BROADCAST PROGRAMS FROM EVERYWHERE

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RADIO WORLD

Title Reg. U. S. Pat. Off.

Boy Scouts enjoy winter sports at Kanowahke Lakes, near Tuxedo, N. Y. The harmonica band follows a radio tune while another scout fishes through the ice and listens in.—(C. Photonews).

VOLUME FOUR OF

RADIO WORLD

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How to Build a Neutrodyne Receiver

By R. L. Dougherty

WITH the exception of the super-heterodyne there is no receiver at this time getting as much attention in the radio field as the neutrodyne. Its advantages are many, as any user of this circuit will testify.

Foremost among the features of the neutrodyne is the absence of oscillations. This in itself is one of the most desirable features of a radio-frequency receiver, as it gives ease of operation and freedom from horrible squeals that would ordinarily attend the operation of a multi-tube receiver of the radio-frequency type. The tendency toward oscillation was the bugbear of all experimenters who desired the distance obtainable with a radio-frequency receiver, with the clear, quiet programs possible.

The principle of the receiver is fairly well known, but for the information of those who do not understand it, a short explanation of the whys and wherefores of the circuit will be of interest. In the first place, where we are concerned with nullifying or making impossible oscillations in a radio-frequency circuit we have to deal with a type of feedback commonly called "capacity coupling" or "capacity feedback." This capacity feedback in the circuit takes place between the elements of the tubes, when the circuits are in exact resonance. The grid and the plate elements of the tube, being closely confined, make it possible for the circuit to produce and maintain oscillations by the capacity between these elements. Needless to say this capacity feedback is exceedingly small, but it is, notwithstanding, enough to entirely unbalance the circuits and cause oscillations in the inter-tube circuits. Thus if one circuit or tube starts to oscillate it will produce like oscillations in the second or third tubes, when the circuits of these tubes are in resonance with the other circuit. In this case the circuit will resemble the regenerative type when it is allowed to "spill over," and the set will act as a transmitter permitting the radiation of energy into the antenna circuit which will interfere by the beat method with any receiver capable of picking an audible note out of the ether.

There are several methods in common use to prevent oscillation of radio-frequency circuits, foremost among which is that of introducing resistance into the radio-frequency circuits, making it impossible, however, to get the most efficient use out of the receiver. This is because the resistance renders it hard for the minute radio-frequency signals to pass. Another method is by the use of a potentiometer in the filament circuit, so that the potential on the grid can be changed. In this case when oscillation occurs, just enough negative potential is permitted in the circuit to overbalance the positive or capacity feedback. Both these methods have their certain limitations, because as the number of tubes increases, the control of the oscillations increases likewise, or rather the difficulty of controlling them increases. Any one who has tackled a three-tube radio-frequency receiver and has relied upon either of the above methods of accomplishing this purpose will agree with this statement.

Professor L. A. Hazeltine finally evolved a method of overcoming the difficulty attendant on the ocillations of the tube circuit due to capacity coupling, by introducing minute capacities in the grid circuits of the tube, which allow just enough capacity of a reverse polarity to be introduced into each circuit to over-

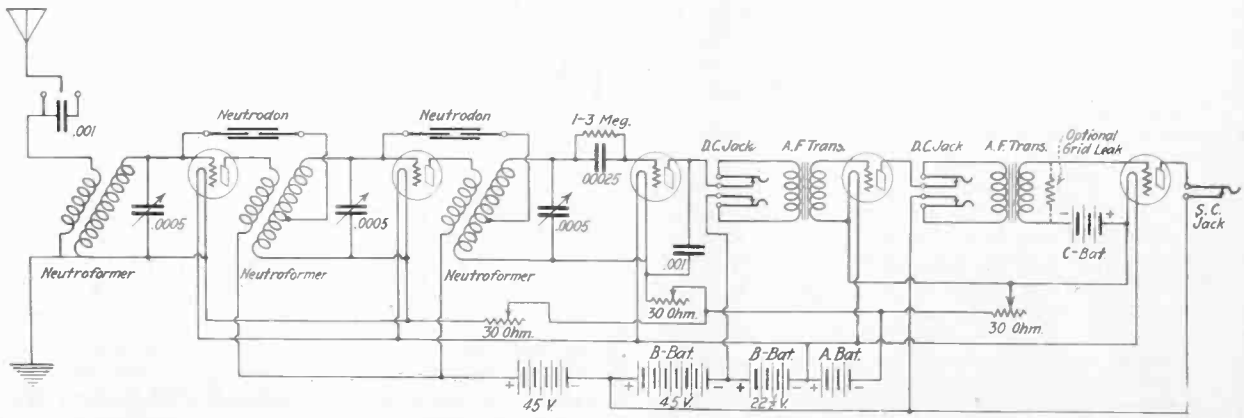


Diagram of a five-tube neutrodyne receiver incorporating two stages of neutralized radio-frequency, detector, and two stages of audio-frequency. Special radio-frequency transformers, called "neutroformers" are used, with minute capacitances called "neutrodons" for the checking of tube oscillation by capacity neutralization. The condenser in the antenna circuit is necessary when an antenna longer than 60 feet is used.

come the tendency of the circuit to oscillate. This method of stopping the oscillation of the circuit is known as the capacity neutralization method, and brings into play condensers of minute capacity. These condensers generally take the form of two small surface electrodes, enclosed in a suitable insulating medium such as glass, with a sliding outer plate so arranged that it can cover any part of either of the two other plates. These condensers are placed in the circuit at predetermined points which allow just enough bias to be introduced to counteract the positive bias that produces the oscillation.

Now that the principle of the circuit has been explained to some extent, the next step is to prepare to build the circuit. One warning must be given to all prospective builders, and that is to use only licensed parts. These parts are easily obtainable from shops where radio accessories are sold, and should bear some identification stating that they are made under license granted by the Independent Radio Manufacturers. To use parts other than those licensed is to invite disaster, as the special air core transformers and small neutralizing capacitances that must be used, call for manufacture under special conditions.

It will be necessary, therefore, to get the following parts before the receiver can be attempted: Three neutroformers (special air core transformers); three condensers of the special type used with these transformers. (These condensers generally come with the neutroformers, or in case the dealer sells them separately he will recommend some particular make of condenser that has been found by the manufacturer to serve the purpose); two neutrodons. (The special small capacitances used for the neutralization of the oscillations). The panel should be 27″ x 7″ by 3/16″ and should be of either radion, bakelite or formica.

Apparatus other than that mentioned will be: Five sockets; three rheostats (30 ohms, as UV201A tubes are to be used); two amplifying transformers; three jacks (one single circuit, two double circuit); one mica fixed condenser .00025, with grid leak of 1—3 megohms; two .001 mfd. fixed condensers; necessary A. B and C batteries.

This is the apparatus that is necessary for the successful construction of the receiver. As before stated, use only the best of parts, and when buying the neutrodons, neutroformers, and parts of the radio-frequency circuits, use only the standard parts that are made and distributed by licensed manufacturers.

(This is the first of a series of articles illustrating and instructing the reader on how to make and operate the neutrodyne receiver. The cautions given the reader on the point of using standard apparatus are necessary, as the parts, when home-made, are generally inefficient and will not work correctly.)

The Radio Primer

TAKING THE TROUBLE OUT OF RECEIVERS.

While it is known that sometimes things go wrong with receivers, nine cases out of ten can be laid to the incorrect manipulation of the receivers. Take, for instance, the popular three-coil honeycomb receiver that is so simple to tune, and to get loud and distinct signals out of. Three out of four operators will complain that they cannot get the distant station in. They can get the squeal that means the carrier wave of the station, and the low muffled sound of the band, but bring it in they cannot.

In the first place, these receivers generally incorporate too much capacity for proper tuning. The booklet coming with the coils states that their wave length when shunted by a 43-plate condenser is so and so, and the builder very unwisely incorporates this large capacity in order to conserve money that would be necessary were a smaller condenser used. It is better to buy four or five extra coils (duplicates of the smaller ones) and get the most out of your receiver than to use a large condenser. So the first rule is to use smaller condensers. A good 23-plate condenser across the secondary, and another 23-plate condenser in the primary (with a series-parallel switch) will often help 100 per cent, as the tuning is not so critical.

Another point is that most of the operators of these receivers work the sets with the tickler too close to the secondary. This coupling should be just tight enough to produce the desired amount of regeneration necessary for loud and clear signals.

When tuning in, always remember that the primary coil should be just large enough to cover the wave length desired, with the antenna used. With a 23-plate condenser, no coil should be used which makes it necessary to utilize the scale on the condenser below 10° or above 85°. If it is necessary to go lower than the coil will reach, use a smaller coil and counterbalance with the condenser. If the coil does not reach high enough, use one size larger and compensate with the condenser again. The secondary coil should be of a higher value than the primary and the tickler should be the smallest value coil that can be used and with which enough energy can be fed into the secondary to produce satisfactory regeneration.

Tuning these sets is simplicity itself. The primary coil is manipulated until it is at close proximity to the secondary, and the tickler is coupled rather close. The two condensers are then manipulated almost in step with one another until the carrier wave is heard. Then the primary and the tickler coupling are loosened and the two condensers again tuned to get the circuits in resonance. After this is done the fine touches are made by slightly varying either the primary or tickler coupling until distortionless signals are possible.

The arrangement of the condensers plays a large part in the tuning. In the primary condenser, the rotor should be connected so that it is in the ground side of the circuit. In the secondary circuit, the rotor is connected so that it is in the filament-grid return that leads to the minus filament side. This will effectively remove any body capacity when the set is tuned.

Know Any "Kinks?"

IF you have any particular little fancy way of doing something that you think would interest the other fans, write and tell RADIO WORLD and give a sketch showing it. If it is a handy kink, many fans will be grateful to you.

UP-TO-THE-MINUTE BROADCAST LIST

A complete list of broadcasting stations in the United States and a list of those in Canada, Cuba, Mexico and Porto Rico, corrected to February 8, 1924, was published in RADIO WORLD for February 16, 1924.

Another list, corrected up to the minute, will appear in an early issue.

Receiving Loops of the Army Message Center, Washington, D. C.

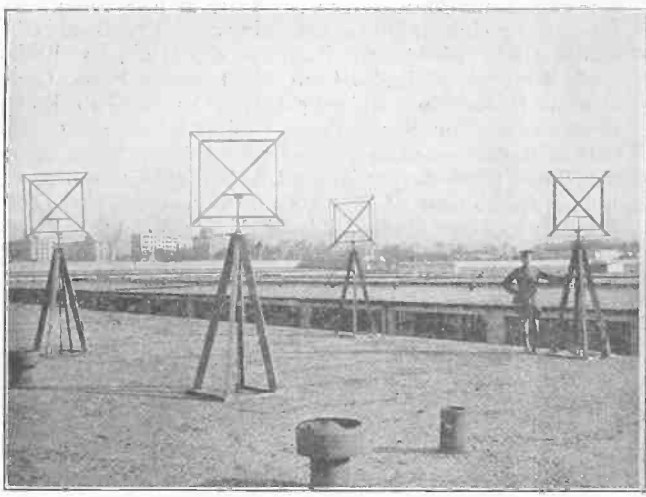


Fig. 1. These four loops atop the Munitions Building, pick up all the incoming radio signals addressed to the Army Message Center at Washington. Dispatches from army stations in Atlanta, Indianapolis, San Antonio, and Columbus, are received regularly, and frequently messages from Fort Douglas, Utah, and all Pacific Coast naval stations are picked up. All high-powered European stations are also heard. Each of the loops contains ten turns of bare antenna wire, forming a square 43½ inches on a side; the turns are 7/16 inches apart.

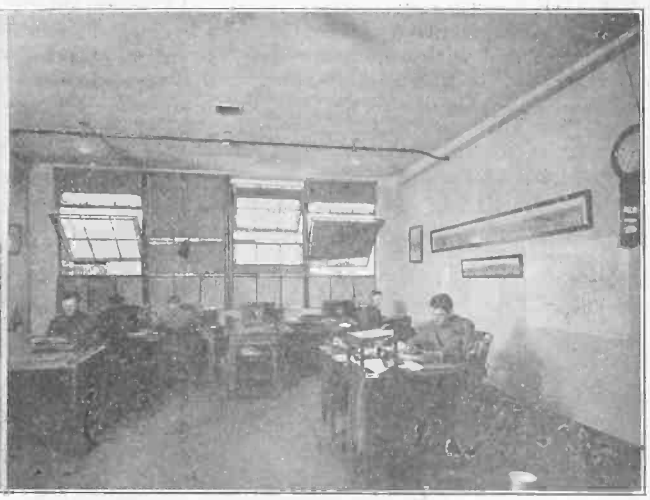


Fig. 2.—Receiving room, Army Message Center, Washington. Messages picked up on the four loop aerials above are brought into the army receiving room to a loop tuner condenser, connected with an amplifier employing three stages of radio amplification, one detector tube, and two stages of audio amplification. Four operators are seen copying incoming messages, and at the right sits Captain R. B. Woolverton, Signal Corps, chief of the Message Center. These men are expert operators and keep in constant touch with all the Army Signal Corps stations day and night.

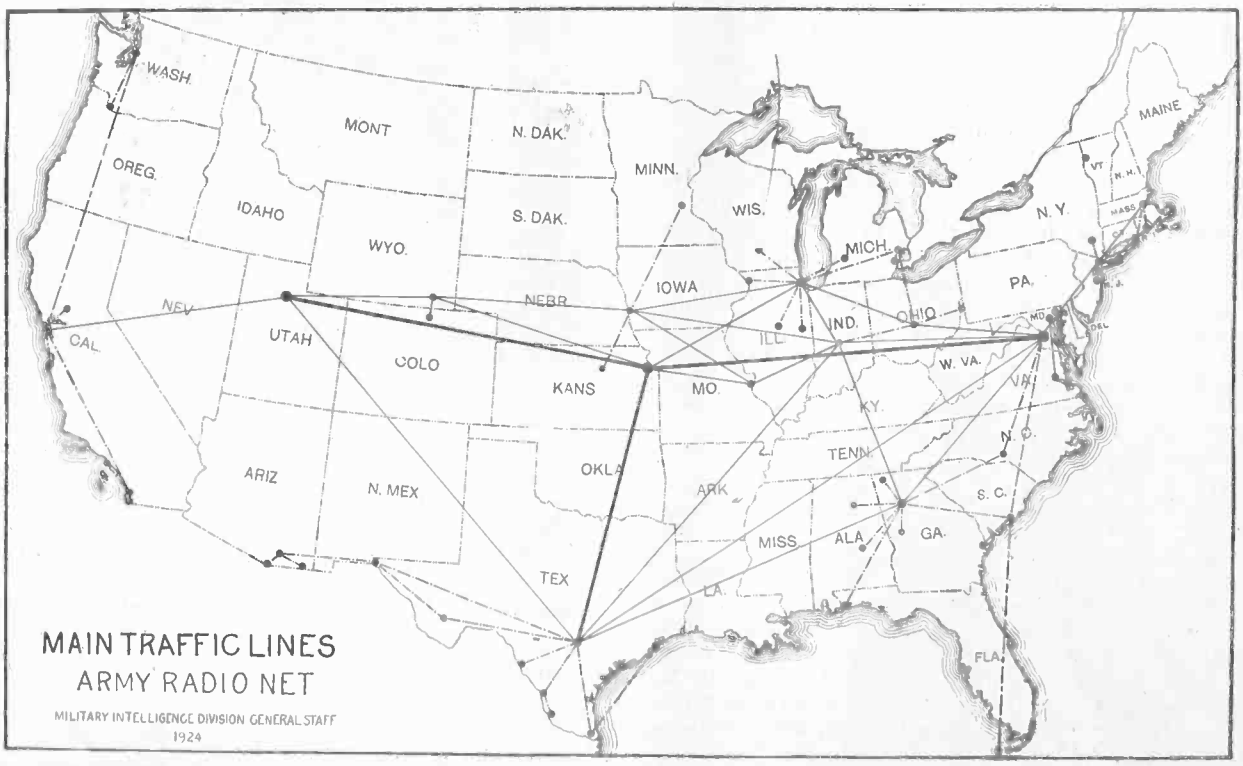


Fig. 3. Map of the Army radio net. The main arteries of the army, or Signal Corps, radio net reach practically every state of the Union, at least all corps areas, which in turn have smaller nets throughout their jurisdictions. The Message Center in Washington is in touch with all army stations and posts constantly.

Second District Executive Council Radio Show in New York City

THE fourth annual radio show and convention of the Executive Radio Council, Second District, opened with a bang on the evening of March 3, at 7 o'clock. It was held in the grand ballroom of the Hotel Pennsylvania, New York City, and was "some show."

(C. Foto Topics)

The exhibit of the Bronx Radio Club, at the Fourth Annual Radio Show and Convention, New York City. It typifies the type of shack the amateurs are preparing to erect this summer to aid the Life Saving Corps. This one will be put up at City Island. S. Schneider, President of the Club, is working the station.

Long before the official opening, crowds of impatient fans gathered in little knots in the lobby, or on the stairs leading to the ballroom, and renewed acquaintances or made new ones. This year's show, differing from those of former years, was well attended by older folks, both women and men.

As to exhibits, there were all the newest creations in radio—neutrodynes, super-heterodynes, superdynes, plain and fancy sets of every other type. Manufacturers vied with each other this year in producing the most efficient as well as the best looking sets, and it cannot be said that any of them failed in their purpose.

In the manufacturers' section the following displayed interesting exhibits for the benefit of the spectator: John U. Constant Co.; Eisemann Magneto Corp.; R. E. Thompson Mfg. Co.; Electric Storage Battery Co., De-Forest Radio Tel. and Tel. Co., Radio Corporation of America, Amsco, American Radio Relay League, General Radio Co., Waterbury Button Co., Pathe Phonograph & Radio Corp., Norman W. Henley Publishing Co., F. A. D. Andrea, Inc., Fansteel Products Co., Haynes Griffin Co., The Bristol Co., The Acme Apparatus Co., Radio Improvement Co, Metropolitan Battery Service Co., The Crosley Radio Corp., The Freed-Eisemann Radio Corp., The General Instrument Co., The Dubilier Condenser and Radio Corp., A. H. Grebe & Co., Inc., Radio Stores Corp., Jefferson Electric Mfg. Co., Jewell Electrical Instrument Ca., Allan D. Cardwell Mfg. Co., Federal Tel. & Tel. Co., National Carbon Co. and Eveready Battery, U. S. Signal Corps, Willard Storage Battery Co., Adams-Morgan Co., Duplex Engine Governor Co., and Radio Receptor Co., Primary Manufacturing Co., Kellogg Switchboard and Supply Co., Malone Lemmon Products.

The following radio clubs were well represented on the mezzanine floor of the ballroom, where some very interesting club exhibits were shown: The Bronxville Radio Club, Bloomfield Radio Club, Hill City Radio Club, Ridgewood Radio Club, Hackensack Radio Club, Passaic Radio Club, Ridgefield Park Radio Club, Radio Division Hudson River Yacht Club, Radio Club of Jamaica, Radio Association of Greater New York, Hudson Radio Club, Bronx Radio Club, Radio Club of Long Island, Radio Club of Brooklyn, Stuyvesant Radio Club, Rockville Center Radio Club, M. M. Radio Club.

There were numerous features staged throughout the week, such as the speed code contest, for both men and women; interesting movies of radio industry; talks by prominent men in the radio field; and the awarding of prizes for the best club exhibits.

(C. Foto Topics)

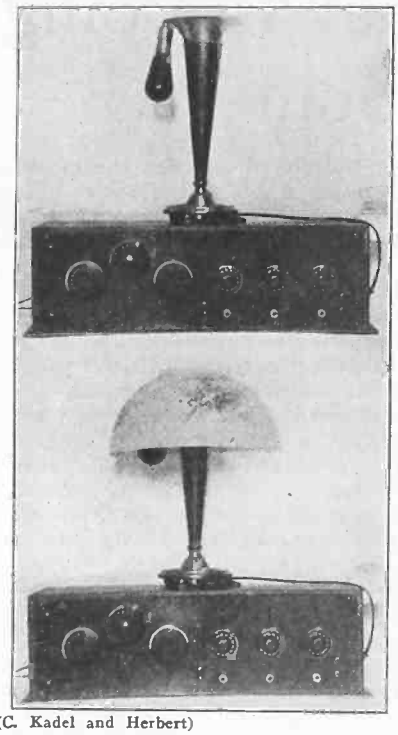
The Army exhibit at the Fourth Annual Convention, New York City, held the interest of the fans. This illustration shows Captain Livingston Swentzel, working the new "77A" portable army receiving-transmitting set, operated on the folding loop shown.

New Broadcasters

Supplemental List of Limited Commercial Broadcasters

Call	A Stations	Frequency Kcys.	Wave Lgth. Meters	Power Watts
WBBS	First Baptist Church, New Orleans, La.	1200	250	100
KFNZ	Royal Radio Company, Burlingame, Calif.	1300	231	10
WBBW	Ruffner Junior High School, Norfolk, Va.	1350	222	50
WCBE	Uhalt Radio Company, New Orleans, La.	1140	263	5
KYQ	Electric Shop, Teves & Joaquin Co., Ltd., Honolulu, H. I.	1110	270	100

A Loud Speaking Lamp



(C. Kadel and Herbert)

This is how Thomas Styles, of Athenia, N. J., combines the usefulness of an old phonograph horn as a loud speaker with the utilitarian reading lamp. The glass shade has the effect of acting as a resonator, thus making the loud speaker very loud and clear.

