tubes. Every time you operate the set you have an opportunity to prolong their lives.

"It is obvious that the less current you send into the tubes, the longer they will last, and what little current you send to them you should be careful to apply gradually. I haven't any patience with the man who will leave his set one evening with the rheostats way up and then the next evening when he starts off plug in for the full current load.

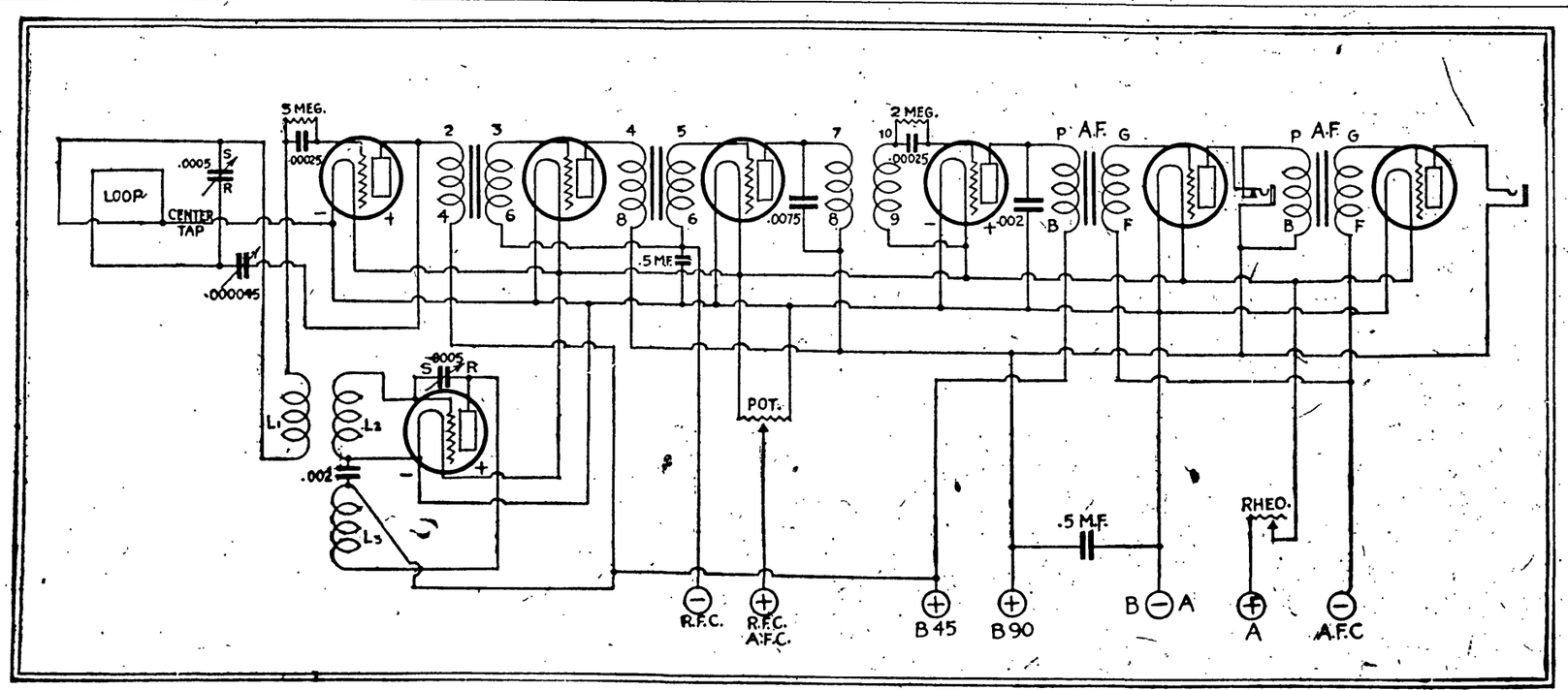
"If you have to do some intensive work with the set, such as trying to bring in a very distant station against many difficulties, you can spare the tube unnecessary wear by increasing gradually the amount of current for the filament. The danger of burning out the tube is practically confined to the filament, but it is true that the more 'B' current you have on the plate of the detector tube, let us say, the more negative electrons will be snatched from the filament wire and the sooner the tube will lose its efficiency.

"It is a common error to think the tube is dying out when the trouble is in the prongs that form the electrical connections with the socket. After many months of use these are apt to become dirty. It depends upon the climate in which the set is operated and the conditions under which it is used. But if the prongs are nat making good contact, of course, reception will be interfered with. I have even seen cases where a tube fitted into one socket much better than another, and with better results. It seldom does any harm to change the tubes around.

"You'll notice that whenever you have a station on the loudspeaker in good order, you usually can decrease the current to the tubes. It may be just a few degrees on the rheostats, but it may mark the difference between needing a few new tubes on Monday night instead of Saturday.

"Finally, there are tubes that are worn out before you get them. That's where you rely on the honesty of your dealer, unless you are an expert and have a means of testing the milliampere output of the tube, which is the measure of energy flowing from the plate of the tube under conditions at which the tube will normally operate. I could easily fool you by increasing the 'B' battery voltage above 90 volts or the grid potential from the 'C' battery beyond the 4½ volts while making the test."

Smith began to feel that he had made a friend in his dealer, which any experienced radio fan will admit is a landmark in the process of getting on in radio.



