





# RADIOTORIALS

Last week's papers contained a press dispatch which said that some one in South Africa had heard plainly the radio program from America, given as a part of the International Radio Tests. So plainly was this program heard, said the dispatch, that the listener in South Africa could distinguish the barking of a dog in the United States.

Those who listened to the program of KDKA on the opening night of this International Radio Week will at once recognize the program as one played by the KDKA Little Symphony Orchestra, in which a descriptive hunting scene was given which included the barking of dogs.

Barking dogs may be heard every day, but to hear one at a distance of eight or nine thousand miles is another thing entirely. The dog with such an attenuated bark should be listed in the dog hall of fame along with such other canine immortals as may spring to our minds. Unfortunately the bark which travelled so far by radio was the only portion of the dog that was not non-existent. This bark should take its place with the grin of the Cheshire cat in "Alice in Wonderland," which you will probably remember was the only visible portion of the cat.

The bark of the dog, however, will have a more abiding reason for eternal fame, for the accomplishment which proclaims it to the world is one of real achievement in the realm of science.

The transmission of a voice, be it of man or of beast, for such a distance, is undoubtedly one of the wonders of the age.

In the early days of our country's history, the mere suggestion of such a thing would have raised the cry of witchcraft, and dire punishment would have been the result.

Today we read such announcements in our morning papers, and our credulity is not taxed in the least.

Letters are being received regularly by Station KDKA reporting the successful reception of this Pittsburgh station in South Africa.

This is all the more wonderful because our friends in South Africa must of necessity wait until the wee small hours of morning before they can listen to far away America. But with rare consistency, they have been losing their sleep while hearing programs from Pittsburgh, and two continents are being bound closer together by these invisible lines of communication through the air.

Perhaps some of us are slow to realize the good which may come as the result of this pioneer work in international broadcasting, and it is well to repeat as frequently as possible that every tie which binds us closer to the people of other lands is bringing us nearer to the ultimate realization of the world peace which is the dream of all our great thinkers and statesmen.

When the people of one nation understand the peoples who are their neighbors, know their ways of living and their habits of thinking; there will be small danger of bickering and quarrelling. This is the same principle which governs many of our acts with those with whom we come in contact. The better we know our friends and acquaintances the more inclined we are to be lenient and forgiving when their actions do not meet our conception of right and wrong. Nearly every misunderstanding can be explained away, if the persons involved know each other well enough; and the same is true of nations.

Radio broadcasting will provide the way for such mutual understanding among the nations, and, once it has been established as an international service, we may expect it to be a veritable dove of peace to the nations of the world.

So when the dog's bark from Pittsburgh, which was heard in South Africa, becomes immortal, it may be the symbol of a finer and better civilization in which radio broadcasting will occupy a very prominent position.



## The Men who know use Formica

RADIO engineers of 125 leading radio manufacturers use Formica for panels, base-panels, terminal strips, winding tubes, transformer cases and so on. These are the men who make radio what it is. With an experience based on hundreds of sets a week, they have the best opportunity to know just what radio insulation will do.

Formica is made in the largest plant in the world devoted to the production of laminated Bakelite.

You can get Formica in three beautiful finishes: Gloss black, walnut and mahogany, and in any standard or special size.

Insist on Formica and get the tried and proven panel material.

THE FORMICA INSULATION CO.  
422 First Ave. Pittsburgh, Pa.  
Near the Formica Plant, every Wednesday evening from 9 to 10, Central time, over WLW.

**FORMICA**  
Made from Anhydrous Bakelite Resin  
SHEETS TUBES RODS

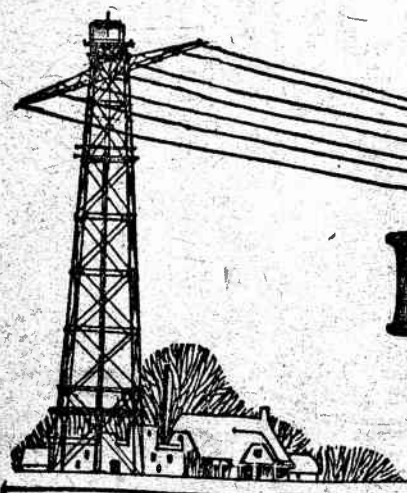
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O-M-C SUPPLY COMPANY,  
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Walk a mile out of your house, without results, WHEN you call the very best  
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Until Christmas—Open  
Evenings Till 9 o'clock.  
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Steinlite Gives Distance On Crystal Sets!  
Results truly amazing. Everyone astonished. H. H. Harrison, Dayton, Ill., says: "I have heard 25 stations, most distant 300 miles. Schenectady, N. Y., Laporte, Council Bluffs, Ia., says: 'Second night I got KDKA, E. Pittsburgh.' You can't doubt your own ears. Listen in on STEINLITE at my risk. EACH 50¢"  
Special Offer 2 Steinlite Crystals, 1 Cat. SEINLITE opens up new possibilities for Crystal Set Builders. Radio first in history. Send Dollar Bill today for Special Offer. None given unless stamped "OK". Free literature on request. Guarantee prompt refund if not delighted. Write for tests. It is claimed, to reproduce the range of tone, instrumental or vocal, with clarity and fidelity. It recreates the message with particular faithfulness, while in volume it compares favorably with any device so far made.

STEINLITE LABORATORIES  
6 Radio Bldg., Atchison, Kansas



RADIO SECTION.

PITTSBURGH, PA., WEDNESDAY, DECEMBER 10, 1924.

RADIO SECTION.

## H. E. Terodyne Says:

For the first time since the beginning of amateur radio the records of the United States Department of Commerce this year show a decrease in the number of licensed amateur transmitting stations. The decrease in the number of stations is not large, and the number itself is not particularly important, the significant fact is that there are less amateur stations today than there were a year ago. It would be rash, however, to conclude that the passing of the amateur has begun. Instead of viewing this decrease in numbers with alarm, therefore, those who have at heart the welfare and continuing success of the American amateur should rather welcome the reduction in numbers as indicative that the weeding out process has begun.

The possession of an amateur station license is a privilege which should be enjoyed only by those persons who are willing to comply with the very reasonable and generous regulations laid down by the department of commerce. Furthermore, in our opinion, the applicant for a transmitting station license should be required to show some other purpose besides that of mere amusement before a license to transmit is granted. We do not wish to imply that this purpose need be a very serious one. For example, the applicant may desire a station license in order that he may communicate with other stations and by so doing acquire skill and experience in handling messages, or he may wish to qualify for an appointment as an official relay station of the American Radio Relay League, but whatever his purpose, it should be concerned in one way or another with the furthering of amateur radio communication.

Before the coming of broadcasting it did not matter much what purposes actuated the amateur transmitter. Just so he did not cause interference with government and commercial stations, he could play with his set to his heart's content and there were only other amateurs (happily not all like himself) to say him nay. Broadcasting, however, brought about greatly changed conditions and the amateur, in order to live, had to adapt himself to the changed environment.

The serious, no, let us call him the earnest amateur, who he regarded radio as something more than a means of mere amusement, had no difficulty in conforming to the new order of things, and in consequence he exists today and will continue to exist in increasing numbers. It is the frivolous amateur who is disappearing and who is responsible for the decrease in the number of licensed radio stations.

The frivolous amateur, to do him justice, was not as black as he was sometimes painted, and frequently a friendly critic and a helpful hand were all that were needed to set him straight on the road to worthwhile amateur radio. How different, though, is the case of the broadcast listener who continues to annoy his neighbors with his oscillating current in spite of campaigns of education, and appeals to his sense of fair play. The rights of other listeners are nothing to him. He is the greatest hindrance to radio today.

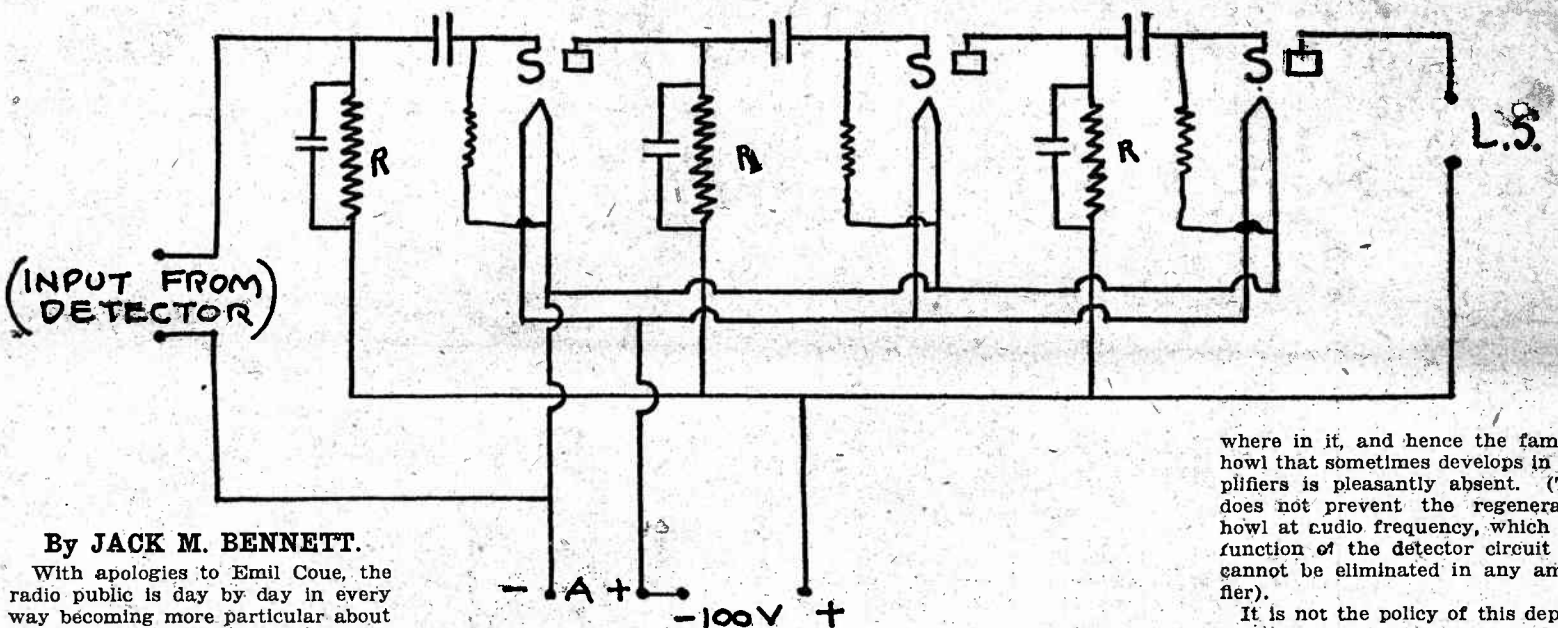
## Du Pont Develops Loud Speaker Horn

After a great amount of experimenting, a radio loud speaker has been developed which, because of the material from which it is made is claimed to be perfect in performance. The new loud speaker is made of pyroxylin plastic which is a non-vibrating material and therefore cannot impress a false note upon that set up by the diaphragm. Its shape is the one which is best calculated to eliminate distortion, it is claimed. The peculiar qualities of pyroxylin plastic have been shown by tests, it is claimed, to reproduce the range of tone, instrumental or vocal, with clarity and fidelity. It recreates the message with particular faithfulness, while in volume it compares favorably with any device so far made.

# The Pittsburgh Post RADIO BROADCASTING NEWS



## DISTORTIONLESS AMPLIFIERS



By JACK M. BENNETT.

With apologies to Emil Coue, the radio public is day by day in every way becoming more particular about the kind of stuff they hear over their loud speakers, and it is a lamentable but incontrovertible fact that the great majority of the stuff is of quality that wouldn't pass muster were anything better easily obtainable or better known.

While a few commercial receivers are equipped with good, loud speakers and amplifiers designed to work together, nevertheless these are by no means great in number, at least when compared to the big majority of sets that have amplifiers that merely amplify and loud speakers that simply speak loud. I hope you will pardon the puns. They are admittedly in bad form, but they do express the fact.

With ordinary types of amplifiers, using transformers and tubes of the type generally available, it is very difficult to get through in good shape all the notes necessary for good reproduction. The primary inductance of the transformers is usually too low, not enough iron is employed in the cores, or the distributed capacity of the secondary windings is usually too high, or a combination of these faults is present. On top of this, if enough "pep" is obtained from the amplifier on strong signals the cores of the amplifying transformers are saturated and the result is a flock of hash.

Push-pull amplifying circuits, when

(DISTORTIONLESS AMPLIFIER)

properly built, give quality that is good enough for anyone, in fact, so good that it is used in the speech amplifier circuits of most of the big broadcasting stations, but here again we have a drawback in the cost. Such amplifiers are expensive, unobtainably so, and it takes a lot of transformer and tube engineering to get the correct result. Ordinary assembled push-pull amplifiers may work all right, but the writer has never seen a particularly good one, at least good enough to justify the cost of the transformers and the additional tube. Some other method of amplification must, therefore, be obtained.

Resistance coupling in amplifiers, both radio and audio, is as old as radio. It has a lot of drawbacks, but none of them seem as serious to yours only to make them take place of the average amplifiers. The one fact sticks out like a life preserver to a drowning man—they cannot distort, and this is a big step. Years ago, resistance coupling was considered good enough to be used in the speech amplifier circuits at KDKA, and has been only recently replaced by a very expensive bal-

anced amplifier outfit that equals the resistance coupled amplifier in all-around quality.

The Daven Radio Company, manufacturing tube ballasts, resistances and leaks, have developed a kit for the construction of a three-stage resistance coupled amplifier that gives excellent quality, with present day tubes, eliminates rheostats by the substitution of ballast resistances, and overcomes the greatest drawback heretofore experienced with this type—noise in the resistances due to changing resistant values. The leaks are sealed in little glass tubes to make them moisture-proof, insuring that the voltage drop across the tube plate and filament remains constant at all times.

A three-stage amplifier of this character gives about the same amplification as the ordinary transformer coupled two-stage, with the quality of the best of the push-pulls, and is somewhat less expensive than an amplifier of equal power built with transformer coupling, even including the cost of the extra tube.

Such an amplifier, the circuit of which is shown here, cannot squeal. There is no oscillatory circuit any-

where in it, and hence the familiar howl that sometimes develops in amplifiers is pleasantly absent. (This does not prevent the regenerative howl at audio frequency, which is a function of the detector circuit and cannot be eliminated in any amplifier.)

It is not the policy of this department, ordinarily, to recommend any particular type of apparatus, nor do we wish to imply that good results cannot be obtained with other resistance coupled amplifiers. The Daven resistances may be replaced with 100,000 ohm resistances (non-inductive types such as the Layite, Ward-Leonard, etc.) and as long as good contact is obtained at both ends of the resistors, noiseless operation is assured. The amplification possible is determined by the amplification constant of the tube multiplied by the voltage drop across the tube plate and filament. Hence, the higher the resistance of the rods, the greater will be the amplification with any given tube. However, the higher the resistance of the rods, the higher must go the plate voltage. A convenient set of values is 100,000 ohm resistors and 100 volts of "B" battery. The condensers across the resistances may be of .001 mfd. capacity, but the grid condensers isolating the grids from the plate battery circuit may be of .0005 mfd. capacity. These must be of the very best quality of mica obtainable.

The writer realizes that he is open to criticism for the method in which this story is presented, but takes refuge in the known fact that the amplifier situation at present is acute enough to justify any reasonable remedy.

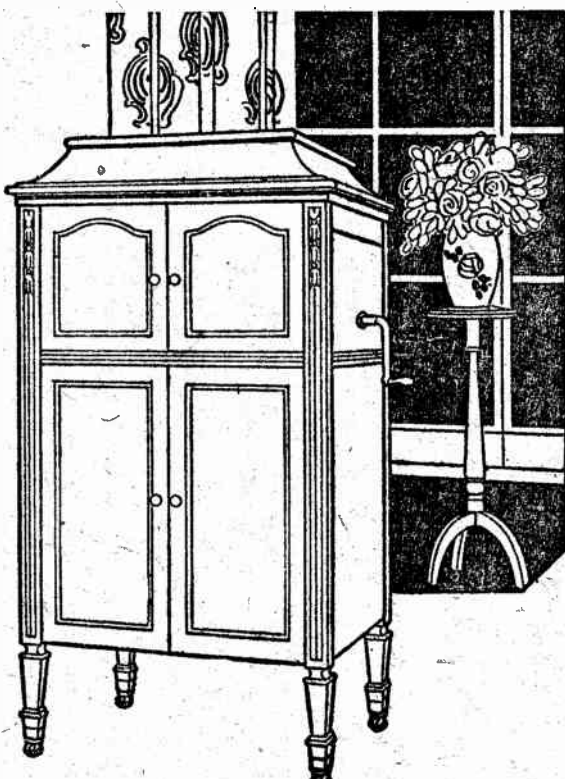
## GREATEST XMAS PHONOGRAPH VALUE EVER OFFERED IN PITTSBURGH!

**\$250 Mahogany Phonograph, As Illustrated, With Gold Plated Equipment, \$99.75**

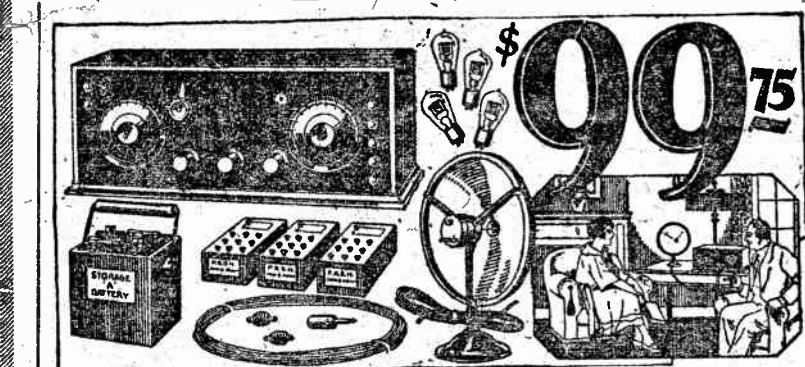
A positive sensation! One of the finest phonographs you have ever seen or heard—large size—beautiful mahogany case, with tone-arm, reproducer, etc., all gold plated.

A phonograph actually made to sell at \$250, in this sale for just \$99.75.

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**This \$161.70 Complete RADIO OUTFIT \$99.75**

Complete Outfit includes the famous SP-2 Receiver, one of the most remarkable radio sets on the market. 4-tube tuned radio frequency, giving wonderfully satisfactory results on both local and long-distance stations. Highly selective and sensitive.

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## Xmas PLAYER PIANO SALE

Of regular \$500 Player Pianos!

The finest instruments for the money of \$398. Offered this season in Pittsburgh. Quality of the highest, comparable in every way with Players usually offered at above \$500.

Liberal Credit.

# PICKERING'S

Direct Entrance to Radio Annex at 963 Liberty Ave., Near 10th St.

## Capt. MacMillan Announces New Arctic Expedition

HARTFORD, Conn., Dec. 10—Back from the Arctic only two months, Captain Donald B. MacMillan is already planning for another trip north, according to an announcement made during his recent visit to the American Radio Relay League headquarters in this city.

Next summer the little schooner "Bowdoin" will again head into the ice floes, this time for the purpose of locating a site for a permanent magnetic station in order that observations made by Richard Goddard of the Carnegie Institute on the last expedition may be continued over a period of two years. The following summer Captain MacMillan will install the station permanently.

This observatory will be situated in the vicinity of 54 degree north latitude, he said, and would undoubtedly be equipped with apparatus for measuring on photographic paper variations in the magnetic needle, which is believed to be swinging westward.

He explained that the advantage of having this station located in the proximity of the magnetic north pole was due to the fact that the nearer one goes to the pole the more pronounced are the deflections of the needle as determined by recording apparatus. Variations of only one or two degrees at the equator show a swing of from 15 to 20 points in the Arctic.

The study of the compass needle, he said, would be accompanied by a further investigation of the aurora, and might even lead to an attempt to measure the height of the aurora with the assistance of radio and motion picture cameras.

## Long Freight Trains Make Radio Signal Necessary Adjunct

With the application of ball bearings to railroad freight cars a new use for radio has come to the fore. The limit number of cars that can be handled on a railroad varies from 25 to 60, depending on the nature of the grades. At the Power Exposition in Grand Central Palace, December 1 to 6, German engineers are showing the new bearings, which they declare will permit a mogul engine to handle a train of cars that would reach from the Palace to One Hundred and Twenty-fifth street, or approximately 350 to 400 cars. It would be impossible, however, to signal from the engine the cars with the bearings in the present use. The only remedy, it is believed, is the use of radio, and they hope for the development of sets that can be used for this purpose without interfering with nearby public broadcasts. Many other exhibits bearing on radio will be shown at the exposition.







## RADIO PROGRAMS FOR THE WEEK

(Continued From Page Five)

hold by Walter Wilson, who is known to the little ones as "Uncle Bob".

7:30 p. m.—Dinner concert broadcast from the Congress Hotel; John Dalbey, piano; orchestra, Louis XVI room.

7:30 to 8 p. m.—Program will be broadcast from KYY's studio in the office of the Dunbar Hotel; music publishing company.

8 to 8:30 p. m.—Musical program will be furnished by the Walther Bros. and Sons, Inc.; program in detail will be announced by radio.

8:30 to 8:45 p. m.—"Around the Town with KYY in Chicago" (stage review).

8:45 to 9 p. m.—Musical program continued.

9:05 p. m.—"Good Roads" report furnished by the Chicago Motor Club.

9:10 p. m.—Talk on "Income Tax" by H. Archibald Harris.

9:20 p. m.—Talk by Mr. E. C. Brown, treasurer of the National Live Stock and Horse Raisers' Association.

9:30 p. m.—Subject, "Protecting Our Nation's Health".

9:45 to 10 p. m.—Midnight revue. This is a Westinghouse "Evening American" feature broadcast from KYY's studio in the Dunbar Hotel; program by Schubert Trio of the Congress Hotel at 11 p. m., a. m., and, N.Y. 12:45 p. m.—"The Kiddle's" review at McVicker's Theater, will render an organologue.

Market reports and weather forecasts.

11 a. m.—Hog, cattle and sheep market; fruit and vegetable shipments.

Noon to 1 p. m.—Music; weather forecast; farm program.

1:30 p. m.—Complete livestock, truck and vegetable market; grain market quotations; farm news bulletins.

2:45 to 3 p. m.—"Housewives' hour."

3 p. m.—Summary livestock, grain, dairy, fruit and vegetable; poultry and eggs; and food markets; farm news bulletins.

3:30 to 4 p. m.—"Pipe organ recital; lullaby time; farm program; WBS theater feature; Wallace Wallace program of the northland; on the book trail; Ford and Glenn time."

WMAQ (497) CHICAGO, ILL.

11 a. m.—Speeches from the weekly luncheon of the Association of Commercial Travelers.

12 p. m.—Dinner talk by Mrs. Grace Earl.

1:30 p. m.—Program by the Compagnon School of Music.

6 p. m.—Presidents by Jean Mowat.

8 p. m.—Chicago Theater organ recital.

8:30 p. m.—Stories for the children by Miss George Faulkner, the Story Lady.

8 p. m.—Weekly lecture from Northwestern University.

8:30 p. m.—Musical program to be announced.

9 p. m.—WMAQ "play-night."

9:45 p. m.—Talk from one of the Chicago Quartets.

WMC (500) MEMPHIS, TENN.

11 p. m.—Silent night.

WHAAS (400) LOUISVILLE, KY.

4:35 p. m.—Selections by the Alamo Theater orchestra, Harry S. Curtis, conductor. Police bulletins, weather and "Stockman" time.

5:30 p. m.—"Just Among Home Folks," a daily humorous column appearing in the Courier-Journal and Louisville "Times" editions. Late important news bulletins.

4:35 p. m.—Local livestock, produce and grain market reports.

5 p. m.—Official Central Standard time announced.

7:30-9 p. m.—Concert by Keith Karnard and his Kentucky Troubadours; Keith Karnard, director; saxophone and violin; Mary McManis, saxophone and violin; John McManis, piano; Bill Lipp, piano; Bill Wilder, drums; Keith Karnard, conductor; Warren, piano; James Horne, saxophone. Late important news bulletins. Official Central Standard time announced at 9 o'clock.

W-KSD (464) ST. LOUIS, MO.

6:45 p. m.—(Aberg's) concert ensemble, Arne Amesen, violinist; direct from Hotel Statler.

9 p. m.—Program by Schubert Trio of the Congress Hotel at 11 p. m., a. m., and, N.Y. 12:45 p. m.—"The Kiddle's" review at McVicker's Theater, will render an organologue.

W-WOC (444) DAVENPORT, IA.

10 a. m.—Household market quotations.

10:35 a. m.—Time signals.

11 a. m.—Weather and river forecast.

11:05 a. m.—Market quotations.

12 noon—Chinese concert.

12:15 p. m.—Weather forecast (repeated).

2 p. m.—Closing stocks and markets.

2:45 to 3 p. m.—Spot news and weather forecast.

W-WOC (444) DAVENPORT, IA.

3 p. m.—Sensational visit—(Bedtime stories by Val McLaughlin).

8 p. m.—Organ recital from the B. J. Palmar Hotel, at 11 p. m., a. m., and, N.Y. 12:45 p. m.—"The Kiddle's" review at McVicker's Theater, will render an organologue.

K-LBS (385) LOS ANGELES, CAL.

12:30-1:30 p. m.—Program presenting the Pertus and the Rose Room Orchestra, courtesy of the Rose Room, Fred C. McNeely of the Rose Room, Fred C. McNeely of the Rose Room, Fred C. McNeely of the Rose Room.

W-SAI (309) CINCINNATI, O.

10 p. m.—The Cincinnati "Enquirer" program—features to be announced by radio.

W-WMI (309) CINCINNATI, O.

8 p. m.—Organ recital by Kurt Henkel, Songs by Frank Wright and Frank Bensinger, the Radio Players. Tenor solo by Carl R. Gennelle; Miss Margaret Bonomi, accompanist.

W-WAI (469) WASHINGTON, D. C.

8:30 a. m.—To be announced.

8:45 p. m.—"Science News of the Week," one of a series of weekly radio talks by scientific men, arranged for by Dr. W. E. Tishler, under the auspices of the National Council and Science Service.

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8:30 p. m.—Concert by the KDKA Little Symphony Orchestra and Mabel Shop King, soprano. Part Rodgers, contralto.

9:05 p. m.—Arlington time signals; weather forecast.

11 p. m.—Concert from the Pittsburgh Post studio.

W-WFI (395) PHILADELPHIA.

10:15 a. m.—Produce market and live stock reports.

11 p. m.—Meyer Davis Bellevue Stratford Hotel Concert Orchestra.

1:10 p. m.—Agricultural reports.

3 p. m.—Report of the closing prices of the Chicago grain market.

3:05 p. m.—Housewives Radio Exchange, "Christmas Candles" under the direction of Mabel S. Brown.

W-WFI (395) PHILADELPHIA.

3:15 p. m.—Program under auspices of Civic Club of Norristown.

5:30 p. m.—Meyer Davis Bellevue Stratford Hotel Concert Orchestra.

7 p. m.—"Sunny Jim—the Kiddle's" Pal, assisted by Andrew Hight, pianist.

W-WFI (395) PHILADELPHIA.

8 p. m.—Meeting of Boy Scout Radio Corps under direction of J. G. Delawitz and Montgomery Committee Council, Boy Scouts of America, Don Board, honorary chairman; special "Hammam Valley" program.

8:30 p. m.—Concert by the Anthony Liuzzi Instrumental Trio, violin, cello and piano.

W-WFI (395) PHILADELPHIA.

8:50 p. m.—Recital, Elizabeth Harrison, soprano, and Warner Weston, tenor, assisted by Lester Kark, accompanist.

9:20 p. m.—Concert by the University of Pennsylvania Band, Hilda Van den Boert, director.

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housewives; market and weather reports.

4:35 p. m.—Mary and Madeline Roy, Harmony Singers. Lecture—Recital on "Robert Schumann" by Victor Hart, pianist direct from the Macmillan Academic Theater, Columbia University under the auspices of institute of arts and sciences.

W-WFI (395) PHILADELPHIA.

10:15 a. m.—Produce market and live stock reports.

11 p. m.—Meyer Davis Bellevue Stratford Hotel Concert Orchestra.

1:10 p. m.—Agricultural reports.

3 p. m.—Report of the closing prices of the Chicago grain market.

3:05 p. m.—Housewives Radio Exchange, "Christmas Candles" under the direction of Mabel S. Brown.

W-WFI (395) PHILADELPHIA.

3:15 p. m.—Program under auspices of Civic Club of Norristown.

5:30 p. m.—Meyer Davis Bellevue Stratford Hotel Concert Orchestra.

7 p. m.—"Sunny Jim—the Kiddle's" Pal, assisted by Andrew Hight, pianist.

W-WFI (395) PHILADELPHIA.

8 p. m.—Meeting of Boy Scout Radio Corps under direction of J. G. Delawitz and Montgomery Committee Council, Boy Scouts of America, Don Board, honorary chairman; special "Hammam Valley" program.

8:30 p. m.—Concert by the Anthony Liuzzi Instrumental Trio, violin, cello and piano.

W-WFI (395) PHILADELPHIA.

8:50 p. m.—Recital, Elizabeth Harrison, soprano, and Warner Weston, tenor, assisted by Lester Kark, accompanist.

9:20 p. m.—Concert by the University of Pennsylvania Band, Hilda Van den Boert, director.

W-WAI (309) CINCINNATI, O.

10 p. m.—The Cincinnati "Enquirer" program—features to be announced by radio.

W-WMI (309) CINCINNATI, O.

8 p. m.—Organ recital by Kurt Henkel, Songs by Frank Wright and Frank Bensinger, the Radio Players. Tenor solo by Carl R. Gennelle; Miss Margaret Bonomi, accompanist.

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# THE NEW YORK HERALD RADIO MAGAZINE

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SECTION EIGHT

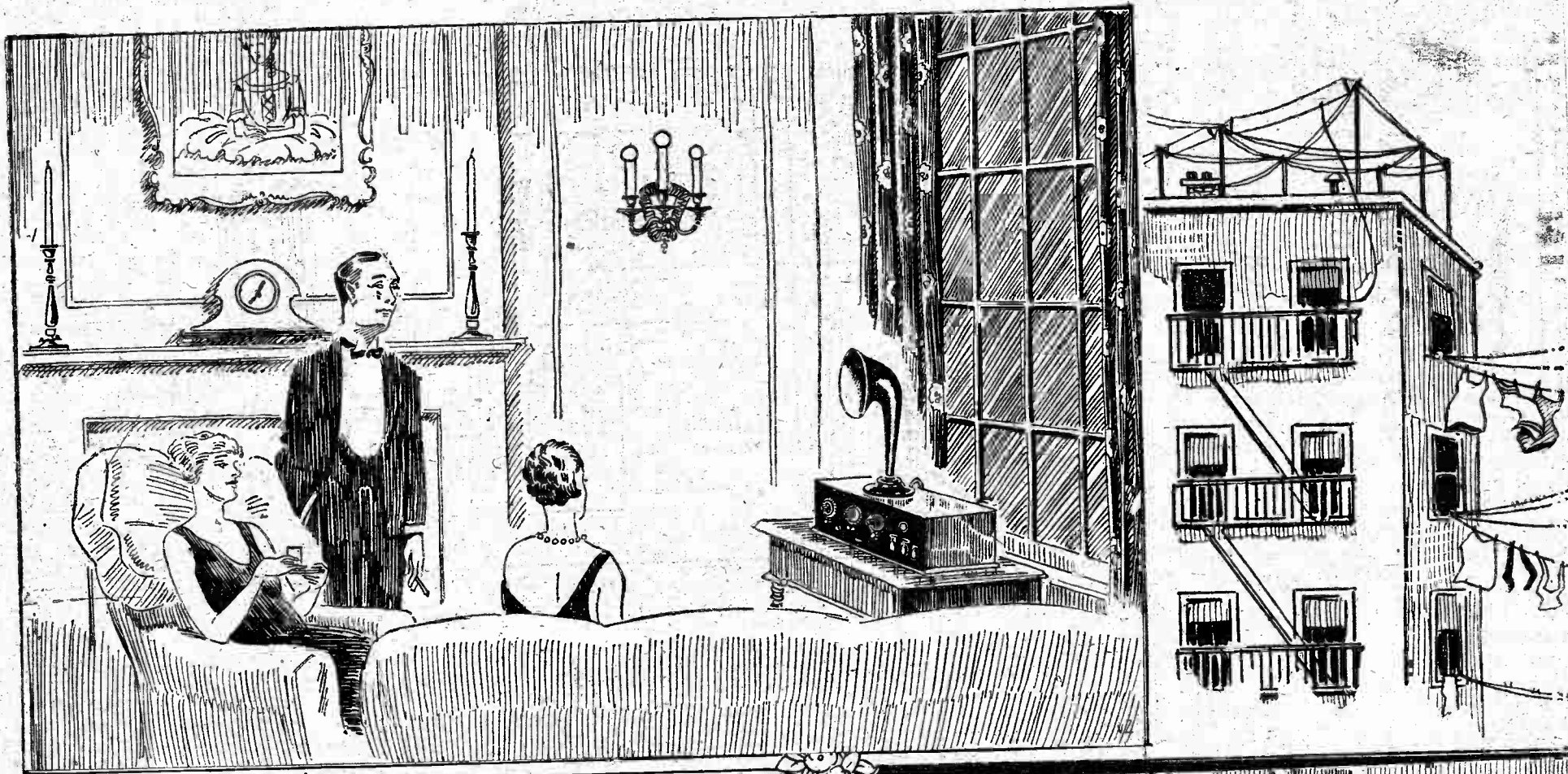
NEW YORK, SUNDAY, FEBRUARY 10, 1924.

TWENTY-EIGHT PAGES

## Radio's Growth Due to Popular Appeal

No Excuse for Anyone to Lack Entertainment, as Good Receiving Sets Are Now Being Made to Fit Every Pocketbook

By A. C. BRADY.



Large sets, capable of bringing in the concerts with excellent quality, are now easily procurable.

**D**ID you ever stop to consider the tremendous growth of radio and what is behind it all? Do you know why it is that radio has such a universal appeal to all classes and walks of life, rich and poor alike? Do you know that there are vast factories working day and night in a vain endeavor to keep up with the tremendous demand for radio sets and parts, and that these sets range in price from only a few dollars to several hundreds of dollars?

At the present time there are many broadcasting stations, all filling the air every night with music, speeches and interesting talks, and many of these stations are within the range of even a small receiving set. This fact alone is responsible for the great interest shown by thousands of fans, who are constantly trying to add to their great lists of stations which they have heard.

The "genus radio" may be subdivided into many classes, but there are relatively few of them that are immune to the urge for greater and greater distance. This notwithstanding the fact that generally the programs from the local stations come in the best, both in clearness and sureness. Distant stations have a bad habit of slowly fading out just at the time you are most anxious to hear what the announcer has to say.

Let us look into this great mass of radio fans and see what they are composed of.

In the first place let it be understood that the average American man or boy has a positive genius for mechanical workings. As a rule he loves nothing better than to be able to make something with his own hands. He is a natural born mechanic, and in most cases a mighty good mechanic at that.

### Father Is Interested.

The father will generally educate his son to like things mechanical. He will

start off with a yearning to be a locomotive engineer or even a garage mechanic. Anything that holds forth a promise for close contact with whirring machinery and where he will have a chance to get his hands begrimed and be in close proximity with machinery. Very few boys are immune to this urge.

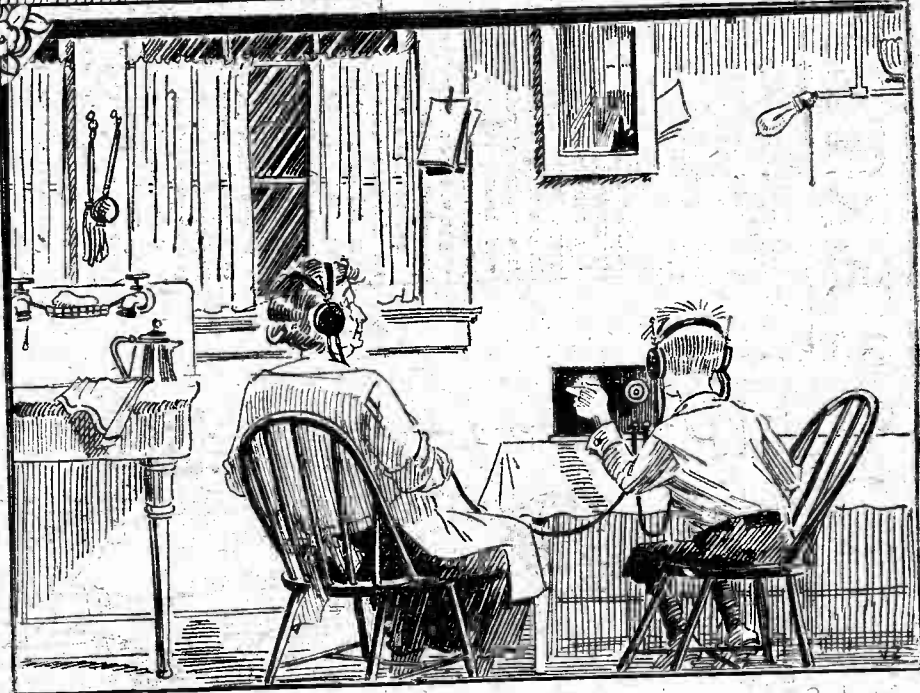
The old joke about the father who buys his son a mechanical toy and then spends his own time in playing with it has been repeated many times in radio. Fathers have a way of going into a radio store and telling the salesman that it "is for their son," and the knowing salesman winks the other eye and lets it go at that. This subterfuge was used a great deal in the early days of radio, but father has become so deeply interested by now that he forgets all about it. He goes in boldly now and orders what he wants. An excuse never enters his head. Father even goes so far as to have heated arguments on the train in the morning with his fellow commuters, and in some cases old friendships have been broken up over the relative merits of certain circuits.

### Small Set Is Practical.

On the other hand there are many boys who have not had a mechanically inclined father and they have become interested in radio through schoolmates or through reading magazines. Many times these boys will surprise their families by what to the family will appear to be great mechanical genius.

Radio, though, has long passed through the stage of a boy's game, and it is at present being taken up by everybody. The millionaire, who has practically no interest in the workings of a set, will order an elaborate affair and then put it up to his chauffeur to keep the thing in working order. He will like to sit down at night after dinner and listen to some good music, because radio has been developed to such a point that it is quite possible to listen to an excellent program without interference or other extraneous sounds. A high grade machine will give everything that a fine phonograph will give, and in some cases will be even better in tone.

Unfortunately things have developed



A small crystal set is well within the reach of any one.

along the lines of trying to get the greatest amount of volume from a given set. Everything will be overloaded in this attempt and the result is bound to be anything but edifying to a real musical taste. It is possible to take such a radio set and tone it down just a little and as a result receive the broadcasting with the finest tonal quality, without distortion and in such a manner as to be thoroughly enjoyable.

Now let us consider the man who cannot afford to spend several hundred dollars on such an elaborate set as this. He will find that it is quite possible to install a smaller set which will give him exactly the same programs as his rich neighbor. It is true that he may not hear as many stations, but what he does hear will compensate him for his expenditure.

It is quite possible for him to start off with an extremely modest set and gradually add to it, when he can afford to do so, until he has a set fully the equal of the larger outfit. The radio set can only be developed so far, and when it reaches this point the extra cost usually goes into a better looking and more expensive cabinet. It is quite possible to buy a receiving set right now which will have all the appearances of a piece of the

finest furniture. Cabinets are procurable in any "period" desired, in much the same manner that phonographs are made up. Such sets, of course, have the wiring entirely concealed, and generally the tuning is done after a hinged lid has been lifted up. This is not any more difficult to do than it is to run a phonograph.

Generally the man who builds his own set will not go in much for such elaboration as this, but the "workings" of his set may be fully as good. There are thousands of cases on record of comparatively cheap homemade sets that have picked up stations thousands of miles away. Some of these feats have been done repeatedly, night after night.

A set that will do this does not have to be any more elaborate than a set that will pick up the local broadcasting stations in good shape.

### Long Distance Easy.

Some types of radio fans will make the remark that they will be perfectly satisfied to have a set which will pick up the local station only. If they have such a set—barring the simple crystal set, of course—they will undoubtedly be able to hear other stations many hundreds of

Continued on Second Page.



# Philip's

## SPORT SHOP

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ANOTHER OPPORTUNITY.  
ORIGINAL TYPE C  
ATHANIEL BALDWIN \$6.75  
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SATURDAY, MONDAY ONLY.

Transformers  
Amer. Tran.-Limited Quantity.  
No. 68.....\$5.25  
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Brades Table Talker and R. C. A  
Tubes. Plenty in Stock.

Erla Crystals-In Stock.  
Complete parts for Ambassador,  
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Neutrodyne-Special Prices.

Mail Orders Promptly Filled

## TUBES COST \$5

### The Kelley Protective Unit

### COSTS \$3

It may save you \$30 worth of tubes  
absolute safeguard against burning out  
tubes. For use in all types of sets.

The Kelley Testing Unit  
is invaluable to the man who builds  
his own set. Has any number of  
tests for the radio enthusiast. Neu-  
tralize your set with this unit. Price  
complete, packed, with full instruc-  
tions.

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There is music in the air. From here,  
here and everywhere. The sweetest story  
ever told sends such a thrill to young and  
old. Don't wait until the cold weather is  
over so you can rig an Aerial on the roof.  
Get the HANDY DANDY AERIAL, and  
listen it on the outside of any window—  
the higher the better—and you will enjoy  
all that your neighbor gets with his ex-  
tensive aerial.

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Connects one, two or  
three phones in series  
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JUST PRESS THE BUTTONS.  
Manufactured and Guaranteed by  
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Write for Bestone Catalogue.

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WE SAVE YOU MONEY

Also Other Types at  
All Tubes Guaranteed New.  
All Tubes are tested in a set  
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CRITERION RADIO CORP.,  
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81 Cortlandt Street

## Radio Pointers to Bear in Mind

### Short Notes That Prove Helpful When Building a Radio Set.

The addition of a C battery may be easily made to any two stage audio frequency amplifier. By following through on the secondary circuit it will be seen that one side of the transformer goes to the grid, the other going to the negative filament. The C battery is simply connected between the negative A battery and the bottom of this transformer, with the negative pole connected so that it is toward the transformer.

Placing a condenser in series with your aerial or ground, will materially reduce the wave length of your receiving set. If you cannot reach the higher waves on your set this may be the cause. Place the condenser so that one side is connected to the aerial and the other to the ground. This is a parallel connection and will raise the wave length range of the set.

It frequently happens that the owner of a new set will experience keen disappointment for the first few days. This is simply because he does not know just how to operate it, but as soon as the secret is learned the results will be forthcoming. This is one reason why it is a good thing to use a set for a few weeks before you make up your mind that it is no good.

Leaving the storage battery completely discharged will probably cause trouble. If you intend to close down your radio set for any length of time it is advisable to take the battery to some convenient service station where it will be taken care of.

When building a three circuit tuner it is wise to mount the apparatus on a panel about 7x20. The two variometers should be mounted about 12 inches apart and the variocoupler should be placed midway between them.

Adding more A batteries to your dry cell tube will not give you any louder signals. On the other hand it is far more apt to burn out the tube. Every box containing a vacuum tube has a printed sheet giving exact data on connection and A and B battery voltages. It is best to follow these exactly.

Dry batteries will have a greater life if they are kept in an upright position.

If an overload is placed on either a U. V. 201-A or U. V. 199 tube it will be noticed that the tube will not work as well after the accident as before. In most cases the tube can be restored to its original condition by burning the filament for an hour or so without the B battery disconnected.

Often the quality of reproduction from a loud speaker can be improved by reversing wires at the terminals.

The selectivity of a receiver can be increased by decreasing the length of the aerial. In most cases an aerial about 100 feet long will give best results.

A "C" battery should be used in connection with all audio amplifiers that use a plate voltage in excess of 45 volts. The negative of the "C" battery should be connected to the common filament terminal of the amplifying transformers, and the positive should be connected to the negative of the "A" battery.

In any type of regenerative set where proper regeneration does not seem to take place it is frequently advisable to reverse the wires which run to the tickler coil. This is particularly true of honeycomb coil sets and other sets of a similar nature.

In a radio frequency set it is highly important that the grid and plate wires be kept separate.

If a tickler feed back receiver regenerates too freely the capacity of the phone condenser should be reduced.

In some instances a three circuit regenerative set can be improved by reversing the terminals of the plate variometer.

A 22½ volt "B" battery should be considered dead after its voltage drops below 17 volts.

The outside wire terminal of the secondary of an amplifying transformer should always be connected to the grid of the tube.

For minimum resistance an inductance should have a ratio of 2.46:1 between the diameter and the length.

## Better Amplification Radio's Need

### Amplification Without Distortion Is More Necessary Than Volume of Sound.

THE outstanding need of radio to-day, both for the enjoyment of the art and to promote its further development as a sound industry is more efficient amplification.

Not only research engineers but manufacturers agree that the wider use of better amplification is the next stage of development of the utility. This will not only vastly increase the number of radio users but immeasurably improve the standard and quality of results obtained in homes throughout the land.

To be sure amplification is already used with a vengeance. Vengeance is often the precise word. Too much of it sounds like an alley cat singing to its mate: "Last night on the back fence I loved you best of all."

Radio's supreme need is amplification without distortion. To amplify is easy, but to amplify so that no distortion or change in the sound is made requires careful design of the amplifier. In all amplifiers there are transformers and vacuum tubes. The transformer is the heart of the amplifier. Unless the proper transformer is used the singer's voice in New York is distorted into squeals and squawks in Chicago. The voice will be amplified, but the tone and the rich natural quality will not be preserved without a proper transformer.

The general public is realizing more every day that amplification is the most important single factor in radio. It is so fundamental that without amplification radio to-day would be impossible. Changing electric waves to sound waves wouldn't mean much if they couldn't be heard plainly. Amplification builds

them up, so that they are clear and easy to hear. Amplification is used at the transmitting station as well as at the receiving instrument. Faint whispers thousands of miles away become clear, living voices in the homes of millions.

Amplification is multiplication. The small amount of sound energy generated by the voice or violin string at the broadcasting station is changed to electrical energy and then multiplied or amplified millions of times. This large amount of energy is then put into an antenna and radiated out into space as an electromagnetic wave. When this wave strikes a similar antenna thousands of miles away it gives up to it a small amount of this energy to be amplified again, so that a whole room full of people at the remote point can listen and understand.

In real and vital sense the key to radio is amplification, and the public is increasingly realizing this. Even more important, they are demanding amplification, which gives not only volume but quality of sound—amplification without distortion.

### Dr. J. Percival Hugot to Speak From WEAF To-day

To-day's afternoon service offered by the New York Federation of Churches through WEAF will be presided over by William B. Millar, general secretary of the organization. He will introduce Dr. J. Percival Hugot. The subject of his address will be "The First American." A solo number by Arthur Billings Hunt as well as choral numbers by the Federation Radio Choir will constitute the musical part of the program.



**FOR RADIO—**  
**COLUMBIA IGNITOR!**

The proven dry cell, for  
all radio dry cell tubes

BRING those distant stations back!  
Signals weak—distant stations inaudible—rheostats turned full on; you need new "A" Batteries. Buy the famous Columbia Ignitor, sold everywhere, used everywhere. Packed with power. Vigorous during weeks of joyful listening.

There is a Columbia dealer convenient to every radio user.

Manufactured and guaranteed by  
**NATIONAL CARBON COMPANY, INC.**

# Columbia

## Dry Batteries

—they last longer

# Morris

## RADIO CO.

### 160 W. 23 ST.

7th Av. Phone Watkins 5408-J

|  |       |   |       |
|--|-------|---|-------|
| MONODYNE 1 Tube<br>List price \$10; sale.....  | 6.95  | RADIOLA SPECIAL 1 Tube<br>Set. Sale price.....  | 21.50 |
| <b>DE FOREST D. V. 2 TUBE..... \$6.50</b>  |       |   |       |
| The New Wonder Tube—Takes the place of U. V. 201A.                                       |       |   |       |
| MAHOGANY FINISH<br>CABINETS. Only a few<br>left. 7x10, 7x12.....                         | 1.15  | ATWATER-KENT 5 Tube Radio-<br>dyne and 4 Tube Sets in stock.<br>Also complete line of A-K. parts. |       |
| <b>BRANDES TABLE TALKERS \$10.00</b>   |       |   |       |
| CROSLY KJ 4 Tube Sets. Limited<br>quantity. List price \$98.75;<br>\$65; sale price..... | 49.50 | KENNEDY 3 Tube Set.<br>List price \$98.75;<br>Sale price.....                                     | 69.50 |

Mail Orders Shipped Day Received. Send Check or Money Order.

# NATIONAL RADIO OUTLET

## 202 EAST 84th STREET, near 3rd AVE

### SALE ALL WEEK

EVEREAD 45 VOLT (large).....\$3.15  
BRANDES PHONES.....3.95  
NEUTRODYNE SET (5 tubes), to order,  
including { Brandes Phones } \$59.50  
                  { Loud Speaker }

|                        |          |                             |        |
|------------------------|----------|-----------------------------|--------|
| ANELS.                 | CABINETS | All Amer., all Ratios.....  | \$3.20 |
| \$ .55.....7 x 10..... | \$1.75   | 3000 Ohm Phones.....        | 2.15   |
| .85.....7 x 14.....    | 2.00     | 23 Plate Vern. Cond.....    | 2.39   |
| 1.05.....7 x 18.....   | 2.25     | Fada Single Sockets.....    | .85    |
| 1.35.....7 x 24.....   | 2.75     | 2 Way Plugs.....            | .49    |
| 1.50.....7 x 26.....   | 3.25     | Loud Speaker with Unit..... | 5.50   |

TEL. UNIVERSITY 4200-1-2

# Simpson

135 WEST 116th STREET

Expert Repair Service  
at our  
**RADIO HOSPITAL**



We sell and ins. all GOOD radio sets

## 201-A TYPE TUBES

### \$3.50

BRAND NEW—NOT REFILLED.  
Tested in a Set and Fully Guaranteed.

**MAIL ORDERS FILLED**  
**Guarantee Radio & Lamp Co.**  
446 Seventh Ave., near 34th St.  
Dealers Write for Discount.

## Henley's 222

### Radio Circuit Designs

A Complete and Up-to-Date Collection  
of Modern Receiving and Trans-  
mitting Hook-Ups.  
Written and Edited by a Staff of Radio  
Engineers of Wide Practical Experi-  
ence and Thorough Theoretical Train-  
ing.

284 Diagrams and Illustrations.  
267 Pages.  
**Price \$1.00**

An entirely new and thoroughly practical  
book on radio circuit designs  
which will meet the needs of every  
radio enthusiast, whether novice or ex-  
pert, amateur or professional. It is  
replete with correct and trustworthy  
radio information from which any one  
can successfully build and operate any  
of the circuits given. Contains the  
largest collection of radio circuits and  
hook-ups ever published, including all  
the latest and standard circuits, such  
as ARMSTRONG, DE FOREST,  
REINARTZ, COCKADAY, HAZEL-  
TINE, COLPITTS, GRIMES, SUPER-  
HETERODYNE.

The Latest in Circuit Designs

Can be had direct from us or  
carried by all Radio Dealers.

**The Norman W. Henley Publishing Co.**  
2 West 46th St., New York



### China Society Dinner Will Bring Orient to WJY

The addresses which will be given at the China Society dinner, to be broadcast by station WJY Tuesday evening, will afford a great deal of genuine enjoyment to the listeners, in dealing as they will with the mysterious country of the East about which most Americans have only hazy impressions. The two principal speakers whom Gen. J. G. Harbord, the toastmaster, will introduce will be Prof. Henry Fairfield Osborn, chairman of the American Museum of Natural History, and Roy Chapman Andrews, the famed finder of the dinosaur eggs and head of the recent expedition to Mongolia. The principal subject of the talks will undoubtedly be the recent archaeological expedition and the fascinating and thrilling incidents attendant upon the trip.

### Swinging of Aerial Will Cause Fading

Around this time of year, as at all other times, watch your outdoor aerial to see that the ropes or other supports are not loosened by the wind, allowing the aerial to sway. The capacity which governs wave length of an aerial depends on, among other things, its distance from the ground. Therefore, if the aerial is swinging and thus changing its wave length, the tuning of your set will vary from instant to instant, upsetting the operation of the set. Keep the aerial taut. If supported by a rope over a pulley, suspend a weight on the rope, to take up the slack as the pole sways.—G. M. C.

### Soloists at WJY Sunday Afternoon

Two noted soloists will be heard by WJY listeners Sunday afternoon, for Jewel Farrington, celebrated soprano, and Max Schwartzman, tenor, will give radio recitals from that station. Jewel Farrington is one of the most promising of the younger singers, and has achieved considerable success in the few concerts which she has as yet given. Max Schwartzman is one of the leading church singers of the city, and has a host of enthusiastic adherents in both the metropolitan and outlying districts.

### Frank McGlynn to Speak About Lincoln

Frank McGlynn, famous character in the presentation of Drinkwater's play "Abraham Lincoln," will broadcast a talk on the Great Emancipator as a feature of WEA's Lincoln's Birthday evening program. He will give his views of the character of Abraham Lincoln as based upon Drinkwater's study of original sources, which he portrayed behind the footlights.

## RADIO EXCHANGE

Rates 5 cents a word; minimum, 18 words. White space or broken lines, 30 cents an apate line. Apatc gaps and white space permitted. No display type or borders.

**TROUBLE?**  
BRING THEM TO ME.  
Electrician, 15 years' experience, will BUILD, REPAIR OR REWIRE YOUR RADIO SET.  
SUPER-HETERODYNE,  
NEUTRODYNE AND REFLEX  
A SPECIALTY.  
CHAS. DOWN,  
307 West 44th St.

**8 TUBE VARIOMETER COUPLER SET,**  
ALL MODERN PARTS IN GLASS CASE.  
INSTRUMENTS GUARANTEED \$60. HIRSHFIELD, 1506 LEXINGTON AV. AT WATER 0755.

**RADIO BATTERY SERVICE.**—Batteries recharged, called for and delivered. REX AUTO SUPPLY CO., 185 Lenox av. Call University 8054.

**NO TUBES.**  
Build the wonderful NEW IDEA crystal set; distance and volume; purchase parts any 5 & 10; plan and instructions. NEW IDEA RADIO, 575 82d St., Brooklyn, N. Y.

**YOUR opportunity.**—only a few more left: one tube receiving set, tested and fully guaranteed, in handsome cabinet, to close out at \$6.75. BURCH, 276 Canal St., cor. Broadway.

**PART of store and large basement in good radio section, automobile district.**—show windows; might become interested in radio business. Phone Columbus 7618.

**CABINET factory** selling out genuine mahogany cabinets \$2 up. open Sunday morning. CLOVER CABINETS, 2378 84th av.

### WEAF's Increased Power Appreciated by Many Fans

WEAF's development work in connection with the use of higher power has aroused the interest of radio listeners not only in the metropolitan area, but throughout the eastern half of the United States. It has long been realized by radio engineers who have studied the situation here that there can be no further improvement in broadcasting conditions, particularly as regards spark telegraph interference, unless it is possible to increase the power of New York broadcasting stations.

Increased power results in greater volume; it reduces the ratio of telegraph and static interference with the broadcast program. This improvement applies not only to expensive receiving sets, but to the most modest equipment in operation. The owner of a crystal receiving set receives WEAF's program with much greater volume and is consequently much better able to enjoy the program.

Those possessing vacuum tube sets with many stages of amplification are able to operate successfully with reduced amplification, avoiding overloading of tubes and securing in consequence a much higher quality of reproduction. Sensitive receiving sets must, of course, be adapted by correct adjustments to receive properly under the new conditions. Audio frequency amplifiers if overloaded by signals of too great volume do not reproduce as faithfully as they do when amplifying a current of normal volume.

Receiving sets located within a short distance of WEAF's transmitter or those not adapted to selective tuning may at first interfere with satisfactory reception of other local broadcasting stations. However, this is a condition which can certainly be corrected by simple adjustments of the receiving sets. It may be recalled that when two channel broadcasting last year on 350 and 400 meters listeners were troubled by interference, but by improvement in their sets now separate these two wave lengths without any difficulty. Similar difficulty was experienced when four channel operation was undertaken in the metropolitan area.

An indication of the selectivity obtainable with suitable receiving apparatus is given by the fact that a 600 meter watch is maintained within a few feet of WEAF's antenna. A short receiving antenna is employed, which successfully eliminates WEAF so that reception of ship wave lengths is possible. If this can be done within fifty feet of the broadcasting station the feat can be duplicated at greater distances.

One of the causes of difficulty which have frequently been noted is the use of antenna of too great lengths for local reception.

**SUPERDYNE**, the best set yet developed for perfect tone and long distances when properly constructed of correct materials. 4 in. long. Designed by radio engineer and have fully developed this circuit; will in spare time construct tuning units or make up complete sets, using your parts; is well adapted for installation in phonograph cabinet or any on market at far greater cost; can demonstrate. Phone Whitehall 6945 or write Y 2920 Herald, 290 Broadway.

**BROOKLYN SERVICE.**  
Have you a phonograph or a cabinet? Let me build a radio in it. I build and rebuild. Neutrodyne specialist. 310 Decatur st. Haddingway 1060.

**DISTORTIONLESS** five tube set, automatic filament control, 8x28 panel, space in cabinet for tuner, easy to operate; all tuning with one dial. P. A. JULY, 219 East 39th st. Vanderbilt 3494.

**4 TUBE** reflex sets, 1,000 miles on loop, \$50; also made to order. Basement, 114 W. 90th.

**COCKADAY** Improved four-tube tuner, with power amplifier, perfect condition, new \$75; demonstrated evenings. 264 Nicholas av., Brooklyn, N. Y.

**UNDERWOOD** No. 5 rebuilt typewriter, new, cost \$85; will exchange for radio set, loud speaker. Write W. P., 2631 Palmetto st., Brooklyn.

**SEISMANN** 3 tube set, cost \$85, sell \$47; also sell equipment extra, best price; demonstrated evenings. 15 Wyona st., near Jamaica av., Brooklyn.

**FOR sale**—Radio and bicycle store, established 10 years in the heart of the largest growing section of New York city. Y 2915 Herald, 290 Broadway.

**THREE** tube regenerative set, Magnavox, storage battery, Tuner, charger, bargain. J. GELTMAN, 2833 West 34th st., Coney Island.

**GREBE** C.R. 12, new, inside aerial, 4 tube, radio frequency set, \$115; must sell quick; leaving town. Phone evenings, Fordham 2510, apt. 58.

**HERE'S** your chance!—Beautiful 3 tube set with all accessories at a bargain. Schuyler 2718.

**YOUNG** man, experienced, to become part-time radio dealer in established radio store; small investment. AARON SEIGALL, 2007 3d Ave., City.

### Changes in Station List

| Call.  | New Stations, Class A.  | Frequency, Wave Lgth., Power. | Meters. | Watts. |
|--|---|-------------------------------|---------|--------|
| WBNN   | —Blake, A. B., Wilmington, N. C.                              | 1090                          | 275     | 10     |
| WBHQ   | —Frank Crook, Pawtucket, R. I.                                | 1190                          | 252     | 50     |
| WBMM   | —Fr. Atlas Produce Co., Lincoln, Ill.                         | 1330                          | 226     | 200    |
| WBK  | —Kaufmann & Baer Co., Pittsburgh                              | 1180                          | 254     | 10     |
| WBHO   | —Limestone & Chem. Co., Rogers, Mich.                         | 1200                          | 250     | 500    |
| WBRR   | —Peoples Pulpit Assn., Rossville, N. Y.                       | 1230                          | 244     | 500    |
| WBEE   | —Petoskey High Sch., Petoskey, Mich.                          | 1220                          | 246     | 10     |
| KDZE   | —Rhodes Dept. Store, Seattle, Wash.                           | 1110                          | 270     | 100    |
| KFJQ   | —Valley Radio, Div. of Elect. Constr. Co., Grand Forks, N. D. | 1070                          | 280     | 5      |
| TRANSFERRED, CLASS C TO CLASS A.   |   |                               |         |        |
| WJAS   | —Pittsburgh Radio Supply House, Pittsburgh                    | 1200                          | 250     | 500    |
| LIST OF BROADCASTING STATIONS DELETED DURING THE MONTH OF JANUARY, 1924. |   |                               |         |        |
| KFAV   | —Abbot Kinney Company, Venice, Cal.                           |                               |         |        |
| WJAB   | —American Electric Company, Lincoln, Neb.                     |                               |         |        |
| KFIY   | —Brett Laboratories, Seattle, Wash.                           |                               |         |        |
| KFKC   | —Colorado Springs Radio Co., Colorado Springs, Col.           |                               |         |        |
| KFKH   | —Denver Park Amusement Company, Lakeside, Col.                |                               |         |        |
| WOAJ   | —Ervin Electrical Company, Parsons, Kan.                      |                               |         |        |
| WDAJ   | —First National Bank, Centerville, Ia.                        |                               |         |        |
| WABC   | —Fulwider-Grimes Battery Company, Anderson, Ind.              |                               |         |        |
| KFKK   | —Gladbrook Electric Company, Gladbrook, Ia.                   |                               |         |        |
| WAAJ   | —Hollister Miller Motor Company, Emporia, Kan.                |                               |         |        |
| KFIB   | —Jenkins, Franklin W., St. Louis, Mo.                         |                               |         |        |
| WBAW   | —Marietta College, Marietta, Ohio.                            |                               |         |        |
| KFDU   | —Nebraska Radio Electric Company, Lincoln, Neb.               |                               |         |        |
| WGAY   | —Northwestern Radio Company, Inc., Madison, Wis.              |                               |         |        |
| WLAN   | —Putnam Hardware Company, Houlton, Me.                        |                               |         |        |
| WLAT   | —Radio and Specialty Company, Burlington, Ia.                 |                               |         |        |
| WABJ   | —Radio Laboratories, South Bend, Ind.                         |                               |         |        |
| KFCD   | —Salem Electric Company, Salem, Ore.                          |                               |         |        |
| WKAW   | —Turner Cycle Company, Beloit, Wis.                           |                               |         |        |
| KFJD   | —Weld County Printing and Publishing Company, Greeley, Col.   |                               |         |        |

### Here's a Way to Guard Against Mistakes

Radio set builders who take pains to secure the best layout of material on the panels are often puzzled to know, without drilling the panel, just how instruments will appear. Take a piece of heavy cardboard or duplex board, cut it to panel size. Lay out the panel as you think you want it, drill the holes, attach it to the baseboard and mount the instruments, using rubber bands to hold them temporarily. You can see how they look and how the distances

between instruments work out. If it is satisfactory use the cardboard as a template for drilling the panel. If changes are needed you can make as many as needed without ruining a sheet of expensive paneling.—G. M. C.



**CITY RADIO CO.**  
70 CORTLANDT ST.

**U. S. TOOL VERNIER CONDENSERS**  
14 PLATE \$2.85 24 PLATE \$2.95 34 PLATE \$3.45  
**MUSIC MASTER SPEAKERS, \$21.95**  
**WESTERN ELECTRIC 10 D. SPEAKERS, \$36.00**

|  |  |  |
|--|--|--|
| <b>VARIO COUPLERS</b><br>Cortwell... 1.50<br>Waters... 2.45<br>Simplex... 2.50<br>Sleeper... 3.45<br>Columbia... 3.25<br>wave... 2.25<br>23 plate... 2.40<br>44 plate... 2.75<br>MONTROSE<br>43 plate... 2.75<br>R. C. CO.<br>23 plate... 1.80<br>23 plate... 1.95<br>44 plate... 2.75<br>CHELSEA<br>23 plate... 4.00<br>44 plate... 4.25<br>RHEOSTATS<br>Regal... .50<br>AMSCO<br>6 ohm... .75<br>6 ohm... 1.10<br>Pawer... .55<br>KLOSNER<br>6 ohm... 1.10<br>30 ohm... .90<br>RAYMOND<br>30 ohm... .75<br>FRANKHAM<br>6 ohm... .90<br>30 ohm... .55<br>CUTLER<br>6 ohm... .75<br>HAMMER<br>6 ohm... .75<br>30 ohm... 1.10 | <b>RHEOSTATS</b><br>ERMOSTATS... 1.50<br>BRADLEY... 1.55<br>STATS... 1.55<br><b>VENNER CONDENSERS</b><br>17 plate... 2.25<br>23 plate... 2.40<br>44 plate... 2.75<br>MONTROSE<br>43 plate... 2.75<br>R. C. CO.<br>23 plate... 1.80<br>23 plate... 1.95<br>44 plate... 2.75<br>CHELSEA<br>23 plate... 4.00<br>44 plate... 4.25<br>RHEOSTATS<br>Regal... .50<br>AMSCO<br>6 ohm... .75<br>6 ohm... 1.10<br>Pawer... .55<br>KLOSNER<br>6 ohm... 1.10<br>30 ohm... .90<br>RAYMOND<br>30 ohm... .75<br>FRANKHAM<br>6 ohm... .90<br>30 ohm... .55<br>CUTLER<br>6 ohm... .75<br>HAMMER<br>6 ohm... .75<br>30 ohm... 1.10 | <b>AERIAL WIRE</b><br>Stranded... .45<br>Light... .45<br>Heavy... .55<br>Enamel... 1.40<br>AUDIO FREQ. TRANSFORMERS<br>Mar... 5.45<br>Chel... 5.45<br>National... 2.25<br>N. Y. Coil... 2.75<br>Jeff Star... 2.75<br>RADIO FREQ.<br>U. V. 1714... 5.25<br>Erie... 3.50<br>Rubicon... 3.50<br>Ame... 2.25<br>SUPER<br>HETERODYNE<br>1714 Type... 2.50<br>PUSH-PULL<br>Reb... 10.50<br>Medern... 5.00<br><b>SOCKETS</b><br>Bell... .65<br>White... .45<br>National... .35<br><b>BATTERIES</b><br>Bakelite Tubes, all sizes, cut to size. Brands... 10.00 |
|--|--|--|

**Amberaids Coils... \$5.50 Red Seals, 3 for... 85c**  
**RUBBER PANELS**  
7x10... .55 7x12... 1.05 7x10... 1.15 7x12... 1.25  
7x12... .55 7x12... 1.15 7x14... 1.40 7x18... 2.15  
7x14... .85 7x24... 1.50  
**MISCELLANEOUS**  
Var. Comb. Tubing... .10 Eureka Clips, 2 for... .05  
Sagehetti... .02 Large Clips... .05 45 v. 200... .60  
Enam. Bus Bar... .03 Inlt. Blinding Pests... .04 22 1/2 v. 200... .10  
CABINETS  
7x10... 2.20 7x12... 2.50 22 1/2 v. Small... 60 22 1/2 v. Large... 1.35  
7x12... 2.30 7x24... 2.50 22 1/2 v. Medium... 65 45 v. Medium... 1.35  
7x18... 2.40 7x28... 2.90 45 v. 450... 1.35  
**Eveready "B" Batteries, \$1.65 \$3.20**

**ACE ELECTRIC CO.**  
204 West 34th Street, Near 7th Ave.  
**FADA 160 NEUTRODYNE SET**  
Completely assembled—ready to operate  
**\$152.50**

**These Parts are Included:**  
Fada 160  
1 U. V. 200 or C 300.  
3 U. V. 201A or C 301 A.  
1 Brandes Table Tuner.  
2 Insulators.  
50 Ft. Lead-In Wire.  
1 Aerial.  
2 Patent Phone Plugs.  
100 Ft. Aerial Wire.  
1 Ground Clamp.  
1 Ground Wire.  
1/2 lb. Bell Wire.

**SALE! Ace Single Tube Regenerative Set, complete with \$24.75**  
W. D. 12 Tube, A and B Batteries. Only

**Sale**  
Prices drastically reduced to the lowest in the city. You never saw such values. You may never see them again.

**LISTEN TO THE LEO**  
A-Tube set before buying a radio set at any price.  
**FADA Assembled \$65.95**  
Regular Price \$75.00  
Our Price \$65.95  
TUBES \$3.75 (R. C. A. in stock)  
Music Masters... \$30.00 \$20.95  
Perfectone Horns... 15.00 8.49  
Other Horns in stock.  
Perfectone Phones... 5.00 2.74  
Perfectone Phonograph attachments, special Stromberg-Carlson... 8.75 4.79  
Exide "A" Storage Batteries, 100 Amps... 23.00 12.98  
Exide "A" Storage Batteries, 50 Amps... 17.50 11.49  
Eveready "B" Batteries, large 45 volts... 5.00 3.24  
Eveready "B" Batteries, large 22 1/2 volts... 2.50 1.79  
Complete line of other radio parts at equally low prices.  
Mail Orders Filled.

**LEDO RADIO**  
403—6th Av., Bet. 24 & 25 Sts.

**QUICK!!!**  
**IMPORTERS CLOSING OUT!**  
**\$2.35**  
6 VOLT Amplifier & Detector, 45 Ampere, Plus Standard Sockets  
Guaranteed GENUINE GERMAN TELEFUNKEN Tubes (You Know What THEY Are).  
Room 216, 80 Wall St., New York

**AMPERITE**  
the Self-Adjusting Rheostat is helping them do their job right. Eliminates hand controls. Saves fiddling set in good humor.  
**\$1.10 From Your Dealer**  
RADIALL CO.  
326 West 42d St. New York.

**"THE HOUSE OF SERVICE"**  
Special Price \$13.25  
**AMBASSADOR TONE PHONES**  
**THROOP AUTO SUPPLY**  
832 E. Kalb av. at Throop, BROOKLYN, N. Y.  
DECATUR 8379.

**For Real Bargains in Radio Sets see Radio Exchange Page 22**

**World Radio History**

# Australia Now Has One of the World's Largest Broadcasting Stations

## "2 FC" Near Sydney Will Probably Be Heard in the United States

RADIO broadcasting has now been introduced into Australia. A scheme which is unique and which has been drafted after the experience of other countries in regard to broadcasting had been considered has been evolved. In considering the broadcasting problem in Australia difficulties which were unknown in other parts of the world presented themselves. The

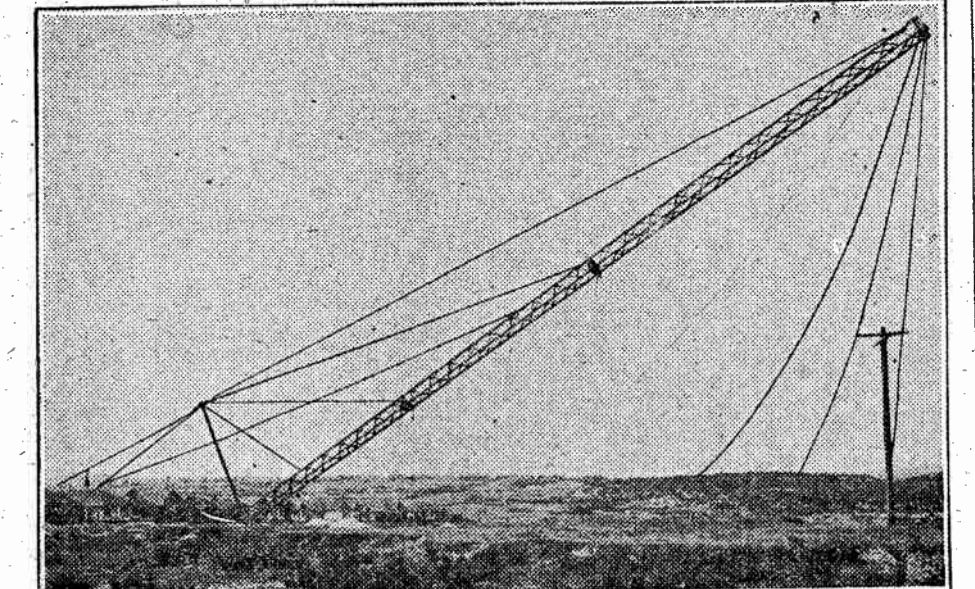
sued after the broadcasting company's subscription has been paid. Arrangements have been completed whereby radio dealers become agents of the broadcasting companies for the issue of licenses and the collection of the subscription fees for the broadcasting service. No person can purchase a wireless set unless the license has first been obtained. Most people have now thoroughly realized that if broadcasting is to be

should also be heard under ideal conditions in other parts of the world. Situated on the highest point of Willoughby, about eight miles on the northern side of Sydney, New South Wales, the station, which is officially known as 2FC, has now commenced transmission. The two steel towers which support the aerial system are each 200 feet high and are built in lattice fashion. The distance between these towers is 575 feet, and across this space the aerial system is stretched. Directly beneath the aerial and almost in the center of the two towers is situated the operating house and quarters for the staff. A large room houses the 5,000 watt set which is used for the transmission of programs and also a smaller 500 watt set. Adjoining the instrument room are the living quarters, bedrooms and bathroom for the operating staff, and situated some little distance is a large storehouse.

**Uses Cage Aerial.**  
The aerial is of the cage type and consists of four wires stretched taut and kept in position by means of huge brass hoops, which are secured at regular intervals along the wire and to which the wire itself is attached. Special attention has been given to the "earth" system, which is most elaborate. No direct contact is made with earth, but a complicated earth screen has been constructed. This comprises a counterpoise arrangement, the wire used in connection with it being supported by small steel masts, each carrying heavy insulators and holding the earth screen a distance of about fifteen feet from the ground.

A special steel tower set in concrete is erected near the side of the operating room, and to this tower the "lead" connection with Farmer & Co.'s service are provided in elaborate studios which have been constructed on the roof garden of the company's big retail store in Pitt, Market and George streets, Sydney, and about eight miles from the station. A land line conveys the speech and music to Willoughby, where it is transmitted. The studios have been constructed at considerable expense from plans and specifications obtained after consultation with representatives of broadcasting interests in all parts of the world. No stone has been left unturned to insure the best results being achieved, and the studios have been planned accordingly. Constructed in a special manner so as to be soundproof, they comprise a large and a small studio, an instrument room and a special reception room for the artists. The instrument room adjoins both studios, and the operator is able to watch the progress of the concerts being broadcast through a special double soundproof plate glass window. Walls and ceilings have been draped carefully with thick felt. All doors are double and have been constructed on sound-proof principles.

**Two Studios In Operation.**  
The use of two studios results in their being very little delay, the manager of the service being able to arrange his artists in one room while the item is actually being rendered in the other. A quick change over on the part of the operator results in one item following another in rapid succession. The microphones into which the artists sing are kept in the studios, and the sound is "stepped up" before being carried by telephone wire to the station at Willoughby. A special series of switches enables the



Raising one of the 200 foot Towers was quite a feat.

immense area of the Commonwealth, with its almost minute and greatly scattered population, rendered it impossible for any of the systems which had been adopted in England or America to be employed in Australia. It was realized, of course, that the establishment of broadcasting should be on such a basis as to render it permanent, and with this end in view a conference of those interested was summoned by the Postmaster General, Mr. Gibson, who is the Minister responsible for the administration of the wireless telegraph act of the Commonwealth. This conference discussed the matter, and eventually evolved a scheme which at a later date was approved of by the Government and was made the subject of special Government regulations.

Under this scheme those wishing to erect stations and broadcast, after being approved of by the Government and also after providing a financial bond of \$1,000 guaranteeing continuity of service for five years, are allotted a certain wave length upon which to transmit. Receivers designed to respond to the wave length of the service and sealed so as to respond only to that wave length are then available for purchase by those wishing to avail themselves of broadcasting. This system is an entirely new one, and the exact manner in which it functions is being watched with keen interest by experts. The providing of a service under it becomes similar to the providing of an ordinary telephone service, except that in the case of broadcasting a set is purchased and not hired, and also that it is a receiver only. At first sight the scheme may appear strange and complicated, but the exact manner in which it will operate becomes quite clear if the case of, say, one broadcasting company is considered.

If a company is desirous of establishing a broadcasting service after being granted the necessary approval and license a wave length is allotted to it. The company then erects its station and transmits programs of speech and music according to its own arrangements. The person desirous of receiving then purchases a set designed by experts and tuned so as to receive telephony on the wave length of the service for which it is sold. It is sealed to that wave length, and is not alterable except by deliberate tampering. The testing is done by the Government, and the seal is a Government seal applied by the manufacturer under Government permit.