Radio Round Table

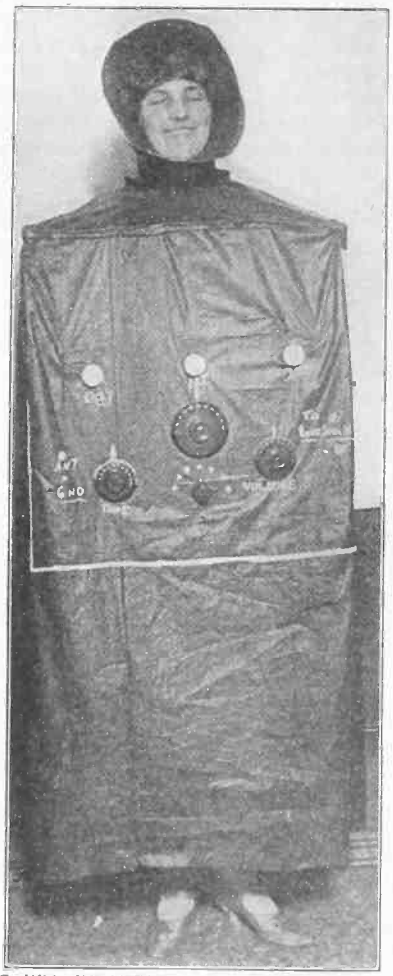
A BIG round table at the National Press Club in Washington, D. C., has come to be a radio table, where members of the Fourth Estate foregather each noon to discuss radio developments of the day or, better, perhaps, the night before. Once it was a golf table, and some of the uninitiated refused to sit there; the discussions were so specific and technical it embarrassed those not afflicted with the "disease." With the coming of winter, however, the members of the round table began to discuss radio golf as well as its earthly forbear, whereupon some skeptical members resigned their seats for newcomers, refusing to "listen-in" to such etherial matter as permeated the atmosphere. Many who chanced to sit there once, however, came back another day. A few who purchased crystal sets are now proud owners of super-multiple tube sets.

The result is a circle of radio enthusiasts, who occasionally welcome exponents of the broadcasting arts, and some of the artists. Among the guests have been C. Francis Jenkins, who hopes to broadcast pictures and movies soon; Wendell Hall, the migratory musician; Bruce Lum, of WRC; and Bill Pierson, of WCAP.

Miniature Set Maker Goes One Better

THE Washington newspaper correspondent, Harold Lane, who made one of the simplest and most compact complete receiving sets yet recorded, has gone himself one better. First he attached a small fixed crystal detector on the back of a single ear phone which he carried in his vest pocket, connecting it to an aerial and ground.

A Toddling Radio Set



(C. Wide World Photos)

Miss Charlotte Clark, of Rockville, Center, N. Y., in her costume as a full-fledged radio set which created considerable talk at the seventh annual masquerade ball of the University Forum of America, held recently at the Belleclair Hotel, New York City.

Now he has found a very small crystal detector, which he has placed inside a single head phone. His set complete consists of a single loud-speaking phone with the leads. He carries it with him, listening in on the strongest local station sending whenever he finds a convenient aerial or ground. On its face the set looks like an ordinary apartment telephone receiver, but it works.

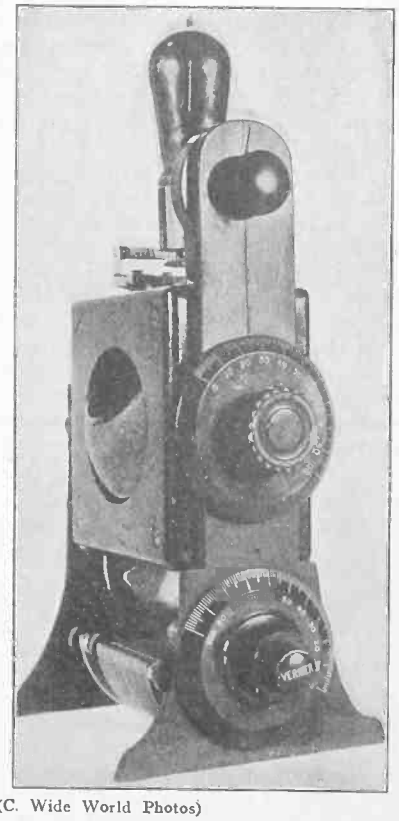
Big Public Awaits Good Radio Fiction

THERE is a dearth of good radio fiction. With an audience composed of the millions of listeners-in who are familiar with radio at least in a minor degree, and with the many romantic aspects of radio itself at hand, it seems strange that more of our writers of really thrilling tales of adventure and mystery do not turn their talents to radio stories. Here is a fallow field waiting the development of the competent craftsman.

Atlantic City Wants Broadcast Station

THE Chamber of Commerce has asked Atlantic City, N. J., officials to establish a 500-watt broadcasting station in the Albany Avenue High School, in order to advertise the shore resort to all parts of the country and perhaps abroad. Installation, it is estimated, would cost approximately $22,000, with maintenance and operating expenses $28,000 per year.

Built on the "Up and Up"



(C. Wide World Photos)

Unique radio set built by Walter F. Palmer of Brooklyn, N. Y. Instead of using the regular panel, the set was mounted on upright strips of insulation, and is "open-faced" as shown.

Broadcasting Abroad—What Is Doing Outside the United States

AMERICAN radio listeners-in should appreciate the excellent broadcasting rendered in this country, the freedom from taxes, licenses and the red tape which hampers fans abroad, delaying development in general.

There are foreign lands where broadcasting has not yet developed or is prohibited. In some countries there is a monopoly, only one service being available; in others heavy fees are levied. In several places sets are sealed except for the reception for one wave length or a special station making the great American game of "Aerial Fishing" or 'Radio Golf" impossible.

Over here in the "Land of the Free," one of the chief delights of a fan is his ability to tune in on any of the 538 stations broadcasting. But in Australia, for example, receivers are sealed by the Government, after being set to pick up only the station to which a fee is paid. Australian broadcasters are permitted to charge whatever they please, and there are not many stations which eliminates any great variety of programs even though fans could afford several subscriptions.

In Ireland radio interest is described as "awakening," and the formation of a radio association in Dublin is announced. This organization will attempt to foster the interests of its members and cooperate with governmental authorities. The association plans to open a broadcasting station, experiment extensively, publish a periodical and aid in reducing restrictions on reception.

Weekly broadcasting of concert programs on a wave length of 400 meters by the station at the Ecole Modele de Telegraphie in Marseilles has begun in France. This broadcasting will be under the special patronage of the "Petit Provencal," a local daily newspaper, acting in conjunction with the National Congress of Wireless Telegraphy.

Although no broadcasting stations have as yet been established in Spain, there is considerable interest of late in radio sets of sufficient range to receive broadcasts from Paris, The Hague, Berlin, and London.

The public broadcasting stations in Chile are innovations, according to advices reaching Washington. One station is owned by the Chile Radio Co., in Santiago, and the other is the property of Antonio C. Besa, at Vina del Mar. As a rule, nothing but phonographic entertainment is transmitted for about 200 receiving sets in Chile. The broadcasting of instrumental concerts, as well as current news, will be undertaken soon.

In the Argentine, radio is more popular, and has developed further. In Buenos Aires, alone, there are estimated to be at least 9,000 amateur receiving sets. Practically all of the well-known types have been introduced there.

Radio in Sweden has been controlled by the King, but the Royal Telegraph Board has prepared a draft of a new law which is more liberal. It is believed that with a decrease in fees for transmitting and receiving stations, greater interest will be aroused in broadcasting. A combination seeking to control broadcasting in Sweden has not yet succeeded in obtaining an exclusive concession, although it has improved licensing and reduced the fees from listeners-in. Three hundred licenses have been granted by the King, and fifty applications are pending before the Telegraph Board, which is authorized to issue receiving licenses at 92 cents each instead of $10.50, the previous royal fee. The plan now being considered includes the erection of many small broadcasting stations by the government instead of a few large stations. To date, there are five broadcasting stations in Sweden, but communication is also to be had with stations in Copenhagen, Berlin, London, and Manchester.

In Mexico an increasing number of requests for establishing both transmitting and receiving stations has been received by the Director General of Telegraphs. Broadcasting stations are now subject to a tax of 100 pesos per annum, and receiving sets are taxed 5 pesos a year. There are now only three broadcasting stations, all operating from Mexico City.

The Polish Government also regulates radio stations in that country. A new bill is before the Diet, under which amateur or privately owned receiving sets may be authorized with government supervision. But little radio manufacturing is done in Poland, the output of the single factory being taken up by the national army, so fans do not have much choice.

The "Radio Stude," the first official Berlin broadcasting station, began operation at Christmas, with an excellent program and a "political" Christmas greeting from Chancellor Dr. Marx, advices from Berlin state. The broadcasts during the holidays carried recitations, vocal, instrumental and dance music far beyond the borders. In Germany, the programs were received with much enthusiasm. Radio will soon become a power in music-loving German circles, it is predicted. Classical music and operatic music predominate. The comparison with American programs is interesting.

The radio Stude transmitted a few song hits or dance numbers, but mostly folk songs and opera excerpts. Nearly every German loves music, and great numbers today who cannot afford the exorbitant prices charged in theatres, may now listen in on classical music.

Chinese natives are prohibited from purchasing and operating radio receiving sets, by a recent order of the Chinese Ministry of Communications. The order states that such sales and operation are against the law and that offenders will be punished severely. Foreigners living in Chinese territory also come under this ban, and steps are being taken to prevent the sale of radio apparatus or its installation by Chinese living in foreign settlements. Foreign residents in the Hongkong colony use radio by special permit, however.

My Radio Experience

WRITE your experience with radio—anything that is unusual, extremely interesting or that has a new angle. It need not be of a technical nature.

For instance, not long ago, a man living in a Michigan town was using his radio set early in the morning. He smelled smoke, and while making investigations found that there was a fire in the house. Quick action succeeded in saving the lives of his family.

Here is another example: A young man using his head phones at his home on the Maine coast and who understood code heard an SOS call from a ship at sea and discovered that his own father was on the ship which fortunately was saved. In other words, we want TRUE STORIES, that have unusual or dramatic interest and that have happened to our readers.

The best of these will be published from week to week and paid for at our regular space rates.

Write on one side of paper only, and the copy should be typewritten if possible. Articles to be from 100 to 500 words in length. Address, Experience Editor, Radio World, 1493 Broadway, New York City.

How to Connect Radio-Frequency Amplification to Existing Tuners So as to Reduce Radiation

By Leroy Western

RADIO WORLD is putting up a big fight against the bugaboo which threatens the broadcast listeners of this country—radiation from oscillating receiving sets. The help of each and every individual at all interested in radio is needed to put this over and to reduce the interference now found in many congested and even semi-congested districts. One squealing receiving set in a neighborhood can spoil more other people's programs than a man with a chronic cold at a musical recital.

In a recent article by the writer it was pointed out

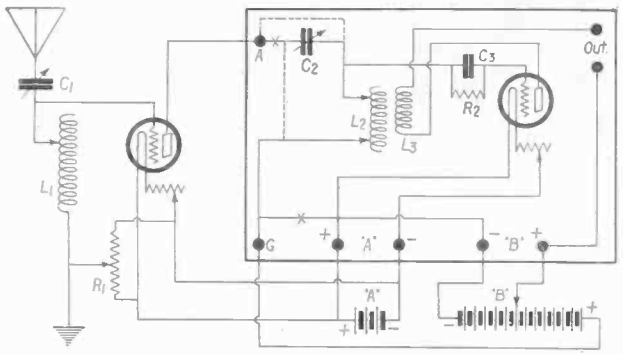


Fig. 1. Diagram showing how one stage of radio-frequency can be added to a regulation single-circuit regenerator, which increases its distance and stops it being a "squealer."

how various steps may be taken to reduce or eliminate radiation from a receiving set. The writer always preferred the use of the word "radiation" rather than "reradiation" when applied to the interfering oscillations from a receiving set. The reason for this is that the word radiation means just exactly what takes place in a receiving set wherein an oscillating current is radiated into the ether from the antenna. The term reradiation applies more specifically to a receiving set which, being in the state of oscillation, heterodynes an incoming signal and reradiates the signal from its antenna. Sometimes long distance reception on a crystal detector is apparently done in this manner as a high-powered receiving set in a state of oscillation may be receiving from a DX station whereupon if you are within its reradiation range you may be able, on a crystal detector, to hear the signals. Thus reradiation is in some cases a boon to various nearby receiving sets, but even at that it causes interference. The howling and squealing caused by the oscillations of a receiver should be more properly termed radiation and in this sense the writer uses it throughout.

One of the benefits of this fight against radiation is that many radio receiving operators will be led to add another tube to their sets, thereby increasing the receiving range considerably, making their sets much more sensitive and reducing QRM in the neighborhood.

Two circuits which employ an extra tube for cutting down radiation are illustrated herewith. Fig. 1 shows how a single tube may be added to a single-circuit tuner giving the effect of one stage of radio-frequency amplification and cutting down the possibility of the set radiating. The instruments enclosed in the rectangle in Fig. 1 will be seen to constitute a standard single-circuit tuner. It will be necessary before connecting up the extra tube to remove the two leads marked with X's and insert the two connections shown in dotted lines. The lead from the ground to the "A" battery must be removed as otherwise the "B" battery would be directly short-circuited. The lead from the antenna to the variable condenser is removed and the other two connections inserted so that the variable condenser C2 will be shunted across L2, which is the primary or stator of a variocoupler. L3 is the rotor of the coupler and is connected in the ordinary manner. C3 should have a capacity of .00025 mfd. while R2 should be variable from one-half to three megohms. It might, however, be left fixed at about two megohms for all practical purposes, although in some cases better results will be obtained if it is variable.

In order to add the extra tube it will be necessary to employ a condenser, an inductance coil and a potentiometer. The first of the three, C1 in the diagram Fig. 1, should have a capacity of .001 mfd. L1 may either be a honeycomb coil or a one-slide tuning coil. R1, a

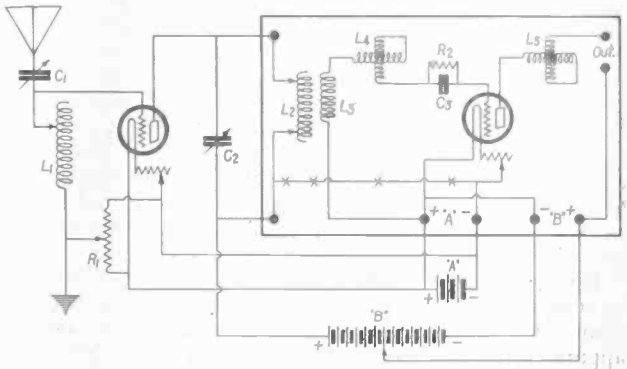


Fig. 2. The same idea applied to a triple circuit "howler," which effectively stops it being a nuisance, and at the same time allows the advantages obtained by the use of radio-frequency.

standard "A" battery potentiometer, should have a resistance of 200 to 400 ohms. A word in regard to L1 will not be amiss. It should have the same value as the stator of the variocoupler or L2. Thus it may be made to tune to the incoming wave length whereupon L2, which acts as a tuned impedence radio-frequency amplifying coil, is balanced up by means of the variable condenser. Using this circuit, regeneration can be employed in the detector circuit only, thereby giving rise to much louder signals without at the same time causing the set to radiate. The potentiometer R1 must be varied until the grid bias on the amplifying tube is of the correct value. If this is not adjusted correctly in the first place it will be found that the circuit will oscilate and act to a certain extent as a transmitter. This,

(*Concluded on next page*)

Provisions of the White Radio Bill

By Washington R. Service

WASHINGTON, D. C.—The new radio bill introduced by Representative White, of Maine, when enacted, will grant the Secretary of Commerce authority to regulate radio communications in all the United States and its possessions. It is intended by the author, who had the assistance of Representative Davis, of Tennessee, and many governmental officials in framing the bill, that "H. R. 7357" will supersede the existing radio act of 1912 and fully meet all present legislative requirements.

The new bill, which is now before the Merchant Marine and Fisheries Committee, provides that all transmitting ships and shore stations and operators be licensed at specified fees, but exempts government stations and all receiving stations. The bill confers upon the Secretary of Commerce general powers of regulation over all transmitting stations, in the interest of reducing interference and the development of an orderly system of communication. Certain obsolete requirements have been eliminated, ambiguities clarified and new provisions of importance introduced.

The Secretary of Commerce is authorized to license, classify, locate, assign calls, and supervise all transmitting stations; control the nature of service rendered, allocate wave lengths, prescribe operating time and prevent interference. The President is given authority to close or take over any station in time of war or disaster.

Station licenses may not be issued to aliens, and all licenses may be revoked or suspended by the Commerce head. Whereas present laws place no time limitation upon licenses, time limit for licenses is now authorized at 10 years. Special provisions seek to promote efficiency of mobile stations, making for safety of ships at sea, and require transmission for at least 100 miles.

No licenses are required for receiving sets or stations, and no control over such sets is attempted by the bill. Transmitting amateurs are not specifically provided for, but the limitations of wave lengths and power set forth in the 1912 bill are eliminated. Under his general power to allocate wave lengths, the Secretary of Commerce may now assign amateurs such wave lengths as the importance of their work may make advisable.

He is directed to refuse to license any applicant who is seeking unlawfully to monopilze radio communication, either through control or manufacture, sale of apparatus or exclusive traffic arrangements, or other means. Revocation of licenses may be made when provisions of the bill or its regulations are broken, or whenever the Interstate Commerce Commission, or another proper body, shall find that a licensee has failed to provide reasonable facilities, or has made any unjust charge, or has instituted unreasonable practices in connection with communications. All laws relating to monopolies shall apply to radio apparatus and communication, the bill states, and in addition to other penalties, licenses may be revoked. The bill also provides for the application of the "Cable Landing License Act" to radio transmission to foreign countries.

The Secretary of Commerce is authorized to collect, in advance of the issuance of licenses, fees for both transmitting station licenses and for operators' licenses. A trans-oceanic station license will cost $300 per annum; a land commercial license a minimum of $50; a ship station license, $25; experimental station, $25; technical and training school licenses, $15; special amateur, $10; and general and restricted amateur stations, $2.50. Operators' licenses run for two years and range from $2.50 for extra commercial first class, to $1.00 and $0.50 for first and second class amateurs. Charges ranging from $2.50 to $0.50 will be made for each examination if the bill becomes a law. The bill provides that all fees collected for examinations and licenses may be used to defray the Department's expenses.

A maximum fine of $1,000 will be imposed upon all persons who violate provisions of the pending bill or any regulations authorized by it, within four months after the passage of the act.

Before a radio station may be erected in the future, a construction permit must be secured from the Secretary of Commerce, setting forth all necessary information about the station.

The advisory committee authorized will comprise members appointed by the Secretaries of State, Treasury, War, Navy, Post Office, Agriculture and Commerce Departments, the Shipping Board, and seven members, not representing the government, will be appointed by the Commerce Secretary. No salaries are provided, but expenses in connection with meetings are to be paid out of Commerce appropriations.

Broadcasting and other private stations located within such proximity to governmental stations as to interfere with government business must not operate during the first fifteen minutes of each hour, the bill sets forth. On the other hand, governmental stations located within a hundred miles of commercial stations may not handle commercial traffic.

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however, is readily overcome by varying the potentiometer and the property of radiating can be noticed at once because of the great amount of noise found in the receivers. Thus the operator can always be on the lookout for radiation and can check it before it goes too far.

The so-called three-circuit tuner, consisting of two variometers and a variocoupler is a very great offender as far as radiating goes. In order to reduce this, the additions shown in Fig. 2 may be made. The standard three-circuit tuner may be seen within the rectangle and the only additional instruments necessary are those shown to the left. Here L1 should be of the same value as L2; C1 and R1 are the same as mentioned above, while C2 should have a capacity of .0005 mfd.

Before hooking up this radio-frequency amplifier to a three-circuit tuner, make sure that the filament circuit is not grounded. If it is, eliminate the connection as shown in 2. Here a wire connecting the negative side of the filament to the ground is shown and is marked with x's. This must be removed before the set is placed in operation. In Fig. 2, coil L2 is the stator of a variocoupler, L3 is the rotor, and L4 and L5 are variometers. R2 and C3 are a standard grid leak and condenser. The phones are to be connected to the binding posts marked "Out." The operating instructions for the set illustrated in Fig. 2 are the same as those for Fig. 1.

With the addition of a radio-frequency amplifier, much better results may be expected, while if two stages are added between the antenna tuner and the radio-frequency amplifier tube illustrated herewith, stations operating 2,000 miles away may be expected to come in clearly and consistently if the set is operated properly.

Research Develops Protection Against Accidental Tube Burn-Outs

By C. White, Consulting Engineer

FEW people realize the enormous number of vacuum tubes burnt out every year through accident. Many radio fans never give thought to this enormous loss until they themselves are the victims. There are indeed very few tubes that last anywhere near their possible life of 1000 to 3000 actual burning hours. Accidental tube burn-outs are caused by many things; two much filament voltage will not always immediately cause burn-outs but will eventually result in premature "death." The application of excessive "B" battery voltage is another cause. The latter is generally experienced by radio fans when changing tubes, "B" batteries, connections in general

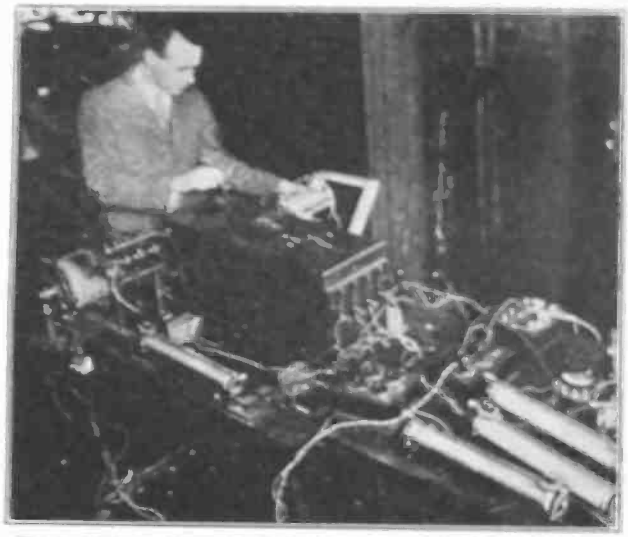

Fig. 1. Professor Bangratz, of the Massachusetts Institute of Technology, testing the time curve necessary to burn out one of the new safety fuses used to protect vacuum tubes. The test is made by the use of an oscillograph, producing the effect shown in Fig. 2.

or by dropping a piece of metal into the cabinet thus short-circuiting leads.