Schematic Diagram of Special Superhetrodyne for Home or Travel

Radio Supervisors Have Hands Full as Stations Increase

Department of Commerce Overwhelmed With Work As Commercial Houses and Amateurs Build Daily. Operatives Too Few for Inspections

"It does not seem to be generally understood that the existing radio law does not give the Secretary of Commerce control over interference caused by various electrical devices, which frequently causes a serious trouble with broadcast reception," said W. D. Terrell, chief of the radio section of the Department of Commerce, discussing some of the problems with which he is daily confronted.

The radio inspection service is constantly being called upon to investigate such sources of interference and to suggest some remedy to overcome it. As far as possible, investigations of this character are made and through co-operation on the part of owners of such systems relief is often made possible.

The Department of Commerce does not issue licenses or permits for the erection of a broadcasting station. The license is intended to control the operation of a station to insure non-interference as far as practicable. At the present time the inspection force of the radio section consists of nine supervisors, 16 inspectors and nine assistant inspectors, covering the territory of the United States, Alaska, Hawaii and Porto Rico, under the direct supervision of the Washington office. Officials of the department admit that it is a difficult task to give any degree of satisfaction in this large territory with the small force available.

Under the existing law, no fee is charged for an inspection, examination or a license, and the law is applicable to transmitting stations only. Receiving stations are not required to have a license. This is fortunate for the radio fans of the country, because they get a broadcasting service which is not rendered in any other country, most of which charge a fee for a license.

The radio art is changing from day to day, and the 1912 radio law is hard to apply to present conditions, according to the Department of Commerce. A determined effort was made during the last session of Congress to pass a new radio law which would bring the situation up to the minute, but the bill, which was introduced by Representative White of Maine, failed of passage. There is no question but what a strenuous effort will be made to pass new radio legislation at the next session of Congress.

The radio inspection service was organized in July, 1911, for the purpose of enforcing what was then called the wireless ship act, and two inspectors were appointed, of which Mr. Terrell was one. The purpose of this law was to require radio apparatus on all foreign and domestic steamers carrying 50 persons or more. This act was amended the following year, and it is under this old law of 1912 that the broadcast stations of the country are now operating.

"At that time we had 367 American merchant vessels equipped with radio," said Mr. Terrell, "now we have 2741. As far as possible the radio equipment on every vessel coming under the requirements of this act is inspected before the vessel clears in order to insure the safety of the vessel and to safeguard the lives of those on board. These inspections cover a thorough test of the transmitter, receiver, storage battery and the means of communication between the radio room and the bridge.

"This is considered the most important work of the radio inspection service and thousands of persons owe their lives to the efficiency of the radio equipment. There have been numerous cases of vessels completely destroyed at sea and every one on board saved as a result of assistance obtained through the SOS call."

The act to regulate radio communication was approved Aug. 13, 1912. This act, the one now in force, requires the inspection and licensing of all commercial and private radio transmitting stations, the adjustment of such stations to prevent interference and the assignment of call letters as a means of identification. It also requires the examination and licensing of all operators of all these stations.

When this law became effective it was necessary to increase the inspection force and 11 additional men were employed in the field and four men assigned to the Washington bureau. The country was divided into nine inspection districts covering the United States, Alaska, Hawaii and Porto Rico, with headquarters at Boston, New York, Baltimore, Atlanta, New Orleans, San Francisco, Seattle, Detroit and Chicago.

When this act went into effect there were 1224 amateur stations. Now there are 13,545. In 1912 there was only one transoceanic station in this country and at that time it was being used largely in an experimental manner. There are now 12 such stations carrying on a large volume of traffic daily between this country and European countries across the Atlantic and Hawaii and Japan across the Pacific. There is also a service between New Orleans and Central America.

In 1912 the International Radio Conference met in London. The International Radio Convention was amended and the Berlin Convention of 1906 was revised. The radio ispection service of the Department of Commerce enforces the terms of this convention.

Broadcasting service was not established as such until September, 1921. Prior to that time some broadcasting had been carried on to a limited extent in an experimental way.

In September three broadcasting station licenses were issued. Less than a year later, on July 1, 1922, there were 382 broadcasting stations and on July 1, 1923, there were 573 such stations. At the present time there are 562 broadcasting stations, one or more in every State and also in Alaska, Hawaii and Porto Rico.

Under the existing law the Government has no control over the matter of broadcast and the Secretary of Commerce does not exercise censorship in any way.

Discussing the difficulty of providing proper wave lengths for all who wish them, Inspector Terrell says: "It is a difficult problem to provide operating channels for all stations in the various services to use wave lengths from 150 to 200 metres, class A broadcasting stations from 203 to 278 metres, ships are required by law to use 600 metres, wave length is used for calling and distress purposes; class B broadcasting stations are assigned wave lengths between 283 and 546 metres. They cannot be assigned wave lengths closer to 600 metres because of the interference they would cause ship stations. Ships are also assigned the wave length of 705 metres for traffic and use 600 metres for general public service long-range traffice. Radio compass work is conducted on 800 metres. The larger vessels equipped with continuous wave transmitters use wave lengths of 2100 and 2400 metres.

The Bureau of Lighthouses use the wave length of 1000 metres. This service is just being developed, and those stations which are established at lighthouses or on light-vessels are to insure safe navigation of ships equipped with radio compasses or direction finders. There are between 100 and 200 vessels so equipped at present. The wave lengths between 1600 and 2000 metres are used for marine phone by the Government for various services and for point to point commercial service on land. The wave commercial service on land. The wave lengths between 2500 and 3100 are left for the exclusive use of Government stations. The wave lengths between 3100 and 7000 metres are used for commercial service and the Government for point-to-point service. The wave lengths above are used largely for transoceanic service running as high as 23,450 metres. In the range of wave lengths above 7000 metres consideration has to be given to foreign stations with which our stations must communicate and to insure satisfactory communications without serious interference."