**Must Pay for Broadcasting.**  
The Government fee for a receiving license is 10 shillings per annum. The broadcasting stations control the issue of these licenses, and also charge whatever subscription fee they may think fit per annum. The license can only be is-

## Radio's Popular Appeal

Continued From Second Page.

one to build at home, with the possible exception of the really mechanically inclined man. Even then he is apt to get into trouble unless he has had previous experience with smaller and less complicated sets. There are many cases of success, though, and generally it is simply a matter of time and patience.

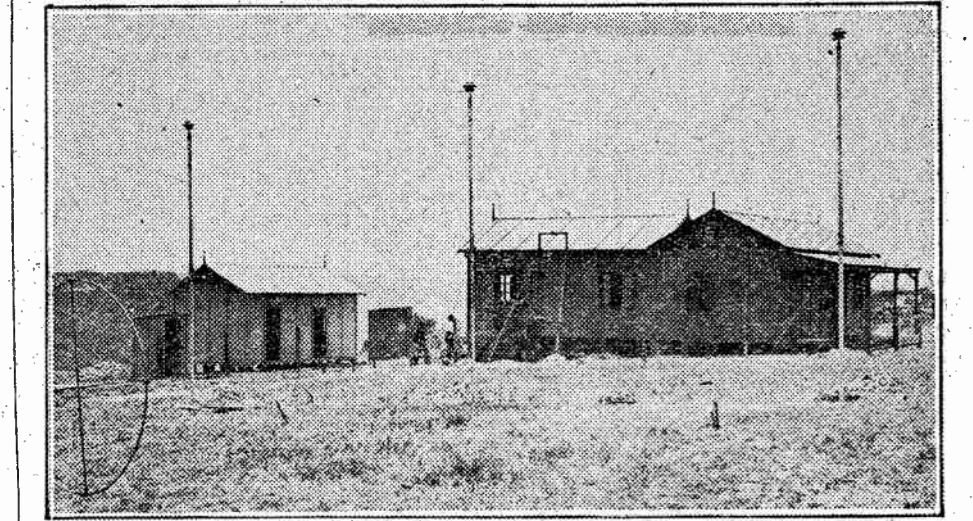
Radio has an appeal to every one. The programs offered by the great broadcasting stations are such that there is almost sure to be some feature which will interest any taste. There are talks for the children, for women and for the men. These run from bedtime stories to talks on the financial situation or sporting events. The great leaders of politics and of the nation take advantage of radio to place their thoughts right in the homes of millions of citizens, and the home with a radio set should never lack for entertainment of some kind from the day the set is built until the last instrument has been completely worn out. Radio is here to stay and it has reached

the status of a public necessity. Do not let any one try to convince you that it is only a passing fancy and that it cannot last, because there are vast sums of money tied up in manufacturing plants and millions of dollars have been spent by the fans in purchasing their parts.

What started as an interesting experiment has taken the public fancy by storm and it has reached such a high stage of development that it is now possible for every one to own and operate some form of set.

## President Coolidge's Address to Be Broadcast.

The address by President Calvin Coolidge, to be given at the annual Lincoln dinner of the National Republican Club, on February 12, will be broadcast by Station WJZ of the Radio Corporation of America directly from the main ballroom of the Waldorf-Astoria Hotel. Station WJZ will commence broadcasting the proceedings of the dinner at 9 o'clock,



The Studios are located seven miles from his operating house.

operator and studio manager to control the operation of the studio with the utmost simplicity, and a series of signal lamps is arranged so as to give full warning to artists and staffs when the station is in operation.

One of the greatest achievements by the directors of Farmer & Co., Ltd., has been the securing of the sole broadcasting rights from J. C. Williamson, Ltd., and Messrs. J. & N. Tait, the Australian theatrical organization, of the whole of their musical and dramatic productions. For this purpose the four theaters controlled by J. C. Williamson, Ltd., and Messrs. J. & N. Tait have been connected by trunk lines with Farmer's broadcasting studios, and the productions are broadcast as they are produced direct from the theaters.

In addition Farmer & Co., Ltd., have secured the sole rights of the Sydney Morning Herald, Australia's principal morning newspaper, and the Evening News, the principal evening newspaper in Sydney, for broadcasting purposes. A regular feature of the broadcast program will be stock exchange quotations and market reports embracing all the primary products of the country, for which purpose the cooperation of Dalgety & Co., Ltd., has been secured. The Sydney Town Hall, the headquarters of the city Municipal Council, has also been connected with Farmer's broadcasting station by a trunk line, while arrangements are being made for the connection of the New South Wales Conservatorium of Music, which is controlled by the State Government, and is the seat of musical education in the Commonwealth.







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## Confessions of a Radio Wife

Police Reports Prove Too Much for Hubby When He Tries to Make a Capture.

By ANNE COLLINS.

WHEN Randy brought home a radio set I was furious. We had been married five months and two days and hitherto had lived a happy married life. He is twenty-three and I am twenty-two and we are both good looking and he works in a bank—it's a shame what little vision that bank has when it comes to appreciating real merit in a man like Randy. Randy is really keeping that bank going in a way for if he divulged the things he's learned in the Statistical Department where he works, the bank would be ruined and there'd probably be a run on the bank tomorrow. But Randy is a real hero and he's never said a word to any body but me. I'm a stenog in a downtown office and believe me, it's no joke to be a "woikin' wife." However I stuff twenty-two dollars in my stocking every week. Which reminds me of why I was furious with Randy and the radio. You see we, being a business couple, and especially Randy being in the banking business, agreed we should have a bank account. A joint account, if you get what I mean, being as we were both contributing to its support. Then as the lawyers say, we had further agreed to withdraw no money without the other's knowledge and consent. I certainly had no intimation that he was to take any money out with him to buy a radio.

I knew instantly when I got home and found him arrived before me—I should say I—one has simply got to be particular in such things if you're a stenog for a fussy man—when I found that Randy was home first, I knew it must be mischief. Because he always lingers until he is certain things are started in the dinner line. And then he rushes in and offers to help. This evening he was guilty looking and was whistling to keep his courage up. I knew this instinctively.

"Here's a radio," he said in a surprised sort of voice, as though it got in, like a muskito, without his aid. He fumbled industriously with the battery or the volts or whatever you call them and whistled "When You Went Out."

"I like your nerve," I said in a cold voice.

"Sure you do. That's why you married me," he retorted.

I sat down in the new red velvet wing chair, and because I was tired of pounding a "Noiseless" more than because I was sore on the radio, I began to cry on the arm. The chair arm, not Randy's.

"You've destroyed my confidence in you," I sobbed. "You took the money out of the bank without telling me. Without my knowledge and consent."

"Listen, Pettie—"

"You ought to be ashamed! How much did it cost? And you know very well I want a gold band set of dishes."

"Aw, honey, listen," returned Randy, leaving the insides of the radio and running over to me. "Don't you go and get all stirred up. Listen, sugar, I didn't touch the bank account. I won this in a crap game."

Honest. I was so relieved. I dried my eyes and we made up and kissed and then I took an interest in the radio.

The radio was wonderful. If I must say it, Randy is clever. He got the thing all hitched up and never shall I forget how awed and queer we felt when first we got tuned in and heard the Farm Report. It was WJZ and as clear as crystal. Of course I don't know a thing about farms and petter does Randy, but as he pointed out, that's just where the radio makes for knowledge. Then we got WOR and heard the Moon Man. He told some bed time stories and Randy said "Gee." Then, true to our mutual promise to stop slanging, Randy began again. You see when one works for a bank, one simply must acquire a manner born. "Children have a much better chance now than when I was a ki—a youngster," said Randy. "When ever I asked some one to tell me a story they always said 'Go away and don't bother me.'"

We got KYW—Chicago—and heard the market report as plain. I

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**R. P. CLARKSON**  
Author Radio Sun-Globe Data Sheets.

1. Tickler  
2. Tickler  
3. R.F. R.F.  
4. Reflex

**STEP BY STEP FROM REGENERATION TO REFLEX.**

ALMOST any one who has had a panel to look behind has used the "daddy of them all," the Armstrong regenerative. It is going to take a whole lot of persuasion to make the old timers believe there is anything better. There may be differences of opinion whether plate tuning or tickler feed back is to be preferred and whether the grid circuit should be tuned by a condenser across the secondary or by a variometer in the grid circuit between the secondary and the grid condenser, but there is no difference of opinion as to whether a good old fashioned well made regenerative brings in the signal. It sure does.

Then there is the reflex, the circuit that makes a tube do double duty. It has lots of admirers and we are all its friends. Theoretically it should be the best hook-up of all from the standpoint of economy. Commercial sets using this hook-up are, on the average, more successful in bringing in distance than commercial sets using the regenerative hook-up, so far as my experience goes. Home made sets where only one tube is used are on the average more satisfying with the reflex than with regeneration, I think.

Both these circuits have a lot in common and modifications in between the two have given some surprising results. As a field for experiment and for the purpose of learning the workings of both, the four diagrams are given at the top of this page. There is no intimation here that reflex involves regeneration nor that regeneration contemplates reflex, but having the two circuits in mind it seems almost natural to pass from one to the other step by step, pausing at each step to contemplate what we are doing and what results we are getting. We'll learn the whys and wherefores of what's behind the panel and maybe find something wrong with our present set or some way of changing it to give results we prefer to have. Some want volume, some look for distance, some prefer quality, others desire easy tuning, and many just want to tinker and see what happens. The last group at least will get a lot of fun out of the process of changing from regeneration to reflex by the easy payment method shown above.

The first diagram shows the usual tickler feed back regenerative circuit. If the primary and secondary coils are to have variable coupling and the tickler is to have variable coupling with the secondary, the only coils you can use with this set are those arranged for a three coil mounting. Until recently that meant either honeycomb coils or spider web coils. Now in addition we have the splendidly effective curkoids which are O. K. in every particular except the name and that may not be as bad as honeycomb since I heard a man about fifty stroll in a store last week and ask to see some "beehive" coils!

Of course, the tickler may be fixed—a separate winding on the stator alongside of, but separated from, the primary. Some couplers are made that way. Another way of arranging the three circuits, and perhaps a better way, is to use the

rotor as a tickler, use the primary as a secondary, and wind three or four turns around the tube over the new secondary and use this winding as an untuned primary. On the whole, though, the three coil mounting works out best for tickler feed back. It permits a wide range of adjustments.

As to the action of the circuit shown in (1), you know the explanation of the three-circuit hook-up. The plate circuit is coupled with the grid circuit by means of the tickler so that the energy in part is returned to the grid circuit and reinforces the current already there so as to impress an amplified signal on the grid. It's a good deal as though you hitched a hose pipe on the smoke stack of a locomotive and connected the other end of the hose to the fire box of the locomotive to increase the draft and burn up the smoke.

The tickler is coupled to the secondary normally but you can put a coil in series with the secondary as shown at (2) and

couple the tickler to that. Where you have a coupler in the set now this arrangement, using a two coil mounting for the grid coil and the tickler, makes it easy to change over to the tickler feed back. In effect you now have a radio frequency transformer with primary connected to plate and forming the tickler and secondary connected in the grid circuit and delivering energy thereto in place of a second tube. In fact, an R. F. fixed transformer may be used here with pretty good results, if the primary is tuned by a variable condenser.

It is but a short step from (2) to (3). In place of coupling grid and plate circuits together directly, two couplings are used with an in-between circuit, tuned by a small variable condenser. Two coil mountings or fixed R. F. transformers may be used in each position, whichever are desired. Maybe I had an unusually effective rabbit's foot with me that night, but I certainly learned to re-

spect the circuit shown in (3) as an experimental circuit for DX reception.

To change from (3) to (4) is as easy as lying. The R. F. transformer or coupler on the grid end is taken out and replaced by an audio frequency transformer. A crystal rectifier is placed somewhere in the circuit between the transformers. Try it both ways and in both legs of the circuit to satisfy yourself that you have it in the right place. If the reflex is operating, you can't take the rectifier out and get just as good results. The crystal is there for a purpose. In (3) we fed back or reflexed all radio frequency. In (4) we rectify the radio frequency in the in-between circuit so that audio frequency is impressed on the A. F. transformer in the grid circuit and through that to the tube.

The circuit shown in (1) is the standard Armstrong regenerative, three circuit hook-up. The circuit shown in (4) is the standard straight reflex giving one step of radio frequency amplification, detection, and one step of audio frequency amplification with the one tube, assisted by a crystal and two transformers. There is no tickler in (4). The circuits of (2) and (3) are used here as illustrative of imaginary working from regeneration to reflex and are well worth playing with a while.

It is possible, of course, to use neither coupled coils nor fixed transformers at the various places in (3) and (4) where R. F. coupling is shown. A variometer in any of these places is exceptionally effective. Especially is this true in the circuit of (4). A variometer may be here placed in the plate lead just as if the circuit were to be plate tuned regenerative and from the terminals of the variometer leads are taken which form the connections to the crystal and the audio frequency transformer.

Any one of these circuits also forms a good starting place to begin experimenting with resistance coupled amplification. In (3) or (4), for example, in place of the radio frequency transformer in the plate side, try out resistance coupling—something of the general value of 100,000-ohms. You can buy short carbon rods of approximately that resistance at some of the stores and they will go in the usual fixed grid leak mounting or in a couple of clips.

Resistance coupling will also work out for audio frequency amplification. If you retain the coupled coils or some good radio frequency transformer in the circuit shown by diagram (4), try out resistance coupling at the other end, in the grid circuit. Maybe you will make it work well. Remember, resistance coupling does not give the volume of transformer coupling but has a clarity and freedom from distortion which is highly prized. In a circuit such as (4) no B battery current passes through it so it cannot be attacked as wasteful of B battery current.

For the experimenter nothing offers quite the lure of using something and then using it over again. That's what reflex does. It makes the tube do double duty. Why not see if we can't make it do triple duty or even more?

**STANDARD APPARATUS—Variometers**

THE object of all tuning operations in the control of a radio receiver is to so adjust the circuit in which the control lies as to put that circuit in resonance with some other circuit. Without breaking connections or inserting some fixed unit this adjustment may take place by varying the electrical constants of the units in the circuit. The variation can only be in two electrical characteristics, namely, inductance and capacity. With a fixed value of either the other may be adjusted so that the circuit is in resonance with some other circuit. Both may be adjusted and it is usually desirable to adjust both unless one or the other is very small. Usually it is very important for sharp resonance to make the inductance as great as possible and the capacity as small as possible.

The problem of making a variable inductance is not an easy one to solve. The ordinary single slide tuner is a variable inductance, but it varies irregularly and by jumps. The tapped coil is an adjustable inductance, but just as unsatisfactory. A coil with an adjustable metal core has been used on at least one first class receiving set. Another manufacturer at one time used a fixed coil with a plate movable to and fro from

World Radio History



# Mirrorlike Surface in Sky Reflects Distant Radio Waves to Listener

Interesting Article Explains in Simple Language the Causes of Fading.

By ALFRED N. GOLDSMITH.

**P**ECULIAR things happen sometimes in the receiving of broadcast radio. Every listener, as soon as he gets acquainted with a number of nearby and distant stations, finds that he is puzzled by some of the results he gets. How shall he explain such things as these:

1. Late at night he can hear stations hundreds of miles away clearly, while earlier in the evening, or by day, he can hardly hear fifty miles.

2. He will hear some stations at night steadily, and particularly the distant ones, but some other nearer stations will "fade" in and out rapidly and in irregular fashion.

3. Still nearer stations, say twenty-five miles away, will not fade in or out at night or by day.

4. In one part of a city, station 1 in that city will be heard loudly and station 2 in that city hardly at all. In another part of the same city the reverse will be the case. Outside the city both stations will be about equally loud.

5. A listener in the country will sometimes hear stations hundreds of miles away much better than he will hear stations in a nearby city say fifty miles away.

## The Heaviside Theory.

Radio engineers have a theory to explain these effects. It can be simply expressed, but it should be remembered that it is not a positively proven theory but only a plausible and satisfying explanation of all the puzzling effects just mentioned. It is based on a theory of Sir Oliver Heaviside, the eminent English electrician and mathematician. Heaviside pointed out that, twenty-five or fifty miles up, the air enveloping the earth becomes very rare and is therefore an electrical conductor just as is the rarefied "violet ray" tubes used for medical purposes. So that, far up in the sky, there is a layer of conducting air which scientists have called the Heaviside layer. It is also well known that substances which conduct electricity, such as metals, are good reflectors for radio waves, so that this layer is actually a sort of curved reflector in the sky. It is therefore called the "mirror layer" in this description for the sake of simplicity.

By day the mirror layer is spoiled in several ways. In the first place the brilliant sunlight falling on it causes disturbing air currents and irregularities, so that instead of being a smooth and polished mirror it becomes a roughened irregular layer of little use as a reflector. Furthermore, sunlight has the property of converting rarefied air into a sort of "fog" which, while clear and transparent to ordinary light, does absorb radio waves vigorously. By day the mirror layer is rough and most covered.

Probably most listeners have never speculated as to whether the radio waves which reach their receiving aerial come sweeping along the ground or whether they are shot down to the aerial wires after reflection from a mirror layer in the sky. Yet actually radio waves arrive by

either one of these dissimilar routes.

In the illustration of this article part 1 is a general sketch of a sky wave. It leaves the radio transmitting station at the left, passes obliquely up until it strikes the mirror layer far up in the air and is then reflected back again to the earth, arriving finally at the receiving station to the right. It may be mentioned that these sky waves do not die down rapidly because their path is entirely through the air and they are but little absorbed or interfered with in their mes-

are steel structured buildings, mountains (particularly those containing metal deposits) and to a less extent forests of large trees. The result is that a ground wave rapidly dies away, and this has been indicated in the diagram.

To take typical figures, which are roughly correct for an average broadcasting station in the eastern portion of the United States, the ground waves are very strong near the transmitting station for the first few miles and rapidly die down, becoming relatively quite weak at

to about 200 miles he gets both ground waves and sky waves. Beyond 200 miles most of his reception is dependent on the sky waves.

## What Is 'Fading'?

For locations where both sky waves and ground waves are received reception may become very erratic with marked "fading effects." Part 3 of the illustration shows how this may come about. The two sets of waves, arriving at the receiving station by different paths, may help each other or they may actually annul each other. Furthermore, as the mirror layer shifts slightly from moment to moment the ground waves may sometimes strengthen and sometimes weaken or annul the sky waves and thus cause fading. We can therefore explain the "fading" effects mentioned at the beginning of the article as follows:

1. Night reception over long distances is accomplished by the slightly absorbed sky waves, and these cannot exist by day because of the absence of a "smooth" mirror layer and the disturbing presence of sunlight "fog." So that day reception is by ground waves, which do not reach out powerfully nearly as far as sky waves. This partly explains the superiority of night reception.

## Night Reception Best.

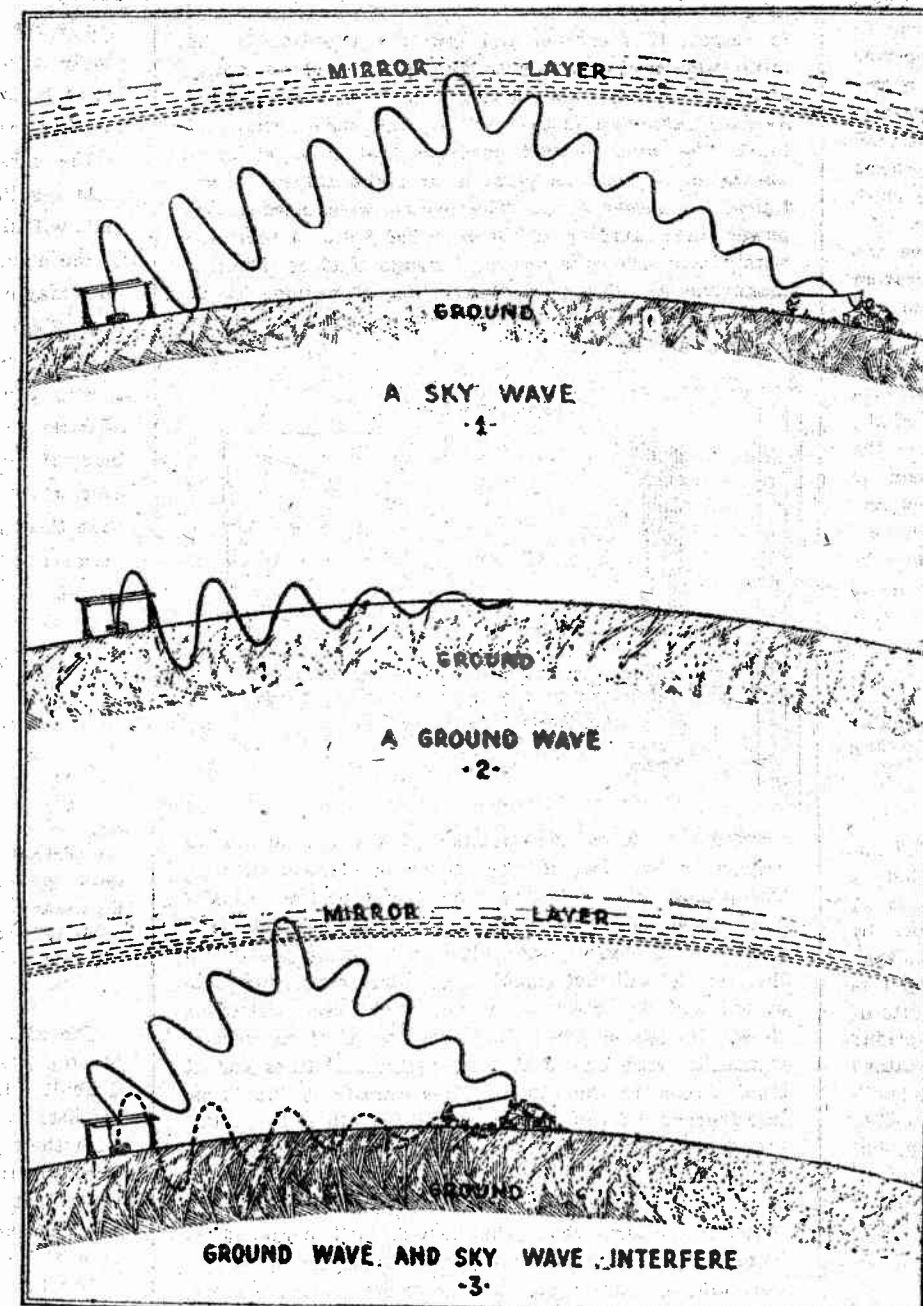
2. Night reception from distant stations is by means of the sky waves only and is therefore comparatively steady. Night reception from stations roughly from seventy-five to 200 miles away is by a combination of sky waves and ground waves and therefore fades in and out as these two sorts of waves interfere with each other.

3. Reception from stations nearer than seventy-five miles is chiefly by ground waves only and is therefore reasonably steady.

4. Reception in a city from nearby stations is by ground waves, which are badly absorbed by the steel structures of the city. A mile or two of city buildings will so weaken the signals from a city station, as received by a city listener, that reception may become quite poor. As a result in those parts of the city where the signals have first to plow through miles of steel to reach the listener, reception from that station will be poor. In other parts of the city the reception will be excellent. Far outside the city, reception will be by the sky waves and about equally good from all comparable stations within the city.

5. A listener in the country will get signals from the city fifty miles away almost entirely on weak ground waves, but will get distant signals on the powerful sky waves. Thus the distant signals are sometimes astonishingly loud in comparison with the nearby signals.

It adds another chapter to the romance of radio to know that the concerts from distant cities have traveled up to the sky on their way to the broadcast listeners, and that an enormous mirror in the upper layers of the earth's atmosphere is chiefly responsible for the enjoyment of distant concerts.



sage. So that we should expect sky waves to carry radio messages loudly over great distances, particularly at night when the mirror layer is smoothest and most effective and when the absorption of the radio waves by the "electrical fog" caused by sunlight is absent.

Part 2 of the illustration is the other sort of wave which may reach a receiving station. It is a ground wave and clings closely to the earth. Naturally such a ground wave encounters all sorts of energy absorbing obstacles in its path, which rapidly reduces its power and the loudness of the signals it can produce in the receiver. Such objectionable obstacles

a distance of a hundred miles or so. The sky waves, on the other hand, are hardly received at all near the transmitting station since their path is above the earth until after they have been reflected back to the ground. They come back to the ground and begin to be useful at distances of about seventy-five miles from the transmitting station, and beyond that distance they are readily received with good intensity for distances of several hundred miles. It amounts to this, to summarize: For distances up to about seventy-five miles the listener is depending almost entirely on the ground waves for his signal. From seventy-five miles

## By-Pass Condensers Frequently Help in Radio Set

**T**HERE are many uses which a fixed condenser may be put to that the fans do not take advantage of in order that the reception of concerts may be improved. All of the uses to which one may be put are classed under the heading of by-pass condensers.

The capacity of a by-pass condenser will vary with the use, and each use will take a different capacity for various tubes, transformers, batteries and other details such as wiring, etc. Therefore, only the uses will be given, and the capacity of the condenser will be left to the fan. However, the various sizes will be between .00025 and .006 mfd., with a few applications of a 1 or 2 mfd. condenser.

In regenerative tuners it is sometimes of advantage to place a large condenser from the plate of the tube to the filament

side of the tube that is not connected to the "B" battery.

The most general use of by-pass condensers come, however, in amplifying circuits, and these will be taken up instead of the slight use in detector circuits. Audio frequency amplification is the first step.

In audio frequency circuits a small condenser connected across the secondary of the second transformer will aid in clearing up raspy noises. A condenser from plate to filament of the last amplifier will also do much toward clearing up the signals. This condenser must be large.

If a 1 or 2 mfd. condenser be placed across each set of batteries a lot of the battery noises will be eliminated. If a resistance of about 1,000 ohms across the "A" battery and a resistance of about 20,000 ohms be placed across the "B" bat-

tery, these resistances will, with the condensers, clear up all battery noises.

In radio frequency amplifiers it is important that the potentiometer be bypassed properly. There are two ways to do this. One is to take a 2 mfd. condenser and connect it from the middle leg of the potentiometer to the negative leg of the potentiometer. Or to use two .006 mfd. condensers and connect them as follows: One condenser goes from the middle leg of the potentiometer to the negative leg of the potentiometer. The other condenser connects the middle leg and the positive leg of the potentiometer together.

A medium-sized condenser connected from the "B" battery side of the radio frequency transformer to one side of the filament—just which side will have to be found by experiment—will improve reception considerably.

A good, strong condenser from the plate

of an audio amplifier to the ground will often improve the tone of the set.

## Transformer Hints

In building audio frequency amplifiers always ground the cores of the transformers by running a thin wire from the transformer core to the ground binding post. This should be done even with the shielded type of transformers. Some types of transformers should be turned at right angles to each other, but many other types are not benefited by this. To be safe, the transformers should be placed as far apart as possible. The use of a low ratio transformer for the second stage is advised if clarity and quality of tone is your object rather than volume. Buy only the best materials and transformers in building your amplifier.

## Storage Battery Tube Proves Best

Operating Cost Is Lower in the Long Run With This Type of Tube.

By MICHAEL SAMITCA.

**D**ESPITE the numerous articles that have appeared explaining the proper fields for the dry cell and storage battery tubes there still exists a need for further enlightenment on this subject. Hence this article, the purpose of which is to assist prospective purchasers in reaching a wise decision.

The most widely used tubes are those of the Radio Corporation and Cunningham, known as the 201A, 201A-11, 12 and 193. The two former are classed as storage battery tubes, and the latter as dry cell tubes. The characteristics of these tubes, which are of interest in this discussion, are listed below:

|                            | UV 206 or C 200       | UV 201 A or C 201 A   | WD 11, WD 12 or C 11 or C 12       | UV 199 or C 199                     |
|----------------------------|-----------------------|-----------------------|------------------------------------|-------------------------------------|
| Rated filament voltage     | 5.0                   | 5.0                   | 1.1                                | 1.0 volts.                          |
| Rated filament current     | 1.0                   | 0.25                  | 0.25                               | 6.04 amps.                          |
| Source of filament current | Star bat. or dry cell | Star bat. or dry cell | 1 dry cell in series (50 ohm res.) | 3 dry cells in series (50 ohm res.) |
| As R. F. amplifier         | Excellent             | Excellent             | Good                               | Excellent                           |
| As detector                | Excellent             | Excellent             | Good                               | Excellent                           |
| As A. F. amplifier         | Excellent             | Excellent             | Good                               | Excellent                           |

As these figures are somewhat vague, it is necessary to explain that as detectors there is wide choice between them, although the 201A is best; as radio frequency amplifiers only the 201A and 193 are suitable; but as audio amplifiers the 201A will give results infinitely superior to any of the others, and is really the only tube to use where real loud speaker reception is desired.

It is important to note that in the majority of cases dry cell tubes are incapable of furnishing sufficient volume for dependable loud speaker operation on the regulation two stages without overloading the tube and consequent distortion of the music and shortening of filament life. Of course, they will do much more than their share considering the much smaller power they consume, but compared to the 201A their results are very unsatisfactory.

This being the case, our conclusion must be that wherever one wishes to operate a loud speaker at full volume or contemplates adding amplification at a later date for the same purpose the use of storage battery tubes is advisable. Also for DX friends who insist on the very last mile of distance a soft detector tube and storage battery is essential. For practically all other purposes the dry cell tubes will do.

Now, assuming that we are satisfied with the volume that dry cell tubes produce, let us investigate the economy and convenience of dry batteries. A dry cell costs but 35 cents, compared to the \$10 to \$20 price of a storage battery. Dry cells are light in weight, clean to handle, require no attention and can be procured almost anywhere.

The current that dry batteries furnish, however, is decidedly inferior to that supplied by storage batteries. Dry cells are primarily intended for open circuit work; that is, supplying small currents for short periods of time with comparatively long rests intervening. Under such conditions they seem to recuperate their strength during the idle intervals, and will give satisfactory service and amperage hour capacity. When used continuously, however, or for large currents, or both, they are subject to rapid deterioration, their voltage drops, internal resistance increases and they become unfit for use.

Interpreting this quantitatively we find that a standard 6 inch dry cell must never be called upon to deliver more than 1/4 ampere, and should not be used at this rate for more than two or three hours a day. When so used, with a WD 11, for example, we may expect a useful life of 60 to 80 hours, which is not an accurate estimate, however, as it depends on many other conditions. Toward the end of this period it becomes necessary to advance the rheostat more and more, until finally the signals received become so weak, with all the resistance out, that the owner decides to purchase a new battery.

If two cells be connected in parallel and used to furnish the same current their life will be more than doubled and, likewise, if used for shorter periods the useful life will be more than proportionately increased, all because of the partiality of the dry cell to small currents and intermittent service.

These are not the characteristics desirable for vacuum tube operation, and the storage battery is much better suited to this use. The storage battery, whether of lead-acid or alkaline-nickel type, will furnish a steady current, large or small, for a long period, continuously or intermittently, with hardly any difference in terminal voltage or amperage hour capacity. That is what we want in a radio battery.

As to the economy of dry cells let us compare the cost of running a WD-on dry cells with that for a 201A on storage battery.

Assuming a life of 76 hours for a per hour storage battery lighting a 35 cent dry cell with a single WD

|                            | UV 206 or C 200       | UV 201 A or C 201 A   | WD 11, WD 12 or C 11 or C 12       | UV 199 or C 199                     |
|----------------------------|-----------------------|-----------------------|------------------------------------|-------------------------------------|
| Rated filament voltage     | 5.0                   | 5.0                   | 1.1                                | 1.0 volts.                          |
| Rated filament current     | 1.0                   | 0.25                  | 0.25                               | 6.04 amps.                          |
| Source of filament current | Star bat. or dry cell | Star bat. or dry cell | 1 dry cell in series (50 ohm res.) | 3 dry cells in series (50 ohm res.) |
| As R. F. amplifier         | Excellent             | Excellent             | Good                               | Excellent                           |
| As detector                | Excellent             | Excellent             | Good                               | Excellent                           |
| As A. F. amplifier         | Excellent             | Excellent             | Good                               | Excellent                           |

the cost per hour is one-half cent. The life per charge of an 80 am-201A will be 320 hours and the cost of recharging may vary from 15 to 80 cents, depending on the method, etc. Let us say 40 cents, which is a rather high average, since the majority of folks use A.C. chargers, consuming less than 10 cents worth of juice per charge. Then the cost per hour of lighting the 201A is only 1/4 cent. And yet the 201A consumes more than four times the power of the WD.

If four dry cells are used for a 201A the cost per hour will be 2 cents, compared to 1/4 cent for the storage battery. These figures are striking and conclusive and show how the storage battery saves money for its owners, in spite of its high initial cost. The saving is still more pronounced when several tubes are used for many hours each day. However, the storage battery is heavy and bulky, apt to become dirty and requires some attention, which features cause it to be passed up by many people to whom its superiority and greater satisfaction in more important matters have not been explained.

UV 199's consume so little current that dry cells give very efficient service with them; they are the most economical tubes made, and for portable sets they have no equal. But many persons do not realize that a storage battery can be used to operate these or any other low voltage tubes by inserting proper resistances, and the current will be much steadier than with dry cells.

For most power amplification a storage battery is needed; in fact with a storage battery we can operate any tube, but with dry cells we are strictly limited.

Now to summarize:

The proper field of the dry cell tube is:

1. For portable use
2. In localities having no storage battery recharging facilities.
3. Where the initial cost must be kept down.
4. For owners unable or unwilling to give the storage battery the attention it requires.
5. Where power amplification using 110 volt current supply systems is employed.

In all other cases the storage battery is preferable and is highly recommended by the writer.

## "Pigtails" Improve Poor Variometers and Couplers

Avoid sliding, friction or pressure contacts in condensers, variometers and variocouplers. They may be tight when you get them, but they are bound to wear and get loose and this will make them noisy. If you buy instruments made up in that way use flexible wire to put a pigtail around each such contact. It's easily done, costs little and often makes an A1 instrument out of a bargain counter article.—G. M. C.

## A New Use for Sealing Wax

A drop of sealing wax at the start and finish of a coil will hold the wires firmly and make it possible to avoid use of shellac or other dopes, which broaden tuning.—G. M. C.

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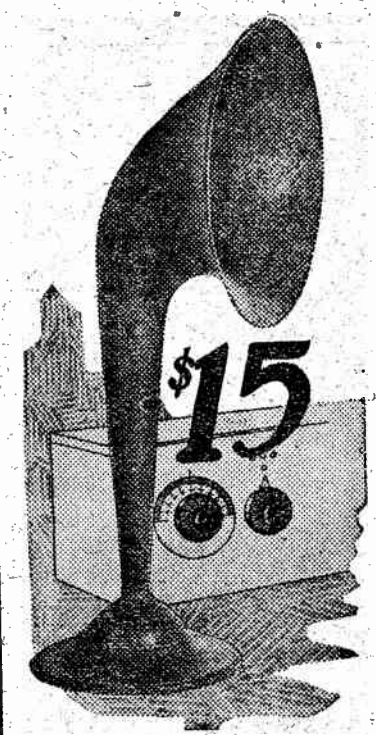
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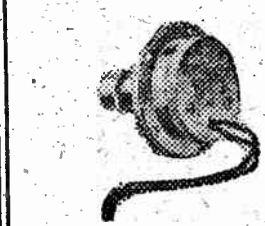


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utilizes the tonal chamber of your phonograph for radio reproduction.  
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## This May Be The Ideal Set

(Continued from preceding page.)

wire for the primary and sixty-five for the secondary. A 3/4-inch tube is required for the primary winding and a 3/4-inch tube for the secondary. The secondary should fit snugly over the primary. The secondary is tapped at the fifteenth turn for the neutralizing capacity connection, and the entire secondary winding is shunted by the variable condenser, C2, which should be a seventeen plate, but may be a twenty-three plate condenser. The neutralizing capacity used is variable instead of the conventional fixed type, and for this reason: Those who are familiar with the neutrodyne know that the Hazeltine method of neutralizing the capacity of the tubes is a delicate operation—so delicate, in fact, that very few ever succeed in doing it properly, with the result that the circuit does oscillate on some wave lengths, and on others reception is poor. By using a variable capacity here, controlled from the front of the panel, we can neutralize the capacity of the tube at will and on all wave lengths. A small three plate variable condenser will serve our purpose here, but the capacity of this will probably be too great, and it will be necessary to cut away some of the rotor plate. How much to cut away depends upon the size of the plates, but a little experimenting will give you the right amount.

Now we come to the detector, of which the only thing to comment on is the grid leak and condenser. The grid condenser should be mica and of .00025 capacity, and the grid leak should be glass inclosed and of half to one megohms resistance. As U V 199s are recommended throughout in this circuit the detector tube will not be critical and you'll never know its there, but if you try to obtain regeneration by putting a variometer in the plate circuit your troubles will begin. Take the writer's word for it and don't try it. Not only does it not work well but it seems that it doesn't work at all, so leave it alone.

Thus far we have concerned ourselves with catching and detecting the signal, and it looks as though we have done it pretty thoroughly and efficiently. Now we will concern ourselves with amplifying the rectified signal to appreciable proportions. We could follow the line of least resistance and tack on two stages of audio frequency amplification and let it go at that, but that would be getting away from the thing we are striving for, namely, perfection. We used all the genius at our command designing the amplifier ahead of the detector, let it be an inspiration to us in designing the amplifier behind the detector. Why have half the circuit efficient and the other half inefficient? Two straight stages of audio frequency amplification would give volume aplenty, there is no doubt, but we are looking for something more than volume in this circuit; we want fidelity of reproduction, and we are even willing to sacrifice some volume in order to get that reproduction. So we are going to use push-pull amplification, or, rather, a modification of it.

### Push Pull Gives Volume.

The standard push-pull amplifier employs two tapped audio frequency transformers, one in the grid circuits of the tubes, as shown in the drawing, where the primary is tapped and not the secondary, and one in the plate circuit, where the primary is tapped and not the secondary. The by pass condenser, C4, should have a capacity of .002 mfd. In the plate circuits of the tubes in our drawing we use two phone units instead of another transformer for two reasons. One is that were we to use another transformer we would require a special loud speaker, and the other reason is that by eliminating this transformer we eliminate still further the chances of distortion, because always when you step up you increase the possibilities of distortion through lag between primary and secondary.

Push-pull transformers are on the market and can be purchased at your dealer's. The phones may be two loud speaking units, or you may use your present standard phones by taking off the cord and rewiring them so that you can get a middle connection. The drawing shows 90 volts on the plate of the audio frequency amplifier tubes, but if you use 201As this may be considerably increased. Also the drawing shows 90 volts on the plate of the radio frequency amplifier tube, which may be too much, and should, if necessary, be decreased.



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# YOUR LABORATORY SCRAP BOOK

Copyright by John F. Rider.  
A page for the radio fan who needs the results of actual laboratory tests, but who, for lack of equipment, must shape his course from conclusions reached by others.

Q. No. 13.  
Do adjacent aeriels affect reception?

A. No. 13.  
Aerial wires, although adjacent, if unconnected to the earth do not affect reception, but when connected to receivers both detrimental and beneficial effects have been noticed, these effects being dependent upon the type of receiver used and the proximity of the aeriels. This is the first of several "Scraps" on this subject. Future ones will discuss it in greater detail.

Effects, as noticed by the writer while conducting some experiments, are given herewith. The receivers used consisted of one single circuit, with tickler coil in the plate circuit, and another double circuit receiver with a variometer tuned plate. The aeriels were of the single wire type, fifty-five feet long, lead in forty-five feet, approximately eighty feet from the ground, parallel to each other and fourteen feet apart. Separate ground leads to the heating system of the building were used. The receivers were approximately thirty feet apart.

With this separation it was possible to detune the double circuit receiver by adjusting the regeneration control on the single circuit receiver to maximum and varying the tuning control. On the other hand it was possible to increase the intensity by the same method. The detuning effect was greater than the increase in signal intensity. By varying the primary circuit of the double circuit receiver it was possible to detune the single circuit receiver, but not to such an extent as when the single circuit receiver tuning was varied and the double circuit maintained constant. Both the detuning and the signal increase effect were overcome by locating the aeriels at an angle of 50 or more degrees of each other. This subject will be discussed in future Scraps.

Q. No. 14.  
Is a noticeable gain in signal strength obtainable by increasing the plate voltage in an amplifier utilizing UV 201As or C301As?—Fred Corlear, Jersey City.

A. No. 14.  
The question of increasing signal strength by increasing plate voltage is an interesting one, but it cannot be definitely decided, due to the variation in tube characteristics. However, an average may be struck by noting the effects of increased plate voltage upon a certain number of tubes whose signal input is maintained constant. The following are the results of experiments conducted with the tubes you mention: Using UV 201As, with the filament voltage maintained at the proper value, the increase in signal strength when the plate voltage was increased from 45 to 67½ was barely perceptible and not worth the outlay, but a marked increase was noted when the plate voltage was increased from 67½ to 105 volts and a further increase when another 22½ volts were added. The addition of another block of 22½ volts, making a total of approximately 150 volts, this value being the limit for that tube, did not afford the increase in signal strength that would justify the outlay for that block, hence the maximum plate voltage should be approximately 120 to 125 volts.

With plate voltages up to 67½ volts the C battery may be omitted, since the required grid bias may be obtained by properly connecting the grid return of the transformer. This lead should be connected to the negative lead of the A battery. One and a half volts proved a satisfactory value of C battery for a plate voltage up to 90 volts and from 3 to 4½ volts for voltages up to 125 volts.

Q. No. 15.  
Are the filaments of the various low filament current amplifying tubes critical in operation?

A. No. 15.  
I presume reference is being made to the C301A-UV201A and the DV2. It is to be regretted that the superiority of the present day low filament current amplifying tubes over their predecessors is not visible to the radio fan. The filament is made of tungsten and has an extremely thin coating of thorium. It is this substance that affords the greatest electronic emission while the filament is maintained at a low temperature—i. e., low incandescence. The filament control of these tubes is not critical, providing the voltage and current values are maintained at or below the figures specified by the manufacturer. This value is 5 volts and .25 of an ampere for the first two tubes and 5 volts and .30 of an ampere for the DV2. The number of electrons emitted by the filament when maintained at these values is more than is required for average operation. Excellent results can be obtained with the tubes when the filament voltage is only 4 volts. This reduction of voltage and current not only increases the life of the thorium coating on the filament, but also increases the life of the A battery. To accomplish the reduction it will be necessary to use a rheostat of from 8 to 10 ohms in place of the regular 4 to 5 ohm rheostat, or, if one desires, a separate external rheostat may be connected into either of the leads directly at the storage battery terminal.

Q. No. 16.  
What is the best layout for an aerial when one is close to power lines and other lines that carry electric current.

A. No. 16.  
The elimination of various kinds of induced noises from power lines, arc lights and other such equipment has not yet been accomplished, but in many instances it has been minimized. Anyway the constructor must give the question of his aerial proper consideration if he is in proximity to any of these sources of induced interference. In the erection of aeriels in cases of this kind one must forget the directional effects of the aerial in respect to reception and give his attention to the minimization of this induced interference. The simplest and most feasible method that may be followed by the average radio fan is to erect a single wire aerial and locate the wire in such position that it is at right angles, or as near as possible at right angles, to the lighting or power wires. The electric wires need not be power lines carrying 10,000 or 20,000 volts; a feed line with 110 or 220 volts flowing through it is of sufficient magnitude to cause bad interference of various kinds, such as generator hum, clicks due to sparking at the brushes, etc.

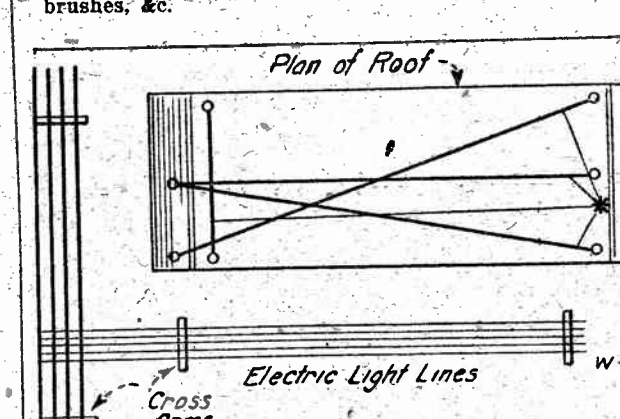


Figure 1 shows the location of various aeriels in respect to two sets of lines carrying electric current. The proper location for the aerial may be theoretically determined, but it must be checked by actual experiment. Some electric lines, although running parallel to the aerial, will not cause any interference, whereas others will be extremely powerful sources. Figure 1 shows two sets of power lines. The aerial, C, as erected, is parallel with one of the two systems of lines and at right angles to the other. Theoretically it should be free from interference from the lines south of the building and strongly interfered with by the lines on the left of it. Interference was bad, and another aerial, B, at an angle to both, was erected. This minimized the interference somewhat; that which still persisted in being present seemed to come from wires on the left of the building. The aerial was therefore shifted into the location shown by A. The interference was further reduced, and finally the aerial was shifted into the position shown by D and the induced interference from the lines west was practically eliminated, but a slight hum due to the lines south was noticeable. This hum was not bothersome, but was reduced by raising the aerial wire to a height higher than the electric wires. This arrangement may not work in every case, but it is worth trying. Although interference from electric wires was reduced, that due to an X-ray machine under no circumstances could be eliminated or minimized. The same is true of sputters due to arc lights. Those fans who are unfortunate enough to be annoyed by such interference must make the best of it. In some instances a loop helps, but that cannot be guaranteed.

Do You Know—  
That the velocity of the radio wave is the same as that of light—186,000 miles a second—and that this is equivalent to 300,000,000 meters a second?  
That some of the terms used in electricity and radio are parts of the names of the earliest experimenters? Examples of these are the VOLT, after Volta; the AMPERE, after Ampere; the OHM, after Ohm; the FARAD, after Faraday.  
That the terms microfarad and millihenry mean exactly what the prefix denotes—microfarad, a millionth part of a farad (a farad is the unit of capacity); a millihenry, a thousandth part of a henry (a henry is the unit of inductance)? Other terms in the same category are micro-microfarad, microhenry.  
That a receiver need not tune sharply in order to be selective?  
That the term 80 ampere hour stamped on storage batteries does not mean that you can light the filament of four 5 volt 4 ampere tubes for 80 hours? It is merely a rating. Using the tubes just mentioned, the storage battery would need recharging after approximately 56 hours of service.  
That the mere fact that the filament lights does not necessarily indicate that the tube is in good condition? Either the grid or plate lead within the tube may be broken or short-circuited.

Q. No. 15.  
I am obtaining satisfactory results with my receiver, but have been advised by one friend to substitute spider web coils in place of my variocoupler and by another to insert honeycomb coils. Is the change worth while? Is one type of coil really more efficient than the other?

A. No. 15.  
When one obtains satisfactory results why not leave well enough alone? Considered from a theoretical standpoint every coil has its salient features and practically every type of winding is more efficient than the single layer arrangement used in variocouplers, but the latter is the most simple and the easiest to wind and for that reason is most popular. Further, it is doubtful if the substitution of another type of winding when good results are being obtained with the single layer coils will show a difference that would justify the outlay of the money required to effect the change. The difference may be there, but it would not be discernible to the human ear when used in this type of work.

The spider web and other types of coils which have a very low distributed capacity are excellent and are heartily recommended, but why should the change be made if the equipment on hand is satisfactory? However, if one is experimentally inclined, nothing better than these coils can be used as subjects. It is up to the person constructing the receiver to decide upon the type of coils he is to use. If it were possible to arrange the varying controls for the spider web and honeycomb coils so that they would not require more space than the ordinary variocoupler control they would be more popular.

Q. No. 16.  
I have a three tube receiving set using the small dry cell tubes and am obtaining satisfactory results on distant reception but not enough volume on the loud speaker. I am desirous of effecting a change that would afford me greater volume on both local and distant signals. I do not care to reconstruct the receiver. What is the method of procedure?

A. No. 16.  
The situation as set forth above constitutes a perplexing problem for many fans, but its solution is not difficult. In accordance with the above conditions it consists in the replacement of the small dry cell tubes with their larger brothers. The first step is the determination from a standpoint of economy of the types of tubes that will be used. The filament terminal voltage and current consumption are the important factors, for upon these depends the selection of the storage battery.

The following three types of tubes are recommended as economical and excellent amplifiers and fair detectors: the UV201A, the C301A and the De Forest DV2. The filament terminal voltage for all of these tubes is five volts and all may be operated from a six volt storage battery. The filament current consumption of the last named tube is slightly greater than that of the others, but this additional drain is so small as to be negligible. In view of the small current drain the storage battery need not be larger than a 6 volt 60 ampere hour or, at maximum, an 80 ampere hour for sets using as many as five tubes. If one desires to use a detector tube in place of an amplifier as a detector either the UV200, or the C300 or, if possible and preferably so, a VT1, also known as the "J" tube, may be used.

The rheostats as contained in the receiver need not be changed, since they will function with the larger tubes. The "B" battery voltage should be increased to about 90 or 120 volts. If the owner already possesses enough batteries to supply the above mentioned plate potential they can be used and additional "B" batteries will not be necessary. With the increase in "B" battery voltage it may also be necessary to increase the value of the "C" battery. Additional "C" batteries should not be purchased until those on hand have been tried. Very often the same value of "C" battery suffices for both types of tubes. If "C" batteries have not been used in the previous amplifier they should be incorporated with the insertion of the new tubes.

The audio frequency amplifying transformers need not be changed. If they functioned satisfactorily with the dry cell tubes they will in all probability function as well with the larger tubes. The plate to filament impedance of the smaller tubes is practically the same as that of the larger ones. Changes in the wiring due to the insertion of the different tubes are unnecessary, for the larger tubes will operate in any circuit in which the dry cell tubes have been used. Two slight changes may be necessary—the insertion of a new grid condenser when the new detector tube is used, i. e., to increase the capacity value from .0005 mfd. to .0005 mtd. But, as in the case of the "grid bias," the one in the receiver should not be removed until it has been tried. The other change will be a new value of grid leak.

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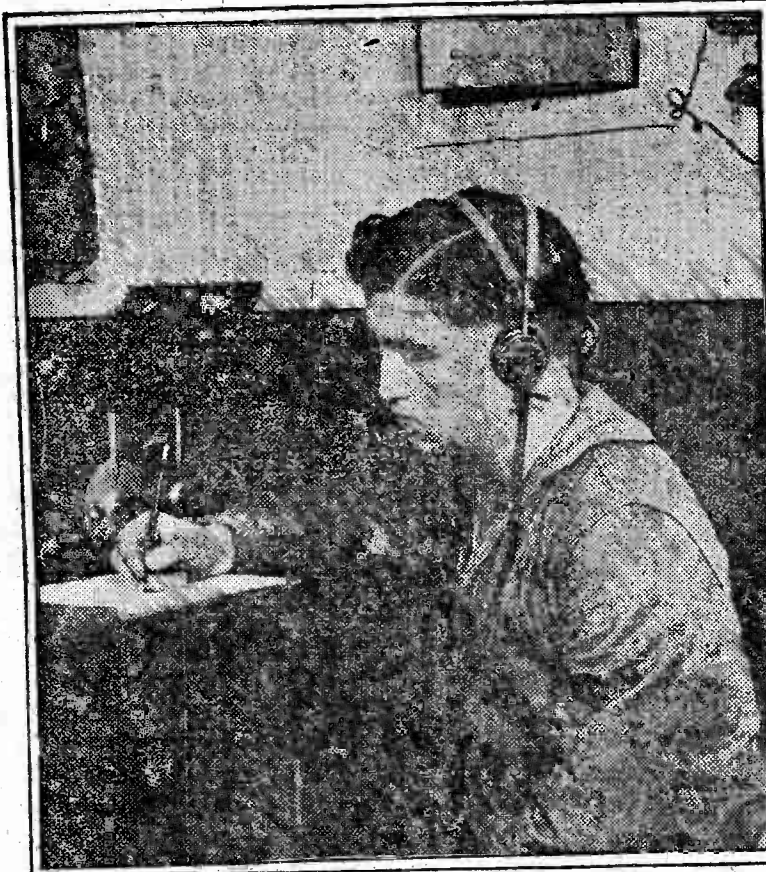
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|---------|-------|-----------|------|---------|-------|-----------|------|
| Ware    | \$110 | Our Price | \$55 | Grebe   | \$130 | Our Price | \$65 |
| Federal | 116   |           | 65   | Eagle   | 175   |           | 88   |
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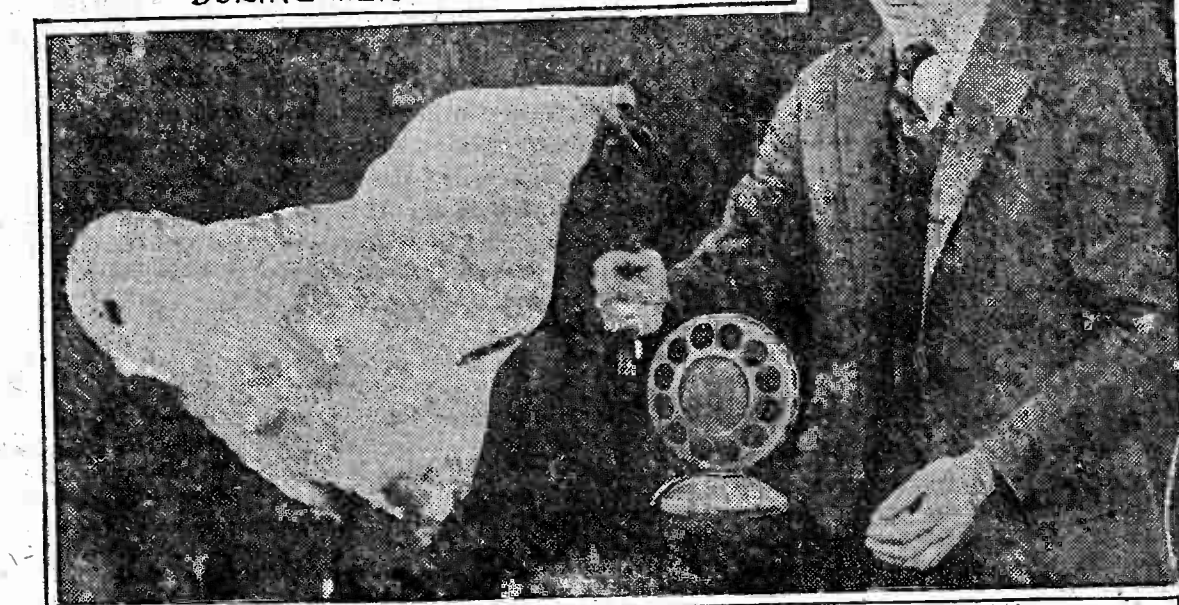


# Radio News and Developments in Pictures



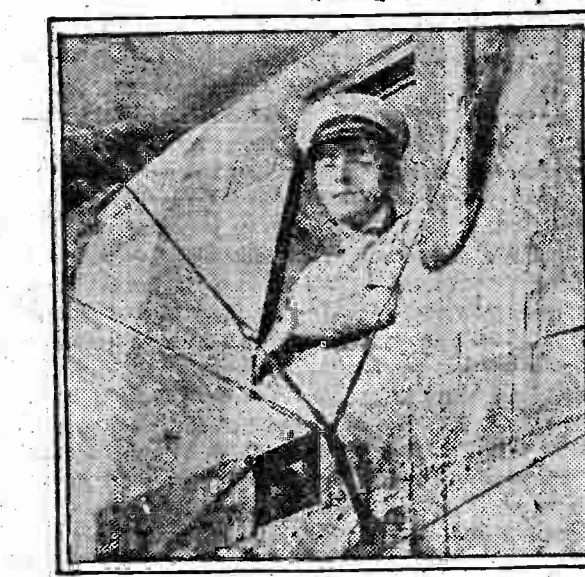
WILLIAM LESH OF WASHINGTON HAS CONSTRUCTED A SET SMALLER THAN A CIGARET

THE OPERATOR AT LAKEHURST KEPT IN CONSTANT TOUCH WITH THE SHENANDOAH DURING HER FLIGHT.

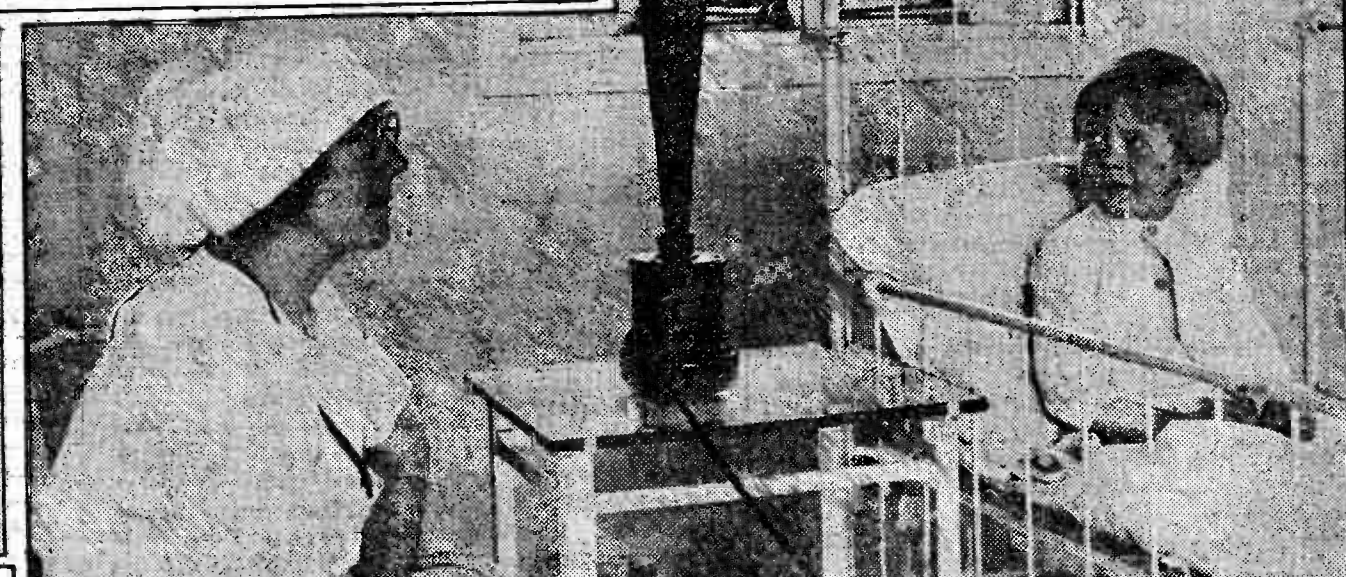


DR. S. PARKES CADMAN (RIGHT) WELL KNOWN TO THOUSANDS OF LISTENERS

STATION W.LAG OPENS AND CLOSES WITH A CROW FROM BILLY, THE MASCOT.



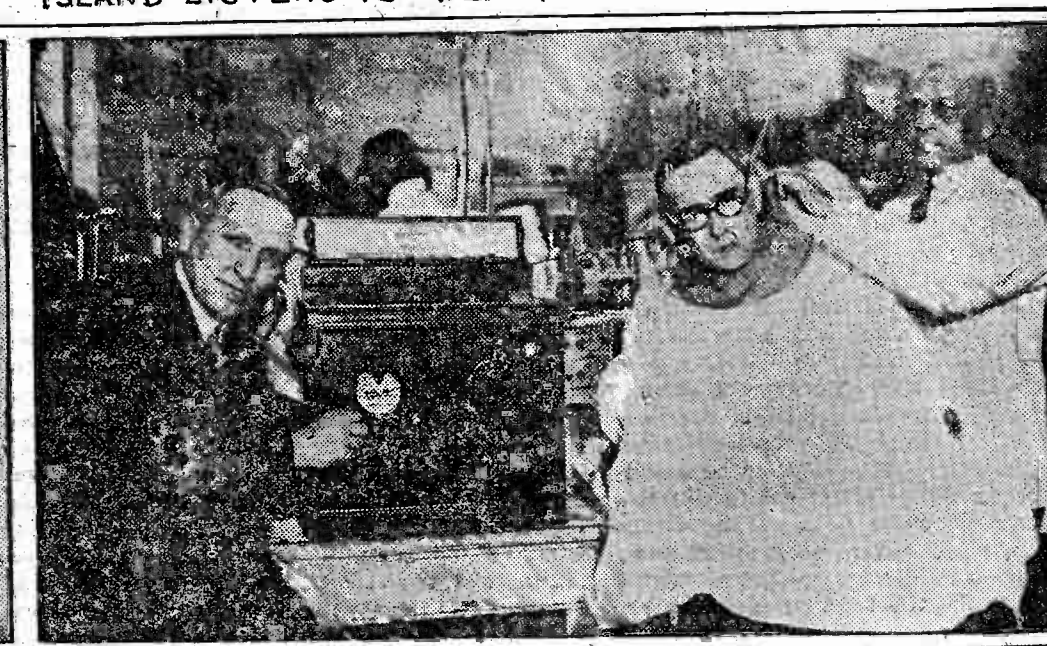
JOHN ROBERTSON, RADIO OPERATOR OF THE SHENANDOAH DURING HER RUNAWAY FLIGHT



A SMALL PATIENT IN THE ISOLATED WARD ON NORTH BROTHERS ISLAND LISTENS TO WEAF.



C. FRANCIS JENKINS AND HIS NEW DEVICE FOR SENDING PICTURES BY RADIO

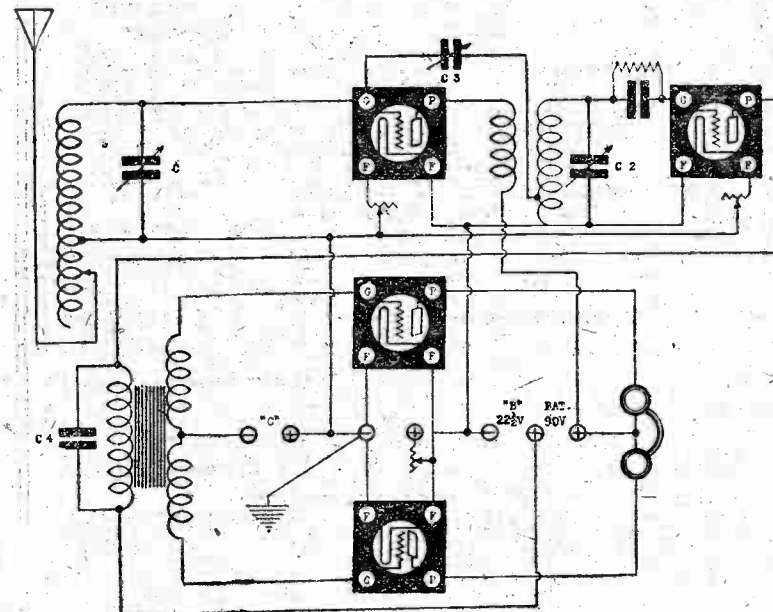


RADIO HAS AT LAST REACHED THE NICKEL-IN-THE-SLOT MACHINE STAGE.

## This May Be the Ideal Set

It Has Possibilities, but Results Have Yet to Be Determined.

LIKE Diogenes ever searching for an honest man we search constantly for the perfect circuit. We wind and rewind coils, change the capacity of fixed condensers, add a touch of refinement here and a touch there, always hoping that the results immediately following the last manipulation will have the long desired and dreamed of effect. We started with a single tube and ended with ten tubes, and in the light of proportionate results we were no more satisfied with the ten than we were with the one. We learned that there were two tremendously important divisions in radio reception—radio frequency and audio frequency amplifications. There is



Many fundamental circuits are incorporated in the one above.

of course, also rectification or detection, but it is of minor importance when radio frequency amplification is employed ahead of it, and radio frequency amplification must be employed for worth while results.

If with all our experimenting we have not yet discovered the perfect circuit who can say that we are not every day in every way getting nearer to it? At least we know what we are after, and that is half the game. We must devise a circuit that will be selective to the point of tuning in distant stations to the exclusion of local ones. We must, and we will, some day devise a circuit that is capable of getting anything that is in the air, no matter where it comes from, because the waves are in the air all around us, but we have not yet learned how to catch the weak ones.

We must devise an audio frequency circuit that is capable of amplifying the signal after it is caught and rectified, and it must amplify without distortion. Less attention has been paid to this part of radio reception than to catching the signal out of the air, and in many ways it is probably more important in so far as music and speech are concerned. To be able to reproduce with volume and fidelity without distortion or blurring is a consummation devoutly to be wished and well worth working for.

In the accompanying drawing we hope we are a little nearer the perfect circuit. Let us analyze it step by step and see what conclusions we can draw. First we have the tuning element, and here is where our selectivity comes in. The circuit we use is of the semi-aperiodic type, and we are indebted to Mr. Reinartz for its origination. Those who have used it know that its selectivity leaves nothing to be desired; it separates the stations with an ease that makes it a veritable thing of beauty and a joy forever. It consists of seventy turns on a 3 1/2-inch tube, tapped every five turns for twenty turns, and the remainder (C1) is connected across the untapped portion of the coil, while the aerial is connected to the switch lever.

Next we come to the radio frequency transformer part of the circuit, and therein lies an argument. They used to tell us that a single tube regenerative set was the equivalent of one stage of radio frequency amplification and a detector, and some even went so far as to say that it was the equal of one stage of radio frequency amplification, a detector and one stage of audio frequency amplification. Yea, verily, they made rash statements in those days! They said that at least three stages

of radio frequency amplification was necessary to improve upon the results that could be obtained with a single tube regenerative; they said that radio frequency amplification did not improve volume on local stations, and they said that transformer coupled radio frequency amplification was better than tuned impedance! They really said those things and they can't deny it, because many of them published statements to that effect.

### One Staged Tuned R. F.

In the drawing you will find one stage of tuned radio frequency amplification, and we have borrowed from Mr. Hazeltine for the most efficient method of amplifying at radio frequency. We use only one stage, because we have found that,

taking everything into consideration, one stage is better than two. This we know is a bold statement, and we will explain it later. First let us take up radio frequency transformer amplification.

Those who are familiar with the construction of radio frequency transformers know that they consist of two small coils placed in inductive relation to each other, one coil serving to tune the plate circuit of a tube and the other serving to tune the grid circuit of the succeeding tube. Sometimes an iron core, and even an iron shell is used to broaden the tuning. Now, it does not take a Steinmetz to figure out that, as these coils are fixed they cannot operate properly on all wave lengths. They are bound to have one wave length peak on which they respond best, and all wave lengths above and below that peak must necessarily suffer. A potentiometer is used to aid tuning and to control the oscillations that are set up when the antenna circuit is tuned to the lower wave lengths, but the function of the potentiometer is to control the grid bias, and if you give the grid less potential than it must have to operate at maximum efficiency just to stop oscillations in the circuit it can readily be understood that his method of radio frequency amplification leaves much to be desired in the way of efficiency. Of course we know that three stages of transformer coupled radio frequency amplification will produce some results, but it is the writer's belief that these results are obtained through sheer force of excitation, and that one stage of tuned radio frequency as shown in the drawing will equal or surpass the results obtained with the other.

It is agreed by almost every one that more than two stages of tuned radio frequency amplification is impractical, but the writer is going a step further and states that more than one stage of tuned radio frequency is also more or less impractical. At any rate it is unnecessary. The writer has found that what you can get with two stages you can get with one stage, if that one stage is efficient, and if that one stage is efficient another stage of tuned radio frequency or a variometer in the plate of the detector tube to produce regeneration is not only not a help but a hindrance, because the more controls you have in a circuit the more combinations of settings you have, of which only one is the right one.

The variable radio frequency transformer shown in the drawing is of the conventional neodymium type and consists of fifteen turns of

## Army Radio Operators Wake Up by Radio

At the Great Lakes Naval training station, where radio operators are trained, the new fangled psychological method of increasing speed in code reception, while the partly trained gobs sleep, is being used with as great success as met the initial sleep instruction tests at Pensacola. One night, after sending at high speed to seventeen sleeping embryo

operators, equipped in "ear muffs," a petty officer ended his watch with the code message: "Hey gobs, get up; it's five fifty-five!" Much to his surprise, the snoring ceased, three of the men awoke, and in a few minutes the other fourteen rolled out, asking what was the matter. The flabbergasted petty officer now admits night code practice may increase receiving speed, but he knows it will get the students up at four bells.

## Chest From Shenandoah To House Radio Set

A radio set will be built soon in the home of Leslie Lambert of Alton, N. J., with pieces of a tool chest cast from the Shenandoah to lighten the ship in its flight in the storm. While observing the course of the Shenandoah over his home a tool chest crashed to the ground not more than twenty feet from where Mr. Lambert and his family were standing.

## A CROSLEY RADIO MESSAGE

CROSLEY AGAIN ASTOUNDS THE RADIO WORLD!

— Greatly Increased Production Allows Lowered Prices! —  
New Two Tube Armstrong Regenerative Receiver at \$18.50!

Ever since we started making radio apparatus it has been our fixed policy to offer to the public the best possible receivers at the lowest possible cost. That this policy has been appreciated is proven by the fact that a shortage of Crosley radio apparatus has existed at all times, although The Crosley Radio Corporation has been producing more radio receiving sets than any other organization in the world. Heretofore constantly added improvements have forced us to maintain steady prices, but so great has been the response of the public for Crosley instruments that greatly increased production now allows us to lower the price of the entire line and still maintain our constant research for improvements.

As an astounding example of the results of this research, we now offer a new and wonderful two tube receiver consisting of Armstrong regenerative amplifier and one stage of audio frequency amplification, giving loud speaker volume on local stations at all times and on distant stations under fair receiving conditions. Otherwise, head phones should be used for instant reception. This instrument, known as the Crosley Model 51, fills at the remarkably low price of \$18.50. It has been thoroughly tested in our laboratories and its satisfactory performance has even surprised us.

Other Crosley instruments are well known. Their exceptional performances have given pleasure to hundreds of thousands of people in all parts of the United States. Note the following price reductions on these well known Crosley receiving sets:

- CROSLEY TYPE V, single tube Armstrong regenerative receiver, the same instrument used by Leonard Weeks in Minot, North Dakota, in his established communication with the McMillan expedition at the North Pole, formerly \$20.00. . . . . Now reduced to \$16.00
- THE CROSLEY TWO STAGE AUDIO FREQUENCY AMPLIFIER to match the Crosley Type V, formerly \$20.00. . . . . Now \$18.00
- THE CROSLEY MODEL VI, two tube receiver incorporating radio frequency amplification and detector, formerly \$30.00. . . . . Now \$24.00
- THE CROSLEY TYPE 3-B, a three tube Armstrong regenerative receiver, consisting of detector and two stages of audio frequency amplification, in a beautiful solid mahogany cabinet, formerly \$50.00. . . . . Now \$42.00
- THE FAMOUS CROSLEY MODEL X-J, a four tube receiver, consisting of one stage of radio frequency amplification, detector and two stages of audio frequency amplification, probably the biggest selling radio receiver in the world, formerly \$65.00. . . . . Now \$55.00
- THE CROSLEY TYPE 3-C, a three tube Armstrong regenerative console model with built-in loud speaker, formerly \$125.00. . . . . Now \$110.00
- THE CROSLEY MODEL X-L, a four tube set consisting of one stage of radio frequency amplification, detector and two stages of audio frequency, formerly \$140.00. . . . . Now \$120.00

It is our firm belief and hope that these new lowered prices will enable every family to enjoy the benefits in pleasure and education that only the radio can give. Take advantage of this astonishing announcement. Choose a Crosley Radio Receiver today.

FOR SALE BY THE BEST DEALERS AND JOBBERS EVERYWHERE.

## THE CROSLEY RADIO CORPORATION

POWELL CROSLEY, Jr., President

FORMERLY CALLED

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Crosley Regenerative receivers are manufactured under Armstrong U. S. Patent Number 1,131,499.

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\$25 for \$10

## The Famous BEL-CANTO Acoustical Amplifier

DIRECT FROM MANUFACTURER TO YOU

YOU CANNOT BUY THE BEL-CANTO THROUGH ANY DEALER, ONLY DIRECT FROM US. WE SAVE YOU THESE THREE PROFITS—DISTRIBUTOR, JOBBER AND DEALER. SENT PREPAID TO ANY PART OF U. S. AND POSSESSIONS

GUARANTEE. Money back any time within ten days if dissatisfied. We further guarantee to the publisher, carrying this advertisement that each and every speaker sold will be exactly as advertised in this issue.



- 7 POINTS OF BEL-CANTO SUPERIORITY.
- 1. Our own fiber arm.
- 2. Our own adjustable "loud speaking" unit, giving a wide range of tone quality and volume without distortion.
- 3. The base of cast iron, weighing four pounds, eliminating top heaviness.
- 4. All other metal parts are of heavy cast aluminum, highly polished.
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Battery is a  
Space Saver

Where space is limited the new Eveready Vertical "B" Battery fits in with room to spare. For cabinet or table use this vertical form is ideal. The vertical Eveready "B" has a base practically the same as the smallest size Eveready "B," but it is twice as high and will last more than twice as long. Fifteen vigorous cells give 22½ volts. Two Fahnestock Spring Clip terminals. For compactness, for full vigorous service, buy the new Eveready Vertical "B" No. 764.

Buy them from your dealer.

If you have any battery problems, write to Radio Division, National Carbon Company, Inc., 210 Ontario Street, Long Island City, N. Y.

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### THE ROBERTS "B" BATTERY

A STORAGE BATTERY MADE OF EDISON ELEMENTS

No change of wiring necessary. Only three (3) main terminals to connect. Type A—100 volt, with variable detector, from 16-22 volts, \$30.50. Type B—100 volt, with variable detector, from 16-22 volts and variable voltage, from 41 to 100 volts for amplifier, \$33.50. Type C—140 volt, with variable detector, from 16-22 volts, \$26.50. Type D—140 volt, with variable detector, from 16-22 and variable voltage, from 41-140 volts for amplifier, \$30.00.

Manufactured by **Roberts Storage "B" Battery Co.**  
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Open Till 8 P. M. Daily  
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Batteries can be obtained from the following dealers:  
Brooklyn Radio Service, 17 John Street, New York City.  
Liberty Radio Co., 106 Liberty St., 4 John St., 22 Beaver St., 745 Sixth Av.  
Romeo Storage Battery, 148 West 88th Street.  
Conroy Storage Battery Co., 147 East 78th Street.  
Smith and Livingston Streets, Brooklyn.  
Twentieth Century Radio Shop, 102 Flatbush Ave., Brooklyn.  
Brooklyn Radio Shop, 1064 B'way, Bklyn.  
Aldo Radio Battery & Supply Co., 201 Patterson Street, Paterson, N. J.  
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## GLOBE AUDIO TRANSFORMER

Volume Without Distortion

Insist on getting the genuine Type "C" Globe Audio Transformer to use in neutrodyne radio sets. It is better to be sure than sorry.  
**AT ALL GOOD RADIO DEALERS**  
ROBERT F. SHARPE, 507 Fifth Avenue, New York  
Manufacturers and dealers will find the Globe Proposition decidedly attractive.

### EUREKA! We Have Found It!

## TO THOSE WHO WANT THE BEST IN RADIO

We are offering to the public some exceptionally built Neutrodyne Receiving Sets. Superb workmanship of the highest grade. Install this set in your own home and Guarantee Satisfactory results.

## EUREKA SPECIALTY COMPANY

Manufacturers of Radio Equipment of the Better Grade  
ONE SEVENTY-THREE EAST NINETY-SIXTH STREET  
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We manufacture a complete line of Solid Mahogany Radio and Phonograph Cabinets with a high grade Piano Finish.  
Stock sizes 7x10, 7x12, 7x14, 7x18, 7x21, 7x24, 7x26.

## Radio Cabinets

We can also make you a combination cabinet for Radio and Phonograph in upright or console style.

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### Public-Health Service To Be Broadcast

If a plan now contemplated by the United States Public Health Service is carried out, ten or a dozen radio broadcasting stations in various parts of the United States, partly Government stations and partly privately owned, will be linked together for the dissemination of information on health and hygiene, according to a prediction made this week by John M. Dobson of Chicago, secretary of the Bureau of Health and Sanitation of the American Medical Association.

Mr. Dobson, in his report on the Medical Congress of America, recently published, paid a high tribute to radio as already a factor in public health education. He said that New York, Chicago, Philadelphia, Pittsburgh and other cities are already using radio under the direction of State health authorities. He looks to the Public Health Service headquarters in Washington to provide direction for the present haphazard, desultory efforts, however.