What happens when a filament burns out by an excessive over voltage? An over voltage applied to the filment causes an excessively high current to flow. It is not this current or the over voltage that directly causes the burn-out, but the heat developed by allowing the excessive current to pass through the filament for a certain amount of time. The heat energy developed by a current is proportional to a function of the current and the time allowed for this current to flow. In other words, to burn out a filament we must develop a certain amount of heat energy to melt it. One of the easiest tubes to burn out on a low voltage is the UV200, because the normal operating temperature of this filament is so high that but little increase in current is needed before the melting point is reached. The UV201A on the contrary is not easily burnt-out by a slight increase in its normal filament current. This tube will not burn out when a 22½-volt "B" battery is connected across the filament because at normal current the operating temperature of the filament wire is far removed from the melting temperature. Nevertheless all tubes are equally susceptible to accidents and all will burn out if subjected to an abnormal current for any length of time.

Electrical engineers have worked for a long time to perfect a fuse for vacuum tubes that would render all tubes free from this danger. The problem resolved itself into a method of finding a special composition of fuse wire which would have a relatively low resistance when passing the normal current of the tube and still be ready to melt in far less than 1/1000 of a second when excessive current was passed. By coordinated chemical and electrical research such a wire was developed, which could be commercially manufactured uniform and would regularly blow in less than 1/10 of 1/100 of a second. In the commercial form this wire is mounted in a small holder that slips over the filament prong of the vacuum tube to be protected and in this way it is always with the tube no matter how often the tube be changed from one socket or set to another. Under normal current this fuse has such a low resistance that it in no way alters the adjustment or efficiency of the most delicate receiver.

Naturally after the fuse was developed it was necessary to place it through a series of scientific tests to see that it actually lived up to its specifications. In a recent series of tests conducted by Professor E. G. Bangratz, assistant supervisor of the dynamo division of the Electrical Engineering Laboratories at the Massachusetts Institute of Technology, a new precedent

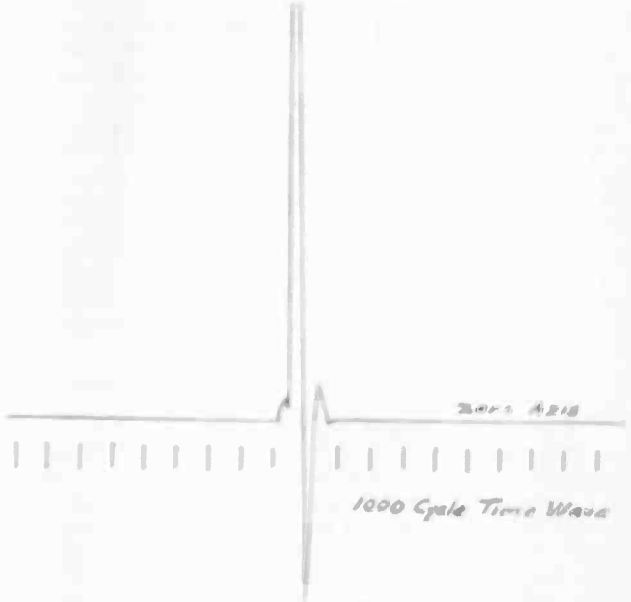

Fig. 2. Oscillogram taken when fuse is connected directly across 12 volts. Each vertical section means 1-1000th of a second, so it can be seen that it took much less time than that for the fuse to reach the burn-out point and break the circuit.

was set for fuse testing. A real photograph of the current passing through the fuse is shown in Fig. 2. This photograph was obtained from a very sensitive oscillograph, the instrument at which Professor Bangratz is standing in Fig. 1. On the extreme right in Fig. 1 can be seen a WD-11 type vacuum tube protected by the fuse. The photograph showing the current through the fuse is called an oscillogram. The horizontal spaces marked off on the oscillogram and labelled "1000-cycle Time Wave" represent 1/1000th of a second each. The oscillogram is read from left to

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Radio-Frequency and Audio-Frequency Amplification

By M. C. Batsel

CONSIDERABLE confusion exists regarding the functions of radio-frequency and audio-frequency amplifiers. The following paragraphs give the distinguishing differences between these two methods of amplification, and show their advantages.

If music or speech is received by means of a detector tube only, without regeneration or other amplification, the music is not very loud, even when received from a nearby, powerful station. Distant stations, though received distinctly, may be so weak that they are heard with difficulty. When weak stations are heard distinctly, they may be made as loud as desired by using audio-frequency amplification. If head phones are to be used, there is little or no advantage in using more than one stage of audio-frequency amplification, as experience has shown that if the music or speech cannot be heard distinctly with one efficient stage of amplification and good head phones, they cannot be heard with any amount of audio-frequency.

If an efficient loud speaker is used two stages of audio-frequency amplification will give about the same strength as an ordinary phonograph, provided the music can be heard distinctly on the detector tube alone, and if sufficient power can be delivered by the last amplifying tube. It is often advisable to use two tubes in parallel in the last stage of amplification unless a much higher plate voltage is provided for this stage than is used for the first stage. Additional stages of audio-frequency amplification can be added to make the music or speech as loud as may be desired.

In order to preserve the quality of music and speech, the audio-frequency amplifier must be capable of amplifying practically all audible frequencies. All noises due to batteries and tubes are, therefore, amplified to the same extent as the music. For this reason it is necessary to use plate circuit batteries especially designed for use with vacuum tube amplifiers and to have all parts of the circuit well insulated.

Audio-frequency amplification is absolutely necessary for satisfactory operation of a loud speaking receiver. Since the advent of radio broadcasting much development work has been done to improve the audio-frequency amplifier, and, as a result, amplifiers have been developed which produce practically no distortion of music or speech and loud speaking receivers are now available that reproduce music so accurately that it meets with the approval of the most exacting critic.

All radio detectors that can be used for the reception of music are least efficient when the received currents are weakest. For this reason radio-frequency amplification is desirable.

Radio-frequency amplification strengthens the received currents before they are changed to audio-frequency by the detector. Thus, by using radio-frequency amplification, stations can be heard distinctly which cannot be heard on a simple detector with any amount of audio-frequency amplification.

The benefits accruing from the use of a great amount of radio-frequency amplification are: It gives greater sensitivity; smaller antennae or coil antenna may be used; and, because of the greater sensitivity, very loosely coupled antenna and secondary circuits may be used, resulting in a great selectivity.

The greatest use of multistage radio-frequency amplifiers is where receivers are located in apartment houses or in other locations where an efficient antenna cannot be erected, or when extremely weak stations are to be received. The loud speaking receiver with three stages of radio-frequency amplification usually has at least six vacuum tubes. The expense of maintaining the tubes and batteries is, of course, greater in proportion to the number of tubes used.

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right. Starting at the left with the straight horizontal line which indicates the zero axis, meaning the fuse is carrying no current, we first come to a little hump which indicates the first accidental contact being made with the "B" battery voltage. This causes a slight rise, but as soon as the contact becomes firm the current immediately shoots upward along the straight vertical line until the fuse blows; then the current immediately falls since, by the fuse blowing, the electrical circuit is broken. The reason the oscillogram shows the current dropping on the break below the "zero-axis" is because the vibrator of the oscillograph swings past the "zero" or neutral position in the same manner as a weight on a spring bobs up and down before coming to final rest or "zero axis." The time represented for the fuse to blow is the horizontal space covered by the long steep-rising curve, and from actual measure and comparison to the 1000 cycle timing wave, this space is *less than* 1/10 *of* 1/1000*th of a second!* This is many times less time than would be required to melt the filament of the most sensitive vacuum tube. Such a test was run on more than 100 such fuses picked from various commercial lots, and in all cases the same degree of time, current accuracy and precision was maintained. Which means that the protection afforded against accidental burn-outs from over voltage is not only ample, but absolute.

It is hard for us to grasp on first thought the meaning of the results of these tests conducted by Professor Bangratz at the Massachusetts Institute of Technology. Although the perfection of such a fuse in no way increases the receiving range of your set, the benefits to be accrued are positive. It means that you can insure your tubes against accidental burn-outs more completely than any type of lock can insure your automobile against theft. It means that you can rest assured that inquisitive strangers or visitors can not burn out your tubes, and finally it means that you have more latitude to do experimental work. I personally consider myself a careful manipulator when using vacuum tubes for experimental purposes and always check every wire before placing the tubes in the circuit. At the same time I have burnt out through accidents more tubes than the average amateur, and I would certainly like to have the money that "blew away" with these tubes. In my present experimental work I do not hesitate in any case to fuse all my tubes before use.

The Ultradyne, an Improved Super-Heterodyne

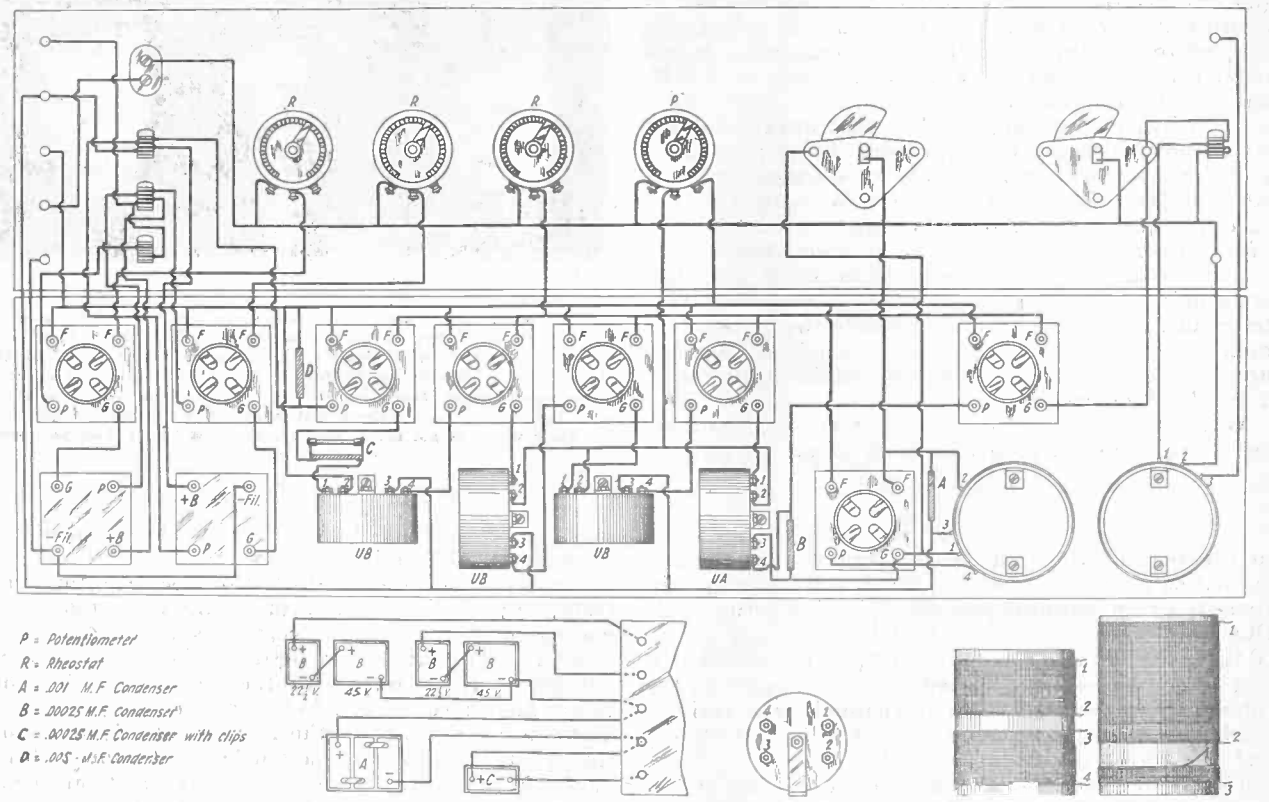
By John W. H. Beresford

THE Ultradyne, developed and designed by R. E. Lacault, has created considerable interest among the radio public. Still, it is evident that a good majority of broadcast listeners are skeptical as to the worthiness of this new improvement on the standard super-heterodyne circuit. Yet what could be expected, since so many novel circuit arrangements have been offered to the public that have proved indifferent or inefficient in operation?

However, the Ultradyne has been put to the acid test and has not been found wanting. Results obtained with it have left no doubt that it is a most sensitive receiver.

Any energy picked up from a broadcast station is naturally passed to the modulator tube first. This tube, being connected to the oscillator, has a direct effect on the modulations produced in the circuit, consequently any incoming energy which tends to vary the resistance existing between the grid and the filament of the modulator tube, will necessarily control the current from the oscillator which flows into the plate filament and therefore modulates, in the true character of the original wave, the oscillations produced by the second tube.

The modulated wave produced in the oscillator circuit instead of being radiated from an aerial is passed



Schematic diagram of the ultradyne, the improved super-heterodyne, as designed by R. E. Lacault, giving details for the construction of the antenna tuning coil and oscillator inductance, and also battery connections.

The operation of the Ultradyne can be made more comprehensible by the use of a simple analogy. The system used in a broadcast station to transmit speech and music consists principally of a transmitter which produces the waves eventually radiated by the aerial, and a microphone into which the artists sing or speak.

When the transmitter is turned on, but the microphone is silent, a continuous stream of waves or electric vibrations leave the aerial. When some one speaks into the microphone the carrier wave is varied in accordance with the speech waves or, in other words, is modulated.

In the Ultradyne, the same principle is made use of. The second tube or oscillator can be compared to the transmitter of the broadcast station and the first tube to the microphone.

through a three stage radio-frequency amplifier and then rectified by the detector tube which makes the signal audible. From this it can be clearly understood that the oscillations produced by the oscillator tube in its own circuit are amplified thousands of times before reaching the detector.

A rear view of an Ultradyne receiver is shown in the illustration. The tube sockets are placed so that the leads running to the other instruments are as short as possible. The socket on the extreme right is for the modulator tube, the next one the oscillator tube, then the three long wave radio-frequency amplifiers, followed by the detector and finally the two audio-frequency amplifiers on the extreme left.

The coils shown mounted on the extreme right and

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Low Power Handicaps Samoa Radio Fans

HARTFORD, CONN.—Radio interest in Western Samoa has been stimulated to a considerable extent recently on account of the reception of broadcast programs from New Zealand and the United States, according to a report of Quincy F. Roberts, American Vice-Consul in charge.

The development of radio on the Samoan islands was very slow prior to January, 1913, owing to the many restrictions which were in force up to that time, and even now the owners of receiving as well as transmitting equipment are licensed under the administration of Western Samoa. This territory, under a mandate issued by the League of Nations, has been created a radio district of New Zealand and is of necessity subject to its regulations in this respect.

The licenses are issued for one year and other than this the only restriction upon receiving stations is as the report states: "No licenses will be granted to use circuits which unduly energize the receiving antenna (an example of such type is that in which one coil of a two-coil tuner is used as a reaction coil, inductively coupled to the antenna coil)." Amateur radio transmission is not permitted between the hours of 7 P.M. and 8 P.M., N. Z. M. T.

One of these receiving sets has been installed at the American Consulate at Apia, Samoa, being a regenerative receiver with a range of wave length between 200 and 2,000 meters. The battery is charged with a small gasoline engine and a 6-volt generator. The lack of electric current is deplored as a serious handicap.

Plate voltage for tube transmitters is not available, according to the consul, and the short life of dry batteries in the tropical climate prohibits their use. One radio receiving fan erected a small windmill and harnessed it to a motor car generator, while another used a small Pelton wheel.

What is most surprising is that receiving conditions permit reception of programs from broadcast stations at Kansas City, Chicago, Portland (Oregon), San Francisco, Los Angeles and Calgary, Canada. Reception of WJAZ has been accomplished on a single circuit regenerative receiver with two stages of audio-frequency.

Behind the "Mike" at WEAF

(C. International Newsreel)

It is seldom that the fans have a chance to see the announcers' faces, although they recognize and know their voices by heart. Well, here is our little Radio gallery of the announcers at WEAF, New York City. Upper left, R. V. Llufrio. Upper right, P. Carlin. Lower left, Helen M. Hann. Lower right, Graham McNaman. In the center is a good close-up of the eavesdropping instrument that makes it possible for you and the other fans to hear each whisper that is passed in the studio. Now that you know them, do not fail to drop them a card telling them just what programs you liked.

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to the rear of the base board form the tuning and oscillating circuits. The first, which is the tuning unit, consists of an untuned primary coil of 8 turns of 20 DCC wire on a 3" radion tube, and a secondary coil of 60 turns of the same size wire. To provide loose coupling these two coils are spaced 1½ inches apart on the tubing. The secondary coil is shunted by a variable condenser having a capacity of .0005 mfd. (23 plates) and this forms the tuning control.

The second coil on the base board is that of the oscillator. The lower winding connected in the plate circuit of the oscillator vacuum tube consists of 30 turns of 20 DCC wire on a 3" tube and the upper winding connected in the grid circuit of the same vacuum tube consists of 26 turns of the same wire. A variable condenser of .001 mfd. capacity (43 plates) is connected across the grid coil as shown in the circuit diagram. This condenser is employed for varying the frequency of the oscillations produced and is the second and only other control.

The Ultraformers or long wave radio-frequency amplifying transformers can be seen mounted directly behind the radio-frequency amplifying tubes. These are of different design than generally employed in such receivers and are constructed to amplify at one frequency band only. This band is just wide enough to avoid cutting off any portion of the frequencies which are a part of the signals. The first Ultraformer is of a slightly different design than the other three, the primary being shunted by a fixed condenser having a capacity of .00025 mfd.

The potentiometer, marked P on the diagram, controls the potential on the grids of the three radio-frequency amplifier tubes. It has a resistance of 400 ohms. The first rheostat to the right regulates the flow of current to the filaments of the modulator tube, the three radio-frequency tubes and the detector tube. There is no rheostat in the filament of the oscillator tube as it is desirable to have it heated to normal brilliancy at all times. The other two rheostats are connected to the two respective audio-frequency amplifier tubes and prove very useful in the elimination of circuit noises when receiving from distant stations. All three rheostats have a resistance of 30 ohms.

Three jacks are provided so that the detector, first audio stage and second stage audio can be plugged into at will. A fourth jack, shown on the extreme right of the panel, is provided for plugging in a loop aerial. This jack automatically cuts out the aerial, ground and tuning coil and connects the loop across the first variable condenser, when a plug is inserted.

The manner in which the A, B and C batteries are connected up to the set is clearly shown in the lower portion of the diagram. Although the C battery can be dispensed with, it is best to use one if undistorted audio-frequency amplification is to be expected. Note the fact that a separate B battery is used in conjunction with the audio-frequency amplifier. This arrangement has many advantages.

A Powerful Two-tube Receiver

By Byrt C. Caldwell

THERE are many radio enthusiasts who would like to build a reflex circuit which is powerful and at the same time includes all the advantages of the ordinary type of straight receiver. This article explains the construction of such a receiver, which is equal in range and volume to a four-tube set using regeneration. As seen in Fig. 1, one stage of radio-frequency, detector and two stages of audio-frequency

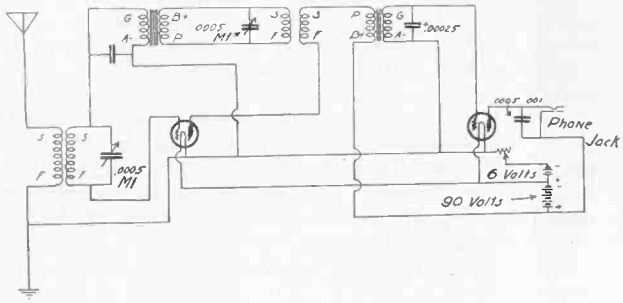

Fig. 1. Circuit diagram of a two-tube reflex as explained in the accompanying text.

amplification are incorporated in this two-tube set, by using the reflex principle. With a set of this type the average loud-speaker range is about five hundred miles. This, of course, should be considered as the range that can be covered on the loud speaker, when everything favors such performance. It is perfectly possible, on good cold evenings, when real distance signals are possible to put on the loud speaker anything that can be heard on the detector of an ordinary two-tube regenerative receiver. However, a warning is intended for those that expect "coast to coast" reception on a set of this kind, not to be disappointed when they do not do it if the distance is over 1500 miles—with phones.

Fig. 2 clearly explains the construction of the radio-frequency transformers. Both secondaries have 55 turns of No. 22 DSC wire wound in one single layer on the 3" radion tubing. A sheet of paper is then placed over the secondary winding and the primaries are wound on, over the paper. The primary of the first transformer should consist of 22 turns of the same size wire, and that of the second transformer should be 30 turns of wire. The diagram shows the proper connections to make on both the primary and secondary.

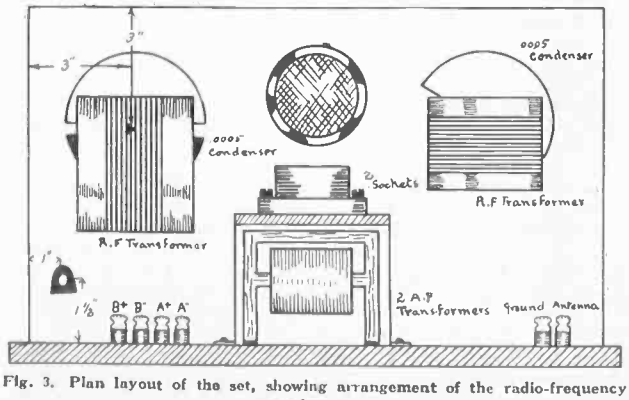

Fig. 3. Plan layout of the set, showing arrangement of the radio-frequency transformers.