The Bureau of Navigation annually publishes two lists of radio stations, giving the call letters and other particulars. One list contains the Government, commercial, broadcasting and special statics and the other list contains the amateur stations. The commercial and Government list is kept up to date by the publication of the Radio Service Bulletin monthly.

Efficient Antenna.

The antenna should be unshielded from all surrounding objects. It must not be strung in a courtyard between two buildings, nor should it be wired along the front or sides of a building running vertical to the roof. Aerials that are behind an apartment building or next to a wall will generally be shielded in certain directions and may never receive distant stations in those directions.

Use of Templets.

Templets are usually sent along with various instruments showing the spacing of the holes to be drilled. These should be used when drilling the holes. If made of paper, they can be pasted directly on the panel and the holes drilled through them. The paper is then removed with a wet cloth.

Guard Against Short Circuit.

The use of well-insulated wires and the tight clamping of all binding posts are the two most important safeguards against the danger of a short circuit around a set.

Care of Dry Batteries.

A dry battery will not stand much abuse. If it is accidentally dropped its internal connections are liable to be broken or the sealing compound on its top might become cracked through which moisture can seep, causing a leakage between cells which act as a continual drain on the battery. If dust accumulates on the top of the battery, wipe it off with a dry cloth, never with a wet rag, as this, too, will cause a drain or leakage between the terminals until such time as the moisture evaporates. Metal articles, such as trays, shears, metal pencils, etc., if placed on a battery will cause a possible short circuit.

TO RECORD RADIO TRANSMISSIONS

Viennese Inventors Call Device Aid in Picture Sending.

Conversations or Concerts May be Registered and Reproduced at Later Dates.—Steel Band Called Radiofilm Employed. — Prevents Missing Programmes.

Two Viennese inventors, Dr. Moreno-Levy and Franz Lornitzo, have built a new device in an attempt to solve the problem of making radio listeners independent of the time of broadcasting. For example, if President Coolidge broadcasts a radio set owner can adjust his receiver to make a permanent record of the talk.

In order to elminate static a special device for registering the sounds had to be made. The Danish engineer, Valdemar Poulsen, had already invented it in 1898. He passed a steel wire through an electro magnet of a telephone and magnetized it corresponding to the rhythm and strength of the sound waves. This principle is also used in his telegraphone, which permits a registration of a telephone talk in the absence of the telephone subscriber. Instead of a steel wire, the Viennese inventors pass a steel band through the magnet of the radio headphones.

This steel band is the radiofilm. It preserves the magnetization. If one wants to listen to the radio programme the steel band is allowed to run off. Again it passes a magnet in the winding of which currents are being induced corresponding to the magnetization of the steel band, according to the New York Times. These currents strengthen or enfeeble the magnet and bring a telephone diaphragm into vibration which produces vibrations of the air corresponding to those which actuated the microphone.

The reproduction corresponds entirely to the original transmission, but is feeble in sounds. Therefore no diaphragm is used, but the winding of the magnet is connected to the grid of the vacuum tube of the receiving apparatus in order to distribute the negative current.

Nothing is used here which had not been employed in other contrivances. But entirely new and for practical use are two important factors: A special device of drums which permits the band to unwind repeatedly without tangling. Then there is the replacement of the steel band through a steel disk which is selected by a magnet in spirals.

A marking permits the operator of the apparatus to fit the disk for the running off in such a way that he need listen in to only those parts of the programme which interests him. The rest can be omitted just as one can skip the pages of a book. The steel band or steel disk can be made receivable for a new transmission by demagnetization, which an inexperienced person can perform. The owner of a radio apparatus can, for example, listen to a programme in December which had been broadcast in August. He can preserve a broadcasting film which pleases him, as he would a phonograph record. The inventors point out that this possibility is of special importance in teaching by radio.

In the sending station also the principle of the radiofilm can find extensive use. Certain performances can be repeatedly rehearsed and then taken by a radiofilm before they are transmitted. The best film is chosen and passed through an electric magnet, the winding of which is over an amplifying tube similar to the receiving apparatus. The taking of the film can be done at any chosen time. Mistakes can be corrected, since the taking of the film and its transmission are not simultaneous. Films which are enjoyed by the listeners can be heard by them repeatedly. Since only electrical and magnetical forces are used as mediums between the sounds at the taking of the sending film up to the listening at the receiving film, it is to be expected that the fullness of sounds and the purity of tones will be in no way less than in a normal transmission.

The inventors have gone one step further still. Just as sounds can be transformed into electrical currents, so they are able to use light for the generation of currents through special devices. On it are based the various means of picture telegraphy and the attempts of solving the problem of television. In order to make the latter possible the single elements of the picture in the receiving apparatus must come in such a rapid succession that the last element has already arrived before the first impression comes to the mind. The transmission itself of pictures can be done according to one of the known methods. But in the receiving side the arriving picture film is not used to produce a light effect but over an electro magnet to the magnetization of a steel band. Since the magnetized spots lie closely on the steel bands its synchronic unwinding with the broadcasting apparatus proceeds with relatively slow velocity, yet in the reproduction of the picture the band can be allowed to run off as quickly as the inertia of the light relay which is being used permits it. If this inertia is low enough in order to change within the tenth of a second ten thousand alternating current impulses into corresponding light effects, then can be reproduced a picture of a square millimetre or a moving picture 10 by 10 centimetres.

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

10:45—Church, WEAN.
7:20—Concert, WJAR.
8:00—Concert, WEAN.
9:15—Band, WJAR.