"It is only a matter of time," he said, "when sending out health hints and bulletins will be a portion of the important work of the broadcasting stations."

Mr. Dobson, who was authorized by the American Medical Association to investigate and report on the use and availability of radio in relation to public health, pointed to the unbelievable rapidity with which the United States is installing family radio receiving sets and reported that shortly, as far as laymen were concerned, radio would provide a more effective field for the distribution of knowledge than the printed word.

"It is likely," he said, "that in the near future there will be ten or twelve radio broadcasting stations linked together for diffusing advice as to how to keep well in the mass and how to guard against and treat smallpox, diphtheria, scarlet fever and other diseases. Other subjects such as care of infants, prenatal care of mothers and industrial hygiene will be topics of discussion by State and Federal specialists."—L. B.

### Fix Your Aerial

If you put up an outside aerial last fall it would be a good idea right now to lower it and look at the insulators. If they are covered with soot and dirt clean them thoroughly with a brush, gasoline or whatever will clean them best. A layer of soot on aerial, along the insulators to the pulley and thence to the pole or other support allows a lot of energy to leak off the aerial. If you can afford it, it would be a good investment to replace the corroded and blackened aerial wire with bright new wire. Enamelled wire won't corrode and is well worth while.—G. M. C.

### Mechanical Verniers Are Excellent for DX Work

Vernier controls often spell success or failure in distance work. A four inch dial with a mechanical Vernier applied to its rim is almost equal to a stage of radio frequency when you are after the distant signals. They enable tuning to the peak of the wave, which is where you find the DX stuff. A Vernier condenser with a sliding plate, however, is not usually very satisfactory, as often the friction contact causes noises in the receiver.—G. M. C.

### Good Potentiometers Help To Reduce Noises

When you buy a potentiometer of the wire wound type look it over. Be sure the wire is fine, firmly held to the support, that it is evenly wound, with no "lumpy" places and that the contact arm rides smoothly from end to end of the winding. Any defect in a potentiometer is reproduced in noise in the headphones or loud speaker. The best is none too good.—G. M. C.

### How to Use a Potentiometer.

A potentiometer across the A battery, with the middle point, or contact arm, connected to the minus B battery lead is a good investment in any set. It will clear up mushy signal and help in getting that elusive DX station. In a 6-volt tube circuit variation. In any event, the ability to vary the plate current will be found valuable in DX hunting.—G. M. C.

**Electric Company**  
66 Cortlandt St  
Our Sales Increase Every Week.  
Our Customers Must Be Satisfied. THAT'S THAT

| GREVE C R 12—REDUCED TO \$122.50   |        |   |         |
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| ACMES, AUDIO—UNLIMITED QUANTITY, \$2.69  |        |   |         |
| RCA 201A   | \$4.99 | C-300   | \$4.99  |
| RCA UV 200   | \$4.99 | C-WD 11   | 3.75    |
| C-199  | 3.95   | C-WD 12   | 3.95    |
| Note—One 201A tube to a customer without a purchase.   |        |   |         |
| PHONES   |        | CONDENSERS  |         |
| Turner, 3000 ohms  | \$2.65 | 23 pl. table mounted  | \$1.29  |
| Murdoch, 2000 ohms   | 2.50   | 17 & 23 pl. vernier   | 2.45    |
| Murdoch, 3000 ohms   | 2.65   | 43 pl. vernier  | 2.65    |
| Ambassador   | 3.25   | The above condensers are  |         |
| Federal  | 3.85   | U. S. L. Vernier  |         |
| Baldwin  | 6.95   | 23 pl. U.S. Tool vernier  | 2.95    |
| Baldwin, single  | 3.75   | 43 pl. U.S. Tool vernier  | 3.35    |
| Stromberg-Carlson  | 3.45   | 14 pl. U.S. Tool vernier  | 2.90    |
| Holtz-Cabot in stock   |        | 23 pl. Comco, vernier   | 2.75    |
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|  |        | Amisco condensers in stock  |         |
|  |        | 3 Columbia Dry Cells  | 1.00    |
| WESTERN ELECTRIC VICTROLA ATTACHMENTS, \$10.50   |        |   |         |
| WESTERN ELECTRIC 10A LOUD SPEAKER, COMPLETE WITH TUBES AND AMPLIFIER, \$97.00  |        |   |         |
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# Phenomenal Results May Be Secured With Low Resistance Radio Apparatus

Methods of Winding and Mounting Inductance Will Be of Great Assistance

By L. G. INGRAM.

WHEN starting to build a tuner that will bring in stations hundreds of miles away and be selective, the fan of to-day will figure on using some form of amplification that calls for from three to eight tubes. "The more tubes the better the set" seems to be the general idea. But as this does not always come true and as a great number of radio fans in the country cannot afford so many tubes, it would be advisable for them to build an efficient regenerative set.

It is possible to build a one tube set that will run circles around any tuner that is on the market and that will equal in results any tuner outside of a well constructed neutrodyne or a super-heterodyne. It is even possible for a tuner such as is described in this article to equal some of the homemade neutrodyne.

The factor that limits a receiving set in range and selectivity is resistance. The question will arise among those of you who have studied the theory of regeneration that the regenerative action of the tuner lowers the resistance of the secondary circuit. This is true; but regeneration does not make a poor secondary circuit a good one. In other words, the signal strength of a station can be brought up by regeneration but it can never be as high as it would be in a low loss secondary. Also the tuning of a poor secondary circuit is never as sharp as the tuning of a good one.

There are several things that make for a poor tuner and these will be taken up before entering into the constructional details of the set in order that the reader will understand just why certain things are done. The following information will also aid one in designing his own tuner:

### Coil Forms Resistance.

The first form of resistance is the coil resistance. That is, the resistance of the tuning coils in the set. This is not in the wire itself, if No. 16 or larger is used. The resistance is in the parts near the wire, the yarnish on the coil and the apparatus mounted near the coil. The perfect coil would be one that has no form and is air insulated. This is impossible, but as will be described is used, one will come very near the ideal. Tapping a coil also introduces a large amount of resistance in the tuning circuit. Leave out all taps.

The next item is the condenser loss. When a poor coil is used a poor condenser may be used, but if a good coil is used

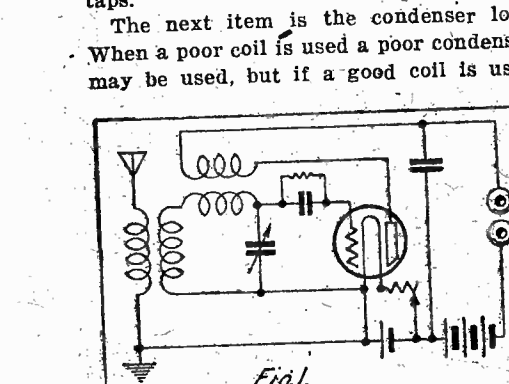


Fig. 1.

a poor condenser will make the tuner as inefficient as if both a poor coil and a poor condenser were used. There is a big difference between a poor and a good condenser. The increase in efficiency is not manifested in stronger signals but in an increase in the number of stations that are heard.

There are no set rules for a good condenser. But those having good insulation, and mighty little of that, are generally all right for a circuit in combination with a low loss tuner.

Now, if one makes a good tuner and uses a low loss condenser the entire efficiency of the set can be ruined by using a poor socket. The best socket is one that is made of porcelain and is of rugged construction. The contacts of the socket must be good and preferably make contact on the side of the tube prongs. Another way of decreasing the efficiency of a good tuner is to couple it to another circuit that is high in resistance. As the antenna circuit is one circuit that is hard to make near perfect, that is the one that will bring resistance in through coupling.

Now to eliminate all the resistance possible, one should have a tuning coil

that is self-supporting, of large wire and kept clear of all other parts. This includes the wall of the cabinet and the baseboard. Next use a condenser of low losses. Then a good socket must be used. For reducing the antenna resistance one should use loose coupling and a small coil. In other words, use an untuned primary coil.

### Ordinary Circuit Good.

To make the tuner simple and one that will not radiate a strong signal, the author has chosen a two circuit regenerative tuner, with regeneration obtained in a set of coils that is not coupled to the antenna circuit. The circuit for this

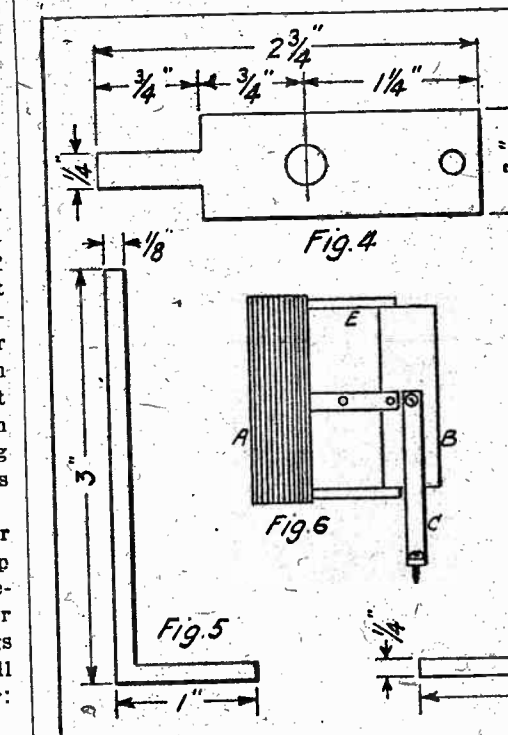


Fig. 2.

tuner is given in Fig. 1. As will be seen it is a standard tuner.

The list of parts of this tuner will be seen to be similar to that for any other set except for the coupler.

1 tube, UV-200, 201A, WD-12, UV-199.

1 socket and rheostat to fit tube used.

1 23 plate low loss condenser.

1½ pounds of No. 16 double cotton covered wire.

2 one inch lengths of 3½ inch composition tubing.

10 2½ inch lengths of ¾ inch wide composition strips.

12 inches of ¾ inch by ¾ inch brass strip.

15 inches of ¾ inch fiber tubing for shafts.

1 composition tube, 2½ inches in diameter and 2½ inches long.

¾ pound No. 26 single cotton covered wire.

1 grid leak condenser.

Now to the construction of the coils: Besides the parts given in the list one will need fifteen round wooden pegs, 4½ inches long and 3-16 inch in diameter. These may be obtained in any carpenter shop. They make up the form upon which the coil is wound.

Upon a board draw a circle 3½ inches in diameter. Mark off on this circle fifteen equidistant points. At each of these points drill a hole into which the pegs can be fitted tightly. Then on the inside of this circle draw another one 2½ inches in diameter. Mark off fifteen equidistant points and again drill for the pegs.

### Winding the Coils.

Push the pegs into the holes of the larger circle and place the coil of No. 16 wire so that it may be easily unwound. Fasten the end of the wire to one of the pegs by running it around one of them twice. Then wind the coil as follows, and as is shown in Fig. 2. Carry the wire around one peg on the outside, then around the third peg on the inside, from here to the third peg and around on the outside. The fourth peg is wired on the inside, and so on. This gives a coil a neat appearance and one that is highly efficient.

Be sure in winding the coil that the wire is kept taut at all times and that it is pulled tight after being carried around every third peg. Wind on this coil thirty-five turns. When this number of turns

has been wound on the coil cut the wire and fasten it as in the beginning. This must be done carefully. A small hacksaw is the best instrument to use.

Then on the two tubes mark off four equal parts of the tube, on the circumference. At each mark, one-quarter of an inch in from one edge, drill a hole to take a 6-32 bolt. Then in the center of the tubes, on each side, drill two more holes, same size, for mounting the brass strip.

The brass strip is now divided into four three inch strips and each strip is drilled for bolt holes. Drill the holes as follows: One at each end and one-quarter of an inch from the end. Then, one inch from one end make a right angle bend as shown in Fig. 5. The tubes may then be fixed up with the brass strips and the composition strips as shown in Fig. 6—that is, exclusive of the coil. When the strips are mounted and bolted down tightly the coil is put on.

### Mounting the Parts.

Before mounting the two strips that have holes in them on one of the tubes place in the center the coil that has the fiber tube mounted in it. Then mount the strips having the hole in the center, as follows: Slip the hole over the tube and bolt. Then do the same with the other strip. This leaves the coil so that it can be rotated by turning the fiber tube (Fig. 7).

The second tube is mounted with all strips and then the second fiber tube is filed with the large hole as the former was and in the same place. Then the tube that is the tickler is held in position so that when the fiber tube is pushed through the holes in the strips it also passes through the holes in the composition tube. This places the coil so that it also can be rotated by turning the fiber tube.

Two fifteen inch lengths of flexible wire must be bought for flexible leads to the two rotating coils. These lengths are cut in half and two pieces are pushed through the end of the fiber-tubes and out through the holes in the tube as shown in Fig. 3. This is perfectly all right for the tickler coil, but when it comes to the other coil, which is the primary, it is advisable that the flexible wire be just fastened to the ends of the coil and left to swing in mid-air. The leads on the primary may be pushed through the tube, but the resistance will go up so much more. However,

### The Primary Winding.

Lay this tube on the unfinished coil so that it cuts the coil exactly in half. Mark on the tube just where the wire touches it on each side and then file the tube at these places on each side so that it looks similar to the tube shown in Fig. 3. Then place the tube on the coil, in the center, with the notches down on the wire. Continue winding and wind into the top notches on the tube. When five more turns have been wound on cut the wire and tie the coil as was done with the others. When trying around include the tube in the tying so that it will be made more solid. Remove the pegs and set completed coil aside. This is the primary coil.

The next coil to be wound is the tickler coil. This is wound on the composition tube that is 2½ inches in diameter. In the center of the tube, and on each side of the tube, a hole is drilled. This should be a quarter-inch hole for the shaft to go through. This hole in the center divides the tube into two halves and on each half wind thirty-two turns of the No. 26 single cotton covered wire. This is, of course, a continued winding—that is, the thirty-third turn is the ending of the thirty-second, and the beginning of the thirty-fourth turn is three-quarters of an inch from the thirty-second.

The next step is the preparation of the composition tubes and strips for mounting. First come the strips. These are prepared as shown in Fig. 4. Drill a hole one inch and a quarter from the end; this hole should be one that will enable the fiber tube to pass through. Then in the end from which the measurement for this hole was taken drill a hole to take a 6-32 brass bolt. Drill this hole as close to the edge as possible.

The center hole, or rather the hole one and one-quarter inches from the end, is only drilled in four of the strips. The remaining four have only the end holes

drilled. Then the strips are cut as shown in the drawing given in Fig. 4. This must be done carefully. A small hacksaw is the best instrument to use.

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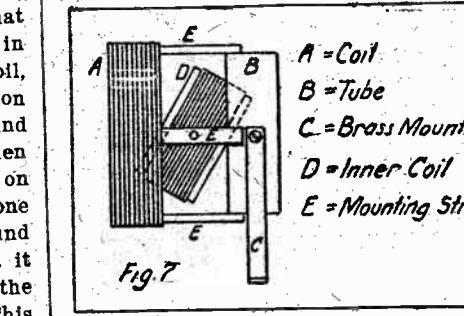


Fig. 7.

this is a point for each individual to decide.

After this has been done the next step is to mount the coils on the tubes. This is simple. Simply force the small ends of the composition strips into the open places in the coils. That is, the places where the pegs were. It will be necessary to force the coils on the strips and they will be pulled slightly at the points where the strips enter the coils, but this is perfectly all right.

After this is done the couplers are finished and the set is ready to be mounted on a panel. A 7x14 panel is the best size to use for a one tube set. If the constructor has special ways of mounting the coupler it is well to remember that the length of the brass strip is the length which controls the height of the coupler dials. But do not use a shorter length of leg, as this would bring the coils too close to the baseboard.

The wiring diagram for the set is given in Fig. 1 and should be followed to a "T." Due to the fact that the tuning of this set will be sharper than any other tuner the constructor may have had it will pry slightly unsatisfactory until one understands it.



# Highly Efficient Set Necessary for Proper Reception on Loop Aerial

Outside Antenna Is Generally Far Better, Especially for Distant Stations.

By WILLIAM M. HENDERSON.

TO many fans an aerial is either an impossibility or an undesirable part of a radio set. This state of affairs is, of course, due to two things: either the landlord has an aversion to aerials or the fan himself has. In these cases it is necessary to use a loop and a special receiver to bring in the stations.

In using a loop receiving set it must be remembered that the amount of energy that is picked up on the small frame of wire is extremely small and has to have sensitive tuners to bring in stations and a sensitive arrangement of the tubes. Crystal sets cannot be used.

All loop receivers have certain limitations. The greatest of these is the fact that broadcasting of stations that are far away from the set cannot be received with any certainty. Nor can they be counted on as coming in with great volume. There are cases, of course, where loop receiving sets have done wonderful distance work, and some of it even on the loud speaker. But this article is to take up receivers as a general case, and these exceptions will therefore be ignored.

The first type to be taken up will be three receiving sets that will work on a loop for local stations. Each one is easy to build and usually will work without any playing around with special parts of the circuit. The fourth receiver is a popular reflex that, if constructed properly, will bring in stations that are fairly distant. The fifth and last is a three stage radio frequency amplifier and two stage audio frequency amplifier. With this receiver it will be possible to do more distant work than on any of the others, but of course not count on too much, as loop reception is nothing one can guarantee.

Before entering into a description of any of the receivers there is one thing to be emphasized. That is the matter of equipment. One of the first things stated in this article was the fact that loop receivers deal with minute currents. And this is one fact that should be kept in mind when buying equipment.

## What Makes a Good Loop.

The two units that are of great importance are the loop and the tuning condenser. The loop in all its forms is hard to make efficient, therefore one should procure one that is well insulated, has large wire and of good diameter.

The condenser should be one of extremely low losses. There are many on the market to-day and it should be easy to get one. Do not use condensers that have molded end plates or that have metal end plates that are part of the stationary plates. The end plates should be metal and be part of the rotary plates. The remaining parts of the set must be of the best—sockets, rheostats and trans-

results. The dry cell tubes may operate the set, but it is doubtful. For the 200 use 22½ volts on the plate. For the 201A the plate voltage must be played with to obtain the best results.

Fig. 2 shows a more efficient tuner than that in Fig. 1. It will be possible to use this tuner a slightly greater distance from a broadcasting station. The tuning of the loop is the same as in the former set, but the amplification is obtained through the use of tuned radio frequency amplification. The variometer is used in this capacity. It is positively necessary that this variometer be one that will respond to the high wave stations, otherwise the set will only receive stations below 450 meters.

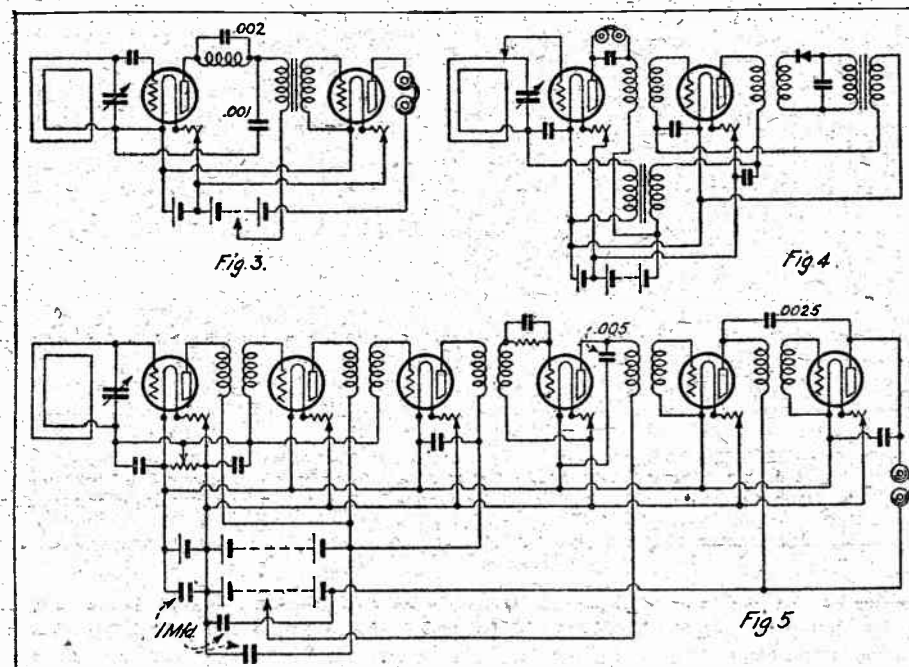
## Must Be Efficient.

It will be possible to substitute a variable condenser connected in shunt to a coil of about fifty turns of wire in place of the variometer, but this is not suggested because it is easier to get an efficient variometer than an efficient condenser and coil. That is, the efficiency of a variometer, if of good construction,

Fig. 3 is a diagram of a simple two tube circuit that will work well on local stations. This set obtains its sensitivity through a slight superregenerative effect through the use of the honeycomb coil and the condenser across it, as shown in the plate circuit of the detector tube. The second tube is an ordinary audio amplifier.

It is extremely important that the fixed condensers in this set be good ones. The capacity of them, though given herein, might well be experimented with in order that the best values be found. There is one point to be entered into before closing this set out. That is the detector tube. It is preferable that this tube be a UV-200, and that it be one that will take more than 22½ volts. The more plate voltage that can be placed on the tube the greater the volume.

The circuit given in Fig. 4 is a popular reflex set that has found much favor of late. This is a two tube reflex that employs a crystal detector for rectification. This is an advantage due to the fact that the crystal gives perfect reproduction of the transmitted speech or music.



will be greater than the average condenser and coil.

Following the general layout of this tuner it is possible to carry the amplifier to any number of stages. It is not wise, however, to use more than three stages. In fact two stages are more than enough to control.

The condenser connected from the middle leg of the potentiometer to the negative filament is a necessity. It is used to lower the resistance than the potentiometer offers in the circuit. Without this condenser the set will not be selective.

The capacities of the fixed condensers are not given, as it is a positive necessity that one find the best values for each position. One should start off with a neutral value of .0005 and use all the variable condensers in the house as shunt capacities to these. The correct working capacity can then be found and fixed condensers of the correct capacity may be put in place. This procedure should be followed in every reflex set that is built.

The radio frequency transformers and the audio frequency transformers for this set are critical and should be of the best.

## An Experimental Circuit

THERE seems to be a general feeling among radio fans who have had a set for any length of time to wish to try something new and difficult to get working.

The circuit given herewith is theoretically perfect and practical. The set will work with the winding data given, but it may be found that a few turns more or less will materially aid it to become more efficient.

The main part of the circuit is the tuning coil. This is somewhat similar to the four circuit tuner. The aerial coil is of forty turn coil wound on a three inch tube. It is tapped every five turns. The condenser in series with the grid and the coil is one of .001 capacity, but may be eliminated without affecting the circuit any.

The grid and plate coils are exactly the same and are wound on the same tube. The tube which is used as the form for this tuner is three inches in diameter and five inches long. Starting at one end, fifty turns are wound on the tube. No. 24 SCC wire is used throughout.

The plate coil is wound one-quarter of an inch away from the grid coil and in the same direction. The two condensers that are used to tune the circuit

are both .0005 mfd. in capacity. The single turn around the grid coil must be wound in the same direction as the grid coil and near the end of the coil that is connected to the grid.

The condenser across the phones has a decided value, but it may be made a fixed condenser of .0005 mfd. capacity if a variable condenser is not handy.

The grid leak and condenser are the same as in any receiving set.

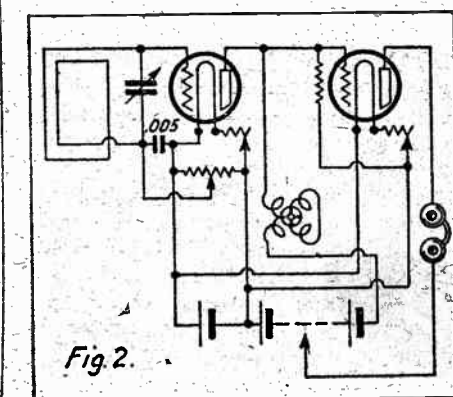
As to the type tube to use, that must be left up to the experimenter, as the set may be built around any tube that it is desired. It is probable, however, that the UV-201A tube will give good results on the small drain from the A battery, but the UV-200 will be the best tube to use.

In the tuning of the set, if it is found that it is not possible to bring the plate condenser up to the highest point of volume without the set howling, then a small fixed condenser connected between the plate and grid coils will eliminate this.

Just where this condenser is to be connected will be doubtful, but the right tap on each coil will be easily found with a little experimenting. The lead to the filament of the tube is also something that might improve the set greatly if shifted from one side to the other.

Unfortunately the transformers control the working of the set, and unless matched audio and radio transformers are used the set will not do much in the way of distant reception.

The tapped loop is a necessity. The tapping controls the amount of energy put upon the grid of the tube. This con-



trols the circuit and keeps it from oscillating. For local stations it will be found that the tap switch will be near the center of the loop, while for distant stations the tap switch will be at the outside of the loop.

Fig. 5 shows a diagram of the best three stage radio frequency amplifier that can be built outside of the superheterodyne. With this set the clearest reproduction of broadcast speech and music is possible. For distant reception it is not possible to accurately state just what the set will do. Some sets constructed on this line have done extremely well, while others have failed to do better than 100 miles.

For efficiency the transformers should be of the best. The fixed condensers across the batteries must be of rugged construction. They are used to eliminate some of the battery noises that arise in a set of this number of tubes. The condensers across the potentiometer are also necessary for sharp tuning. The fixed condenser from the plate of the first audio amplifier to the plate of the second audio amplifier is used as a clearance condenser and is of great aid in clearing up signals. The one-quarter megohm grid leaks across the secondary of the audio transformers should be used if positive clarity is desired. These take up the small crackling noises that are so prevalent in most receivers.

## What Tubes to Use.

The tubes that should be used in any of the above sets, except where otherwise specified, are the UV-201A or the C-301A. These tubes will give the best results as amplifiers. The UV-200 or the C-300 is the best detector.

Dry cell tubes are not as efficient as radio or audio amplifiers because of their small wattage. This limits the output of each tube, and consequently the set could never be as loud or get as much distant stuff as the storage battery tubes.

Of the two dry cell tubes the UV-199 or the C-299 is the better for radio frequency amplification.

Remember that the loop is one of the tuning controls and should be turned with its plane pointing toward the station to be received. In this position the greatest signal strength will be obtained.

There are a few points in the construction of a radio frequency amplifier, and these hold true of every set, that should be read, marked and inwardly digested.

The first is to connect the condensers so that there is no hand capacity in order that one will not have to shield the panel.

Second, make the leads short as possible. That is, mount the instruments in such a manner that the leads will naturally be short. Mount the transformers in such a position, i. e., at right angles to each other, that there is no feedback coupling between them. This is necessary in order that the potentiometer may be made more negative for volume. If the transformers are mounted in a row the set will howl and be difficult to control.

When using a loop do not use long battery leads. Long leads will detract from the directional properties of the loop and make the tuning broader. Be sure that all batteries are fully charged and well up in voltage for best results.

## 200 Meters and Less

THE radio show and convention of the Second District Executive Council will take place March 3 to 7 inclusive and is to be quite an affair. This is their fourth convention, and nearly every radio fan knows the crowds that it draws.

It will be held at the Hotel Pennsylvania, the same as last year, but this time the council has secured the ballroom, which is more convenient than the Butterfly Room.

The admission to the show is 50 cents, which includes a magazine program. Nearly fifty manufacturers have taken space, and the best apparatus will be on view in the different booths. On Wednesday night the banquet and hamfest takes place. If it is anything like last year there will be fun for all, and plenty of it, too. The price of the banquet this year is \$5, which includes a season's pass. A visit to WEAF and WJZ is also included in this ticket. Many of the prominent amateur stations will be visited, also. Make your reservations to Executive Radio Council, 120 Liberty street.

2 VH since changing his transmitter is much louder. Have you increased your power as yet, Om? Heard that you intended to put in two more fifties.

The RAGNY of New York city now have a transmitter and use the call 2 CMB. They are using at the present two five watters, DC CW.

They say that 2 CHY, now that he is a code instructor, is very careful how he sends on the air. HI. Watch your step Om or some one will try to burn you up with fast sending. Plenty of fast boys on the air, MIM.

Notice that many stations are still above the 200 meter wave. I have an accurate wavemeter at the shack and check up on most of the boys. I am glad to see, though, that the tendency of most of the hams is to go below the 200 meter wave. This shows that the talks and lectures given by radio clubs and the campaigns by the different amateur editors are having some effect. If the Government is good enough to give us the license, why not show our appreciation by obeying the law to the letter. What say, men?

I haven't heard 2 KU on the other in some time now, and wonder if he would shortly come back with a big transmitter. What you doing now, OM? Hope you haven't turned to receiving altogether, as some of the hams have.

## 2 CEI Heard in England.

Understand that 2 CEI has been heard in England several times in the last month, and all on one fifty watt. He seems to favor the low waves, as many of the prominent amateurs do.

2 WC must be still tuning his OW transmitter, as no sign of his familiar sigs are heard on the air to date.

Many have written to me inquiring if the call 2 RK is a reassigned one. No, Kenneth Hewitt has his old call again. I guess every one has heard 2 RK and knows the DX which this well known station has done.

2 FZ seems to stick at the key each evening. At first thought that he would not be on so much, but recently his signals are there each night. By the way, OM, how's the radio convention coming along? Best luck with it.

2 BL seems to be doing some good work with a pair of fifty watters. Your note is good, Om.

111, located in Rhode Island, seems to be getting through fine. He has rebuilt his transmitter and has done better work since tearing it down.

1MO is on the air, but who has happened to LAW? This well known station seems to be without an operator lately. How cum?

1XU certainly comes through strong at times though he is not consistent. Who are the operators at this station? The fists are very familiar to me.

231R, only using a fifty watt, is there with the dx work. I think we all have heard his ether bluster of a CW transmitter. FB, Glaser, ole top.

All the attention is at present on the low waves and nearly every night some new station is heard down there. Wonder what the difference will be when all the gang try a hand at it? Here's the important part of the testing. Get permission from the radio inspector first, because you'll be called for this.

wave band between 150 and 200. Don't forget this.

2ADE has been reassigned to J. Morrow, 547 West Fiftieth street, New York city. Morrow is installing a CW transmitter with a fifty watt. I am sure that all the gang will be glad to welcome him to the air.

I wonder if 2CWR has been copying all the short wave stuff as well as the boys did out to Rockaway? It's a strange thing about locations sometimes. A set will work fine at one place and when moved to a different location, perhaps only next door, will perform in a different manner.

## 2CNO Talks Spark.

2CNO, the boy with the big five watt, again talks about putting in a spark set. Can't you see the folly of putting in a cement mixer, Om? If you want noise why not work in a boiler factory? HI and then some.

2BQS has not been heard in some time now, but guess that the work at the amateur radio office must keep you busy. How about that, Morris?

2BNL, the fone expert, is still working his set though he has little time to be on at night. Hope they change your hours, OM, as I know you would like to do some dx work with that 100 watt transmitter.

Heard 2ATF up in Westchester recently. Too bad that you don't get more time to work that "P" tube, OM. You sure come through strong. 2DJ had the good fortune to get a 900 cycle spark set and it is just the thing to run two fifties, but guess he will use only spark.

9MC is starting to come through. Haven't heard him in some time and thought he had dropped out entirely. Hope you stay with us now, MC.

Remember that spark at 3FB? It certainly seems strange to hear him on the CW. The CW transmitter is very steady and I couldn't have said the same of the spark. The old rock crusher faded at every opportunity.

If there is a station in and near Poughkeepsie working would be very pleased to hear from them. I have had several messages on the hook for Hudson. Poughkeepsie and nearby points. It is time that we organized a Hudson River relay line again. How about it, fellows? Who is on in that direction? A letter would be appreciated by the writer.

9BP is off for a vacation, so it is a good chance for some other station to work WNP. MCIX must hear some DX up there in the north. He is fortunate in not having some single circuit dial twister near him to create QRM. If we would only find some of these squawkers it would be a good idea to make them take out a transmitting license.

2AGB is doing great work receiving as well as transmitting. He uses a superheterodyne and has copied more foreign stations than any other amateur. Great work, OM! Have heard you doing some real transmitting and am sure that you will do some more with your set. It has some kick.

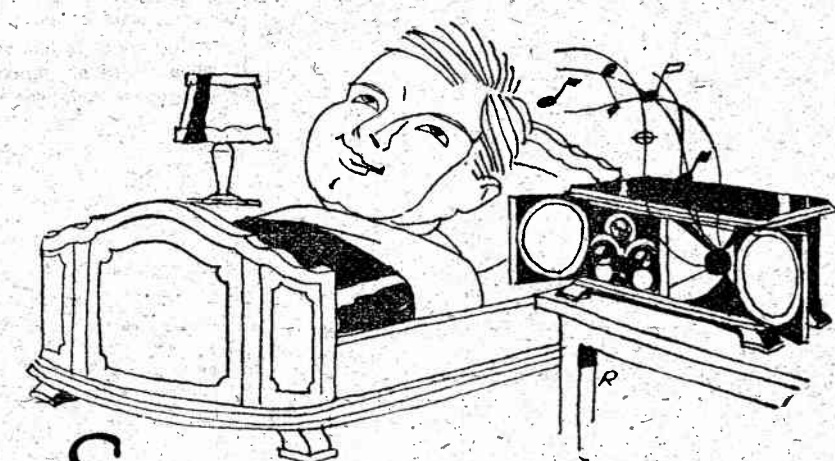
## F 8 AB Is Star Station.

Listening down near 100 meters recently I heard 1 MO work English 2 KF several times. While the British boys are not as loud as the French and Dutch stations they are quite steady. French 8 AB has the reputation, though, of being the star foreign DX station. It seems he is reported every time he pushes the key. He started to use two tubes but recently is only using one and he still is very strong. We congratulate French 8 AB upon having a real amateur transmitter. Only wish I could visit him this summer.

2KV must be working on a new set again, as his signals have disappeared from the ether again. The last time he was working he used a 500 cycle set, which was very QSA (very strong). How are the BCLs treating you in Bronxville? KV had the misfortune of losing his counterpoise one evening through the kindness of some neighbors, who thought they would get rid of the transmitter. Well, I notice that 2 KV is still on the air, so the plan was a failure.

I know a certain spark hound in the Bronx that has to CQ Jo 25 on a station. This is great recommendation for the cement mixer. Say, OM, I know a great resting place for that spark set, but the only fish who would go after it would be a sucker. HI! How's that for a slam?

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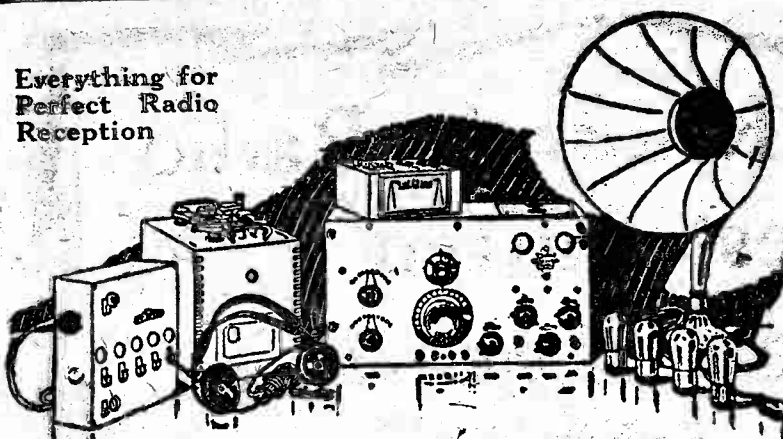
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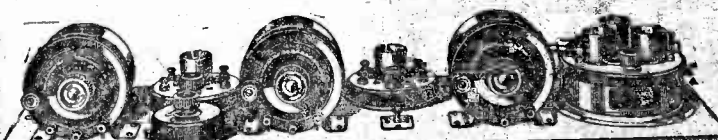
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### American Amateur Hears Canadian Gold Miner

The element of surprise is generally conceded to be one of the major fascinations of radio. When one puts a record on a phonograph he knows exactly what he will hear. He may have listened to the same tune many times. On the other hand the radio receiver, like Pandora's Box, is full of mystery. When one turns the dials on his set he opens the door to the unexpected. Reception of programs is being standardized, but that point is not yet reached.

This phase of philosophy of radio was emphasized here recently when Edward C. Jones, Jr., district superintendent of the American Radio Relay League, the national association of radio amateurs, picked up his phone and heard a Canadian amateur station calling. Jones replied with his code transmitter. The surprise came when the Canadian, located in northern Ontario, suddenly shifted from code to phone and a voice from the air called: "Hello, United States, 8SP. This is Canadian 3GG calling you."

In a few minutes Jones learned that he had communicated with a radio fan in the gold mining area so far north that the Canuck, instead of giving his town and street address, called out his latitude and longitude. Not every fan can get a thrill like that—out of the air anyway.

While the average listener would have been overcome with astonishment, Jones had an added advantage. He could talk back. He has one of the finest transmitting stations in this section and has been copied repeatedly in England and France, as well as many times by ships in the North Sea, Pacific ocean and South American waters. Amateurs in Holland, Hawaii and Mexico have reported 8SP's signals.

The station, which is also operated by Albert G. Kinner, has many unique features in its construction and layout. The transmitter has a power of 150 watts, three 50 watt UV202's in parallel, with about 1,200 volts rectified A. C. on the plates. The sockets are arranged on the circumference of a circle, with grid and plate leads bunched and exactly the same length and as short as possible.

### Radio Is Considered a Luxury in Germany

German interests desiring a monopoly, or at least control of radio, assert that it is a "luxury" and should be subject to taxation, contending that it will only be possible to finance good broadcasting if the control remains with the Government. Recently, however, the Post Office has granted permission to special companies to construct broadcasting stations and given private persons licenses to buy receivers.

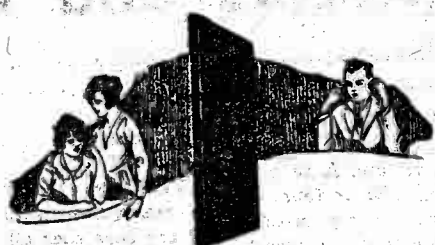
Those who approve of private operation say such control will discourage initiative and that it will be impossible to enforce regulations without spying out home made sets. The system of Government control will, however, be continued temporarily, and those who listen in must use outside antennae and purchase sets stamped by the Government as well as possess a Post Office license, costing 25 gold marks a year. The first broadcaster licensed in Frankfurt was the Sudwestdeutsche Rundfunkdienst, A. G., which will operate exclusively within a radius of 150 kilometers.

### How to Improve Your Aerial

If you have to splice wires in your aerial, lead or ground, don't let it go with a simple twisting of the wires together. It is possible to have the lead in and aerial one continuous solid wire from furthestmost insulator to the set. In case of making a splice lay the wires side by side, twist each free end along the other wire for at least two inches, and then make a soldered connection.—G. M. C.

### It Does Not Pay to Overload Tubes

One of the most common traits of a person with his first radio set is to persist in turning up the tubes in an effort to increase the signal strength. "It can't be done." Up to a certain point increasing the filament temperature by turning up the rheostat brings an increase in signal strength. Beyond that the signal gets mushy, and further increase in current won't take out the mush or produce any louder or clearer signal. It may burn out the tube if the minimum resistance of the rheostat is low enough.—G. M. C.



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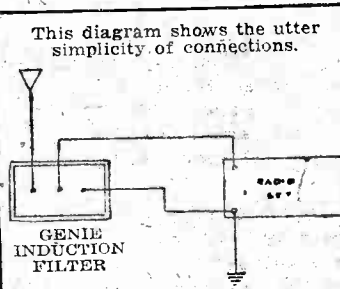
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# Basic Theory of Radio Dates Back to Ancient Times With the Discovery of Sparks

People Once Believed That Peculiar Actions of Amber Were Caused by Hunger

By THURLOW EDSON

WHEN you turn the dial of your variable condenser you control in a scientific way a small portion of the stuff that goes to make up a thunderbolt. It is called static electricity.

"I get three stations within five degrees on my dial," announces the proud owner of a DX receiver, which is good at reaching out into space and picking up Dallas, Texas; Denver, Col., or perhaps Los Angeles, Cal. He has the thing down to a science, and, weather permitting, he can turn the dial any night and pick up the three stations. His tuning is scientifically accurate.

If he built this set himself he can in all probability tell you that the condenser has one-thousandth of a microfarad capacity. This means that its forty-three plates, separated by thin layers of air, will hold a certain electrical charge rated technically as .001 mtds. His twenty-three plate condenser has a rating of .0005 mtds. and his fixed condensers are rated in a similar manner.

The technical man can calculate the proper amount of capacity needed to make the set oscillate to waves of broadcasting length, and he is apparently still more scientific, but not even the most technical man can tell you just what it is that he is gauging. He knows the theory and practice of static electricity.

It is believed that each atom may be the center of a solar system, with electrons revolving about it as the planets revolve about the sun.

but no matter how technical he may be he still wonders what is at the bottom of it all.

The best of technical men recently gave a certain amount of credit to a theory that all static electricity which is uncontrollable came from the mountains of Mexico.

Such are the vague theories which go about among the millions of Americans who have suddenly turned to the highly technical subject of radio. This latest theory comes from a radio operator who had made a few trips to Mexico and had observed on each trip what he thought was an unusual crashing in his phones, caused by natural elements which interfered greatly with the reception of messages. The crashing was no doubt caused by some kind of electrical discharge in the air, such as that which takes place between clouds or between the earth and certain charged clouds during a thunderstorm; but to say that the Mexican mountains were the source of all such static noises was one of the many wrong statements which pass for scientific theories to-day.

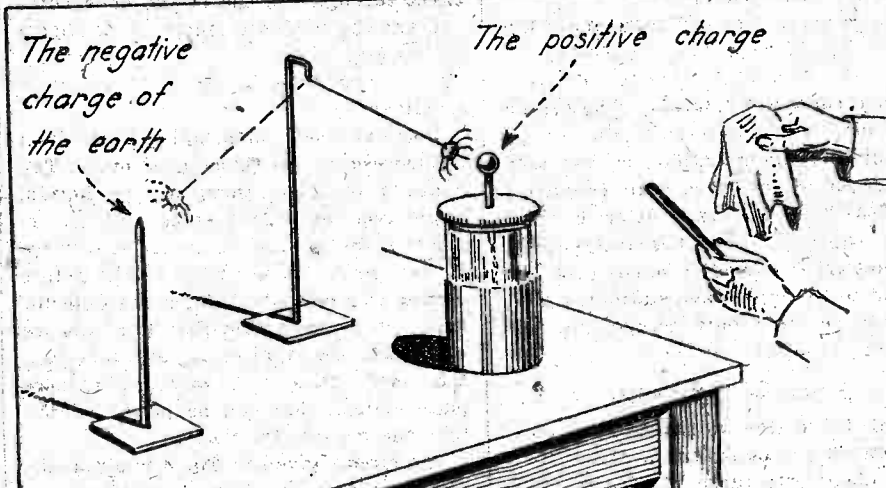
### Do Not Understand Static.

Static electricity is found everywhere in the world to-day. We do not yet understand it. We merely know that it will produce certain results when treated in a definite manner. It may be at the origin of the Northern Lights, at which we stand in wonder, and when we say that it makes its chief home in the Mexican mountains we are like those ancient monks of about two thousand years ago who mistook static electricity for appetite in a piece of amber.

The monks, the guardians of all learning at that time, had both forms of electricity which are necessary to radio, but they could not interpret them. They could understand the mystery of appetite in a way, but they could not make their minds grasp the nature of two kinds of electricity—that produced by their magnets, as described last week, and that which was attendant upon the friction of a piece of amber against a cloth.

When they rubbed the amber they noted that it attracted bits of dry leaves, and their explanation was that the amber was hungry for vegetable food. When nature forces amber she frequently entraps leaves and insects with it in such a way that they are fossilized and preserved inside the amber. The explanation of the monks was that the piece of hard rubber is touched to a

When a body with such a charge on it touches another body of matter it may communicate a part of its charge. If the piece of hard rubber is touched to a



How a pith spider "oscillates" between a body charged with a glass rod which has been rubbed with silk and an object of negative or ground potential.

### Theory Is Sound.

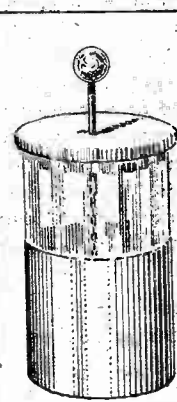
We may be as far away from the truth in explaining the "hunger" of the amber as the monks were, but we have a theory which is sound when it is applied in many other ways. It is the electron theory, and it is broad enough to explain all such static electricity effects. In brief, it assumes that the smallest amount of matter which may be separated by chemical means, the atom, has a number of tiny bodies called electrons associated with it, and the static charge of any substance depends upon whether its atoms have their allotted number of electrons.

Electrons are considered to be definite quantities of electricity which do not change, and they are said to have a negative or minus-charge. As unlike charges of electricity attract each other and like charges repel, the atom is assumed to

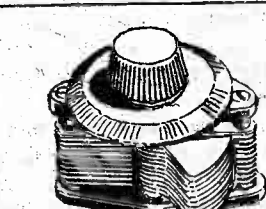
When a body with such a charge on it touches another body of matter it may communicate a part of its charge. If the piece of hard rubber is touched to a

### What High Frequency Is.

This action of electrons in moving back and forth from a positively charged body to one which is negatively charged produces the high frequency or oscillating current necessary for radio waves, and the radio part which helps them to perform in this manner is the condenser. The condenser consists of two plates of metal, separated usually by air or mica. One plate or set of plates has a positive charge, while the other has a negative charge, and at the proper time the electrons flow from one plate to the other in an effort to neutralize the plates. They must surge back and forth a great many times, however, before the condenser is



The Leyden jar stores electricity by means of metal on the inside of the glass, which attracts a charge to the metal on the outside of the glass.



The condenser of the radio set uses a number of plates to secure a greater surface.

performance before it again returns to the rod. It will continue its antics until the charge upon the glass rod has been dissipated.

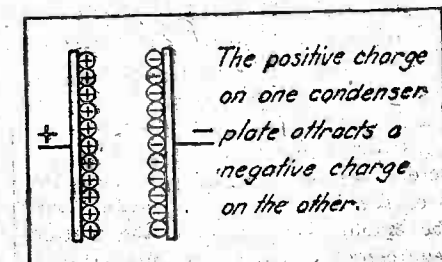
### The Forerunner of Radio.

It was not so long ago that such a jumping spider was as popular in a parlor in the homes of some serious minded men as the radio set is to-day. It was popular because it had something to do with the mysterious electric fluid that men were talking about.

In Europe a machine was invented which would rub a glass ball continuously by revolving it against silk pads, and the first man to be shocked by such a device was as much startled as the first to hear a radio message actually traveling through the air. Fakers went about Europe selling shocks to the ignorant country folk for so much apiece.

It was not long after the discovery of the shock that men found a way of "bottling" the "electric fluid." They filled a bottle with water, corked the bottle tightly and thrust a metal rod through the cork into the water. They found then, that they could place a charge of electricity in the water by touching the metal rod with a charged body, or by connecting a wire between the metal rod and one side of the machine which produced shocks.

This bottle was the first condenser, and it survives yet in the form of the Leyden jar. The water inside the bottle served as one plate of the condenser and the table upon which it rested formed



the other. In the present day Leyden jar the plates are formed by metal sheets inside and outside of the glass.

The plate on the inside of the glass, receiving a charge of electricity attracts an opposite charge from the ground to the plate on the other side of the glass, acting as a storehouse for electrical charges.

Next week the method of making electrical charges flow along a wire will be described, together with the first discoveries of substances which act like the modern battery. The much used "volt" will be explained, together with practical hints on how to employ it in operating our radio set.

### Mounting Condensers.

If condensers are not mounted on the panel correctly the shaft will be crooked and the dial will turn unevenly, rubbing against the panel and causing microphonic noises in the tube. This condition is found in many home made sets because of the difficulty of locating the holes for the mounting screws of the condenser when drilling the panel. A few manufacturers are considerate enough to furnish cardboard or paper templates with their instruments, but the great majority of the condensers now sold are not provided with any such templates.

A simple method of locating the holes for the mounting screws after the hole for the shaft is drilled is to put the mounting screws into their holes in the condenser and cover their heads with a light colored paint or paste. The shaft of the condenser then being pushed through the hole drilled for it in the panel, the condenser is firmly pressed down upon the panel in the position it is to be mounted and is then carefully removed.

If this process is followed carefully little spots of the paint or paste will remain on the panel, indicating the points where the screw holes should be drilled. After the holes are drilled any surplus paint can be wiped off with a damp rag.—J. L. Rifkin.



## Radio Comes to the East Side

UP until quite recently Mr. Abramovitch was not exactly what you would call a radio fan. In fact, he was distinctly averse to radio.

Radio, he would declare, was a foolishness on which his son Izzie spent hard earned dollars, and for what? For speeches? Bah! you could hear all the speeches you wanted free for nothing by the speaker on the corner. Music, you tell me? Don't talk to me foolishness. Even a \$3.98 phonograph gives better music than what the radio gives. And with the phonograph all you got to do is wind it up and it plays just like you want it should play. You ain't got no bother with no dials and electric lights and batteries, which you need new ones every time, and you don't got to be afraid that some other music or dit-dah-dah things will butt in like what they do in the radio. No, sir, you ain't going to see me playing around with that radio thing.

And Mr. Abramovitch would wag his beard with an air of finality and put the Second Hungarian Rhapsody on the phonograph.

But he's changed. Now before he goes to work, after he comes back from work, while he eats supper, after supper, and until he goes to sleep he talks radio with Izzie. He changed his family paper because another Yiddish daily had a radio column every day. Together with his son Izzie he built two stages of audio frequency. He even gave up the phonograph and uses its sound box as a loud speaker.

And here's what caused the whole change:

One night Izzie had crept up behind his father and put the ear phones on his head. His father had listened a while, an expression of great awe and wonderment spreading over his face. Finally he had taken the phones from his ears and gazed at them long and silently.

Then, waking from his temporary stupor, he had called loudly for his wife. "Hannah! Hannah! Quick come here! There's a chazan (cantor) on the radio! Come quick here!"

His wife came running up from her dishwashing, wiping her hands on her greasy apron.

"Nu, what's the matter? What's so much excitement about?"

Mr. Abramovitch placed the phones

on her ears.

"Listen to it!" he commanded.

She held the phones to her ears and listened, her head bent forward. A surprised smile came over her face and then abruptly disappeared.

"It's stopped already," she announced. "Listen a minute. It'll begin again soon," Izzie reassured her.

She listened, and her face lit up again as the silence in the phones was broken. Then, with an impatient exclamation, she began to take the phones from her head.

"Oh, they're saying WJZ something. Who knows what they're talking about! Go already with your radio and your WJZ. I got to wash the dishes, better."

"But listen a little more, momma!" Izzie implored. "Wait till he starts singing again. You'll like it, I tell you." Mrs. Abramovitch, still taking the phones from her head, suddenly stopped and pushed them back tightly over her ears. A wondering, delighted smile crept over her face.

"Oy, oy, oy," she crooned, nodding her head from side to side. Then she snatched the phones from her ears and extended them eagerly to her husband.

"Listen, Moishe, there's a lady singing Eli-Eli! Quick, before she stops!"

She hugged Izzie to her.

"Oy, such a wonderful boy I got! All by himself he makes a radio with chazans and Eli-Eli and everything!"

Mr. Abramovitch, absorbed in a new song of the cantor and his choir, motioned frantically to her to keep still.

"Keep quiet yet a minute and let me hear something, too!"

During the remainder of the program Mr. and Mrs. Abramovitch took turns in listening to the cantor and his choir and to the lady who sang the Jewish songs, while Izzie sat at the set, pride and importance and happiness shining out of his grinning face.

"Nu, Hannah," Mr. Abramovitch said at the end of the program, "isn't that a miracle. A chazan sings at Forty-second street and the whole world can hear him on the radio! Isn't it a wonder?"

And Mrs. Abramovitch agreed that it was something very unusual indeed.

That is why, if you visit Mr. Abramovitch any night except Friday night, which is Sabbath eve, you will find him with Izzie deep in the plans for adding three stages or radio frequency to his present set.

His pet dream is to hear Russia on the radio.

## British Tune In All Night Long

Special Correspondence to THE NEW YORK HERALD  
New York Herald Bureau,  
London, Jan. 25.

ALTHOUGH the first new year's rush to renew expiring licenses has now slackened, and the excitement of hearing America has temporarily died down, interest in wireless is still as great as ever and thousands of new licenses are being taken out every month. The British Broadcasting Company, anticipating a record year in wireless development, is preparing several novel features in addition to the usual broadcasting of speeches and concerts. "We have already broadcast several wireless plays written specially for us by well known authors," an official of the broadcasting company told THE NEW YORK HERALD yesterday, "and we shall continue this feature. In a short time we expect to begin broadcasting lessons for school children every Friday afternoon—music, languages and other subjects will be included in the program—and several prominent educators have been enrolled for this purpose. We have now one of the largest orchestras in London and have just completed a new transmitting studio, so our musical programs ought to be better and clearer than ever."

"The Pittsburgh program which we broadcast at the end of the year did much to stimulate interest in America and probably induced many operators to take out licenses in the hope of hearing the United States."

### May Hear Commons.

Transatlantic telephonic transmission is still pretty uncertain, even with the system of reception and retransmission employed by the big companies. Capt. A. G. D. West of the British Broadcasting Company, who first heard and relayed the Pittsburgh station KDKA on December 27, spent many nights in his hut on the North Downs before he was finally successful. When the program did come through, however, it was remarkably clear and caused great excitement and enthusiasm among the many fans who heard it. The last concert from the United States came from station WGY in Schenectady. It was received on January 5 by the Metropolitan Vickers Company of Manchester and transmitted to thousands of delighted enthusiasts.

The refusal of the Baldwin Government

to allow the King's speech to be broadcast on the ground that it was without precedent came as a great disappointment to radio fans all over the country. There is at present considerable agitation for the broadcasting of debates in the House of Commons. Exponents of the plan argue that it will make the public much more keenly alive to questions of the day if they hear them thrashed out on the floor of the House instead of merely reading about them in the newspapers. There seems to be considerable objection to the plan, and it is quite possible that the question may be cause for heated controversy.

Radio fans in North Surrey whose nightly pleasure it is to listen to the programs broadcast by the B. B. C. have been roused to fury lately by the activities of an unknown operator of the "hooligan" type. This "gentleman" has a violent dislike for any kind of music except jazz and any kind of lectures that do not contain spicy stories and jests, and whenever the program does not suit him, which is most of the time, he sets up a loud buzzing and howling from his oscillating set which drowns out everything else in the vicinity. The local radio fans would give anything to locate the unknown disturber of the peace, but so far he has been able to escape detection. Steps have been taken to track him to his lair, however. Four members of the Radio Society are now almost constantly listening for the culprit, and a motor truck equipped with receiving apparatus and frame aerial has been pressed into service. If the enemy indulges in any more lengthy howling the truck will be rushed to the amateur nearest the noise, whence it is hoped to locate the outlaw station with the frame aerial. If the howler is run down he may expect little pleasure from his meeting with the other members of the radio mad community.

The "uncles" and "aunts" who tell bedtime stories, sing funny songs and dispense homely wisdom from the Aberdeen station are very popular with their many nephews and nieces, if the presents they received at Christmas and New Year's can be taken as a criterion of popularity. Nineteen black cats, thirty-six pounds of candy, twenty-eight pounds of fish (from the Lord Provost of Aberdeen), eighteen pounds of shortbread, 200 calendars, three bottles of port and one of whisky were only a few of the many gifts they received.

## Answers to Questions

### Indoor Aerial.

Edw. Nordman—I live in Connecticut and have put up an indoor aerial, but it does not seem to work. Is it possible that an indoor aerial cannot be used in this part of the country?

Answer—It is more possible that your set is not capable of operating on the small amount of current that is received on an indoor aerial.

### Aerialia Circuit.

Paul Jackson—I am interested in the set constructed along the line of the Aerialia senior. All hookups given for this tuner differ. Is the one shown in the radio section of January 13 the best? Should the shield on the panel be connected to the positive side of the filament?

Answer—The diagram given in the radio section was an efficient one and good results will be obtained from it. Do not shield the panel. Connect the parts in the proper manner. That is, reverse connections to all shaft parts if there is any capacity effect noticed.

### A. C. on Tubes.

Ralph J. Ayeta—What transformers and what tubes should be used to operate a neodyne circuit from A. C. and D. C.?

Answer—We do not recommend that you attempt to operate any receiving set from the house current, if you intend to try and construct the rectifier or the transformer. Battery supply is much more satisfactory. Any hard tube will do.

### R. F. on Honey Comb Set.

David Geffer—Please publish a diagram for using the honeycomb tuner with two stages of radio frequency amplification and two stages of audio frequency amplification. Answer—The diagram for which you have asked is given on this page. The tuning of the unit will be difficult at first, but perseverance will conquer that. Diagram is given in No. 27.

### Inverse Duplex Circuit.

Edwin Knaack—Please print a diagram for the Inverse Duplex receiver using UV-201A tubes.

Answer—The diagram is given herewith. Suggest that you experiment with the by-pass condensers for best results. These are very critical.

### Wants Wave Trap.

Wm. D. Gosnell—Can the wave trap described by MacLavin be bought in any radio store?

Answer—It is not possible to buy this particular type of wave trap.

### Push-Pull Amplifier.

F. E. Sanburn—Is it necessary to have a one stage amplifier before a push pull amplifier? I wish to add a push pull amplifier to my detector without the addition of an external stage of audio.

Answer—Though the push pull amplifier, as you wish to build it, making two tubes will work fairly well the addition of the other tube will add greatly.

### Troublesome Hand Capacity.

Irving Biren—I am greatly troubled with hand capacity. Is there any way in which this may be eliminated?

Answer—If you will reverse the connections to the condenser that causes the hand capacity you will probably eliminate the trouble.

### Experiences Interference.

Dan Napoli—I have constructed two arionometer vario-coupler set and have trouble in eliminating unwanted stations. The tone and quality of the reproduction cannot be located, but the interference is annoying to say the least.

Answer—There are only two causes for the interference from undesired stations with this set. The first is the inability of the operator to tune the set properly, and the second is the size of the instruments. For the first one there is only one thing to do—learn to tune the set. For the second the best method of repairing would be to shunt the entire secondary circuit with a small fixed condenser, and also the plate variometer with a condenser of the same size.

### Adding a One Step.

Joseph N. Snyder—Will the addition of a one step amplifier add to the range of my single circuit tuner? If so, what tube should I use for best results?

Answer—One stage of audio frequency amplification will not add

any mileage to the present range of the set, but it will aid in making the signals now received loud enough to understand and enjoy. Suggest the UV-201A tube for loudest signals.

### Wants a Call Book.

Fred F. Wakerly—Where may one obtain a complete list of the broadcasting stations of the United States?

Answer—If you will purchase a call book in a radio store you will find most of the stations listed.

### One Stage of Radio.

Henry R. Metzger—Please inform me whether I can put one stage of tuned radio frequency amplification on a single circuit regenerative tuner?

Answer—There is only one way in which this may be done. Do not use a transformer, but put a ten turn coil in the plate circuit of the amplifier and place this coil in close to the primary of the tuner.

### Superdyne Information.

S. H. Turner—Where may one obtain more information on the superdyne?

Answer—If you send 50 cents to the C. D. Tuska Company at Hartford, Conn., they will send you the latest booklet on this circuit.

### Grounding a Battery.

A Fan—I have built the three honeycomb coil tuner as described in the radio section a few weeks ago. The set works fine, but I have a few questions I would like to ask. First, I have been told that if the negative side of the filament is grounded the set will work better; is this true?

Answer—Grounding the negative of the filament sometimes improves reception some, but it is all a case of individual operation. You might try it and see if you get any better results.

### "C" Battery on WD-12 Tubes.

Harold Weyser—Would I gain in volume or distance by adding one stage of radio frequency amplification to the vario coupler, condenser, variometer circuit? Is it preferable to use separate batteries for the amplifier and the detector? Is a "C" battery necessary for WD-12 tube?

Answer—One stage of amplification at radio frequency will not give enough volume or increased distance reception to compensate for the additional tuning controls, the added drain on the battery or the extra cost. A "C" battery is not necessary on WD-12 tubes when used as audio amplifiers.

### Burns Out a Fuse.

Louis Samber—When I tried to use the electric light socket on my crystal set as an aerial I blew out the fuse and since then I have not been able to receive signals. What could have happened?

Answer—When you connected the house current to the set you grounded the circuit. Therefore, you might have either burned out the phones, the crystal or the coil. Test each one for a broken section. Try a new crystal and an outside aerial.

### Facts on the U V 199.

George E. Pray—I intend building the set described by Harriman in the radio section, and wish to ask some questions about it. What is the correct capacity for the grid condenser? What resistance should the grid leak have? This for a UV-199 tube. What "B" battery voltage should be used. What "A" battery voltage? What size rheostat for this tube?

Answer—The grid condenser should have a capacity of .00025 mfd. The leak should have a resistance of about 4 megohms. The "B" battery voltage should be varied for best results from 22½ to 45. The filament voltage is three volts. To obtain this drop across the filament it is necessary to use three dry cells in series. A 30 ohm rheostat should be used.

### Changing the Single Circuit.

Harry Mayerhoff—How is a single circuit tuner changed to a double circuit tuner? Are any extra parts necessary?

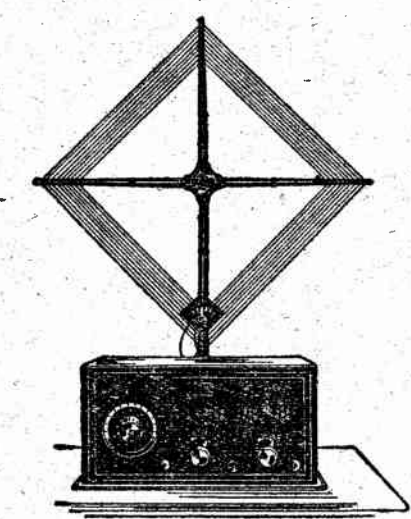
Answer—If you buy a variometer and change the hookup as follows you will have a two circuit tuner. Use the secondary of the present coupler as the grid filament coil. Place a variable condenser across it and then put the variometer in series with the plate and the phones. The primary of the coupler is used to tune the aerial and has no connection with the other parts of the circuit.

## HOW TO CHOOSE A RADIO RECEIVING SET

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It grips you. You can hardly wait to get your set home. Then you find that there are wires to put up. The landlord balks. Or there isn't any tree or pole within convenient distance. Friends are consulted—the electrician called in. A day or two slips by—perhaps a week. At last you get the outfit rigged. You listen in. Nothing happens. The trouble starts.

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—and you can listen in to all the stations you will want to hear before you go to bed tonight.

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Volume? Sets with twice as many tubes can't give you more. Clarity and tone? There's nothing to compare with Sleeper Monotrol. Distance? Count the stations you will hear. Compare them with the stations heard by any other set in your vicinity. Ease of tuning? If other sets knocked off a dozen of their knobs they could not tune as easily. And if they added to their knobs they could not give you such a crystal-clear and interference-free reception.

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The practice of parties selling as "Freed-Eisemann Receivers" sets which they have built from Freed-Eisemann parts is prohibited.

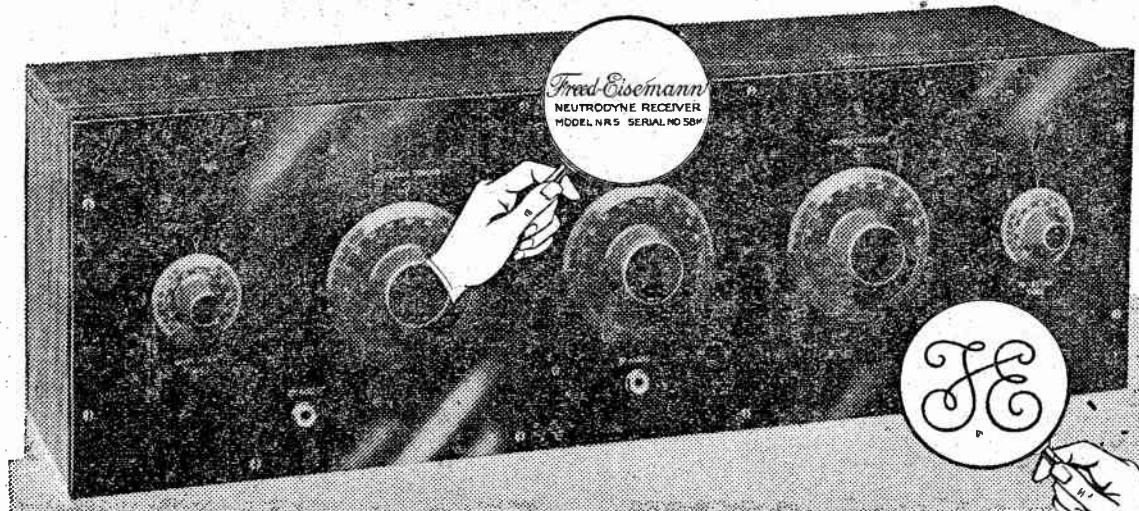
Obviously, if anyone purchased certain Packard parts from the Packard Motor Car Co. it would be illegal to build these parts into a motor car and sell it as a "Packard."

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Our attention has been called to many cases in which imitations have been sold as genuine Freed-Eisemann Receivers—and therefore—the public is cautioned to beware of spurious imitations which are being offered as Freed-Eisemann Receivers.

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Master Radio Craftsmen, not mere assemblers, build the Freed-Eisemann Receiver. The elaborate testing department and equipment used during construction and the testing apparatus which fixes the standard of performance before shipment are devoted to the most rigid and uncompromising ideals of quality.

Every man employed in its construction is proud of it—just as he is proud of this organization having been selected as the builders of new receivers for the United States Government.

This pride extends itself to every satisfied owner. One man tells another and therein lies the reputation which Freed-Eisemann apparatus enjoys.

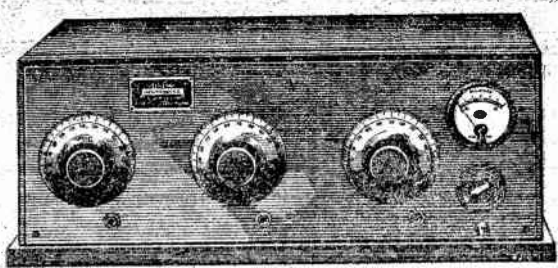
That the model NR-5, five tube, non-reflex Freed-Eisemann Receiver is the last word in the Radio art is a compliment paid not only by thousands of enthusiastic amateurs but by such critics as well known radio engineers, radio editors and experimenters whose experience covers the whole field of modern radio.

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### Answers to Questions

#### A Good Regenerative Set.

Morris Guth—Please give me a diagram for the set as described by A. C. Brady in the radio section. What is the best tube to use? What is the best grid condenser and leak to use?

Answer—The best detector tube that can be used is the UV-200 of the C-300. For these two tubes, the grid condenser should have a value of .00025 mfd. and the leak a value of 1 or 2 megohms. The diagram for the circuit is given herewith.

#### Radio and Audio Amplifiers.

Walter S. Murgatroyd—Please give a diagram for a set employing both radio frequency amplification and audio frequency amplification.

Answer—The diagram for which you ask is published in reply to another question. However, it suits your needs, and you will probably get good results from the set if properly constructed. The diagram is No. 27.

#### Untuned Radio Frequency.

Arthur J. Howard—Please print a diagram for a transformer coupled amplifier radio frequency amplification.

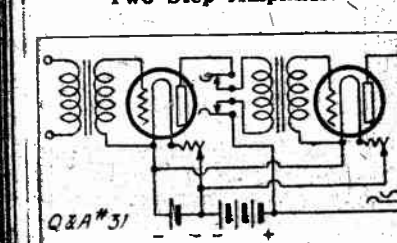
Answer—The diagram for a two stage amplifier and detector is given on this page. Remember, in making this set not to expect to hear much further than you would with a regular efficient regenerative set, unless you use low loss apparatus.

#### Phone Condenser Necessary.

R. A. Funke, Yonkers—I have found that my three circuit regenerative receiver will not oscillate properly when using an amplifier, but have had excellent results with the same receiver when using only one tube. What change would you suggest in my receiver?

Answer—The condenser capacity between the primary terminals of an amplifying transformer is much less than that of a pair of phones, and therefore in order to make the receiver oscillate properly when using an amplifier it is necessary to connect a fixed condenser across the primary of the transformer. The capacity of the condenser should be about .002 mfd.

#### Two Step Amplifier.



R. Flaurbauch—Please give me a hookup for a two step amplifier to add to a one tube set.

Answer—The circuit for this amplifier is given on this page, No. 31. The input posts of the amplifier are connected to the phone posts on the one tube set.

#### Rheostat for UV199.

G. W. Stern, N. Y. C.—Can a UV199 tube be operated from a six volt storage battery, and if so, what size rheostat should be used?

Answer—Yes, the UV199 tube can be operated from a six volt storage battery provided a 50 ohm rheostat is placed in series with the filament.

#### Use of C Battery.

Francis Baker, Hartford, Conn.—Kindly explain the effect of a C battery on a two stage audio amplifier using UV201A tubes.

Answer—In cases where more than 45 volts of B battery are used on an audio amplifier, the addition of a C battery will reduce the distortion and lengthen the life of the B battery. The C battery is connected between the common filament terminal of the audio amplifying transformers and the negative of the A battery, the negative of the C battery being connected to the amplifying transformers.

The following table gives an approximation of the C battery voltage necessary when various plate voltages are used. This table is approximately correct for all standard tubes:

| Plate volts | Grid volts   |
|-------------|--------------|
| 40.....     | .5 to 1.0    |
| 60.....     | 1.0 to 3.0   |
| 80.....     | 3.0 to 4.5   |
| 100.....    | 4.5 to 6.0   |
| 120.....    | 6.0 to 9.0   |
| 150.....    | 9.0 to 12.0  |
| 200.....    | 12.0 to 20.0 |
| 250.....    | 20.0 to 25.0 |

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| Station             | Call    | Dial No. 1 | Dial No. 2 | Dial No. 3 |
|---------------------|---------|------------|------------|------------|
| Newark, N. J.       | W E A F | 36         | 38         | 45         |
| Newark, N. J.       | W E A F | 36         | 38         | 45         |
| New York, N. Y.     | W E A F | 62         | 65         | 78         |
| New York, N. Y.     | W J Z   | 50         | 53         | 58         |
| New York, N. Y.     | W H N   | 26         | 29         | 32         |
| New York, N. Y.     | W B R   | 37         | 41         | 49         |
| Philadelphia, Pa.   | W F I   | 33         | 35         | 42         |
| Philadelphia, Pa.   | W D A R | 32         | 35         | 40         |
| Philadelphia, Pa.   | W I P   | 62         | 67         | 73         |
| Philadelphia, Pa.   | W O O   | 54         | 59         | 65         |
| Philadelphia, Pa.   | K D A   | 17         | 20         | 27         |
| Pittsburgh, Pa.     | W C A E | 50         | 55         | 56         |
| Pittsburgh, Pa.     | W B Z   | 30         | 33         | 39         |
| Springfield, Mass.  | W J A S | 35         | 37         | 42         |
| Schenectady, N. Y.  | W G Y   | 30         | 32         | 37         |
| Washington, D. C.   | W C A T | 33         | 37         | 42         |
| Washington, D. C.   | W R C   | 33         | 36         | 43         |
| Atlanta, Ga.        | W S B   | 43         | 45         | 51         |
| Chicago, Ill.       | W J A Z | 38         | 40         | 45         |
| Chicago, Ill.       | W D A P | 35         | 37         | 42         |
| Buffalo, N. Y.      | W R K   | 16         | 18         | 26         |
| Zion, Ill.          | W D B D | 21         | 23         | 28         |
| Davenport, Iowa     | W O C   | 42         | 45         | 51         |
| Montreal, Canada    | K A C   | 9          | 12         | 19         |
| Berkeley, Cal.      | K R F   | 9          | 12         | 19         |
| San Francisco, Cal. | W O S   | 45         | 48         | 54         |
| San Francisco, Cal. | W O A W | 70         | 73         | 80         |
| Wichita, Kan.       | W E A H | 27         | 29         | 33         |
| Cincinnati, Ohio    | W J A R | 14         | 16         | 23         |
| Providence, R. I.   | W S A D | 25         | 28         | 32         |
| Providence, R. I.   | W J A R | 9          | 11         | 16         |
| Boston, Mass.       | S X M   | 4          | 5          | 10         |
| Madison, Wis.       | W T A   | 33         | 36         | 40         |
| Cleveland, Ohio     | F W X   | 35         | 38         | 45         |
| Havana, Cuba        | W G I   | 33         | 35         | 42         |
| Medford, Mass.      | W G I   | 33         | 35         | 42         |
| Troy, N. Y.         | W J Z   | 33         | 35         | 42         |
| Detroit, Mich.      | W V J   | 64         | 69         | 74         |

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Run your fingers over the exposed metal edges of the movable and stationary plates. ROUGH AND RAGGED EDGES CREATE UNEVEN VARIATION OF CAPACITY. You can't tune sharp with an instrument of that kind. You can't obtain the maximum volume your set is capable of producing with an ordinary condenser.

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For Real Bargains in  
Radio Sets see Radio  
Exchange Page 26

## Broadcasting Notes

by Mel A. Shauer

HELLO, everybody! We radio enthusiasts today are able to tune in on varied musical offerings. The development of broadcasting has given us the chance to discriminate in the selection of our aerial music.

Almost any evening, in one jump across the dials of our sets, we can pick up at will vocal or instrumental recitals, symphonic concerts, opera or popular dance music.

To most of us it is no longer a question of the mechanics of radio. The program's the thing!

This column will deal with music which has been sent forth over the ether. Each week we shall discuss some of the high lights of harmony which we hope you, too, have heard.

Every one loves music. And much of the melody which fits so mysteriously out to us is worthy of repetition. We all want to encourage the continuation of the kind of music we like best. What better way could there be than to follow the radio performances closely and to convey our own enthusiasm to the broadcast-casters?

The program's the thing! We should feel grateful, too, to the artists whose labors make our listening in so real a pleasure.

As a novel way to determine just what to write about first I decided to close my eyes and to tell you about the very first music I turned in by chance. My first air fortunes in the interest of "Broadcasting Notes" brought to me the wonders of Beethoven's Symphony No. 9.

This symphony is so well known that it is only necessary to tell you it was rendered by the New York Symphony Orchestra, conducted by Mr. Walter Damrosch. Station WEA F broadcast the whole concert direct from Carnegie Hall.

### Radio Helps Thousands.

Hundreds of thousands of people have had the thrills of hearing the New York Symphony Orchestra. Many times that number were eager but unable to do so until radio made it possible. Look for the reappearance of this kind of music. It is a privilege to hear it.

The Oratorio Society of New York sang the choral finale, written to Schiller's "Ode to Joy." Ruth Rodgers, Mabel Ritch, Fred Patton and Richard Crooks were the soloists.

From WOR Anna Hamlin, soprano, of New York city, gave a series of short song recitals. Among other things she sang "Annie Laurie," "Down in the Forest" and "Voices of Spring," which three selections I liked most. Her voice is freely emitted and her diction unusually clear. Imogen Peay was the accompanist. She played Chopin's "Butterfly Etude" as a solo.

As I write I am listening to Vincent Lopez and his dance orchestra. This is a regular feature from WEA F. The Lopez orchestration make symphony of jazz. Generosity in the number of dances played is notable during this hour of entertainment.

Dance programs from WGY, Schenectady, are excellent, but would be more enjoyable if they did not fade out at intervals.

For those who would trip the light fantastic through the wee sma' hours of morning more distant stations furnish food inspiration. Have succeeded in locating lively orchestras from WTAM, Cleveland, and KYW, Chicago, hearing both in quick succession.

WJY gave every one a real treat last Sunday afternoon, transmitting direct from Carnegie Hall the violin recital of Manuel Quiroga, the most eminent violinist in all of sunny Spain.

### Has Interesting Experience.

I heard this recital in Spring Valley, N. Y. A brand new five tube neutrodyne receiving set was entertaining a family group of eight people, most of whom had never listened in before. The expressions on the faces in that room bore excellent witness to the enchanting powers of Quiroga's art.