The arrangement of the instruments on the panel is shown in Fig. 3. The radio-frequency transformers are mounted on the back insulating plates of the condensers at right angles to each other. The audio-frequency transformers are mounted on the base in the center of the panel and the tubes are mounted on a sub-panel. The binding posts are all mounted on the rear of the base, to provide back cabinet connections to be utilized and thus keep unsightly wires from the front of the set.

A .00025 mfd. fixed condenser is shunted across the secondaries of the audio-frequency transformers and a .002 mfd. condenser is placed as a by-pass across the phone jacks. In the use of condensers in a reflex, always take care when purchasing to see that the best are obtained. A poor grade paper insulated condenser has often been the cause of failure in a reflex receiver. In any case, the waxed paper used in insulating them is capable of creating plenty of trouble, and lots of noise, so if you would have a nice quiet set that has plenty of volume and good clear signals, use the heavy mica insulated ones.

The variable condensers should have a capacity of .0005 mfd. A capacity of .00025 mfd. can be used in a pinch, and when such is the case it will be necessary

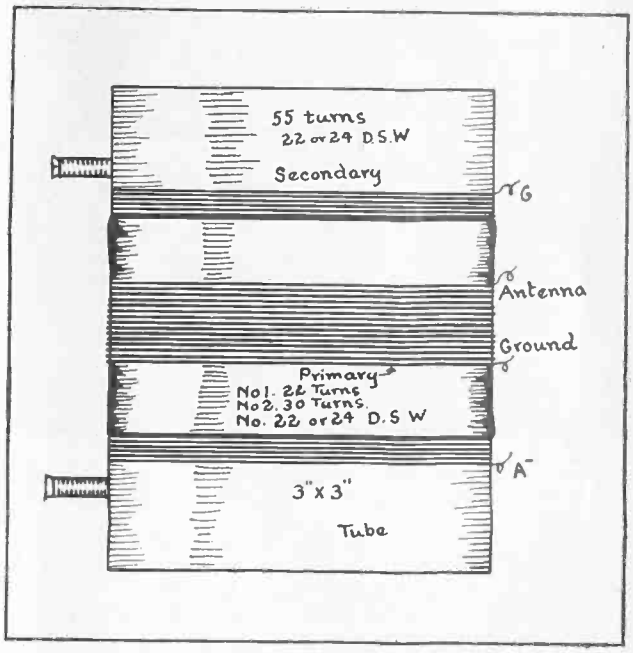

Fig. 2. Constructional details of the transformers used in the circuit. Each tube has two windings, separated by a sheet of heavy paper.

to wind an additional ten turns of wire on the secondaries of the transformers.

Do not attempt to change the values of the condenser capacities or the number of turns on the transformers from that given above with the idea of improving the set. The values given have been thoroughly tested for best all-around results.

The crystal detector should be of the fixed or semi-fixed reflex type, and is connected directly to the plate-primary binding post of the audio-frequency transformer.

The tuning of this set is exactly the same as the one-tube reflex set described in RADIO WORLD for February 8, 1924. Tune with the antenna circuit condenser first until the station is found, then clarify and increase the volume by the use of the second condenser.

Major Armstrong Explains the New Super-heterodyne

AT a meeting of the Institute of Radio Engineers, in the auditorium of the Engineering Societies Building, New York City, on the evening of March 5, Major E. H. Armstrong, well known radio engineer and inventor, made an address on the "Development of the Super-heterodyne."

Major Armstrong's talk was mainly on the development of the super-heterodyne from an experiment during the recent World War, up to the present time, when it is now a household radio receiver. Few

(C. Wide World)
Major Edwin H. Armstrong demonstrating the new Super-heterodyne receiver before a meeting of the Institute of Radio Engineers.

people realize that the circuit was developed in France, with French apparatus, to meet the demands in short wave and direction finding work that the French apparatus could not accomplish. Major Armstrong explained the difficulties experienced in getting apparatus and in applying the principles, up to the present time, when the new circuit employing what is known as the "second harmonic" was developed.

By the use of this new method, which was developed by Sgt. Haupt, one of Major Armstrong's staff, the former eight and ten tubes were rendered unnecessary, and the difficulties attendant upon its operation, including a control for each tube, were eliminated. The present receiver, developed to meet the need for a powerful yet thoroughly efficient and easily worked receiver, embodies simplicity of operation, economy in control and is as fool-proof as possible.

Several models of the new receiver were demonstrated. In all cases, they incorporated UV199 tubes, allowing the use of dry cells, instead of the cumbersome storage battery hitherto necessary for the operation of the circuit. The models were completely enclosed, having all batteries necessary for their operation included in the receiver. In the case of the console models, the loud speaker was also embodied in the set itself.

This new receiver, which is termed a "second harmonic regenoflex super-heterodyne receiver," has several advantages that no other receiver embodies. One of them is the simplicity of operation, two dials and a rheostat for switching on and off the tubes being the only controls used. The second is the use of a comparatively small loop, enclosed within the set itself. The third is the distance possible with this set.

Major Armstrong cited a case where one evening he tuned in without the least trouble, Los Angeles, and right after that, two old ladies who to his knowledge had never operated a receiver before, tuned in 2LO, London, England, on the set which he had on the platform. These, coupled with the fact that the set is so built that it is fool-proof (the apparatus inside the set, with the exception of the batteries, is enclosed in an aluminum case, bolted to the front of the set) make it one of the simplest home receivers yet placed before the public.

Before the meeting opened, Professor Morecroft called upon Professor Pupin to say a few words and introduce Major Armstrong. Professor Pupin referred to Major Armstrong and a half dozen well known radio engineers as "his chickens," as they were reared under his tuition. He said that "it is probably unnecessary for me to talk about Major Armstrong, as his name has become almost a household word—and it surely is that wherever radio is known."

Radiograms

One thing about a radio set is that it causes a lot of dust to collect on the books.—The Sun and The Globe.

* * *

Radio fans complain bitterly of "static." But, after all, isn't the old ether more sung against than singing?—New York Tribune.

* * *

An enterprising proprietor of an uptown radio store in New York City advertises "All night service." Another anchor to windward for the enthusiastic DXer who blows a tube at 4 a. m.

* * *

Federal radio inspectors have been assigned to "listen in" on the sermons broadcast by Wilbur Glenn Voliva at Zion City, Ill., which, according to the protests of many persons in the fifty-mile radius around Zion, are objectionable.

Col. Samuel Reber, U. S. A., retired, has been appointed director of traffic production for the Radio Corporation of America, vice Lee Lemon, resigned.

* * *

The statement of Bell System statistics shows one telephone station for each seven of the total population. The average daily telephone conversations during 1923 were 42,792,000.

* * *

The musical program given during the Food Show in Cincinnati was broadcast by station WLW directly from Music Hall. A fresh person telegraphed he heard some one eating soup.

* * *

Seventeen ships of the Merchants and Miners Transportation Company will be equipped at once with radio by the Radio Corporation of America. The vessels are in the coastal service between Boston and Jacksonville. The service contracted for is to include maintenance, operation and repair of the standard marine radio equipment and the handling of traffic.

The Radio University

A Question and Answer Department conducted by the Technical Staff of RADIO WORLD for the information and instruction of its subscribers. A "trouble shooter" is always ready here to help new radio fans.

INQUIRIES CANNOT BE ANSWERED OVER THE TELEPHONE.

RADIO WORLD cannot undertake to answer technical questions over the telephone.

Please communicate with the Radio University Department by mail, and your inquiry will be answered at as early a date as possible.

I have built the Greene Circuit receiver as described by C. White, in RADIO WORLD *for January 5, and the specifications have been carried out with the two exceptions I have noted. I notice that the removal of the condenser across the phones brings in the signals louder, and also that the set jumps into oscillation with a loud click, which I understand should not be present. I perceived this after putting an additional 22½ volt battery in the set and then removing the condenser. The potentiometer seems to have no effect on the volume of the signals. What can you suggest as my trouble?—Howard Greene, 320 Bond Bldg., Washington, D. C.*

In the first place you are using entirely too much B battery voltage. For a UV199 when it is used as a detector, from 18 to 30 volts are entirely sufficient, depending of course upon the particular tube used. Any set using a variometer in the plate circuit will jump into oscillation once the value of inductance and capacity in the plate circuit is in resonance with that in the grid or antenna circuit. There is no regenerative set made that will approach the oscillating point and then gently slide into oscillations. There is always a click denoting a sudden jump. The potentiometer will have an effect on a soft tube if the correct balance is affected by applying the right plate current, and the tuning is correct. If the signals are louder and less distorted when the condenser is removed that means there is enough capacity present in that circuit and a by-pass condenser is unnecessary Your set is working perfectly all right if you can receive Hastings, Nebraska, clearly on one tube.

* * *

I am using a UV199 tube, with 2 dry cell batteries and a 45 volt B battery. How much would I benefit by the use of a 4½ volt A battery and 22½ volts more on the B battery? Would I get louder signals?—Frederick C. Bray, Voluntown, Conn.

You do not state whether you are using your tube as an amplifier or a detector. If it is the former case, 67½ volts will not be too much. If it is used as a detector, use no more than 30 volts at the most. Using a 4½ volt A battery is necessary with these tubes. Two dry cells are not sufficient.

* * *

I read with considerable interest the article of Mr. Huff concerning the elimination of static and his new long distance records, appearing in RADIO WORLD *for January 5. It was just a reading story and gave no technical details. When will they be published?—F. M. Kerclunes, Glen Corban, Ill.*

It was stated that the device was not perfected as yet, as all the patents had not been thoroughly covered. When the device is perfected we shall probably inform our readers of the uses of it, but until that time we cannot disclose any additional information on the subject.

* * *

Enclosed please find a diagram of the set I am using, but which for some reason lacks selectivity and volume to a great degree. I cannot get anything outside of locals, even using three tubes, while I get long distance stations with a Grebe CR5 one tube set. What is my trouble?—George R. Taylor, 336 East 67th Street, New York City.

Your trouble is that you are using a freak circuit, which by nature of its construction would tune broad. It is a cross between an ultra-audion, a three-circuit regenerative and the reflex type. Remove the variometer from the lower lead, and make the lead from the secondary of the coupler go to the one side of the filament. Then replace the variometer in the plate lead in place of the crystal, and place the grid leak across the grid condenser instead of where it is now located. In other words, make it into the regulation three-circuit regenerator.

* * *

I have constructed a five-tube neutrodyne set from parts furnished by the Fada people. The set works perfectly with but one exception. The first dial does not seem to have much to do with the tuning, as a difference of from 30 to 40° on the dial are necessary before any change in the volume takes place. My antenna is 100′ long, with a lead in about fifteen stories not counting the penthouse, which makes it approximately sixteen and a half stories above my apartment. The antenna works fine on a crystal set that I have, but of course the crystal set does not tune sharply, as crystal sets never do. What can my trouble be? I spent fully a whole week neutralizing it, and if I do say so myself, I have it perfect.—Charles Evans Clifton, Chicago, Ill.

Your antenna is entirely too long for this set. Shorten it. You do not need any flat top on your antenna, simply use about 75 to 90′ of the present lead in, and cut the rest down. This will be sufficient for all your needs. These sets work much better on a short antenna than on a long one, and for all practical purposes with local stations they should not need any antenna at all.

* * *

In reference to the diagram published in RADIO WORLD *for Jan. 26 in reply to S. N. Massey, I have been trying to use this circuit for some time, and with the exception of using a pencil mark grid leak I can see no difference between my circuit and the one you publish. You remark about using care in the operation of the set to avoid creating howls and squeals. I want to use care, but the only way I can see clear is to stay off the air.—Chas. E. Hull, Clifton, Arizona, care of Western Union Telegraph Co.*

By using care we mean operating the set on the safe side of the margin. Do not let it oscillate (don't use tight coupling on the tickler except late at night when hunting for long distance stations) and do not continually switch from one station to another during the early evening hours. Be content to hear the locals or near locals with the tube turned up just loud enough, and the set not oscillating. If you must use this type of set, go hunting when you are not likely to disturb the fellows who like to enjoy the good programs from the nearby stations. It is the "station or call hunter" that is, spoiling the reception, not the owner of a regenerative set that is content to listen to one or two stations an evening. See RADIO WORLD for Feb. 23, 1924, for information concerning a choke tube circuit that may be used with this type of set.

* * *

I have constructed the tuned radio-frequency receiver that is modeled after the famous Grebe set, according to instructions given in RADIO WORLD *for Nov. 10, 1923. I find that no matter how I operate the set that I get two stations at once, if both are near one another, as for instance, WDAP and WHN. Sometimes I get three at the same time. I have the two variometers right next to one another as outlined in the sketch, with the radio frequency tube in back and between the two variometers, as I inspected a Grebe set and this is the method that they used. What can I do to improve this? I constructed the variometers myself out of cardboard rotors and stators, using approximately the number of turns outlined in the article. Advise me how I can make this set more selective.—Gerald Connover, Port Huron, Mich.*

Considering the fact that you use the word approximately several times in your letter, as to the windings and the capacities, the only remedy for your case is to rebuild the set, using standard variometers and condensers specified. Also separate the two variometers sufficiently to prevent any chance of coupling between them. If you really looked at one of the manufactured sets you would note that there is a spacing of at least 6" between the two units, and that the radio-frequency and detector tubes are set between them.

* * *

In RADIO WORLD *for Jan. 26 you have answered a query of N. S. Massey by a printed circuit diagram of a set using honeycomb coils. Will you kindly repeat this diagram with the exception of using UV200 as detector and UV201A as amplifiers? I have spiderweb coils made by the L. W. Goodman Co., which I would like to use. Is this possible to get just as good results as with the honeycomb coils? If not, what coils should I use?—W. H. Schultz, 3321 Liberty Street, St. Louis, Mo.*

You may use this same diagram for the tubes you mention by simply using the tubes instead of those specified. A detector and two-stage hook-up suitable for use in this circuit, but minus the coils appeared in RADIO WORLD for Feb. 16 on the Answers to Readers page. You may use the coils mentioned with good results. It is not necessary to load these coils if the correct capacity is used in the circuit with them.

* * *

Enclosed please find a copy of a circuit that appeared in RADIO WORLD *some time ago. I constructed it and have not had much success with it. What can you suggest as my trouble?—W. H. Sharp, St. Paul, Minn.*

Your diagram is correct, and if you have the circuit connected as per the diagram you furnish, the set should work. We cannot diagnose trouble when there is no indication of any. Change your tube, examine your batteries, and make sure that your phones are good. Also see that there are no short circuits, and that all the connections are soldered.

* * *

Would you kindly advise me if it is possible to use a stage of Como push-pull amplification in conjunction with a 5-tube Freed-Eismann Neutrodyne? —Thomas F. Barnes, 42 Edson Avenue, Waterbury, Conn.

You may use this type of audio frequency amplification in conjunction with any receiver at all, if at least one stage of straight audio frequency amplification is placed ahead of it. Two stages are sometimes too much if push-pull audio frequency is used.

* * *

I recently purchased a De Forest Reflex receiver using four tubes, with the interchangeable transformers. In the instructions it states that certain combinations are to be used for specific wave lengths, but the receiver does not seem to respond to these wave lengths except on the loop antenna. When I use my regulation outside antenna, which is 100′ overall, with a 18′ ground lead, the set responds to all the wave lengths on the set of transformers that are only supposed to cover up to 400 meters. The set works prefectly on the loop, even to cutting out my local station and bringing in Chicago and Davenport. What is the reason for this?—Harry Clauson, Fort Worth, Texas.

This set is not intended for continuous use on an outside antenna, being exactly calibrated for use on the loop antenna. It will work on the outside antenna, but, of course, with broader tuning. The advantage of the interchangeable transformers is only felt on the indoor loop furnished. Your set is working right, as the wave length of these transformers overlap and thus give real sharp tuning, except on an outside antenna, when the tuning is broadened considerably.

* * *

Where can I obtain a technical description of an electrolytic battery charger?—S. Rosenblatt, 65 West Broadway, New York City.

A charger of this type was described in RADIO WORLD for Oct. 27, 1923, on page 11 by Le Roy Western. This gives all details. For details concerning the construction of a B storage battery, which is suitable for use with a regulation radio receiver, see RADIO WORLD for Oct. 20, 1923.

* * *

Kindly inform me of the address of a firm handling blue prints that would enable me to construct a Reinartz receiver?—Carl Howe, Tyler, Minn.

Advise you to write to S. Newman & Co., 74 Dey Street, New York City, for details of all blue prints. They handle them.

* * *

In several different magazines they printed descriptions of radio receivers. I noted that most of them used a minus A going to a minus B connection, that tap going to the filaments. In your issue of Dec. 15 you printed a circuit called the Superdyne and I note that the minus B goes to the minus A battery. Which is correct?—Jake S. Herman, Valley Stream, N. Y., Route No. 2.

The connection shown is correct. There is a little latitude given the constructor in this matter in most regenerative receivers, and also in quite a few of the more complex receivers, as the negative bias on some of these receivers is obtained by means of potentiometers or by-pass condensers or leaks. However, you will note that any circuits appearing on the Superdyne are always shown with the connection noted. It might interest you to read the article on "Characteristic Curves of Vacuum Tubes, and Their Meaning," by J. E. Anderson, which appeared in RADIO WORLD for Sept. 22, 1923, on page 14.

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MARCH 15, 1924

New Sun Spots

DR. DAVID TODD, of Amherst College, reports the appearance of a new crop of sun spots, one of them 9,000 miles in diameter. He also is quoted as expressing the belief that these sun spots will have a decidedly interfering effect on the transmission of radio waves through the auroral phenomena which will disturb the upper atmosphere surrounding the earth. However, Prof. W. B. Morecroft, of Columbia University, is of the opinion that nothing serious is to be expected in the way of radio interference from the electrical discharges which usually accompany the appearance of sun spots. At the worst the effect would be of a static character and so far no means of determining the extent of the auroral influence has been developed. Observations, however, are being made of the matter and after sufficient data have been collected some interesting deductions may be possible. Captain McMillan's Arctic vessel, the "Bowdoin," now wintering within ten degrees of the North Pole, may bring back valuable data on the auroral influence.

We Recommend an Autobiography

IT isn't usual to review a book in the editorial columns of a publication, so we won't do it. Rather, what follows may be taken as a recommendation—a strong one. And the book is an autobiography—not the dry routine of places, names and dates, nor the chronicle of a chain of events marred by an irrepressible ego—but a real human document carrying a life story of absorbing interest, modestly but most entertainingly told.

The book is "From Immigrant to Inventor" and the author is Dr. Michael Pupin, professor of electromechanics in Columbia University, New York City. It is published by Charles Scribner's Sons, New York City. Those of our readers who have had the pleasure of perusing this remarkable autobiography doubtless will agree with our enthusiasm about it. To those who have not read it we can only say that they owe it to themselves to get it and read it. The four dollars it costs properly may be charged up to education and culture.

It is the story of a young Serb boy who had the courage to sell all he possessed, except the very clothes on his back, to raise passage money to the United States; how he landed at Castle Garden with exactly five cents, which was gone in ten minutes for a piece of worthless prune pie; how he found jobs here and there from factory to farm; how he educated himself and paid his way through college, partly by hard manual labor in the summers and partly by scholarships and prizes won by unremitting study and application. He earned his way to the European universities where he became the pupil and later the friend of the greatest scientific men of the day. At last he achieved the renown of being recognized as one of the outstanding research men of the world, an instructor of pronounced ability and an inventor whose name is known to every electrical, telephone and radio engineer.

The lofty idealism of the book, its zestful flavor and its touches of quaint humor make the reader forget that it is the story of a scientist's life and lead him to believe rather that he is absorbing a most enjoyable tale of adventure. In all his vicissitudes—lack of money, illness and the handicap of a foreign language—the young Pupin never loses his faith in God, never forgets his love and veneration for his mother, and always cherishes his belief in himself and in the traditions of his homeland and those of his adopted country. The book forms one of the greatest Americanization documents possible to imagine.

In the latter portion of his book Dr. Pupin gives a remarkably clear and easily understandable exposition of the Faraday-Maxwell electromagnetic theory upon which our modern electronic physics is based. The fundamentals of radio lie in this theory. It is a tribute to the greatness of Dr. Pupin as a teacher that he has been able to elucidate the principles discovered by scientists like Faraday, Maxwell, Tyndall, Helmholtz and Hertz with such clarity that they become interesting even to the non-technical reader.

Our final word is simply this: If you haven't read "From Immigrant to Inventor," do so at the earliest possible opportunity.

Radio for Shut-ins

THERE is increasing realization of the possibilities of radio, not only for persons whose hearing is too defective to enable them to hear sermons and public addresses, but also for persons who, from ill health, or other cause, are not able to go into the crowds of public places to hear sermons, lectures, addresses, concerts, etc. With a single home-made set, all of these treasures of entertainment and education are brought to their own library. No better example of this has been afforded the country than the experience of former President Woodrow Wilson, who, while an invalid during the last years of his life, spent hours of every day listening to the radio and thereby keeping in close touch with the world in which he had formerly been so active.