OUT-OF-TOWN STATIONS

9:00—Children's Hour, WJZ.
10:30—Church, WGR.
Church, WGY.
10:40—Chimes, WJZ.
11:00—Chapel, WOAW.
Church, WJZ.
Church, WNAC.
11:30—Church, WREO.
Church, WMCA.
12:00—Church, KYW.
Church, WWJ.
Church, WHAS.
Church, WCAP.
12:30—Church, WCCO.
1:00—Recital, WHN.
1:30—Church, KOA.
2:00—Church, KNX.
Church, KFI.
Recital, KOA.
2:30—Recital, WHAR.
Forum, WJZ.
2:55—Recital, WHAR.
3:00—Vespers, WGR.
Church, KGO.
Orchestra, WOC.
Church, WCAE.
Songs, WEAF.
3:30—Concert, WGBS.
Concert, WNAC.
4:00—Church, WEAF.
Church, WCAP.
4:30—Recital, WJZ.
Concert, WSAI.
4:15—Church, WPG.
Church, WIP.
4:30—Recital, WJZ.
5:00—Concert, KYW.
Concert, WHN.
Concert, WZJ.
Church, WCAP.
5:30—Musicale, WEAR.
6:10—Church, WCCO.
6:20—Orchestra, WCAP.
6:30—Concert, WCAE.
6:45—Church, WNAC.
7:00—Concert, KOA.
Orchestra, WJZ.
7:15—Church, WIP.
Concert, WMCA.
7:15—Church, WIP.
7:20—Concert, WEAF, WCAP, WWJ, WCTS, WCAE, WEEI.
7:30—Concert, WFI.
7:50—Church, WHAR.
8:00—Orchestra, WGBS.
Concert, WGY.
Baseball scores, WJZ.
Vespers, KFI.
Concert, WNAC.
8:15—Recital, WJY.
Concert, WMAF.
8:30—Bible class, WFAA.
8:45—Baseball scores, WOC.
9:00—Concert, WHAR.
Orchestra, WPG.
Concert orchestra, WEAR.
Orchestra, WJZ.
Talk, WBZ.
9:15—Band concert, WEAF, WCAP, WCTS, WCAE, WWJ, WEEI, WFI.
9:30—Church, WCCO.
Recital, WJY.
10:00—Violinist, WJZ.
Church, WFAA.
Violinist, WBZ.
Violinist, WGY.
Church, WOC.
10:00—Concert, WIP.
Concert, WZJ.
10:30—Talk, KFI.
10:30—Church, KGO.
10:45—Weather report, KFI.
Church, KOA.
Concert, WHN.
11:00—Concert, KFI.
Baseball scores, WCCO.
Chapel, WOAW.
Recital, WPG.
Chapel, KNX.
11:15—Recital, WHAR.
11:30—Recital, WFAA.
Orchestra, WOC.
11:55—Church, KGW.
12:00—Recital, KFL.
Orchestra, KNX.
1:00—Special, KNX.
Concert, KFI.
2:00—Orchestra, KFL.

RADIO PROGRAMMES

WEAN will broadcast this morning's service of the Cathedral Church of St. Paul, Boston, beginning at 11 a. m. At 3:30 the concert of the First Corps Cadet Band at the Parkman stand, Boston Common, will be broadcast. Tomorrow night the station will feature the programme of Boston Lodge No. 10 of Elks. WJAR to-night will broadcast the Capitol Theatre entertainment for the early programme and at 9:15 will present a concert of Russian music by the Goldman Band in New York city. Wednesday night Old Timers' Hour will be continued with various request numbers.

WEAN, THE SHEPARD STORES,
(270 METRES.)
TO-DAY.

11:00 a. m.—Services of Cathedral Church of St. Paul, Boston.
3:30 p. m.—Broadcast from Parkman bandstand, Boston. First Corps Cadet Band, John B. Fielding, director. March, "On the Mall," Goldman; overture, "Il Guarany," Gomez; selection, "It Happened in Nordland," Herbert; two movements from "Ballet Egyptien," Luigini; "Reminiscences of Scotland" (by request), Godfrey; dedication and benediction from Les Huguenots; "Pas des Fleurs," Delibes; operatic selection, "Ernani," Verdi; "Evolution of Dixie," Lake; march, "First Corps Cadets," Fulton; "Star Spangled Banner."
8:00 p. m.—Conrad's Society Orchestra from the Horseshoe Piazza, Newport Casino.

MONDAY

11:55 a. m.—Time Signals.
12:00 m.—Shepard Colonial Concert Orchestra, Harold Sheffers, director.
12:10 p. m.—Weather Report.
12:15 p. m.—Musical programme.
4:00 p. m.—Musical Programme.
6:30 p. m.—WEAN Dinner Dance—Shepard Colonial Orchestra.
8:00 p. m.—Varied Programme, arranged by Boston Lodge No. 10, B. P. O. E.
9:30 p. m.—Dreyfus Casino Dance Orchestra, broadcast from Narragansett Pier Casino.

TUESDAY

11:55 a. m.—Time Signals.
12:00 m.—Shepard Colonial Concert Orchestra.
12:10 p. m.—Weather Report.
12:15 p. m.—Musical Programme.
4:00 p. m.—Musical Programme.
4:30 p. m.—Home Service Talks by Miss Gladys L. Peckham, Home Service Dept., Providence Gas Co.
6:30 p. m.—WEAN Dinner Dance—Shepard Colonial Orchestra.
7:30 p. m.—Naval Training Night, courtesy of Captain O. P. Jackson, broadcast from U. S. Naval Training Station, Newport.
9:00 p. m.—Dreyfus Casino Dance Orchestra, from the Narragansett Pier Casino.