Every tone seemed perfectly registered. Mozart's Rondo was voted by those of us present as the most appealing selection.

Ex-President Wilson's death put our great nation into deep mourning. It is most natural that the sad news should have affected the spirits of both entertainers and listeners during the remainder of Sunday's programs. Some of the broadcasting stations quickly changed their plans and toned down the gaiety of their programs to the sadness of the moment.

No music is more completely enthralling than that of the church. Sunday's programs abound with the splendors of organ and choir incidental to the morning and early afternoon services.

I had looked forward particularly to the Monday evening appearance of Cecil Aaron, mezzo-soprano and Metropolitan Opera prima donna. It was hence quite disappointing when WOR announced a postponement. I trust this great pleasure will not long be deferred to radio audiences.

Have you heard the Ever Ready Trio? WEA F can justly be proud of them. You'll appreciate "Puccini-ana," their own medley of the most popular Puccini arias from "La Tosca," "Madame Butterfly" and "La Boheme." They seem to specialize in home classics. You will know and enjoy everything they play.

### The Classic Saxophone.

The dance craze nourished the saxophone, but at the same time kept it too definitely limited to that usage.

Jaucha Gurewicz, saxophonist de luxe, plays classical music. He has already appeared in recital and can be heard again at Aeolian Hall, March 6, according to WEA F's announcement. Certainly Gurewicz's two fifteen minute groups at WEA F were full of novelty and surprise.

The famous Orientale was beautifully weird. Kreisler's "Schon Rosmarin," Brahms's Hungarian dance No. 1, and a ballet, a waltz and a tango of his own creation made up Gurewicz's diversified proof that the sax and the dance floor are not entirely synonymous.

Ida Gurewicz deserves credit for her splendid accompaniments. They added just the right touch.

Gurewicz has espoused a worthy cause. The tonic beauty of the saxophone is ample foundation for its elevation to higher musical spheres. His originals are pleasing, but I think he should put his saxophonistic art and abilities above the desire to popularize his own material. None the less his offerings were a delight and I hope he will broadcast soon again.

Being unable, of course, to listen to all the music sent out, I shall mention each week those programs which I believe should be encouraged to repeat. Not having heard them, I am assuming that they were sent out as scheduled. It seems only right to mention them and to try to tune them in if and when they go on again.

WSAI, Cincinnati—Musical program by faculty and students of the Cincinnati Conservatory of Music.

KDKA, Pittsburgh—Westinghouse Symphony Band.

WOR, Newark—Zimble Trio, Albert Sanders Bureau of Entertainers.

WEAF, New York—C. F. Springer, American contralto.

WJZ, New York—Mayor Hyland's People's Concert.

### Use the Proper Rheostat.

Regardless of tube and regardless of the resistance which may be attributed to the rheostat, don't use a rheostat that will cause the tube to flash up to full operating voltage as soon as the contact arm touches the first turn of wire. It is best to use a rheostat that is half way "open" when the tube is operating at the proper operating voltage. G. M. C.

### Body Capacity Can Be Reduced by Proper Wiring.

Two variometer-vario-coupler sets which howl from hand capacity can be quieted by making sure that the lead from the grid goes to the stator side of the grid variometer and that the plate B battery lead goes to the rotor side of the plate variometer. This is the same as the rule applied to condensers to connect stationary plates to grid and rotary plates to ground. In either case it keeps the shaft at or near ground potential.

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| 68.60 AERIOLA SENIOR.....   | 41.60      | Four Tube Set, Complete, Ready to Operate.    |            |
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| With Tubes and Loud Speaker.  |            | 115.00 PARAGON RA 10 WITH DA 2 AMPLIFIER..... | 91.75      |
| 245.75 RADIOLA VI.....  | 130.80     |   |            |
| No outside aerial required. Sale price includes tubes, phones, storage battery, B Batteries, Manhattan Loud Speaker and Radiola Loop. |            |   |            |
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| 11 Pl. Telco Condenser .00025..... | .85    |
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1

**SATURDAY**

7:00-7:30 P. M.—"Must While You Dine" by Ben Friedman. Entertained by the George F. Root's Chamber Orchestra.

**WOO—PHILADELPHIA—369.**

7:30 P. M.—Dinner music.

8:00 P. M.—"Musically Fly."

8:15 P. M.—Musical setting of Longfellow's "The Rime of the Ancient Mariner."

8:30 P. M.—Special musical program.

9:15 P. M.—Grand organ recital.

9:30 P. M.—Scottish Kora Dance Orchestra.

**WDAR—PHILADELPHIA—385.**

4:50 P. M.—Continuation of dance music, by the Scranston Sirens.

10:10 P. M.—"Howarth Lantis Dance Orchestra."

**WIP—PHILADELPHIA—369.**

7:00-7:30 P. M.—Dance program by the Carolinians Orchestra: Helen Albus, soprano.

7:30 P. M.—C. F. Fields.

8:00 P. M.—David Fenn, pianist, and "Tom Butler, baritone: "The Chieftain Trio," "My Darling Clementine."

8:30 P. M.—Hindemith. Recital by George Vincent, accompanied by George Vause. Recital by George Vincent, accompanied by George Vause. Recital by George Vincent Lopez and his orchestra, direct from the Grill of the Hotel Pennsylvania.

**WZZ—NEW YORK—369.**

3:00 P. M.—Charles Phillips, pianist.

3:30 P. M.—Charles Phillips, pianist.

4:00 P. M.—Flea concert by the Hotel Belvedere Orchestra. HARRY Lerner, leader; direct from the balcony of the Tea Room of the Hotel Belvedere.

5:00 P. M.—Famous Pain Orchestra.

THURSDA

7:40 P. M.—**WJAR-PROVIDENCE-569.**  
7:40 P. M.—Ted Gibbs, tenor soloist.  
8:15 P. M.—**All-All-All.**—The night.  
8:30 P. M.—**WFL-Philadelphia-509.**  
8:30 P. M.—Bellevue-Stratford Hotel Concert  
Orchestra.  
8:30 P. M.—**WLP-Fort Worth-475.**  
8:30 P. M.—Concert by the Junior Rotary  
Club Band.  
8:30 P. M.—The musical nature.  
8:30 P. M.—**WRW-Tarrytown-273.**  
9:05 P. M.—Victor Wilbur in request popular  
songs.  
9:15 P. M.—**WRW Trio.**  
9:30 P. M.—"Boy Scout Activities."  
9:30 P. M.—Concert by Norman Hastings.  
10:00 P. M.—Victor Wilbur in popular songs.  
10:00 P. M.—**WSAD-PROVIDENCE-281.**  
10:00 P. M.—Musical program.  
10:00 P. M.—Children's songs by "Foster's  
Story Lady," Mrs. Beattie Archer Ander-  
son.  
10:30 P. M.—Musical program continued.  
10:30 P. M.—**WNAC-Boston-278.**  
8:30 P. M.—WNAC dinner dance.  
8:00 P. M.—Concert program. To be an-  
nounced by radio.  
8:00 P. M.—**WGI-Medford Hillside-360.**  
8:00 P. M.—The New York City Exchange, foreign  
exchange quotations; Bradstreet's financial  
and business reports.  
7:00 P. M.—"Uncle Wiggly Stories," by  
Howard Karp.  
8:00 P. M.—"Ocean Asset value of the Ocean  
Liner to a Port," by Emerson E. Parvin.  
8:40 P. M.—Dr. Alfred N. Goldsmith, di-  
rector of Radio City, "The Corporation  
of America: 'Applying the Golden  
Rule in Radio'." Series of  
Modern Radio Broadcasting, series of  
talks.  
9:15 P. M.—"In a Persian Garden" (quar-  
tets), accompanied by Creighton Allen.  
9:45 P. M.—Harold Lieberman, violinist, ac-  
companied by Creighton Allen.  
9:55 P. M.—Time signals and weather re-  
ports, transmitted by the Government  
station NAA at Arlington.  
10:00 P. M.—Harold Lieberman, violinist.  
10:00 P. M.—"English Folk Songs," Kenneth  
K. Wheeler.  
10:45 P. M.—"Familiar" by Alphonse Bohner,  
pianist, directly from Aeolian Hall.  
**WOR-NEWARK-465.**  
2:30 P. M.—Broadcasting from Radio Ec-  
clesiastic, Episcopal Church.  
2:30 P. M.—Frank Dailley's Meadowbrook

LANCASTER, PA.—

7:40 P. M.—Midnight revue.  
**WRC—WASHINGTON, D. C.—469.**  
 8:15 P. M.—Edna's talk.  
 8:30 P. M.—Song recital.  
 8:35 P. M.—A talk on the Coast Guard.  
 9:00 P. M.—The 30th.  
 9:45 P. M.—A talk on the navy by Admiral W. Eberle.  
 9:50 P. M.—Concert by the United States Navy Band.  
**WGR—BUFFALO—319.**  
 8:30 P. M.—Dinner music.  
 7:30 P. M.—Digest of the day's news.  
 8:30 P. M.—Musical program.  
**WGTV—GREENSBORO—500.**  
 8:30 P. M.—The Detroit News Orchestra.  
**WOC DAVENPORT—284.**  
 7:30 P. M.—Sandman's visit.  
 8:20 P. M.—Sunday school lesson.  
 9:00 P. M.—Musical program.  
**WOAW—OMAHA—626.**  
 8:00 P. M.—Dinner program.  
 10:00 P. M.—Independent Order Elmal Fifth.  
**WNC—NASHVILLE—500.**  
 8:30 P. M.—Miss Gladys Barber.  
 9:10 P. M.—Burt Grant's entertainers.  
**WJAZ—CHICAGO—448.**

**WOO—PHILADELPHIA—560.**  
 5:45 P. M.—Grand organ and trumpets.  
**WDAR—PHILADELPHIA—395.**  
 4:30 P. M.—Bobbie Lee and his Cotton Pickers.  
 5:00 P. M.—Dream Daddy with the boys and girls.  
**WSAD—PROVIDENCE—261.**  
 5:00 P. M.—Dance music.  
**WTF—PHILADELPHIA—560.**  
 6:30 P. M.—Bellevue-Stratford Hotel Concert Orchestra.  
 10:10 P. M.—Charles Kirk's Orchestra.  
**WTF—PHILADELPHIA—560.**  
 8:00 P. M.—Paul Whiteman Orchestra.  
 8:30 P. M.—Blonde Music by the Greenwich Village Sirens.  
 10:15 P. M.—Ed Weems and his Cafe L'Aliglon Orchestra.  
**WAAR—PROVIDENCE—609.**  
 7:05 P. M.—Nagel's Providence Baltimore Hotel Orchestra.  
**WRAP-FORT WORTH—476.**  
 8:00 P. M.—Interdenominational Sunday school lesson and radio Bible lessons.  
**WNAC—BOSTON—278.**  
 6:30 P. M.—WNAC dinner dance.

**FRIDAY**

|  |   |
|--|---|
| 8:00 P. M.—Musical program.  | 11:00 P. M.—Program to be announced by radioophone.                         |
| <b>WHAS—LOUISVILLE—460.</b>  | 9:00 P. M.—Dance music  |
| 9:00 P. M.—Concert given by students of Louisville Conservatory of Music.  | <b>WGT—MADRID HILLSIDE—360.</b>   |
| <b>WSB—ATLANTA—429.</b>  | 7:30 P. M.—Ballroom dancing lesson; music calcs.                            |
| 9:00 P. M.—Popular music.  | <b>WBZ—SPRINGFIELD—377.</b>   |
| 11:45 P. M.—Transcontinental entertainment.  | 7:00 P. M.—Dinner concert.  |
| <b>WOS—JEFFERSON CITY—441.</b>   | 8:00 P. M.—Concert by Harry Knight, saxophone and clarinet.                 |
| 9:00 P. M.—Concert.  | <b>WKDA—PITTSBURGH—326.</b>   |
| <b>WFAA—DALLAS—476.</b>  | 6:15 P. M.—Dinner concert.  |
| 9:30—Musical variety program.  | 8:00 P. M.—Piano.   |
| <b>KSD—ST. LOUIS—546.</b>  | 8:15 P. M.—"Personal Income Tax Returns for Small Income," Robert D. Ayars. |
| 9:00 P. M.—Concert by Civic Orchestra.   | 8:30 P. M.—Concert by the Westinghouse Band.                                |
| <b>WDAP—KANSAS CITY—411.</b>   | <b>WGY—SCHENECTADY—361.</b>   |
| 7:00 P. M.—The children's story and information program.   | 9:15 P. M.—Dance music, by Jack Symonds' Orchestra.                         |
| 9:00 P. M.—Classical program.  | <b>WDAP—CHICAGO—360.</b>  |
| 12:45 A. M.—Jazz orchestra.  | 11:00 P. M.—Organ concert; popular music.                                   |
| <b>WBH—KANSAS CITY—411.</b>  | <b>KYW—CHICAGO—436.</b>   |
| 9:00 P. M.—Piano solos and songs by L. L. Mansfield and the last talk of the series on "Mansfield's Talks from the Department of Agriculture." | 8:00 P. M.—Dinner concert.  |
| <b>KZN—SALT LAKE CITY—485.</b>   | 9:00 P. M.—Musical program.   |
| 8:00 P. M.—Music, talk, stories.   | 11 P. M.—Midnight revue.  |
| <b>KZNS—DENVER—485.</b>  | <b>WRC—WASHINGTON, D. C.—468.</b>   |

4:00 P. M.—Weather, news, clock reports.  
 4:30 P. M.—Mount Royal Hotel Dance Orchestra.  
**WMAQ—CHICAGO—448.**  
 8:00 P. M.—"Wide Awake" Club program.  
 8:30 P. M.—Music memory contest.  
 9:00 P. M.—"The Salute of the Cent."  
 10:00 P. M.—Bush Conservatory of Music.  
**KRH—LOS ANGELES—395.**  
 11 P. M.—Program arranged by Floryane Thomas, soprano.  
 1:00 A. M.—Broadcasting Art Hickman's Orchestra.  
**KLS—OAKLAND—360.**  
 11:00 P. M.—Musical entertainment.  
**WER—DALLAS—360.**  
 9:00 P. M.—Music.  
**KEL—LOS ANGELES—469.**  
 11:00 P. M.—Evening Herald concert.  
 12:00 P. M.—Examiner concert.  
 1:00 A. M.—Vocal and instrumental concert.  
 2:00 A. M.—Newport Grove Orchestra.  
**KEAY—MEDFORD, ORE.—283.**  
 12:00 P. M.—Concert.  
**WPAB—STATE COLLEGE, PA.—283.**  
 8:00 P. M.—Music program.  
 8:15 P. M.—Educational talks.  
 8:45 P. M.—News; music; announcements.  
**KEX—OAKLAND—669.**  
 11:00 P. M.—Music program.  
**WHR—CLEVELAND—360.**  
 10:00 P. M.—Concert and dance music.  
**KMO—TACOMA—360.**  
 9:00 P. M.—Popular program.  
 12:15 A. M.—Variety program.  
**WQAN—SCRANTON—280.**  
 8:00 P. M.—Concert.  
**WLAG—MINN. AND ST. PAUL—417.**  
 8:30 P. M.—Lecture.  
 10:30 P. M.—Concert.  
**KFCG—BATON ROUGE, LA.—254.**  
 9:00 P. M.—Debate. L. S. U. Band.  
 6:30 P. M.—Stories for children, by Peggy Albon.  
**WGR—BUFFALO—319.**  
 6:30 P. M.—Dinner music.  
**WOC—DAVENPORT—484.**  
 7:30 P. M.—Band program.  
 8:00 P. M.—Educational lecture.  
 10:00 P. M.—Orchestra program.  
**WEM—MEMPHIS—506.**  
 9:30 P. M.—Old Time music.  
**WJAZ—CHICAGO—448.**  
 11:00 P. M.—Musical program, by Oriole Orchestra.  
**WHAS—LOUISVILLE—466.**  
 8:30 P. M.—Classical concert.  
**WSB—ATLANTA—429.**  
 9:00 P. M.—Music.  
 11:45 P. M.—Late entertainment.  
**WTAM—CLEVELAND—396.**  
 10:00 P. M.—Dance music.  
**WFAA—DALLAS—470.**  
 9:00 P. M.—Recital by Southern Methodist University.  
 12:00 M.—Dance music program.  
**KSD—ST. LOUIS—544.**  
 10:00 P. M.—Orchestra concert, organ recital; vocal and instrumental specialties.  
**WDAF—KANSAS CITY—411.**  
 7:00 P. M.—Address, Edgar A. Riney, writer and lecturer; the children's story and information period; music.  
 12:45 A. M.—Novelty program, Orchestra.  
**WQAE—SPRINGFIELD, VT.—275.**  
 7:30 P. M.—Concert.  
 10:30 P. M.—Concert.  
 11:00 P. M.—Late program.  
**WGAW—ALTOONA, PA.—261.**  
 9:00 P. M.—Program.  
**WCAPE—PITTSBURGH—456.**  
 6:30 P. M.—Dinner concert.  
 8:30 P. M.—Uncle "K" music.  
 8:30 P. M.—Musical program.



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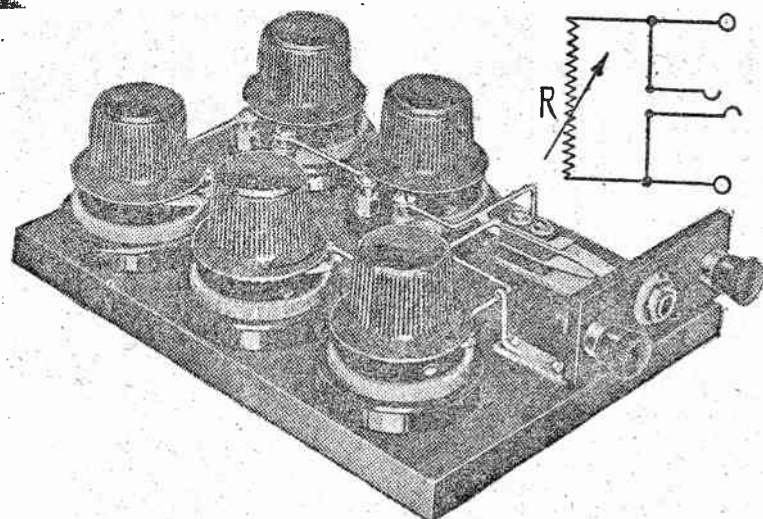
Engineer, Amco Products, Inc.

IT is often desirable for experimental purposes or personal satisfaction to measure the per-stage amplification of an audio frequency amplifier. The "experimental purposes" to which this measurement suggests itself in the radio life of the average enthusiast is the comparison of various tubes or transformer, resistor and impedance coupled stages. While most laboratory measurements are fraught with mechanical and theoretical complexities, the observations to be outlined in this article are easily made on any amplifier equipped with jacks and with auxiliary apparatus not more involved than a pair of telephone receivers and a bank of five-thirty-ohm rheostats. The method to be described is not a precision test, several elements of error entering into the system. However, it provides an approximation adequate for its purpose.

If a more accurate determination of intensification is desired it will be necessary to measure carefully the various constants of the tube and circuit and to calculate according to amplification formulas—a complete operation far more involved than the simple system to be outlined.

**Voltage Amplification**  
The average fan is interested in the voltage or current amplification (the same thing) of his amplifier. Therefore, if the effective alternating currents in the plate circuits of two adjacent amplifying stages (detector and first stage or first and second stages) can be determined, the comparison of one over the other will indicate the amount of amplification.

By the theory of shunt circuits it is possible to state the relative values of alternating currents in two or more circuits in terms of a unit common to each without actually measuring the current in amperes. Let us assume two circuits in which alternating or equivalent currents of



the same frequency are flowing. The current in the first circuit is weaker than the current in circuit No. 2. The difference in current strength can be noted by telephone receivers plugged into the respective circuits. The sound in one case will be louder than in the other. Now, if we shunt the telephone receivers with a variable resistance we can in each circuit reduce the current through the receivers until the sound is just audible. Quite naturally, we shall cut less resistance into the second circuit than into the first in reducing to this minimum signal intensity. Then, by a comparison of the various known resistance values in each circuit, we are able to calculate how much more intense the current is in one circuit than in the other without actually knowing the amperage flowing in either.

It is analogous to the instance of two moving bodies—automobiles perhaps—one of which covers a given distance in half the time required by the other. It is obvious, regardless of their actual speeds in miles per hour, that one car is moving twice as fast as the other.

Applying the Idea

The variable resistance for the purpose of the fan may conveniently be five or more rheostats connected in series. Rheostats having accurate values will facilitate measurements. The author chose five 30-ohm rheostats manufactured by the Amco Products, Inc. (If it is impossible to obtain adequate signal adjustment on the detector output, more rheostats can be added. However, on a good

1.5/075-20 ohms, the resistance of the shunt.)

We now have sufficient data to calculate the amount of amplification in the first stage.

The formula is  $I_p(R_1+R_2)/R_2$ , where  $I_p$  is the effective alternating plate current,  $I_p$  the portion of  $I_p$  passing through the telephone receivers,  $R_1$  the resistance of the phones, and  $R_2$  the value of the shunt resistor. The resistance of the telephone receivers used by the author was 2,000 ohms. Therefore, in the detector circuit  $I_p(R_1+R_2)/R_2 = I_p(2,000+140)/140 = 2.140I_p/140 = 15.31I_p$ .

In the first amplifying stages we have  $I_p(R_1+R_2)/R_2 = 2,020I_p/20 = 101I_p$ .

The amplification is, of course, the current in the second circuit of the current in the first circuit, or  $101I_p/15.31I_p = 6.6$ .

The same procedure is followed out in comparing other stages. However, in measuring the higher steps of amplification, the input should be reduced by detuning until a minimum signal is obtained, on the lower of the stages to be compared, with a shunt resistance of over 130 ohms.

## Some Data on Radio 'B' Battery Eliminators

A large number of radio fans are under the impression that a full wave "B" battery eliminator supplies an output current twice that of a half wave unit. This idea is especially prevalent among fans who use two rectifying tubes in a full wave rectifying system and only one tube in a half-wave rectifier.

That impression, however, is erroneous. A full wave rectifying system does not produce an output twice the value obtained with a half wave rectifying system. The difference between the two systems lies in the characteristic of the output of the rectifier, that is, the output current. It is true, however, that the total output current with a full wave rectifier is slightly greater than that obtainable with a half-wave rectifier, but the real advantage with the former system is more economical rectification, with less residual A. C. hum.

The reason for the non-doubling of the output of the full wave rectifier is in the phenomena that each half of the full wave is rectified alternately. At no time do both units in a full wave rectifying system function simultaneously. Hence at any moment the approximate value of the output current is that of only one tube. So we see that a half-wave rectifier will supply almost as much current as a full wave unit, but the output current of a full wave rectifier is much smoother and more closely approximates the desired D. C.

Now, with respect to filters, the use of a full wave rectification does not signify that the filter current can be omitted. Many fans believe that the reason for the filter circuit is because half-wave rectification is used. The output of all such rectifiers must be filtered if satisfactory D. C. is desired. The ordinary output of a rectifying system is not D. C. but pulsating D. C., which must be filtered if applied to the plates of the various tubes in a receiving system would be entirely useless as D. C. plate potential. Hence filter circuits are essential if D. C. is desired, irrespective of the type of rectification being employed.

J. R.

## Peerless Male Quartet in Twentieth Birthday Program

The Peerless Male Quartet, composed of Albert Campbell, first tenor; Henry Moeller, second tenor; John Meyer, baritone, and Frank Croxton, bass, will celebrate its twentieth birthday since its organization with an anniversary program from WFBH to-morrow at 6 p. m.

Albert Campbell is the originator of the group, having organized it twenty years ago, while John Meyer follows with fifteen years' connection with the quartet, and Frank Croxton, twelve. The quartet has been recording for Victor, Brunswick, Columbia and other companies for the last fifteen years.

Their program to-night will include "Come Where My Love Lies Dreaming," "O, Susanna," "Old Black Joe," "Camptown Races," a medley of Stephen Foster songs and Victor Herbert's "Gypsy Love Song," a bass solo by Frank Croxton.

## Philharmonic to Play Novelty "Andante," First Time Here

A novelty will be introduced into the program of the New York Philharmonic Orchestra's concert from the Lewisohn Stadium to be broadcast by station WJZ at 8:30 Wednesday night. The name of this composition is "Andante," a selection written by Roy Harris, and this will be the first time that the work has been rendered by the Philharmonic Orchestra in New York City. Another composition which the orchestra will play at that time will be the Symphony in D minor of Cesar Franck. This will be the third concert of the 1926 series at the stadium and Willem van Hoogstraten will wield the conductor's baton.

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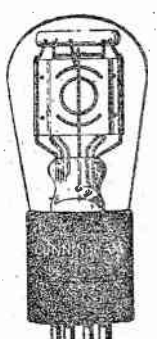
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# NEW YORK Herald Tribune RADIO MAGAZINE

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SECTION IX

SUNDAY, JULY 11, 1926

TWELVE PAGES

## Britain Has High Speed Radio Telegraph Service With Continent

Automatic Transmitters Make Possible Sending Messages at a Rate of 100 Words a Minute

By A. DINSDALE

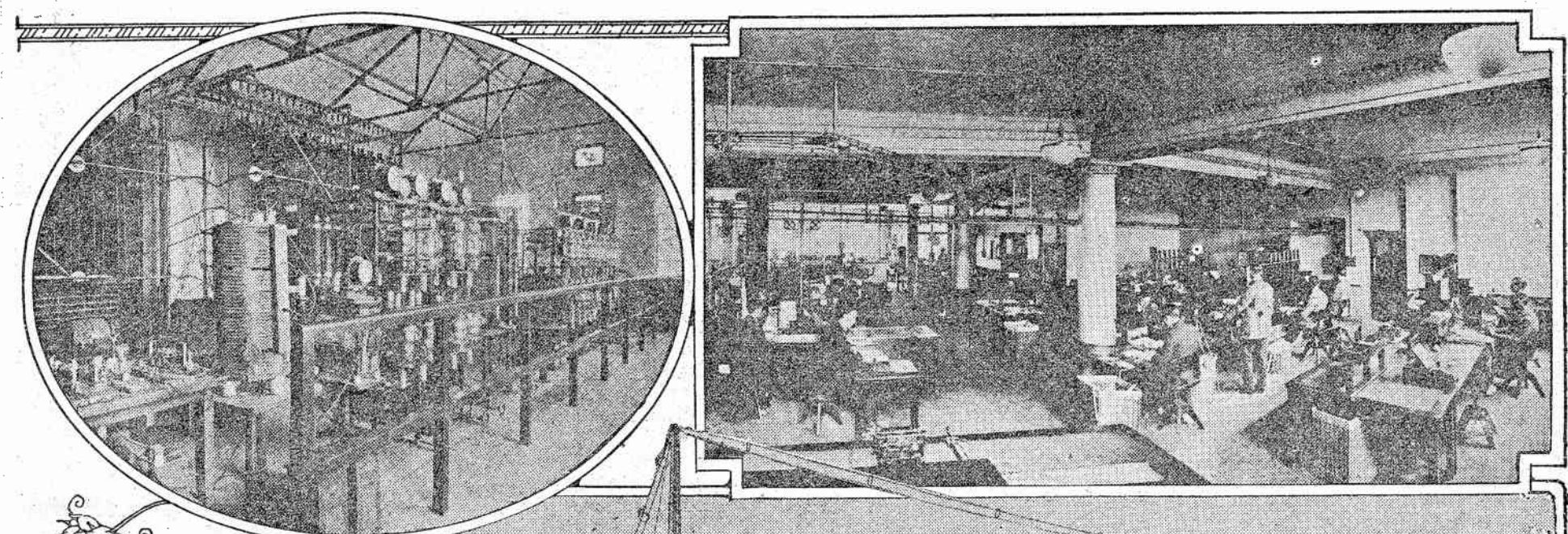


Figure 3. Marconi fifty-kilowatt tube transmitter at Ongar. This station is controlled from Radio House, London

RECENT advances made in the technique of the design and operation of thermionic tube radio transmitters have had many far-reaching effects, not only in the realm of broadcasting but outside of it as well. Not so many years ago, in order to conduct a long distance transoceanic radio-telegraphic service successfully, huge amounts of power were required to supply spark, arc or alternator systems of generating high frequency oscillations. Even then communication was not so reliable as could be desired, and the speed of signaling had to be relatively slow on account of the very high current values, which had to be handled by the transmitting key.

Nowadays, by means of modern and highly efficient tube transmitters, much more reliable communication may be maintained over a given distance with the expenditure of much less power. By introducing the signaling key into appropriate circuits where low current values prevail, exceedingly high signaling speeds can be attained, thus enabling the stations to handle more traffic and conferring upon the service a measure of secrecy.

Probably one of the most extensive, fastest and highly developed and organized networks of radio telegraph communication in the world is that at present in operation between Great Britain and Continental Europe. This network has grown up within the last few years, and is steadily expanding. It is operated and controlled from London by the Marconi Company, and at the various European terminal stations by associates of that company, which also controls from London a high speed trans-Atlantic service, operated and controlled on this side of the Atlantic by the Radio Corporation of America.

### The Nerve Center

There are at present five European services in operation between London and the following capitals: Paris, Berne, Madrid, Barcelona and Vienna, and a license has been granted for the extension of the service to include direct communication

with Bulgaria, Denmark, Finland, Greece, Portugal, Russia, Yugoslavia, Sweden and Turkey.

All the existing services, including the trans-Atlantic, are entirely operated from one central office, known as Radio House, which is located in the heart of the city of London, and as new services are opened these also will be controlled from the same office. This policy of centralization has also been carried out in the case of the actual transmitting and receiving stations, the former being located at Ongar and the latter at Brentwood, both of which places are about thirty miles from London in a northeasterly direction.

Land lines connect both Ongar and Brentwood with Radio House, over which all outgoing and incoming traffic is relayed to and from the transmitting and receiving stations. The relative positions of Radio House, Brentwood and Ongar are shown on the map accompanying this article, while the other diagram illustrates the manner in which the three centers are linked together, but for the sake of simplicity the land lines required for operating one service only are shown. The land line between the control office and

the receiving station is worked duplex and over this line are relayed the incoming signals, while the control of the transmitter is effected through a simplex extension from the receiving station to the transmitting station.

### Control Apparatus

The method employed requires close co-operation between the transmitting and receiving operators at the control center, which is facilitated by the arrangement on a common table of the automatic transmitting and receiving apparatus under their charge. Provision is also made for immediate communication between these operators and the attendants at the transmitting and receiving stations. The receiving operator can thus, through the transmitting operator, control the speed of operation of the distant transmitter, while the cause of defective signals may be promptly located and remedied.

The automatic transmitting and receiving apparatus for each service is located on a separate control table fitted with an indicator of the particular service being carried out. These tables are identical and may be considered as standard control

units. Figure 2 is a panoramic view of the control room in Radio House, showing the European circuits on the right and the trans-Atlantic circuits on the left.

The system utilizes the international (Continental) Morse code and consists essentially of the perforator for the preparation of the paper tape which controls the signals sent out, and the transmitter, which sends out signals in accordance with the perforated tape.

Electrically operated keyboard perforators are employed which permit of the tape being prepared at speeds up to eighty words per minute. This perforator utilizes a standard typewriter keyboard, but perforates paper tape with the Morse characters it is desired to transmit, instead of printing the familiar typewriter characters on a sheet of paper. The tape is then passed through a Wheatstone transmitter, the output impulses of which operate the relay of the transmitting apparatus.

The speed of the tape through the transmitter is controlled by means of the electric driving motor, which permits of

Continued on page five

Additional Radio News Will Be Found in Another Section of To-day's Herald Tribune



# Improving the Appearance of the Radio B Battery Eliminator

## Mounting the B-Power Unit in an Auto Tool Box Makes It Look Like a Commercial Product

By R. C. HITCHCOCK

THE comparatively new B-power unit or battery eliminator, taking ordinary house alternating current and delivering rectified direct current suitable for radio sets, is proving satisfactory to its many users. The majority of construction articles on the B-power units have been of the laboratory type or board style of apparatus. It is probably simpler to construct a piece of apparatus where all parts are readily accessible; and there is no doubt that an instrument so built is as effective as a more compact one. This article departs from the usual practice by presenting the details of making a B-unit which will compete in looks, as well as in performance, with the commercial product.

If you intend to experiment with the B unit it is perhaps advisable to put it on a board at first; it will then be easier to try the effect of larger condensers, different chokes, etc. But if you are making a B unit from instructions given by the manufacturers of the component parts, or have already a board model of a unit which is giving satisfaction, the present article will show a simple and easy way of improving the appearance of the B unit, so that one may feel justified in placing it in a conspicuous place on the radio table, and not feel that it should be hidden from view because of its unfinished appearance.

The illustrations, Figures 1 and 2, show how the B-power unit may be mounted in a storage battery box, automobile running-board style, and its appearance compares favorably with the factory-built units. The baked enamel finish is easy to keep clean, certainly much easier than trying to keep a board type of instrument free from dust.

### Tool Box Suitable

A pressed steel auto tool box would also prove suitable for housing a B unit, and the dimensions of the apparatus involved will determine the size and type of box which is secured. If the eliminator is long and narrow, the tool box might be preferable; but if you desire the unit to be more compact, the construction of Fig. 4, using a sub-base, may be employed. For the unit shown in the illustration the auto battery box was found to be deeper than was necessary, and the first operation was to cut off three inches from the lower part of the box. This is perhaps the hardest part of the whole business, and if you do not want to bother with the cutting down, the box may be used with its original depth.

However, by scratching a guide line accurately around the box and using a long hack-saw blade in a wide frame it will be found that with a little care and time the sheet steel can be cut neatly. It is unlikely that tin shears would provide a satisfactory job, as the sheet metal would bend and the enamel would be cracked off in places.

After cutting the bottom off the box, an "on" switch, and as the words "off" and

wood base was carefully fitted inside and secured by heavy round-head (blued) wood screws, three on each side and two on each end. Four "domes of silence," or rubber bumpers, were pounded into the four corners of the wood base to prevent scratching by the cut metal, thus completing the base.

### Switches

The switches, shown on the end of the box in Fig. 1, are of standard types, and may be purchased at any electrical store. Some B units will require only the "off-on" switch, so do not buy both switches until you make sure that both are required for your particular unit. The battery eliminator described here employs the Acme full wave transformer which has two taps on the house current side, one for high and one for low voltage; so a switch was necessary to change from one to the other of these connections. A regular three-way switch is the proper one to use for connecting either of two taps. The three-way switch has, as one would expect from its name, three terminals. The end that has only one terminal is the place to connect the wire going to the "off-on" switch (see Fig. 3), and the other two terminals connect to the high and low taps on the transformer, T. By carefully inspecting the switch mechanism it can be found which connection should go to the "high" and which to the "low" tap, and the switch buttons marked appropriately, or the switch plate could be en-

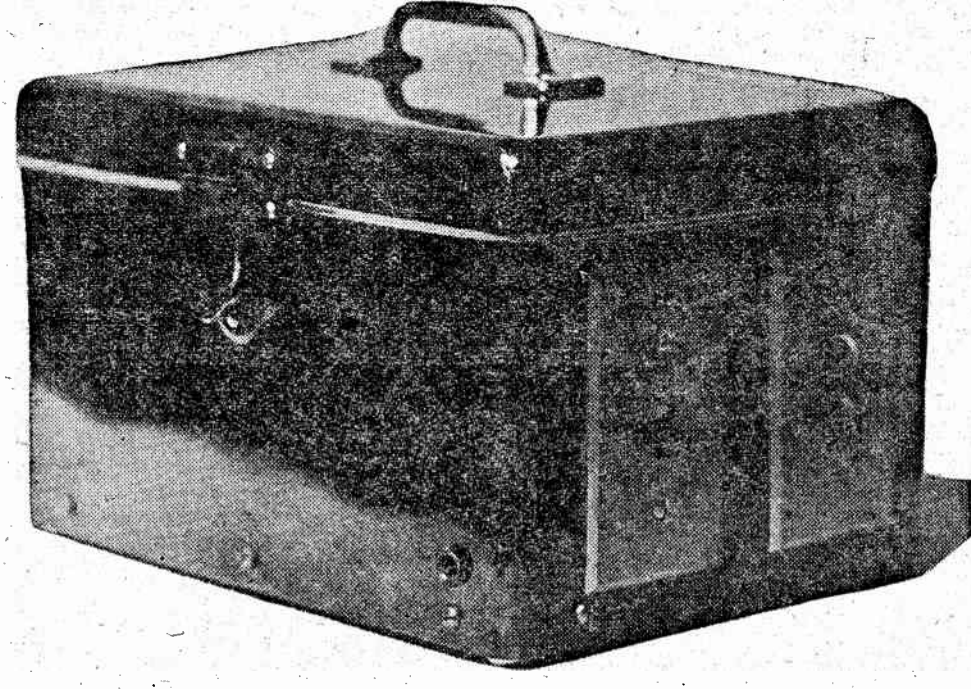


Figure 1. An external view of the B battery eliminator, housed in an automobile tool box, described in this article

"on" are engraved in white on the toggle lever, the position of the switch at any time can be noted at a glance.

Flush type switches, such as these two boxes, are ordinarily mounted in wall outlet boxes made of sheet iron with round "knockouts" for the wires to enter and leave. These can be installed if the builder

which are resistors in this case, R 1 and R 3 of Fig. 3 are shown in Fig. 4. The style of binding posts recommended is one which has the name engraved in white on the cap and whose tops do not come off. This latter feature makes it impossible for the caps to become interchanged, and perhaps applying the amplifier voltage to

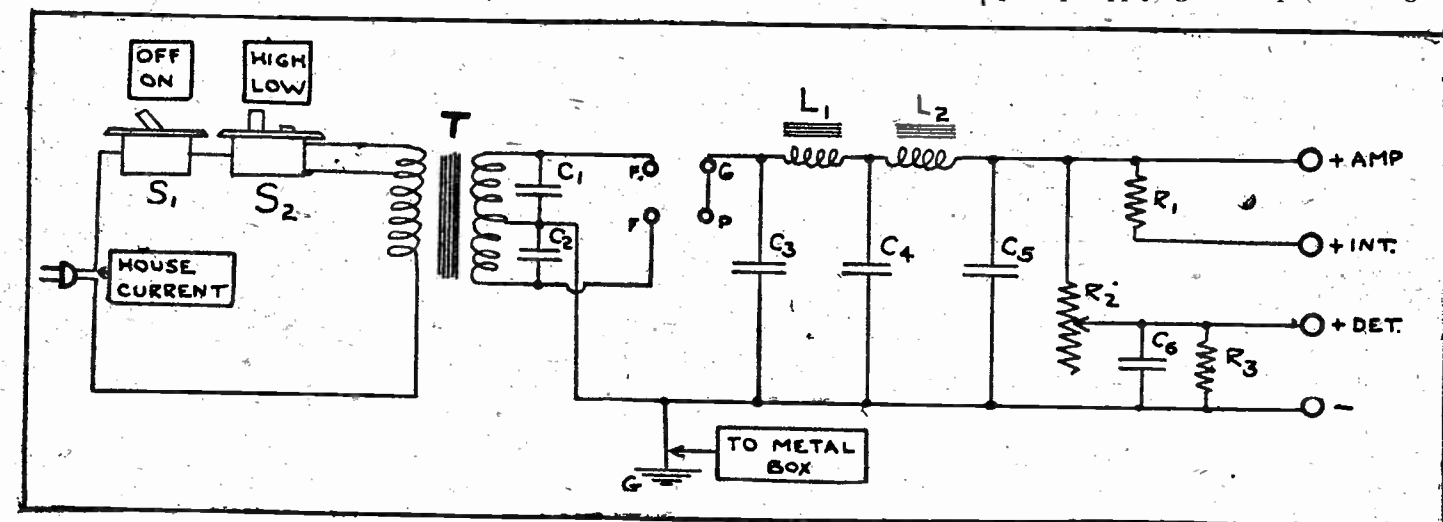


Figure 3. The wiring diagram of the raytheon B battery eliminator circuit employed in the construction of this device

graved. The arrangement on the writer's set was as follows: When the higher voltage was wanted, the upper button was pressed, and when the lower voltage was wanted the lower button was pressed.

### The "On-Off" Switch

The "off-on" switch was purposely chosen to be of a different type from the "high-low" switch, to prevent possible confusion about which switch should be operated to turn off the B unit. A toggle switch was the style chosen for the "off-on" switch, and as the words "off" and

so desires. However, as the whole box is of sturdy sheet metal, the outlet boxes may be dispensed with and holes cut in the metal box just large enough for the porcelain part of the switches and the mechanism bolted to the box. This is done by marking lines about one-eighth of an inch larger than the porcelain part of the switch, boring several small holes on the line, then inserting a hacksaw to cut the rest of the straight portion. The horizontal cuts will have to be bored along their entire length unless a hacksaw with a wide frame is available and the blade set at right angles to the frame. After cutting these holes for the switches it is a good plan to smooth off with a file the sharp edges left by the drilled holes.

The variable resistance, shown by R 2 of Fig. 3, may be mounted on the outside of the box, but in the model shown it was put inside the box between the two choke coils.

### Mounting Insulated Bushings

A small hole to let in the wires which connect to the house current is drilled near the edge of the box. In this hole is inserted a small insulating bushing, such as is used for drop cord lamp sockets. The hole may be drilled small and tapped with a one-eighth-inch pipe tap to fit the bushing thread, or it may simply be drilled large enough for the bushing to pass through freely, and then rubber cement or shellac applied to keep it in place.

The outlets for the direct current to pass out of the container to the radio set are similar to that which lets in the house current just described. The outfit has four binding posts: (1) Amplifier plus, (2) intermediate (90 volts) plus, (3) detector (22 volts variable) plus, and (4) the common negative lead. These connections and the mounting of the grid leads,

a detector tube, with disastrous results if a soft detector tube was being used.

### Wiring

The complete wiring diagram showing the switch connections is given in Fig. 3. This is the regular wiring scheme using the Raytheon tube and the Acme transformer, G, of the negative post to the metal box housing the B unit. Also—and this is important—a portion of the containers of the condensers and chokes should be scraped clean and bright and a wire soldered to each, all these wires being connected together to the common negative terminal. These wires were omitted from Fig. 3 in simplifying it as much as possible.

In wiring the general precautions of regular radio practice should be observed, especially that of keeping wires far apart; remember that some of the wires carry over 200 volts of direct current. Use rosin flux for soldering and tinned bus wire for connections. Spaghetti need not be used on the negative terminal, but it is wise to use it on the higher voltage wires to insure proper insulation. Spaghetti also may be used on all wires to improve the general appearance of the unit, using red for positive wires and black for the common negative lead.

### Necessary Parts

One Auto battery or tool box.  
One toggle "off-on" switch and plate (S1).  
One three-way switch and plate (S2).  
One Raytheon tube and socket.  
One Acme full-wave transformer (T).  
Six tube filter condensers of the following capacities: C1, 0.1 mfd.; C2, 0.1 mfd.; C3, 2 mfd.; C4, 2 mfd.; C5, 8 mfd.; C6, 1 mfd. (Not: A B block may be used instead of separate condensers for C3, 4, 5).  
Two Acme 30 henry choke coils (L1, L2).  
Two Bradley unit resistances (R1, 15,000; R3, 10,000).  
One 15,000 to 100,000 ohm Bradley variable resistor (R2).  
One hard rubber binding post panel.  
Four marked binding posts.  
Five insulating bushings, lamp socket type.  
Wire, spaghetti, screws, etc.

## Public Utilities Utilize Radio Broadcasting to Advantage

### Good Will Publicity, Which May Be Included in Carefully Selected Programs, Is a Good Type of Advertising for Firms of This Class

By Martin P. Rice

Director of Broadcasting, Advertising and Publicity, General Electric Company

The following are abstracts of an address delivered before the utility section of the Associated Advertising Clubs of the World, during a recent convention at Philadelphia.

THE early days of public utility companies were necessarily occupied largely with problems of the production and distribution of gas and electricity or the operation of cars. Central station men went diligently about their business—financing, improved generation of power and light, better methods of distribution and greater reliability and increased safety. The number of customers increased rapidly, and personal acquaintance, which results in mutual understanding, became more and more difficult. The public did not enjoy the utility companies' full confidence, and an unfriendly feeling began to develop. Even an announcement of plans designed to render improved service was likely to be received with suspicion as to the real motive. Those were the days when people spoke of "soulless corporations."

The last two decades have witnessed no greater accomplishment than the building up of friendly relations and mutual confidence between public utility companies and the public whom they serve. This accomplishment was brought about by the adoption of a few fundamental principles:

1. Absolute honesty as the only policy.
2. "Service to Customers," the public utility slogan.
3. Complete publicity.
4. Customer ownership.

This article is concerned chiefly with the third of these fundamental principles; namely, complete publicity, and it should be unnecessary to point out that in a business which expands so rapidly as the public utility business, there are always new customers to reach as well as older customers with whom friendly relations must be maintained.

### Two New Agencies for Publicity

In times past the printing press has furnished the only method of reaching great masses of people. With its aid the great structure of modern advertising has been built up, and it has been employed effectively by public utilities in telling their story. In modern public utility advertising we find sincerity, frankness, and a conscientious desire to render service—all expressed in a friendly fashion which invites acquaintance and inspires confidence. Science and inventive genius have recently contributed two new agencies for reaching the public, so that in addition to the printing press we now have two other important factors in influencing public opinion. They are the motion picture film and radio broadcasting.

Broadcasting is an example of one of the few ideas that did not have to be sold to the public. From the time that C. Q. D. messages were flashed from the steamship Republic and resulted in the dramatic rescue of a shipload of passengers, every one has been interested in radio. Boys constructed home-made transmitting and receiving sets, learned the code and carried on a truly remarkable system of communication. When the radio-telephone came into existence, doing away with the necessity of code, broadcasting became popular in nearly every home. Every one is familiar with the characteristics which resulted in this unparalleled interest. Radio broadcasting is instantaneous; it travels almost everywhere, knowing no inaccessibility; it is free, and it has personality.

### Growth of the Industry

Five years ago broadcasting stations were almost unknown. To-day there are nearly 600 in the United States, and the applications for new stations for which no wave lengths are available are a serious embarrassment to the Department of Commerce. The number of receiving sets five years ago was possibly a few thousand, mostly home made and crude. To-day there are millions of receiving sets highly perfected for quality, sensitivity and selectivity. Many of them are designed as "period" furniture to ornament the home. The radio audience is variously estimated at ten to twenty million, and quite possibly it varies within these limits, depending upon the importance and character of the program. In some respects radio broadcasting reminds one of the most primitive method of circulating news; namely, gossip. It is found that ten receiving sets in a small

era, the best electric service within our power.

"In order to help you realize we are real human beings we are planning, through this new radio station, to have the friendly voice of Edison Light as well as the friendly glow of our electric service reach you regularly through the week. If you get pleasure from the programs which we shall broadcast, if our voice coming to you nightly through the air has a cheery tone, as we mean that it shall, we shall have accomplished our purpose. A happy human voice can often spread more happiness and sunshine than a friendly light. We have no other motive in the establishment of this new broadcasting station than that of humanizing ourselves to you, our customers. Big business to-day must humanize itself in order to continue big. A big public service corporation like the Boston Edison Company wants friendly relations with its customers. It is endeavoring to maintain these friendly relations by giving good service.

"It intends through this new broadcasting station to give you good entertainment, and the price we hope you will be willing to pay for this entertainment is a friendly feeling for this company. Our prosperity is dependent upon this relationship, and the continued growth of this great community is in a measure dependent upon our prosperity."

This address was given in September, 1924, and its expectations have undoubtedly been fulfilled, for in a recent statement of J. B. Crook, head of the public relations bureau, he speaks of how strongly the station has established itself in the life of the community and he refers to thousands of letters from customers and listeners expressing their appreciation. He says, "I think you will agree with me that the broadcasting station has been the greatest builder of good will for the Edison company in our large territory which we have ever had."

A similar view is expressed by Vice-President Arthur Williams of the New York Edison Company, which has had several years of experience in broadcasting. "We do not look upon broadcasting as an advertising medium," he says, "but rather as an educational force and as a means of regaining, to some extent at least, the personal touch that was possible between the company and the customer in the early days."

### A Third Instance

A third instance of the use of broadcasting by public utilities is found in Canada. Sir Henry Thornton, president of the Canadian National Railways, addressing members of the Canadian National Railways Association, said:

"It is about three years—since we went into the broadcasting business. Three years ago it was thought to be a mild form of madness from which I, the president, was suffering. Suffice it to say that the Canadian National was the first in this field, just as it has been and will be the first in everything. The people of Canada appreciate our broadcasting stations and the radio receiving equipment on our trains."

On October 21, 1925 eighteen broadcasting stations participated in the celebration of "Electric Night" to commemorate the forty-sixth anniversary of the incandescent lamp and to pay tribute to Thomas A. Edison for his greatest contribution to mankind. Executive officers of twenty-two public utility companies as well as officials of the government made appropriate addresses on this occasion.

It is hoped that no one infers that broadcasting is presented as a substitute for older forms of advertising and publicity. There seems to be no warrant for such assumption. Broadcasting is a new agency which has been received into millions of American homes, and it has inherent personality. The public has not been educated to believe that it should pay the cost of broadcast programs any more than it expects to pay the cost of a newspaper or popular magazine. The advertiser pays, and there seem to be many advertisers interested in educational or institutional programs who are willing to pay the cost of broadcasting.

**FADA Radio**  
Announces the New  
1926-27 Models  
Distributed by

**VICTORY ELECTRICAL SUPPLY COMPANY**  
Bedford Ave., Cor. of Hancock St.  
Brooklyn New York  
Phone Decatur 8000-1

## News and Notes of the Radio Trade

### Combines Phonograph and Radio

In exact antithesis to the familiar radio attachments which enable one to use the horn of a phonograph as a loud speaker is the gracenote, an instrument that combines phonograph and radio. With the gracenote tones from the phonograph records pass through the electric vacuum tubes of the radio and emerge with remarkable tone depth and volume. It includes the advantages of both phonograph and radio. As with the radio, the music can be played either soft and low or loud and can be regulated to play slowly or rapidly, as with the phonograph.

This instrument is the invention of E. O. Thompson, head of the research department of David Grimes, Inc., 151 Bay Street, Jersey City, makers of Grimes radio receiving sets.

### Rival Radio Teams to Clash

The Freshman Masterpiece nine is to play against the Radio Corporation of America baseball aggregation on Tuesday afternoon at 5:45 at Recreation Park, Springfield, L. I.

The former team is making a splendid showing in its effort to obtain leadership in the Industrial League of the metropolitan district, of which they are members. The team is under the management of Jack Zatlouev.

It is expected that a large crowd will witness the game, as both teams have a large following.

### New Detector Tube

E. T. Cunningham, Inc., have just announced a new alkali vapor tube, the Cunningham CX300A, specially designed for service only as a detector tube. In the statement released by the company they say: "In sensitivity the new tube fully exceeds the best obtainable from tube CX300 when the latter tube is critically adjusted. In the CX300A extreme sensitivity is obtained without critical adjustment either of the filament or plate voltage. Special precautions have been taken in designing the tube to eliminate microphonic noises."

Another advantage of the tube is that no change in the wiring or circuit design is necessary. But some slight improvement in performance will be noticed if the grid return is changed and connected to the negative filament lead.

### Winner of Radio Receiver

Public School 23 is the winner of the radio receiver donated by the Freed-Elsemann Radio Corporation as first prize in the music appreciation contest held in the schools of New York City.

### Fada 1927 Models

F. A. D. Andrea, Inc., has announced a new eight-tube receiver, the Fada 8, as their contribution to the radio art of 1927.

This set is of the totally shielded type. This means that there is full shielding of the tubes and coils and on the audio stages.

The new model, along with another new set, the Fada 6, will supplement the present line of those manufacturers, but will not replace a single item, since every model now being made will be continued throughout the year.

## Radio Exchange

Rate, 40 cents a line. Ads. accepted until 12 o'clock noon Friday.  
PHONE PENNSYLVANIA 4000

### Parts and Equipment

THE GREATEST QUALITY BUY-TO-DAY The "Hawley" rechargeable "B" storage battery completely assembled and ready to use. Price \$24.50. Write for literature. 22 1/2 volts, \$23.50; 45 volts, \$25.25; 67 volts, \$27.50; 90 volts, \$30.00; 112 1/2 volts, \$32.50; 135 volts, \$34.75; 157 1/2 volts, \$36.80; 180 volts, \$39.20; 202 1/2 volts, \$41.50.

Knock-down kits at still greater savings. All assemblies batteries and kits contain the new recognized famous "Sur-Loc" connector. Does not close up 15 to 30% of the elements as crimped on connectors do. With its patent pending grip, it cannot come loose from the expansion and contraction of the positive element which others are subject to. All told, this means—clearer, brighter, greater length of life per charge and economy in buying. Don't be satisfied with antiquated construction. Complete, ready to run "B" storage battery charger, \$22.75. This may be connected directly to battery. Also may be used as trickle "A" battery charger. Complete sample call, 30c prepaid.

All goods sold with understanding that they give satisfaction, and can be returned in 30 days for complete refund. Further guarantee—2 years. Order direct—send no money—simply pay express cost. Write for free literature—it's free—it will tell you what to expect and contains some interesting material. B. A. WILLY, SMITH, 310 Washington Ave., Danbury, Conn.

## A Way to Increase The Voltage of a Battery Eliminator

The majority of B battery eliminators or "line power" devices in use to-day were not designed to supply voltages sufficiently high for adequate power amplification. By "adequate power amplification" is meant sufficient volume without tube distortion to fill the average living room. With the production of power tubes requiring from 150 to 180 volts on the plate for the most efficient operation the inadequacy of the 90 to 130 volt line power devices is emphasized.

However, the discarding of the old equipment and the purchasing of new design is a proposition unattractive financially. A simple and efficient expedient suggesting itself as a substitute for a high-voltage eliminator is to connect a 45-volt B battery in series with the plate supply. This will add the voltage of the battery to the plate potential. A "heavy duty" battery is recommended, and the negative terminal should always be connected to the plus side of the line power arrangement.

If a resistance coupled amplifier is used the extra battery should be wired in series with the plus lead to the amplifier. When the amplifier is transformer or impedance coupled it is more economical and quite efficient merely to place the battery in series with the output or loud speaker.

Z. B.

## GREENHUTS

Selling Radio Since 1919  
6 Warren Street  
Sleeper MINERVA  
The most perfect 5 Tube T.R.F. set. Quality—Selectivity—Sensitivity—All in one. The most perfect. Now \$15.95

Crosley Tridyn "Special" 3 R 3  
T. R. F. amplification, regenerative detector, reflex back on the first tube, and an ad. REG. \$75 additional stage of audio frequency amplification which gives the effect of at least 5, although there are but 3 tubes. Now \$12.95

\$60 Super-Tridyn Special, \$21.25  
\$50 Super-Tridyn Regular, 16.95  
\$60 T.R.F. Set, 5-Tube, \$12.95  
\$60 T.R.F. 6-Tube, 14.95  
\$27.50 Paragon "Two" (R.C.) 5.99  
\$60 Paragon "Four" 14.99

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18 in. Cone Speakers  
Exquisite tone and ample volume. Adjustable, adjustable, adjustable. No distortion, no distortion, no distortion. \$5.95 Reg. \$15

\$35 Atlas Loud Speaker, \$6.95  
\$27.50 Wood "C" Horn, \$9.99  
\$15 Perfection Adj. Unit, 2.75  
Mail orders filled. Send money order.

ROBERTS ASSEMBLED BATTERIES  
100 Volts, Type A or B, \$14.50  
former prices \$21.50 & \$24.50.  
140 Volts, Type C or D, \$17.50  
former prices \$27.50 & \$31.00.  
All supplies carried in stock.  
Order from your Dealer or send direct to the

Roberts Battery Company, N. Y.  
1122 Myrtle Avenue Brooklyn, N. Y.  
\$6.75 BUYS 100 VOLT KNOCKDOWN unit, including cabinet and alkaline iron elements, with new type connectors. Send for our literature. Wholesale and retail.

ROMCO STORAGE BATTERY CO.  
146 W. 88TH ST. TRAFALGAR 5222  
"B" BATTERY POWER UNIT. Sending new in "B" battery. Write for 24 page illustrated booklet. SEE JAY BATTERY CO., 115 BROOKLYN, N. Y. C. 101st St. Station. Jerome 1719. Open evenings 7 P. M.

Service  
SET's repaired, rewired, built. Speaker units, headphones repaired, wiring, etc. Weak tubes revived. 50c. ROY 100 West 46th.  
For Sale  
VARION A and B Battery Eliminator for D. C. Price \$22. B. J. Novak, 6. 68th St.

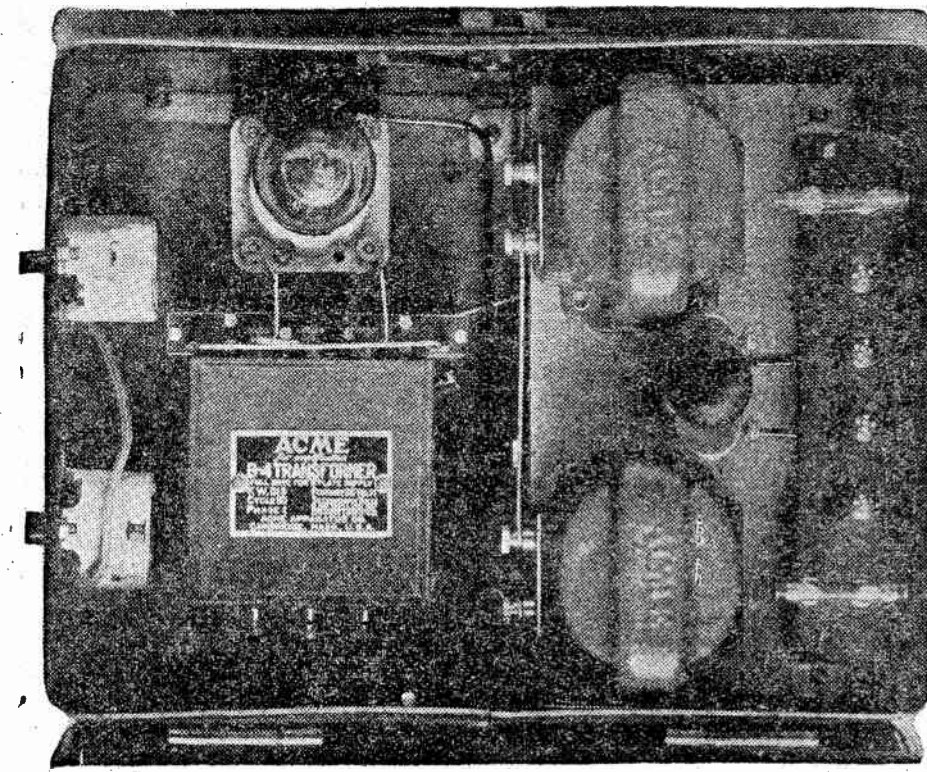


Figure 2. This picture shows how the apparatus used in the construction of the B battery eliminator may be arranged inside the automobile tool box



## Ten Commandments for the Radio Broadcast Listener

Best Long Distance Records Made in Winter; Fans Should Be Reasonable and Should Get the Best There Is During All Seasons

By Alred N. Goldsmith

Chief Broadcast Engineer, the Radio Corporation of America

WHILE excellent radio reception is frequently possible during the summer months, yet the best long distance records come in the winter. Signals are not quite so loud in the summer, and electrical disturbances are naturally more common in the summer and interfere occasionally with concerts, particularly those received from distant points. A reasonable attitude will help the listener here. He should remember that he cannot expect every act in even the best vaudeville performance to be tremendously amusing and just what he wants, nor can he expect the weather every day to be clear and pleasant.

Similarly, he must not expect every day to be just right for long-distance radio reception. Now and then a summer storm may interfere with both picnics and radio. The listener should become acquainted with his local stations or with the nearest "super-power" stations and enjoy them during the summer, and be satisfied with the long-distance records he has made or will make in the winter. In other words, he should get the best there is in radio during all seasons, and, above all, he should be reasonable.

### The Distant Listener

If the listener lives rather far away from all radio broadcasting stations of a power of a few kilowatts or less which he wants to hear there are several things he can do. He can lengthen his aerial wires and increase their height from the ground. Both of these measures make the signals louder, as a general rule. He can add an audio amplifier, unless, of course, he already has this instrument. He can also increase the voltage of his B battery, or plate battery, up to 90, 112 or even 135 volts. He can use a more sensitive loud speaker or content himself with head-set operation. He should also tune more carefully, so as to get the very loudest signal which his set is capable of giving. If there is a tickler adjustment on his set he should learn how to use it so as to get full volume of signals. And he should remember that the good results he will then get are going to be even better results in the winter.

### The Nearby Listener

If the listener is very near a powerful broadcasting station he may get excessively loud signals from that station and have difficulty in picking up other stations when the nearby station is in operation, particularly if the receiver is not very selective. In extreme cases it is not possible to get the distant station at all under such circumstances any more than it is possible to hear a whisper from a distance when some one else is shouting nearby. Still a good deal can be accomplished by some of the following measures which should be tried.

The listener can cut down the size of his antenna or use a small indoor antenna having a length of between a few feet and, say, 30 to 50 feet. A few trials may be necessary to find the best length of indoor antenna in such cases. When an antenna less than 30 feet in length is used, a small fixed condenser of five ten-thousandths of a microfarad (0.0005 mfd.) should be connected between the aerial and ground binding posts or terminals of his set. This will permit the reception of signals of the same wave length as is possible with an outdoor antenna. Or he may use a large antenna and add to his set any of the better wave traps now available which will greatly aid in cutting out an undesired station.

The listener should experiment until he gets the best signals and the greatest ease of choice of one station or another. A little patience is required to get the desired results in some cases. It should be remembered that no one ever learned in five minutes to run an automobile skillfully through heavy traffic. Sometimes the "traffic" in the ether is heavy, and it may not be easy at first to pilot the desired signals through the receiver. Faderewski took quite a little time to learn to play the piano but it was worth while. So is time spent in mastering the capabilities of the receiving set.

### Miscellaneous Hints

First of all, it is not wise to invite a large group of critical people to a party at your home some distance from getting the best out of your set.

## Battery Removal Aids Appearance Of Installation

The A and B batteries required for most radio receivers need not be kept directly beneath the table holding the set, but may be hidden behind some convenient piece of furniture in the room and then connected properly by means of flexible extension wires. The electrical operation of the outfit is not affected by this separation, but the general appearance of the installation is improved considerably.

Favorite places for the batteries are behind lounges or couches arranged diagonally across a corner and the sides of dummy fireplaces. Owners of private houses frequently drill holes through the floor and drop the wires directly to the cellar, where the batteries are, out of sight but still readily accessible for the occasional inspection they require. A total of four or five wires is necessary for the extension, two for the A current and two or three for the B. For the A cable standard double flexible lamp cord is ideal, as it is plenty heavy enough electrically and easily handled mechanically. One wire of such double cord has a red marker string running through it, which acts as an indicator; this wire should be regarded as the A plus lead.

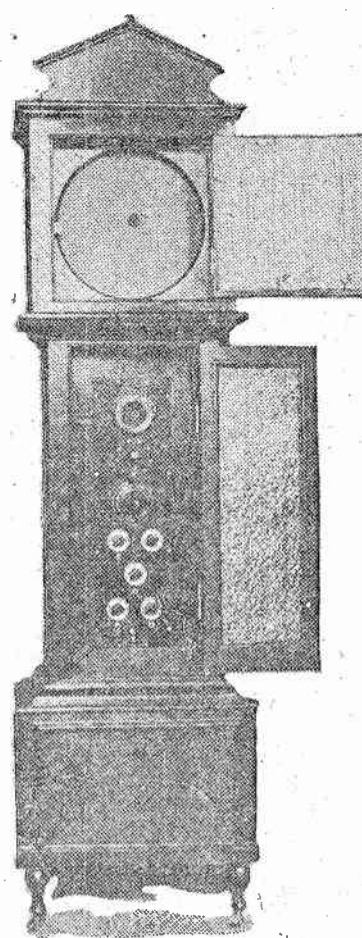
For the B circuit the flexible wire sold for Christmas tree fixtures is best, as it is thin and does not occupy much space. Single flexible lamp cord is also available, but it is much heavier than the other material and forms a rather bulky cable if several strands are bunched together.

The wires should be tied together with pieces of string every foot or so and fastened in place along the edge of the floor by means of U-shaped tacks known as "staples." To prevent accidental short circuits connect the ends of the wires to the receiver binding posts first and secure the ends at the batteries later. Tag the various wires properly before bunching them together, so that you will have no difficulty in identifying them afterward.

Lamp cord is obtainable in dozens of different colors of insulation, and if you visit a large supply store you may be able to select some wire to match your woodwork exactly. Apply the color scheme to the aerial and ground wires as well as to the battery leads; there is no reason why you should use the ugly black wires usually supplied for the purpose.

The set's loud speaker can also be extended by means of a flexible wire and located wherever it happens to look best or give the best results. The thin, Christmas tree wire is suggested for this purpose. R. H.

## Grandfather's Radio



Henry S. Gruger, of Lancaster, Pa., a cabinetmaker and radio fan, has produced this unique radio set which is housed in a grandfather's clock. It is a big improvement on Longfellow's "Clock on the Stair," whose vocabulary was limited to "For ever—Never."

## Summer Is the Ideal Time to Fix Up the Radio Set for Fall

Once Every Year a Receiver Should Be Thoroughly Examined, Tested and Repaired to Assure Satisfactory Operation

By Elmer M. Wakefield

NOW that the warm days of summer are upon us it seems a fitting time for radio fans to improve their radio receiving apparatus. The radio receiver, like every other mechanical appliance—for it is an electrical machine—needs a thorough overhauling about once a year.

The coming fall and winter has many things in store for the radio fan. There are to be tests, excellent programs and hosts of other things which will make the ardent fan burn with desire to hear them.

A good plan to follow for the overhauling is to start with the antenna system. If the aerial wire is badly corroded it should be replaced with new. Enamelled wire is always desirable because the coated surface will prevent corrosion.

The ground, which is, by the way, part of the antenna system, should be thoroughly examined. The earth connection is as important as the aerial itself. A cold water pipe is generally considered a good ground connection. However, it is possible the ground clamp which connects the wire to the pipe has become loose. In such instances the clamp should be replaced with a new one.

While experimenting with the ground connection it might also be a good plan to attach a connection to other grounded objects, such as vent pipe, stove, etc. If possible buried wire or copper strip, should be tried. In other words, everything that is connected to the earth in any manner whatsoever should be connected to the ground post of the radio set.

The additional ground connections may not make any noticeable difference on the reception of local stations. By local stations we mean those within a radius of about 100 miles. The improved ground connection may make a great difference, however, on the reception of distant stations. So much for the antenna system—now the receiver itself.

The logical way to start is to remove all signs of dust which may have collected during the preceding winter. This may be done with a camel haired paint brush. Dust is apt to have a disastrous effect on the efficiency of the apparatus. When it (the dust) becomes moist it becomes a conductor of radio frequency currents. This naturally reduces the efficiency of the set. In some instances it has been known to cause a short circuit, rendering the set inoperative.

The next step is to clean all mechanical connections, such as binding posts and clips. Sandpaper is very effective for this purpose. Also the prongs of the vacuum tubes should be cleaned. The solder on the tips is corrosive. The black corrosion which forms on them is a fairly good insulator. These may be cleaned with a nail file.

The dust which collects between the plates in a variable condenser also should be removed. A pipe cleaner may be used for this purpose.

If contact to the rotary plates of the variable condenser is made through a sliding bushing the bushing should be cleaned as an insurance that good contact is being made. If a "pigtail" connection is used for this purpose it should be examined to see whether or not it is making the necessary connection. One point to remember in this connection is never to use oil for lubricating the bushings of a variable condenser. Oil takes the form of an insulating film on the contact surfaces, spacing them a fraction of an inch apart. Although this distance is not very great, nevertheless it insulates the two points where connection is desired.

Next, all soldered connections should be given the "once over." If a poor connection is discovered it should be resoldered.

The battery leads to the set also should be examined, especially those which lead to the storage battery. The fumes from the sulphuric acid in the battery solution attack upon the copper wire in such a way that it causes it to corrode. The chemical action which takes place makes the wire brittle and often causes it to break.

If dry-cell B batteries are used they should be tested with a volt-meter. Poor B batteries are often the cause of many queer noises in a radio set; 22½-volt B batteries

## WJZ's Transmitting Towers Guide Mail Flyers to Field

The 300-foot antenna towers of station WJZ's transmission plant at Bound Brook are doubly useful. In addition to supporting the six-wire "T" type cage antenna used in broadcasting from this station, they also serve as towers of light to guide the United States air mail flyers to their landing field, which is only a few miles distant from the transmitter.

Before the erection of the transmitter at Bound Brook, the officials of Hadly Air Mail Field were forced to use makeshift guide posts to lead the planes "home," but as soon as they discovered the two 300-foot structural steel towers rising into the atmosphere, they immediately arranged to convert a possible air menace into a guide pylon by day and an aerial lighthouse by night.

There were certain difficulties which had to be overcome. The towers are of steel and to prevent absorption are insulated at the base. They acquire a heavy charge of radio-frequency currents when the station is in operation. This charge is so great that even when the base insulators are shorted to "ground" the towers, a severe high frequency burn can be received by touching them. The task of placing markers to distinguish the towers in daylight was simple, but no lights or wiring could be placed upon the structures to light them at night. Red reflectors were placed in such a manner on each tower to reflect the beam of searchlights located on the ground sending rays of red light into the evening heavens.

## Monterey Society Orchestra Opens First Shore Season

In a setting that breathes the air of the sea, the Marine Arts Room of the New Monterey Hotel, Ashbury Park, N. J., the Monterey Society Orchestra, which has just opened its first shore season, will broadcast to thousands of WOR fans throughout the East during the warm summer months.

By tuning in to WOR on Monday at 10 p. m., Wednesday at 9:45 p. m. and Saturday nights at 10:30 p. m., this organization may be heard with its lilting dance tunes.

Elmer Cook, who conducts the orchestra in this atmospheric setting, is extremely popular among the collegiate set. His orchestra was one of the first choices among Princeton students at a recent "frat" dance, and he has helped make enjoyable many "hops" at universities and colleges throughout the East. It was likewise this orchestra which played at the inaugural ball when Governor A. Harry Moore took the reins of the State of New Jersey.

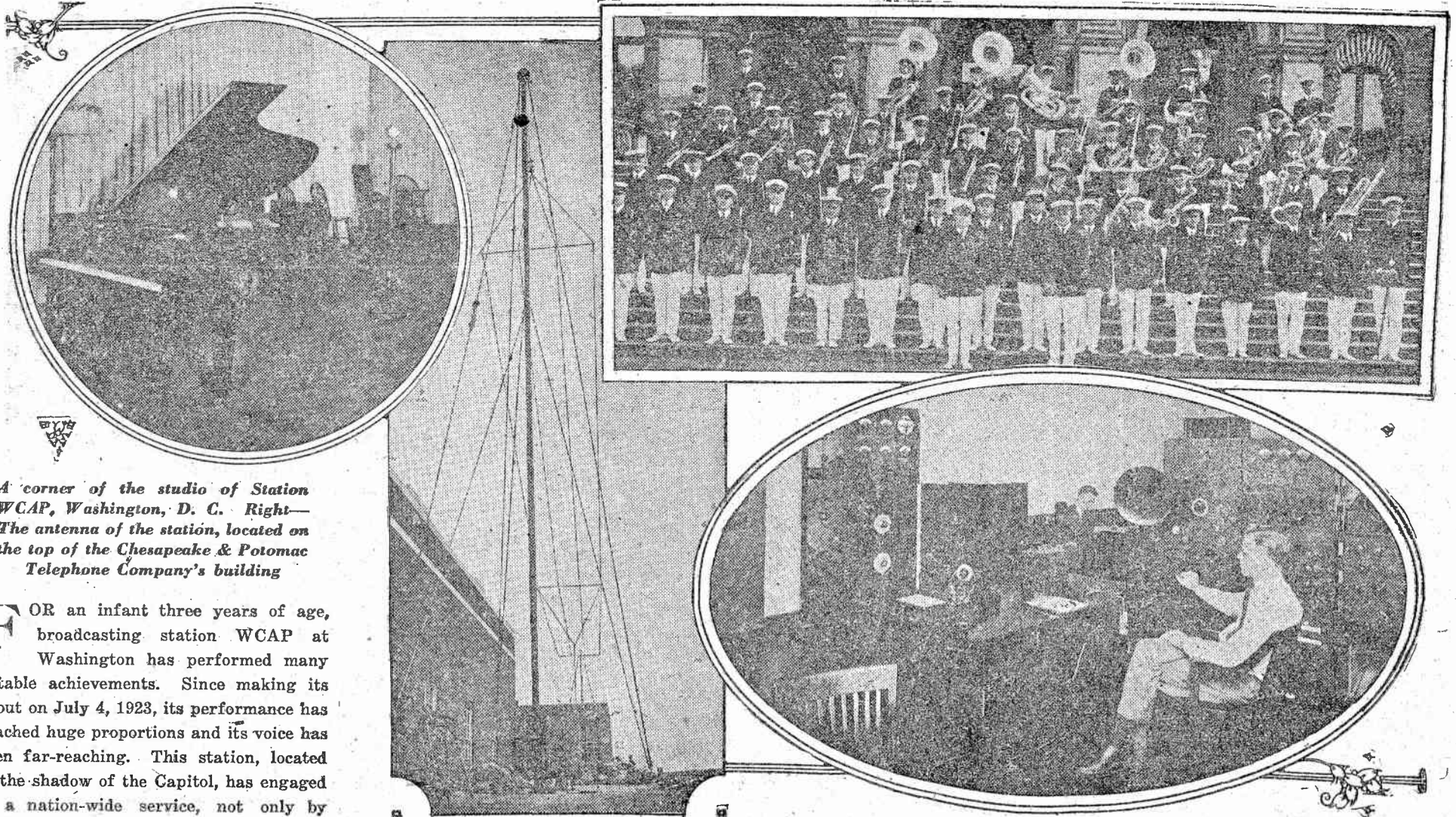
## Novel Lead-In Arrangement

Those who do not want to deface their houses by drilling a hole through the window sill for the lead-in will find that a board may be set in the sill under the sash. A piece of wood the width of the window and about three inches high will answer the purpose admirably well. As many holes may be drilled in such a board for the insulators as desired without defacing the house.

# W C A P, at Age of Four Years, Has Memory of Many Events of National Interest

A List of This Station's Programs Includes the Most Important Broadcasts in History of Radio

By JAMES E. CARTIER



A corner of the studio of Station WCAP, Washington, D. C. Right—The antenna of the station, located on the top of the Chesapeake & Potomac Telephone Company's building

FOR an infant three years of age, broadcasting station WCAP at Washington has performed many notable achievements. Since making its debut on July 4, 1923, its performance has reached huge proportions and its voice has been far-reaching. This station, located in the shadow of the Capitol, has engaged in a nation-wide service, not only by broadcasting nationally known programs, but in picking up and transmitting to other stations features of outstanding activities on the part of the President, his Cabinet and other high officials of the government.

The first lusty output of WCAP was the broadcasting of a joint Fourth of July program with its sister Bell operating station WEAF, New York. Since that time it has been on its own for many important performances, while in other cases it has been on the air jointly with stations located from coast to coast and border to border throughout the United States.

Its first hook-up of national importance was the broadcasting of the President's message to Congress, December 6, 1923, when WCAP, in conjunction with WEAF, New York; WJAR, Providence; WDAF, Kansas City; WFAA, Dallas, and ESD, St. Louis, connected by long distance telephone lines, carried the voice of the President to millions of people scattered from the Atlantic Coast to the Rocky Mountains. With the broadcasting of this message to Congress, a new era in communications was established. The President spoke into the microphone of WCAP in the House of Representatives at Washington and his voice was picked up and carried over telephone circuits to the radio stations in various sections of the country where it was broadcast simultaneously to the people of the country at large.

## Another Big Hook-Up

The next national hook-up in which WCAP participated occurred February 28, 1924, when California and Cuba were tied in by long distance telephone lines and a program, arranged for and presided over by General John J. Carty, vice-president of the American Telephone and Telegraph Company, New York, called the roll of radio stations, extending from Havana to San Francisco, was broadcast over the Western Hemisphere.