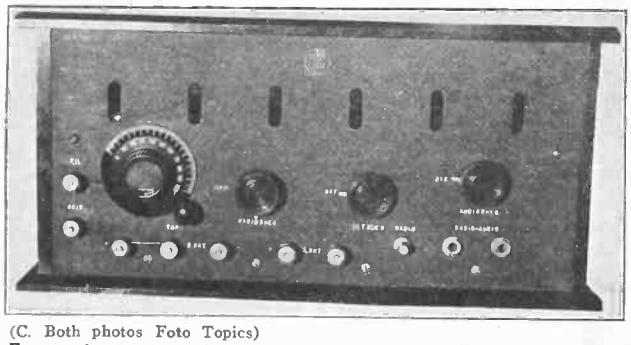
Are We Surrounded By Nitrogen?

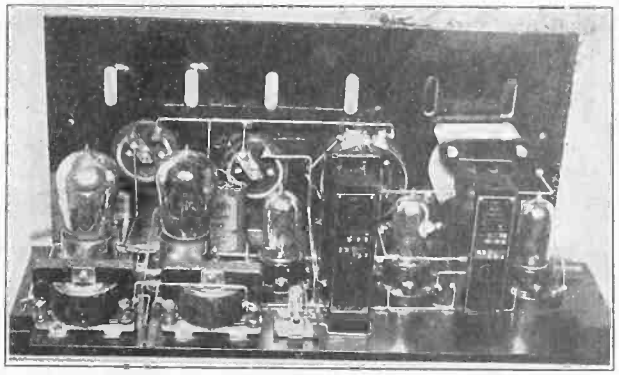
CABLE despatches from London report that Prof. Vigard, of Christiana University, claims to have made a discovery which leads to the suggestion that the atmosphere of the earth outside of the air stratum is enclosed in an envelope whose wall consists of a solid mass of crystalline nitrogen. This, he says, is what gives the sky its blue color and not the action of the sun's rays on solid particles in the atmosphere, as heretofore understood. Prof. Vigard believes his theory also accounts for the fact that radio waves follow the contour of the earth instead of flying off at a tangent. These speculations are interesting, especially to the radio student. Definite proof, however, is not always so easy to bring forward. Is it possible that Prof. Vigard's theory coincides with that of the "Heaviside layer?"

Three Subjects of Radio News Interest

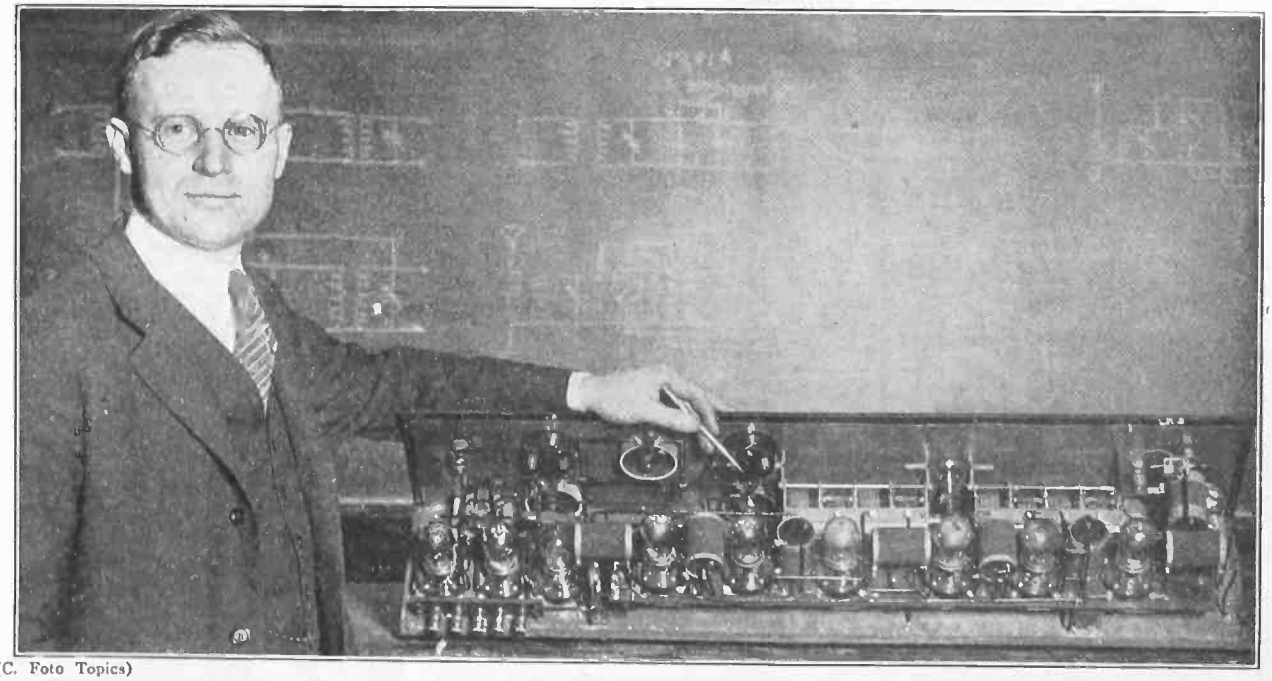
(C. Kadel and Herbert)
Interesting picture of an English orchestra broadcasting from Station 2LO, London, England. Note the microphone on the extreme right, suspended in a hammock of felt, to stop any vibration.

John High, Jr.'s, New Five-Tube Set





(C. Both photos Foto Topics)
Front and rear views of an exceptionally effectlve 5-tube circuit devised by John High, Jr. It consists of two stages of radio-frequency, detector and two stages of audio-frequency. Tuning is accomplished by the condenser, placed in shunt of the loop. The transformers overlap in frequency range, thus giving sharp tuning and unusual selectivity. Three UV199 tubes are used for radio-frequency and detector, with UV201As as audio-frequency amplifiers.



(C. Foto Topics)
C. L. Farrand, inventor of the Super-Pilodyne circuit, standing next to a model of his receiver, pointing to the condensers which, due to the fact that they are all coupled together, allow all the radio-frequency tubes to be tuned together. Note the arrangement of the air core transformers, as well as the extremely neat workmanship.

Here Are Good Broadcast Programs

Station KDKA, East Pittsburgh, Pa.

326 Meters (920 Kcys.) E. S. T. Mar. 14.—9:45 A. M.—Union live stock market reports. 11:55 A. M.—Arlington time signals. 12:00 Noon—Weather forecast; United States Bureau of Market reports. 12:10 P. M.—Concert by Braudy's Orchestra from Kaufmann's dining room, Pittsburgh, Pa. 6:15 P. M.—Organ recital by Lucile Hale, from the Cameo Motion Picture Theatre, Pittsburgh, Pa. 7:15 P. M.—"What Israel Achieved Under David," the Sunday school lesson for March 16, presented by Mr. R. L. Lanning. 7:30 P. M.—Feature. 7:45 P. M.—Market reports. 8:00 P. M.—Radio Boy Scout meeting. 8:30 P. M.—"The Rose Maiden," by the Clef Choral Club of Ingram, conducted by Thomas Harbone. 9:55 P. M.—Arlington time signals; weather forecast.

Mar. 15.—9:45 A. M.—Union live stock market reports. 11:55 A. M.—Arlington time signals. 12:00 Noon—Weather forecast; United States Bureau of Market reports. 1:30 P. M.—Concert by Broudy's Orchestra from McCreery's dining room, Pittsburgh, Pa. 6:15 P. M.—Dinner concert by Westinghouse Band under the direction of T. J. Vastine. 7:15 P. M.—Feature. 8:00 P. M.—"Radio Receiving Helps," A. K. Phillipi, radio engineer, Westinghouse Elec. & M. Co. 8:15 P. M.—Feature. 8:30 P. M.—Concert by Westinghouse Band conducted by T. J. Vastine. 9:55 P. M.—Arlington time signals; weather forecast.

Station CKAC, Montreal, P. Q., Canada

425 Meters (710 Kcys.) E. S. T. Mar. 14—1:45 P. M.—Concert by Mt. Royal Hotel Orchestra. 4 P. M.—Weather, news, stocks. 4:30 P. M.—Mt. Royal Hotel Dance Orchestra.

Mar. 15—7 P. M.—Kiddies' stories in French and English. 7:30 P. M.—Rex Battle and his Mt. Royal Hotel Concert Orchestra. 8:30 P. M.—William Eckstein, foremost Canadian theatrical pianist and his Strand Theatre Gang. 10:30 P. M.—Jos. C. Smith and his Mt. Royal Hotel Dance Orchestra. Sporting news.

Mar. 16—4:30 P. M.—Sacred Concert. Organ, vocal and instrumental.

Mar. 17.—1:45 P. M.—Mt. Royal Hotel Concert Orchestra. 4 P. M.—Weather, news, stocks. 4:30 P. M.—Mt. Royal Hotel Dance Orchestra.

Mar. 18—4 P. M.—Weather, news, stocks. music. 7 P. M.—Kiddies' stories in French and English. 7:30 P. M.—Rex Battle and his Mt. Royal Hotel Concert Orchestra. 8:30 P. M.—All French vocal and instrumental studio concert, under the direction of Raoul Vennat. 10:30 P. M.—Jos. C. Smith and his Mt. Royal Hotel Orchestra.

Station WGY, Schenectady, N. Y.

380 Meters (790 Kcys.) E. S. T. Mar. 14—11:55 A. M.—Time signals. 12:30 P. M.—Stock market report. 12:40 P. M.—Produce market report. 12:45 P. M.—Weather forecast. 2 P. M.—Music and fashion talk, "Spring Outer Apparel," Robert L. Smith. 6 P. M.—Produce and stock market quotations; news bulletins. 6:30 P. M.—Children's program. 7:35 P. M.—Health talk, N. Y. State Department of Health. 7:45 P. M.—General Electric program consisting of addresses by John G. Barry, vice-president of the General Electric Company, and C. E. Eveleth, manager of the Schenectady works; musical numbers by the General Electric Band; ladies sextet, male quartet, and string quintet made up of General Electric talent. 10:30 P. M.—Program by WGY Orchestra.

Mar. 15—11:55 A. M.—U. S. Naval Observatory time signals. 12:30 P. M.—Stock market report. 12:40 P. M.—Produce market report. 9:30 P. M.—Dance music by Romano's Orchestra, New Kenmore Hotel, Albany, N. Y.

Station KFI, Los Angeles, Calif.

469 Meters (638 Kcys.) P. T. Mar. 16—10-10:45 A. M.—L. A. Church Federation service. 4-5 P. M.—Federated Church musicians vesper service. 6:45-7:30 P. M.—Concert by Patrick O'Neill, Irish tenor. 8-9 P. M.—Ambassador Hotel concert. 9-10 P. M.—Examiner concert. 10-11 P. M.—Theron Bennett's Dutch Mill Orchestra.

Mar. 17—4:45-5:15 P. M.—Evening Herald's news bulletins. 5:15-5:45 P. M.—Examiner news bulletins. 8-9 P. M.—Evening Herald concert. 9-10 P. M.—Examiner concert. 10-11 P. M.—Ambassador-Lyman's Cocoanut Grove Orchestra.

Mar. 18—4:45-5:15 P. M.—Evening Herald's news bulletins. 5:15-5:45 P. M.—Examiner news bulletins. 6:45-7:30 P. M.—Geo. J. Birkel Co. program. 8-9 P. M.—Ambassador-Lyman's Cocoanut Grove Orchestra. 9-10 P. M.—Examiner concert. 10-11 P. M.—Concert arranged by Sol Cohen.

Station WBAP, Fort Worth, Texas

476 Meters (620 Kcys.) C. S. T. Mar. 14—7:30-8:30 P. M.—Concert arranged by Ted Roy, with assisting artists from Ardmore, Okla. 9:30-10:45 P. M.—Monthly concert by the College of Industrial Arts, Denton, Texas.

Mar. 15—7-7:30 P. M.—Review of the interdenominational Sunday School lesson and Radio Bible Class by Mrs. W. F. Barnum. (Fans are invited to enroll in the class by writing to Mrs. Barnum for membership certificate, in care of WBAP.)

Station WJZ, New York City

455 Meters (660 Kcys.). E. S. T. Mar. 14.—12:10 P. M.—Friday Noon Hour of Music, direct from the Brick Presbyterian Church. 1 P. M.—Luncheon concert by the Hotel Ambassador Trio, direct from the Green Room of the Hotel Ambassador. 2 P. M.—New York City Board of Education program. 3 P. M.—Organ recital played by Leo Riggs on the Hotel Astor organ. 4 P. M.—Fashion developments of the minute prepared by Women's Wear. 4:05 P. M.—William Mumbrauer, baritone. 4:30 P. M.—Arline Fecker, soprano. 4:45 P. M.—"The Larger Aspect of World Affairs," by the International Interpreter. 5 P. M.—Arline Felker, soprano. 5:15 P. M.—"Systematic Psychology," by Dean James Lough, of New York University. 5:45 P. M.—Closing reports of the New York State Department of Farms and Markets; Farm and Home reports; closing quotations of the New York Stock Exchange; foreign exchange quotations; Bradstreet's financial report; Evening Post News. 7 P. M.—Looseleaf current topics. 7:30 P. M.—General Electric program. 9:15 P. M.—Lucille Clemons, pianist. 9:45 P. M.—Louis Hann, baritone, accompanied by Creighton Allen. 9:55 P. M.—Time signals and weather forecast retransmitted from the government station NAA at Arlington. 10 P. M.—"Stories from O. Henry." 10:15 P. M.—Louis Hann, baritone. 10:30 P. M.—Dance program by Paul Specht's Alamac Hotel Orchestra.

Mar. 15—3:15 P. M.—Edna Gormley, soprano. 4 P. M.—Tea concert by the Hotel Belmont Stringed Ensemble, Harry Lerne, leader, direct from the Balcony of the Tea Room, Hotel Belmont. 5 P. M.—Josephine M. Evans, contralto. 5:30 P. M.—Closing reports of the New York State Department of Farms and Markets; Farm and Home reports; closing quotations of the New York Stock Exchange; foreign exchange quotations; Evening Post News. 7 P. M.—Howard Garis' "Uncle Wiggily Stories." 7:15 P. M.—"The Rehearsal of a Play," by the cast of "Tarnish." 7:30 P. M.—Concert by the Western Union Boys' Band. 8 P. M.—K. M. Wellinger "Opportunity." 8:15 P. M.—Concert by the Western Union Boys' Band. 8:45 P. M.—Dr. Alfred N. Goldsmith, Director of Research of the Radio Corporation of America, "Following Its Vocal Master," one of the "Highlights of Modern Radio Broadcasting" series. 9 P. M.—"China Today" by Helen Fitzgerald. 9:30 P. M.—"Mignon" by the Grand Opera Society of New York. 10:30 P. M.—Dance program by Ben Selvin and his Moulin Rouge Orchestra, direct from the Moulin Rouge.

Mar. 16—Church services. 11:00 A. M. to 1:00 P. M., and 7:00 to 10:30 P. M.

Station WSB, Atlanta, Ga.

429 Meters (700 Kcys.) C. S. T. Mar. 14.—12 M.-1 P. M.—Entertainment. 4-4:30 P. M.—Howard Theatre overture and prologue. 5-5:30 P. M.—Vick Meyers' Melody Orchestra. 5:30 P. M.—Miss Bonnie Barnhard's songs and bedtime story. 8-9 P. M.—Gertrude L. Johnson quartet and instrumentalists. 10:45-11:45 P. M.—"Surprise broadcast."

Mar. 15—12 M.-1 P. M.—WSB's second birthday. Special entertainment. 4-4:30 P. M.—Howard Theatre overture and prologue. 5-5:30 P. M.—Special birthday broadcast. 5:30 P. M.—Miss Bonnie Barnhardt's songs and bedtime story. 8-9 P. M.—WSB's second birdthday concert, featuring pioneer radio stars of Dixie, including Mrs. James H. Whitten, mezzo soprano; Solon Drukenmiller, tenor; Dr. Charles A. Sheldon, organist. 10:45-11:45 P. M.—WSB's second birthday jubilee, by Journal hired help, including Miss Bonnie Barnhardt, "The Lady o' the Radio"; Ernest Rogers, Journal's singing-reporter; Ancient Ed and Silent Will Calloway, old-time mandolin-guitar duo; Jesse Johnson, the linotype bard, and other Journal workers.

Mar. 16—11 A. M.—First Presbyterian Church service; Rev. J. Sprole Lyons, pastor. Dr. Charles A. Sheldon, organist. 5-6 P. M.—Buford, Ga., Methodist Church, Rev. P. S. Harris, pastor. 7:30-9 P. M.—Wesley Memorial M. E. Church service; Rev. Marvin Williams, pastor.

Mar. 17—12 M.-1 P. M.—St. Patrick's Day entertainment. 4-4:30 P. M.—Howard Theatre overture and prologue. 5-5:30 P. M.—St. Patrick's serenade by Vick Meyers' Melody Orchestra. 5:30 P. M.—Miss Bonnie Barnhardt's songs and bedtime story. 8-9 P. M.—St. Patrick's Day concert, by Elk Royal Purple Band, Atlanta Lodge, No. 72, B. P. O. E. 10:45-11:45 P. M.—St. Patrick's Day concert, George McNulty, Irish tenor.

Mar. 18—12 M.-1 P. M.—Entertainment. 4-4:30 P. M.—Howard Theatre overture and prologue. 5-5:30 P. M.—News, etc. 5:30 P. M.—Miss Bonnie Barnhardt's songs and bedtime story. 8-9 P. M.—Concert, sponsored by Mrs. C. W. Merck. 10:45-11:45 P. M.—DeKalb quartet, Decatur, Ga.

Station WAAW, Omaha, Neb.

360 Meters (830 Kcys.) C. S. T. Mar. 14—8:05 P. M.—Lessons in Bridge by Mrs. Purdy, Omaha.

Mar. 17—8-9 P. M.—Program under auspices of Latin Saints Church, Council Bluffs, directed by G. Skinner and Mrs. Weaver. Readings, and instrumental solos.

Mar. 20—8-9 P. M.—Educational program.

Mar. 21—8:05 P. M.—Lessons in Bridge by Mrs. Purdy, Omaha.

Station WEAF, New York City

492 Meters (610 Kcys.) E. S. T. Mar. 14.—11:00 A. M.—Talk under the auspices of Garden Magazine; Consolidated market and weather reports by the U. S. and N. Y. State Departments of Agriculture and American Agriculturist. 4:00-5:30 P. M.—Helen Jenks Dietrich, pianist; Herbert Oestricher, baritone, accompanied by Frances Eschel; Camilla Miller, lyric soprano. 7:30-11:00 P. M.—David Brown, pianist; "The Happiness Boys," Billy Jones and Ernest Hare. Music by the World Mutual Insurance Company's Instrumental Trio, and talk on the care and safe operation of automobiles by Major A. A. Stewart. B. Fischer and Company's "Astor Coffee," Dance Orchestra. 12:30-1:30 A. M.—Special concert by Paul Whiteman and His Orchestra, repeating program recently given at Aeolian Hall.

Mar. 15—1:45-3:30 P. M.—Luncheon by the Foreign Policy Association direct from Astor Hotel, New York City. 4-5:30 P. M.—Carolinians Orchestra; Katherine Le Roux, soprano. 7:30-10:30 P. M.—Mary Van Dorn, soprano, accompanied by Mrs. William Reddick; "The Chiclet Quartette," assisted by the "Chiclet Trio" of the American Chicle Company. Talk by Ralph Hayes, Director of the New York Community Trust Company; Harriet Youngs, lyric soprano; Madeline Marshall, pianist; George Dunstan, baritone; Mary Lackland, violinist, accompanied by Catherine Widman.

Station WFAA, Dallas, Texas

476 Meters (630 Kcys.) C. S. T. Mar. 14.—12:30-1 P. M.—Dr. Robert Stewart Hyer, on the Sunday School lesson, "The Reign of David." 8:30-9:30 P. M.—Program, orchestral, presented by employes of the General Electric Company at Dallas, L. T. Blaisdell, district manager.

Mar. 15—12:30-1 P. M.—Address, Z. M. Duckworth, secretary Dallas Typographical Union. 8:30-9:30 P. M.—Piano recital, Elizabeth Gay Jones. 11-12 P. M.—Adolphus Hotel Orchestra, Lawrence Morrell, director, broadcast from the Adolphus Hotel Junior ballroom.

Mar. 16—6-7 P. M.—Radio Bible Class, Dr. William M. Anderson, Jr., pastor First Presbyterian Church, teacher; half-hour Bible study and half-hour Gospel song. 7:30-8:30 P. M.—Service at City Temple Presbyterian Church, Dr. L. N. Young, pastor, broadcast from the church. 9-9:30 P. M.—Dr. Thomas H. Harper, pastor Central Congregational Church, on "Christianity as a Social Force." 9:30-11 P. M.—Popular music recital by Jimmy Allen's Serenaders, S. A. E. boys from Southern Methodist University.

Station WGI, Medford, Mass.

360 Meters (830 Kcys.) E. S. T. Mar. 14—12 M.—Selection on the Ampico in the Chickering. Amrad Round Table. Selections on the Brunswick. 12:40 P. M.—New England weather forecast. 12:45 P. M.—Farmers' produce market report. 3 P. M.—Talk by Miss Dorothy H. Goodwin. Musicale by the Brunswick. 5:30 P. M.—Closing stock market reports. Live stock market report. 6:15 P. M.—Code practice. 6:30 P. M.—Big Brother Amrad Club. 7 P. M.—Boston police reports. 7:30 P. M.—Verses by Charles L. H. Wagner. Red Cross Health Talk by Henry Copley Green. Concert by the Ampico in the Chickering. Musicale.

Mar. 15—6:30 P. M.—Big Brother Amrad Club. 6:45 P. M.—Code practice. 7:05 P. M.—New England weather forecast. New England crop notes. 8 P. M.—Talks on New England business industry. Musicale.

Mar. 16—4 P. M.—"Adventure Hour" by the Youth's Companion. Musicale. 8:30 P. M.—Talk on "World Unity." Concert.