WEDNESDAY

11:55 a. m.—Time Signals.
12:00 m.—Shepard Colonial Concert Orchestra.
12:10 p. m.—Weather Report.
12:30 p. m.—"Fifteen Minutes of Music Appreciation."
6:30 p. m.—WNAC Dinner Dance—Broadcast from the Hotel Westminster Roof Garden, Max I. Kruleo and his orchestra.
8:00 p. m.—Newport Community Night Programme under the direction of the Entertainment Committee, of the Newport Chamber of Commerce, through the courtesy of the Newport Beach Association.
9:30 p. m.—Dance Music—Rhodes Orchestra, Charles E. Culverwell, director, from Rhodes-On-The Pawtuxet.

THURSDAY

11:55 a. m.—Time signals.
12:00 m.—Shepard Colonial Concert Orchestra, Harold Sheffers, director.
12:10 p. m.—Weather report.
12:15 p. m.—Musical programme.
4:00 p. m.—Musical programme.
4:30 p. m.—Home Service Talks by Miss Gladys L. Peckham, Home Service Department, Providence Gas Company.
6:30 p. m.—WNAC Dinner Dance, Shepard Colonial Restaurant, Shepard Colonial Orchestra, direction Billy Lossez.
8:30 p. m.—Louis Calabrese's Newport Beach Dance Orchestra, broadcast direct from Newport Beach dance hall.
9:00 p. m.—Broadcast from Braves Field. Report of the Jim Maloney-King Solomon bout, courtesy Suffolk A. A.
9:30 p. m.—Louis Calabrese's Newport Beach Dance Orchestra, broadcast from Newport Beach dance hall.
10:00 p. m.—Dreyfus Casino Dance Orchestra, broadcast from Narragansett Pier Casino.

FRIDAY

11:55 a. m.—Time signals.
12:00 m.—Shepard Colonial Concert Orchestra.
12:10 p. m.—Weather report.
12:15 p. m.—Meeting of WEAN Noonday Club.
4:00 p. m.—Music.
6:30 p. m.—WEAN Dinner Dance, Shepard Colonial Orchestra.
Silent night.

SATURDAY

11:55 a. m.—Time signals.
12:00 m.—Shepard, Colonial Concert Orchestra.
12:10 p. m.—Weather report.
12:30 p. m.—"Fifteen Minutes of Music Appreciation."
6:30 p. m.—WEAN Dinner Dance, Shepard Colonial Orchestra.
8:00 p. m.—Broadcast from Loew's State Theatre, selections by the State Theatre Orchestra.
8:30 p. m.—Broadcast from State Ballroom, State Ballroom Orchestra, direction Lambert Brothers.
9:00 p. m.—Louis Calabrese's Newport Beach Dance Orchestra, broadcast from Newport Beach dance hall.

WJAR, THE OUTLET COMPANY,
(305.9 METRES.)
TO-DAY.

7:20 p. m.—Musical programme by Maj. Bowes and the "Capitol Gang," direct from the Capitol Theatre, New York city, by courtesy of the Capitol Theatre management. The first part of the programme will be taken direct from the stage of the theatre and will consist of music by the featured artists and the Capitol Grand Orchestra. The second part of the programme will consist of a special presentation by Maj. Bowes of vocal and instrumental artists direct from the broadcasting studio in the theatre.
9:15 p. m.—Goldman Band Concert, Edwin F. Goldman, conductor, direct from Hall of Fame, New York University Campus, New York city. Russian programme. Soloist, Viola Sherer, soprano.

MONDAY.

10:00 a. m.—Housewives Radio Exchange. A department conducted by Mrs. Wood on all matters of household interest.
1:05 p. m.—Studio programme. Fanhie Shapiro, vocal solos.
8:00 p. m.—"Berry Spring Time."
8:40 p. m.—Baseball scores.
8:45 p. m.—Stephen W. Hannon will deliver a talk on "Stolen Automobiles."
8:50 p. m.—Jack and Olive Cosgrove in a programme of semi-popular and popular selections.
9:10 p. m.—Thomas Masso, trumpeter, assisted by Helen Masso, pianist.

TUESDAY

1:05 p. m.—Providence Biltmore Concert Orchestra, under the direction of Erwin White, relayed from the dining room of the Providence Biltmore Hotel.
7:30 p. m.—Baseball scores.
7:35 p. m.—Paul Wigham, baritone soloist. Programme: "It Is Enough," "When the Dew is Falling," "A Blood-Red Ring Hung Round the Moon," "Recessional."
7:50 p. m.—Miss Doris Skipp, soprano soloist, of Perkins Institute for the Blind.
8:10 p. m.—Donald MacDonald, tenor soloist.
8:30 p. m.—Gold Dust Twins, relayed from New York city.
9:00 p. m.—"Eveready Hour."

WEDNESDAY

10:00 a. m.—Housewives Radio Exchange. A department conducted by Mrs. Wood on all matters of household interest. All questions submitted will be answered by radio.
1:05 p. m.—Studio programme, under the direction of Harold Strong, tenor.
7:30 p. m.—Raymond O'Brien, baritone, and Dorothy Hoyle, violinist.
8:00 p. m.—Concert by the United States Navy Band, under the direction of Lieut. Charles Benter, direct from Navy Barracks, Washington, D. C.
9:00 p. m.—"Old Timers' Hour." Programme of vocal and instrumental request numbers.

THURSDAY.