WCAP has had the distinct privilege of broadcasting the addresses of the President of the United States on numerous occasions, while two former Presidents have made a number of talks before its microphone. The voice of President Coolidge has undoubtedly been heard by more people—due entirely to the radio and its telephone connections—than any other man in the history of the world. His talks from Washington are generally broadcast by other stations connected by long distance lines with WCAP.

## Wilson's Last Appearance

Former President Wilson made his last public appearance at the Armistice Day celebration in the Arlington National Cemetery, November 11, 1923. This address, picked up and broadcast by WCAP and other stations, was heard far and wide, judging from the hundreds and hundreds of letters of appreciation and commendation on this memorial message to the American people by the war President which have been received by the management of WCAP.

The funeral service of former President Woodrow Wilson, held February 5, 1924, in the Washington Cathedral, as well as the funeral service of President Harding, were broadcast by WCAP.

Chief Justice and former President Taft has also talked before the microphone of WCAP on a number of occasions. Notable among the outstanding events was the ceremony incident to the laying of the cornerstone of the George Washington Masonic Memorial at Alexandria, Va., November 1, 1923, and the dedication of the United States Chamber of Commerce at Washington, May 20, 1925.

The National Defense Day programs of September 12, 1924, and July 4, 1925, were picked up by WCAP and transmitted by long distance telephone circuits to other broadcasting stations throughout the country, making it possible for millions and millions of people to hear these patriotic programs.

## Nominees Speak Frequently

In 1924, when the political campaign was warming up and at its height, the nominees for President and Vice-President made frequent addresses from WCAP. President Coolidge, John W. Davis, Democratic nominee, and Senator La Follette, running on an independent ticket, as well

as General Dawes and Senator Wheeler, talked frequently from this station. The program incident to the inauguration, March 4, 1925, was picked up by WCAP and transmitted to a chain of stations that broadcast this national event to every section of the country.

Outstanding sports, including the world series ball games, football games of national interest and hundreds of other features, have been put on the air for the entertainment and edification of the people of the North American Continent.

One of the features of universal importance broadcast by WCAP was the program of the National Holy Name convention held at the Monument Grounds, Washington, September 21, 1924. The estimated attendance at the ceremony was 125,000 persons. President Coolidge addressed the assembly. He was followed by his eminence, Cardinal O'Connell, of Boston, legate of the Holy Father, and the Rev. Michael J. Curley, Archbishop of Baltimore.

The Lincoln Day program of February 12, 1926, brought together many extraordinary features. It was the first time in history that so great a number of notable statesmen had been brought together in the studio of any broadcasting station.

Among the speakers who eulogized the great war President were Herbert Hoover, Secretary of Commerce; William M. Jardine, Secretary of Agriculture; Herbert Work, Secretary of the Interior; Theodore Douglas Robinson, Assistant Secretary of the Navy; John Barton Payne, chairman of the American National Red Cross and formerly Secretary of the Interior; James E. Watson, United States Senator from Indiana; the Hon. C. W. Ramsdell, of Iowa; Mrs. Anthony Wayne Cook, president general Daughters of the American Revolution, and Mrs. John D. Sherman, president of the American Federation of Women's Clubs.

## U. S. Army Orchestra Plays

An added feature of the program was music of the time of Lincoln by the United States Army Music School Orchestra. The ceremony was opened by the grand march "Germania," which was one of the numbers played at the inaugural ball of President Lincoln, March 5, 1861.

The Memorial Day services from the Arlington National Cemetery, at which the

President has delivered the principal address during 1924, 1925 and 1926, have also been broadcast by WCAP and other stations. In addition the Maine Memorial exercises have also been put on the air for three successive years by this station.

The Educational Week program of February 21, 1926, as well as the oratorical contests of 1925 and 1926, in which high school students from every section of the United States have met in competitive orations, have been put on the air by WCAP.

The Kentucky Derbies, as announced by the sports editor of "The Washington Post," of 1925 and 1926 have also broadcast from the studio of WCAP. On May 13, 1925, the program of the National Conference on State Parks, at which Judge John Barton Payne was the principal speaker, was put on the air from this station.

Other outstanding features have included music by such nationally known organizations as the United States Marine Band, Captain William H. Santleman, leader; the United States Army Band, Captain R. G. Sherman, commanding, and Captain William J. Stannard, leader, and the United States Navy Band, Lieutenant Charles Benter, leader.

## Civic Programs Broadcast

In addition to the above features, national and otherwise, station WCAP has had the distinct privilege of picking up and transmitting from its studio or in the field all civic programs that would be and have been of general interest to the public.

During the present session of Congress "matters before the House" have been discussed almost weekly by members of Congress, while other officials of the government have talked on various and sundry subjects of interest to the people of the country at large.

Each Sunday at 11 o'clock this station broadcasts the service from a Washington Church and at 4 o'clock Sunday afternoon it puts on the air the service of the Washington Cathedral. In addition, through an arrangement with WEAF of the Broadcasting Company of America, New York, it puts on the air the program of the Capitol Theater, New York City, and the Atwater Kent radio hour, outstanding musical features that have brought pleasure and entertainment to millions of people.



# New Circuit With Uniform Energy Transfer on All Waves Solves Important Problem

Combination of Electromagnetic and Electrostatic Couplings Works Out to Advantage in Radio

By FULTON H. CRAWFORD

EVER since the first multi-tube tuned radio-frequency broadcast receiver was placed on the market one of the biggest engineering problems facing the radio industry has been the development of a circuit which would have a uniform energy transfer characteristic throughout the entire wave band of 200 to 600 meters. As the exact meaning of the last phrase in the above sentence may not be appreciated by the non-technical reader of this article, an attempt will be made to explain and illustrate its importance and significance. Also, a new circuit, which, it is claimed, overcomes many of the undesirable characteristics present in most tuned radio-frequency circuits, will be described.

Before discussing the question any further it might be wise to explain, so that home builders who may contemplate the construction of a receiver using this circuit will not be disappointed, that no attempt will be made in this article to give detailed directions for making a set of the type to be described. At the present it is the writer's sole purpose to give data on a development in radio which may in time effect an improvement in radio receivers. The fundamental circuit of the receiver, however, will be found on this page, and those who are experimentally inclined will find sufficient information to enable them to investigate the possibilities of this circuit and design a set employing it.

To explain the undesirable effect of un-uniform energy transfer in a radio receiver, the simplest type of tuned radio-frequency set will be considered, i. e., the type of circuit which employs two or more stages of tuned radio-frequency amplification in cascade where each stage consists of a three-element vacuum tube and an inductively coupled transformer with a fixed primary winding and a capacity tuned secondary winding, and where stabilization is maintained by a "losser," such as a high resistance in the grid circuit. When operating this type of set one of two things will be discovered: either the set will not oscillate on any wave length, but will give best results on the low waves, or the set will oscillate easily and will be very hard to control on the low waves. In the first case the set is not efficient and for this reason will not produce satisfactory results. In the second case the receiver is efficient but unstable, and as a result the signal may be distorted by too much regeneration, the set will be found more difficult to tune and it is apt to cause interference in nearby receiving sets due to its radiating characteristics. All of the objectionable features mentioned above may be traced to one fundamental cause, namely, the energy transfer, and therefore the efficiency, is greater on short wave lengths than it is on the higher waves. To make the efficiency equal on all waves some kind of a compensator is inserted in the circuit and this variable control causes instability.

In addition to the type of radio-frequency circuit mentioned above there are also circuits in which oscillations and instability are prevented by a fixed balanced circuit. In properly adjusted receivers of this type oscillations will not occur, but the set is most efficient on the wave length to which it was balanced, and on the other wave lengths a certain amount of regeneration is present, which might cause distortion. Two other disadvantages of receivers of this type are: first, the wave length range must necessarily be very limited, and, second, to obtain highest efficiency the set must be balanced for the particular tube with which it is to be used.

A circuit without the objectionable characteristics mentioned above has recently been announced by Edward H. Loftin, a consulting engineer of New York City. Six important claims are made for this circuit, which are as follows:

1. It may be constructed so that the energy transfer throughout the entire broadcast wave band is uniform rather than greatest on the high frequencies and falling off as the frequency is decreased. 2. The tendency to oscillate as a result of the coupling through the tubes is overcome by a method that is independent of

the capacity of the internal elements of the tubes used in the radio-frequency stages.

3. The possible wave length range of the receiver is greatly increased, without increasing the maximum capacity of the variable tuning condenser or inductance of the coil, by the form of coupling employed, which decreases the distributed capacity of the circuit.

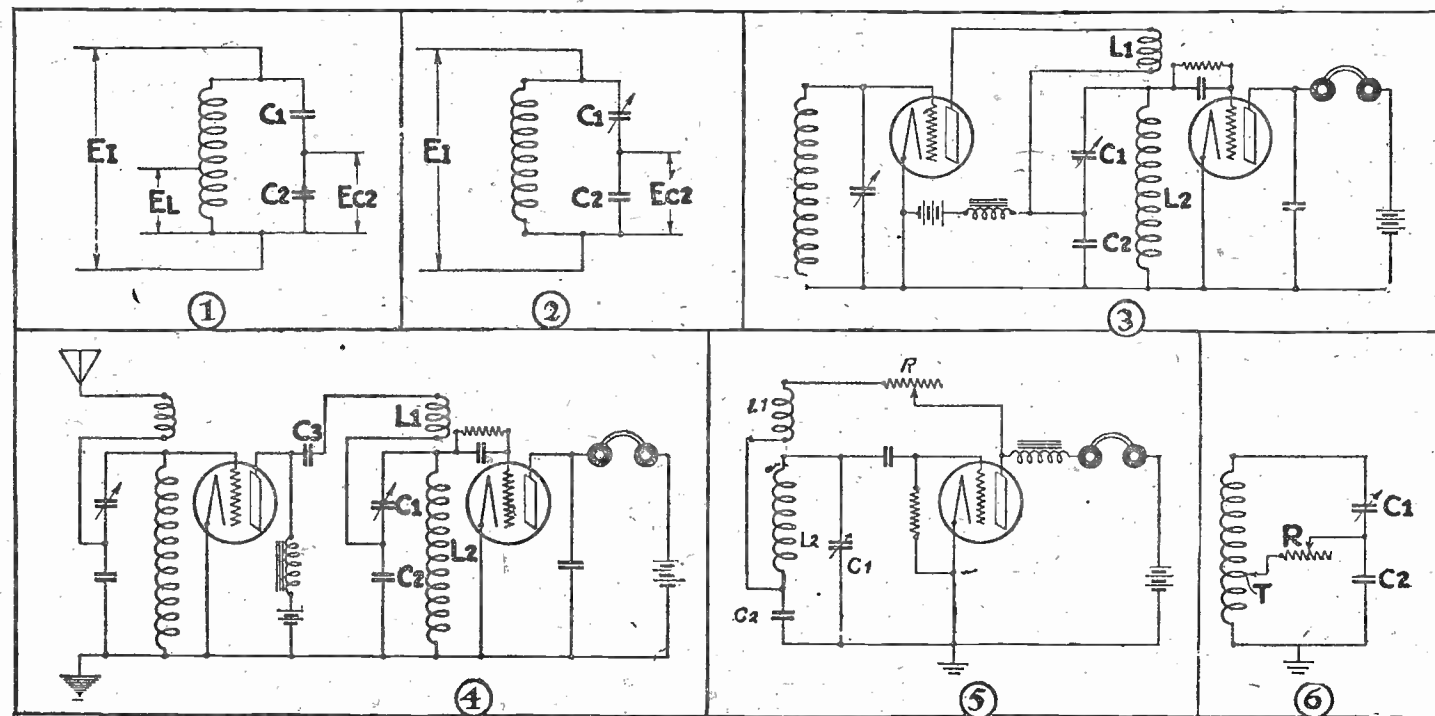
4. The quality of reproduction is improved by the complete elimination of regeneration and oscillations.

5. Positive interstage regenerative couplings that may be produced in the construction of the receiver may be overcome by the production negative regeneration through the tube capacities.

radio-frequency amplification. It is a three stages of tuned radio-frequency amplification, a detector and two stages of batteries, in a cabinet measuring only 16 in. by 8 1/2 in. by 6 in. The set employs one control set and aside from the wave length tuning dial there are only three rheostats, knobs and a battery switch on the front of the panel. The set is also so designed that it may be operated with either dry cell or storage battery tubes.

For a technical description of the circuit no more authoritative data could be obtained than that presented by the inventor. The following are abstracts of a paper entitled "Combined Electromagnetic and Electrostatic Coupling and Some Uses of the Combination," which was read

"Starting in an elementary way, let us consider the various voltages existing in the oscillatory circuit shown in Figure 1. With an impressed voltage  $E_1$  across both the inductive leg and the capacitive leg, any desired fraction of this voltage may be obtained by tapping the inductive leg, resulting in a voltage  $E_L$ , which increases in value with the number of turns in the tapped portion of the inductance. Similarly, the capacity leg may be tapped by dividing its capacity into two series portions, as is shown by condensers  $C_1$  and  $C_2$ . Assuming a resonant condition, the voltage developed across  $C_2$  will be inversely proportional to its ratio with  $C_1$ . For example, if  $C_1$  and  $C_2$  are equal, then the voltage  $E_{C2}$  will be just half the im-



Six diagrams used in describing the new circuit discussed on this page

6. After the receiver has been stabilized for use with one set of tubes, it may be used with any other set of tubes without making any further adjustments. This makes it possible for a manufacturer to provide a receiver which will operate efficiently with all available tubes and it enables the owner to use either dry cell or storage battery tubes, as he desires.

In addition to the advantages just enumerated, there are other interesting features of the circuit from the manufacturer's and also from the broadcast fan's viewpoint. The circuit adapts itself excellently to single wave length control operation, which is very desirable in these days of simplified tuning. Also because of the unusual stability of the circuit it is possible to construct a single control set employing as many as three stages of tuned radio-frequency amplification.

A commercial receiver employing this circuit, namely, the Hartman Single-Six Compact, which is manufactured by the Hartman Electrical Manufacturing Company, Mansfield, Ohio, provides an excellent example of how simple a six-tube receiver of this type may appear. This set, which is shown in the accompanying half-tone, is completely housed, with the exception of the loud speaker, antenna and

at a meeting of the Institute of Radio Engineers by Edward H. Loftin and S. Young White on June 30, 1926:

"The energy transfer characteristic of the normal forms of coupling employed in radio receivers is well known to all of us and in the usual forms transfers energy more readily at higher frequency than lower. This characteristic makes for higher efficiency and consequently greater tendency toward instability of commercial vacuum tube receivers on the high-frequency portion of the broadcast band.

"Our investigations of the combination of electromagnetic and electrostatic couplings were for the purpose of removing this objectionable characteristic, and we undertake in this article to outline some of the more salient of our observations during these investigations, as well as some uses made of the combination. One of these features is the use of a coupling means which has its frequency characteristic reversed in that its most efficient energy transfer takes place at the lowest frequency. By suitably combining this coupling means with a coupling having the usual characteristic we are enabled to so design the combined coupling that the total energy transfer will vary in any desired manner with frequency.

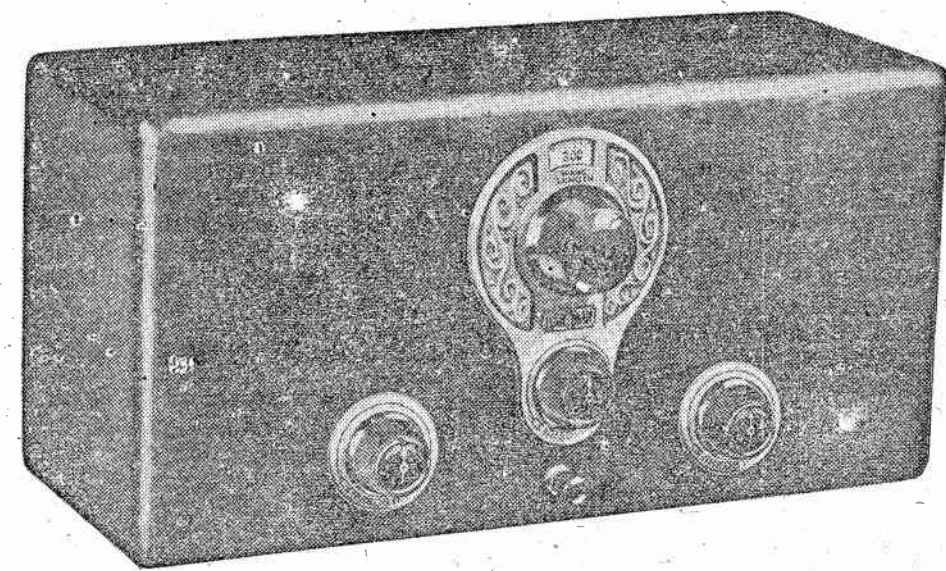
pressed voltage  $E_1$ . If  $C_2$  is larger than  $C_1$  it will have proportionally less voltage across it, and vice versa.

"Keeping these voltage relations in mind, let us examine Figure 2. In this circuit  $C_1$  has been made variable, while  $C_2$  remains fixed. It is evident that  $C_1$  has now become the variable tuning condenser for the system. However, in varying  $C_1$  we find that we continuously vary its ratio with  $C_2$ . The larger  $C_1$  becomes in its relation to  $C_2$ , the higher will be the voltage  $E_{C2}$ . However, when  $C_1$  is maximum, the frequency to which the system is resonant is minimum, and we have the condition that the voltage  $E_{C2}$  is maximum when the frequency is minimum, and this voltage can be made any desired portion of  $E_1$  by adjusting the capacity ratio of  $C_2$  and  $C_1$ .

"One practical application of this effect is shown in Figure 3, where the arrangement of Figure 2 is used as a portion of an interstage coupling for a three-electrode vacuum tube amplifier system of the so-called tuned radio-frequency type. The principal addition lies in the use of a coil  $L_1$ , through which the output of the tube passes before reaching the branch point of the two condensers  $C_1$ - $C_2$ . The energy transfer due to  $L_1$  has the normal characteristic of increasing with an increase of frequency, while the coupling due to the varying reactance of  $C_2$  with variations of tuning condenser  $C_1$  has the reverse characteristic.

"It is obvious that the electromagnetic coupling, due to  $L_1$ , may be combined with the electrostatic coupling due to  $C_2$  in either an opposing or an aiding phase. If they are combined in an opposing phase there will be some point in the frequency band where they will be equal, and since they oppose, a balance will obtain at this point and no energy transfer will take place. It is, therefore, obvious that an adjustment of this kind would be of no value in receivers.

"To satisfy the requirements of receivers that must cover wide ranges of frequencies, such as broadcast receivers covering the broadcast band, we have found that by combining electromagnetic and electrostatic couplings to transfer



This picture shows the commercial receiver employing the circuit referred to in this article

Continued on page five

# Radio as a Profession for the Young and Old Men of America

One Must Have a Keen Ear, a Quick Eye and Skill at Manipulation to Qualify as an Engineer

By BORIS S. NAIMARK

THERE is no doubt that large numbers of boys and young men are at this very time considering "radio" as a profession. Many of these have just left grade and high schools and are trying to find a place for themselves in the world—a place which would offer the opportunities that youth well deserves. What is it that prompts the average young American to turn his attention to radio as a profession?

Spanning the world in a single second, taking pictures, voice and music through the air with the speed of light, radio today has changed our very mode of living. The first radio program was broadcast in Pittsburgh about 1920. To-day there are about 600 broadcasting stations in the United States alone. In 1920, when broadcasting just started, there were only seven manufacturers of radio equipment; there are probably over 3,000 to-day. There are about 10,000,000 completely equipped receiving outfits in daily use in the United States.

It took the automobile industry fifteen years, the talking machine industry twenty-five years, to cover the same ground of industrial development that the radio industry has covered within the last five years. Within this short period of time radio has grown from a \$2,000,000 a year industry to one in which probably not less than \$500,000,000 is spent yearly. There are over two score magazines devoted exclusively to the subject of radio.

Radio has grown at a terrific pace, yet who will deny that there is still plenty of room for improvement and expansion?

More likely than not it is this restless activity of a new and fast moving industry that attracts large numbers of young men to the radio engineering profession.

## Young Read Advertisements

Young people read advertisements of various radio correspondence schools, some good, some not so good, in which the enterprising publicity and advertising managers of the respective institutions make it a point to misinform the reader and prospective student that radio offers any young (or old) man who takes their course (at \$5 down and \$5 a month) the opportunity of making money easier than he ever made it in his life.

"Why," the "educators" exclaim in a paroxysm of prospective business, "it is easy to make big money in radio—\$50 to \$250 a week, \$3,000 to \$10,000 a year," and when the stunned yet conscious youth inquires "What Price Glory?" he will be cheerfully informed that the only prerequisite knowledge for taking the "radio expert's" course is just the ability to read and write and that if he carefully studies their easy-to-learn-big-pay-course he should within less than a year (why, many a do it in less than six months!) become a radio expert, a master of not one but every branch of radio.

In other words, the whole process of becoming a radio expert in all branches is reduced to a formula as simple as A B C; simply "tune in" on a big pay radio job—choose any position you want! Ridiculous!

One cannot deny that real opportunities exist in the radio engineering profession and that radio to-day is urgently in need of trained radio experts. But one cannot fit himself quickly for success in this new field, and one must have an aptitude for mathematical and physical sciences and a taste for mechanical and electrical contrivances and devices if one expects to succeed at all. It must be noted in this connection that the greatest obstacle to success experienced by the youth who has the ability to fight his way upward from the levels of a trade position is usually the meager nature of his general education.

## Radio Engineering

Radio engineering consists of a large number of very important phases; any one who knows anything about engineering at all will tell you that no one engineer can hope to attain success in all its branches, since every branch requires a great amount of specialized knowledge, as well as great amounts of minute detail work.

Dr. Alfred N. Goldsmith, chief broadcast engineer of the Radio Corporation of America and editor in chief of "The Proceedings of the Institute of Radio Engineers" and who is by far one of America's most prominent radio engineers, in a statement to this writer had the following to say in the form of advice to young men who aspire to take up radio as their life's work:

"Before entering the radio field a young man should ask himself these questions: Have I a keen ear, a quick eye and some skill at manipulation? Do I quickly grasp scientific facts about machinery and electrical devices? Am I willing to study nights? Am I prepared to spend several years working my way up from the bottom in a radio factory, a broadcasting station or a trans-oceanic or marine station? And will I be at home in an engineering profession?"

"If he can answer all of these questions sincerely and positively in the affirmative he may consider radio as a profession. There are two ways to get into the radio field. One of them is to study electrical engineering and finally concentrating on radio engineering. He can then enter a radio company in an assistant engineering capacity and work his way up.

"The other method largely involves self-tuition. It is a harder way and a longer way and requires real grit and unusual aptitude. The prospective radio engineer must study at home the best available books on elementary and advanced physics, algebra, some trigonometry, some good books on direct and alternating current machinery, and a succession of radio engineering textbooks, starting with the more elementary and ending up with the most advanced books which he can find. At the same time, or shortly thereafter, he will do well first to assemble a number of radio sets himself at his home, and then to get a job in the assembly of radio sets or in the test or serving of sets with a reliable and up-to-date radio concern. By sticking to this job and keeping his eyes and ears open there is no reason why he should not within a few years secure a fairly responsible engineering position in the radio field.

"He should also keep in touch with other engineers and attend meetings of engineering societies, at the same time

reading the best journals which he can secure. It is only in this way that he can keep up to date in the radio art.

"Radio engineering is a splendid profession for a moderate number of ambitious young Americans, but it has no place for the man who is waiting for life to hand him its rewards on a gold platter. He will have to learn his job and stick to it to make a success in radio."

During his teaching years Dr. Goldsmith has inspired and instructed some of the best known radio engineers of today. At the College of the City of New York he gave the first regulation engineering course in this country, and, judging by the caliber of the engineers that he has turned out it was one of the best anywhere.

Pressure of professional and other responsibilities have prevented the continuation of these radio engineering classes five years after their inception in 1913. At the time Dr. Goldsmith gave up teaching entirely—this was at the end of 1924—he was an associate professor, in charge of the Department of Electrical Engineering at the College of the City of New York.

Dr. Goldsmith is a charter member and one of the founders of the Institute of Radio Engineers, and in addition to being editor of the "Proceedings" since 1912 he has also been the secretary of the institute since 1918.

When one considers the fact that the doctor is only thirty-eight years young, one cannot help but be inspired to greater heights.

## College Education Not Necessary

Dr. Donald McNicol, president of the Institute of Radio Engineers, author of "American Telegraph Practice," the standard textbook on telegraphy, and inventor of several telegraph and telephone devices, is, like Dr. Goldsmith, of the opinion that college training, while desirable, is not absolutely necessary to succeed in the art, especially where there is a capacity for learning, ambition and facilities for experimentation.

Dr. McNicol's statement to this writer in full follows: "In judging the employment future for radio engineers and radio technicians it is helpful to recall that twenty-five years ago there were perhaps

less than one hundred telegraph and telephone engineers employed in this country. It was stated then that electric communication did not offer a field for more than a very limited number of engineers. But to-day there are more than two thousand communication engineers employed in New York City alone.

"Radio is a profession which I believe will offer to the student and engineer a useful future at rates of income comparing very favorably with other lines of engineering.

"The colleges are now giving thorough instruction in radio science, and from this source will likely come the men who will excel in research work.

"Of course, the fellow who is not in a position to secure a college training may still make good progress in the art. Systematic study of radio books and journals, together with as much experimentation as can be carried on, paves the way to position and salary."

## Required Technical Knowledge

It is this writer's opinion that the amount of technical knowledge required by one to have a chance to succeed in radio will depend largely upon what branch of the radio industry one has chosen to specialize in. College training is more important to one who expects to specialize in radio research and engineering; it is of less importance to the operator, manufacturer and publisher, and sometimes has very little, if any, value to the radio salesman whose main qualification is the ability to sell. The latter statement does not, of course, apply to the salesman who has to cater to the engineering fraternity.

The idea that radio offers a short cut to wealth to all, irrespective of ability, knowledge or amount of work, should be dismissed at once by all who seriously consider radio as a vocation. This is the warning that Dr. J. H. Dellinger, chief of radio laboratory of the Bureau of Standards, issues to the radio student. Dr. Dellinger says: "In each of its branches no one should expect great returns from radio unless he has some aptitude or some service to put into it."

It has been the writer's experience that entirely too often young people select radio as their life's work without due deliberation and without a thorough analysis of their "personal equation" as well as of the opportunities that radio may or may not offer as compared with the opportunities presented by other professions. One must have more than a liking for radio to succeed in it professionally, and one must bear in mind that "radio as a vocation is very different from radio as an avocation."

Dr. Dellinger says: "Radio is an established industry, or set of industries, and its future growth is inevitable. The person who seriously considers it as a vocation must weigh both the service which he can render it and the satisfaction it can return to him. We are living in a whizzing age, and radio is taken as the most conspicuous example of the rapidity of our times. Many a young man who wants to keep up with the times concludes, therefore, that radio is the line for him. It is certainly worth while coolly to pause and examine what returns you are likely to get, and perhaps even more worth while to consider what service you can render." To illustrate that radio is not a field where one may at will get rich overnight, Dr. Dellinger says: "I am told (I do not vouch for it) that only one in a thousand of the radio patents that are filed are of any value to radio, and only a fraction of that fraction brings returns to their inventors."

To sum up, if you are seriously considering radio as a profession you must sweep aside the mere glamour that radio derives from its newness and its patent marvels." Before making any final decision read some books relative to engineering as a profession; this will help you to determine if you will be at home in an engineering profession, such as is radio. And, above all, remember that "radio has no place for the man who is waiting for life to hand him its rewards on a gold platter."

## New Circuit With Uniform Energy Transfer

Continued from page five

in a positive phase. The variable resistance  $R$  controls the amount of feedback. This form of coupling is also used between stages of a radio-frequency amplifier where it is necessary to ground the condenser  $C_1$  for single control receivers and the like.

"The phenomena so far discussed allow designing circuits which will permit a vacuum tube amplifier or detector type of receiving set to oscillate at the upper or lower or at all dial settings. Figure 6 shows an arrangement which allows oscillation at any one intermediate dial setting.

"As we have observed before, the point between the two capacities  $C_1$ ,  $C_2$  is at a potential difference to the grounded side of the system, which is determined by the ratio of  $C_1$  to  $C_2$ . Whatever value this voltage has we can also always find a point  $T$  on the inductance of exactly the same potential to ground. If we join these points with a resistance  $R$  of any value no current will flow through  $R$ , since both points are at equal potential to ground. If we now vary  $C_1$ , as in tuning, we find that a potential difference develops across  $R$ , since point  $T$  remains at substantially the same voltage, while the potential across  $C_2$  varies. This potential difference becomes greater as we vary  $C_1$  either up or down from the value at which we balanced the system. If we balance midway of the dial reading of  $C_1$ , we find that to be the only spot where the absorbing action of  $R$  has no effect, and if this Figure 6 arrangement is placed across the input of a vacuum tube whose plate cir-

cuit is sufficiently reactive to allow of oscillation throughout the frequency band,  $R$  can be so adjusted as to stop oscillation at all points except the balance point. If we balance at the lowest frequency, the damping action of  $R$  will increase with the frequency, and can be adjusted to prevent oscillation throughout the band. Precaution should be taken that  $R$  does not reach a sufficiently low value to allow the portion of the inductance below  $T$  to form a resonant circuit with  $C_2$ .

"While we have investigated and used numerous other applications of the above, those we have outlined are considered sufficient to illustrate the principles involved."

## Joseph Richter to Play on 200-Year-Old Seidel Violin

Those who listen in at station WHN tomorrow from 4:30 to 4:50 p. m. will hear the strains of a 200-year-old Seidel violin, played by Joseph Richter, accompanied on the piano by Arthur Kuester. Richter is a native of Bohemia and has been here for twenty years. He has studied under Krakau and Zolynsky in Poland, and for years was concert master in the Austrian army. His violin was passed down to him from ancestors who played it before many members of European royal families. Once he left it in the hallway of his home, and on awakening in the morning was shocked to find it missing from its customary place. His wife had put it safely away, however. Both men are well known in German circles around the city for their musical abilities.



## "Lead-In" Wire Forms Part of Antenna System

Most radio fans are accustomed to thinking of the radio "aerial" as the horizontal wire stretched on the roof of a building and consider the vertical connecting section, the "lead-in," as a separate part of the antenna system. This impression is entirely erroneous, as the vertical wire acts just as much like an "aerial" in picking up radio impulses as does the

flat top portion, and its length must be added to that of the latter in determining the overall dimensions of the system. As a matter of fact, the vertical wire is a more effective "aerial" than the horizontal one in the respect that it is non-directional and receives equally well from all directions; a flat-top aerial with the lead-in fastened at one extreme end, as is usually done, receives markedly better from the direction in which the lead-in ends than from any other. The proximity of large bodies of metal affects this directional property, but in general the rule holds true.

The failure of set owners to take the length of the lead-in into consideration is responsible for many complaints of broad tuning. A man living on an eight-story house will erect a nice horizontal wire about sixty or seventy feet long on his roof and will then drop a lead-in of about fifty feet down to his apartment window, making a total length of at least 120 feet or more, depending on the route the wire takes inside the house. If he lives in the city near any one of the dozen or more powerful broadcast stations he undoubtedly will experience some interference, the seriousness of which will depend on

his exact location, the total stretch of the aerial wires and the selectivity of the receiver. The first factor he cannot control at all, and the third is dependent to a not inconsiderable extent on the second, so the simplest remedy for the trouble is a trimming of the aerial.

Residents of the lower floors of tall houses really need not worry about installing wires on the roof at all, especially if the building exceeds eight or so stories. All they need do is to hang single vertical wires over the side of the roof directly above their windows, and if the drop is equal to fifty feet or more they will have excellent pick-up sys-

tems. Such aerials may seem rather short, but with any standard type of tuned radio frequency receivers they provide entirely satisfactory reception with a minimum of interference.

## Use Back of Knife

In cleaning copper wire from which the insulation has been stripped scrape with the back of a knife blade, not with the sharp cutting edge. If you do this you will be saving the good edge and at the same time making a better job of the cleaning, for the dull back edge has less of a tendency to pare the soft copper wire than the keen one has.

## Additional Herald Tribune Radio Programs for the Week Ending July 17

Continued from preceding page

### 600K-WJZ-NEW YORK-455m

10:00 p. m.—Setting-up exercises.  
10:05 p. m.—Lunchtime music.  
10:10 p. m.—Department of Agriculture.  
10:15 p. m.—Department of Agriculture.  
10:20 p. m.—Department of Agriculture.  
10:25 p. m.—Department of Agriculture.  
10:30 p. m.—Department of Agriculture.  
10:35 p. m.—Department of Agriculture.  
10:40 p. m.—Department of Agriculture.  
10:45 p. m.—Department of Agriculture.  
10:50 p. m.—Department of Agriculture.  
10:55 p. m.—Department of Agriculture.  
11:00 p. m.—Department of Agriculture.

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### 1070K-WNAC-BOSTON-280m

10:00 p. m.—Setting-up exercises.  
10:05 p. m.—Lunchtime music.  
10:10 p. m.—Department of Agriculture.  
10:15 p. m.—Department of Agriculture.  
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# Britain Has High Speed Telegraph Service

Continued from first page

speeds of transmission varying between 10 and 150 words a minute. A speedometer calibrated in words a minute is fitted to the Wheatstone for the purpose of indicating to the operator the speed at which he is transmitting.

The high speed receiving apparatus, apart from the purely radio reception apparatus, consists of a Creed receiver, which perforates a tape with a replica of the Wheatstone tape in use at the distant transmitter, and the Creed printer, which prints the received message on a strip of tape in plain type and at the speed at which the messages are received. The printed slip is then drawn through an automatic gumming machine and affixed in suitable lengths to a form ready for delivery to the addressee.

In addition to this printing apparatus, each table is equipped with an undulator, or trailing syphon recorder. This instrument is connected in parallel with the receiving perforator and consists essentially of a relay carrying a light ink syphon in addition to the usual tongue, the latter being used to operate a sander in the local circuit. Paper tape is fed steadily forward by a motor driving through a continuously variable gear, permitting the speed of the tape to be adjusted in accordance with the speed of the incoming signals.

The undulator is capable of recording signals at speeds up to 200 words per minute and is used to replace the printing apparatus when atmospheric conditions cause mutilation of signals. The record of signals takes the shape of a wavy line, the waves of which take the form of the Morse code. This record is subsequently transcribed by typist-telegraphists.

A "hand speed" telegraph key is also fitted to the control table to enable the receiving operator to "break in" with short service remarks. A second key and sander are used for communicating with Ongar and Brentwood over a land line reserved for that specific purpose.

## The Transmitting Center

There are at present four transmitters located at Ongar, the general equipment of which may be taken as representative of that used at all the other terminal stations. There is room on the site for future additions to the service.

The aerial systems closely resemble one another and consist generally of one or two circular cages of four wires, each suspended from two or three 300 foot self-supporting lattice towers. These aerials are not directly grounded, but are connected to counterpoise systems comprising a number of insulated wires supported on a thirty-foot lattice masts. These counterpoises are arranged parallel to and extending beyond the horizontal portion of their appropriate aerials. This system has been found to give more efficient results than the more usual buried ground system.

With modern methods of radio frequency and audio frequency tuning, the efficacy of a transmitting station and the legibility of the signals under bad atmospheric conditions depend largely upon the steadiness of the transmitted wave. In this connection it is worthy of note that the receiving apparatus installed at Berne has tuning and filter circuits so selective that a change of only two meters in a wave length of 3,000 meters gives by the English

station reduces the output energy of the receiver to approximately one-fourth.

It will be realized, therefore, that constancy of the transmitted wave is of primary importance if the receiving station is to utilize efficiently the means available for reducing atmospheric disturbances and special precautions are taken at the Ongar transmitters to keep the emitted waves constant.

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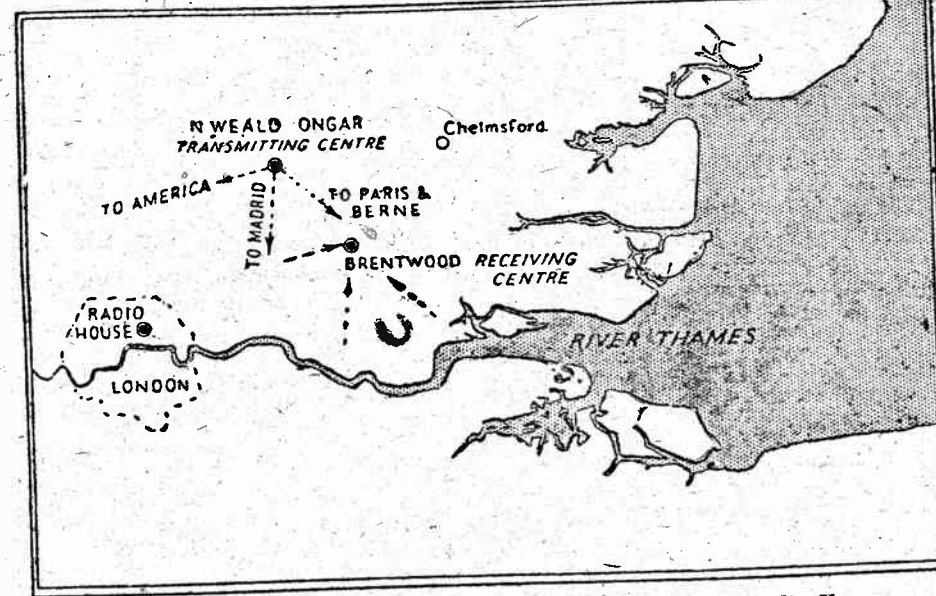


Figure 1. Map showing positions of Ongar, Brentwood and Radio House

transmitters and the auxiliary apparatus are identical, there is a difference in the size and number of tubes used in each set, but the following remarks are applicable to each transmitter.

## The Transmitting Apparatus

An outstanding feature of each transmitter is the "independent drive," or master oscillator system, which, besides other advantages mentioned later, simplifies the high speed signaling apparatus by dispensing with heavy contacts and blowers for cooling purposes. As is well known, the fundamental principle of this system is to control the main oscillatory amplifier system through the medium of a separate low power oscillation generator adjusted to the required wave length.

In Figure 3 the left hand tube panel is the master oscillator, the panel on the extreme right being the power amplifier. The two units are inductively coupled together by means of variometers which can be seen in the illustration. This system permits of great constancy of radiated wave length, as the wave length is unaffected by alteration of capacity due to any swaying movement of the aerial system.

A high speed signaling switch is con-

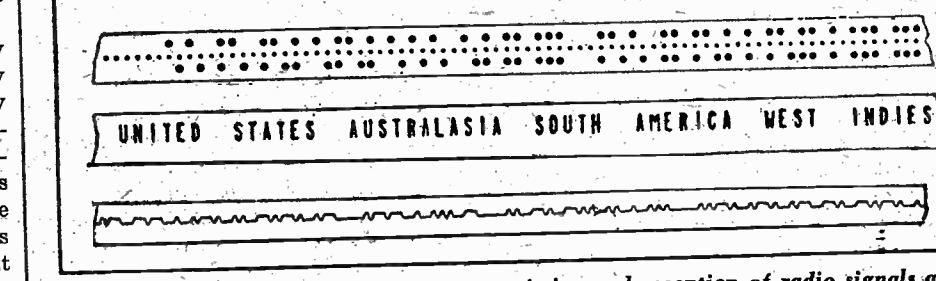
oscillating system to oscillate at the same frequency as the drive unit.

In order to prevent undue rise of potential on the smoothing condenser of the main oscillator, and thus forces the main intervals the drive coupling coil is short-circuited by the signaling key, a power absorbing unit is connected as a shunt across the terminals of the condenser.

The main oscillation panel for the Paris service utilizes four tubes for rectifying purposes and four tubes as oscillators. The high tension plate potential for the tubes is applied at 10,000 volts. The power supplied to the plate circuit is approximately three kilowatts and the antenna current is about twenty-five amperes.

The main oscillation panel for the Berne service utilizes four tubes for rectifying purposes and six tubes as oscillators, the tubes being of the same size as those of the Paris transmitter. The power in this case is about six kilowatts, and the aerial current about thirty-six amperes.

In the case of the Madrid transmitter, there are ten rectifying tubes and ten oscillator tubes, both sorts of tubes being somewhat larger than those used for the



Different kinds of tape used for transmission and reception of radio signals at Radio House. Above—Wheatstone perforator, Creed printer and Creed recorder

# New Circuit With Uniform Energy Transfer on All Waves Solves Problem

Continued from page four

energy in phase, and using at the same time the reverse characteristics of these two couplings properly adjusted, most satisfactory results are obtained in the production of a total energy transfer, which will, if desired and by proper adjustment, increase with frequency increase, or remain substantially constant throughout the frequency band.

"Again considering Figure 3, we find that by judicious proportioning of constants we can so adjust the coupling that at any point throughout the frequency range there is the correct amount of inductive reactance in the plate circuit to maintain the tube in a condition of critical regeneration. The tube can also be made to oscillate or to regenerate slightly throughout the band, as desired. It will be noted that the plate circuit is energized through a radio-frequency choke. Any actual design of this type of receiver must take into consideration the amount and phasing of stray feedbacks, if operation with extreme regeneration is required. The frequency band covered by this combination is quite large, larger than usual,

due to extreme loose coupling at the high frequencies.

"A commercial application of the coupling is shown in Figure 4, and it will be noted that the system is similar to that described in Figure 3, with the exception of condenser C3.

"The principal cause of oscillation in a radio-frequency amplifier system is feedback through the capacity between electrodes of the tube. It is necessary that this feedback energy be in phase with the inductive reactance due to the coupling means. Since the capacity of C3 is fixed, its reactance varies inversely with the frequency, so it is necessary to design the coupling to provide an inductive reactance which also varies inversely as the frequency, and to the same degree. This is accomplished by properly proportioning the couplings and values of C1, C2, C3, L1 and L2. In actual practice, it is occasionally found desirable to leave the plate circuit with slight predominance of capacitive reactance, since under these conditions a slight negative feedback will ex-

ist in the tube, which will oppose any stray positive interstage feedbacks. In other words, the relative values of C1, C2, C3, L1 and L2 vary in different styles of assemblies.

"The automatic variation of the antenna coupling is also employed. This allows the coupling at the highest frequency to be quite loose, which is found to widen the frequency band covered by the tuned circuit associated with the antenna. The so-called absorption tune, which occurs when the antenna tune falls in the reception band, is also much reduced in effect.

"A variation of the circuit is shown in Figure 5, where it is used to couple the plate circuit of a regenerative detector directly to the grid circuit, to produce either regeneration or oscillation throughout the band. If a coupling similar to that previously discussed is used, it is found that the instantaneous polarity of the feedback energy is in a negative sense, which necessitates the rearrangement shown, which allows direct capacitive feedback

Paris and Berne services. The power applied to the plates of the oscillators is fourteen kilowatts and the aerial current approximately eighty amperes.

The fourth transmitter, for the Vienna service, is of fifty kilowatt rating, and has an aerial extended over three 300 foot towers. A single cage antenna is used, as against a double cage for the other services, and the wires are spaced round spreaders twenty-five feet in diameter.

It is this 50 kilowatt transmitter which is illustrated in Fig. 3, and besides communicating with Austria, it is also used to work Glace Bay, Canada.

## Power Arrangement

The generating plant for the supply of power to these various transmitters and their auxiliary apparatus is installed in a separate building, each transmitting station being connected to the generating station by underground cables.

The prime movers consist of three sets of semi-Diesel oil engines direct coupled to 50 kilowatt 220 volt direct current generators. A battery of 1,600 amperes capacity is connected across the busbars of a direct current switchboard, and constancy of potential on the busbars is maintained by means of an automatic reversible booster controlled by an automatic pressure regulator.

Eight motor alternator sets are installed for the supply of power to the outlying stations, these taking their power from the 220-volt direct current main busbars. They generate single-phase alternating current at 1,000 volts 350 cycles. Four of these sets, each rated at 25 kilowatts are provided to supply power to the tubes of all the main oscillation generators, or power amplifiers. The remaining four sets, each rated at 15 kilowatts are provided to supply power to the tubes of the independent drive, and also current for the filaments of all the tubes in each transmitting station, the potential being transformed down to the required voltage.

Under normal working conditions the large storage battery is connected to "float" across the direct current busbars, and the current for running the motor alternators is supplied by two only of the direct current generators. Generally, three only of each set of four motor alternator sets are in use at one time, one set being spare for main amplifier supply, and one set for the independent drives and filament lighting.

Such is the equipment of the Ongar transmitting center as it is today, but it is constantly being added to as new services are opened, so that it bids fair one day to be the transmitting center for one of the most extensive networks of radiotelegraph communication in the world.

The only other transmitting center operated by the Marconi Company is the station at Carnarvon, in Wales, and this is also controlled and operated from Radio House, London. There are two transmitters at Carnarvon, both high power tube transmitters, one being used for commercial radiotelegraphic communication with this country. The other transmitter is occupied with the newly instituted photoradiogram service between London and New York, and is at present kept quite busy transmitting photographs and pictures of all sorts across the Atlantic.

## FRIDAY

6:00K-WFAP-NEW YORK-492m  
6:05 p. m.—Health exercises.  
6:10 p. m.—Morning prayer services.  
6:15 p. m.—Music.  
6:20 p. m.—Hints to Housekeepers.  
6:25 p. m.—Elisabeth Condit.  
6:30 p. m.—Market and weather reports.  
6:35 p. m.—Jules Hatfield, soprano.  
6:40 p. m.—Marenzio Nelson, soprano.  
6:45 p. m.—Lucille Blase, pianist.  
6:50 p. m.—Interpretation of Standard Song Literature.  
6:55 p. m.—Butler.  
7:00 p. m.—William Stearns, tenor.  
7:05 p. m.—New Yorkers Dance Orchestra.  
7:10 p. m.—Dinner music.  
7:15 p. m.—Baseball scores.  
7:20 p. m.—Gene Ingham's Orchestra.  
7:25 p. m.—Bernard Abrams, baritone.  
7:30 p. m.—"Winged Enemies of Man."  
7:35 p. m.—Dr. I. Goldston.  
7:40 p. m.—The Happiness Hour.

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6:45 p. m.—Lucille Blase, pianist.  
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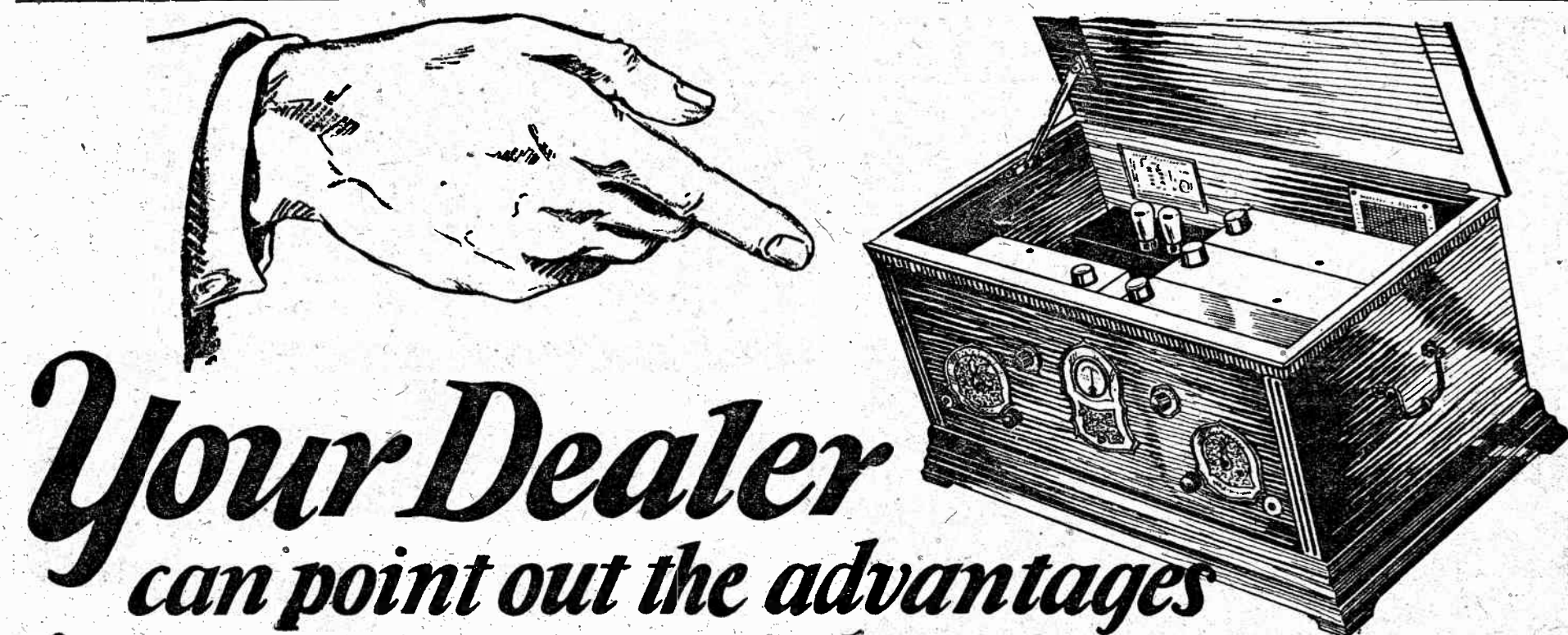
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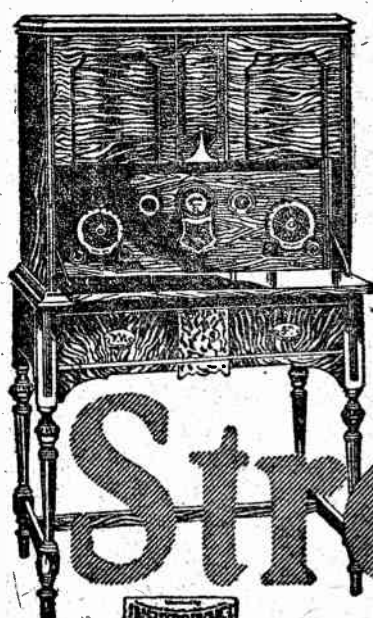
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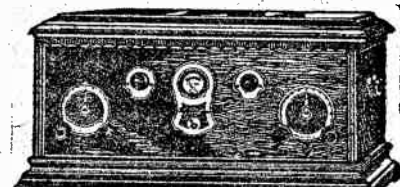
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# NEW YORK Herald Tribune RADIO MAGAZINE

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SECTION IX

SUNDAY, JUNE 20, 1926

TWELVE PAGES

## Simple Directions for Constructing a Sound Board Cone Speaker

This Unit Is Easy to Build With Apparatus Which Is Now Generally Available

By JOHN F. TRAVER

IN AN attempt to create a full and natural reproduction of all the musical tones via radio one is apt to overlook the fact that it is necessary for all links in the chain, from broadcasting station to loud speaker, to be so designed that they will pass correctly all of these tones.

The modern broadcasting station has made very good progress in striving for this ideal, and furthermore it is entirely outside of the broadcast listener's control, so we will consider only the receiving equipment.

A little thought will show that a well-designed audio amplifier will not pass high notes if the radio frequency stages have already cut off these high impulses. Carrying this thought a bit further, it is evident that a high-priced loud speaker designed to bring out the low tones is a useless expense if the set and audio amplifier fail to pass these low notes.

My object in giving the above introduction is to explain the following suggestion: If your set is not capable of correctly amplifying and passing all notes in the musical range don't begin with this article which has to do with a loud speaker, but look for a good article which will tell you how to remedy the faults in your set. The loud speaker to be described will then be of more benefit to you.

I have been interested particularly in audio amplification and sound reproduction for several years, and among other things have built quite a number of cone type speakers. Some gave very pleasing results, while I will admit that others were very disappointing.

### Cone Requires More Power

Cone type and horn type speakers have been compared and discussed at length, so I won't attempt it here, except to point out two facts which I do not find emphasized elsewhere. It has been my experience that a good cone speaker requires a more powerful unit to operate it satisfactorily than is necessary with the average speaker of the horn type. With a cone speaker it is also advisable, if not absolutely necessary, to use a power tube and feed it with a more powerful signal.

Failure to take care of these matters has caused many to be dissatisfied and unjustly criticize their cone speakers. Another cause for complaint is the tendency of this type to bring out low frequency noises, defects and distortion prevalent in a poor receiving set.

As I am an experimenter by inclination, I like to make my own equipment, as far as possible, and endeavor to improve on the marketed variety. In this work my greatest trouble lay in the fact that until recently no powerful, satisfactory unit was available to the public.

In view of this fact, I was very much interested when, a short time ago a number of New York stores offered complete parts for building cone speakers, including a powerful unit designed for the particular purpose. A little later an even better unit appeared, which, it is claimed, is identical to the one used in one or more of the better commercial cone speakers.

I investigated these offers of cone parts, and while I was pleased with the parts themselves I thought most of the plans for assembling were very crude. In fact,

most of the stores either recommend suspending the cone unmounted or leave the mounting to the purchaser's ingenuity.

About this time I was attracted by one of the better class of radio manufacturers bringing out a cone speaker which incorporated a wooden soundboard. I had been thinking of the theoretical advantages of a soundboard in connection with this type of speaker and had thought it strange that the principle was not used.

Most of the data had been to the effect

might be expected if the soundboard and cone were caused to vibrate more as a single unit.

### The Construction Plan

This thought led me to the following plan: I would mount the unit on the soundboard at the center and between the board and the cone. I would attach the edges of the cone and soundboard together and support the whole from a point on the soundboard directly in back of the

will find it easier to first cut your board down to a square just outside of the circle and then cut off the four corners. This will bring the edges of the board down pretty close to the circle and then the scroll saw may be used with much greater ease. Having cut out the circle file and sandpaper the edge smooth.

### Mounting the Unit

The unit, mentioned earlier in this article, has a large horseshoe magnet, which is very powerful. The coil is located between the poles, and the armature is of the balanced type, adjustable by means of a small screw in the back. From this armature a pin some six inches in length projects for connection to the cone. The unit has a flat shield-shaped aluminum back for mounting. In this back is located the screw for adjusting the armature and also two threaded holes for machine screws to be used in mounting. From a point on this back directly in the rear of the pin these are located as follows: Mounting hole, seven-eighths-inch to the right; mounting hole, seven-eighths-inch to the left, and adjusting screw, seven-eighths-inch below.

Check up these measurements, and then, making sure that the pin of the unit will be directly over the center of the soundboard, drill holes for the mounting screws large enough to accommodate them comfortably and another hole about three-eighths inch, located so it will come directly over the adjusting screw. Also drill another three-eighths-inch hole far enough above the center to completely clear the unit. This is to be used for bringing out the cord from the unit. This board from the rear will look as shown in Fig. 1.

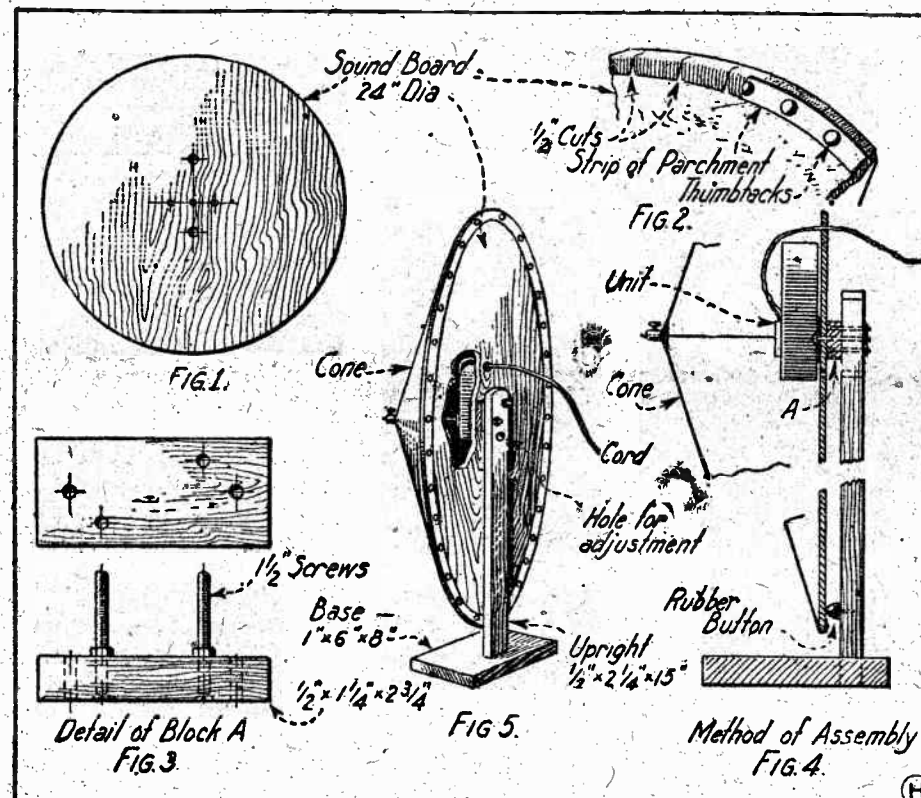
We now come to the mounting block. Details are shown in Fig. 3. This block should be cut from tough wood, which is not inclined to split, and should measure about 2½x1½x½ inches. Two holes should be drilled so as to directly coincide with the mounting holes in the unit and soundboard. Between these holes, but not on a line with them, holes are to be drilled for the two machine screws, whose length should be about 1½ inches. Arrangements should be made to counter-sink the heads of these screws, as that side of the block is to fit flush against the soundboard. Nuts are then put over these screws and turned down tight.

Before assembling all wooden portions those already described, as well as the stand and upright to be described later, should be rubbed down with fine sandpaper, then stained and varnished or stained and lacquered, preferably the latter.

Now place the unit in position on one side of the soundboard and the mounting block on the other. Insert the mounting screws through the block and board to the unit, and by tightening up bring the three firmly together. (Note.—It is important that the block should not cover up the hole in the soundboard opposite the unit adjusting screw.)

We next come to the cone itself. These are sold in two sizes, 18 and 36 inches. It will be necessary to buy the large size and cut it down, so that when glued into cone shape it will be about three-quarter inch larger than the soundboard. An adjustable connection is also provided for

(Continued on page eleven)



These drawings clearly illustrate the construction of the sound board cone loud speaker described in this article

that a free edge was necessary for a cone to vibrate properly. This may have deterred manufacturers from attempting to use a soundboard. However, one concern had overcome the difficulty, it seemed, so I decided to try.

I was pretty well convinced of the superiority of the free edge principle. Vibrations set up at the center should be allowed to build up without undue damping at the edge, which would be the case if the edge was held firm.

This was my first problem, and one over which I spent quite a bit of thought. If the soundboard was to be held in a vertical position the most accepted solution would be to support the cone from a point on the edge of the top, in order to take the strain off the pin from the unit, and cushion the rest of the edge against the soundboard with felt, rubber or other suitable material. This solution naturally occurred to me first, but I did not accept it, for one reason—vibrations set up by the unit would be transmitted directly to the cone by the unit pin, but the soundboard would receive these vibrations only through the movement of the air pocket between the cone and the board. That does not mean, of course, that the soundboard would thus fail to perform its function. On the contrary, it would be more truly a soundboard in such an arrangement than if actuated directly by the unit. However, it seemed to me that a better register of the low notes and greater volume and fidelity over the entire scale

unit. Now, if my soundboard were sufficiently thin to respond readily to the sound vibrations the above arrangement would give me an instrument incorporating the free edge cone principle, and in addition a soundboard vibrating in absolute harmony with the cone.

I tried it, and I can assure you I was more than pleased with the result. The instrument is very easy to build, and if care is taken with the construction it will be exceedingly attractive looking as well as efficient in operation.

Perhaps the hardest piece of work involved in cutting out the circular soundboard. A section of veneer board or paneling should be obtained from a carpenter shop or cabinetmaker. These sections usually come, I believe, about twenty-four inches wide and a little over thirty inches long and about one-quarter inch thick. At any rate, such a section will be large enough to enable you to put a circle between twenty-three and twenty-four inches in diameter. Such a board is three-ply, which will insure against warping, and the two surfaces are of wood having an attractive grain. This latter feature is a decided advantage, as the back of your soundboard will be open to view.

A twelve-inch piece of cord, with a tack at one end and a pencil at the other, may be used to mark out your circle. A cheap iron frame scroll saw may be obtained at the hardware store for a few cents and used to cut out the circle. However, you

Add Radio News Will Be F in Another Section of Today's Herald Tribune



# Data on the Construction of a One-Control Five-Tube Radio Receiver

## This Set Employs Two Stages of Efficient Tuned Radio-Frequency Amplification

By WILLIAM M. HENDERSON

DESPITE the off-trail steps taken in the forward trend of receiver design the final achievement, single control, has never been lost sight of. Coincident with the improvement in quality, part design and circuit advancement there has been a consistent reduction of the number of tuning controls.

The introduction of the gang condenser in which two, three and more variable condenser units are mounted on one shaft has placed before the experimenter a means of building his own single control receiver. Such an accomplishment has heretofore been impossible because of the difficulty encountered in getting proper gears or pulleys to couple several condensers together.

The gang condenser solves for the constructor the problem of getting similar condensers to tune the various circuits. It must be remembered here that positive single control is not possible unless the complete set be made so sensitive that a small coil can be used as an energy collector.

Aerials and loops will not permit of the design of a receiver without some compensating member to take care of the wave length variations inherent in these collectors with a change in tuning. But one compensating control that operates in such a manner that its setting is regular with the change in main dial setting is far from objectionable.

The single control receiver described here has one main tuning control with a small compensating condenser that has a regular increase of capacity change with the tuning of the triple condenser unit to the higher wave stations.

### Parts Required

Such accomplishments no doubt fill the bill, and we can now get on to the actual constructional data on the set. The first is the list of parts. The following is the apparatus used by the writer in his receiver:

- 1 General Instrument triple condenser (each section .00035 mfd. straight line frequency type).
- 1 Set of three General Instrument radio frequency transformers.
- 2 Precision audio frequency transformers.
- 1 Electrostatic resistance coupler.
- 1 Electrostatic resistance, 250,000 ohms.
- 1 Daven grid leak mounting.
- 1 Hammarlund midge condenser.
- 1 General Instrument 20-ohm rheostat.
- 6 Radion UX-type sockets.
- 1 Dubilier 1 mfd. by-pass condenser.
- 1 Dubilier .00025 mfd. grid condenser.
- 1 Dubilier .005 mfd. fixed condenser.
- 1 Radion 24x7 1/4 inch panel.
- 1 Baseboard 23 1/2 x 11 1/2 inches.
- 1 BMS single circuit jack.
- 1 Radion dial.
- 1 Radion binding post strip.
- 8 Eby Binding posts.

### Triple Condensers Used

The construction of single control receivers using double or triple condensers has been greatly hampered by the general impression that balancing of the circuits would be an impossibility for the average individual to accomplish. This is an erroneous opinion and should be discarded. The balancing of the second stage and the detector circuit in this particular set will not take more than fifteen minutes at the most; that is, providing the coils are made carefully in as far as keeping even tension on the wire while winding and using the correct number of turns.

As it is usual to enumerate the various features of a set undergoing the operation

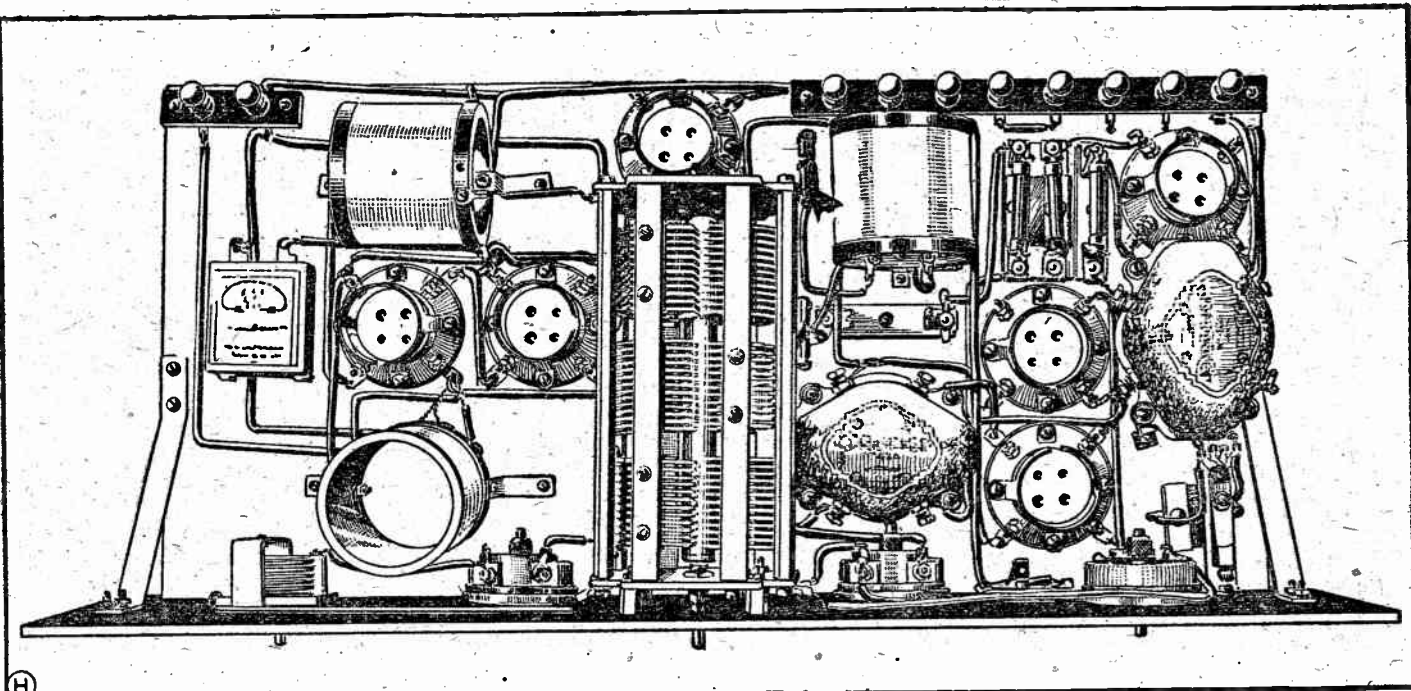
of being described in a radio magazine, the author finds it incumbent upon him to do so also. There are no glaring headlines to be written about this particular set. It is simple to build, works well, gets plenty of distance, and gives good quality and to this may be added, the decided advantage of having single control tuning. Could anything more be desired?

The radio-frequency transformers, of which there are two, are both wound the

input so that there will be no interference. This coil has one single layer winding of seventy turns of No. 26 D. C. C. wire. The antenna tap is taken off at the fifteenth turn, counting from the filament end of the coil.

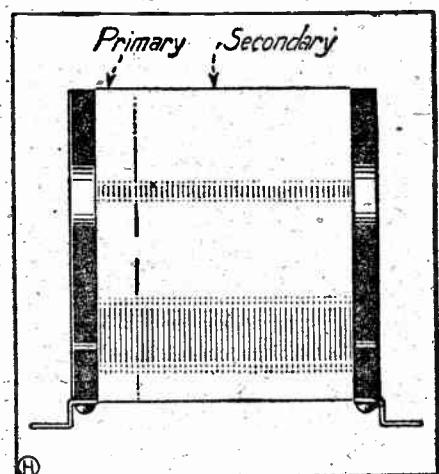
In all three of these coils it will be found advantageous to drill the ends of the forms to take small 6-32 machine screws and make the coil terminals secure to lugs. Use two lugs for each terminal,

noticed that all leads are down on the baseboard and are covered with cambric tubing. This is far from essential, but as a neater appearance is presented when the cabinet cover is raised this system of wiring was used. It is much easier, however, to leave off the insulating tubing and to separate the low potential leads more. The operation of the set will not be affected by any change in wiring that may be made by the constructor.



Drawing showing how the parts of the writer's one-control receiver are arranged on the subbase panel

same. The secondary coil is wound adjacent to the primary and in the same direction. The primary coil consists of ten turns of wire space wound; that is, separated by about half the thickness of the wire. The secondary coil consists of seventy-six turns. No. 26 D. C. C. wire is used for both coils. The end of the secondary that is over the primary is the



Coil construction details

filament end of the coil. The start of the primary is the "B" terminal and the end the plate connection. They are wound on a tube 2 1/2 inches in diameter.

The antenna coil does not have a separate primary coil. A tap connection on the grid coil is employed in this circuit because of the increased signal strength obtained. The rest of the set; that is, the two stages of amplification, are selective enough to take care of the broad

one for the coil ends and the other for connecting to the circuit. If one lug is used for both purposes there is a possibility of the coil end coming loose when making the circuit connection.

With the coils wound, the next thing to do is drill the panel. The layout is probably best shown in the drawings given on this page. The multiple condenser is mounted in the center of the panel and four inches from the bottom.

The midge condenser and the detector rheostat are mounted 4 1/2 inches from the edges and three inches from the top, the left end for the midge and the right end for the rheostat.

The radio-frequency rheostat and the audio-frequency rheostat are mounted two inches from the bottom and seven inches from the left and right ends of the panel, respectively. The jack is mounted two inches from the bottom of the panel and two inches from the right end.

After the original model was built it was found that the detector rheostat and audio-amplifier rheostat were unnecessary and could be eliminated. To control the filaments of these tubes any of the automatic resistances can be used, one rheostat can control them all.

The baseboard layout that is shown in another drawing should be followed. Changes can be made if necessary, but this arrangement of apparatus gives the most direct leads.

With the parts all mounted and the panel secured to the baseboard by means of brackets, as shown in the drawings, the set can be wired according to the diagram given in Figure 1. In the set shown in drawings, it will be

one hint in wiring the tuning circuits that should be remembered is that one lead to the rotor plates, or frame, of the condenser is all that is necessary, and that should connect to the negative filament. Then the filament ends of the coils can be wired directly to the negative side of the tube socket.

When the set has been wired and the batteries connected and the tubes placed in their respective sockets a local station should first be tuned in. If the coils have been made as per specifications and the wiring is correct no trouble should be encountered in getting several stations before any attempt at balancing is done.

If by any possibility no stations are received and the set sounds alive, connect the aerial directly to the grid terminal of the detector coil. If a signal is picked up then, change the aerial to the plate terminal of that transformer.

By successively changing this lead from the detector to the aerial post in the above manner poor connections or a bad tube will be located. The next step is the matching of circuits. This may and may not be necessary, depending upon the care taken in winding the coils and the quality of the multiple condenser used.

To match the detector and second stage circuits it will be necessary to first obtain a large coil form and wind fifteen turns of wire on it. A fifteen turn basket-weave coil is admirable for this purpose. The coil should be connected to the aerial and ground leads, which are, of course, not connected to the set.

Matching the Coils

This antenna coil is placed about seven inches from the detector tube coil and the two radio-frequency tubes are turned out. Tune in any station that is operating and record the dial setting.

Then take the first radio-frequency amplifying tube out of its socket and light the other one. The antenna coil should now be placed exactly the same distance from this coil as it was from the detector coil; the separation is not critical as long as the same distance is maintained in both instances.

Tune in the same station again. If the station has two peaks, that is, has two loud points, then one or the other of the coils is out of tune. Pick one of them as a standard. Remember the detector dial setting it will be found that the second setting giving the second peak signal will be that for the amplifier.

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## How Broadcasting Is Spreading The Gospel Throughout World

The Catholic Church Has Many Stations in the U. S.; WWL, Said To Be the Pioneer of the South; WLWL the Largest With 1,000 Watts

By Peter J. Dolin, S. J.

THERE was a school debate, some twenty years ago, in which "we of the affirmative" maintained that "Nowadays, Oratory exercises a greater force for good than Journalism." One of the cogent arguments of the gentlemen of the negative which palpably confronted us in our preparation, and almost overwhelmingly in the rebuttal, was that the efforts of an orator were necessarily circumscribed. He could reach only the limited few who came within the sound of his voice, while the field of the journalist was practically unlimited, his influence for good as far-reaching as the world that runs and reads.

I may mention, incidentally, that the protagonists of the forum won the debate—not, of course, without a struggle. But, were we to assemble to-night on that same college stage and re-enact the scene, the victory would be ours, hands down. The opponents of oratory who in this modern day of radio would intimate that the written word can carry further than "the throbbing, pulsating plea of the orator" would be leaving altogether out of consideration the microphone, the transmitter, the aerial tower and the hundred and one other elements that have combined to revolutionize the transmission of the human voice and of artificial sounds.

### Radio Has Changed the Earth

Radio has changed the face of the earth. It has opened up possibilities which even a generation ago would have been deemed as ridiculous as were the prophecies of Mother Shipton. I suppose that in the usual order of things the Catholic Church, as the undying foe of scientific progress in general, has been cited here and there as an adversary of the radio in particular. Yet in the atmosphere in which were reared the famous Ampere, a devout Catholic; Gavran, a Tertiary of St. Francis; Ohm, a teacher in a Jesuit college, and Volta, a man who began each day by hearing mass and ended it, after he had visited the Blessed Sacrament, by saying his rosary, one would be disappointed not to find that the radio has its place in circles professedly Catholic, and that it is serving as a veritable handmaid of the Catholic religion in aiding the dissemination of Catholic teaching.

One of the first broadcasting stations in the United States—that which is now known as WEW—was installed at St. Louis University in 1910 by Brother George Rueppel, S. J. Its pioneer efforts were only suspended with the entrance of the country into the war, when the government utilized its facilities in the training of radio operators for the United States Signal Corps. With the removal of war-time restrictions the station in 1919 resumed its former programs, and in April, 1921, the scope of its usefulness was extended by the introduction of a radio-telephone for the transmission of the United States Weather Bureau reports, market and crop estimates. In March, 1924, WEW began to broadcast Sunday afternoon lectures on doctrinal subjects. The divine origin of the Church, the marks of the Pope, the sacraments, the priesthood, confession, the Holy Eucharist, marriage, etc., were among the topics which have been explained. Every Sunday afternoon at 2 o'clock answers are given to the difficulties submitted by listeners. Thanks to the generosity of the Catholic Laymen's Association of Missouri, which has appropriated \$25,000 for the purpose, it is announced that WEW, heretofore a 100-watt station, is now to have a 1,000-watt transmitter.

In the fall of 1921 the Rev. John B. Kremer, S. J., head of the department of physics at Marquette University, Milwaukee, outfitted, largely with equipment of his own making, a 100-watt station at the university. Under his manipulation programs were broadcast once a week until a little over a year ago, when the power was increased to 1,000 watts and "The Milwaukee Journal" combined with Marquette in operating the station. It is located in the tower of the new Science and Administration Building of the university, but remote control programs can be broadcast from the new \$200,000 plant of "The Journal" as well as from several other points throughout the city. WHAD operates on a wave length of 275 meters, and with few changes could be readily increased to 1,000 watts. The Marquette studio is on the air only on Monday nights, when, in addition to

musical and other features, a talk is given on some current topic by the Rev. Edward G. Garesché, S. J. Each day at 11 a. m. and 4 p. m. the "Journal" studio broadcasts music, news, market reports and talks by prominent individuals. The "programs of quality" are advertised through the columns of the "Journal" and have elicited acknowledgments from listeners in every state in the Union, and from points as remote as the Tabiti Islands, 6,000 miles from Milwaukee.

**Pioneer Station of the South**  
Credit for establishing the pioneer broadcasting station of the South belongs to Loyola University, New Orleans, which applied to the government authorities April 2, 1922, for a broadcasting license. Authority to operate was forthwith granted, and that same evening Louisianians who possessed radio sets heard the first radio concert ever given in the Southland. When the university launched its building campaign to raise \$1,500,000, the appeal which was made by wireless brought valuable results. Later the station enabled Loyola to open a radio school. Completely rebuilt and brought up to date, WWL broadcasts regularly once a week, furnishing musical programs and incidental educational talks.

The Benedictine Fathers in charge of St. Martin's College, Lacey, Washington, "out where the cedars meet the sea," received in April, 1923, a broadcasting license for station KGY, the outgrowth of an amateur radio telegraph station installed by Father Stanislaus Ruth, O. S. B., eight years previously and interrupted only by the restrictions of wartime. Three evenings each week a varied program is broadcast, with concerts, debates, plays, lectures, recitals and college news in variety. Although until very recently only a five-watt station—it is now operating on fifty watts—twenty-three different states have been heard from in appreciation of the programs of KGY, with particular praise for the renditions of operas, etc., produced through the use of Victor records, with supplementary explanations and descriptions. In this form of broadcasting the fathers at St. Mary's were pioneers. Their unique station, housed in a log cabin, which, like all of the apparatus used, was "home-made."