Station KGW, Portland, Ore.

492 Meters (610 Kcys.) P. T. Mar. 14.—11:15 A. M.—Market basket. 11:30 A. M.—Weather forecast. 12:30 P. M.—Concert. 3:30 P. M.—Lecture by Esther B. Cooley, clothing specialist, Extension Service, Oregon Agricultural College; subject, "Ostrich Tendencies in Hat Choice." 7:30 P. M.—Weather forecast and market reports. 8 P. M.—Accordion solos by Johnny Sylvester. 8:15 P. M.—Dance music by George Olsen's Metropolitan Orchestra of Hotel Portland, Herman Kenin, director. 9 P. M.—Educational lecture provided by University of Oregon Extension Department. 10:30 P. M.—Hoot Owls.

Mar. 15—11:30 A. M.—Weather forecast. 3:30 P. M.—Children's program. Story by Aunt Nell. 10 P. M.—Weather forecast and dance music by George Olsen's Metropolitan Orchestra of Hotel Portland. (2 hours.)

Station WJY, New York City

405 Meters (740 Kcys.) E. S. T. Mar. 14.—7:30 P. M.—Ralph W. Barber, bass. 7:50 P. M.—Frank Shevitt, "Income Taxes." 8 P. M.—The work of the New York Assembly by the Honorable Julius Berg. 8:15 P. M.—Violin recital by Michal Hoffman, direct from Carnegie Hall, Tschaikowsky Bureau. 10 P. M.—Musical Glass concert by Charles Wold. 10:30 P. M.—Breau & Tobias, popular program.

Mar. 16—Church services, 2:30-5:30 P. M., and 8 to 10:30 P. M.

Station KSD, St. Louis, Mo.

546 Meters (550 Kcys.) C. S. T. Mar. 15—9 P. M.—Missouri Theatre Orchestra, concert and specialties broadcast direct from the theatre.

Station WOC, Davenport, Iowa

484 Meters (620 Kcys.) C. S. T. Mar. 14—10 A. M.—Opening market quotations and household hints. 10:55 A. M.—Time signals. 11 A. M.—Weather and river forecast. 11:05 A. M.—Market quotations. 12 M.—Chimes concert. 2 P. M.—Closing stocks and markets. 3:30 P. M.—Lecture by R. G. Maybach, "Structure and Function of the Lungs." 5:45 P. M.—Chimes concert. 6:30 P. M.—Sandman's visit. 6:50 P. M.—Sport news and weather forecast. 7:20 P. M.—International lesson for next Sunday discussed by Dr. Frank Willard Court, pastor St. John's Methodist Episcopal Church, Davenport, Iowa. 8 P. M.—Musical program (1 hour)—Erwin Swindell, musical director.

Mar. 15—10 A. M.—Opening market quotations and household hints. 10:55 A. M.—Time signals. 11 A. M.—Weather and river forecast. 11:05 A. M.—Market quotations. 12 M.—Chimes concert. 12:30 P. M.—Closing stocks and markets. 3:30 P. M.—Lecture by C. C. Hall, "Bacteria, Insects and Plant Life as Chemical Agents." 5:45 P. M.—Chimes concert. 6:30 P. M.—Sandman's visit. 6:50 P. M.—Sport news and weather forecast. 9 P. M.—Orchestra program (1 hour) P. S. C. Orchestra, Gerald M. Barrow, director.

Station KFAE, Pullman, Wash.

330 Meters (910 Kcys.) P. T. Mar. 14—7:30 P. M.—"Ice Cream as a Food Dish," Prof. E. V. Ellington. "Traits of Childhood," Dean A. A. Cleveland. "Influences Producing Strange Forms in Plants," Chas. F. Lackey. Soprano solos, Constance Grace. Piano solos, Jean Fulmer. "Handling Sheep in the Spring," C. M. Hubbard. "Ideas from New Books," Alice Lindsay Webb.

Mar. 17—7:30 P. M.—"Top Grafting," Prof. O. M. Morris. "Birds of a Summer Day," Prof. W. T. Shaw. Orchestra numbers, Pullman High School Orchestra. "Some New Plant Diseases," Prof. George L. Zundel. "Importance of Correct Design to Engineering," Prof. E. B. Parker. Songs, Agnes Dilts.

Mar. 19—7:30 P. M.—"Better Hatches," Prof. L. W. Cassel. "Fabrics You Will Wear in the Spring," Prof. Edna Irene Avery. Soprano solos, Margherita Beneke. Piano solos, Fredericka Kershaw. "Use of Whole Grain Cereals," Miss Mary Sutherland. "Goitre and Its Prevention," Dr. D. T. Ford. Banjo solos, Erle Hannum.

Station WBZ, Springfield, Mass.

337 Meters (890 Kcys.) E. S. T. Mar. 14.—11:55 A. M.—Arlington time signals; weather reports; Boston and Springfield market reports. 6:00 P. M.—Dinner concert by the WBZ Orchestra. 7:00 P. M.—"Steady Now," a dramatized story prepared by the "Youth's Companion." Current book review, by R. A. MacDonald. 7:30 P. M.—Bedtime story for the kiddies. 9:55 P. M.—Arlington time signals. 11:00 P. M.—Program of chamber music by the WBZ Orchestra, and Mrs. Helen Winkley, soprano.

Mar. 15.—11:55 A. M.—Arlington time signals; weather reports; Boston market report. 7:00 P. M.—Dinner concert by the Hotel Kimball Trio, transmitted from the Hotel Kimball dining room, Jan Geerts, director. 7:30 P. M.—Bedtime story for the kiddies. 7:40 P. M.—Piano recital arranged by Professor Gustav Kriedte. 8:25 P. M.—Story for grownups, by Orison S. Marden. 9:55 P. M.—Arlington time signals.

Station WOS, Jefferson City, Mo.

441 Meters (680 Kcys.) C. S. T.) Mar. 14.—8 P. M.—Concert by the Miller Theatre Orchestra, E. S Emerson, director, by line telephony from Miller Theatre, Jefferson City. 9:15 P. M.—Dance program at the annual "St. Pats" Ball given by student engineers of the University of Missouri, broadcast by remote control from Columbia, 35 miles from WOS.

Mar. 16—7:30 P. M.—Service of the First Christian Church, Jefferson City, Robert M. Talbert, pastor. Prof. Seibert Price, organist. Mrs. Fred Reagle, violinist, and Robed Choir of twenty-four voices.

Mar. 17—8 P. M.—Regular musical program, the details of which will be announced by radiophone.

Station KGG, Portland, Ore.

360 Meters (830 Kcys.) P. T. Mar. 16—9 P. M. Hyatt program of phonograph records released March 15.

Mar. 19—12:15 P. M.—News bulletins from the "Oregon Daily Journal." Market news and auto theft bulletins. 5:30 P. M.—Vocal and instrumental selections. 5:45 P. M.—Sports news and brief press time flashes. 7:30 P. M.—"Oregon Journal" news, market reports, police bulletin. 9 P. M.—U. S. Public Health Service bulletin. Address under auspices of P. A. T. Association on "Springs," by Gus Benz. Address under the auspices of the City and County Medical Society on "Food Values."

Station PWX, Havana, Cuba

400 Meters (750 Kcys.) E. S. T. Mar. 15—Concert at the studio of Station PWX, by the violinist, Vallero Vallve; Carlos Fernandez, pianist, and Mrs. Graciella Yanez del Castillo, soprano, with foreign and Cuban music.

Mar. 19—Concert at the Malecon Band Stand, by the General Staff Band of the Cuban Navy, Lieutenant Juan Iglesias, director.

Station KYW, Chicago, Ill.

536 Meters (560 Kcys.) C. S. T. Mar. 14.—9:30 A. M.—Late news and comment of the financial and commercial markets. (This service is broadcast every half hour during the twenty-four.) 11:35 A. M.—Table talk by Mrs. A. J. Peterson. 12:30 P. M.—"The Progress of the World," furnished by "Review of Reviews." 6:30 P. M.—News, financial and final markets. 6:00-6:30 P. M.—Spanish lessons by Prof. A. A. Brashie. 6:50 P. M.—Children's bedtime story. 7:00-7:30 P. M.—Dinner concert broadcast from the Congress Hotel. 10:00 P. M.-2:00 A. M.—Midnight revue.

Mar. 15.—9:30 A. M.—Late news and comment of the financial and commercial markets. (This service is broadcast every half hour during the twenty-four.) 10:30 A. M.—Farm and Home Service. 11:35 A. M.—Table talk by Mrs. Anna J. Peterson. 6:30 P. M.—News, financial and final markets. 6:50 P. M.—Children's bedtime story. 7:00-7:30 P. M.—Dinner concert furnished by the Congress Hotel. 8:00-8:58 P. M.—Musical program. 9:05 P. M.—"Safety First" talk by Chicago Motor Club. 9:15 P. M.—"Under the Evening Lamp" service furnished by the "Youth's Companion."

Mar. 16.—11:00 A. M.—Central Church service from Orchestra Hall, Chicago. Dr. F. F. Shannon, pastor. 2:30 P. M.—Studio chapel service by the Chicago Church Federation. 7:00 P. M.—Chicago Sunday Evening Culb service from Orchestra Hall, Chicago. The speaker of the evening will be Albert Parker Fitch.

Station KHJ, Los Angeles, Calif.

395 Meters (760 Kcys.) P. T. March 14—12:30-1:15 P. M.—News items; weather report; music. 2:30-3:30 P. M.—Matinee musicale. 6:40 P. M.—Live stock and vegetable reports. 6:45-7 P. M.—Richard Headrick, screen juvenile. 7-7:30 P. M.—Organ recital from First Methodist Episcopal Church, Arthur Blakeley, organist. 8-10 P. M.—Studebaker Radio Orchestra, of Long Beach. Walter F. McEntire, on "History." 10-12 P. M.—Art Hickman's Orchestra by line telephony from the Los Angeles Biltmore Hotel.

March 15—12:30-1:15 P. M.—News items; weather report; music. 2:30-3:30 P. M.—Matinee musicale. 6:40 P. M.—Live stock and vegetable reports. 6:45-7:30 P. M.—Helene Pirie, screen juvenile. Clinton and Hays Coddington, pianists. Bedtime story by "Uncle John." 8-10 P. M.—Kathryn Stilwell, mezzo soprano. Silver Gate Trio of San Diego. 10-12 P. M.—Art Hickman's Orchestra by line telephony from the Los Angeles Biltmore Hotel.

Station WDAR, Philadelphia, Pa.

395 Meters (760 Kcys.) E. S. T. Mar. 14.—11:45 A. M.—Daily almanac. 12:02 P. M.—Organ recital from the Stanley Theatre; Noonday Lenten services; Arcadia Concert Orchestra. 2:00-3:00 P. M.—Arcadia Concert Orchestra. 4:30 P. M.—Dance music. 7:30 P. M.—Dream Daddy with the boys and girls. 7:45 P. M.—Herman Widmaier, Dream Daddy's own music man. 8:00 P. M.—Program by the General Electric Company's Quartette; Playlet—The Walter Greenough WDAR Players. 10:10 P. M.—Howard Lanin's Dance Orchestra; special features during intermissions.

Mar. 15.—11:45 A. M.—Daily almanac. 12:02 P. M.—Organ recital from the Stanley Theatre; Noonday Lenten services; Arcadia Concert Orchestra, Feri Sarkozi, director. 2:00-3:00 P. M.—Arcadia Concert Orchestra; recital. 4:30 P. M.—The Cotton Pickers, direction Wilbur De Paris. 7:30 P. M.—Dream Daddy with the boys and girls.

Station WHAZ, Troy, N. Y.

380 Meters (790 Kcys.) E. S. T. Mar. 17—9 P. M.—St. Patrick's Night concert of Irish songs and music. Address by prominent speaker on "Ireland Today." 10:30 P. M.—Popular dance music by Blue Bird Ladies' Orchestra.

Station WDAF, Kansas City, Mo.

411 Meters (730 Kcys.) C. S. T. Mar. 14.—3:30-4:30 P. M.—Musical matinee—Regular "request" program by the Leo R. Davis "Radio" Orchestra. 6:00-7:00 P. M.—Piano tuning in number on the Duo-Art. Marketgram, weather forecast, time signal and road report. Address—Speaker from the Kansas City Children's Bureau. The children's story and information period. Music—Fritz Hanlein's Trianon Ensemble, Hotel Muehlebach. 8:00-9:15 P. M.—Novelty Night—Program arranged and presented by O. J. Ochs. 11:45 P. M.-1:00 A. M.—Nighthawk Frolic—The "Merry Old Chief" and the Coon-Sanders Novelty Singing Orchestra, Plantation Grill, Hotel Muehlebach.

Mar. 15.—3:30-4:30 P. M.—Musical Matinee—The Riley Ehrhart Orchestra. 6:00-7:00 P. M.—School of the Air—Piano tuning-in number on the Duo-Art. Marketgram, weather forecast. time signal and road report. Address—Edgar A. Linton, writer-lecturer of Kansas City. The children's story and information period. Music—Fritz Hanlein's Trianon Ensemble, Hotel Muehlebach. 11:45 P. M.-1:00 A. M.—Nighthawk Frolic—The "Merry Old Chief" and the Coon-Sanders Novelty Singing Orchestra, Plantation Grill, Hotel Muehlebach.

Station WBAP, Fort Worth, Texas

476 Meters (620 Kcys.) C. S. T. Mar. 16—11 A. M. to 12:15 P. M.—Services of First Methodist Church; Rev. J. W. Bergin, pastor. 4-5 P. M.—Organ concert by Miss Margaret Agnew White of the Rialto Theatre. 5-6 P. M.—Address by Rev. J. Frank Norris, pastor of the First Baptist Church. 11 P. M. to 12 A. M.—Popular concert by Fred Cahoon's WBAP Southern Serenaders Orchestra.

Mar. 17—7:30-8:30 P. M.—Concert by Owen Crockett's Yeoman Orchestra, featuring Irish tunes for St. Patrick's Day. 9:30-10:45 P. M.—Concert by the orchestra and band of the Odd Fellows Orphanage, Corsicana, Texas.

Mar. 18—7:30-8:30 P. M.—Concert offered by Miss Virginia Jackson, pianist, and other artists. 9:30-10:45 P. M.—Concert by the 450-voice choir and 25-piece orchestra of the First Baptist Church J. Dalbert Coutts, director.

Station WOAW, Omaha, Neb.

526 Meters (570 Kcys.) C. S. T. Mar. 14—6 P. M.—Dinner program by Tarkio, Missouri, Band, C. Howard Duncan, director. 9 P. M.—Tarkio College Conservatory of Music, Tarkio, Missouri, Robert D. W. Adams, director. Courtesy Tarkio, Mo., Chamber of Commerce. Auspices W. O. W.

Mar. 15—6:30 P. M.—Dinner program by Francis Potter's Mandolin Quartet. Banjo and mandolin solos, Francis Potter. Vocal solos, Mrs. Francis Potter. 9 P. M.—Stanley Jan Letovsky, prominent pianist.

Station KFKB, Manhattan, Kas.

286 Meters (1050 Kcys.) C. S. T. Mar. 14.—7:05 P. M.—"Economical Farm Buildings," Prof. W. G. Ward. 7:30 P. M.—"The Place of Mechanical Power on the Farm," Prof. W. H. Sanders. Musical program: Vocal solo, Edna Ellis; piano solo, Gertrude Rosemund; vocal solo, Orpha Russel. "Dramatics in Your School and Community," Prof. Ray E. Holcombe.

Station WLW, Cincinnati, Ohio

309 Meters (970 Kcys.) C. S. T. Mar. 14—10:30 A. M.—Weather forecast and business reports. 1:30 P. M.—Market reports. 3 P. M.—Stock quotations. 4 P. M.—Special program.

Mar. 15—10:30 A. M.—Weather forecast and business reports. 1:30 P. M.—Market reports.

Mar. 16—Religious services, 9:30 A. M. and 11 A. M.

(Concluded on page 25)

A list of votes received to date as going to press will be published in RADIO WORLD of March 22.

Who Is America's Most Popular Radio Entertainer?

Everybody is interested in this query: Who is America's most popular radio entertainer? You have your favorite. Who is she or he? Let us know your choice, whether a comedian, an opera singer, a jazz band, or a story-teller.

RADIO WORLD wants to be able to tell the world the name of the entertainer who stands highest in the regard of listeners-in.

Use the accompanying blank and mail to Broadcasting Manager, RADIO WORLD Cut off. Fill out. Mail today.

BROADCASTING MANAGER, RADIO WORLD,
1493 Broadway, New York City.

Dear Sir:

My favorite entertainer is.....Station.....

Name.....

Street Address.....

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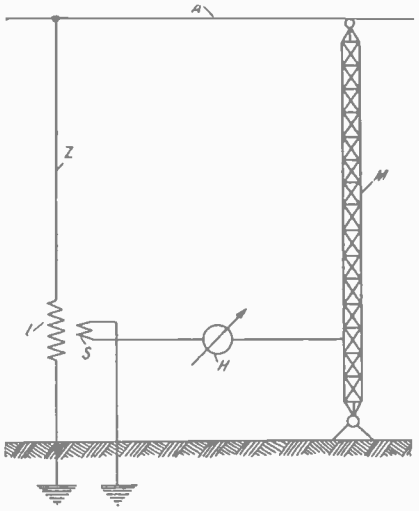
Latest Radio Patents

Antenna Arrangement for Wireless Telegraphy

No. 1,483,860: Patented February 12, 1924. Patentee: O. von Bronk, Berlin, Germany.

This invention relates to radio signaling systems and particularly to a method and apparatus for eliminating undesirable effects of the antenna masts.

The great height of the masts used for radio antenna makes it necessary to provide relatively great mechanical firmness. It is therefore necessary to make the masts almost entirely of metal. The masts are a troublesome necessity in the alternating field of the antenna as they pro-



Method of erecting wireless antenna using metal masts, without the effect of the metal being apparent in the radiation of the current.

duce distortion in the path of the lines of force between the antenna and its surroundings which unfavorably influence the radiation and produce currents in the masts, which, depending on the resistance present result in losses and diminish the effectiveness of the entire antenna arrangement. To prevent these, the masts are usually separated from the ground by means of insulation but it is difficult to maintain the insulation permanently good.

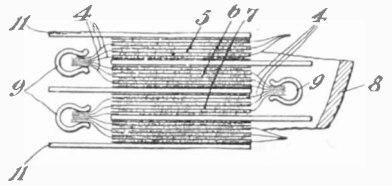
The present invention discloses a further means to counteract the effects mentioned as will be hereunto described. The mast is subjected to an electromotive force by means of an auxiliary source of energy drawn from the high frequency source and having the phase and distribution substantially equal to the electromotive force in the neighboring dielectric. The lines of force from the dielectric entering into the mast are thus reduced to a minimum so that the energy consumed in the mast can only be very small.

The antenna A carried by mast M is connected to the input feed conductor Z which contains the antenna induction coil L. The latter is coupled with a second coil S and from this the auxiliary energy is supplied to the mast. If S is uncoupled from L then a current flows through the mast and feeding conductor, the value of which can be determined on the meter H. By correct coupling of S and L and proper electrical values of the current path comprising the earth mast and dielectric an electromotive force of the proper phase and amplitude can be impressed on the mast so that the current in it will be a minimum.

Terminal Connection for Condensers

No. 1,480,604: Patented January 15, 1924. Patentee: William Dubilier, New York City

The invention has for an object to provide terminal connections for the sections of a high potential condenser which will minimize the occurrence of brush discharge or arcs between terminals and other adjacent metallic bodies.



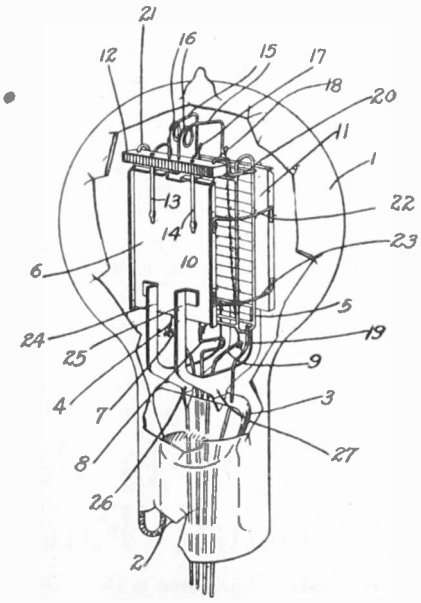
Method of constructing high tension condensers which has several novel points.

Another object of the invention is to provide a connection which will afford adequate electrical conductivity and be of such character as not to be readily injured or dislocated during handling or use of the condenser.

Electron Discharge Device

No. 1,479,991: Patented January 8, 1924. Patentee: R. W. King, New York City.

The invention relates to improvements in the mounting of electrodes for vacuum tube devices, and by way of example is illustrated and described as embodied in an electron discharge device of the audion type. It has been common in vacuum tube devices to support one or more of the electrodes from a glass rod or arbor



Electron tube utilizing a new arbor made of metal to support the elements. Several advantages are claimed for this improvement, one being the added strength of the interior construction.

which projects into the tube. The use of a fragile support, such as a glass rod, is obectionable, however, due to the frail character of the support.