1:05 p. m.—Studio programme.
8:00 p. m.—Baseball scores.
8:05 p. m.—Braemore Dance Orchestra.
8:50 p. m.—Stephen W. Hannon will deliver the second of the series of talks on "Stolen Automobiles."
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 on all matters of household interest. All questions submitted will be answered by radio.
1:05 p. m.—The Woodstock Entertainers.
8:15 p. m.—William Martin, baritone soloist, and Leonard E. Langlois, violinist.
8:40 p. m.—Musical programme.
8:55 p. m.—Baseball scores.
9:00 p. m.—"Maine Creamery Hour."
11:00 p. m.—Providence Biltmore Dance Orchestra under the direction of Erwin White, relayed from the dining room of the Providence Biltmore Hotel.

SATURDAY.

1:05 p. m.—Studio programme.
Silent night.

WNAC, BOSTON, MASS.
(230 METRES)
TO-DAY

11:00 a. m.—Morning service from the Cathedral Church of St. Paul.
3:30 p. m.—Broadcast from Parkman bandstand, Boston, First Corps Cadet Band, John B. Fielding, director.
6:45 p. m.—Evening service, broadcast from Park Street Congregational Church.
8:00 p. m.—Broadcast from the Horseshoe piazza, Newport Casino, concert by Conrad's Society Orchestra.

WMCA, NEW YORK CITY
(341 METRES)
TO-DAY

11 a. m.—Services, Third Church of Christ, Scientist, of New York, Park avenue and 63rd street.
7:00 p. m.—Ernie Golden and his Hotel McAlpin Orchestra.

WHN, NEW YORK CITY
(360 METRES)
TO-DAY

1:00 p. m.—Loews Lexington Theatre organ recital.
5:00 p. m.—Roseland Dance Orchestra.
10:45 p. m.—Janssen's Hofbrau Orchestra.

WPG, ATLANTIC CITY, N. J.
(300 METRES)
TO-DAY

4:15 p. m.—Community vocal and instrumental recital St. James Episcopal Church.
9:00 p. m.—Hotel Traymore Concert Orchestra.
11:00 p. m.—Organ recital, auditorium of Atlantic City high school, by Arthur Scott Brook, city organist, assisted by Louisa Corson, soprano; Ida Taylor Bolte, contralto; John Charles Brown, tenor; William Watkins, bass, and Leslie Hughes, pianist.

WMAF, SOUTH DARTMOUTH, MASS
(441 METRES)
TO-DAY

8:00 p. m.—Programme from the Steel Pier Studio, Atlantic City; Veselli's Band and Comfort's Symphony Orchestra.

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

7:30 p. m.—Services from the Arch Street Presbyterian Church.
9:15 p. m.—Goldman Band concert.

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 Rev. John W. Wetzel.
2:30 p. m.—Sunday Radio Forum; Dr. Isaac Ward, of Washington, D. C.; musical programme.
4:30 p. m.—John J. Keating, tenor; Helen O'Connor, contralto; Lillian Doyle, accompanist.
7:00 p. m.—Nathan Abas's Hotel Pennsylvania Orchestra.
8:00 p. m.—Final baseball scores.
8:05 p. m.—Selections from Special Score of "Siegfried" under direction of Josiah Zuro.
8:35 p. m.—Max Kalfus, tenor.
9:00 p. m.—Lakewood Farm Inn Ensemble.
10:00 p. m.—Godfrey Ludlow, violinist.

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

8:15 p. m.—Recital. Mary Rashkin, pianist; Leon Kristel, tenor; Felix Vivier, saxophonist; Anne B. Tyndall, soprano; Creighton Allen accompanist.

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

3:00 p. m.—"Sunday Hymn Sing," under the auspices of the Greater New York Federation of Churches. Frank C. Goodman, presiding officer.
4:00 p. m.—Interdenominational services, under the auspices of the Greater New York Federation of Churches. Frank C. Goodman, presiding officer. Address by Rev. Claude C. Colle, pastor, Embury Memorial Methodist Episcopal Church, Brooklyn, N. Y. Music by Federation Quartet, with Lotta Madden, soprano; Mildred Bryars, contralto; Louis Caton, tenor; Sara Reynard, accompanist, and Arthur Billings Hunt, baritone and musical director.
7:20 p. m.—Musical programme by Maj. Edward Bowes and the "Capitol Gang," from the Capitol Theatre, New York city, by courtesy of the Capitol theatre management.
9:15 p. m.—Goldman Band Concert, Edwin Franko Goldman, conductor; soloist, Viola Sherer, soprano.

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

3:30 p. m.—Programme from Piccadilly Theatre Studio.
8:00 p. m.—Programme from Steel Pier Studio, Atlantic City, Veselli's Band and Comfort's Symphony Orchestra.

WBZ, SPRINGFIELD, MASS.
(331 METRES)
TO-DAY

9:00 p. m.—Talk by George Leo Patterson on "Starlore and Religion" interspersed with organ music, broadcast direct from the Estey Organ Studio.
9:45 p. m.—Programme of violin, piano and 'cello selections by Malcolm H. Holmes, violinist, Richard B. Greenman, 'cellist, and Myron U. Lamb, pianist from Estey Studio.

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

10:30 a. m.—Service of the First Presbyterian Church of Albany, N. Y.
8:00 p. m.—Studio programme from WJZ.
8:45 p. m.—Lakewood Farm Ensemble from WJZ.
10:00 p. m.—Godfrey Ludlow, violinist, from WJZ.

WCAP, WASHINGTON, D. C.
(469 METRES.)
TO-DAY.