### The Holy Cross Station

The next center to develop collegiate radio activity was Holy Cross College, Worcester, Mass., which began broadcasting in the fall of 1924, first with the news of football games. Through the provision of its owner, Theodore T. Ellis, a generous benefactor of Holy Cross, "The Worcester Telegram and Gazette" utilized its station, WCTS (now WTAG) for the football program and later provided connections with the college auditorium and students' memorial chapel. Thus the radio audience was enabled to enjoy all the lectures, organ recitals, glee club and orchestra concerts, intercollegiate debates, etc., intended primarily for the undergraduates' benefit. The following summer, under the supervision of the Rev. Daniel H. Sullivan, S. J., various points of the campus were linked by underground cables to a central control panel, and through the courtesy of the Westinghouse Electric and Manufacturing Company, the facilities of its stations at Springfield and Boston, WBZ and WBZA, were placed at the disposal of Holy Cross. Since last November the college has broadcast one Sunday night each month a full evening's program through WBZ, which will transmit, during the present month, "Twelfth Night," the Shakespearean play scheduled for production this year. It is said that this is the first time that Shakespeare had been thus broadcast. And what again was claimed by press critics to be the first time such use has been made of the wire-

less, was when a debate was carried on last May between the teams representing Holy Cross and Boston College. This "duel of brains" was virtually staged on a platform forty-two miles wide, for the Worcester boys spoke into the microphone at WEAM, the Shepard studio at Providence, R. I., while the Boston College debaters radiocast their arguments through WNAC, the Shepard studio in Boston. The decision was rendered only after the listening public had submitted its vote by telegram, telephone or letter. A total of over 1,300 ballots, thus received, from Montreal, Washington, Cincinnati and practically every city in New England, was significant of the widespread interest excited by the novel competition.

Newer than all the foregoing, and second to none in its equipment, is station WLWL, opened last October by the Paulist Fathers at their headquarters, West Fifty-ninth Street, New York City. The station, with its twin towers 225 feet high, is equipped to use 5,000 watts, and represents an investment of over \$100,000. Its installation was directed by the Rev. James F. Cronin, C. S. P., who is in charge of the plant and largely responsible for the refined and varied programs that have been broadcast, beginning with the evening when, according to press comments, an audience of at least one million listened to the opening address of His Eminence, Cardinal Hayes. WLWL is on the air three evenings each week. The Sunday program is a purely religious one, affording the listening public the incidental opportunity of hearing the world-renowned Paulist Chorists, whose efficiency as radio artists is attributed to the skill of their director, the Rev. William J. Finn, C. S. P. On Monday evenings the Rev. James M. Gillis, C. S. P., conducts a "question box" hour, supplemented by a discussion of civic or spiritual interest. Thursday evening is set apart for treatment of literature, public affairs and the arts. Reports have been forthcoming from all parts of the United States and from various provinces of Canada of the efficiency of WLWL's broadcasting and of the grateful delight with which its services have been received.

An altogether distinct article might be written of the widespread use of the radio which has been made, here and there about the country, by arrangement with stations purely secular in their management, for the broadcasting of Catholic interests. Thus in Chicago on the second Sunday of January Cardinal Mundelein was listened to, not merely by the members of the Holy Name Society before whom His Eminence appeared in his cathedral, but by the thousands to whom "The Chicago Tribune" broadcast the services through its station WGN. In the same city for the last several years the Rev. Claude Parnin, S. J., professor of homiletics in the Archdiocesan Seminary, has been giving weekly readings in literature from KYW, a Westinghouse station.

Over the General Electric Company's station KOA, at Denver, January 31, the pontifical mass celebrated by Bishop Thien in the Cathedral of the Immaculate Conception, the sermon by the rector, an afternoon organ recital and later in the day the complete vespers' service were sent out on the air.

On February 6 the first of a series of half-hour lectures to be given every Saturday night by teachers in the various faculties of Creighton University, Omaha, Neb., was broadcast through WOAW, the local station of the Woodmen of the World. Drama, fiction, athletics, public speaking, law, dentistry, medicine, sciences, etc., are to be treated from the popular viewpoint.

And so this thoroughly modern vehicle for the carrying of truth and enlightenment and spiritual cheer continues to grow in efficiency and practicability. Its advent has brought undreamed-of encouragement to those who would fain hearken to the mandate of Christ: "Preach the Gospel to every creature!" The possibilities of radio as a factor for good give even greater reason than did the invention of its predecessor in scientific achievement for one to exclaim: "What hath God wrought!"

**"Always"**  
Runnigham  
RADIO TUBES

## Radio Mail Order and Parcel Post

The articles advertised on this page can be ordered by mail, receiving the same attention as if personally selected purchase. Cut out the advertisement of the article desired, write your name and address plainly, attach money order or mail it to-day. If inconvenient to send money order, merchandise can be shipped by express or parcel post, C. O. D.

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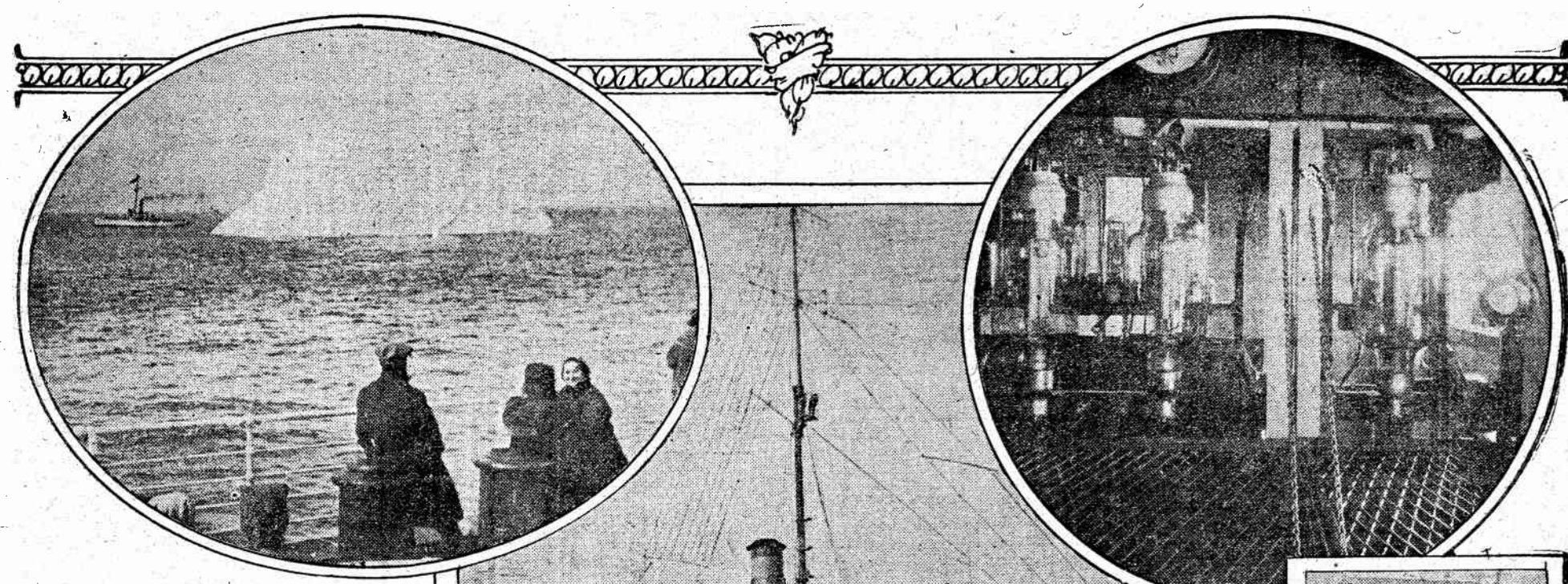
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# How Radio Helps the U.S. Coast Guard Keep Tabs on the Ice Menace

Cutters Are Well Equipped With Wireless Apparatus; Positions of Icebergs Charted Regularly

By A. GORDON SHIRT



The Coast Guard cutter Modoc on guard alongside a large iceberg as seen from the decks of the S. S. Tuscania

THROUGH May and June the yearly ice patrol kept by the United States Coast Guard along the north Atlantic steamship lanes has been and will continue to perform its arduous task. A glimpse into the daily routine of the officers and men upon the ships designated for the purpose reveals that radio plays the major part in the work. In fact, were it not for radio, the service would be practically impossible.

The cruising cutters of the Coast Guard are well equipped with radio. The nature of their work compels them to be, else how could they receive information of shipwreck and danger in time to be of practical assistance? And they find constant use for all that they have. At sea, the vessels of the Coast Guard send in their daily noon position to headquarters, and keep a constant and vigilant radio watch for orders rushing them to spots along the coast to aid in the relief work of some disaster.

The cutters likewise put their radio compass to good use. In the first place, it is possible for them to navigate in the thickest fogs with a considerable degree of safety. Instances are on record where Coast Guard vessels in ports along the coast have been enabled to proceed to sea in dense fogs and to locate stranded vessels by means of the radio compass, especially if the distressed craft is a steamship equipped with radio. The disabled vessel lying still and sending out radio impulses is readily located by the cutters and the work of rescue facilitated sometimes by days.

### Radio Routine Strict

The radio routine as outlined in orders from headquarters is exceedingly strict. Before even a glint of the morning sun warms the backs of the playful seals on the plateaus of the icebergs, a complete diagnosis of the icy regions must go forward by radio to the hydrographic office. Not to the main office in Washington, although the message finally arrives there for publication in the daily memorandum, but to the branch office in New York City, so that the big shipper, the controlling stockholder, and the members of the Maritime Exchange may know the moment they come to their desks the extent of the ice menace out there on the Banks. Furthermore, the station at Arlington broadcasts this report—known to the service as the 4 a. m.—and doubtless reaches vessels that somehow or other would have entered the ice field unguided.

Just before the darkness intensifies the dread of the Newfoundland fogs, there is broadcast from the patrol ships a general ice report. It contains all the information secured that day with reference to the positions of bergs and ice fields, together with a complete summary of the

The U. S. S. Tampa, the first electric Coast Guard cutter. (Insert.) A view of the radio transmitter used on the U. S. Coast Guard cutters. Right—The radio telephone attachment used in connection with the radio transmitter.

Photos Courtesy, General Electrical Company

situation, for the benefit of ships who are listening in for the first time. This evening report is sent out on a 600-meter wave length, and is repeated twice, with an interval of two minutes between the messages. East coast amateurs listening in at 6 p. m. during the months of the ice visitation may intercept the report, and if they are ambitious enough to spot the icebergs on a school map they will have in duplicate the problem of the transatlantic navigator that night, minus the anxiety and the worry. Many a cautious skipper has been enabled to give his whole attention to the fog on the radio assurance from the ice patrol that no icebergs lie in his path for the next eight hours.

### All Ships Asked to Give Aid

In addition to these general reports, a request is sent out to all ships within reach asking them to report their positions, courses and speed, water temperatures and general ice information to the cutter. This request goes out every four hours. It brings in the greatest volume of business; in fact, the responses make up the bulk of the radio work of the cutter.

Upon the receipt of this request, which is a way of informing vessels that there is skilled protection to be had for the asking, all ships who wish to take advantage of it send in their name, geographical position, their course and speed. On board the Coast Guard cutter, the positions are plotted on the commander's chart, and the courses are laid down and examined to see whether or not they are clear. After a week or so of work, this chart comes to be a moving diagram of ocean shipping, as more and more ships send in their positions and indicate the direction in which they are going, and as more and more dots are hourly brought forward on the chart.

The constant reports of these vessels constitute considerable radio traffic in themselves. In 1923, over 945 vessels reported themselves 2,646 times. The steamship Strathearn, for example, to take at random one of the hundreds ships that performed similar services in late years, reported the presence of a large berg in latitude 42 degrees 10 minutes north, longitude 46 degrees 53 minutes

west, adding that it was not responsive to the fog whistle and therefore particularly dangerous to navigation.

When this information was received aboard the cutter it was not only made the subject of a specially broadcast warning, but was examined with reference to the score or more ships following in the wake of the Strathearn. If it was apparent that any one or more of them were heading into danger, that vessel or vessels were made the recipients of a special direct report.

### Routine of the Work

The routine of the work, as it might be expected, has lost its thrill for the active chief of the ice patrol. He dispenses with warnings and information as methodically as though he were laying down his course for home. He awaits developments in the most dangerous of situations with a calmness that would have done credit to Napoleon. But in spite of his uncomplaining exterior, he is often supremely tired. This work taxes a man to the limit. Two days of dismal nose-poking into a whirling fog, blasting constantly on the nerve-racking whistle and coming so close to what they were looking for that at times only a prompt shift of helm averted a crash and a cold, cold grave.

He looks at the radio officer, who has silently appeared in the doorway. Another man who has not rested for days.

"The master of the S. S. Noord would like to know if a straight course from latitude 41 degrees 44 minutes north, longitude 46 degrees 43 minutes west, could be laid toward Cape Breton, or would it be advisable to round Sable Island and proceed from the west."

"Tell him to proceed with caution," replies the commander. "He cannot make Cape Breton without meeting ice on either course he mentions. Give him position of the nearest bergs . . . here, numbers five and seven . . . with their approximate drift. Ask him to give us his position and water temperatures every four hours. Another?"

"Yes, sir. Steamship Yamahill reports large iceberg in 41 degrees 12 minutes north, 53 degrees 34 minutes west in shape like a broken tooth. It is 400 feet long and 100 feet high, with a broad

plateau at one end, on which seals are sunning themselves."

"Umm, let's see. That's there," making a dot on the chart at the reported latitude and longitude. "That is to be numbered 15. It has a probable set to the southeast of five-tenths of a mile per hour. Make the usual broadcast warning, Mr. K.; notify the hydrographic office at New York in the 4 a. m. report, and get in touch directly with the ships Senwell and Bethelridge, advising a change of course to the southward and warning them to proceed with caution."

"Yes, sir."

"And, Mr. K."

"Sir?"

"Thank the Yamahill."

And so the work goes on . . . neither the radio operators nor the ship's navigating officers getting an overdose of sleep. While the battle with the ice field is taking place, the transatlantic steamship lanes are shifted to the southward one degree. This change takes steamers below the southernmost edge of the ice field. During these months the Coast Guard cutters keep constant watch over the field, following and marking its southern limits, and tracking like sleuths the paths of individual and isolated bergs. June is the receding period, when the field goes back to the northward, and around about the last days of June or the first week in July the steamship lanes are again freed from the menace, the ships are withdrawn from the patrol, and the danger, for the present year at least, is over.



# For the Love of Mike---A Radio Romance Involving a Greek Exam and an Old Flame

The Announcer Leaves His Microphone Open, With Interesting Results

By HILLIARD BOOTH

"GOOD afternoon, Albert. Where is Stella?"

"Sh!" Albert Gaines, professor of Greek at Biltwell College, motioned his elderly sister to silence as he adjusted the dials of his radio receiver. "They're broadcasting the Biltwell-Brown football game."

"This is the end of the second period," came the announcer's voice through the loud speaker. "The feature of the first half was the brilliant playing of Buck Rogers, of Biltwell. I'll let you listen to the band during the intermission, while I go out for a drink of—nothing stronger than black coffee, I assure you. Please stand by."

"Stella?" The young-ish professor turned to his sister. "Why, Stella went to see you, Rachel."

"Um!" Rachel shrugged. "Our niece has probably gone to the football game."

"No, I forbade her to go. I'm trying to

of a brass band filled the loud speaker. "They've gone!" Rachel shut off the radio. "Wait till I get my hands on Stella!"

"Wait till I mark Rogers's exam paper!" The professor's voice was grim.

"Do you mean to tell me, Albert Gaines,

hands full of telegrams. The professor groaned as they started to open them.

"Kansas City. Hot Sapho, give Buck Rogers 100 per cent on that kiss, Professor!"

"New Orleans," read Rachel, "your love is just my wave-length. Marry Stella off to Buck and I'll take care of your income."

"Baltimore," read Gaines. "Tell Rachel she can have my plus-fours if Buck passes his Greek exam."

"Flunk him on the examination!" cried

everything in plus-fours! Good afternoon!" She went out and slammed the door after her.

"Uncle dear," began Stella.

"Not another word!"

A smile broke over Buck Rogers's face as he opened one of the telegrams. "Listen to this one, professor."

"I don't wish to listen to it. I've heard enough of those atrocious wires. Tear it up!"

"All right. But it's signed 'Alice Deering.'"

"Alice Deering?" The professor, excited, snatched it out of Rogers's hands and read it quickly.

"Why, it's Alice Deering's picture which you keep on your dresser," said Stella.

"Listen, Stella!" The professor's voice trembled with excitement as he read the message. "Heard Stella and Rogers over radio. Is it true you keep my picture on your dresser? Yours is on mine. If you



"Here's a quiet place, Buck. Oh, you were wonderful!"

get this Buck Rogers out of her head. I hope Mr. Rogers will be as brilliant in his Greek examination to-morrow as he is on the gridiron this afternoon!"

"Small hope!"

"Exactly! But where is Stella?"

As if in answer to his question Stella's voice sounded loud and clear through the loud speaker of the radio.

"Here's a quiet place, Buck. Oh, you were wonderful!"

"I only have a moment, Stella." The deep voice which came to them over the air was that of Buck Rogers. "Gee, but you look good!"

"It's Stella at the football game!" gasped Gaines, "with Buck Rogers!"

"And broadcasting over the radio!"

"Oh, we're right in front of the microphone!" came Stella's voice, "you don't suppose it's open, do you?"

"Not a chance of it," Buck's voice reached them. "Mike is mute during the intermission."

"They're on the air and don't know it!" exclaimed Gaines.

"Stella is speaking again," warned Rachel. "Sh!"

"Listen, Buck. If you don't pass your Greek exam to-morrow you won't be allowed to play in the big game with Stafford. Uncle Albert's found out you care for me and he's furious. He'll flunk you if he can."

"Won't your Aunt Rachel help us out by pleading with him?"

"Mixed pickles! Aunt Rachel went sour on everything in plus-fours since she failed to land a pair of bell-bottoms for herself."

Rachel shook her fist at the loud speaker. "This is abominable!"

"What's your uncle got against me?" came Rogers's voice.

"He's sore on the love game, too. Some girl by the name of Alice turned him down. He keeps her picture on his dresser. Uncle has an independent income. I wish some girl would grab him and make a human being out of him!"

"I have it!" boomed Rogers's voice. "We'll announce our engagement and Professor Gaines can't flunk me. If he does, every one will say he did it out of spite!"

The sound that followed and filled the quiet room was unmistakably that of a kiss. The voices died away and the strains

that you still keep Alice Deering's picture on your dresser?"

The telephone and door-bell, ringing simultaneously, saved Gaines from a reply. He took up the 'phone as Rachel went to answer the door.

"Hello! . . . Yes; I'm Professor Gaines. You are—who? . . . Tootsie La Rue, of the Follies? You'll—what? Make a human being out of me if my income is big enough? Ha! He banged up the receiver as Rachel entered the room with three telegrams.

"Three wires for you, Albert! Cousin Maria must be dead!"

Gaines tore open one of the telegrams and read:

"New York. Oh, you sugar daddy! Wait for mammal Am leaving on the 5:03." The paper fell from the professor's nerveless hands. "Rachel, what does it mean?"

"Mean? It means that Stella and Buck broadcast your name and the fact that you are an eligible bachelor. The wires are all addressed to Biltwell College. Open the others." She tore one open herself as Gaines opened the other.

"Rochester," he read; "will exchange widowed state for bonds of matrimony, or what bonds have you?"

"This is from Chicago," said Rachel. "Don't be a crab. Shoot Buck through his Greek. I have an extra pair of bell-bottoms. What size does Rachel wear?" She tore the paper to bits. "Abominable!"

The door-bell and the 'phone both rang again.

"Hello!" Gaines spoke into the 'phone. "What color is my hair? . . . Do I object to cats? No; this is not Professor Gaines! He's not home—he won't be home to-night!" He put down the receiver, but left it off the hook. Rachel re-joined from the front door, with both

Rachel, as the door-bell rang again.

"I will," snapped the professor.

By the time Stella returned home the table was piled high with telegrams, many of them still unopened. On either side of the table sat the professor and his sister, grimly waiting.

"Hello, Aunt Rachel!" cried Stella gayly as she ran into the room, followed diffidently by Buck Rogers; "what are all the telegrams about?"

"Many of them," replied the Professor sternly as he looked from Stella to Rogers, "are about the kiss which you and Mr. Rogers shot around the world this afternoon, some are offers of bell-bottoms to your Aunt Rachel, and most of them are proposals of marriage to me! The microphone in front of which you discussed love, Greek and your family this afternoon was open."

"The mike open? Great heavens!"

"For the love o' Mike!" exclaimed Rogers, startled.

"This message is for you, Mr. Rogers." Gaines handed it to Buck.

"St. Louis," read Buck. "Use a crib for your exam."

"How vulgar," cried Stella, "but that reminds me, Uncle, Buck and I have something to tell you. We're engaged to be married!"

"Engaged so I can't flunk Mr. Rogers in his Greek exam. Yes, together with about half the country, I heard you mention the fact. But I can assure you, Mr. Rogers—the professor's tone was emphatic—"that unless your Greek paper is of a high order of excellence, I will flunk you, and with a great deal of satisfaction!"

"Aunt Rachel," cried Stella, "you plead with Uncle."

"Mixed pickles!" exclaimed Rachel sharply. "You forget I've gone sour on

answered my last letter I never got it. Alice Deering."

"She still loves you, Uncle Albert!" cried Stella.

"I did answer her letter. It must have been lost. It's like a miracle. Where's my hat?" The professor searched for it frantically. "I'll go send her a wire at once. I'm the happiest man in the world."

"Just a minute, professor," Rogers detained him, "don't you think there's any chance of my passing that Greek exam. to-morrow?"

"Greek exam? Ah—eh—yes—just so!" Gaines beamed on Rogers. "If you know any Greek at all, certainly you'll pass it! Why, if it hadn't been for you and Stella I wouldn't have found Alice! Heaven bless you both!" He hurried out of the room and was gone.

"You'll pass the exam and be allowed to play in the big game with Stafford," cried Stella, jubilant.

"It was my love for you that brought it all about," said Buck.

"Nonsense! It wasn't your love for me, it was the microphone!"

"For the love o' Mike!" Buck took Stella in his arms.

## How to Locate Losses Due to Poor Dielectric

Dielectric losses refer to the power dissipated in insulating material and which evidences itself as heat. (Of course, only in extreme cases is a temperature rise appreciable.) Such losses occur in panels, cabinets, baseboards, winding forms, supports—in fact, in any insulating material included in electric fields.

In some materials the losses are greater than in others. The phenomenon of dielectric losses and a comparison of the dielectric efficiency of different insulating materials may be demonstrated by any fan possessing a loosely coupled receiver. By loosely coupled reference is had to the space between any two radio frequency circuits across which energy is transferred.

The substance to be tested, a sheet of pasteboard, or perhaps a panel, is placed between the two adjacent coils. Note should be made of any variation in signal strength. If the dielectric is highly efficient, the interposition of the material will have no appreciable effect upon the signal.—Z. B.

## Use of Power Tubes and Why Needed in Audio Amplifiers

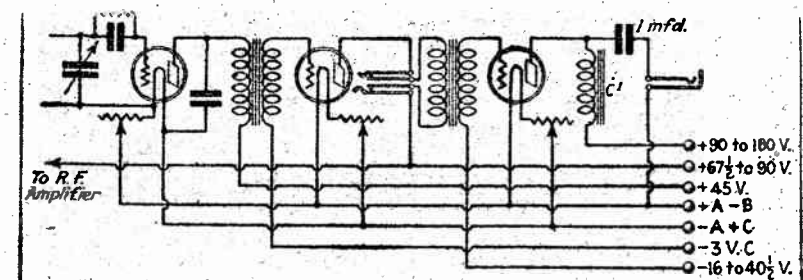
Such Tubes Are Not Designed to Give Greater Volume, but to Withstand High Currents and Thereby Prevent Distortion

By A. J. Haynes

Haynes-Griffin Radio Service, Inc.

DURING the last eight or nine months noteworthy progress has been made in the development of "special purpose" tubes for use in specific parts of the radio receiver. Special detector tubes of improved design, radio frequency tubes with greater amplification, and power tubes for use in the last audio stage of the set—all these have come within a period of less than a year, and as a result the set owner has been able to improve the range, volume and tone quality of his receiver by replacing his old type tubes with new and improved ones as the old ones became inoperative or as he felt the desire to make the small investment required.

Most of the attention of laboratory workers and tube experts has been devoted to the perfecting of power tubes for use in the last audio stage. There is a very good reason for this concentrated effort. To any one who is familiar with vacuum tube theory



and operation, the necessity of a special tube for the output or final audio stage is perfectly apparent.

By far, the greatest single source of distortion in radio reproduction arises from an overloaded grid at the final audio tube.

**Why a Power Tube?**

The popular conception of a power tube seems to be that it is designed to give great volume. This is not necessarily true. An overwhelming volume of sound from a radio set is seldom needed or desirable. All we ask of a good power tube is to provide a comfortable and reasonable degree of volume without blasting or distortion. However, this requirement is not as simple as it sounds. The vacuum tube is a voltage operated device with the grid as the controlling element. When properly connected in an amplifying circuit it converts any voltage impulse, impressed on its grid, into a surge of electrical power in its plate circuit.

It is then the function of the so-called amplifying transformer to convert this electrical power surge into a higher voltage which, in turn, is passed on to the grid of the succeeding tube. This action is the same whether the tube is used as a radio frequency or audio frequency amplifier.

The term "amplifying transformer" is an unfortunate one. A transformer (either radio or audio) not only does not amplify, but an actual and appreciable amount of energy is always lost and dissipated in the transformer. The best we can do is to use an efficient transformer and lose as little energy as possible.

The point to remember is that the only parts of a radio set that do any amplifying are the tubes themselves.

When the signal is intercepted by the antenna and delivered to the radio receiver, it is in the form of a very weak voltage surge, having almost no power behind it. This initial voltage is amplified as it passes through the succeeding tubes of the receiving set.

By the time the signal has reached the final tube in the receiver it has been built up and amplified tremendously.

We find that the actual voltage of this signal when it is passed to the last tube is usually in the neighborhood of fifteen volts for just an average comfortable signal response in the loud speaker. To fill a large room it is often necessary to increase this voltage to twenty-five or thirty volts. This is regulated, of course, with the tuning and volume control on the receiver.

**Try This Test**

To understand this action thoroughly, try it out on your own set. Tune in a good station and retard the volume control (this control should be on the R. F. end of the set ahead of the detector—usually the R. F. rheostat). Start with the signal barely audible, and then increase the volume slowly. If you have a high quality audio amplifier in your set and a good speaker, your reproduction will be excellent until you reach a certain point—the point where

potentials, but which has a specially constructed grid which will allow the use of a high "C" battery voltage with the ordinary filament and plate voltages.

Several such tubes have recently been placed on the market, one of which is known as the Cleartron super power tube, type CTX 171.

The characteristics of this new tube are as follows:

|                     |         |
|---------------------|---------|
| Filament volts      | 5.0     |
| Filament amperes    | .5      |
| Plate voltage       | 90-180  |
| Negative grid volts | 16%-40% |

The proper negative grid voltages for various plate potentials are as follows:

| Plate Volts | Negative Grid Volts |
|-------------|---------------------|
| 90          | 16%                 |
| 135         | 27                  |
| 157½        | 33                  |
| 180         | 40%                 |

## Bureau of Standards

### May Discontinue Signals

The United States Bureau of Standards is considering the termination of standard frequency transmissions, according to the "Radio Service Bulletin" of the Department of Commerce.

Sinced March, 1923, the bureau has been transmitting, twice a month, radio signals of definitely announced frequencies for use by the public in standardizing frequency meters (wave meters) and transmitting and receiving apparatus. The signals are transmitted by the bureau Station WWV, Washington, and from Station 6XBM, Stanford University, California.

The reason for discontinuing this service is that other means for obtaining standard frequencies have become increasingly available. The other means referred to are the use of piezo oscillators, and the wide availability of reliable standards and testing service from a number of laboratories that do commercial testing of frequency meters. None of these means were available when the standard frequency transmissions were inaugurated.

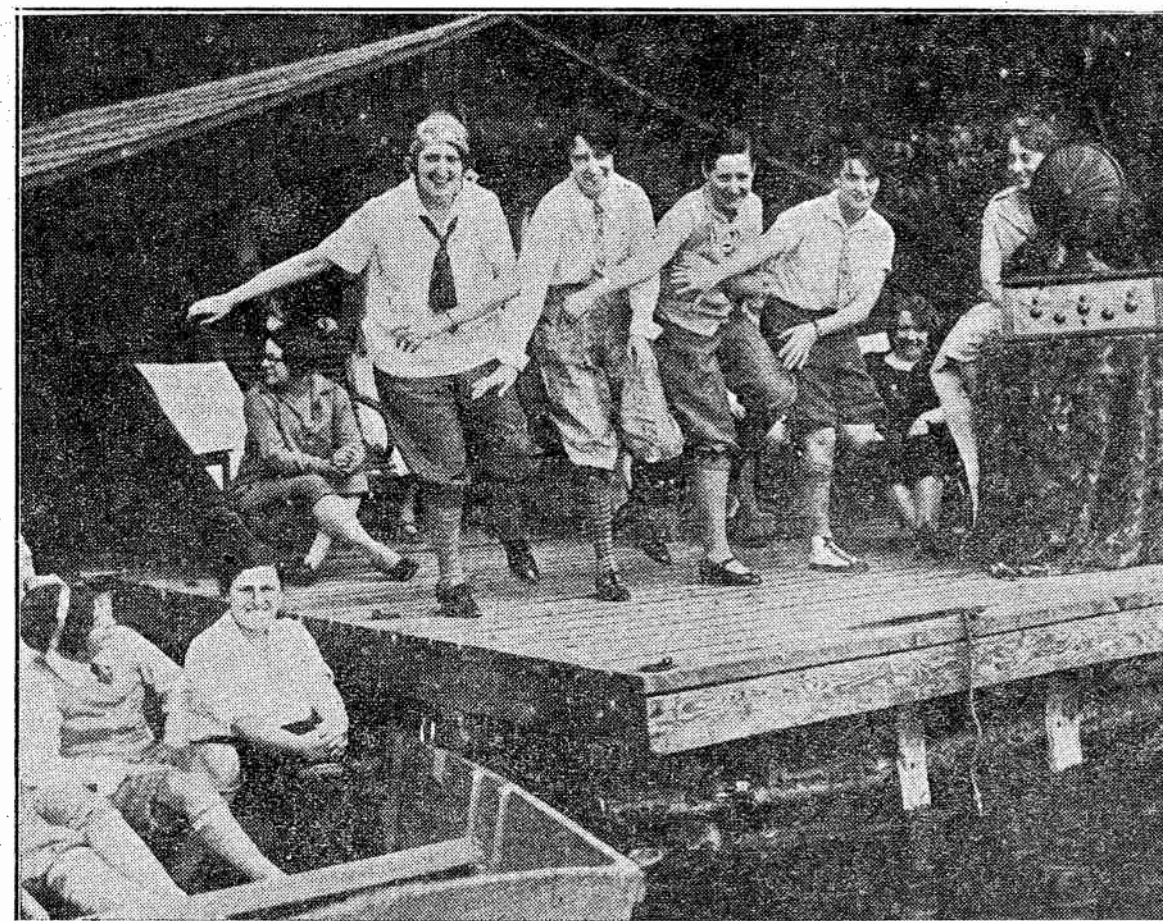
The standard frequency transmission schedule already announced, extending through June, will be carried out. The Bureau of Standards is now announcing the possible termination of the service after that date in order that persons who depend upon the service in any special way may inform the bureau of any objection to its termination, says the bulletin.

## Use Small Antenna in Summer

### To Reduce Volume of Static

Static, which is frequently heard in radio receiving sets this time of year, may be greatly reduced by using a shorter aerial for reception of broadcast signals. A short, low aerial will not be as acceptable to static noises as a larger one. During the summer an aerial about fifty feet in length and suspended about twenty feet above the earth will be excellent for receiving local stations. However, it must be remembered that a short antenna is not capable of picking up distant stations as readily as a larger one.

## Dance Charleston to Radio Music



The members of the Kittredge Foundation for Girls at their Bear Mountain summer camp have become proficient in dancing the Charleston by utilizing the dance music broadcast by New York City radio stations for practicing on every possible occasion

## Behavior of Radio Waves Is Chief Problem to Solve

Attracting Wide Attention of Scientists; First Problem of Radio Dealt With Apparatus; Waves Suffer Changes Which Cause Fading

By Dr. J. H. Dillinger

Chief, Radio Division, United States Bureau of Standards

UNTIL recently the problems and difficulties of radio were wrapped up with apparatus and currents. Now the chief limitation on progress is the erratic behavior of the waves. And because of this, radio-wave behavior is attracting widespread attention, for it is the unsolved problem, the difficult job, the frontier of conquest, which challenges people's interest.

The history of radio in our days turns on three major problems. The first was the problem of five years ago, when broadcasting began, and it had to do with apparatus and circuits. Every one felt the crying need of improving the apparatus for receiving the broadcast programs. The ideal and goal of those who devoted themselves to radio's problems was the development of receiving sets with which programs could be received with the full volume and quality of the original, by the mere touching of a single control, without unsightly antennas or batteries, dials, wires, complications, static and interference of all kinds. By and large, this ideal has been realized. Apparatus which meets all these conditions is now available.

**Second Problem**

The second great problem of radio is to-day's problem of how to control or circumvent the vagaries of radio waves and the improvement of reception thereby. The first problem, that of yesterday, was a problem solved by the engineer. To-day's problem of the radio-wave vagaries is one for whose investigation we must look to the scientist; and I am sure I don't know that it will not be settled.

The subject of radio-wave vagaries is of interest not only because of its timeliness, but because noteworthy progress is being made in the understanding of their hitherto inexplicable mysteries. There are some noteworthy manifestations of the importance of this problem. For instance, the unfavorable reception conditions of the last winter were notorious and stimulated universal inquiry. Some of the mysteries now are being cleared up, and the scientific radio world is as excited now over the developing explanations of radio-wave behavior as the practical radio world was two years ago over the newly discovered potentialities of the very high radio frequencies.

To be sure, the explanations cover a relatively small part of what is known, for as the explanations develop the complexity and extent of known radio phenomena increase still faster. A flood of theory and explanations is appearing in current radio literature. The way our ignorance is camouflaged may be handsomely illustrated by the following complete

description of the accepted theory: The magneto-ionic hypotheses whereby the electronic phase velocity is so modified that there is a rotation of the plane of polarization for propagation along the earth's magnetic field and double refraction for transmission at right angles thereto. The cat is now out of the bag and we have only to fill in details.

In a sense we know much less about the actual behavior of radio waves now than we did ten years ago. We then had a comfortable explanation in terms of wave motion in the ether. The ether is a strictly homogeneous something filling all space, and its sole function is to transmit electrical actions. To be sure, Einstein and some other scientists declare that the ether doesn't exist, but the idea of its existence gives great help in understanding radio wave action just the same.

Since the ether is entirely uniform, it was supposed that the waves spread out uniformly in all directions, meeting no obstacles or changes until arrival at a point where they were received. The character of this beautifully simple transmission could readily be predetermined by theoretical calculation. Unfortunately, we now know that the waves suffer a great many changes and variations due, not to the ether, but to many things with which the ether is filled, including the air and the earth. The atmosphere is by no means uniform, electrically speaking, but contains electrical particles of varied character and distribution, all in a turbulent state of motion. The clear and perfect kind of radio transmission which was formerly expected is found only for rather short distances from the transmitting station. As the waves spread out farther and become weaker they are more and more subject to the various sorts of variation.

**Vagaries of Reception**

The vagaries of radio reception are subject include: (1) intensity variation; (2) fading, or fluctuation of received signal; (3) atmospheric, or static; (4) variation of wave direction and polarization; (5) interference of various kinds.

The chief practical question that arises out of all this is the question Mark Twain asked about the weather, "What are you going to do about it?" The only answer is that radio wave vagaries, like the weather, are phenomena of nature, and since we cannot remove them we only can go around them. Each proved fact is the sure answer to the problem it raises, for it thereby determines a fixed element of calculation. The hitherto elusive problems of radio waves are now being clarified and solved through experimental determination of the facts and through their interpretation by a reasonable theory.

**"The Big Brother and the Children's Court" by Boyle**

"The Big Brother and the Children's Court" will be the subject of an address delivered before WEAF's microphone by Judge Edward F. Boyle, of the Children's Court of New York City, on Saturday evening at 7:15 o'clock.

Judge Boyle has been for some time a Justice in the Children's Court and has given particular attention to juvenile cases. He is known as a popular and accomplished speaker.

**"Lucia di Lammermoor" by WEAF Grand Opera Co.**

At 10:30, instead of 10 o'clock, as is usually the case, the weekly tabloid grand opera by the WEAF Grand Opera Company will be broadcast through WEAF, WOO, WCAP, WTAG, KSD, WTIC and WSAI to-morrow evening. The presentation of the evening, which will be under the customary direction of Cesare Soderi, will be the famous opera by Donizetti, "Lucia di Lammermoor."







# The Herald Tribune Daily Broadcasting Programs for Week Ending June 26

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Baseball news of the day.  
Matters before the House.  
Whinola Merrymakers.

**M-meters**                      **K-kilocycle**

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[illegible]

## THURSDAY

[illegible]**TUESDAY**

|  |  |
|--|--|
| 6 p. m.—Pilgrim String Ensemble.       | ports.                                 |
| 8 p. m.—Wm. Eichelsdoerfer, violinist. | 11 a. m.—Jack Cohen, pianist.          |
|  | 6 p. m.—Perist and Tedesco, violin and |
|  | tenor.                                 |
|  | 10:15 p. m.—WBAL Trio; Edward Jendrek, |
|  | Giri.                                  |
|  | 8:30 p. m.—Luna's Marine Band.         |
|  | 4:35 p. m.—"Republica," Women of Penn- |
|  | sylvania; artist.                      |
|  | 9 p. m.—Walshboro Chamber Orchestra    |
|  | 9 p. m.—Jointly with WEAF.             |
|  | villie.                                |
|  | 9 p. m.—Fitzpatrick Brothers, old-time |

|   |  |  |  |   |
|---|--|--|--|---|
| <p>10.00 m.—Ethel Holles, contralto.</p> <p>10.00 m.—Thee Albas, tenor.</p> <p>10.00 m.—Jimmie Shearer.</p> <p>10.00 m.—Gustave Buschopf, pianist.</p> <p>10.00 m.—Gustave Buschopf, pianist.</p> <p>10.00 m.—Irene Brann, harpist.</p> <p>10.00 m.—Irene Brann, harpist.</p> <p>10.00 m.—Direct Comfort Entertainers.</p> <p>10.00 m.—WODA—PATERSON—224m.</p> <p>10.00 m.—Employment Bureau service.</p> <p>10.00 m.—WHP—PHILADELPHIA—358m.</p> <p>10.00 m.—Community vocal instrumental.</p> <p>10.00 m.—Evening service.</p> <p>10.00 m.—Ambassador Concert Orchestra.</p> <p>10.00 m.—WPI—PHILADELPHIA—358m.</p> <p>10.00 m.—Baptist Church.</p> <p>10.00 m.—WCAU—PHILADELPHIA—275m.</p> <p>10.00 m.—Catholic Church services.</p> <p>10.00 m.—Clarence Seaman's Orchestra.</p> <p>10.00 m.—Cathay Concert Orchestra.</p> <p>10.00 m.—Helen Zals, songs.</p> <p>10.00 m.—Organ recital.</p> <p>10.00 m.—Community vocal and instru.</p> <p>10.00 m.—News flashes and scores.</p> <p>10.00 m.—Concert program.</p> <p>10.00 m.—Organ and vocal recital.</p> <p>10.00 m.—WHAU—ATLANTIC CITY—275m.</p> <p>10.00 m.—Morning service.</p> <p>10.00 m.—Beauty talk by Mrs. C. D. Sankin.</p> <p>10.00 m.—Evening service.</p> <p>10.00 m.—An hour with the classics.</p> <p>10.00 m.—WGY—SCHENECTADY—340m.</p> <p>10.00 m.—Service of St. George's Episc.</p> <p>10.00 m.—Madison Orchestra.</p> <p>10.00 m.—Palisades Amusement Park Or.</p> <p>10.00 m.—Leroy Smith's Orchestra.</p> <p>10.00 m.—Silver Slipper Orchestra.</p> <p>10.00 m.—WGR—BUFFALO—312m.</p> <p>10.00 m.—Morning service.</p> <p>10.00 m.—Jointly with WEA.</p> <p>10.00 m.—Chamber music.</p> <p>10.00 m.—WJAR—PROVIDENCE—306m.</p> <p>10.00 m.—Hartford—476m.</p> <p>10.00 m.—WEEI—BOSTON—340m.</p> <p>10.00 m.—Jordan Marsh Company's Spark-</p> <p>10.00 m.—Capitol Family.</p> <p>10.00 m.—Kent Radio Hour.</p> <p>10.00 m.—Golden Band concert.</p> | <p>10.00 m.—Thee Albas, tenor.</p> <p>10.00 m.—Harrison Stevens, pianist.</p> <p>10.00 m.—Gustave Buschopf, pianist.</p> <p>10.00 m.—Irene Brann, harpist.</p> <p>10.00 m.—Irene Brann, harpist.</p> <p>10.00 m.—Direct Comfort Entertainers.</p> <p>10.00 m.—WODA—PATERSON—224m.</p> <p>10.00 m.—Employment Bureau service.</p> <p>10.00 m.—WHP—PHILADELPHIA—358m.</p> <p>10.00 m.—Community vocal instrumental.</p> <p>10.00 m.—Evening service.</p> <p>10.00 m.—Ambassador Concert Orchestra.</p> <p>10.00 m.—WPI—PHILADELPHIA—358m.</p> <p>10.00 m.—Baptist Church.</p> <p>10.00 m.—WCAU—PHILADELPHIA—275m.</p> <p>10.00 m.—Catholic Church services.</p> <p>10.00 m.—Clarence Seaman's Orchestra.</p> <p>10.00 m.—Cathay Concert Orchestra.</p> <p>10.00 m.—Helen Zals, songs.</p> <p>10.00 m.—Organ recital.</p> <p>10.00 m.—Community vocal and instru.</p> <p>10.00 m.—News flashes and scores.</p> <p>10.00 m.—Concert program.</p> <p>10.00 m.—Organ and vocal recital.</p> <p>10.00 m.—WHAU—ATLANTIC CITY—275m.</p> <p>10.00 m.—Morning service.</p> <p>10.00 m.—Beauty talk by Mrs. C. 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|---|--|--|--|---|



## Elementary Information For the Radio Novice

### Interference in Radio Receivers Is Very Often Caused by Some Household Appliance; Static Is Not as Bad as It Has Been Painted

This is the twenty-second of a series of twenty-four lectures for the radio layman, which are being broadcast through KDKA, the Westinghouse Electric and Manufacturing Company's station at East Pittsburgh, Pa.

By James W. H. Weir

Technical Editor, "The National Stockman and Farmer"

HERE it is again, that scratching, frying, clicking, grinding noise that is forever marring radio reception. Interference it surely is of some type or another and the average radio user classifies this particular difficulty as "static." By the way, how many of you are familiar with what the word "static" really stands for? The word "self" is a short term used to express "static electricity." In truth the static electricity or the small deposits of static electrical charges on the antenna causes but a very small portion of the interference we are forever complaining about.

Perhaps it has already occurred to some of you that this so-called "static" may be the product of man's own creation and that many devices of electrical nature are responsible in whole or in part for that great bugbear "interference." This is precisely the truth.

#### Man-made Interference

It is an absolute fact that many pieces of electrical equipment in industrial and domestic use to-day transmitters of electrical waves, and these waves are the very things that are causing the trouble. Such interference, if located, can often be eliminated, while that produced by the static charges of nature, as far as is known at present, cannot be cured. Let me give you a list of the things here that may be causing your trouble in your neighborhoods. First take power circuits, including lines, insulators, lightning arrestors, transformers, generators and motors. Secondly the industrial appliances, including arc lights, telephone and telegraph lines, telephone ringers, street cars and electric railroads, factory motors, store motors and barber shop appliances, smoke and dust precipitators and electric sign flashers. Third, domestic appliances including door bells, light switches, sewing machines, vacuum cleaners, flat irons, electric refrigerators, dish washing machines, kitchen mixers, violet ray outfits and heater pads, and lastly, a miscellaneous group including X-ray machines, storage battery chargers, electric elevators, annunciator systems, automobiles, stationery gas engines, tickers and dentists' motors. These are but a few of the direct causes of interference, and doubtless there are many others of similar nature that are equally as bad. There is not the slightest doubt but that if all the electric circuits and installations were kept in perfect order there would be very little radio interference from such sources.

Naturally there are exceptions to every rule and there are some causes of interference that may not be eliminated even though the installation and the apparatus are perfect. Among these may be included lightning arrestors on power lines, telephone ringers, some types of motors, smoke and dust precipitators, door bells, light switches, a variety of motor-driven devices, violet ray outfits, X-ray machines, storage battery chargers, annunciator systems and gas engines with electric ignition. All such devices mentioned in the above may be said to cause interference even when in perfect operating condition.

#### Sparks Cause Trouble

The electric power line for instance, in itself is not the cause of interference with radio, but frequently in some parts of the power system there develops a poor contact which produces a spark. These sparks may be very minute, but nevertheless create considerable disturbance. The remedy of course, is to locate the spark and repair the condition which causes its production. This source of disturbance develops in the power line through "leaky" insulators, or in other words, insulators that do not permit a perfect insulation, but allow the power to creep off in small jumps. Sometimes when the power line touches tree branches, interference is also noted. Other sources of trouble may be found in the transformer in the vicinity of your home, these often being located on poles near your residence.

It is only natural that the power companies are anxious to aid in the

### A. Atwater Kent to Improve His Weekly Broadcast Program

The broadcasting of noted singers and instrumentalists has proved so popular with the public and so successful from the standpoint of the artists themselves that A. Atwater Kent, the radio manufacturer, has decided to continue his broadcasting plans on an even greater scale in the future.

Last fall, when the present series of concerts known as the Atwater Kent Radio Hour was started, the idea of broadcasting famous artists over an area comprising the greater part of the United States and Canada was more or less of an experiment. The artists were not at all sure how they would like it, or how it would affect their other plans, but they were eager to have a part in making the best music available to millions over the air.

Mr. Kent was convinced that the public wanted music of this type when he scheduled thirty consecutive Sunday evening concerts, beginning October 4 and ending April 25. These concerts have been heard through fifteen broadcasting stations as far West as Minneapolis, Davenport and St. Louis, and as far East as Washington, New York and Boston. It is impossible to say how many people have listened to them, but judging from the number of letters received and other signs of interest the total undoubtedly runs into the millions.

In addition to the concerts which have gone over the network of fifteen stations, several concerts have been given through broadcasting stations in parts of the United States and Canada not reached by the network.

A few weeks ago, several of the artists who have been particularly enthusiastic about the results of their broadcasting in the Atwater Kent Radio Hour suggested that a week after the close of the scheduled season there be a final concert which would be in the nature of a gala evening. This concert will be heard over the network of fifteen stations on Sunday evening, May 2. It will begin at the usual time, 9:15 Eastern time, 8:15 Central time, but will last an hour and a half instead of an hour. Those who will participate are Frances Alda, soprano; Josef Hofmann, pianist; Louise Homer, contralto; Kathryn Meisle, contralto; Allen McQuhae, tenor; John Powell, pianist, and Albert Spalding, violinist. This will perhaps be the most distinguished group of artists ever assembled in a broadcasting studio.

The concert will be specially appropriate at this time, for May 2 marks the beginning of Music Week. The public having signified its appreciation of the appearance of the finest artists in radio concerts, Mr. Kent has made arrangements with the Metropolitan Opera Company, which will make available many of the singers of this great organization. The first of the artists to appear under this arrangement is Mme. Frances Alda, who sang the night of Sunday, April 18, through WEAF and fourteen other stations.

For the season of 1926-1927, beginning in October, Mr. Kent is planning a series of Sunday evening concerts to include not only most of the artists who have appeared this season, but additional distinguished artists from the Metropolitan.

It has also been apparent that the radio audience wants concerts of a somewhat lighter type through the summer. So, with the closing of the present series with the gala Atwater Kent radio hour on the evening of May 2 it is planned to continue through the summer with a series of half-hour concerts under the direction of the Irish-American tenor, Allen McQuhae. These will be broadcast through the following eight stations: WEAF, New York; WEEI, Boston; WSAI, Cincinnati; WCAP, Washington; WCCO, Minneapolis-St. Paul; WGN, Chicago; WGR, Buffalo; WWJ, Detroit.

Allen McQuhae, well known as an oratorio singer and also for his rendition of Irish ballads and other folk songs, has had an extraordinary career. He was a ranchman, a Klondike miner, an engine wiper and a vaudeville and cabaret singer before undertaking a musical career. He was singing in a cabaret in Cleveland when Felix Hughes, the barytone and teacher, heard him and persuaded him to study. Within two years he was appearing as soloist with leading orchestras and had more oratorio engagements than he could fill. Then he went to war as a private, won a commission and two citations and returned to the United States to resume his concert work.

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# THE NEW YORK HERALD New York Tribune RADIO MAGAZINE

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SECTION TEN

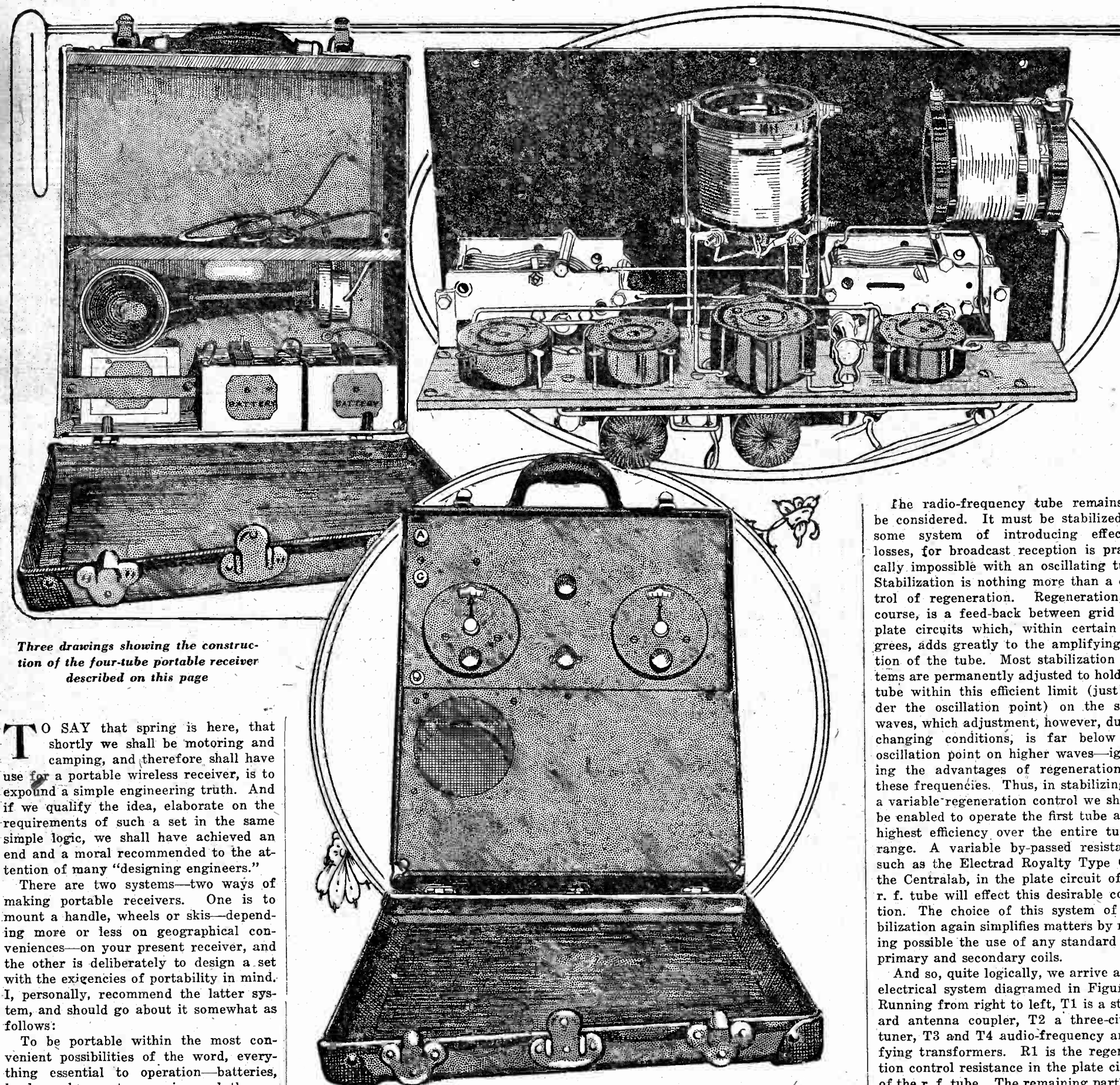
SUNDAY, APRIL 25, 1926

12 PAGES

## This Season's First Portable Set

The Four-Tube Receiver Discussed Is Housed in a Small Carrying Case, Which Also Holds the Batteries and Loud Speaker; It Weighs Twenty-two Pounds

By ZEH BOUCK



Three drawings showing the construction of the four-tube portable receiver described on this page

TO SAY that spring is here, that shortly we shall be motoring and camping, and therefore shall have use for a portable wireless receiver, is to expound a simple engineering truth. And if we qualify the idea, elaborate on the requirements of such a set in the same simple logic, we shall have achieved an end and a moral recommended to the attention of many "designing engineers."

There are two systems—two ways of making portable receivers. One is to mount a handle, wheels or skis—depending more or less on geographical conveniences—on your present receiver, and the other is deliberately to design a set with the exigencies of portability in mind. I, personally, recommend the latter system, and should go about it somewhat as follows:

To be portable within the most convenient possibilities of the word, everything essential to operation—batteries, loud speaker, antenna wire and the receiver proper—must be carried within a single case or container, and this last must not exceed reasonable dimensions or weight. Considering the accessories, certainly not more than half of the available space can be devoted to the receiver proper—the coils, tube sockets, transformers, and so on.

#### Four-Tube Set Best

These considerations will generally eliminate the five-tube two-stage tuned r. f. arrangements. For passable efficiency such systems must as a rule be

spread out with comparatively large spaces between components. Four tubes, therefore, are as high as we can efficiently go in the average portable equipment, and it remains to make the most of the four tubes to which we are limited. These are one radio-frequency tube, the detector and two stages of audio amplification.

Two transformer coupled stages immediately satisfy the conditions of high electrical efficiency in the audio-frequency

amplifier. In passing we note mentally the desirability of small transformers. Continuing our inverse order, but progressing from the obvious to the more abstruse, we come to the detector circuit. By employing regeneration we shall make the most of our possible detecting efficiency, and by achieving this desirable feed-back by means of the conventional rotating tickler coil the mechanical problem resolves itself into the buying of one of several efficient ready-made units.

The radio-frequency tube remains to be considered. It must be stabilized by some system of introducing effective losses, for broadcast reception is practically impossible with an oscillating tube. Stabilization is nothing more than a control of regeneration. Regeneration, of course, is a feed-back between grid and plate circuits which, within certain degrees, adds greatly to the amplifying action of the tube. Most stabilization systems are permanently adjusted to hold the tube within this efficient limit (just under the oscillation point) on the short waves, which adjustment, however, due to changing conditions, is far below the oscillation point on higher waves—ignoring the advantages of regeneration on these frequencies. Thus, in stabilizing by a variable regeneration control we should be enabled to operate the first tube at its highest efficiency over the entire tuning range. A variable by-passed resistance, such as the Electrad Royalty Type C or the Centralab, in the plate circuit of the r. f. tube will effect this desirable condition. The choice of this system of stabilization again simplifies matters by making possible the use of any standard r. f. primary and secondary coils.

And so, quite logically, we arrive at the electrical system diagrammed in Figure 1. Running from right to left, T1 is a standard antenna coupler, T2 a three-circuit tuner, T3 and T4 audio-frequency amplifying transformers. R1 is the regeneration control resistance in the plate circuit of the r. f. tube. The remaining parts are self explanatory or labeled.

Throughout the design and construction of the receiver compactness and the concomitant necessity for small parts should be kept in mind. This consideration leads the writer to recommend such parts as Ameco sockets and S. L. F. condensers, Amperites at R2, R3, R4 and R5 in place of rheostats, Hedgehog audio-frequency transformers and Bruno coils.

This circuit is the starting point of an efficient portable receiver. Though the

(Continued on page four)

Additional Radio News Will Be Found in Another Section of To-day's Herald Tribune



# A Four-Tube, Single-Control Set Using Two Stages of Tuned Radio Frequency

The Compensated Triple Condenser Employed Tunes Three Circuits Simultaneously

By JAMES E. CARTIER

THERE was a time when radio sets were judged by the size of the panel. That is to say, the larger the panel and the more knobs and dials the better the set. Nowadays things are different and the real fan is more likely to boast of his set because of its compactness and efficiency than ever before. Super-heterodyne sets were formerly measured off by the yard, now a two-foot panel is plenty.

Of course, the panel manufacturers aren't making as much money, but look at what the relief amounts to on the fan's pocketbook. Right at the start, then, this set was laid out to use the smallest convenient panel possible without stretching the layout too much toward the rear. The result was a seven by fifteen inch panel, without the slightest crowding of the controls.

## Wave Length Range

The next question that came up in the design and lay-out was the problem of wave length range. So far the tuning range of a coil and a variable condenser has been sufficient to cover the ordinary broadcasting band. There is this difficulty, however, that the same efficiency and selectivity are not obtained over the lower wave length range. In addition, there is a decided trend for lower wave lengths which are beyond the range of the ordinary set. A number of fans would like to listen in to the low wave experimental stuff.

To take care of these conditions, interchangeable coils are used. This means that for the regular wave length band one set of coils is sufficient, but if lower wave lengths are to be received, different coils are simply plugged in on the coil mounts without any rewiring or changing of the circuit. This has been done without any sacrifice of any sort, but, on the contrary, adds considerably to the advantages of the set.

## The Circuit

The circuit is standard and simple. Two stages of tuned radio frequency, detector and three stages of resistance coupling combine to guarantee selectivity, volume and quality. The three secondary circuits are tuned with a single rotor triple condenser that has two small side knobs for compensation adjustments. This condenser has the standard semi-circular plates, but the use of a straight line frequency dial separates the lower wave lengths for the dial settings and simplifies the tuning and logging problem. The two radio frequency tubes are controlled with one ten ohm rheostat, the detector with a twenty ohm rheostat and the three resistance coupled stages have the filaments controlled with another ten ohm rheostat. A jack and a battery switch complete the units that are mounted on the front panel. A variable grid leak is used to control proper potential on the grid of the detector. The resistance coupling furnishes maximum volume with the best tone quality possible. All the parts have been

selected for efficiency and compactness in assembly. Even the tube sockets have the double feature of spring mounting and unusually firm contact with the tube prongs. The resistance coupling units are small and compact to fit in on the lay-out with the minimum possible space requirements.

## List of Parts Required

One front panel 3-15x15 inches.  
One subpanel or baseboard 3/4x10x14 inches.  
One binding post strip 3-16x14 inches.  
Three general radio coils, Type 277-D.  
Three general radio bases with jacks, Type 274-B.  
Twelve general radio contact plugs, Type 274-P.  
One U. S. L. compensated multiple condenser .00035 mfd.

One Radiant Tune-Rite dial.  
Six C. R. C. four-pin sockets No. 310.  
Three U. S. L. rheostats, two 10 ohms and one 20 ohms.

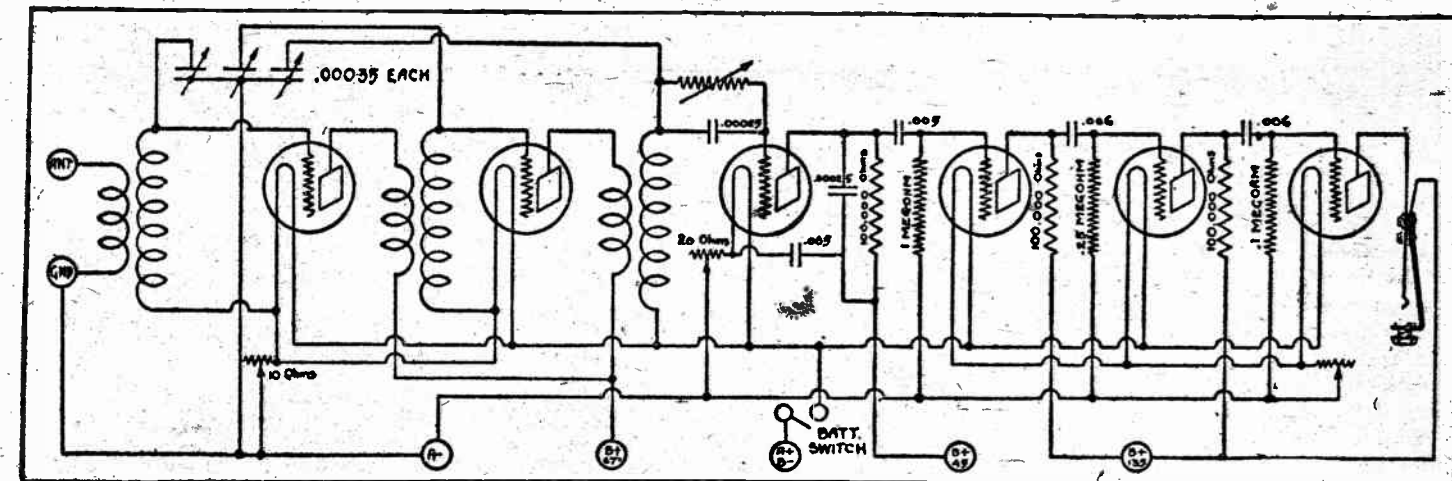
One electrad resistance coupled kit No. 1-C.

One electrad variomh-base mount.  
One electrad grid condenser, Type VS .00025 mfd.

One electrad fixed condenser .0005 mfd.  
Seven binding posts, Eby.  
Fifty feet black flexible cehatsite wire.

One Carter battery switch.  
One Carter open circuit jack.  
One cabinet to suit.

Miscellaneous nuts, lugs, screws, etc.  
The question of the selection of apparatus to be used is one that should not be neglected. The performance of any cir-



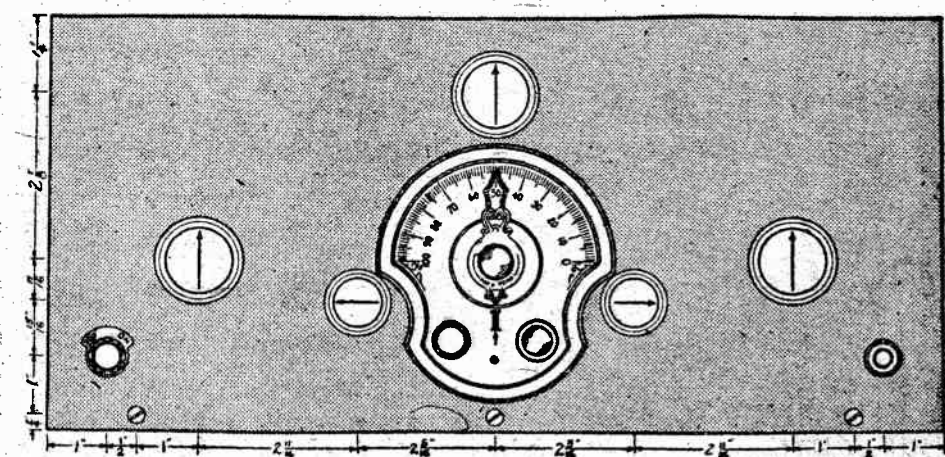
The wiring diagram of the six-tube tuned radio-frequency receiver constructed by the author

cuit is dependent on the quality of the apparatus that is used in the set. Therefore, if the parts named are not used be sure to select equally efficient substitutes.

For wave lengths from 100 to 300 meters the coupling coils type 277-D<sup>1</sup> should be used, and if a range from 50 to 150 meters is desired the type 277-D<sup>2</sup> can be used. Plug jacks will be required for these extra coils. They will fit into the base mounts as used in the set. The compensated multiple condenser should have a capacity of .00035 microfarad in each section. In order to get the vernier

tuning and the separation of the stations on the dial, a straight line frequency converter dial is necessary. The dial named above just fits in and allows room for the compensator knob on each side.

The resistance coupled amplifier consists of three units, each with its condenser, two resistances and mounting, and



A suggested panel layout for the receiver herein described

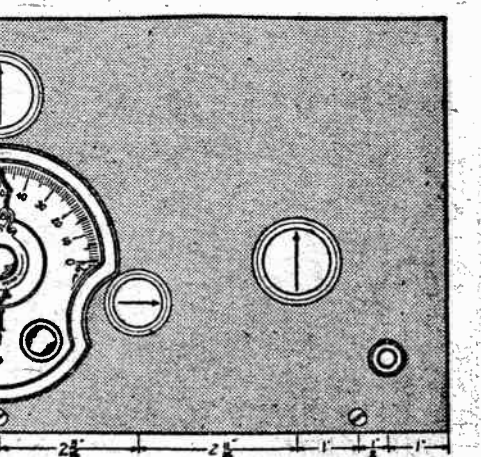
also the extra .00025 mfd. condenser and mounting clip. These units are compact, efficient and make the wiring a simple matter.

## The Panel Layout

The layout of the front panel is shown in Figure 2. This shows the simplicity of arrangement and emphasizes the ease of tuning. The battery switch and the plug-in jack are in the two lower corners, where they are out of the way

and the separation of the stations on the dial, a straight line frequency converter dial is necessary. The dial named above just fits in and allows room for the compensator knob on each side.

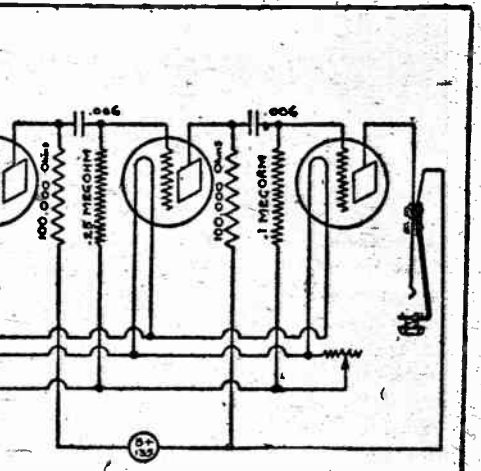
A mahogany baseboard was used in the original set and with a hard wood of this



A suggested panel layout for the receiver herein described

sort, it was necessary to drill small holes for the wood screws in order to get them started and to avoid splitting the board. Don't put the coils into the mounts, as they are only in the way.

The four contact plugs have to be mounted in the four holes in the base of each of the coupling coils. The terminal lugs that are furnished with the plugs should be on the inside of the coils. Then connect the lugs to the terminals as shown in the picture in the upper right hand



A suggested panel layout for the receiver herein described

corner of the baseboard, Figure 3. The tap at the center of the secondary winding is not used, so just disregard it. All three coils are connected the same way. In order to avoid putting in the coils, facing the wrong way (no harm would be done), it would be advisable to put some mark on the baseboard or the mounting to indicate which way the coils should face. If they are put in wrong it would simply mean the primary and secondary are interchanged and reception would be weak and limited to very low wave lengths. The two terminals on the coil in a straight vertical line, or above one another, should always face toward the variable condenser.

## Wiring Instructions

After the apparatus on the baseboard has been screwed down and the panel mounted, the wiring of the set is to be considered. Study the hook-up, Figure 1.

First put in all the negative "A" leads, as these branch out to more terminals than any of the others. Note that the rotor terminal of the condenser is connected to this. The ground post is also connected to the negative "A." The next step is to make the connections from the three rheostats to the respective tubes. Note that the grid returns of the secondary of each of the first two coupling coils is connected inside the rheostat (tube side) of the negative filament.

Now connect the A plus and B minus binding post to the battery switch, then make all the A plus connections from the other side of the battery switch. The grid return of the secondary of the third coupling coil is made to this A plus lead. The connections from the antenna and

(Continued on page eleven)

## News and Notes of the Radio Trade

### By-pass Condenser

The Polymet Manufacturing Corporation, 599 Broadway, New York City, has recently announced their new line of by-pass condensers, which are now in production on a large scale. Polymet by-pass condensers are manufactured with the latest, most improved apparatus, in capacities from 1 to 4 microfarads. A special impregnation process assures



maximum durability and long life and absolutely prevents leakage.

These condensers are made in special sizes for manufacturers according to specifications submitted. They are put up in standard cans, for distributors and dealers.

### Loop and Battery Cable

The Becker Loop Lead is a new radio product designed to obviate the loss of efficiency to loop sets through the tangling of the wires connecting the loop with the set. It consists of two or three cords imbedded in rubber and spaced one-quarter of an inch apart. It can, therefore, be moved in any possible direction without affecting the spacing of the wires. The cables are of copper and the rubber casing makes the lead acid proof, which is an advantage when the lead is likely to come in contact with the storage battery.

There is also a five conductor cord to be used as a battery cable. These leads are very compact, the loop lead being only three-sixteenths of an inch thick, permitting it to be easily slipped into the cabinet under the cover or through a hole smaller than would be necessary for a round cable.

The Ralph Becker Company, of Cleveland, has placed these leads on the market.

### Re-enters Radio Field

Harold Herbert, Inc., owners of a radio shop in New York City two years ago, are again active in the radio field. They now have a large plant at Ely and Paynter Avenues, Long Island City, for the manufacture of radio receivers. Mr. Herbert is the designer of the Whitestone and Kismet sets and was also production manager for G. Boissonault Company. The officers of the company are Harold Herbert, president; William Schatzkin, treasurer and vice-president; and N. H. Herbert, secretary. Mr. Herbert states that plans are under way for the production of 20,000 five-tube receivers for the new season.

### Resistance Coupling Unit

Ameco Products, Inc. are the manufacturers of a new coupling unit, for use in resistive coupled audio frequency amplifiers. It departs from the conventional design in the arrangement of the binding posts which are so placed that the "couplers" are lined up before the sockets, rather than between them. Connections are made to the grid and plate post of the sockets by soldering directly lug to lug, no leads being necessary. In addition to the constructional advantages, this arrangement results in compactness not otherwise possible, cutting three inches from the average panel. A coupling condenser of the optimum value is molded into the bakelite base. Massive prongs clip the resistors, of the same man-

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416 Broome Street

ufacture, into a permanent mechanical and electrical contact.

### Service Organization

A. W. Gruno, who has been in charge of all factory activities of the Ware Radio Corporation for the past twelve months, is at present planning a service organization. This organization is intended not only to supply sales people with a service including installations and maintenance but a laboratory service for taking measurements, etc., as well. Approximately one hundred men, fully conversant with actual service work, have been enrolled for this organization already, and in addition to them, there will also be inside repair men and two laboratory technicians. The location of the new company has not yet been decided.

## A Four-Tube Single Control Set

Continued from page two

ground binding posts to the first coil mount can now be made.

There are three B plus binding posts, one for 45 volts for the detector plate circuit, another of 67 1/2 volts for the radio-frequency plate circuit, and a third, 135 volts, for the resistance coupled audio amplifier stages. These connections should all be added in now. Then wire in the .005 mfd. by-pass condenser from the B plus 45 lead to the A minus inside of the detector rheostat.

The next step is to put in all of the grid and plate leads. These must be kept short as possible. Make sure that each terminal is well tightened down and that every joint is firmly soldered with a good electrical connection. A poor joint introduces resistance into the circuit, which means that tuning will be broad and selectivity poor. Check up the connections to the fixed plates of each of the sections of the multiple condenser with the picture wiring diagram, so as to get the proper arrangement. The first section of fixed plates, nearest the front panel, connect to the grid circuit of the first tube. The last section, farthest away from the panel, is the detector grid circuit. The lower terminal on the Variomh connects to the grid terminal on the detector tube.

### Checking Up

After the wiring has been completed it is best to check over to see that all connections have been correctly made. A simple way of doing this is to put six tubes in the sockets and then connect the A battery to the proper binding posts. Now, without adding any B battery, turn the battery switch on. Turn on the left rheostat knob and see if the two radio-frequency tubes light up. If the other knobs are turned off no other tubes should light. Then turn the knob of the center rheostat and see that the detector lights up. Last turn the right or audio rheostat knob. The last three tubes should light.

Disconnect the A battery from the binding posts, then connect the negative side to the A plus B minus post

and the positive side to the B plus 45 post and see if any of the tubes light. If so, there is a wrong connection and wiring should be checked up. Remove the positive battery lead from the A plus and try the same thing when connected to the B plus 67 1/2 and also the 135 binding posts. This gives an accurate check without danger of blowing out the tubes, as might be the case if the B battery were connected directly.

### Tuning In

After all the checking is completed make all the battery, antenna and ground connections, plug in the loud speaker on the jack and have the set ready for operation. Don't try for distance right away, get accustomed to the set and give it a chance.

Tune in a local station first. Keep the little compensator knobs turned as shown in the panel view. The radio-frequency rheostat should be turned about three-quarters on, the detector half way and the audio three-quarters way. Now turn the knob on the dial slowly until reception is heard. Rotate back and forth until maximum volume is reached. Now try turning the left compensator knob until a new maximum point of volume is reached. If the volume is too great, just turn down the left rheostat knob. Do the same thing with the right compensator. Keep the approximate setting of the compensators in mind, as they will not alter much for the various wave lengths. These having been adjusted, then the main dial knob can be turned for further reception, making any little adjustments of the compensators as required.

### A Half Hour of Music

The Far East on Friday  
On Friday evening the radio audience of WEAFA's chain will again be wowed by the magic rug to the quaint, mystic cities of the Far East, for at the hour of 10 o'clock, Eastern Daylight Saving Time, The Whittall Anglo-Persians will be heard in their half hour concert through WEAFA, WCAP, WJAR, WOO, WGR, WEEL, WTAG, WCAE, WOC, WDAF, WCCO, WWJ, KSD, WEAR and WGN. This symphonic orchestra, known as the Whittall Anglo-Persians, is under the direction of Louis Katzman, an expert in the rendition of music of the Far East. The program will include the selections "In the Sudan" by Sebek, "Loves Dream After the Ball" by Cizulka, "My Little Persian Rose" by Friendland and "Under the Leaves" by Thomas.

'Macbeth' Last Shakespeare Play Presented by WEAFA  
Murder, intrigue and the ultimate triumph of right over wrong are all woven into Shakespeare's immortal play, "Macbeth," which will be presented in tabloid form under the direction of Katherine Emmet this evening, as the farewell performance of the WEAFA Shakespearean Players, beginning at 6 o'clock, Eastern Daylight Saving Time, and to be heard from WEAFA, WGR, WFI and WSAI. These weekly tabloid productions, formerly a Saturday evening feature at WEAFA, have met with great favor from radio listeners. Outstanding actors are Miss Emmet, Pedro de Cordova, Alfred Shirley, Captain Laurence Cecil, Gertrude Phillips, Gerald Stopp and Harrie Green.

## How to Eliminate Distortion in the Audio Amplifier

The audio frequency amplifier of a radio receiver has a far greater effect on the quality of reproduction than many persons realize. If this part of the set is efficient, it will make a good program very enjoyable, but if it distorts signals it will make the same program almost impossible to listen to.

Distortion in an audio frequency amplifier may be divided into two classes, that which is caused by the poor design of the amplifier itself, and that which is caused by the improper use of the amplifier. If it is manufactured set that is rendering distortion music, the owner should not attempt to correct the design of the amplifier, as in most cases this would necessitate rebuilding the receiver. However, in most instances, it will be found that a factory built set will give satisfactory reproduction when the audio amplifier is properly operated.