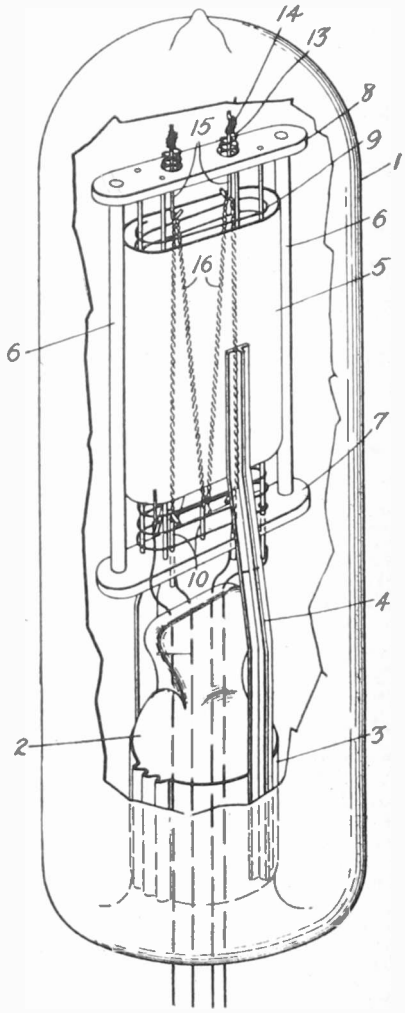
An object of the present invention is to avoid, to a large extent at least, the use of a glass supporting structure for an electrode or electrodes to the end that a stronger and more rugged mounting may be employed instead. This is accomplished, according to the present invention, by providing a metallic supporting connection between the plate electrodes and the press or squash in which the leading-in wires are sealed. The support for the grid and filament is provided in the form of a block of insulating material connected to one of the plate electrodes.

Vacuum Tube

No. 1,480,208: Patented January 8, 1924. Patentee: W. G. Houskeeper, New York City.

This invention relates to a suspension device and has particular reference to a device for supporting an electrode of a vacuum tube.

The object of this invention is to provide a resilient electrode supporting element of a simple design and so con-



Means for suspending an electrode in a vacuum tube whereby constant pressure is exerted and the electrode "floats" on resilient members, thus rendering it less susceptible to injury from jars.

structed as to permit ready adjustment of the electrode during assembly of the tube and the constant maintenance thereafter of said electrode under uniform tension.

This object is attained by providing a resilient member adapted to engage a member rigidly supported within the tube and providing in combination with said resilient member a portion to embrace and firmly grip a suspension element. The electrode to be supported is engaged with the suspension element and the resilient portion maintains the electrode under uniform tension.

The DX Nite Owls are Busier Than Ever This Week

DX Nite Owls, Attention!

THE DX season is now upon us.

All faithful DXers are requested to prepare themselves for the night vigil.

Send your records to the DX Editor of RADIO WORLD.

Write only on one side of the paper and write clearly.

Give full particulars of your location, your set, your aerials and other items of interest.

Also Pretty Pretty

From W. V. Cooper, 229 West 12th St., New York City

Seeing your request for DX stations received by your readers of the RADIO WORLD, I am sending in mine, which was done on a Tuska 220 Tuner. The following is my list:

WOC, WDAP, WGR, KDKA, WNAC, KYW, WOAW, WSB, WDAR, KFKX, WWJ, WCBD, WTAS, KOP, WFAA, WGM, WMAK, WBZ, WGY, WOS, WCAL, WDAF, WFI, WHB, WJAZ, WBAK, WLAG, WSAI, WCAE, WLW, WJAR, WTAM, WJAX, WIP, WPP, PWX, WHAM, WBT, WAAC, WHAS, WRC, WCAP, WGI, WHAZ, WEAF, WHN, WJZ, WJY, WOR, WQAO, WBAN, WRAZ, WEAM, WDT, WLAW, WBS and WAAM.

My set employs no amplification whatsoever. I use a UV201A for detector with four dry cells lighting the filament, and a twenty-two and a half volt "B" battery. My aerial is about a hundred feet long.

This One Is Rather Nice

From Fenton Tall, 812 West 35th St., Norfolk, Va.

I am a school-boy and I have been reading your DX column for some time, so I have decided to send in my records of three nights. I have a Federal 110 receiver with 3 tubes. My antenna is 100 feet long and consists of two wires 75 feet high.

Here are the results of three nights: My local station, WTAR, 9 blocks; KDKA, Pittsburgh, 330 mi.; WDAP, Chicago, 770 mi.; WJAR, Providence, 440 mi.; WDAR, Philadelphia, 220 mi.; WOO, Philadelphia, 220 mi.; WEAF, New York, 275 mi.; WCAP, Washington, 165 mi.; WTAM, Cleveland, 440 mi.; WHAS, Louisville, 550 mi.; WDAF, Kansas City, 1,054 mi.; PWX, Cuba, 1,200 mi.; WJAX, Cleveland, 440 mi.; WFI, Philadelphia, 220 mi.; WGY, Schenectady, N. Y., 450 mi.; WSB, Atlanta, 550 mi.; WOR, Newark, 275 mi.; WBZ, Springfield, 380 mi.; WCAE, Pittsburgh, 330 mi.; WBAP, Fort Worth, 1,320 mi.; WRC, Washington, 165 mi.; WOS, Jefferson City, 930 mi.; WMC, Memphis, 770 mi.; WBAN, Columbus, 495 mi.; KYW, Chicago, 770 mi.; WJAZ, Chicago, 770 mi.; WWJ, Detroit, 550 mi.; WIP, Philadelphia, 220 mi.; WOC, Davenport, 880 mi.; WHAA, Iowa City, 935 mi.

I heard all these on a Baldwin speaker.

Sorry We Missed You Last Time

From F. C. Arnold, 104 North West Street, Waukegan, Ill.

I sent in a list some time ago but have not seen it yet. Since then I have a larger and more complete list. I have also changed my aerial. My aerial is now a V-shaped, each leg is about 45 feet long, with a lead in about 40 feet long. I have power lines on two sides of me. Am using a regenerative three tube set. All my work is done on a loudspeaker, using no phones. Here they are: WDAP, WJAZ, KYW, WMAQ, WAAF, all Chicago, 40 miles; WCAE, KDKA, KQO, of Pittsburg, Pa., 450 miles; WBH, WDAF, Kansas City, Mo., 410 miles; WTAS, Elgin, Ill., 50 miles; WSAI, WLW, Cincinnati, O., 300 miles; WOS, Jefferson City, Mo., 350 miles; WOC, Davenport, Ia., 150 miles; WIAO, Milwaukee, Wis., 50 miles; WTAO, Tecumseh, Neb., 440 miles; WOAW, Omaha, Neb., 410 miles; WCBD, Zion, Ill., 8 miles; KSD, St. Louis, Mo., 300 miles; WCX, WWJ, Detroit, 240 miles; NAJ, Great Lakes, Ill., 3 miles; WTAM, Cleveland, O., 340 miles; WGY, Schenectady, N. Y., 710 miles; WFAA, Dallas, Tex., 820 miles; WEAF, New York, N. Y., 730 miles; WLAG, WBAH, Minneapolis, Minn., 270 miles; WPAM, Topkea, Kans., 460 miles; WBAX, Wilkesbarre, Pa., 630 miles; KFI, Los Angeles, Cal., 1740 miles; WPAH, Waupaca, Wis., 150 miles; KPO, San Francisco, Cal., 1850 miles; KOP, Detroit, Mich., 240 miles; WOI, Ames, Ia., 300 miles; WSB, Atlanta, Ga., 620 miles; WHAS, Louisville, Ky., 300 miles; WCAL, Northfield, Minn., 300 miles; KLZ, Denver, Colo., 900 miles; WMC, Memphis, Tenn., 510 miles; WFI, WOO, WLP, Philadelphia, 670 miles; KLS, Oakland, Cal., 1820 miles; KFKB, Milford, Kan., 520 miles; WGR, Buffalo, N. Y., 450 miles; WTAC, Johnstown, Pa., 490 miles; WABA, Lake Forest, Ill., 10 miles; WMAB, Oklahoma City, Okla., 700 miles; KFKX, Hasting, Neb., 550 miles; WTAY, Oak Park, Ill., 30 miles; WRC, WCAP, Washington, D. C., 600 miles; WOAG, Belvidere, Ill., 50 miles; WBZ, Springfield, Mass., 780 miles; WWAE, Joliet, Ill., 60 miles; CFCK, Edmonton, Can., 1500 miles; GXN, Chicago, 40 miles, and CYL, Mexico City, Mex., 1600 miles. Total miles—25,191. Total stations—60. Record for one night—31 stations, in 3 hours, 45 minutes. All loud speaker work, remember DX'ers. I have an idea this is not so rotten.

Not DX—But for DXers

From A. E. Fischer, 765 B Street, Hayward, Calif.

I have taken note of the fact that you published my DX record in an early January issue of RADIO WORLD and since that time have added over a dozen new stations to my list all of which are over 1,500 (air) miles distant, WGY, Schenectady, N. Y., being the most distant. I have also noted with interest the records of other "dial twisters" published in recent issues and after reading them I feel that a suggestion concerning the computation of distance would not be amiss. Every radio fan and especially the DX Nite Owls should purchase a reliable map on which distance in AIR MILES can be accurately measured. I will never forget the first time that I heard WGY, of Schenectady, N. Y. In my zeal I turned to a b.c.l. friend of mine and exclaimed: "Ye Gods, man, that's over 3,500 miles away." Imagine my chagrin when upon turning to the radio map I discovered that the correct AIR LINE distance was 2,550. Yes, fans, buy a radio map and learn why the U. S. Mail Planes make such good time from coast to coast.

Fans Had Better Send a Stamp for This One

From C. M. Adams, Alpine, Wash.

Many time I have looked at the DX Nite Owls section and longed for a set that would "bring 'em in." Although I had a four-tube set with one stage tuned radio frequency, my distance seemed to be not over 1,000 miles. Last week a friend of mine and myself scraped together a bunch of parts and thought we would try our hand at something original. At least we have never seen any hook-up like the one we built. We used a variometer 43-plate condenser, 2 Acme radio transformers and 2 Crosley audio transformers and assembled the set in one afternoon. Although the volume is not great it sure brings them in. Here is my record for last night:

KGG, Portland; KDKA, East Pittsburgh; WSAI, Cincinnati; KJR, Seattle; KFHR, Seatle; KGO, Oakland; CFAC, Calgary; CJCA, Edmonton; CKCK, Regina CHCE, Victoria; KDZR, Bellingham; CHBC, Calgary; Swanson Bay, B. C. (not listed); WCAL, Northfield, Minn.; CKCX, Calgary; KFI, Los Angeles; KFJC, Seattle; KHQ, Seattle; CKCD, Vancouver; KFFJ, Los Angeles not listed); KJS, Los Angeles; KPO, San Francisco; WDAP, Chicago.

Those Neutrodynes Can Pull 'Em In

From Frank Renschler, 1220 Grand Concourse, New York City.

As a reader of your publication and being interested in your DX column, I am sending a list of station received by me. WTP, Phila., WOO, Phila.; WDAR, Phila.; WTAS, Elgin, Ill.; WSB, Atlanta; KYW, Chicago; WDAL, Jacksonville; WAAN, Columbia, Mo.; WWJ, Detroit; WTAM, Cleveland, WHAZ, Troy; WJAX, Cleveland; WJAZ, Chicago, WOC, Davenport, Ia.; KSD, St. Louis; WPAH, Wampaca, Wis.; WFAA, Dallas; WRC, Washington, D. C.; WLW, Cincinnatti; WLAG, Minneapolis; WDAP, Chicago; WMAQ, Chicago; WRW, Tarrytown; WBZ, Springfield, Mass.; KDKA, Pittsburg; WCAE, Pittsburg; WGR, Buffalo; WABB, Harrisburg, Pa.; WGY, Schenectady, WDAF, Kansas City; WSAI, Cincinnatti; CHYC, Montreal; WCAP, Washington, D. C.; WCX, Detroit; WEAN, Providence; WOEI, San Antonio; WMC, Memphis; WOS, Jefferson City; WHAM, Rochester; WABT, Washington, Pa.; CFCF, Montreal; WFI, Phila.; WCBD, Zion, Ill.; KFKX, Hastings, Neb.; WSAR, Fall River; WAAW, Omaha, Neb.; WMAQ, Lockport; WJAQ, Topeka, Kan.; WKAQ, Porto Rico; CKAC, Montreal; PWX, Havana; WBT, Charlotte, N. C.; KFI, Los Angeles; WCK, St. Louis; WNAC, Boston; WOAW, Omaha; WSAJ, Grove City, Pa.; WGI, Medford Hills; NAA, Arlington; KHJ, Los Angeles.

The receiving set is a five-tube Freed-Eisemann, a Music Master loud speaker, an indoor antenna of twenty-five feet of bell wire and an outdoor antenna of one hundred and twenty-five feet of solid brass wire spring with thirty feet lead in. The above stations were all heard on the loud speaker, and Chicago stations and one station in Canada, were picked up on the indoor aerial, which is quite free from any interference.

BUSINESS NEWS OF THE INDUSTRY

Broadcasting for Farmers

EDGAR L. BILL director of information of the Illinois Agricultural Association, has been appointed program director of the Sears-Roebuck Agricultural Foundation radio broadcasting station, which it is expected will be opened for service in Chicago about April 1. The Loop branch of the broadcasting station will be located in the Hotel Sherman, from which the entertainment features of the programs will be broadcast. The Hotel Sherman studio will be on the mezzanine floor, adjoining a reception room for those who will take part in the program. The broadcasting will be done in full view of the public, as glass windows will permit those interested to watch the broadcasters at work.

"We are going to give the farmer a real program from music to statistics," Mr. Bill declared. "A large part of the entertainment will be given by farm talent, the best to be obtained."

Effort to Close Up Station WHN

SUIT was brought last week by the American Telephone & Telegraph Company against Marcus Loew to prevent the operation of broadcasting station WHN on the roof of the State Theatre, New York City. Eight patents owned by the complainant are alleged to be infringed by the defendant every time WHN operates.

It was reported that the suit against WHN was merely the first step in a well-calculated campaign by the American Telephone and Telegraph Company to protect its patent rights and to stabilize the broadcasting industry.

Makes Record Keeping Easy

THE Progress Press, Union, South Carolina, has started sales distribution on a novel record book they are publishing. It contains sufficient space for all records that are likely to be of use to the fan when he wants to get a station that he has heard once, and also has other information that is of interest. The "hit and miss" idea of getting stations by wildly swinging dials is gradually giving place to the efficient tuning by exact settings, and this little book allows accurate dialings to be kept and thus makes it easy for the fan to get a station back when he wants it.

Aeolian Company Enters Radio Field

ANNOUNCEMENT is made by the Radio Corporation of America that the Aeolian Company, of New York City, and the Aeolian Company, of St. Louis, have been appointed distributors for the Radio Corporation of America products.

Radio Trade Notes

Gus Kempin, Two Buttes, Colorado, states that he will soon enter the retail radio business.

* * *

W. A. Scott, Crowville, La., has just opened a retail radio shop.

Two New Types of Electro-Dynamic Reproducers

THE Magnavox Company, Oakland, Calif., well known manufacturers of loud speakers, have placed on the market two new models of their well known R2 and R3 radio reproducers.

These instruments combine greatly increased sensitivity with minimum current consumption and also include a new volume control, enabling them to be operated on any point between a minimum current consumption of .1 ampere and a maximum current of .6 ampere, when supplied with six volts. This improvement means a great saving in current consumption, as well as making possible true sound modulation.

Both models are furnished with the various finishes that have been so popular in the previous instruments. The Type R2 is furnished with an 18" curvex horn, while the R3 utilizes a 14" horn. Both are capable of being "modulated" by means of the control.

Makes Set Building Simpler

THE United Radio Manufacturing Co., of New York City, have placed on the market a neat triple gang socket so arranged that it is easily and quickly placed on the panel of a set.

It is made of machined bakelite, neatly engraved. The sockets are of heavily nickeled spun brass tubing, with phosphor bronze contact spring. This gang socket answers the problems the fans have been having in mounting their tubes on "sub bases," as no machine work is necessary.

The socket is manufactured to take the standard base tubes. It is a sturdily made article which should meet with approval from the fans desiring to keep up to the minute in all that is new in the way of radio construction.

Coming Events

INTERNATIONAL RADIO & ELECTRIC SHOW, Baltimore, Md., March, 1924.

RADIO will be featured at the electrical exhibition to be held at Melbourne, Australia, in September, 1924.

FIRST ANNUAL RADIO SHOW, Convention Hall, Washington, D. C., March 19-26, 1924.

FOURTH ANNUAL RADIO SHOW, EXECUTIVE RADIO COUNCIL, SECOND DISTRICT, INC., Hotel Pennsylvania, New York City, March 3-7, 1924.

RADIO SHOW, New Haven, Conn., March 15-22, 1924. Thomas M. Friscoe, Manager, 30 Congres Ave., New Haven, Conn.

THIRD ANNUAL RADIO SHOW, Grand Central Palace, New York City, October 2-8, 1924.

Another New York Radio Show

IT was reported last week that a radio show will be held at Madison Square Garden, New York City, beginning September 22, 1924. It will be under the management of James Kerr, who made such a success of last year's Chicago radio show.

Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested, through the Service Editor of RADIO WORLD, by the following:

C. Harwood King, 9 Village Rd., Bebington, Cheshire, England.
W. A. Scott, Crowville, La.
Roy L. Cramford, R. F. D. No. 1, Box 15, Kerens, Texas.
Emil Johnson, Lincoln, Neb.
E. E. Brotholf, Route 7, Winterset, Iowa.
Kentucky Radio Co., Corbin, Ky. (Dealers.)
Fred O. Bouton, 137 N. Cheyenne Ave., Bartlesville, Okla.

Amateur Contest at Washington Show

AN amateur contest will be conducted in conjunction with Washington's first annual radio show at Convention Hall, Washington, D. C., the week of March 19 to 26. Valuable prizes will be awarded to amateurs who construct their own sets. There will be five different classes of awards, as follows:

1—For the most compact, complete portable set.

2—For the most ideal set for the home.

3—For the most efficient single tube set, regardless of circuit.

4—For the best set made by boys under 15 years of age.

5—For the best set made by girls under 15 years of age.

All amateurs interested in this contest should communicate with show headquarters immediately, and by mail only.

Radio and Electrical Business Opportunities

Rate: 40c a line. Minimum, 3 lines.

LET US BE YOUR FACTORY. Don't put your capital into machinery; we have excellent equipment, skilled mechanics and wide experience in building dies, tools and economical manufacturing of small devices; we do not finance inventions, but if you have funds to produce your article you can employ our facilities profitably and with less risk; at a reasonable charge we will design and build your tools, make your parts, and, if desired, assemble, pack and ship the complete device; our responsibility is established. Interstate Mechanical Laboratories, 521 West 57th St. Phone Columbia 5321.

RADIO BUYER seeks reliable party with capital to establish radio business; has extensive radio merchandising experience; knowledge of every phase of radio industry and department store methods; buyer at present for one of New York's largest radio retailers. X, RADIO WORLD.

RADIO and novelty manufacturers. We are distributors, have good selling organization, seeking reliable factory lines, commission basis, or purchase for Southern California; what can you offer? References exchanged. Address Murray Empire Co., 327 West Pico St., Los Angeles.

RADIO—Branching out in this line, seeking additional capital, either with or without services; old established firm, twenty years in business at present address; centrally located, heart of Broadway. L. L., RADIO WORLD.

WANTED, Radio Man, Manufacturer or Dealer preferred, to display complete line of radio outfit and equipment, space to be used on a rental basis, commission basis or on split profit basis; best location in Paterson, on the corner of Main and Market Sts.; write or call Main and Market Music Shop, Inc., 12 noon to 10 P. M.

MAYS makes metal specialties, raw, assembled or finished; quotation from blueprint or model. Mays Mfg. Co., Box 671, Providence, R. I.

RADIO and electrical store, 207 East 14th St., New York City, established 8 years, running business. Edison Mazda Lamp Agency, $2,500 contract included in sale. Call at premises.

More Broadcast Programs

(*Concluded from page 21*)

Station WOR, Newark, N. J.

405 Meters (740 Kcys.) E. S. T. March 14—2:30 P. M.—Harold Taft Wright, tenor. 2:45 P. M.—"It's Not a Home Till It's Planted," by Lester C Lovett, president, Eastern Nurserymen's Association. 3:00 P. M.—Inez Klumph, "Can You Write for the Newspapers." 3:30 P. M.—Harold Taft Wright, tenor. 3:45 P. M.—Piano selections by Louise Egner of WOR. 6:15 P. M.—Songs for the children by Agnes Leonard. 6:30 P. M.—"Man in the Moon Stories for the Children." 7:00 P. M.—Program by the employees of the Edison Lamp Works, General Electric Company.

March 15—2:30 P. M.—George Trisdorfer, baritone. 2:45 P. M.—Piano solo by Ernestine Brown. 3:00 P. M.—Mary Greer on "Passports." 3:30 P. M.—George Trisdorfer, baritone. 3:45 P. M.—Piano solos by Erhestine Brown. 6:15-7:15 P. M.—Paul Van Loan's Cinderella Orchestra. 7:15 P. M.—Fred J. Bendel, "Radio for the Layman." 8:00-9:00 P. M.—Gene Ingraham's Bell Record Orchestra. 9:00 P. M.—Belle Bart, astrologist. 9:15 P. M.—Quartet of the Church of the Redeemer, Newark, N. J. 9:30 P. M.—Gutzon Borglum, famous sculptor, creator of the famous Lincoln statue. 9:45 P. M.—Quartet of the Church of the Redeemer. 10:00-11:00 P. M.—Program under the direction of Nannine V. Joseph.

Station WHAS, Louisville, Ky.

400 Meters (750 Kcys.) C. S. T. March 14—1:00-5:00 P. M.—Walnut Theatre Orchestra. Walter Davison, conductor; police bulletins; weather forecast; "Just Among Home Folks," a daily column appearing in the Courier-Journal; Strand Theatre Orchestra, Harry S. Currie, conductor; late news bulletins. 4:50 P. M.—Local livestock, produce and grain market reports. 5:00 P. M.—Official time. 7:30-9:00 P. M.—Concert; reading: An Interesting Historical Episode; news bulletins; official time at 9 o'clock.