12:00 m.—Service at New York Avenue Presbyterian Church of Washington. Dr. W. I. Chamberlain, secretary of Board of Foreign Missions of the Reformed Church, New York city, will preach the sermon.
5:00 p. m.—Service held at the Peace Cross, Washington Cathedral. Rev. William F. Pierce, D. D., President of Kenyon College, Damvier, O., will preach the sermon.
7:20 p. m.—Musical programme by Maj. Bowes and the "Capitol Gang" from the Capitol Theatre, New York city.
9:15 p. m.—Goldman Band concert, Edwin Franko Goldman, conductor.

WCTS, WORCESTER, MASS.
(268 METRES.)
TO-DAY.

7:20 p. m.—Capitol Theatre Gang.
9:15 p. m.—Goldman Band concert, Edwin Farnko Goldman, conductor.

WHAR, ATLANTIC CITY, N. J.
(275 METRES.)
TO-DAY.

2:30 p. m.—Short sacred recital by the Seaside Hotel Trio.
2:45 p. m.—Sermon, Rev. Robert A. Elwood, pastor of the Boardwalk Church.
7:30 p. m.—Evening service, Chelsea Baptist Church, Dr. Thomas J. Cross, pastor.
9:00 p. m.—Concert by the Seaside Hotel Trio and soloists.
11:15 p. m.—Strand Theatre, organ recital.

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

4:15 p. m.—Musical services from the St. James Episcopal Church, Atlantic City, N. J.
7:15 p. m.—Evening service from Holy Trinity Church, Philadelphia, Rev. Floyd W. Tomkins, D. D., rector.
10:00 p. m.—Feature programme.

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

3:00 p. m.—People's Radio Church services.
6:30 p. m.—Dinner concert transmitted from William Penn Hotel.
7:20 p. m.—Capitol Theatre Gang.
9:15 p. m.—Goldman Band.

KYW, CHICAGO, ILL.
(536 METRES)
TO-DAY

12:00 a. m.—The service of the Second Presbyterian Church, 20th street and Michigan avenue, will be broadcast. Rev. Josiah Sibley, pastor.
5:00 p. m.—Studio concert.

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

1:00 p. m.—Hennepin avenue M. E. Church, Minneapolis, Rev. Lucius H. Bugbee, D. D., pastor.
6:10 p. m.—House of Hope Presbyterian Church, St. Paul, Rev. H. C. Swearingen, D. D., pastor.
9:30 p. m.—First Baptist Church, Minneapolis, Rev. W. B. Riley, D. D., pastor.
11:00 p. m.—Weather report and baseball score.
11:15 p. m.—Classical concert—Mr. and Mrs. William MacPhail, violin and piano; Mrs. Emerson Harris, contralto.

WFAA, DALLAS, TEX.
(475.9 METRES)
TO-DAY

8:30 p. m.—Radio Bible Class, Dr. William M. Anderson, pastor of the First Presbyterian Church, teacher; Bible study and gospel song.
10:00 p. m.—Service of the First Methodist Episcopal Church, South, Dr. Carl C. Gregory, pastor.
11:30 p. m.—Jack Gardner's Orchestra.

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

10:30 a. m.—Morning service direct from Central Presbuterian Church, Buffalo; Dr. R. J. MacAlpine, minister.
3:00 p. m.—Vesper services, under the auspices of the Buffalo Council of Churches.

KGW, PORTLAND, ORE.
(491.5 METRES)
TO-DAY.

2:35 p. m.—Services from First Presbyterian Church.
11:55 p. m.—Services from First Church of Christ, Scientist.

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

2:00 p. m.—Morning services under the direction of the Los Angeles Church Federation.
8:00 p. m.—Vesper services under the direction of the Federated Church Musicians.
10:30 p. m.—MacDaniel's nightly doings and amusement information service.
10:45 p. m.—Father Ricard's sun spot weather forecast. Music appreciation chat.
11:00 p. m.—Programme presented by Mr. Newman, manager, from the stage and studio of the Metropolitan Theatre.
12:00 p. m.—Classic hour, featuring Elsa Zelinda Foley, the vest pocket prima donna; Mai Aline Moran, pianist; Viola Morrow, violinist; Charles F. Brand, flutist.
1:00 a. m.—Programme presented by L. A. Examiner.
2:00 a. m.—Packard Eight Orchestra, under the co-direction of Bill Hennessy and Chet Mittendorf. "Tiny" Dick Barton, soloist.

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

3:00 p. m.—Service, Calvary Presbyterian Church, San Francisco, Rev. Ezra Allen Van Nuys, D. D., minister.
10:30 p. m.—Service, Calvary Presbyterian Church, San Francisco, Rev. Ezra Allen Van Nuys, D. D., minister.

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

2:00 p. m.—Service of First Baptist Church, Denver, Dr. A. H. C. Morse, pastor; Oliver W. Gushee, organist and director.
7:00 p. m.—Sunday afternoon organ recital: First Baptist Church, Denver, Oliver W. Gushee, organist and director.
10:45 p. m.—Service of First Baptist Church, Denver, Dr. A. H. C. Morse, pastor; Oliver W. Gushee, organist and director.

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

2:00 p. m.—First Presbyterian Church of Hollywood, Rev. Stewart P. MacLennan.
11:00 p. m.—First Presbyterian Church of Hollywood.
12:00 p. m.—Ambassador Concert Orchestra, Josef Rosenfeld, leader.
1:10 a. m.—Beverly Hills Nurseries courtesy programme.