Improper battery voltage is one of the chief causes of poor reproduction. A single cell in either the "A" or "B" battery that has been over discharged, may cause noises and howling sounds to be heard in the receiver. Also an "A" or "B" battery having insufficient voltage will result in a lack of volume and poor reproduction.

The voltage required to heat the filament of a vacuum tube, is printed on the box in which the tube is sold, and in operating a receiver it is essential that the tube be operated at this voltage. The required voltage for the "B" and "C" batteries cannot be determined accurately in advance, and these must be found by experimentation. The reason for this is that such things as the degree of vacuum in the tube and the resistance of the audio transformer can change the voltage required by the tubes.

It should be remembered, however, that in all cases where 90 volts or more of B battery is used on the plates of the audio frequency amplifier tubes, a C battery must be employed if quality of reproduction is desired. This battery consists of from one to four dry cells, connected in series with the grid circuit with the negative potential applied to the grid. The voltage of this battery should be varied with the B battery potential.

Another cause of distortion is overloading the last stage of amplification. This can be corrected by using a small power tube in that stage. These tubes are now available for use in receivers, and aside from insert-

ing the new tube and using a slightly higher B and C battery voltage on that stage no other change need be made in that stage.

Rasping sounds in receivers are frequently caused by the use of high ratio audio frequency transformers. If it is not desired to change the transformer to one of the proper ratio, the trouble can be corrected to some extent by connecting a small fixed condenser across the primary winding of the transformer or by shunting the secondary winding with a high resistance. The condenser should have a capacity of approximately .002 mfd., or if the resistance is used, a one or two megohm grid leak will answer the requirements. In some extreme cases it will be found necessary to use both the resistance and condenser in order to obtain satisfactory results.

## Delegations to Attend Last Session of Men's Conference

The last session of the Men's Conference at the Bedford Branch Y. M. C. A., Brooklyn, this afternoon, will be featured in particular by the attendance of 400 members of Vigilant Council, Junior Order of American Mechanics, of Kearny, N. J. In addition there will be a delegation of more than 100 Masons from the Divine Star Lodge, No. 565, F. and A. M., of New York City. Practically the entire proceedings of the conference will be broadcast by WEAFA, WEEL, WCAE, WGSB, WSAI and WTAF, beginning at 4 o'clock Eastern daylight saving time. The speaker of the session will be the Rev. Dr. S. Parkes Cadman, pastor of the Central Congregational Church, Brooklyn, president of the Federal Council of Churches of Christ in America and a nationally known preacher. Dr. Cadman's subject for the closing session of the conference will be "A Review of the Radio Season at the Bedford Branch."

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Solidly molded in bakelite  
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Sangamo By-pass Condensers  
improve reception  
and won't break down.

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### Parts and Equipment

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The New See Jay Battery Power Unit, a tremendous improvement on the old type "B" battery. After several years of development, we have at last found a way to eliminate all "B" battery troubles. This POWER UNIT consists of a single battery, a See Jay Charger combined. Charger is permanently connected to the battery and light socket. Owing to the special transformer used, the battery is never overcharged, and the See Jay Charger, therefore, no electrical connection with outside mains. It is not necessary to remove battery from See Jay Charger. CHARGING is as easy as plugging in your regular 100 Volt SEE JAY Rechargeable "B" Battery, with factory-made Chemical Rectifier, \$12.00; without Charger, \$11.00. Complete 140 Volt Battery and Charger, \$17.00; without Charger, \$15.00. 100 Volt Unit, consisting of 78 pr. connected Alkaline Elements, 78 glass cells, 78 perforated separators, 2 Hydroxide and Hydrosulfide and one blueprint, \$5.00; 140 Volt Unit, \$7.00; 100 Volt finished Bak Cabinet, \$2.00; 140 Volt Cabinet, \$2.75. "B" Battery Chargers, \$5.00; Chemical Rectifier (all parts complete), \$1.75. The See Jay batteries and units are constructed from genuine alkaline elements and connected with a non-corrosive conductive battery. Either send check, money order, or pay expressman on delivery. Write for our illustrated page Booklet & Sample Cell. All orders shipped by express, collect. SEE JAY BATTERY COMPANY, 915 Brook Ave., New York (11th St. Station, 3rd. Ave. "L"). Phone Jerome 1739. Open until 7 all evenings.

**\$2.25 BURE 100 VOLT KNOCKDOWN** unit, including cabinet and alkaline and iron elements, with new type connectors for easy interconnection. Wholesale and retail. ROMCO STORAGE BATTERY CO., 146 W. 68TH ST. TRAFALGAR 6828. For Sale

8-Tube Crosleys, equal to 5.....\$9.95  
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8-Tube Radios, 8 tubes, 8 speakers.....\$14.00  
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4-Tube Ware Neutrodyne.....\$11.95  
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320 West 42d St. Penn. 9313.  
WE LOANED a dealer several thousand dollars (1-3 their value) on the finest 5-tube radio sets made. They equal any 100 set. WE LOANED them to him. He was guaranteed. We are closing the balance at \$20. Act quick. Whitestone Co., 177 Greenwich Street, Room 1, Corlandt 2597.

### Parts and Equipment

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# How Radio Tubes Are Made in Germany

Different manufacturers adopt various means of obtaining the very degree of vacuum necessary in a thermionic tube, but in principle the methods are all very much alike.

In the plant under review bright emitters and dull emitters are dealt with in different ways, for reasons which will be explained.

To do this the gas jets are trained on a spot just below the pinch, while the thin tubing to be attached is introduced inside the foot. Within a short space of time sufficient heat is brought to bear to cause fusion between the tube and the foot, and in order to clear an air passage through this point a blast of compressed air is blown up through the thin tubing. This air blast blows a small hole through the semi-molten glass at the point of fusion.

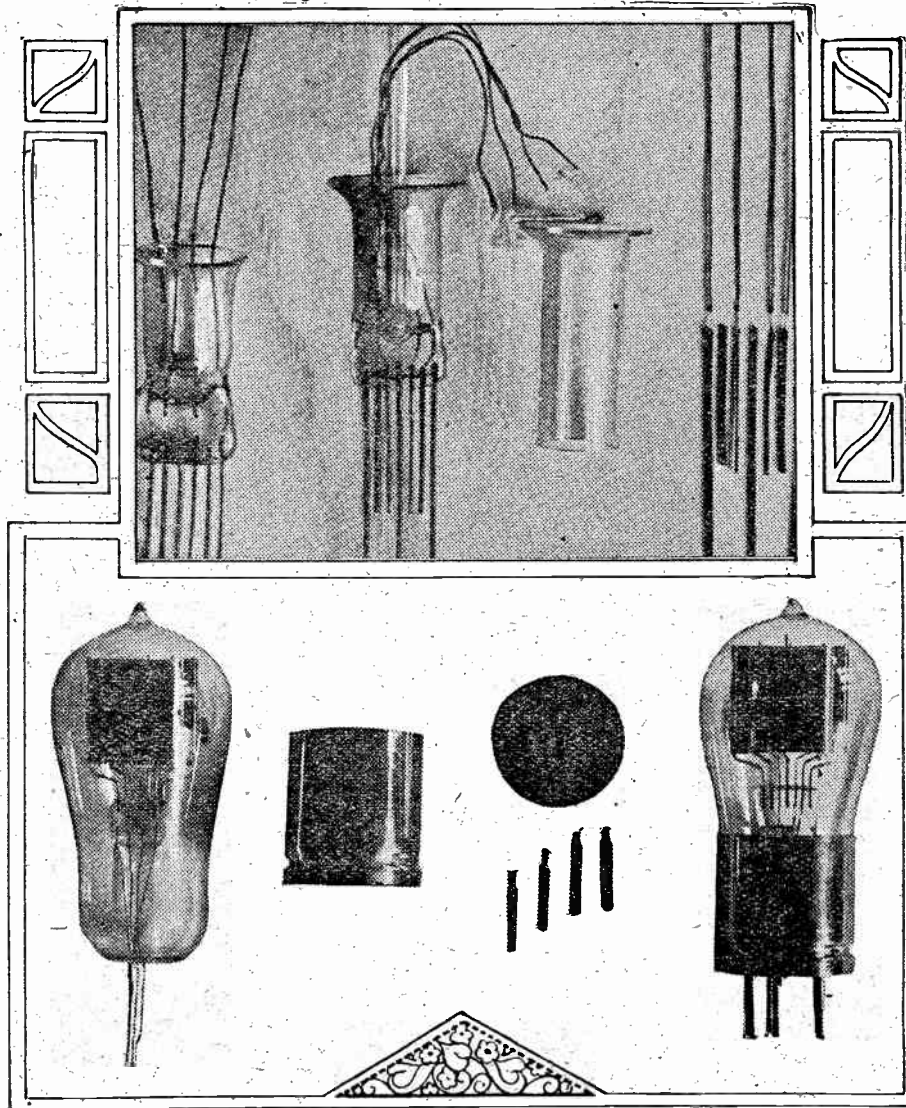
The constituent parts of the foot and the completed article for both tip and tipless valves are illustrated in Fig. 2.

The final process in the manufacture of the foot is when the operator bends the filament, grid and plate supporting wires to the correct angles and then cuts them off to exactly the required length by means of a special machine.

In the case of bright emitters, when the vacuum has reached a certain degree of hardness the filaments are heated to a high temperature and a high voltage is applied to the grid and plate, which are temporarily connected. The high voltage is adjusted to such a value that a powerful electronic bombardment of the grid and plate is set up, so these elements are raised in temperature to a dull red heat. This bombardment is kept up for some time till all the occluded gas within the metal of the electrodes is expelled and the vacuum of the tube arrives at the required degree of hardness.

In the case of dull emitters, however, such a process would be harmful to the fine wire filament, so the elements of this class of tube have to be heated by other means. One method which immediately suggests itself is by inclosing the tube in some kind of furnace, but any such method also would heat up the glass bulb and cause it to collapse, so some other method which will only affect the metallic elements of the tube must be found.

(Continued from page three)



Vacuum tubes in several stages of completion

One satisfactory solution to the problem is to inclose the tube to be exhausted within coils of wire, through which are sent powerful high-frequency currents. In this way the elements are heated by induced eddy currents and can be raised to a temperature sufficient for the purpose.

From time to time the operator tests the degree of vacuum by bringing into

contact with the glass feed tubes a highly charged rod. This rod has an insulated handle to protect the user from shocks and is fed from an induction coil. On coming into contact with the glass tubes leading to the valves under exhaustion a glow occurs within them, such as is familiar to those who have experimented with neon or Geissler tubes.

This glow indicates to the operator in a rough-and-ready fashion how much gas still is left in the tubes.

In the final stages, in the case of dull emitters, the exhaustion process is sometimes hastened by means of magnesium. A small piece of this substance, previously welded to the plate of the tube, is volatilized by increasing the power of the high-frequency currents in the heating coils till the temperature of the plate is raised sufficiently to cause this to happen.

The sudden volatilization of the magnesium consumes the last remaining minute quantity of gas within the bulb, and in so doing the volatilized magnesium is deposited in a thin film over the inside of the glass bulb. This is the explanation of that silvery appearance of many tubes, which readers undoubtedly will have remarked and wondered about.

When finally exhausted the thin tube connecting the valve to the pumps is heated near the bulb and the valve sealed off. This process leaves the tube with the well known tip on top. In the case of pipeless tubes the pip is concealed within the foot.

## Mounting and Aging

The tube is now ready for mounting in its base. After the leads from the tube have been soldered to the pins the base is sealed to the bulb by means of a special compound, which is supplied from a heater.

The next process is that of aging the tube. This process consists simply of running the tube under its normal operating conditions in order that it may settle down and attain stability. For this purpose the tubes are put into large racks.

The final operation in the manufacturing process is that of testing. In the factory herein described every tube is tested before being sent out to insure that each and every one of them shall possess the required standard characteristics.

The Radiorehfabrik factory in Hamburg employs 150 persons, and the writer was informed that each tube during the entire manufacturing process passes through the hands of thirty operators.

## This Season's First Portable Receiver

(Continued from page one)

actual building of the receiver must necessarily vary in individual cases, a list of the exact electrical parts used in the receiver designed by the author will be of assistance to the enthusiast desiring to build a receiver similar to it.

### List of Parts

|  |         |
|--|---------|
| Two Hedgehog audio-frequency 1:5 transformers at \$3.50.....       | \$7.00  |
| One Bruno antenna coupler.....                                     | 3.00    |
| One Bruno three-circuit unit.....                                  | 5.00    |
| Two Amsco .0005 mfd. S. L. F. allocating condensers at \$4.25..... | 8.50    |
| Three Amsco Universal sockets at 75 cents.....                     | 2.25    |
| One Amsco "floating" socket (for detector tube).....               | 1.00    |
| One Electrad Royalty resistor, Type C.....                         | 1.50    |
| Four Amperites for UX199 tubes at \$1.....                         | 4.00    |
| One Polymat grid condenser with leak.....                          | .90     |
| One by-pass condenser, .0025 mfd.....                              | .40     |
| One by-pass condenser, .006 mfd.....                               | .75     |
| One Baldwin unit.....  | 6.40    |
| Total.....   | \$41.20 |

As suggested, the actual building of the receiver must vary somewhat in individual sets, the changes in design being occasioned mostly by variations in carrying cases. The writer can at best designate the major points in the construction of his particular set.

The carrying case measured 15 1/4 inches high, 13 1/2 inches wide and 6 inches deep. A partition divides the interior into equal compartments, one reserved for the set proper and the other for the batteries and loud speaker. A Baldwin unit is the actuating mechanism of the horn. A small Radion horn serves as a resonance chamber. A four-inch circle, the size of the bell, is cut in the panel covering the battery compartment.

Figure 2 shows the simple tuning panel layout. The exact size of the panel will, of course, vary with the dimensions of the suitcase.

The back of panel construction may be observed in photograph, Figure 3, which also illustrates the compartment arrangement of the case. On the subpanel, 12 1/2 inches long by 2 1/2 inches wide, held in

place by brackets to the condensers, are mounted the sockets, amplifying transformers and filament resistors.

Figure 4 is a photograph of the portable set mounted and ready to carry away. Antenna and ground posts are provided on the front of the tuning panel. The use of small knobs and flat dials provides for greater room behind the panel. The weight of the set completely equipped is twenty-two pounds.

The portable set described is, of course, designed for operation from dry cell tubes, preferably the UX199. (However, if the receiver is to be transported consistently by car, arrangements can be made for the lighting of six-volt tubes from the starting battery.) If there is room in the battery compartment for a 22 1/2-volt C battery, a UX 120 tube may be used in the output stage.

Standard dry cells are the preferred A battery. However, if justified by the economy of space, three C batteries, such as the Eveready 771, connected in parallel, may be used.

Needless to say, the smallest 22 1/2 or 45

volt blocks are used to supply the plate potentials.

Three volt and four and a half volt flashlight batteries require less room than the standard C batteries and can be placed in the set compartment if the space thus saved is consequential.

Two 100-foot coils of insulated wire are recommended as a pick-up system for the portable receiver. One wire should be stretched in the usual fashion as an antenna. It may be run from the receiver to the top of a tree or in any fashion that utilizes the highest available point.

The second coil should be connected to the ground post and unrolled on the ground underneath the antenna. It is neither necessary nor desirable that this second wire be grounded. The experienced fan is familiar with this use of a counterpoise.

If more convenient, the receiver may be grounded in the usual way—to a fence, a rod driven into the ground or to tin cans thrown into a well or lake.

And thus do we in the spring divert the young man's fancy from its rhymed and fabled pursuit.

## The Right Way to Listen In; Compendium on Radio Etiquette

First Important Principle Is to Invite Several Guests; Selecting the Evening Having Had the Best Programs Announced

By Charles Roland

THERE are several ways of listening in over the radio, but there is only one right way, just as there is only one right way of doing anything. The writer will endeavor to set down a few rules governing the right way to listen in, issuing a sort of compendium on wireless etiquette.

The first important principle is to invite several guests to your home, selecting an evening in which the very best programs are announced for broadcasting. You instruct your wife to prepare a collation, to be served when the guests show signs of hunger or thirst. This may occur anywhere from ten to twenty minutes after their arrival.

The honored guests, Mr. Grumble Smith, Mrs. Wordy Smith, and their little son, Nuisance, will arrive at 8 o'clock promptly, just when Gall-Curi begins to sing. The exchange of greetings, remarks anent the weather and removing of hats and coats will render this prize number of the week null and void, so that, for all intents and purposes, so far as you are concerned, Gall-Curi did not sing at all, but merely emitted a few poorly timed shrieks.

The trouble with many prima donnas is that they do not know how to arrange their songs to meet the demands of the conversation. Gall-Curi having left the microphone at 8:15 and your guests now being seated, you tune in on the station broadcasting an address on the World Court.

"I was just talking about the World Court yesterday," Mr. Smith remarks. "It seems there were a Senator and a Congressman."

"But this is especially good, Mr. Smith," you remind him. "I'd like you to listen."

"Certainly will listen. Comes over good, don't it."

The little Smith boy, aptly named Nuisance, has meanwhile stolen over to the receiving set and twisted the dial. There is a groan, a splutter and four shrieks as the kaleidoscopic cross-section of radio activities hits the ear. Nuisance is so well pleased with the result that he repeats the process.

"Mother, listen," he shouts. "Ain't radio good?"

### Mrs. Smith's New Hat

Mrs. Smith nods beamingly and continues her report to the hostess, describing the latest mode in Spanish hats, introduced so fetchingly by Raquel Meller. Unfortunately Mrs. Smith does not have the eyes that Mlle. Meller brought with her from Paris, but the hat is a wonderful thing if one does have wonderful eyes.

"My husband was telling me only yesterday," Mrs. Smith laughs, "that he'd flirt with me if he was a strange man. But, of course, he couldn't—it's not a lady, it's only his wife. Ha, ha, ha!"

You laugh with Mrs. Smith, not hilariously, but politely enough to prove you are with her. Meanwhile a little patient tuning restores the broadcasting station, now featuring Paul Robeson at the microphone, singing "I'm a Motherless Child."

"That's Robeson, is it?" Mr. Smith inquires, after the announcer has repeated this information eleven times.

"Yes. He's wonderful, isn't he?" "I don't know. Rosamond Johnson can sing circles around him."

"I don't agree with you."

"Well, anyway, I never did care much for Negro spirituals. Can't you tune in on something else?" There is no necessity for doing this, however. Young Nuisance has made himself at home on the floor, playing with Baby, the French poodle. In the pursuit of Baby by Nuisance, the Smith heir bumps into the table full force. The receiving set lands on the floor, hurting Nuisance, unfortunately, only a little.

Putting the Set Together Again While you pick up the pieces, the wife goes to the kitchen for the eats. Mr. Smith lectures his son vociferously, and Mrs. Wordy Smith advises you on the technique of putting a set together. By adopting opposite measures you do, luckily, get the set working again, although it has acquired a nasal quality and a surreptitious squawk.

Despite these handicaps, Graham MacNamee comes across the ether clearly, with his exciting, warm voice, describing a wildly exhilarating chess game between "Kid" Rubenstein and "Knockout" Lombardi. You grip your chair tensely as MacNamee shouts, "White checks black, with every pros-

pect of forcing a stalemate. Black retreats to the queen's row, fencing for time. White's pawn attacks black's bishop, threatening the castle at the same time, but black's knight leaps the barriers and rescues the fainting queen from this scene of havoc. I predict checkmate in three moves."

This impending crisis, which you want to follow, play by play, at least to learn whether white mated black, or vice versa, is thrown altogether into the discard when your own wife, not Mrs. Smith, takes up the conversation, reminding the guests hospitably that the sandwiches are ready. Will Young Nuisance please pass the cookies, hold the cup of tea on his lap, and help himself to lemon and sugar?

### Another Catastrophe

The expected catastrophe results. The lemon falls on the chair, the sugar settles over the rug, the cup of tea jiggles in the saucer until you grasp it from him, only to upset some of the boiling liquid on Nuisance's trousers.

This never was much of a world for justice, and you take it good naturedly as you, the long suffering one, hear the denunciatory exclamations poured on your head by Nuisance Smith, Mr. Grumble Smith, Mrs. Wordy Smith, and even your wife, who seems to have deserted into the enemy's camp. Whatever came of that chess game? Only Graham MacNamee knows, and he tried to tell, but was cut off.

Ah, well, the luncheon is over. The radio piece de resistance soon will come over the air. Shakespeare's birthday is being widely and eloquently celebrated. John Barrymore is going to read portions from Hamlet and Macbeth, while Jane Cowl recites the affectionate lines given to Juliet.

"This Shakespeare is pretty good, isn't he?" Mr. Smith asks. "These here modern fellows try to beat him, but they don't measure up now, do they? This here Bernard Shaw, a smart Aleck, eh? And Eugene O'Neill gives me the creeps. Too much sad stuff. Give me Shakespeare every time. He's deep. He's learned. That man certainly knew the English language. These here modern problem writers give me a pain."

Mrs. Smith asks her husband to maintain silence. This unexpected courtesy on her part wins your heartfelt admiration. Alas! you quickly discover she demanded silence only to get the floor for herself.

"It was so strange," she reports to your wife. "So unlike him. And yet he wouldn't marry the girl. It really was heartbreaking. I did what I could to make them see the light, but you know how these things are. Why, my cousin's daughter-in-law only last week told me of a niece who threatened to divorce her husband, but that didn't make any difference. You know my cousin's daughter-in-law, don't you? Wears those red hats and earrings—smart effect although, heaven knows, it's not for her type of beauty, so-called, to wear."

Abruptly you turn off the radio for the night. John Barrymore and Jane Cowl notwithstanding, you will suffer in silence rather than betray them to this self-same Smith family, which might be known as the Brown or Jones family so far as the frequency of this type of listener is concerned.

And still you are not relieved of the tragedy of the evening. The heaviest blow comes when Mr. Smith tells you, "I don't think much of your set. It doesn't work right."

It would work right, you remind him, if his duplicate personality, young Nuisance, would not have knocked it over.

"But, anyway," says Mr. Smith, "radio ain't so good."

"They don't give you good programs."

"What's the matter with Gall-

## Interesting Facts About Properties Of Radio Crystals

A small piece of crystalline material is used as the detector in many radio receiving sets. The most common and important crystalline materials used for this purpose are galena and pyrite (iron pyrites). Carbonyl, silicon, selenite, molybdenite and many other crystalline materials are also often used for the detection of radio signals.

Galena is generally found to be the most sensitive. However, this mineral, in spite of its sensitiveness, does not maintain its adjustment for any great length of time. This is largely due to the fact that the "cat-whisker" used to make contact with the mineral is usually a light tension spring, and the slightest jar is likely to throw it off the sensitive spot.

Galena is a very common ore and is found in many parts of the United States. Different specimens vary widely in sensitiveness, even when taken from the same mine. In fact, a single piece of the mineral varies greatly in sensitiveness at different points on its surface. It is, therefore, necessary to test each fragment to determine its suitability for radio reception. This mineral does, however, have a great many sensitive "spots" and is one of the easiest to adjust.

Silver or nickel colored pyrite is, in general, much more sensitive than the dull, somewhat copper-colored pyrite. Not like galena, differences in place of origin have not been known to give characteristic differences in sensitivity. Pyrite with minute crystals scattered throughout has been found unsuitable for radio use. This mineral will withstand a firm contact, and therefore is used in a number of fixed crystal detectors. It is interesting to know that pyrite may be mounted in ordinary solder, whereas galena requires a special metal of low melting temperature for mounting.

It is highly important that the crystal detector be kept perfectly clean. Its surface should never be touched with the fingers, as this will destroy its sensitiveness. If under any circumstances it should come in contact with some oily substance and lose its sensitiveness, it should be washed with soap and water.

If galena crystals become badly scratched and the "sensitive spot" is difficult to find, it may be chipped so that a new surface is exposed. This new surface will be found to have a number of sensitive spots.

Mountings for the crystals should cover a large area of the mineral. It is evident that the mounting should come in contact with a sensitive point as well as the "catwhisker."

**Electric Storms Cause Static** Static disturbances usually are caused by electrical charges and discharges in clouds. These cause numerous cracks in the receivers or loud speakers and are most common in the spring and summer when electric storms frequent this territory.

Curci and Graham MacNamee and John Barrymore and Jane Cowl. "I know but you can't get them. And besides, what do you think they're going to do about prohibition? Any chance of amending the amendment? It's bad one way and worse the other. I can't make any sense out of it."

The evening having been ruined thus far, you take a fierce delight in ruining it to the last bitter drop. You agree with Mr. Smith, persistently, flatter Mrs. Wordy Smith maliciously and pat young Nuisance on the head with a palm that itches to administer a spanking elsewhere on his anatomy.

The moral of this recital is quite immoral. If you want to hear a good radio program betake yourself to the woods and shut out all neighbors, friends, relations and acquaintances. Persons who have the most elegant manners in the drawing room dining room or bathroom feel they violate no social laws by disregarding the social obligations of a radio room.

Just why this should be is not yet determined. The fact has been established, however, that etiquette not having been authoritatively established in this field, no one bothers to meet the exigencies of the occasion. If you need must invite some one to a radio evening invite your enemies, not your friends, and, preferably, invite the dumbest of the enemies. Perhaps you'll have a chance to hear the ether unload its cargo of music, oratory and jazz, which, after all, is as enjoyable a cargo as one may find.

## How to Make an Automatic A.C. Filament Power Supply Unit

This Device Is Said to Give Constant Supply to the Receiver Without Hum; May Be Assembled in the Home at Low Cost

By Perry V. Ogden

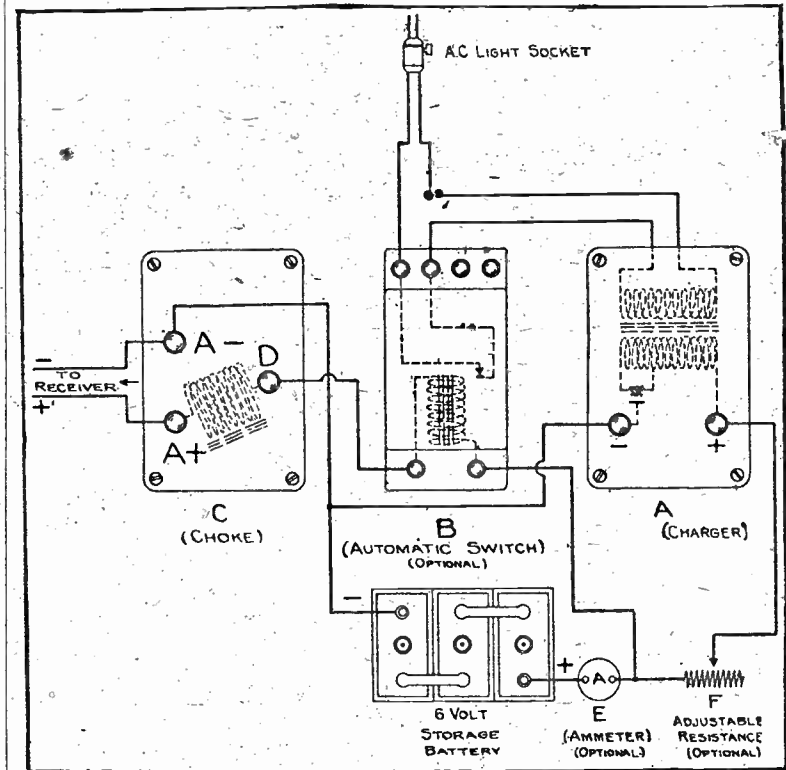
THE demand that current for the operation of any radio receiver be taken direct from the light socket without depending upon trickle chargers to keep A batteries charged is universal wherever radio is known. Many power units using trickle chargers have been offered to radio set owners and builders, but the far-demons that current be sent directly from the light socket to the receiver. Trickle chargers do not keep the battery charged to full capacity, and as the operation is continuous whenever the set is not in operation, the expense of trickle chargers in most cases is too great.

Here is an automatic A. C. filament power supply for tube filament that is in no way a trickle charger and gives perfect reception without the faintest trace of hum or noise. While a battery is used, the battery acts only as a regulator of the current flow, assuming the same duty as a condenser in a B battery eliminator. Because it is not possible to regulate the current flow at such a low voltage as 6 volts with a condenser, the battery, being of six-volt capacity, stores the current and permits a regular flow at this low voltage.

Once the battery is charged and the rectified current properly adjusted to the requirements of the receiver being used, it is never discharged; hence there is no need of

into the power supply from the light socket. This facilitates leaving the light socket permanently connected, while trickle chargers are constantly charging when the set is turned off. While no harm will result from more current than is necessary, because the excess current will be absorbed by the battery, nevertheless, by adjusting the flow to the exact current necessary, current is saved and battery life greatly increased. The cost of operation of this new power supply is between one-half and three-quarters of a cent for every hour the set is operated.

Only a screw driver is needed to assemble this new A. C. current supply, and the total cost, it is esti-



leaving this new automatic A. C. filament supply on the line, because the current flows direct from the light socket to the tube filament and the battery always remains the same.

### Necessary Apparatus

In the illustration, units A, B and C are simply hooked up with your present six-volt A storage battery as indicated. A is a standard 2 1/2-ampere Crescent or Eclipse charger; item B is the Kodak automatic switch, which automatically controls A. C. supply, which is optional and need not be used unless desired, and item C is the Kodak filtering choke, which filters out all irregularities before the current passes on to the radio receiver.

An ammeter (E) and regulating rheostat (F) are desirable, although not necessary, accessories. Inasmuch as the A battery acts only as a regulator and the charger operates only while the set is in operation the battery neither charges nor discharges. The life of the battery, therefore, is almost everlasting. Any kind of a battery with three cells may be used, regardless of size.

This power supply may be built around any bulb or electrolytic-type charger. However, the new Kodak Crescent or Eclipse type bulb chargers have been designed especially for this type of work and operate without transformer hum.

Current leaving the light socket is rectified by the A. C. bulb, but still has irregularities which would produce objectionable noises going directly into the radio receiver. The filtering choke levels all irregularities until the current is a smooth, even flow, producing the same results as a fully charged battery.

If desired, the automatic series switch designed for this power supply may be used. This switch automatically turns on the power supply as soon as the set is turned on. All operations are automatic, directly from the switch and on the set. The instant the set is turned off the power is turned off and no current comes

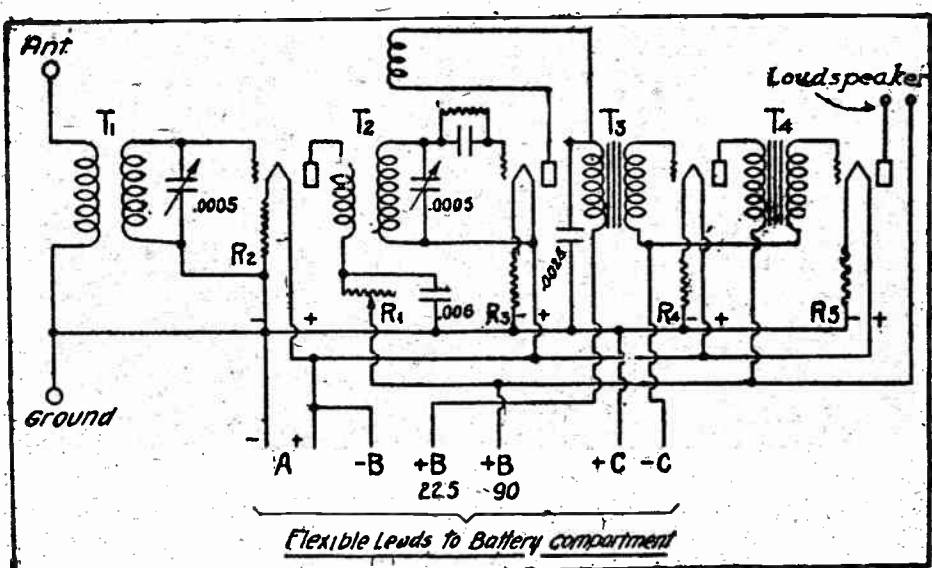


Figure 1—The wiring diagram of the four-tube portable receiver described in this article

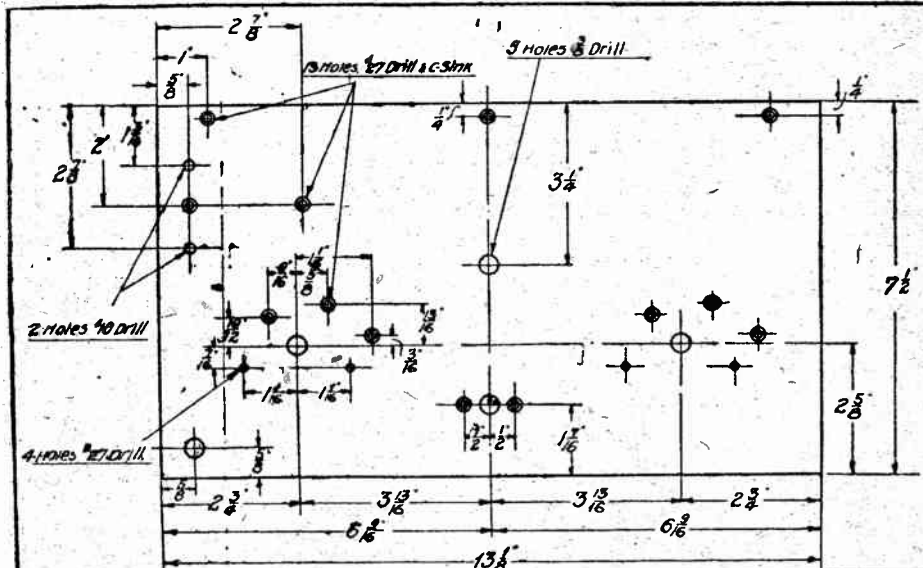


Figure 2—The panel layout employed by the author in the construction of his four tube portable receiver

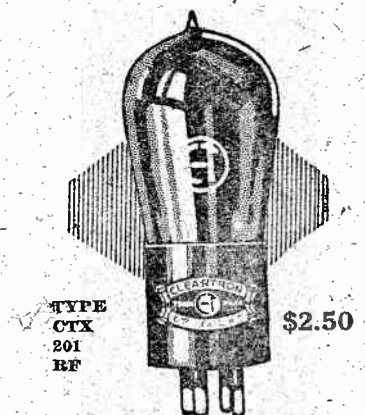


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## Amateurs Invite Radio Public to Share Their Joys

That the American radio amateur has extended the hand of welcome to his cousin, the broadcast listener-experimenter, and is undertaking to show him how easy it is to engage in two-way telegraphic communication with the far distant places of the earth, is shown in a statement just issued by Hiram Percy Maxim, president of the American Radio Relay League, the national association of amateurs and experimenters.

Commenting upon the tribute paid the American amateur by Judge Stephen B. Davis, of the Department of Commerce, recently, Mr. Maxim said:

"Judge Davis's very splendid tribute comes at a time when the amateur is more than ever in the public eye. At this moment three separate Arctic expeditions are in the Far North depending almost entirely upon amateur contact via short-wave radio telegraphy for their communication with civilization. The success of two successive MacMillan expeditions with amateur communication has convinced explorers generally that no other type of communication is so certain or so effective.

"The average citizen, hearing of the important tasks which the amateur has undertaken, no doubt visualizes a class of clannish, serious workers wrapped up in their hobby to the exclusion of outside interests, but this is not so. No class of people is more representative of your true American; no organization is more democratic in spirit and operation than the amateur's organization, the American Radio Relay League. At our amateur conventions it is not an unknown sight to see the eighteen-year-old schoolboy in heated argument with a fifty-year-old business man. Two men at the same convention will hail each other with the familiarity of old friends—which indeed they are—although they may never have seen each other before. One of them may be a wealthy and retired manufacturer; the other a mechanic, but class is no barrier. Such incidents are duplicated time and again.

"Perhaps the explanation of the tremendous growth in amateur two-way communication lately is that there is nothing difficult about the game; no demand for skill or knowledge other than that already possessed by the average home-constructer of broadcast receivers.

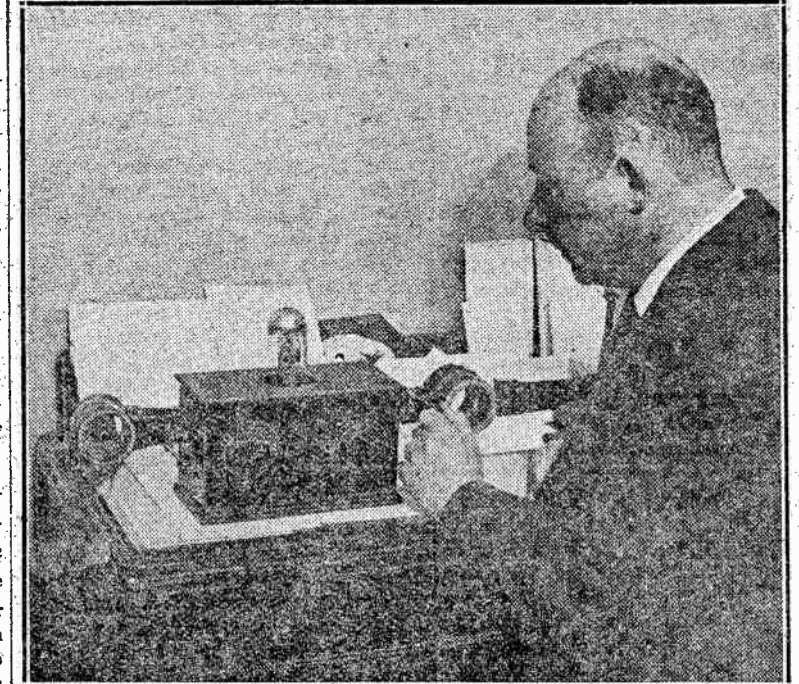
"In this connection we recently published in the April issue of 'QST' a description of a low-power amateur transmitter, costing approximately \$25, but capable of effecting communication over many hundreds of miles. This was written primarily to demonstrate that such a set required no extraordinary skill in construction or operation. We expected that it would create some interest in amateur radio communication, but we had no idea that it would bring the huge response it did. A manufacturer who has undertaken to supply parts for this set reports that he has been literally overwhelmed by orders.

"The radio public is just beginning to realize what has long been the keynote of amateur radio's popularity—that is, the tremendous fascination of being able to effect two-way conversations with other individuals scattered the length and breadth of the earth, and this on apparatus of one's own construction. To-day the amateur can truthfully say that there is no earthly distance over which it is not possible for him to communicate. The antipodes have been linked innumerable times, and transcontinental communication now comes under the heading of local work.

"With international communication a matter of nightly occurrence, amateur radio stands to-day as one of the most powerful forces working for world peace. In this connection, there is no more significant statement than that made recently by one of our members, a retired Army officer. 'Do you think, he said, 'that any politician can stampede me into declaring war on my friends in other countries—friends with whom I hold nightly communication? Never!'

"As the telephone, the railroad and the automobile have brought some national understanding that to-day makes another civil war a virtual impossibility in these United States, so private two-way telegraphic communication is to-day quietly working toward world peace by bringing about international understanding and fellowship."

## German Radio Engineer Visits The U. S. to Demonstrate Tube



David L. Loewe, of Berlin, demonstrating a receiver employing his new vacuum tube

David Loewe, of Berlin, brother of the famous scientist, Dr. Sigmund Loewe, has just arrived in the United States with a phenomenal radio tube which is really three tubes and the other apparatus necessary for an audio or radio frequency amplifier contained within a vacuum. In other words a complete amplifier is housed inside a vacuum tube.

These tubes are made in two types. One contains a detector, a stage of audio amplification and a stage of power amplification. Resistance coupled audio amplification is employed. The resistance and necessary condensers are contained inside the tube. All that is necessary for a complete receiving set with such a tube are the tuning elements for such a circuit. The other tube is termed a "radio frequency amplifier." This latter tube contains the necessary elements for two stages of radio frequency amplification.

Mr. Loewe claims that the tubes are non-microphonic, absolutely noiseless and will last indefinitely.

The underlying basic element in the new multiple tube is the Loewe high vacuum resistance. These consist of rods coated with a deposit of fine metallic compound film, which serve as the resisting element. This element is enclosed in the glass part of the tube which is highly evacuated.

The resistance is said to be free from capacity and will therefore not retain any electrical charge. It is also said that it will not vary with

### Simultaneous Musicals To Be Broadcast From WRNY

What is believed to be the first synchronized air musicals ever broadcast will come from WRNY Tuesday, April 27, at 8 p. m.

At that time the organ, playing from the West Side Unitarian Church, 550 Cathedral Parkway, and Orlando's Orchestra, playing from the palm room of the Hotel Roosevelt, Madison Avenue and Forty-fifth Street, will be heard in a half hour program of classical music.

This will be the first time that air synchronization has ever been attempted, and every precaution will be taken by the engineers of WRNY to have a perfect balance of volume in the different instruments.

To accomplish this feat the "output" of the WRNY speech amplifiers must be fed by direct line to the organist at the church, who will monitor both his own program and also that of the Orlando Orchestra.

Another direct line to the palm room feeds the amplifier output of the organ to the orchestra director, who, by wearing headphones, monitors the organ and directs his orchestra.

Herbert Soman, conductor of Orlando's Concert Orchestra, and Rock Ferris, organist, will wear headphones that will enable them to play the same notes at the same time. Songs of the classical numbers they will play are arranged for short solos. At this time, if Mr. Ferris's organ is thundering forth in a triumphant outburst instantly Mr. Soman's orchestra will pick up the music and vice versa, joined in harmony.

### Shielding Should Be Grounded

All shielding in radio receivers should be grounded.

## Hoover Discusses Situation Created By Court Decision

The following statement relative to the wave length piracy case in which the United States government sued the Zenith Radio Corporation of Chicago for not complying with the stipulations made in its license was issued by Secretary Hoover upon his return to Washington last Tuesday:

"I have now (upon my return to Washington) had an opportunity to discuss the situation created in radio by the decision of Judge Wilkerson in the Zenith radio case.

"The court has refused to impose a penalty upon a concern which admittedly was operating at a time and upon a wave length not authorized under its license. While the holding is in conflict with an earlier ruling in the District of Columbia, it is apparent that under the present law of 1912, as now construed, no one has authority to protect the listening public against utter chaos in the service upon which it has come to rely. The Chicago decision denies the authority of the Secretary of Commerce to assign either wave lengths or time of operation. It does not affect broadcasting alone, but is equally applicable to the amateurs, and any of these services are open to incursion by the others and any station may be attacked by its neighbor. If stations proceed to select their own wave lengths and choose their own time, considering only their own selfish advantage, effective public service will be at an end.

"Congress has full power to confer the needed authority. The White bill now before the Senate, which has passed the House, gives the power. There have been suggestions that this authority should be administered entirely outside of the Department of Commerce by a special commission set up for the purpose.

"There are three separate functions which must be performed by some Government agency. The first is the determination of who may broadcast. This is a discretionary or semi-judicial authority. I have continually advocated that the use of wave lengths is the use of public property, and that the determination of who should have use should not be in the hands of any one person but should be placed in the hands of a Commission, representative of the different sections of the United States, wholly independent of the Department. Such a Commission, to be appointed by the President with the approval of the Senate, is provided for in the White bill. This board will not need to be in continuous session and will imply but little expense.

"The second important function lies in the administration of the decisions of this commission and the minimizing of interference from many causes outside wave conflict. The third is the furthering of development of the art in the interest of the listeners and of the industry.

The last two functions are essentially administrative, and in my view should rest in one of the executive departments rather than by creating a new and additional government agency, which would imply considerable additional expense. Moreover, boards and commissions, by their divided authority have always been a failure in administration; they are desirable for discretionary or judicial determinations. The tendency to create in the government independent agencies whose administrative functions are outside the control of the President, is I believe, thoroughly bad. I believe the staff of the Department has performed a great service in development of the radio art and developing the method of control and regulation in a new field. So far as the Department of Commerce is concerned the extraordinary difficulties and conflicts in the situation are such that we will be well satisfied to see radio administered by any other department which can probably undertake its regulation."

### 43 of Hazeltine's Patents Granted in Foreign Countries

Forty-three patents covering the inventions of Professor L. A. Hazeltine relating to the neutrodyne method of radio reception and transmission have been granted in foreign countries, according to a statement in the annual report of the Hazeltine Corporation.

The report further states that in continuation of its policy to secure world-wide protection for neutrodyne apparatus, components and auxiliaries more than 250 applications for letters patent have been filed in foreign countries located in both of the Americas, Europe, Asia, Africa and Australasia. In addition to the inventions of Professor Hazeltine, the report states, "Your company is also the owner of the John Scott Taggart patent in Great Britain and corresponding patents in the United States and Canada. These patents were acquired directly from the inventor, John Scott Taggart.

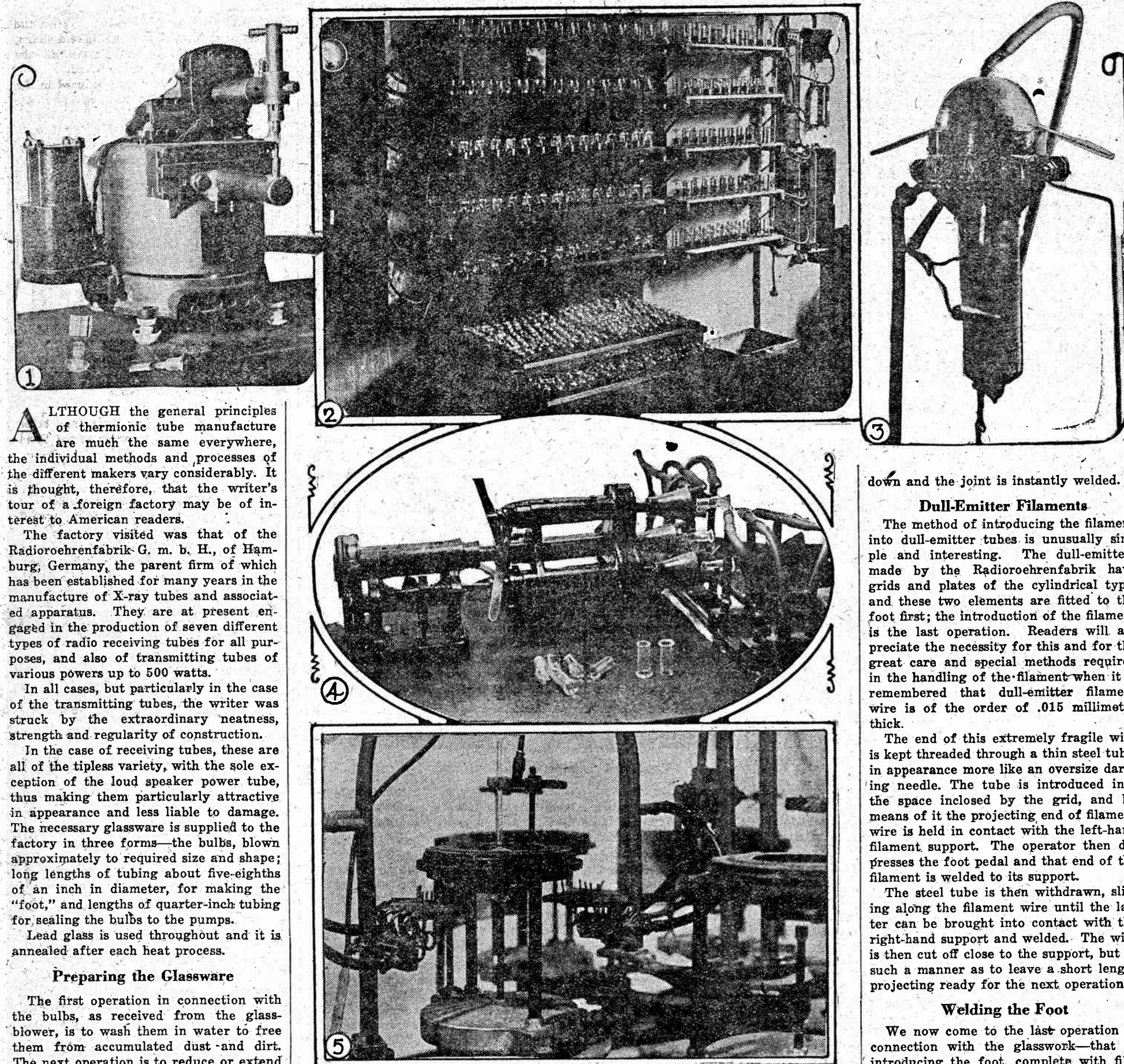
The report also discloses that the Hazeltine Corporation owns 80 per cent of the capital stock of the Latour Corporation. The latter in turn owns "the entire right, title and interest in and to the inventions of Professor Marius G. A. Latour; of France, so far as the United States and Cuba are concerned. These inventions are covered by sixteen issued patents and seventy applications, some of which have effective priority dates as far back as 1915."

An analysis of the foreign patents covering the neutrodyne inventions shows that five each have issued in Great Britain, Italy and Mexico; four each in Belgium, Canada, France, New Zealand and South Africa; three in Spain, two in Argentina and one each in Australia, Brazil and Czechoslovakia.

# How Vacuum Tubes Are Manufactured in a German Radio Factory

Each Valve Goes Through More Than a Score of Hands Before It Is Completed

By A. DINSDALE



These pictures show the apparatus used in the manufacture of vacuum tubes. 1—The electric welding machine used for welding the grids and plates to their supports. 2—The aging racks where the tubes are run under normal operating conditions for stabilizing purposes. 3—The apparatus which supplies the compound for sealing the base to the tube. 4—The machine for shaping the foot. 5—The device used for fitting the bulb to the foot.

### Preparing the Glassware

The first operation in connection with the bulbs, as received from the glass-blower, is to wash them in water to free them from accumulated dust and dirt. The next operation is to reduce or extend the opening into which the foot is inserted till it is of the correct size. This could, of course, be done by the glass-blower at the time of manufacture, but to insure that every bulb shall be blown to just the exact size would prove too expensive a matter, and the process of correcting irregularly shaped bulbs is a simple one.

The bulb is mounted in a kind of lathe, and while the foot opening is being heated in a gas flame the bulb is slowly rotated, and the operator either distends or contracts the opening by pressing against either the inside or outside with a metal rod.

Meanwhile the tubing for the foot is being cut up into lengths about two and one-half inches long. These lengths are then mounted in the machine pictured above, which slowly rotates the tube while the end projects into the concentrated flame of the six gas jets. When the correct temperature has been reached the operator then bends out the end to the correct size for entering the bulb opening by holding against it a curved metal rod. The process is similar to metal turning in a lathe, only instead of the work being cut to size and shape it is pressed while in a semi-molten state.

The next step is the insertion and sealing into the foot of the connecting wires and, in the case of tipless tubes, the thin glass tube used for sealing the completed tube on the pumps.

### Making Grids and Plates

The plates for the various tubes made in this German factory are either cylindrical or rectangular, and in each case they are stamped from the sheet nickel and rolled to shape.

The grids also are either cylindrical or rectangular, but in each case the method

of winding is the same. The requisite number of turns is wound upon a former, cylindrical or rectangular, as the case may be, the winding machine being arranged to stop automatically when the required number of turns has been wound.

The spacing is arranged for by feeding the nickel wire from the bobbin through a slot in a block, which moves along a threaded revolving rod, the threads of which are arranged to give the requisite spacing.

Before the wire is cut and the tension relieved the strengthening rib or ribs are laid along the winding and welded to each turn separately. The former, by a special arrangement, is then slightly contracted in diameter and the completed grid slipped off.

At the assembly benches the filaments and completed grids and plates are then welded to their supports by means of the electric welding machine shown in Fig. 4. This machine is foot operated, so that the operator may have both hands free to arrange the parts in their proper position on the lower welding electrode. On pressing the foot pedal the top electrode comes

down and the joint is instantly welded.

### Dull-Emitter Filaments

The method of introducing the filament into dull-emitter tubes is unusually simple and interesting. The dull-emitters made by the Radiorehnenfabrik have grids and plates of the cylindrical type, and these two elements are fitted to the foot first; the introduction of the filament is the last operation. Readers will appreciate the necessity for this and for the great care and special methods required in the handling of the filament when it is remembered that dull-emitter filament wire is of the order of .015 millimeter thick.

The end of this extremely fragile wire is kept threaded through a thin steel tube, in appearance more like an oversize darning needle. The tube is introduced into the space inclosed by the grid, and by means of it the projecting end of filament wire is held in contact with the left-hand filament support. The operator then depresses the foot pedal and that end of the filament is welded to its support.

The steel tube is then withdrawn, sliding along the filament wire until the latter can be brought into contact with the right-hand support and welded. The wire is then cut off close to the support, but in such a manner as to leave a short length projecting ready for the next operation.

### Welding the Foot

We now come to the last operation in connection with the glasswork—that of introducing the foot, complete with filament, grid and plate, into the bulb and welding the two together.

The foot is slipped over the central iron rod and the bulb placed over it and held there in a jig which grips the exhausting tube. In the tipless type of tube the central iron rod carrying the foot takes the form of a tube, into which the glass exhausting tube is inserted to protect it from the heat, while the bulb is held by a different form of jig.

When the parts are in position the table is moved round so that gas jets play on the bulb at the point where fusion is to take place. There are eight such jigs on this machine, and as they are loaded up with tubes the table rotates them from one set of gas jets to another until by the time they have nearly completed one revolution the glass has been sufficiently heated to cause fusion between the beveled portion of the foot and the encircling lower edge of the bulb.

While still in a semi-molten state an operator pulls away the surplus glass which is left clean and free from jagged edges.

### The Exhausting Process

The completed tubes are now ready for exhaustion and are passed on to the pumping room. Here the thin exhausting tubes are sealed on to the pump mains and pumping is commenced.

(Continued on page four)











# A and B radio power from your house current

*Philco offers you  
either or both*

PHILCO "A" and "B" Socket Powers are plugged permanently into a lamp or wall socket. They change your bumpy alternating house current into the smooth, hum-free direct current necessary for your radio.

One switch controls everything—"A" power, "B" power, even the radio itself. Snap it ON and you get a strong, uniform flow of both "A" and "B" power. Snap it OFF and your power is shut off—your radio is silent—and current feeds gently back into Socket Power "A" from your light wires.

No high voltage transformers—no moving parts—no hum—no distortion—no falling off in reception. As dependable as your electric current. Turned on exactly like an electric light.

Philco "A" and "B" Socket Powers are built into one cabinet for dry-cell tube sets—and in separate cabinets for storage battery tube sets. If you now have a good storage "A" battery and charger, buy Philco Socket Power "B" It can be used on any set.

Once you connect Philco Socket Power to your radio you never need change a single wire. You forget all about getting wires mixed and burning out the tubes of your set. You forget that radio is mysterious and technical. You just enjoy it.

Sold and demonstrated by leading radio and music stores and by Philco Diamond-Grid Battery Dealers.

**Philadelphia Storage Battery Company,**  
*Philadelphia*

New York Office—824 Liggett Building, 41 E. 42nd Street  
(Phone: Vanderbilt 1051)

## PHILCO RADIO A AND B SOCKET POWERS

Philco also builds rechargeable batteries, unique because they may be permanently connected to your radio and safely charged in your living room without changing any wires. Easier (and far cheaper) than the periodical renewing and rewiring of dry cells.

Philco Standard "B" Battery—a complete Adam-Brown mahogany finish replacement for 90 volts of dry cells. Only \$19.85.

Buy a Philco Diamond Grid Battery for your automobile



*This switch  
controls  
everything*

~your A power  
~your B power  
~even the radio  
set itself

Snap it ON and enjoy your radio  
Snap it OFF and go to bed

### For Radiola Super-Heterodyne

(old and new models) and other sets using 3-volt dry-cell tubes, buy Philco Socket Power "AB" shown above. Both "A" and "B" power built into one cabinet, satin-finished in brown mahogany. Connect permanently to your Radio—plug into a light socket—then turn your radio switch "on" and leave it "on." Thereafter nothing more to think about but the one Socket Power switch. Snap it "ON" and enjoy your radio. Snap it "OFF" and go to bed. For 50-60 cycle 105-125 volt alternating current . . . . . \$65.00

(No rectifying tubes to buy)

Socket Power "B" (see below) may be used on any set where house current "B" power alone is desired, at only . . . . . \$47.50

### For Storage Battery (6 volt) Tubes

buy Socket Powers "A" and "B" in individual cases. Socket Power "A" permanently connects to a light socket, and, without any thought about recharging, automatically supplies "A" battery current. Socket Power "B" eliminates "B" batteries and does away with all recharging and all bother and expense of replacing worn out dry cells. Either "A" or "B" may be used alone, but for maximum convenience, use both together. Plug the "B" into the built-in socket on the "A." Plug the "A" into your house current. Both "A" and "B" (and the radio set as well) are then controlled by the one "A" switch. Snap it "ON" and enjoy your radio. Snap it "OFF" and go to bed.

Socket Power "A" for 50-60 cycle 105-125 volt alternating current . . . . . \$42.50

Socket Power "B" for 50-60 cycle 105-125 volt alternating current . . . . . \$47.50

(No rectifying tubes to buy)

Philco "A" Batteries in acid-tight glass cases—for dry cell tubes, \$5; 6-volt tubes, \$16. Built-in charge indicators. In rubber cases, subbed mahogany color, \$14.85 and up.

Philco Radio Batteries are built Dynamic—DRY but CHARGED. Their life doesn't start until the dealer puts in the electrolyte. You can't get a stale Dynamic Philco.

# THE NEW YORK HERALD New York Tribune RADIO MAGAZINE

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SECTION TWELVE

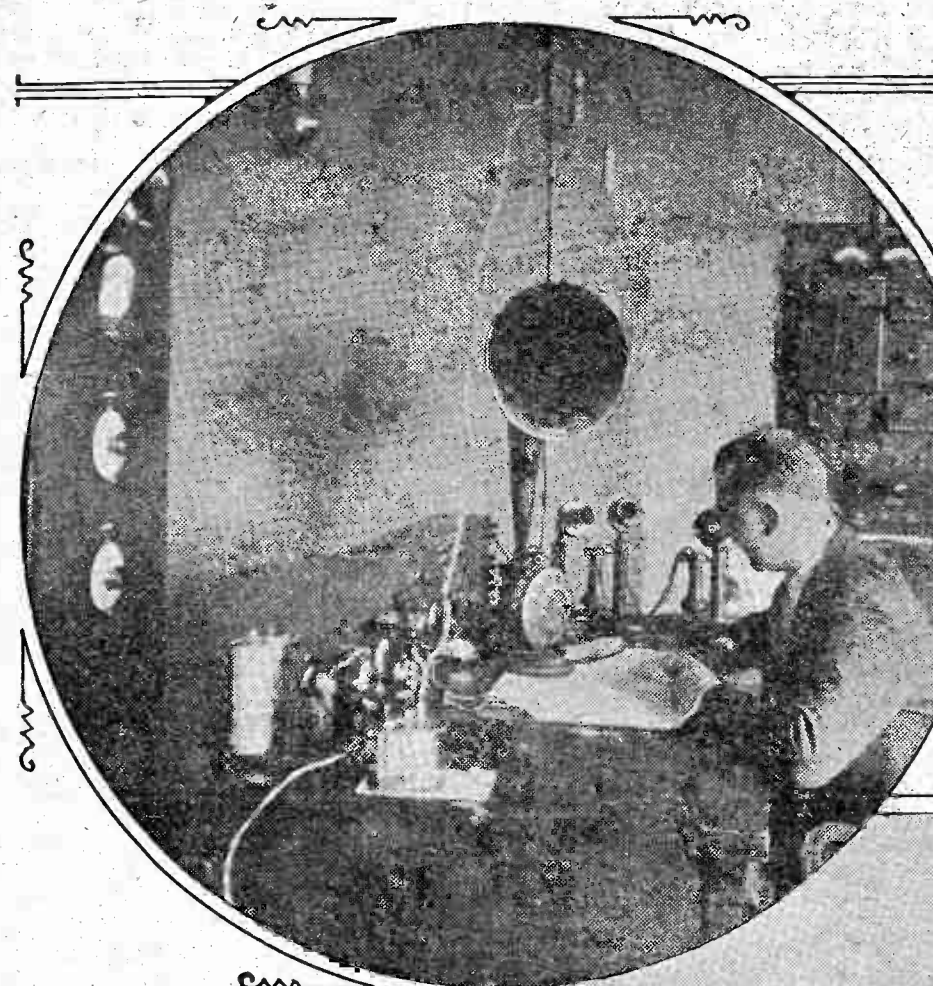
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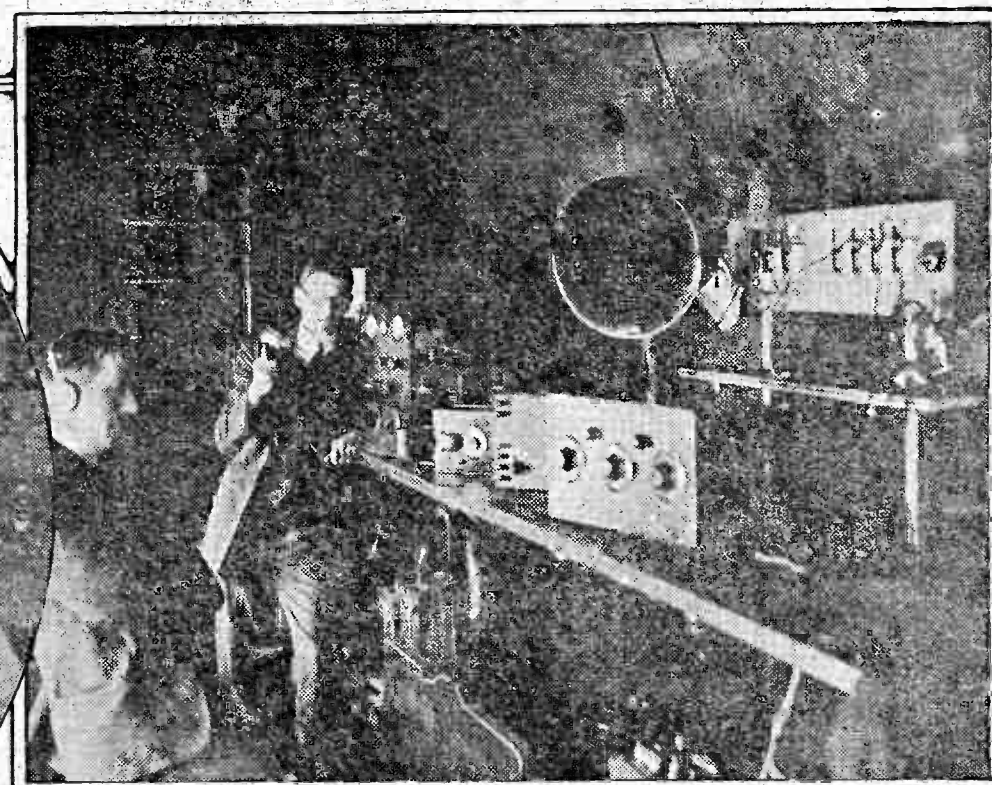
## Administration of Radio in Canada

How Our Northerly Neighbor Regards and Controls Broadcasting; Co-operation With United States Officials; Attitude on Advertising; Tax on Receivers

By CHRISTOPHER CONWAY



Operating room at Station CNRO, Ottawa, Ont., capital of Canada

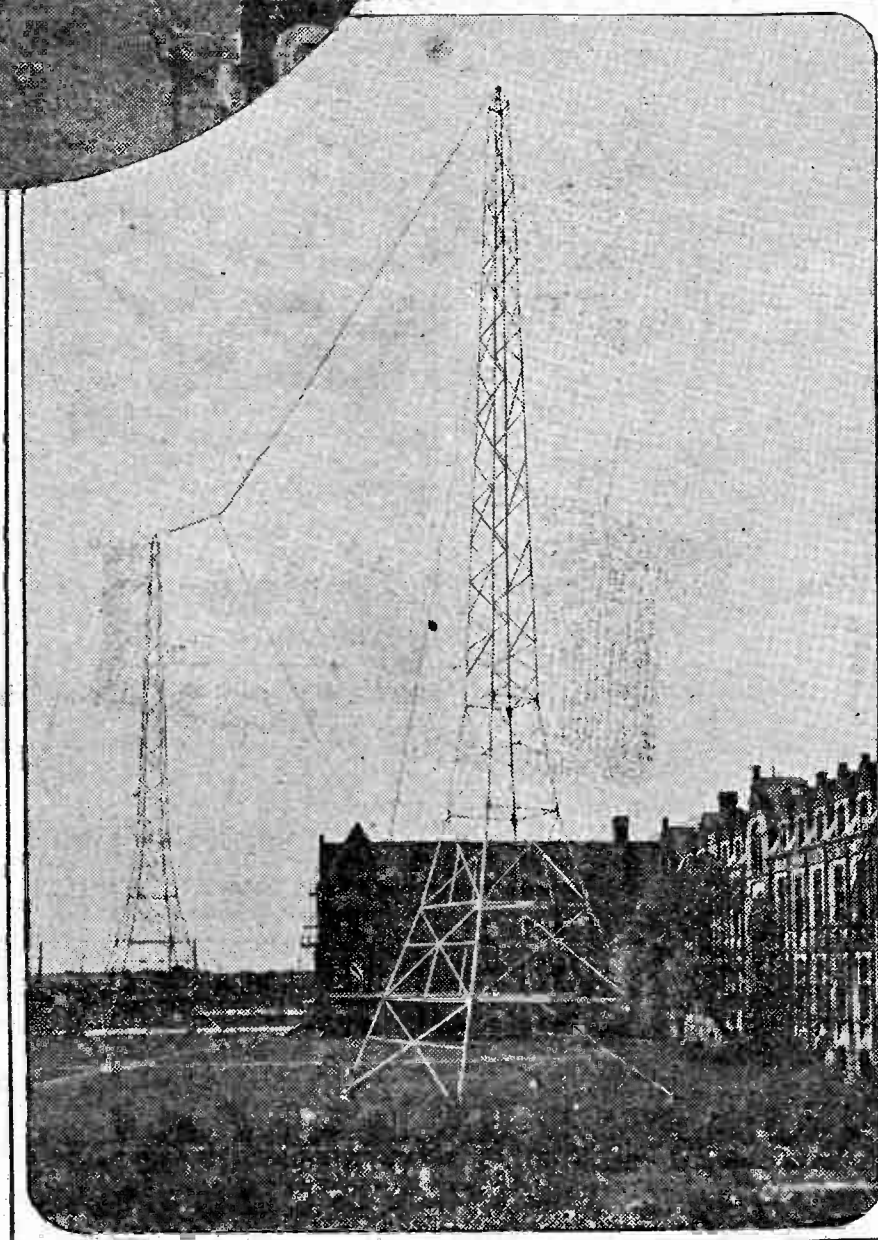


Radio test car operated by the Canadian National Railways. It is equipped for receiving and broadcasting and is used to check up local conditions on any part of the system

ON THE eve of the Fourth National Radio Conference, which opens tomorrow at Washington, a review of conditions regarding wireless as they exist elsewhere should prove of interest, and with that thought in mind it is the purpose of this article to deal with the manner in which the control and administration is undertaken in the Dominion of Canada. While the conference at Washington is national in character, yet questions are bound to arise which will possess a far-reaching international bearing, and Canada is so keenly interested in this aspect of the conference as to have appointed the administrative chief of the radio branch of the Department of Marine and Fisheries, Lieutenant Commander C. P. Edwards, O. B. E., F. I. R. E., A. M. E. I. C., as official representative, and in such capacity he will be present during the meetings and discussions in Washington.

In answer to any question which may arise in the mind of a reader as to Canada's interest in the conference and to clear any doubt as to any interest on the part of those attending the conference in Canadian radio matters, a word of explanation will not be amiss. Without desiring to suggest a lesson in geography, it must be remembered that the northern part of this continent is shared by two peoples, and that the most populous sections of each country are those which touch upon and approach the international boundary, the latter a straggling line of marks stretching across North America from the Atlantic to the Pacific.

Radio broadcasting recognizes no boundaries, acknowledges no border inspectors, nor pays impost to any protective tariff;



Towers and antenna at CNRA, the Canadian National Railways' broadcasting station at Moncton, N. B., Canada, the most easterly of all broadcasting stations in North America. CNRA is powerful enough to transmit across the Atlantic to the British Isles and Europe

in brief, there exists an absolute reciprocity between the United States and Canada, in so far as wireless is concerned, to the extent of the technical skill of oper-

ators in charge of stations and the facilities of engineers who have designed and constructed stations the impulses from which flow freely under two flags.

That is a very fine state of affairs, but unless there remains in force, a proper and effective working agreement between the two countries regarding wireless, a great deal of trouble, inconvenience and annoyance can arise. Therefore, it is essential to maintain friendly co-operation between the recognized authorities on each side of the great boundary which stretches across the girth of this continent.

It is, then, the purpose of this article to deal with conditions in Canada, the method of radio control exercised there and the relationship between the department responsible for such control and the public in general, and that section of the public in particular as represented by the owners of receiving sets.

Canada was a pioneer in wireless control and its official representatives were the real leaders in the movement to clear the broadcast band of waves from interference from ships and coast stations, a principle to which all maritime nations, with the exception of France, have agreed to, and which, indeed, will soon become unanimous. Canada was the first country to recognize the rights and privilege of owners of receiving sets and manifested this recognition by using the money accruing from the collection of the modest license fee to finance adequate inspection of broadcasting, and to establish an efficient check on causes of interference due to power line leaks or any of the thousand and one mysterious influences which make their presence apparent in a receiving set.

Broadcasting in Canada comes under the administration of the radiotelegraph service of the Department of Marine and Fisheries, more popularly known as the Radio Branch, the branch being in charge of Lieutenant Commander C. P. Edwards, as mentioned in the foregoing, with the

(Continued on page four)



# Collecting a Bogus Note Via Radio

By Using His Radio "Invention," J. Y Hampton Collects What Was Thought To Be a Worthless Obligation Thirty Years After It Was Issued

By C. K. THEOBALD

"VICKSBURG, Miss.—18.—THIRTY years after date I promise to pay to John Y. Hampton Three Thousand Dollars with interest at ten per cent."

That was the way the note read. There was no date and the legal phrase, "for value received," was omitted. It was signed Alek Smartley.

George Hampton returned the note across the polished mahogany table to his father. "That represents a pile of money," he averred—"three thousand dollars, with interest at ten per cent—if it can be collected."

They were comfortably seated, father and son, in the spacious library of John Hampton's southern home. George Hampton, thirty, unmarried and too fond of adventure to think seriously of women, had just arrived from Chicago to spend his annual summer vacation with his father. Hampton senior, sixty years young—nobody ever called J. Y. Hampton old—drew the chair containing his long and aristocratic figure nearer the table and struck a match to a fresh cigar.

"More than \$50,000," he asserted. "And the only 'if' barring its collection will be if Alek Smartley isn't worth it. Not having that much, we—for I want you to help me—will take all he has."

"I can see Alek Smartley's finish, all right, J. Y., when you go after his hide," George Hampton, like the rest of Vicksburg's 30,000 population, always called his father J. Y.

"He can dig up fifty thousand, I think, but he won't be worth as much as a dead B battery afterward; which, incidentally, would rid the radio industry of a first-class crook. His business methods are not well liked in Chicago. But tell me how did you ever come to get such a note from Alek Smartley?"

How, indeed! For thirty years John Hampton had held an interest in Alek Smartley; never-to-be-forgotten bitter memories of a clinging past, hateful recollections of a misplaced confidence in his early twenties, which he could not forget. Now that the old memories had again been revived, the suppressed incident of his youth craved expression.

## The Story of the Note

"I'll tell you the story briefly, George," he said at length. "Thirty years ago, when you were a baby, I was employed by Alek Smartley, who owned the old Levee Street light-plant. Smartley was apparently everybody's friend—and a loyal patron of Vicksburg's many saloons. But he was not alone in the last respect. Nearly every little grocery had its bar then, as you, when a boy, may well recall. It seemed quite proper to find a jug of whiskey in the home of every one who could afford it."

"Well, it was Smartley that induced me to take my first drink of whiskey, and taught me how to drink it straight. A hail-fellow-well-met was Alek Smartley, the big man of the little town. But he was practically bankrupt, which I was later to learn to my sorrow."

"It was then that my father died, leaving your mother and me a few hundred dollars and the old homestead. Smartley needed this little money and the property, knowing that he could readily convert the latter into cash, so he made me what appeared to be an alluring offer. Through the friendship which he claimed he held for my father he would give me a third interest in his so-called lucrative business for the small sum of \$3,000. He would also make me manager of the plant. Trusting him completely, I accepted his offer blindly and, I might add, drunkenly, over the few strong drinks which he had cunningly prepared in advance for the occasion."

## Had Been Robbed

"The sequel is the same as all such stories," the father went on. "A few weeks later I saw that I had been robbed. I demanded restitution, and Smartley as good as laughed in my face. We were in his office at the time and I had taken a few more drinks than was good for me. But I had come for my rights, and, shov-

ing a revolver in his face, I demanded my money back then and there. I meant business and Smartley knew it, so he changed his tactics. It was impossible, he told me, to raise \$3,000 on the instant, nor could he procure it to-morrow. But he showed me where he had personal assets—false, of course—of many times the amount. He would give me his thirty-day note, with interest at 10 per cent. And Alek Smartley judged correctly that I was too drunk and excited when he gave me the note to read it aright."

"I did not discover the fraud until the following day," John Hampton concluded, "when I learned that Smartley had absconded and that he had no personal assets. I never heard of him again until you mentioned in your letter six months ago that he is in the radio business in Chicago."

"That was a raw deal, J. Y.," the son consoled. "But tell me, how do you propose to make him pay the note, and how can I help you?"

"I am going to take \$50,000 away from Alek Smartley," John Hampton declared, "the principal and interest on that bogus note, the same way in which he robbed me of \$3,000 thirty years ago. I am going to steal it!"

George Hampton looked at his father in utter astonishment. "Steal \$50,000 from Alek Smartley, you and I, J. Y.?" he exclaimed aghast.

## Will Keep Within the Law

"Oh, we'll keep well within the law," the father smiling assured, rising to return the note to the safe.

George Hampton knew his father to be a resourceful and determined man. He had known him to accomplish many worthwhile things by his shrewdness and discernment, things which many other men would not have dared to start. And he had never known him to begin anything that he had not successfully finished. But this little matter of subtracting \$50,000 from Alek Smartley's bank account, well—

John Hampton must have discerned the doubt in his son's countenance, for he said: "I have my reasons for counting on success, George. To begin with, from what you have told me of Alek Smartley's exploits in Chicago he is as fond of his drink as ever—and the continued use of booze doesn't tend to sharpen one's wits. Then, besides being egotistical, he is a thief at heart. Smartley is a man who glories in putting over a crooked deal and keeping out of jail, since you tell me that he has stolen at least two radio patents and is flourishing now on the fruits of his victims' labors."

"Well," the elder Hampton continued, "when you first wrote me that Smartley was in Chicago; I set about building, for that crooked gentleman's special benefit, a most wonderful radio instrument. It is complete now, all-packed and ready for shipment to Chicago, else I would let you see it."

"Why did you pack it so soon?" George Hampton grumbled his disappointment. "If I may not see it, tell me about it, at least."

"That can keep until some other time. Just now I want to tell you how I propose reducing Alek Smartley's pocketbook \$50,000 and how I want you to help me."

## Unfolds His Scheme

John Hampton now unfolded a scheme which had his son's full sanction, as was evidenced by the look of approval he bestowed upon his father.

"Of course, George," the father said in conclusion, "it is important that Alek Smartley does not recognize me; and I do not think he will, with the flesh I have lost in the past thirty years and the beard I have taken the trouble to grow in the last six months. And I think you have told me that he does not know you. Good. It is equally important, too, that we assume other names in our coup with Smartley, which aliases we will decide upon in the Windy City."

So it came to pass, a few months later, that one J. Yeger Jamison rented, for an indefinite period, a cheap suite of office rooms on the top floor of one of Chicago's

skyscrapers. A sign, in keeping with the price of the rooms, on the reception-room door, apprised the public that Mr. Jamison was a patent lawyer. Just as it had suited the tall and slender new tenant to grow a full beard prior to his advent in the city, he had deemed it expedient now to affect a cough, which seemed to have its origin in the very depths of his lungs. Also, before he opened his doors for business which he never expected to get, it befitted his purpose, in view of forthcoming events, to make the place appear as though its owner had endured many struggling years in his calling. Not until he had satisfied himself that all of this was perfect, did Mr. J. Yeger Jamison hire a freckled faced office boy whose hardest job would be to draw his pay.