March 15—4:00-5:00 P. M.—Strand Theatre Orchestra, Harry S. Currie, conductor; police bulletins; weather forecast; "Just Among Home Folks," a daily column appearing in the Courier-Journal; Walnut Theatre Orchestra. Walter Davison, conductor; news bulletins; Alamo Theatre organ. 4:30 P. M.—Local livestock, produce and grain market reports. 5:00 P. M.—Official time. 7:30-9:00 P. M. Concert; news bulletins; official time.

Station WOO, Philadelphia, Pa.

509 Meters (590 Kcys.) E. S. T. March 14—11:00 A. M.—Grand organ. 11:30 A. M.—Weather forecast. 11:55 A. M.—Naval Observatory time signal. 12:00 M.—Tea Room Orchestra. 4:45 P. M.—Grand organ and trumpets. 5:00 P. M.—Sports results and police reports. 7:30 P. M.—Hotel Adelphia Concert, A. Candelori, director. 8:30 P. M.—Musical program from Fox Theatre. 9:15 P. M.—Address, Dr. J. P. Crozier Griffith. 9:30 P. M.—Organ recital, Mary E. Vogt. 9:55 P. M.—Naval Observatory time signal. 10:02 P. M.—Weather forecast. 10:03 P. M.—Dance program by the Kentucky Kernels from the Hotel Adelphia.

March 15—11:00 A. M.—Grand organ. 11:30 A. M.—Weather forecast. 11:55 A. M.—Naval Observatory time signal. 12:00 M.—Tea Room Orchestra. 4:45 P. M.—Grand organ and trumpets. 5:00 P. M.—Sports results and police reports. 9:55 P. M.—Naval Obsevatory time signal. 10;02 P. M.—Weather forecast.

Station WNAC, Boston, Mass.

278 Meters (1080 Kcys.) E. S. T. March 14—12:15 P. M.—King's Chapel service. 1:00-4:00 P. M.—Shepard Colonial Orchestra 6:00 P. M.—Children's half-hour. 6:30 P. M.—WNAC dinner dance from Hotel Westminster. 8:00 P. M.—Program by General Electric Company.

March 15—1:00 P. M.—Shepard Colonial Orchestra. 4:00 P. M.—Tea dance from Copley Plaza Hotel. 6:30 P. M.—Dinner dance from Hotel Westminster. 8:00 P. M.—Concert program. 9:00 P. M. Dance music—State Ballroom Orchestra from State Ballroom; Copley Plaza Orchestra from Copley Plaza Hotel.

Station KFNF, Shenandoah, Ia.

266 Meters (1130 Kcys.) C. S. T. Regular schedule—General concerts, Wednesday and Saturday, 7:30-9:00 P. M. Sacred song service, Sundays, 6:30-7:30 P. M. Noonday concerts, 12:30-12:55 P. M. each day. Special features, from time to time as announced.

Station KGO, Oakland, Calif.

312 Meters (960 Kcys.) P. T. Mar. 13.—Instrumental and vocal solos, and readings, beginning 8:00 P. M.

Mar. 15.—Instrumental and vocal solos, and readings, beginning 8:00 P. M.

RADIO WORLD SELLING OUT ON THE NEWS-STANDS

Had your newsdealer sold all of his supply of RADIO WORLDS when you tried to get your copy?

Newsdealers are selling out on RADIO WORLD all over the country. Be sure to have a complete file of RADIO WORLD. You can do so by subscribing.

If you wish, you may send your yearly subscription order through your newsdealer.

Subscribe, so that you won't miss any copies. Radio World, 1493 Broadway, New York City.

Valuable Lists

THERE has appeared weekly in RADIO WORLD for several months a list of names of those who have asked for circulars or other reading matter about radio goods. Addresses have appeared in all lists.

We can furnish back numbers containing lists for the past six months. These names will total several hundred.

The issues for the past six months (26 nos.) will be mailed on receipt of $3.00.

SEND NOW before any of these back numbers are out of print.

Sub. Dept., RADIO WORLD, 1493 Broadway, N. Y. C.

OUT OF THE ETHER

Chats About Broadcasting Stations

By Hirsch M. Kaplan

Have you heard station WBZ broadcasting through its new Hotel Brunswick studio yet? Well, tune them in any evening now and you'll get the surprise of your life. At first you will be under the impression that you are listening to a local program. That is how much the station has been improved and above all the programs also have been greatly improved. We were fortunate in tuning them in on their opening night and heard a real treat in an organ recital by Edwin H. Lemare, whose program consisted of classical numbers, followed by dance music by the Hotel Brunswick Orchestra who sure are a peppy combination and a recital of string music as played by the Copley String Ensemble. If such high class programs are to be a regular feature then we will build a receiver that will have a fixed receiving wave of 337 meters. Here is hoping that this will be necessary.

We have always declared in these columns that many of the stations operat-

(*Concluded on next page*)

Out of the Ether

(Continued from preceding page)

ing on the low waves offer programs as good if not better than those offered by some of the most popular stations. The other evening, much to our surprise, we happened to tune down to 240 meters and who should come booming through but station WBBG, "The Voice of Cape Cod," located at Mattapoisett, Mass. At the time Thomas Ellis was rendering a very splendid saxophone program of popular music.

What did you think of Paul Whiteman and his Palais Royal Orchestra which performed through station WEAF the other evening? Greatest in the class of those who offer programs of popular dance music, and we would like to hear them more often. Many have remarked that they prefer Paul Specht and his Hotel Alamac Orchestra which plays through WJZ because they not only play popular numbers to jazz time but also classical and operatic and that is what they think makes them superb. Well, this might lead to much controversy. To avoid it, we would suggest that they tune in WJZ any Tuesday or Thursday evening and then wait until Whiteman's combination returns to the air.

Yes, Yes, You're Right!

EDITOR, RADIO WORLD:

RADIO WORLD is O. K. and your Question and Answer Department very instructive, but some of the questions must be very wearing on the patience of your expert radio engineer editor. Too many of them are like this:

"I expect to assemble a superdyne receiver from designs published in your issues of Dec. 15, 22 and 29, 1923, and will be disappointed if I do not have perfect reception of the entire country from coast to coast, and from the Gulf to Alaska, but can't I substitute a pine board for the panel, use common door knobs instead of dials, avoid the expensive ten-cent stores by winding broom wire on an empty oatmeal box, make my condensers by quartering some tin pie pans, use a salt shaker for crystal detector, and for lights why can't I use 15-watt Mazda bulbs? Could a joint of stove pipe be remodeled into a loud speaker to save ten dollars?"

Yours very truly,
Welch, W. Va. P. W. EARLY

Seventy-five thousand radio "fan" readers look for RADIO WORLD every Wednesday. It is dated Saturday. Its advertising forms close Thursday, nine days in advance of date of issue.

Come on, Fellows! Let's all build that Superdyne that appeared in RADIO WORLD for Dec. 15, 22 and 29. It's the best thing that the past year brought out. Start it now!

When you see it in RADIO WORLD you know it's news—not a month old.

Bell Telephone Annual Report

THAT the Bell System is the biggest and best telephone system in the world is evidenced by the annual report of President H. B. Thayer of the American Telephone and Telegraph Company, who says that it must be even greater to meet the future demands for service.

In the latter part of 1923, submarine cable was put into service between Catalina Island and the mainland, near Los Angeles, superseding the radio installation. However, experiments have continued on trans-Atlantic radio telephony following the successful tests which were noted last year. The experimental broadcasting station in New York has been continued and broadcast important addresses of President Harding and President Coolidge.

During the year there have been installed a total of 2,160,000 telephone stations, and 1,138,900 telephone stations have been discontinued. The net gain in telephones for the year was 891,342. This has meant net additions to plant of $250,000,000, a construction program much larger than any preceding year. A still larger program is planned for 1924.

A second transcontinental telephone line was placed in service during the year along the route through Pueblo, El Paso and Los Angeles. The New York and Chicago long-distance cable line was extended west to Cleveland and will be extended to Chicago within two years.

The financial statements of the American Telephone and Telegraph Company showed that the company in 1923, after meeting all operating charges and making adequate provision for depreciation and obsolescence, and for federal and other taxes, had available for interest and dividends $95,389,918.03. Interest charges were $13,697,736.66, a reduction of $1,800,275.22 from 1922. Dividends paid to stockholders at the rate of $9.00 per share per year, amounted to $63,274,388.10, an increase of $10,303,136.17 over 1922. Of the resulting balance, there was appropriated for contingencies $3,000,000 and the remainder, $15,417,793.27 was carried to surplus.

Fans Aid Fund to Distribute Crystal Outfits

TO provide radio entertainment for sufferers who are confined to their homes because of sickness or injury, the Palmer School of Chiropractic station, WOC, at Davenport, Iowa, is sponsoring a fund among broadcast listeners to send crystal detector sets to such unfortunates.

Many subscriptions, ranging upwards from $1.00, have already been received by WOC in response to its announcement of the plan, and more than 300 sets have been distributed.

These can only be used, of course, where there is a broadcasting station within short range, as the crystal sets, except under the best conditions, do not work well over long distances.

Radio fans are invited to aid with contributions to the fund or to notify WOC of any deserving cases where such a set would provide entertainment for some worthy person.

Woman Trapper Has Radio Set

THE Moose River section of the Adirondack country lays claim to being the home of the only woman trapper in northern New York. The woman is Miss Margaret Rega, who lives alone in a wilderness camp and performs all the hard labor associated with her vocation.

Miss Rega has more than four score traps out on her lines in the Moose River country and at Nicks Lake. This season, it is reported, she has had a good take of raccoon, mink and muskrat.

The loneliness of the wilderness evening is broken for her only by a radio set which she had installed in her camp last autumn.

New Bill Will Revise Copyright Laws

A REVISION of the copyright laws that were drafted before the radio broadcasting stations came into use, is sought by Representative Walter H. Newton, of Minnesota. He has introduced a bill in Congress that will permit the free use of copyrighted music by the movies, theatres, hotels and radio stations. This measure is practically the same as that introduced on June 21, 1921, by Representative Lampert and an effort will be made to secure early consideration of the bill by the committee on Patents. It is likely the bill will come up for action by the House this season.

An attempt is being made by the American Society of Composers, Authors and Publishers to apply the law that was passed years before the advent of radio broadcasting stations, to cover their playing of music that is copyrighted by their members. That such a thing is wrong, is shown by the new bill just introduced by Representative Newton, who believes the playing of copyright music for movies, theatres, hotels and radio stations, is for the benefit of the public and without remuneration to the players. He holds that such performances popularize the music and increase its sale to the public and he believes that the radio stations, movies, theatres and hotels, should not be required to make payment to the publishers.

Representative Newton also complains that certain publishers, acting through secret representatives posing as patrons, have induced movies, theatres, hotels and radio stations to play certain copyrighted music then demand payment of a license fee because of such "unauthorized" rendition.

Bronx Radio Store Burglarized

RADIO fans are blamed for the robbery of the Melrose Batteries Shop, The Bronx, New York City, one night last week. Three receivers, six tubes and a loud speaker, with a total value of about $125, were stolen. The burglary was discovered by a watchman, who found the front door had been forced open. The safe, which contained $400 and the cash drawer containing $10, were not disturbed.

Spanish Radio Dealers Listed

THE Department of Commerce announces that a special list of firms dealing in radio apparatus in Spain is available for American manufacturers. This may be had on request by asking for file No. 118079.

DO YOU WANT TO BUY, SELL OR EXCHANGE RADIO OR OTHER GOODS? TRY THIS DEPARTMENT AT 5c A WORD

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

MANUFACTURERS' REPRESENTATIVES wanted to handle our Genuine Mexican Steel Galena Crystals. A guaranteed product that REPEATS and PAYS. Crystal fans reading this can get three of the hottest, livest, long-distance crystals going by enclosing $1.00. H. D. HATFIELD, 2735 W. 38th Ave., Denver, Colo.

AT LAST—No more trouble and expense in recharging your storage batteries. The one and only RADIO WONDER. A liquid that will recharge any battery right in your own home. Absolutely harmless. Simple to use. Insures a clearer reception. Can only be obtained by writing direct. $1.00 per bottle, postpaid. 75,000 bottles sold last month. RADIO WONDER CO., 131 Cathedral Parkway, New York City.

PATENTS Procured. Send sketch or model today for examination, prompt report and advice. No charge for preliminary advice. Write for free Booklet and blank form on which to disclose your idea. Highest references. Promptness assured. Clarence A. O'Brien, Registered Patent Lawyer, 201-A Security Bank Building. Directly across the street from Patent Office, Washington, D. C.

MUNZIG CIRCUIT. Two tubes do five operations. 500 miles on loop. Write at once for circuit and circulars. RAY-DEE-ARTCRAFT INSTRUMENT CO., Redlands, Calif.

3,000 MILES AND BETTER on receiver built from our plans. Send for your copy to-day. One dollar postpaid. COSMOPOLITAN RADIO CO., 1709 Suburban Ave., Pittsburg, Pa.

AGENTS—SELL RADIO SETS and parts. Tremendous demand. Large profits. Write at once. Merrimack Radio Co., Box 746, Lowell, Mass.

FOR SALE—Slightly used Grebe CR12 receiver and RORN radio frequency tuner, both in good condition. First money order for $125.00 takes it. Cost $190.00 new. Alfred W. Harm, Tabor, South Dakota.

PATENTS—Write for free Guide Books and Record of Invention Blank before disclosing inventions. Send model or sketch of your invention for our prompt Examination and Instructions. No charge for the above information. Radio, Electrical, Chemical, Mechanical and Trademark experts. Victor J. Evans & Co., 924 Ninth, Washington, D. C.

DETECTIVES NEEDED EVERYWHERE. Excellent positions, cities, towns. Particulars free. Captain Wagner, 188 East 79th St., New York.

AUDIO FREQUENCY TRANSFORMERS, REPUBLIC MAKE GUARANTEED. $2.50 postpaid; circular on request. Flint Radio Co., 1766 Wilson Ave., Chicago, Ill.

$100.00 a week to agents. Box 732, New Britain, Conn.

PATENTS—SEND DRAWING OR MODEL FOR EXAMINATION AND OPINION. Booklet free. Watson E. Coleman, Patent Lawyer, 644 G St., Washington, D. C.

MAGNAVOX R3 or M1—Latest nationally advertised reproducers. List, $35. Introductory, $25. The factory sealed carton is your guarantee. RADIO CENTRAL, Dept. W., Abilene, Kans.

WANTED—Mail us your discarded jewelry, Gold Crowns and Bridges, Watches, Diamonds, Silver, Platinum, and Old magneto points. Money promptly mailed. Goods returned if offer refused. United States Smelting Works (The Old Reliable), Dept. 55, Chicago.

New Radio and Electrical Firms

Photaudigraph Corp., Wilmington, Del., develop patents; $100,000. (Corporation Trust Co. of America.)

Electric Sales Corp., Dover, Del., $5,000. (Capital Trust Co. of Delaware.)

Radioset Corp., Jamaica, N. Y., wireless instruments, $10,000; J. A. Ledogar, H. N. Kinn, M. A. Scherl. (Attorney, E. J. Ledogar, Jamaica.)

Merchants Radio Clearing House Corp., New York City, $20,000; S. Forscher, A. Lillienthal, A. Morris. (Attorneys, Forscher, Lillienthal & Morris, 261 Broadway.)

Hefner Electric Co., Brooklyn, N. Y., $10,000; W. A. and G. R. and P. J. Hefner. (Attorneys, Velte & Harwood, 34 Nassau St.)

Kardon Products Co., New York City, wireless apparatus, $25,000; P. S. Kardon, H. Brudney, M. Parmet. (Attorney, R. C. Birkhahn, 206 Broadway.)

Schwartz-Holtzman, New York City, electrical and radio business, 200 shares common stock; no par value; S. Schwartz, J. Holzman, O. Mautner. (Attorney, L. S. Gattler, 36 West 44th St.)

Aleon Radio Products, New York City, $5,000; M. and A. I. and L. A. Abrahams. (Attorney, M. Blumenstock, 110 East 42d St.)

Hazeltine Corp., New York City, research and experimental work, $20,000,000. (United States Corporation Trust Co.)

G. H. Fischer Radio Corp., New York City, to G. H. Fischer & Co.

Emerson Radio Corp., New York City, $200,000; B. and M. Abrams, W. W. Watson. (Attorney, L. Levy, 277 Broadway.)

Turn-It Radio Sales, New York City, $10,000; R. Cohn, B. E. Aron. (Attorney, B. A. Javits, 49 Chambers St.)

Air Line Radion Equipment Corp., New York City, $50,000; C. S. Rich, S. Cohen, G. Sachs. (Attorneys, H. and J. J. Lesser, 305 Broadway.)

Full List of Broadcasting Stations in Radio World Dated February 16th

A complete and corrected up-to-the-minute list of broadcasting stations of the United States, Canada, Cuba, and Porto Rico, appeared in RADIO WORLD, Feb. 16. Mailed post paid for 15c. Or start your subscription with that issue.

RADIO WORLD, 1493 Broadway, New York City

Broadcasters Music Fight Breaks Out Afresh

THE controversy between the American Society of Composers, Authors and Publishers, and the National Association of Broadcasters. has broken out afresh and rapidly has reached an acute stage.

The incident which renewed this fight was the forcing of a license to broadcast their music by the American Society upon the Edgewater Beach Hotel, of Chicago, which they did not want and will not use.

Aroused by these high handed methods, John and Tracy Drake, proprietors of the Blackstone and Drake Hotels of Chicago called a meeting at the Blac stone Hotel, which was attended by the principal hotels, moving picture theatre owners, dancing academies, music schools and broadcasting stations, in the Chicago district. It was the first time in any part of the country that these interests have met jointly for the purpose of resisting the American Society.

The Chicago meeting adopted plans designed to more effectively combat the increasingly unfair demands and tactics of the American Society. It is now felt that the measures adopted will check their avarice, and hold them strictly within the zone of fairly and justly administered enterprises.

The objectionable, coercive methods used by the American Society are not approved by their more representative members. This is shown by the resignations of Waterson, Berlin & Snyder of New York, one of the six big publisher members, and Will Rossiter, of Chicago, one of the oldest men in the music business, immediately upon their learning the facts.

Radio listeners are intensely interested in this weakening of the American Society, indicating as it does the fast approaching time when 5,000 American authors and composers and 1,500 American publishers will have an equal chance with the 277 combined foreign and American authors and composers.

SUBSCRIBE NOW AND TAKE THE WORRY OFF YOUR MIND. RADIO WORLD, 1493 Broadway, New York City.

Weekly Sport Review from WGY

A REVIEW of the Week's Sports," by Elmer Q. Oliphant, one of the best known men in the athletic world, will be given each Monday night at 6:15 o'clock by radio from WGY, the General Electric station at Schenectady, N. Y.

Mr. Oliphant, who won his letters in four major sports at West Point and gained national fame as one of the best all around athletes at the Military Academy, is now director of athletics and physical training at Union College. Before entering West Point, Oliphant played football for three years at Purdue University.

One More Chance to Secure Radio World and Popular Radio for the Price of One

Popular Radio has increased its subscription price from $2.00 to $3.00. Radio World has made arrangements by which it is able to offer Radio World and Popular Radio for one year for the price of Radio World alone. Use the accompanying subscription blank. If already a subscriber, send $6.00 for another year. This offer for new subscribers only.

Special Radio World and Popular Radio Sub. Blank

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for the price of Radio World alone, for which I send $6.00 herewith.

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This offer good only until March 20, 1924

Eveready gives you the right battery *for every radio use!*

EACH Eveready Radio Battery represents thirty years of battery building experience. Each Eveready Battery represents millions of dollars invested in men, methods and machinery. Overseeing Eveready production is the greatest battery laboratory known to science, where every particle of raw material is required to pass Eveready's exacting tests. To insure Eveready serviceability, batches of Eveready Batteries are constantly being set aside for performance tests. And, finally, daily shipments keep dealers supplied with fresh Eveready Batteries, packed full of power.

To be certain of battery satisfaction, insist on Eveready Radio Batteries—they last longer.

EVEREADY Radio Batteries

—they last longer

The radio dry cell triumphant

For economical, satisfactory radio, light the filaments of your dry cell tubes with the Eveready Dry Cell Radio "A" Battery. Will unfailingly outlast any other at ⅛ ampere current. Full instructions for getting this Economical Eighth, on labels and in our booklets. This battery will exceed your expectations in economy and performance.

Equal to all demands

Power flows from your "B" Battery, power that gives life to your head-phones or loud speaker. Some tubes draw more "B" Battery current than others, but whatever the tube or tubes you use, Eveready "B" Batteries will give you maximum results. Eveready "B" Batteries are made in six sizes, for all possible uses. Always use the biggest possible battery, for it contains more energy in proportion to cost, and lasts longer.

This battery is a wonder worker

Eveready's biggest contribution to economical and more satisfying radio is the Eveready "C" Battery, a triple-use, universal battery. It will make the loud speaker respond with a new fullness and naturalness of tone, and save much money by making the "B" Battery last still longer. Connect it with the grids of audio frequency amplifiers and notice the big difference. Can also be used as an "A" Battery for 199-type tubes in portable sets, and as a "B" Battery booster. Eveready Radio Battery No. 771—use it!

NATIONAL CARBON COMPANY, Inc., New York and San Francisco

Headquarters for Radio Battery Information

CANADIAN NATIONAL CARBON CO., Limited. *Factory and Offices:* Toronto, Ontario

Informative and money-saving booklets on radio batteries sent free on request. If you have any radio battery problems, write to G. C. Furness, Manager, Radio Division, National Carbon Co., Inc., 200 Orton Street, Long Island City, N. Y.

"THE AIR IS FULL OF THINGS YOU SHOULDN'T MISS"