WSAI, CINCINNATI, OHIO
(326 METRES)
TO-DAY

4:00 p. m.—Radio sermonette, subject, "Some Principles of Christian Living." WSAI radio chime concert, Robert Badgley.

WEAR, CLEVELAND, OHIO.
(390 METRES)
TO-DAY.

5:30 p. m.—Ivan Francisco, Sunday afternoon musicale.
9:00 p. m.—Park Theatre Orchestra, Angelo Vitale conducting, from Loew's Park Theatre.

WHAS, LOUISVILLE, KY.
399.8 METRES)
TO-DAY.

12:00 a. m.—Church service under the auspices of the Broadway Christian Church, the Rev. Dr. W. N. Briney, pastor. Mrs. Harry W. Long, organist and choir director.

WOC, DAVENPORT, IA.
(484 METRES.)
TO-DAY.

3:00 p. m.—Orchestra concert. The Palmer Little Symphony. Erwin Swindell, conductor; Paul J. Vipperman, tenor.
8:45 p. m.—Baseball scores.
10:00 p. m.—Church service. Rev. W. W. Vose of the Illinois Christian Missionary Society; subject, "Sure Foundations."
11:30 p. m.—Musicay programme. The Palmer Little Symphony; Erwin Swindell, conductor.

SUPER-POWER TEST MADE IN NEW YORK

Waves Tuned Out with Little Difficulty, Fans Report.

Listeners Disappointed at Lack of Expected Volume.—Signals Unable to Dominate Heavy Static. Full Strength Not Released in Initial Trial.

America's first super-power broadcasting station, rated with an output of 50 kilowatts, went on the air four miles from Schenectady recently.

High-powered broadcasting has been much talked about for the past year. Thoughts of it have caused many to utter protest that high-powered waves radiated from a 50-kilowatt station would seriously interfere with smaller stations and that present-day sets would not tune out the strong signals. On the other hand, engineers claimed that high power would benefit listeners as well as the radio business. Among the advantages they explained that super-waves would overcome static, penetrate daylight over long distances and give consistent reception on simple receivers, thereby reducing the initial and operating cost of listening-in.

The first official tests of the Schenectady 50-kilowatt transmitter were made on three nights recently, beginning at midnight, Eastern Standard Time. The wave length used was 380 metres, the same channel WGY employs for its regular programmes. The big station used 2XAG, an experimental call granted the General Electric Company by the Department of Commerce.

Super-power has had so much advance publicity that the waves, when they reached New York from Schenectady, 160 miles, on the night of the first test were somewhat disappointing, says the New York Times. There was no great roar of volume, as might have been expected. The waves could be tuned out without any difficulty by a super-heterodyne or a three-tube neutrodyne. The static was quite heavy and the waves were not strong enough to dominate it. The quality, especially the piano music, was excellent, showing that the high power could apparently be modulated successfully on wave lengths under 1000 metres. It was later learned that only 35 per cent. of the power was modulated on the initial test.

The station sounded quite like any broadcast transmitter, and unless the announcer had revealed the fact that 50 kilowatts were being used to set the ether in vibration, the average broadcast listener would have been justified in thinking that good atmospheric conditions were responsible for an increase in volume, compared with WGY's regular installation. In fact these super-power signals did not seem like 50 kilowatts, when compared with WHT, Chicago, broadcasting at the same time on a nearby wave length with a power output under five kilowatts.

These were the observations made 160 miles from Schenectady. At different distances the effect was undoubtedly vastly changed, because some of the waves would reach the receiver by land waves, travelling close to the surface of the earth, and other antennae, further from the transmitter, would be likely to pick up waves travelling via the Heaviside layer in the sky and thus obtain greater volume. On the second and third tests more power was menulated and the volume increased.

There was no doubt in the minds of auditors in the metropilitan district that they were picking up more power from the up-State station, but the volume was not as great as might have been expected of 50 kilowatts, according to trained listeners. Ten miles from New York, on Long Island the waves of 2XAG during the first test were not as strong as WEAF, rated at 3 kilowatts. WGY has always had difficulty with its waves waxing and waning in and out of the New York area, and this same fading was noticeable during the super-power tests.

Work on the Schenectady plant was rushed so that the station could be tested and data collected on super-power for the national radio conference, scheduled to be called by Secretary Hoover this fall. It is understood that the experiments will be conducted up to that time, so that listeners will probably have plenty of opportunity on numerous occasions after midnight to tune in on super-power.

Based on the reception of WGY's new installation, there does not seem to be any cause for alarm in the New York area regarding interference of the Bound Brook station. However, WJZ's new apparatus will be only 35 miles from Manhattan, and just what interference is likely to be produced cannot be predicted, especially in the winter, when the waves, aided by ideal atmospheric conditions, will cover a much greater distance.

It is not known whether or not WGY's engineers released the full capacity of the tranmitter into the ether during any of the experiments last week. The announcer said they were testing the new "50-kw. station," but did not say the entire output was on the air. If it was running at full power it would seem that a similar station at Bound Brook would be beneficial to New York radio fans rather than a source of interference.

Time alone can tell because of the many variable factors governing radio transmission and reception. Differences in the distance of the transmitter from the receiver, varying conditions of the intervening land, directional effects of the aerials and peculiarities of the atmosphere make it necessary to have an actual test to determine if the plans worked out on paper can be made to come true.

Keep Filament to Normal Point.

Do not burn the thoriated filament tubes at too great a brilliancy; do not turn up the filament rheostat above normal. This will force too much current through the filament and release the electrons so fast that the filament will become "run out" or free electrons in a short time. The filament will burn all right, but there will be little or no signals.