Also in the city of Chicago, and at about this same time, Alek Smartley, selfish, egotistical, domineering, and never as smart as he thought himself to be—but prosperous without—sat complacently fat and comfortable in the warmth of his private office. As was his early morning habit, he indulged in his pre-war drink of red liquor. Then he took up his mail.

## Alek Smartley "Bites"

Assorting the letters bearing first-class postage, he came across a legal-size envelope addressed, "Mr. S. S. Smith, care of Smartley Radio Company." This was

one of many other letters which, during the past few months, had been passing through his hands for this S. S. Smith. Smartley recalled having given this Smith fellow a job in the factory awhile back. He had come well recommended and foreman's reports showed that he was well worth his hire. This fellow must be working on some radio invention, Smartley surmised, since the envelope bore the return address of one J. Yeger Jamison, Patent Attorney. It might be to his best interest to make sure of this, and Smartley did not argue with his conscience in the least when he slit the envelope with his paper-knife. But first he marked it "opened by mistake," indicating previous experience in this direction.

"My Dear Friend Sam": Smartley began reading, "Relative to your 'Non Static Radio Receiver,' if the invention functions as you claim—and I certainly have no reason to believe otherwise, since you say you have it in successful operation—you have at once advanced the science of radio telephony many years and made yourself famous."

"You say that you need money too badly for other purposes to go ahead with the patent. I, too, am so penniless, due to heavy expenses attending my shattered health, that I cannot even supply the Patent Office advance fees. But this invention is of such importance that you should experience no trouble in securing funds for its development. I should like to see and hear your device in operation, also to have talk with you regarding these money matters. With this end in view, I will thank you to inform me when I may have an appointment with you. Yours sincerely, "J. YEGGER JAMISON."

## He Calls S. S. Smith

Alek Smartley thought long and pensively over this perusal. He was not well acquainted with the technical end of radio, but he did know that a successful invention of this nature would be worth millions. This S. S. Smith, he thought, was just one more deluded inventor or he had stumbled onto something that radio engineers had long been trying to solve. Smartley was inclined to believe the latter, as was Smith's attorney friend, according to the letter he had just read. Who was this patent lawyer anyhow, this J. Yeger Jamison. Smartley did not know him, but no doubt there were many patent lawyers in Chicago of whom he had not heard.

Smith needed money and needed it badly, Smartley mused, as he mechanically slid the letter into its envelope. And Smartley needed this invention, if it were genuine. Possibly a few thousand dollars would buy the patent. Probably he could steal it as he had previous ones. Anyway,

he had best feel the inventor out. So he promptly summoned S. S. Smith to his imposing presence.

"Sorry to have disturbed you in your work," Smartley suavely apologized, when Smith, cap in hand and hair unkempt, entered the office, "but I am due to beg your pardon. I opened this through mistake," and he handed over the letter.

"That's—er—all right, Mr. Smartley," Smith managed to say, apparently embarrassed in the presence of so much grandeur. "It's nice—it's good of you to look after my mail, and I am sorry it has annoyed you." With which he was for immediately departing, when Smartley checked him in the doorway.

## It Was a Mistake

"I must tell you, Smith, that I read the greater part of your letter before I discovered my grave error. You see, I have considerable dealings with patent lawyers, and I really thought this letter was mine."

As Smith turned in his steps Smartley's thoughts, for some cause or other, sped back thirty years into the past. He recalled now how easily he had robbed a young greenhorn then of \$3,000—Hampton, yes, that was the name; he had almost forgotten it. Smartley's smooth tongue had done the trick then. Well, he still had that requisite.

"If you have discovered a means whereby we can eliminate static," Smartley continued patronizingly as Smith reached the desk and accepted a proffered seat, "I will say that you have accomplished considerable—that your device will be of much value to us." He might have said "invaluable" to the radio industry, did he not have a selfish purpose in mind.

"My invention will do more than cut out static," Smith asserted proudly. "It also positively excludes local interference from lighting transformers, X-ray machines, spark coils and the like, which is such an annoyance to the city listeners-in. And the beauty of it is its simplicity."

"I should very much like to see this invention," Smartley's interest was genuine in this respect. "I wouldn't steal it," he laughed jokingly. "Even though you haven't applied for patents," he added tentatively. "You no doubt have your original sketches and descriptive matter as proof of your first conceived ideas."

## He Saves the Drawings

Smith stuck his thumbs in his overall straps. "I'll say I have," he assured with an air of shrewdness. "I have every scrap of writing and drawing since I first conceived my idea, six months ago. I have filed these for safe keeping with Mr. Jamison, who was a good friend of my father's, so I feel perfectly safe in that respect. But even so, I'd trust you completely, Mr. Smartley, and I'd like to give you a demonstration of my device."

Here was disappointment for Alek Smartley—the safeguarding of those papers—though he did not let his countenance show it.

"Your caution is to be commended in protecting your evidence," he congratulated, and then went on to say that he would be pleased to see this radio marvel in operation.

"That's very kind of you, Mr. Smartley," Smith responded. "I wonder if you could go this evening after supper?"

The radio dealer glanced out of the window to note the unfavorable weather conditions, but Smith forestalled his objection with:

"The worse the weather, the better demonstration I can give. Mr. Jamison wants to see the invention, too, and perhaps we can all arrange to go to my house together. Mind if I call him on the phone?"

Such an arrangement would be very satisfactory to Alek Smartley. It might be to his advantage to meet this patent lawyer, who, like his client, was badly in need of money. And Mr. Jamison, when Smith got him on the phone, would be glad to go along if some conveyance could be sent for him.

(Continued on page four)



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Ask your dealer for Aristocrat E-Z-Ton, the key to simplified tuning. Aristocrat dials, knobs, potentiometers, rheostats, sockets. If the can't supply, write:

The Kurz-Kasch Company Largest Exclusive Moulders of Bakelite Dayton, Ohio



Carter Radio Co. 1270 Broadway, N. Y. City

Yes, we have Philco Socket Powers and Dynamic Batteries R. H. MANN, INC. 125 Chambers St., Tel. Walder 2100

## Radio Presents Complex Problem

Continued from page eleven

time is that perfection cannot be experienced in reception at such distances, and so the effective service area of a station is now limited to a small area around it. No stone is being left unturned and no technical expedient is neglected in the efforts being made to conquer fading and extend this service area. If all else fails, great distances can be reached by the use of lower frequencies (longer waves), but this requires very high power. It is also questionable whether the radio public of America would agree to putting broadcasting in among the ship and overland message traffic that now uses the lower frequencies. It is of interest that just this has been done in Europe. In England, for instance, a 50-kilowatt station in the center of the country, on a frequency of 190 kilocycles (1,600 meters), delivers programs to owners of crystal sets over most of England.

While radio is already rendering noteworthy service, it will, of course, be made to do far more than at present. It is expected that programs from across the seas will be re-broadcast from American stations. The development of this undertaking from the crude beginnings it has already had to satisfactory perfection is a considerable undertaking, but it is going on. Another advance which is more remote, but which I believe will come, is supplementing radio by some form of appeal to the eye.

Prophecies that we should have radio motion pictures have already been fulfilled. They have been achieved in very elementary form, but it will probably be a long time until they reach anything like a real service basis; and some less direct solution of this problem may be developed.

At present, the radio listener reads the newspaper or uses his eyes on something else wholly unrelated to the sounds that come over the air, and thus loses much of the effect through dividing his attention—or else he concentrates on the radio by shutting his eyes. Now when I do that I am pretty likely to go to sleep. There seems to be a need of the development of some sort of appeal to the eye concurrent with music received by radio, just as the motion picture has very successfully compensated for its silence through the concurrent playing of appropriate music.

## Radio Is Conspicuous Element

The present time is one of marvelous fruition (and it may be of climax) of scientific development along mechanical lines. It will be realized much more ten years hence than it is now how fully we are being released from material restraints. Radio is a conspicuous element of this mechanical paradise; it has rendered communication instantaneous and unlimited.

But there is still greater satisfaction in the thought that radio is also helping to usher in the mental or spiritual era. I am not qualified to estimate the potential social effects of radio. That has been done and will be done by poets and statesmen. Certainly radio is a great force of enlightenment. By it, vast numbers of people receive a flood of light on current affairs and on people. It is such light as removes misunderstandings, cleans out prejudices, and reveals that human differences are the minor instead of the larger facts of life.

While radio's functions may include some extension of the scope of formal education, it is likely to be most valuable as a supplement to the education of the schools. Just such general enlightenment may be the salvation of this transition era of mechanical conquest; it will tend to prevent exclusive devotion to the material things.

In presenting these thoughts I have strayed from the beaten path of technical work with which I am ordinarily concerned. I have done so because I believe the present time opportune to remind the radio audience of the partial approach to perfection radio has already made, and to indicate the problems and difficulties of carrying it forward.

"The Treaty of Versailles" to End Waterman Series In keeping with Armistice Day the final "Waterman's Points of Progress" on Wednesday at 9 p. m., broadcast by WEAF, WOO, WCAP, WGR, WCAE, WJAR, WEEL, WWJ and WCCO, will treat "The Treaty of Versailles" which ended the World War. A program of songs popular during the late war will be given before the talk.

## News and Notes of the Radio Trade

### Opens New Haven Factory

Due to their rapidly increasing business, the Bruno Radio Corporation, of 223 Fulton Street, New York City, has opened a large factory at 38 Canal Street, New Haven, Conn. The new factory will have shift working day and night, as well as Saturday and Sunday, to accommodate their jobbers. Besides the line of Quartzite coils, the Bruno Radio Corporation manufactures the Bruno Powerline Set and boxed kit, the Bruno Magic Dial and ultra-vario condensers, and will shortly bring out a new type of condenser.

### To Test Sets

A new and interesting invention called the Liberty Comparometer, is a product of the Liberty Transformer Company of Chicago. It is a unique and ingenious device that permits putting four radio receiving sets or loudspeakers to the test of comparison at one time. The four different sets—or two or three sets, or speakers, if desired—may be attached to the comparometer, and by merely throwing the switch, any one of the sets or loudspeakers attached may be instantly placed in circuit. It is possible to switch from one set or speaker to another without interruption and thus definitely distinguish the minutest difference in tone quality, volume and clarity.

It also shows at a glance the current consumption, thus indicating whether or not a set can be operated economically or whether it consumes an excessive amount of battery current.

### Radio Service Stations

The free radio service stations, established by the Acme Apparatus Company in the leading cities of the country, are becoming most popular. They are useful not only in aiding set owners to deal with a variety of minor difficulties, which happen in even the best regulated sets, but have also accomplished wonders in building good will among amateurs and especially the great majority of people who build their own sets.

Many of the complaints received at these stations can be remedied almost immediately by a skilled workman, and usually are due to lack of knowledge of set construction or failure to follow simple directions. The number of reasonable kickers in a service station, of course, greatly outnumber the unreasonable ones, and most of them go away with their sets in good working order and with a sense of real gratitude.

### New Coil Forms

Radio fans desirous of constructing their own low-loss single-layer solenoid coils for use in radio frequency transformers, etc., will be interested in knowing that the American Hard Rubber Company, Mercer Street, New York City, have placed on the market rubber tubing for coil forms made from radion. This hard rubber form differs from the standard, in that there are several ribs molded on an ordinary smooth piece of tubing. A coil wound on these forms will be found to have many of the advantages of an air core and yet retain the strength of standard wound inductances.

### Exhibit at Radio Show

The Freed-Bismann Radio Corporation has announced some interesting new sets which will form part

\$27.50 NATIONALLY KNOWN 5-TUBE SET



Must be heard and seen to be appreciated. Take R. M. T. Sea Beach Express to 59th St. Station. Many Other Bargains Open until 11 P. M. RIX RADIO SUPPLY HOUSE, INC. 5505 Fourth Ave. Brooklyn, N. Y.

of their exhibit at the forthcoming Fourth National Radio Exposition, in Chicago. Besides their well known neodyne, they will show the new Labour circuit receivers, one of which is operated on dry cells. They will also introduce the use of six tubes in the neodyne receivers NR-45 and NR-7. The NR-45 is inclosed in a cabinet.

### New Model

The new model Operadio, known as the Consoleite, has a very new mechanism embodying straight line frequency tuning, one dial control, the new UX-120 power tube and many other features. It is in a beautiful hardwood case and requires no outside connections. The loop can be used outside of the set or inside, out of sight.

The Operadio Sales Corporation, who have offices in the Longacre Building, report that many of the dealers who have had the Consoleite on order have obtained them, and in many cases the original samples have already been delivered.

### Slow Adjustment for DX

Slow adjustment of tuning dials is the only kind which brings in long distant stations.

## Radio Exchange

Rate, 40 cents a line. Ads. accepted until 12 o'clock noon Friday.

PHONE PENNSYLVANIA 4000

### Parts and Equipment

#### SEND IT BACK

After 30 days' trial if you do not consider it the biggest buy of the season in a rechargeable storage "B" battery, in the results it will give over so-called cheaper or costlier "B" current delivery. The Edison element "B" battery has been returned without question, if, and only if, this same offer has been in effect during your trial period. (The complete set of this ad. can be verified this ad. and advise as to its being lived up to.) The "HAWLEY" complete 30-volt assembled, rechargeable storage "B" battery \$10.00. Patent pending. Heavy pressure or pull together. Includes complete electrolyte. 22.5-volt, 112.5; 45-volt, 125; 67.5-volt, 147.5; 157.5 volts, \$16.80; 180 volts, \$19.20. Contains the now famous closed top shock-proof cells, the bright, shiny lead processed alkaline elements (not the dirty brown type generally seen), and the experience of building such a battery. For sample, send \$2.00. Gained only through the field of first-hand experience. Tested and approved in various radio laboratories, such as Popular Radio Laboratories, etc. Knock-down kind, minus slant-banded, new at still greater savings. Incidentally these kits include material for supporting cells as well as other material not found in so-called similar kits. An extra following of the "Hawley" instructions, written by the originator, showing the assembly, charging, etc., with every kit. Reply every kit ready to run. "Hawley" B battery charger (charging cable and plug) \$2.75. Sample kit 30c postpaid. Order direct—send no money—simply pay express—cash on delivery. Same day shipments. Or write for my complete literature. It's free—and will tell you what to expect and contains some mighty interesting matter. R. HAWLEY SMITH, 311 Washington Ave., Danbury, Conn.

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FOR \$5 you can build a GOOD "B" Element for a C. Complete instructions, 117. Ferrand, 90 E. 28th St., Paterson, N. J.

BUILD rechargeable B Battery, 100-volt unit, \$2.75; assembled, \$11.75. Royal Storage Battery Co., 124 W. 34th.

### Service

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ERLA SERVICE STATION. Authorized by Electrical Research Lab. A limited number of factory built sets at special prices. REPAIRING, REMODELING, REWIRING all circuits, parts. APEX RADIO SERVICE, 128 Liberty St. Rector 3178.

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BUILD YOUR OWN "B" Battery. Nickel and iron elements, all supplies. Roberts, 1122 Myrtle av., Brooklyn.

ELECTRODYNE CO., 2378 3d Ave., apartment 1122, Myrtle av., Brooklyn. Harlan 2048.

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# New York Herald Tribune

# Notes on Stabilizing Tuned Radio-Frequency Amplifiers for Wireless Reception

Oscillation in This Type of Magnifier Causes Interference, but May Be Easily Controlled

By WILLIAM H. FORTINGTON

PERHAPS one of the most annoying interruptions one encounters when listening to a broadcast program in a congested city area is the squeal of some one else's receiver. Scarcely a night passes but what some listener residing "a la apartment" is roused out of the reverie imposed by one of the many excellent radio instrumental trios through the howls and squeals of a regenerative (?) receiver. But why always blame the regenerative set of the single circuit variety, when at least 30 per cent of the howling is caused by supposedly non-regenerative sets?

The truth of the matter is that too many of these "inherently neutralized" tuned radio frequency receivers suffer badly from oscillation in the radio frequency part of the set, due to faulty design in so many respects that it would require pages to enumerate them.

## Radio Industry Has "Botchers"

The radio industry, like the automobile industry in its infancy, suffered at the hands of the "botcher," and with so many of these botched sets in use to-day, it would be difficult to say who are and who are not the offenders. There are, no doubt, many users of tuned radio frequency sets who are somewhat disgusted. Their disgust may be allayed somewhat, however, by following the points outlined in this article, which deals solely with stabilizing tuned radio frequency receivers.

Stabilizing, as applied to the radio art some years ago, meant essentially pre-

facturer has introduced losses to such a degree as will enable him to build a set that will not squeal. Some of these lossier methods are quite good, while others are atrocious.

The writer has encountered sets utiliz-

method used at (c) is quite good where an infinitely variable resistance is used shunting the inductance. The inductance is, of course, tightly coupled to the grid circuit inductance, and the variable resistance serves to increase or decrease the

design of the R. F. transformer itself. Let us see what form a good R. F. transformer must take.

Fig. 4 represents a radio frequency transformer such as is commonly used. All coils necessarily contain inductance capacity and resistance. Now it is fairly common knowledge that as the number of turns in the primary winding of a radio frequency transformer is increased, the period, or to be more correct, the wave length of the coil, also increases. We find then that if the inductance value of the primary is increased to that of the secondary, the frequency of the two coils will be the same. All experimenters who have played with the old time regenerative sets employing a variometer in the plate circuit know that when the plate and grid circuits are near resonance the tube will oscillate.

The above condition also applies to tubes in radio frequency cascade coupling, but to a much more pronounced degree; and it is quite obvious, therefore, that the primary winding must not be in resonance with the secondary, neither must it be in resonance with any close harmonic frequencies of the secondary. Consequently, the number of turns of wire permissible in the primary is strictly limited.

## Transformer Windings

In sets of the neutrodyne type we find that although the number of turns employed in the secondary is perhaps sixty-five, the number of turns in the primary seldom exceeds eight; in fact, some manufacturers use only six. Again, the num-

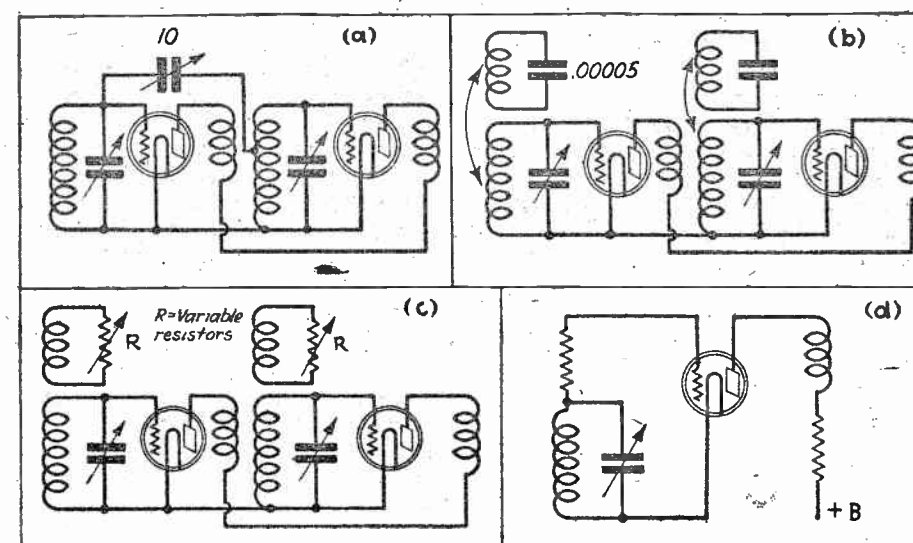


Fig. 2—Four circuits used in present day receivers. (a) The Neutrodyne circuit. (b) An absorption circuit. (c) An absorption circuit for high-wave reception. (d) A method for controlling parasitic oscillations.

ing two or more stages of tuned radio frequency amplification, in which the losses due to stabilizing methods employed were so great that no appreciable benefit from the radio frequency amplifier could be observed. It is quite obvious, therefore, that two stages of well neutralized T. R. F. are better than four stages

loss set up by eddy currents in the absorption coil. With such a device weak signals may be brought up to reasonable volume; that is, until the amplifier is about to break into oscillation.

At Fig. 1d will be seen a much used method of controlling parasitic oscillation. Resistance inserted either in the plate or

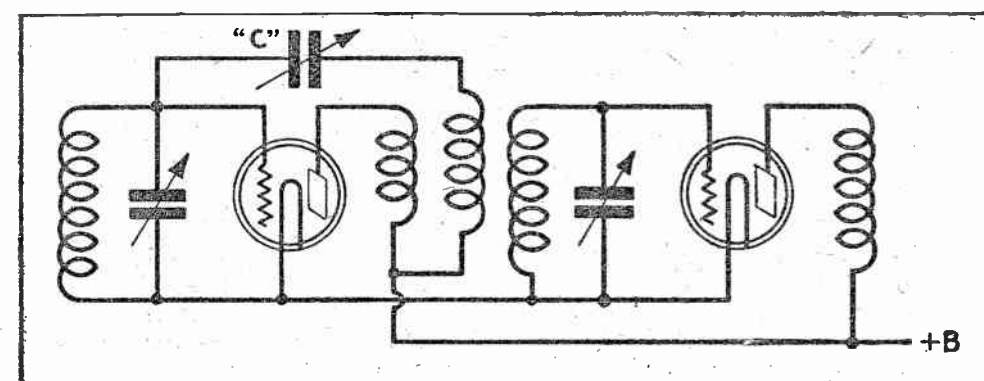


Fig. 3—A wiring diagram showing the reverse feed-back method of preventing oscillations in tuned radio frequency receivers

venting oscillation without losses. To-day "stabilizing" is more of a slogan, meaning "Stop-em-from-squealing-and-annoying-your-neighbors." Many radio fans are under the impression that no matter how much a T. R. F. set squeals, the squeals are not annoying their neighbors. This, however, is not the case in the majority of instances, for although some howling might be confined to the set, the best part of it may be heard outside.

As previously mentioned, the methods

of badly neutralized amplification. At Fig. 1 will be seen perhaps what is the oldest method in existence of controlling oscillation in R. F. amplifiers. This method was used extensively in British aircraft receivers as early as 1916, and even to-day there are still some engineers who advocate its use.

Perhaps an examination of this method would not be out of place. At Fig. 1, which depicts a three-stage R. F. amplifier, it will be seen that a potentiometer is connected across the "A" battery or filament supply, the moving arm, or free contact, being connected to the grid circuit of the amplifier tube. This sliding arm allows a varying positive potential to be applied to the grids of the tubes, which produces damping in the grid circuit through the establishment of grid current a thing which is to be avoided. This method, of course, is now superseded by many improved and more recent ideas, of which perhaps the following will be found to be in fairly common use.

Fig. 2 depicts schematically four methods such as are commonly used in present day receivers, the first (a) is the well known neutrodyne method of Professor Hazeltine which was the forerunner of the many methods discovered thereafter. The Hazeltine method deals solely with neutralizing the inherent tube capacity, and it is by no means a preventive of oscillation where badly designed T. R. F. transformers are concerned.

Two manufacturers use methods depicted at (b) and (c), in which an inductance is shunted either by a resistance or a capacity, forming an absorption circuit which is just sufficient to control oscillation at the lowest wave length. At the higher wave lengths it is, of course, found that the set is usually quite stable. The

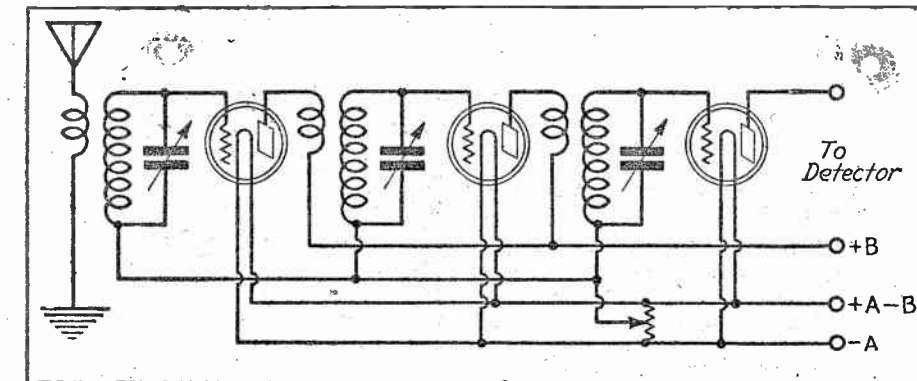


Fig. 1—The wiring diagram of a three-stage, tuned radio-frequency amplifier with a potentiometer grid control

grid circuits (or both) of the tube tend to limit the functioning of the tube as an amplifier. In other words, the circuits are loaded.

Perhaps one of the commonest methods used in cheap T. R. F. sets is the earthed eddy current system, which takes the form of placing the variable condenser end plate, which is usually grounded, within the field of the coil, so that the eddy current flow in the end plate of the condenser is sufficient to set up losses which will restrain the circuit from oscillating. The coupling relation between the grounded end plate and the inductance is usually variable, so that adjustment may be made at the lower wave lengths, at which is encountered most of the trouble. This method has assumed a commercial name known as the Foucault system.

## Reverse Feedback Method

Yet another method, somewhat different from the others, is shown at Fig. 3. This has been referred to as the reverse feedback. Users of this system speak highly of it, especially where short wave work is encountered. It will be seen that the primary winding of the radio frequency transformer is duplicated, the second winding being reversely coupled to the first. The small variable condenser (c) makes possible very fine adjustments, and when the minimum capacity is in circuit the feedback is practically at zero. As the capacity is increased, the control over oscillation becomes more pronounced, accompanied, of course, by a decrease in signal volume.

After analyzing the foregoing methods of stabilization, the reader might ask what causes oscillation in the average two-stage T. R. F. set. As previously stated, the number of causes of oscillation is legion, the chief of which is due to bad

ber of turns allowable in the primary is limited somewhat due to the inherent capacity coupling existing between the two circuits, as shown by the dotted condenser (c) at Fig. 4. Many methods of winding the primary to reduce capacity coupling have been tried out, it being found that the method shown at Fig. 5 is quite successful, inasmuch as the existing capacity effect between the coils is very low, while the coefficient of coupling is reasonably high. The writer has used T. R. F. trans-

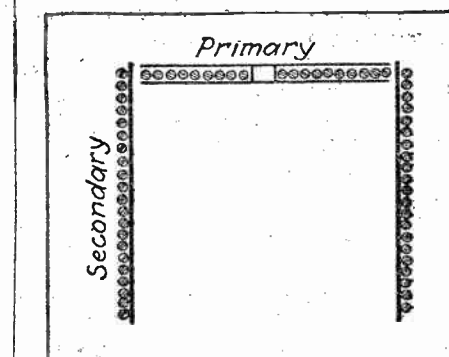


Fig. 5—A diagram showing a method of reducing capacity between coils

formers of this type with as many as sixteen turns in the primary without the slightest trouble from oscillation.

There are, no doubt, many radio fans who are to-day using B battery eliminators and who have found that their receivers oscillate badly, a thing not apparent when ordinary batteries were used. This, it will be found, is due to the effective resistance of the batteries being removed from the plate circuit when a B eliminator is used. This trouble may be overcome by inserting a non-inductive resistance of say 50 ohms in series with the positive B wire,

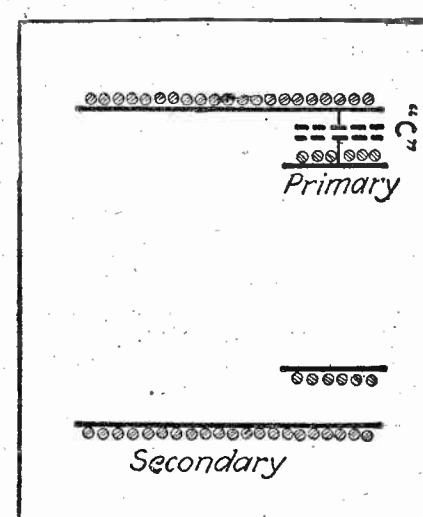


Fig. 4—A diagram showing the effect of capacity between coils

of stabilizing radio frequency amplifiers are many, and it remains for the fan to select the methods which he considers the most applicable to his particular case.

Eighty per cent of the inherently utilized receivers on the market to-day are stabilized by what are known as lossier methods. In other words, to secure quiet and flexible operation of his set, the manu-



# Administration of Radio in Canada

title of director. The activities of the Radio Branch comprise in the main:

(1) Administration of the radiotelegraph act and regulations issued thereunder.

(2) Construction and operation of radio stations.

The administration of radio throughout the Dominion, as presented in the radiotelegraph act, chapter 43, statutes 1913, has, with the establishment of the Department of National Defence, been transferred from the late Department of Naval Services to the Department of Marine and Fisheries.

This administration comprises:

(a) The licensing of all classes of radio stations in Canada, including those on ships of Canadian registry, and on aircraft.

(b) The inspection of such stations to ascertain that they are equipped and operated in accordance with the radiotelegraph act and regulations and with the provisions of their respective licenses.

(c) The examination, for certificate of proficiency in radio, of the operating staffs at such stations.

(d) The inspection of all ships, Canadian and foreign, leaving Canadian ports fitted with radio, to insure their compliance with the radiotelegraph act so far as it affects them, more particularly that section which prescribes that certain passenger ships must be equipped with an efficient transmitting and receiving equipment.

The department has twenty-nine stations on the Great Lakes and the Atlantic coast and eight stations on the Pacific coast, some being operated directly as aids to navigation, others as direction finding stations, while service is also provided for nine private commercial stations installed by owners of lumber camps, canneries, paper mills, etc., on the British Columbia coast.

Canada subscribes to the International Radio Convention which controls the international working of radio.

Other matters which concern the department include the question of an imperial chain of government-owned high power radio stations to interconnect the different dominions of the Empire and at the same time with the United Kingdom. This is rather apart, yet not entirely so, from the purpose of article, and in this connection it may be pointed out that in 1902 the government of the day, realizing the potential value of trans-Atlantic radio service, subsidized the affiliated Marconi Companies to erect the first trans-Atlantic station in the world at Glace Bay, Nova Scotia. This station was duly established, and, while improved practically out of recognition in the matter of apparatus and efficiency, is in operation to-day and giving service to the Canadian people. Licenses have been granted to the Canadian Marconi Company for the installation of super high-power stations at Montreal and Vancouver, the Vancouver station to work with Australia and the Orient, and Montreal with Europe. These stations cost approximately \$300,000 each.

Mention of the date 1902 recalls a coincidence. It was in 1902 that Sir Ernest Rutherford, then professor of physics at McGill University, carried out a most successful demonstration of his theory that communication could be established between a station and a fast moving train by means of electric waves. That experiment was carried out in the vicinity of Montreal and to-day the chief transcontinental and international trains of the Canadian National Railways which dash by the little station of St. Dominique, carry receiving sets as part of their equipment, offering news and entertainment on a scale worthy of the eminent scientist who conceived the thought.

The public, generally speaking, is more directly interested in the problem of radiotelephonic broadcasting, and it is concerning that particular phase of wireless that there is an immediate interest between Canada and the United States, and one which prevails to a greater extent than is generally appreciated. This question as to the wave-length band reserved for broadcasting stations in the Dominion has been very seriously discussed and has been the subject of compromise between authorities in the United States and Canada.

There is a considerable difference in the number of stations licensed and operated in the Dominion and those licensed and

(Continued from page one)

operated in the United States, and that difference would follow somewhat pro rata on the basis of population. There were at most recent report eighty licensed stations in Canada, of which twenty were marked as inactive, and of those included in the remaining twelve are "phantom" stations—that is, stations which are leased on certain occasions and then operated under a call letter different from that of the actual station.

## Location of Stations

The greater number of these active stations naturally will be found in the cities of Montreal, Toronto and their adjacent communities, and lesser numbers in the Western cities, culminating with powerful stations in Moncton, New Brunswick, the most easterly of all North American stations, and Vancouver, B. C.

A glance at a map will show in a graphic manner the proximity of these Canadian stations to well populated stretches of territory in the United States, and immediately indicates the evil effect that would follow unrestricted broadcasting. As it is the channels in use on each side of the line closely approach each other, and the slightest divergence will at once set up a bothersome condition. For the control and protection of broadcasting the radio branch of the Department of Marine and Fisheries maintains constant and adequate protection, using inspectors in every town. These inspectors listen in on the air, check up any interference present and take steps to remedy the same.

These inspectors do not confine their activities to Canadian stations, and any deviation, no matter how slight, from the assigned wave length is reported on instantly in Canada, with a direct call on

the offending station; if in the United States, with an immediate message to the district inspector and a follow-up to Washington. It may be said that this method of "policing" the air has proved satisfactory, and on a recent visit to the offices of the branch at Ottawa it was stated that very little trouble had been experienced on either side of the line, and it was further stated that managers of stations co-operated most sympathetically in rectifying any unusual condition.

## Ship Interference

One other international matter of serious consequence which has been referred to previously is the inter-departmental arrangements which have been made with the United States to clear the broadcast band of waves from interference from United States and Canadian ships and coast stations, with a view to helping broadcast conditions. To aid itself in this work the department has replaced all old type interfering spark apparatus at the stations in Quebec, Montreal, Toronto, Vancouver, Victoria and Prince Rupert with new type continuous wave equipment, and, generally, has taken all possible steps to eliminate all controllable interference with broadcasting by other stations, including those on the Great Lakes.

One other action taken has been a money grant to the Research Council for the purpose of conducting an investigation into noises caused by power lines, etc., with a view to seeing what can be done to reduce interference emanating from this source.

Mention has been made of the fact that owners of receiving sets in Canada are liable to an annual license fee of one dollar, the penalty being forfeiture of the set. It was reported recently that the number of licenses issued to the end of the fiscal

year had been 91,000, approximately, and that the succeeding months had shown increases in the numbers of licenses granted. It is not pretended that there are only 91,000 sets in Canada but it is hoped that eventually the great majority of owners will appreciate what is being done for them and come forward and show appreciation of the service rendered by paying the modest dollar fee with greater spontaneity and punctuality.

There really is a service rendered for the dollar fee and the value of that service can be increased when every owner of a set pays his share. The proceeds of the license fees are used for the payment of the inspectors who keep watch on the ether and for the maintenance of a specially trained "induction squad." This squad has at its disposal properly equipped cars to proceed to any locality to deal with trouble. The car bodies are made of insulating material, and the igniter and battery charging system have been adequately screened to prevent interference from this source. Such cars carry as part of the permanent equipment two specially designed superheterodyne receivers, two portable receivers, loops and other special apparatus developed to locate the different classes of interference.

The subject of advertising has been left to the very end. In Canada, as elsewhere, the question of advertising as a source of revenue for broadcasting stations has been the subject of much discussion; it divides itself into two general classes: "direct" and "indirect," such as, for instance, the renting of a station to extol the virtues of an automobile or any commodity; or the renting of a station by some organization with the mention that the entertainment offered was being given through the courtesy of a commercial organization.

It was decided to allow stations to undertake advertising and to check up the results. After the experience of one year it was found that the owners of stations were favorable to the indirect rather than to the direct method and the problem solved itself without any great difficulty. As it is, the Radio Branch allows direct advertising from any station up to 6 o'clock p. m., but after that hour no direct statement may go out without an immediate reprimand, but, indeed, that is never necessary.

Broadcasting stations operating in Canada may be divided into classes as to ownership, into stations operated by newspapers and intended to exploit these particular journals; stations operated by corporations directly interested in the manufacture and sale of wireless and electrical apparatus and appliances and those owned and operated by the Canadian National Railways.

From none of these stations is the listener disturbed by the direct appeal, it being considered sufficient for publicity purposes to mention the name of the corporation or the company furnishing the broadcast. In the case of the Canadian National Railways the purpose is threefold, to obtain publicity by indirect means, to serve a large and scattered population in the rural districts and to obtain adequate entertainment and bulletin service for the convenience and comfort of travelers using their principal trains all of which are equipped with receiving apparatus.

## Neighboring Problems

In view of the apparently increasing demand in the United States for additional broadcasting privileges, the position of Canada becomes more difficult in retaining channels which will be free from those required across the border, but, again, it is believed that this situation will rectify itself, not at once, perhaps, but in the early future.

It is becoming more evident each day that broadcasting to be of any service to owners of stations must be conducted along broad lines and by means of powerful statistics. It is obvious that the cost of an adequate station is such as to be prohibitive to individuals or companies who merely want to play with radio and the consequent conclusion is that in wireless, as in many other things in life, the survival of the fittest will lead to better broadcasting, improved programs and to a complete advance in appreciation of the wonders of this science.

In Canada, as in other countries, the problems resemble those of the neighbor and it is the hope of those in authority that the measures taken will prove effective. It is with these thoughts in mind that the Canadian representatives will attend the conference at Washington.

ceiver employing all modern improvements is very nearly perfect.

To sum up the whole situation it may be said that tone quality and selectivity are the two features most looked for by purchasers of radio receivers at the present time. It is also possible to say that there are sets available in which these two features exist to as great an extent as could be asked for. Ability to receive distant stations, a non-radiating circuit and volume controls to satisfactorily reproduce signals on a loud speaker are three other very essential features, but these may all most be classed as prerequisites, for they are possessed by practically every receiver.

The price of the complete set is no longer as important a feature as it was, for people have found that they receive just about what they pay for. However, although the price of the average complete set has greatly increased, greater value is given for the money received.

Two features which may or may not be considered important, depending entirely upon the person buying the set, are: ability to receive signals with a loop antenna and pleasing appearance. As both of these usually necessitate the investment of more money and as they are not necessarily essential to the reception of good signals they are not always desired. It is believed, however, that they will increase in popularity in time.

The two remaining features—namely, ease of control and ease of maintenance—are still being perfected, and for this reason many seem doubtful as to their merits. Without doubt, however, before long they will be incorporated in most of the more expensive receivers.

**AMATEUR KICKBACKS**  
By Everett M. Wallace, Sec'y

On Monday, November 9, Secretary Hoover will call the Fourth Annual Radio Conference at Washington for the purpose of discussing problems of general interest to the radio industry. It is probable the conference will discuss the amateur's problems and other questions of extreme importance.

This clan of experimenters will be well represented by men prominent in the radio field, and it is expected they will do all in their power to present matters of importance to the radio amateur.

At last year's conference the amateur was allotted a number of new wave bands. Therefore it is likely that again this year something will be said about this question. Under the present wave length assignments the "ham" has only one legal wave band, that being from 150 to 200 meters. This wave length band was allotted to him by the law of 1912 and is the only band which has been approved by Congress. The other bands which were assigned to the amateur at last year's conference are merely loaned as an experiment and may be taken away at the will of the governing department unless some new bill is passed by Congress.

Therefore, if the governing body were to take the 150 to 200 meter band away from the amateur he would not have any ground to stand on. Without the amateur the radio industry would be lacking an important asset. The Department of Commerce has recognized this and has, whenever possible, favored this clan of experimenters.

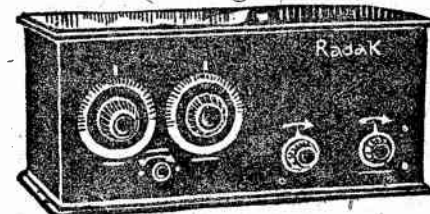
It was the amateur who demonstrated the efficiency of the high frequencies (low waves). Much of the success of present-day broadcasting may be attributed to him. Therefore the outcome of the Annual Radio Conference will be of extreme interest to every one interested in radio.

During recent months there has been much comment on the fact that the transmitting amateurs are not using the high wave band (200 meters). This is not true. In spite of the fact that many members of this fraternity are interested in short wave communication, there still remains a great deal of interest in the high waves. The short waves make local communication almost impossible, due to their peculiar radiating qualities. If amateurs cannot communicate with neighboring "hams" the "game" will tend to lose the fraternal spirit which now prevails.

2CRD has returned to the air after a long silence. This station has apparently either increased power or improved the apparatus, as it seems to have a greater "kick" than ever before. Last year this station did excellent work with one five-watt tube.

## Four Remarkable Bargains Federal

**Radak**  
The Famous Nationally Advertised Licensed Regenerative Armstrong Patent



Manufactured by Clapp Eastham Co., the oldest manufacturers of Radio Equipment in the world. Every one of these sets fully guaranteed by the manufacturers.

RESULTS—ANYTHING WITHIN 1,500 MILES  
Genuine Bakelite Panel—handsomely engraved.

High grade cabinet.  
Circuit—Armstrong regenerative double tuner.  
Tubes—3—either dry cell or storage battery.  
Battery cable ready to attach to batteries.  
No ports or wires on front of cabinet.  
Only two controls—very simple to operate.

SET ONLY

**\$11.98**

Sets are in original Sealed Factory cartons  
These prices are for cash only



NOTE

The Federal is a ten million dollar (\$10,000,000) corporation, and the Federal is one of the best sets on the market.

4 TUBES, STORAGE OR DRY CELL

The receiver comprises one stage of radio detector and two stages of audio frequency amplification with a control which allows the degree of amplification to be varied between wide limits. Genuine Mahogany Cabinet, 15 in. high, 22 in. wide, 11 in. deep. Panel and dials genuine Bakelite. Antenna—A primary condenser switch provides for adjustment of the receiver to suit any type of antenna from the indoor wire to the larger outdoor antenna system.

FREE! including in the purchase of this set we will give ABSOLUTELY FREE a \$7 Federal Head Set and an 80c Phone Plug

OUR SALE PRICE

**\$29.95**

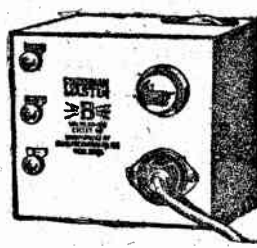
Sets in Original Factory Cartons. Prices for cash only.

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DEALERS GET IN TOUCH WITH US FOR SPECIAL PRICES ON THESE SETS AND ANY OTHER RADIO SETS OR PARTS

## AMSCO ALLOCATING CONDENSER

Unscramble the Stations!

HOW does your set tune? Do most of the stations jam the lower half of the dials and make tuning difficult? **ALLOCATE them**—spread them evenly around the dials by using Amsco Allocating Condensers. (S. L. F.)

Six space-saving sizes—Single and Siamese. Popular prices Ask your dealer.

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## Timmons B-Limiter

"Our tests show that the B-Limiter will supply 25 milliamperes for at least 600 hours without changing the tube and with no drop in voltage."

Radio Broadcast

Here was one test of 600 hours which the B-Limiter had to pass in the laboratory of Radio Broadcast. This 600-hour test was equal to 6 months' average use—and the tube showed no drop in voltage! The output of the B-Limiter, 25 milliamperes, is enough for any five and even some six and seven tube sets, especially Radiola Superheterodynes.

Your radio dealer sells and endorses the B-Limiters. He'll give you a folder quoting authorities who have tested B-Limiters, also fans who are using them daily.

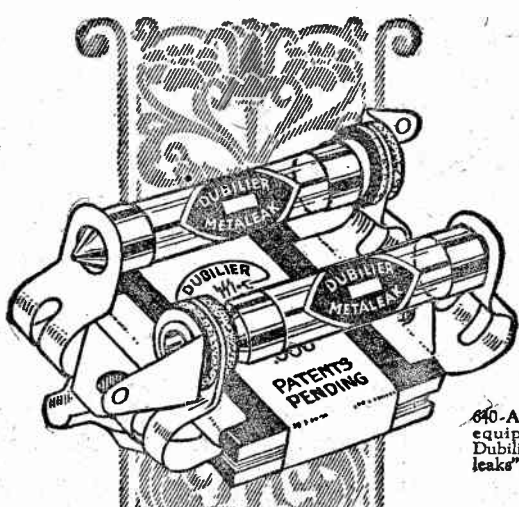
It completely eliminates B batteries and operates from any 110 volt a. c. 60 cycle lighting circuit.



Timmons Radio Products Corporation  
Germantown, Philadelphia

**TIMMONS**  
Radio Products





### The New Resistance Coupled Amplification Unit

Dubilier has now perfected a new resistance coupled amplification unit.

It consists of the well-known 640 Micadon arranged with special clips for holding the new Dubilier metalized filament resistance units.

Together they form a device which is compact, easy to install, low in price—and thoroughly efficient.

Send 10c for 32-page booklet A-1, "Applications of Dubilier Condensers in Radio Circuits."

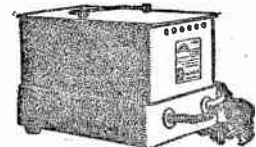
Address 4377 Bronx Blvd., New York

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CONDENSER AND RADIO CORPORATION

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BATTERY CHARGER



Model "A"  
For Radio "A" batteries, A. C.  
line, 110-120 volts, 40 to 60 cycles.  
Battery "A"—6 volts 6-8 ampere. Price \$18

Think of it! Just plug Ful-Wave Charger in on your A. C. electric socket. Watch for the increased clarity and volume from your receiver in the morning!

A Ful-Wave charger keeps your batteries live and enables your receiver to do its best. Ful-Wave is better than others because it is factory sealed—needs no adjusting—uses no bulb—no water—no acid. Type "A-B" charges "A" and "B" storage batteries simultaneously. Type "A" charges "A" storage batteries in almost half the time consumed by other chargers.

Ask your dealer for Ful-Wave, the most efficient charger made, backed by the manufacturer's full guarantee.

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RADIO BROADCAST PAGES

## How and Why Radio Receiving Sets Have Changed in Design

The Up-to-Date Wireless Receiver May Have as Many as Eleven Features, All of Which Should Be Considered by the Purchaser

By Dudley F. Walford Jr.

MANY persons are constantly accusing radio manufacturers of trying to stimulate the sale of wireless apparatus by making a practice of frequently redesigning their products. The fact that these accusations have been impressed on the minds of many prospective buyers of radio sets has done much to retard the growth of the industry. That it is chiefly the desire of the public, and not of the manufacturer, that the design of radio apparatus be changed from time to time may easily be seen by any one who seriously considers the situation. The public states the type of equipment it will purchase, and the manufacturer tries to produce equipment that will answer the requirements. In this connection it might be of interest to point out just how and why the design of radio sets has changed since the early days of broadcasting as this should aid one in selecting up-to-date apparatus.

When station WJZ first opened in Newark the newspaper publicity given the station excited curiosity and caused a great local demand for radio apparatus. As the average layman did not know very much about the benefit to be derived from radio at that time he did not wish to invest much money in a receiving set, and immediately the crystal set became popular among broadcast listeners.

### The One-Feature Set

The crystal set, as most radio fans of to-day know, is the simplest possible type of radio receiver, and aside from the prerequisite of being able to receive radio signals, it possesses but one feature, namely, low price. As this article progresses it will point out how the radio public demanded that manufacturers add ten other features to radio receivers.

The opening of station KYW in Chicago marks the beginning of the second era of broadcasting. When this station started operating interest in radio broadcasting had increased considerably in the vicinity of New York City. The new radio fans soon learned that with comparatively inexpensive equipment amateurs were able to hear the Chicago station, about 750 miles away, and they also wished to do the same. This resulted in a demand for an inexpensive, sensitive receiver, and to satisfy this manufacturers introduced the one-tube regenerative of the single circuit type.

The regenerative receiver remained popular for a long time and still is used by many. However the one-tube receiver was soon found to be inadequate. When it was generally known that the music supplied by radio stations could be amplified and used for dancing, etc., the two and three-tube regenerative receiver became popular and everybody wanted circuits that would give volume. This was carried to a much greater extreme than it is to-day, and many even went so far as to use a two-stage power amplifier and power speaker in addition to the two-stage audio amplifier in the receiver.

Sets possessing selectivity were first called for when the broadcasting stations in this country had increased in number to such an extent that the Department of Commerce found it necessary to assign two wave lengths, namely, 360 and 400 meters, to broadcasting. This problem was first solved by the use of wave traps, because they were inexpensive, but when more and more wave lengths were given over to broadcasting stations a selective receiver was found necessary. Two and three circuit regenerative receivers were first used and later untuned and tuned radio-frequency sets were introduced.

The use of receivers employing radio frequency amplification made possible sets which operate from a loop antenna. These sets are not as popular yet as they probably will be, however. They first attracted attention at this time. There are three reasons for this and they are: first, loop operated sets may be made more selective; second, they are more portable, and third, they help solve the static problem to some extent.

The introduction of tuned radio-frequency amplification may also be held responsible for starting work in the direction of making sets more economical to operate. This was because a five-tube set employing the old "1-amp" tubes cost many times as much to operate as do our present sets. The demand for economy was first answered by the presentation of three new types of vacuum tubes, the WD-11, the UV-199 and the UV-201A. An endeavor is still being made to reduce the cost of operating receivers, and many advances have been made recently.

Continued on next page

**ZENITH**  
**KENNEDY**  
**Radio**  
**Planstahl**  
**Howard**  
**Thermodyne**  
**OZARKA**  
**Deresadyne**  
**ADLER-ROYAL**  
**MURDOCK**  
**MU-RAD**  
**Valley**  
**LEITCH**  
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## "Total Shielding" Improves Tone, Distance and Selectivity

Continued from page five

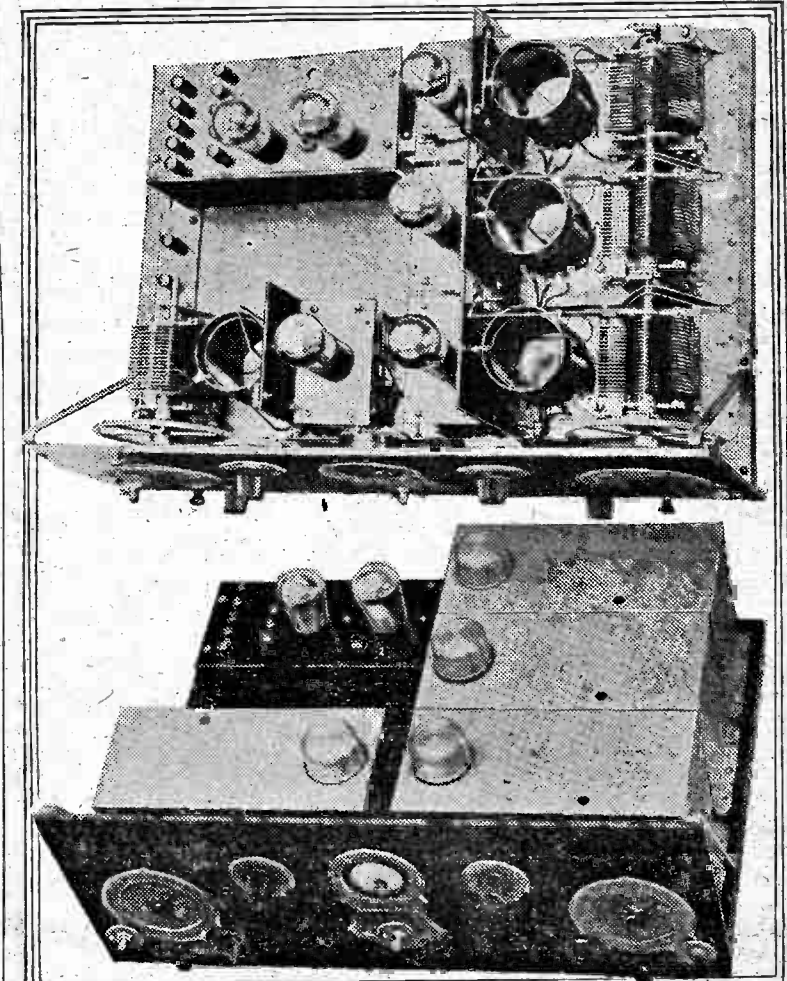
terior view of the receiver with the shields removed, and it can be seen that the set is made up of five units. Four of these units consist of a variable condenser, a radio-frequency transformer and a tube, while the fifth contains the two stage transformer coupled audio amplifier.

The unit on the extreme left near the front of the panel is the antenna coupling unit. This consists of an inductively coupled transformer with a semi-aperiodic primary and a secondary tuned by a variable condenser. This condenser is not coupled to the triple condenser and requires separation of the three radio frequency

transformers with a single control will probably be found the most difficult problem for the experimenter. As each of the condensers must be completely shielded, the standard triple condenser cannot be used, and therefore some other method must be employed.

One solution is to use three standard variable condensers mounted horizontally to the panel, and coupled by a belt system. This is not quite as satisfactory as the arrangement just described, because it requires frequent readjustment. However, this is easily accomplished. Another solution is to do away with the single control idea and employ three tuning dials.

In closing, it should be said that if all the advantages are to be had from a shielded radio-frequency receiver, at least three radio-frequency stages must be employed.



rate adjustment, as different sized antennas would affect the tuning of this circuit.

The three units on the right of the set are the three radio-frequency amplifier units. Each contains one section of a triple condenser and also a radio-frequency transformer and a vacuum tube. The triple condenser is unlike most on the market, inasmuch as it consists of three separate condensers coupled to the same shaft. The condensers are spaced some distance apart to make it possible for a shield to be slipped between them. It will also be noted that in these three units, and also in the antenna coupling unit, a shield has been placed between the vacuum tube and the transformer. Without this, it is said, the set would be impossible to balance.

The unit in the rear on the left contains the audio amplifier. As all of the circuits containing radio frequency currents are entirely shielded,

ing of the three radio frequency transformers with a single control will probably be found the most difficult problem for the experimenter. As each of the condensers must be completely shielded, the standard triple condenser cannot be used, and therefore some other method must be employed.

One solution is to use three standard variable condensers mounted horizontally to the panel, and coupled by a belt system. This is not quite as satisfactory as the arrangement just described, because it requires frequent readjustment. However, this is easily accomplished. Another solution is to do away with the single control idea and employ three tuning dials.

In closing, it should be said that if all the advantages are to be had from a shielded radio-frequency receiver, at least three radio-frequency stages must be employed.

Secretary Hoover to Tell

Proceedings of Conference

The most important event of the coming week in the radio field will be the big radio conference to be held in Washington on November 8, 9, 10 and 11 between the broadcasting interests, the listening public, amateurs and the Secretary of Commerce, Herbert Hoover. The outcome of the "confab" is awaited eagerly by all concerned, inasmuch as many radical changes are expected. Unfortunately, very few of the listening audience will be able to be present in person, but in order to let them know of the proceedings from an authoritative source as quickly as possible, Herbert Hoover, the Secretary of Commerce, who will be the most prominent figure at the conference, has agreed to tell of the proceedings through stations WJZ and WRC from the Department of Commerce Building in Washington. The date set for this talk by Mr. Hoover is 9 o'clock Thursday evening, November 12, and the stations broadcasting it will be WJZ and WRC.

Eliminating Noises

A scratchy noise is sometimes due to corrosion at points of contact. It can frequently be eliminated by cleaning connections to storage batteries.

The price of loud speakers ranges from \$7 to \$200.

Verdi's "Rigoletto" To Be

Presented by WEAF

"Rigoletto," Verdi's famous tragic opera, will be presented by the WEAF Grand Opera Company at 10 p. m. tomorrow and broadcast by WEAF, WOO, WTAG, WJAR, WCAP and WCAE. Although it precedes "Il Trovatore" and "La Traviata" by two years, it is generally classed with them as representing one, if not the final, high-water mark in Verdi's development, for it possesses beauties of melody, harmony and orchestration and subtleties in the presentation of character beyond his previous works.

2d Original Musical Comedy By Rice and Hobart Thursday

The second original radio musical comedy by the "Goodrich Zippers" from the studio of WEAF for a chain of thirteen stations (WEAF, WEEI, WSAI, WGR, WJZ, WCO, WOC, WEI, WCAE, WJAR, WADC, WTAG and KSD) will be presented on Thursday at 10 p. m. Lieutenant Gitz Rice and George V. Hobart, two of Broadway's cleverest lyricists and song writers, have laid the scene on a trans-Atlantic steamer voyaging from New York to Europe in the "Whirl Around the World" series.

Aerial to Light Pole

Never connect an aerial to an electric light pole.

## Radio Presents a Complex Problem to the Government

In Limited Time and Places Radio Paradise or Perfection May Be Found; Overcrowding of the Ether One of the Greatest Problems

By Dr. J. H. Dillinger

Chief of Radio Laboratory, Bureau of Standards

Following is an abstract of an address delivered by Dr. J. H. Dillinger through WRC, the broadcasting station of the Radio Corporation of America, Washington, D. C.

PERFECTION is a rare thing in this world. When you experience it—perhaps in the beauty of a flower, the flash of light from a dewdrop or a jewel, the smooth, silent might of an efficient machine, the polished perfection of exalted art—in any of these things, you may see a corner of paradise. Radio paradise is that condition under which radio attains perfection. Will we ever get there? How do we get there? Are we there now? Many a disillusioned radio fan will rise up here and say: "Oh, foolish question!"

The wives of some fans will say that purgatory is the name of the place, not paradise. There are people whose experience with radio is such that they cannot possibly take seriously a man who talks of radio and paradise in the same breath. Nevertheless, I would remind you that two or three years ago to the man in the street the promise of radio and the millennium seemed to be just about the same thing. Was this promise entirely vain?

Thousands Years to Paradise It is usual to think of paradise as in some very remote time or place. We speak of the millennium; a thousand years from now we shall reach perfection. However, just as there is a religious philosophy which declares that paradise can be entered here and now, so we can say that in limited times and places radio paradise, or perfection, can already be found. We approximate this condition. While listening with a first-class receiving set to some of the fine musical programs or nationally important events broadcast from a local station with no other closer than a hundred miles to offer interference, it would be a dead soul that never got a thrill from the experience. On such occasions one can participate, at a distance, in the excitement of a world's series; or, again, all the power and majesty of musical art is actually brought to one's own fireside. The role of radio, in these experiences, is close indeed to perfection. There is, therefore, a challenge to enlarge and extend the places and the times of such achievement, and to bring about the conditions that will let more people participate. For it is evident that radio has a high mission, a promise of great contribution to progress.

In order to increase the area of radio paradise what must be done? Is it possible for the government, for example, to rearrange the broadcasting system so that every one who chooses may know the thrill of listening in on perfection? While the answer is no, of course, this goal is being steadily pursued. Some of the difficulties that block the way to a rapid reaching of the goal are quite interesting, and I am happy to say that there are hopeful means of meeting and overcoming all these difficulties.

Few people realize the complexity of the problem radio presents to the government, on which rests the responsibility of guiding its development. This complexity arises fundamentally because of interference of one radio wave with another. All the radio signals conveyed along a single-track, the ether, and very skillful dispatching is required to avoid collisions. At the present time every conceivable interest wants to broadcast, simply because radio is the best means of publicity yet devised. It would not be nearly so bad if every one wanted to start a newspaper because the printing of one newspaper does not get in the way of the printing of another; but in radio only so many can operate at one time. When this physical condition, which unfortunately the scientist cannot alter, is generally realized, people will perhaps be at least as willing to hold back from erecting stations as from starting newspapers. Not every one who has a message for the public starts a newspaper; he usually uses for his purpose the newspapers already existing.

Overcrowding the Ether The thing that most stands in the way of radio perfection just now is this overcrowding of the ether because too many kind souls aspire to serve the public through the ownership of broadcasting stations. If America is not convinced from her own experiences in the way of radio traffic jams, what is happening in

Europe may supply proof that there must be iron-handed limitation of the number of stations. There is to-day serious interference among the broadcasting stations of Europe; to cure this by giving every station a separate frequency would require that broadcasting have all the waves from 500 to 2000 kilocycles (600 to 150 meters), and in addition all those from 100 to 375 kilocycles (3000 to 800 meters). To seriously suggest this would be to propose, in essence, that broadcasting monopolize the whole of radio; away with the amateurs, away with ship communication, away with radio aids to navigation. Such a proposal is unthinkable. Faced by this, a conference of the radio engineers of Europe, which just met at Geneva, has taken the bold step of agreeing and declaring that the only solution of broadcast station congestion is to get rid of some of the stations. Whether America, through the forthcoming Fourth National Radio Conference, will take so drastic a step remains to be seen—but it is clear that a definite program of some kind must and will be adopted to preserve radio from the choking of the ether channels.

Another present limitation upon radio perfection, also arising out of the hitherto unlimited freedom of broadcasting, is its commercialization. Listeners are beginning to be uneasy over the too rude intrusion of soap, bonbons and typewriters in the midst of otherwise beautiful programs. The ruthless hand of commercialism is seen also in the occasional announcement that a performance has to be interrupted because of a demand for exorbitant royalties from the holder of copyright on some musical selection. The problems and imperfections of this class which confront radio are serious at the moment, and the exact solution cannot be seen, but there is no question that time will solve them.

Except for the type of difficulties I have mentioned, most of the limitations of radio are being steadily overcome by scientific and technical progress. It is the radio engineer who forges the keys to radio paradise for an ever-growing number of people. At present there is only a small area, a few miles, around each station in which the radio waves reach the listener with ample intensity, undisturbed by atmospheric (static) and electrical interference. Technical progress will bring about increases of power and a proper distribution of the same grade of reception prevails quite generally. It will at the same time provide proper separations of frequency and distance so that these stations will not interfere with each other or with the small stations operated for local purposes.

Illusion of Paradise For most people there can be no illusion of paradise when listening to radio programs until the quality of sound delivered by the receiving set is greatly improved. This can be done. Some of the more expensive sets now give substantially perfect quality, with volume as great as the original performance. These sets readily tune in a desired station without disturbance from any other. It remains to bring apparatus of such perfection within reach of the ordinary pocketbook, and there are steady advances in that direction.

There is one problem which baffles radio engineers at present. That is fading, or the irregular fluctuation of received signal strength which you notice when listening to programs from distances of fifty miles or more. The only answer at the present

Continued on page fifteen

# TREMONT

## Radio Phone Co.

541 E. TREMONT AVE. 3567 BROADWAY (146th)  
PHONE TREMONT 6037 PHONE EDGEcombe 2525

## ANNOUNCEMENT

HAVING for four years successfully merchandised and serviced the Sale of Radio Receivers at our Tremont Avenue store, we are now prepared to extend the same standard of service at our new Radio Salon, 3567 BROADWAY

**SERVICE**  
Our One Year FREE Service Policy Insures Your Continued Satisfaction.

**AUTHORIZED DEALERS**  
STROMBERG-CARLSON — ZENITH  
BOSCH AMBORLO — FADA  
ATWATER KENT — WARE  
FRESHMAN — RADIOLA

**TERMS**  
Are So Conveniently Arranged As To Meet With The Circumstances Of Every Home.

### ATWATER KENT

THE most widely used Radio Receiver. Moderately priced and known for its reliability. \$80. Less accessories. A person hears it, sees it, buys it and then enjoys it in his own home. Atwater Kents encased in Pooley Cabinets on display.

### Radiola

MODEL 25 THE famous R. C. A. Receiver meets the demand of the broadcast listener, with respect to selectivity, range, tone and volume. No antenna is required and all batteries are contained within the cabinet. Price \$165—less batteries.

541 E. TREMONT AVE. 3567 BROADWAY (146th)

## Zooming High



from the kick-off, the ball arcs down the field and thuds into eager arms. The big game is on. Tens of thousands will see it from the stadium but hundreds of thousands can and will hear it via Radio. Play-by-play, the story will throb thru the air.

—That wonderful pass.  
—A half-back circling the end.  
—That deceptive delayed buck.  
—The full-back ripping the line wide open.  
—That fumble and quick recovery.

For the whole story—hot from the Grid-Iron—complete, clear, uninterrupted, it's no secret that you ought to use

## Cunningham RADIO TUBES

In every socket of your receiver.

Since 1915—Standard for all sets

Types CX-301A, C-299, CX-299, C-11, CX-12, CX-300, CX-220, CX-112, CX-310, CX-316B, CX-313

In the Orange and Blue Carton

J. J. Cunningham, Inc.

Home Office 182 SECOND STREET CHICAGO  
SAN FRANCISCO NEW YORK

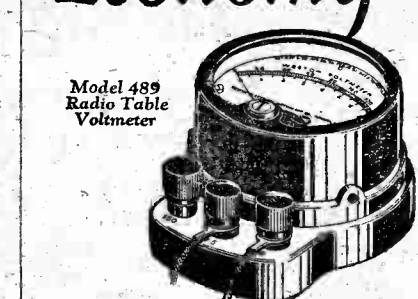
Yes, We have PHILCO Sockets Powers Radio A&B Batteries

Headquarters for Victoreen and Browning Drake Kits Paramount Elec. Sup. Co., Inc. 132 Church St., N. Y. Phone Walker 1750-1751

## FORMICA

Formica panels, base panels, winding tubes, terminal strips are used by the overwhelming majority of the leading set makers. You are sure of the quality of a set insulated with Formica. When you build your own set insist on Formica panels and tubes. Panels are sold in neat individual trade marked envelopes by all leading parts dealers. THE FORMICA INSULATION CO. 50 Church St., New York, N. Y.

## for RADIO Economy



## WESTON

Meets every need of the amateur experimenter and the careful operator who insists on the utmost of reception and the longest life from tubes and batteries. Also affords a means for testing continuity of any parts of the receiving set circuits.

—Drain on batteries is insignificant because of the especially high internal resistance of Weston Voltmeters.

Weston Electrical Instrument Corporation

301 Western Avenue, Newark, N. J.

STANDARD THE WORLD OVER WESTON

Flowers Since 1866

## The Oldest Radio House

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Authorized Agents for

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CROSLBY RADIO

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Mail Orders filled on receipt of Money Order

## FREE 7-DAY TRIAL

Waage "B" Eliminator

Cleaner and Better Than Batteries

JUST THINK OF IT!

ONLY \$26.00

(WITHOUT TUBE)

Use your old 201-A tube that will not operate in set but still lights. Works better than "B" BATTERIES.

Saves Money and Trouble

Full Wave B-Eliminator

FOR NEW U. X. TUBE \$35.00

Guaranteed. Money back if not satisfied.

Mail orders promptly filled.

A. H. WAAGE

6 Reade Street, New York

HOW THAT'S QUALITY! BRACH PUR-A-TONE AUDIO COUPLER



## Ferguson

The Gold Standard of Radio Receivers

YOU will delight in the ability of the Ferguson Model "Eight" to bring in even the distant stations with full, rich volume and tone quality.

The ease with which anyone can tune this instrument; its surpassing tone fidelity; its graceful lines and absolute dependability make it the choice of the lady of the house. Hear it, see it, and compare!

One Tuning Control—Calibrated in Meters!

Rance Corp., 86 Church St. Steelman, Inc., 24 Murray St. Distributors

Choose your program, turn up its exact, soundings, and it comes your station!

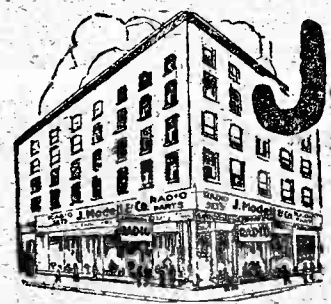
The Gold Standard of Radio Receivers

Sold Only by Authorized Ferguson Dealers

4



## WORLD'S LARGEST RADIO STORE



**J. Modell & Co.**  
VESEY, Cor. CHURCH ST.



**RECEPTOR**  
SUPERHETERODYNE KITS  
List Price \$53.50  
Special While Quantity Lasts

19.95



**MAGNAVOX**  
Model R 3

Power Horn  
Every Speaker in Original Cartons

This is the first time this model has ever sold so low.

11.95

**EVEREADY** 45 Volt, Large No. 767 **2.34**  
FRESH STOCK  
Limit Two Batteries to a Customer.

**BEACON** 45 Volt, Large **1.95**  
Flat or Upright  
FRESH STOCK

**Balkite Trickle Chargers**  
EXTRA SPECIAL **8.45**

**RED SEAL DRY CELLS**  
27c

**Balkite "A" Chargers**  
List Price \$19.50  
EXTRA SPECIAL **12.07**



**Farrand**  
The New Junior Type  
**16.50**

**de Forest**  
Reg. U. S. Pat. Off.

Mahogany Cabinet, with built-in speaker, battery compartments; complete with loop. Every set factory guaranteed.

List Price 180.00

**84.50**

Model D-17M



**Wood's horns**  
in Sealed Cartons  
**2.95**

**Exide**  
STORAGE BATTERIES  
rubber case **10.95**

\*MAIL ORDERS FILLED ON THESE ITEMS. PLEASE ADD POSTAGE

**FREE 7-DAY TRIAL**  
Waage "B" Eliminator  
Cleaner and Better Than Batteries  
JUST THINK OF IT!  
ONLY **\$26.00**  
(WITHOUT TUBE)  
Use your old 201 A tube that will not operate in set but still lights. Works better than "B" BATTERIES.  
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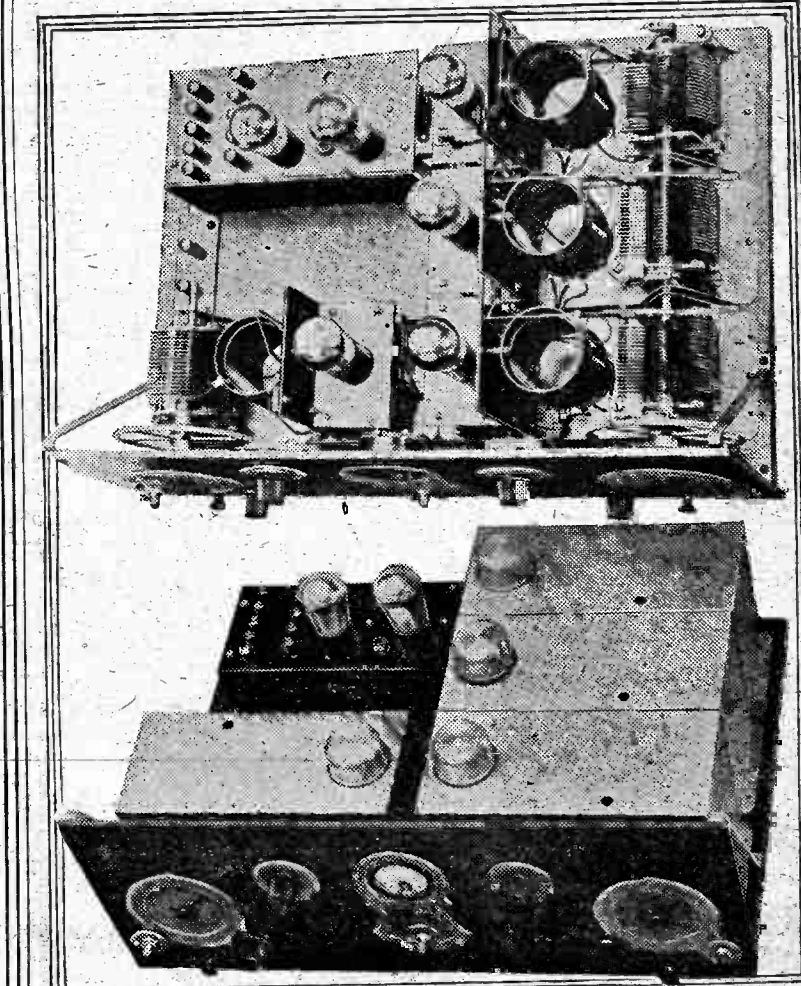
**BRACH**  
PURA-TONE  
AUDIO COUPLER

**Ferguson**  
The Gold Standard of Radio Receivers  
YOU will delight in the ability of the Ferguson Model "Eight" to bring in even the distant stations with full, rich volume and tone quality.  
The ease with which anyone can tune this instrument; its surpassing tone fidelity; its graceful lines and absolute dependability make it the choice of the lady of the house. Hear it, see it, and compare!  
Rance Corp., 86 Church St.  
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Distributors  
One Tuning Control—Calibrated in Meters!  
Choose your program, turn up the exact, powerful, and clear sound your station!  
The Gold Standard of Radio Receivers  
Sold Only by Authorized Ferguson Dealers

## "Total Shielding" Improves Tone, Distance and Selectivity

Continued from page five

terior view of the receiver with the shields removed, and it can be seen that the set is made up of five units. Four of these units consist of a variable condenser, a radio-frequency transformer and a tube, while the fifth contains the two stage transformer coupled audio amplifier. The unit on the extreme left near the front of the panel is the antenna coupling unit. This consists of an inductively coupled transformer with a semi-aperiodic primary and a secondary tuned by a variable condenser. This condenser is not coupled to the triple condenser and requires separate adjustment, as different sized antennas would affect the tuning of this circuit.



The three units on the right of the set are the three radio-frequency amplifier units. Each contains one section of a triple condenser and also a radio-frequency transformer and a vacuum tube. The triple condenser is unlike most on the market, inasmuch as it consists of three separate condensers coupled to the same shaft. The condensers are spaced some distance apart to make it possible for a shield to be slipped between them. It will also be noted that in these three units, and also in the antenna coupling unit, a shield has been placed between the vacuum tube and the transformer. Without this, it is said, the set would be impossible to balance. The unit in the rear on the left contains the audio amplifier. As all of the circuits containing radio-frequency currents are entirely shielded, this unit does not require shielding. The photograph in Fig. 2 shows the same receiver with the shields in place. It will be noticed that they are box-like in shape and cover the entire unit. A small hole is placed in the top of each to allow changing the tubes without removing the shield. However, the tube is completely shielded by a cap placed over the tube after it has been inserted. As the receiver just described is a commercial product it possesses several characteristics which it would be impossible, or at least very difficult, for the amateur experimenter to duplicate. Accomplishing the tuning of the three radio-frequency transformers with single control will probably be found the most difficult problem for the experimenter. As each of the condensers must be completely shielded, the standard triple condenser cannot be used, and therefore some other method must be employed. One solution is to use three standard variable condensers mounted horizontally to the panel, and coupled by a belt system. This is not quite as satisfactory as the arrangement just described, because it requires frequent readjustment. However, this is easily accomplished. Another solution is to do away with the single control idea and employ three tuning dials. In closing, it should be said that if all the advantages are to be had from a shielded radio-frequency receiver, at least three radio-frequency stages must be employed.

## Radio Presents a Complex Problem to the Government

In Limited Time and Places Radio Paradise or Perfection May Be Found; Overcrowding of the Ether One of the Greatest Problems

By Dr. J. H. Dillinger

Chief of Radio Laboratory, Bureau of Standards

Following is an abstract of an address delivered by Dr. J. H. Dillinger through WRC, the broadcasting station of the Radio Corporation of America, Washington, D. C.

PERFECTION is a rare thing in this world. When you experience it—perhaps in the beauty of a flower, the flash of light from a dewdrop or a jewel, the smooth, silent might of an efficient machine, the polished perfection of exalted art—in any of these things, you may see a corner of paradise. Radio paradise is that condition under which radio attains perfection. Will we ever get there? How do we get there? Are we there now? Many a disillusioned radio fan will rise up here and say: "Oh, foolish question!"

The wives of some fans will say that purgatory is the name of the place, not paradise. There are people whose experience with radio is such that they cannot possibly take seriously a man who talks of radio and paradise in the same breath. Nevertheless, I would remind you that two or three years ago to the man in the street the promise of radio and the millennium seemed to be just about the same thing. Was this promise entirely vain?

Thousands Years to Paradise. It is usual to think of paradise in some very remote time or place. We speak of the millennium; a thousand years from now we shall reach perfection. However, just as there is a religious philosophy which declares that paradise can be entered here and now, so we can say that in limited times and places radio paradise, or perfection, can already be found. We approximate this condition. While listening with a first-class receiving set to some of the fine musical programs or nationally important events broadcast from a local station with no other closer than a hundred miles to offer interference, it would be a dead soul that never got a thrill from the experience. On such occasions one can participate, at a distance, in the excitement of a world's series; or, again, all the power and majesty of musical art is actually brought to one's own fireside. The role of radio, in these experiences, is close indeed to perfection. There is, therefore, a challenge to enlarge and extend the places and the times of such achievement, and to bring about the conditions that will let more people participate. For it is evident that radio has a high mission, a promise of great contribution to progress.

In order to increase the area of radio paradise what must be done? Is it possible for the government, for example, to rearrange the broadcasting system so that every one who chooses may know the thrill of listening in on perfection? While the answer is no, of course, this goal is being steadily pursued. Some of the difficulties that block the way to a rapid reaching of the goal are quite interesting, and I am happy to say that there are hopeful means of meeting and overcoming all these difficulties. Few people realize the complexity of the problem radio presents to the government, on which rests the responsibility of guiding its development. This complexity arises fundamentally because of interference of one radio wave with another. All the radio signals are conveyed along a single track, the ether, and very skillful dispatching is required to avoid collisions. At the present time every conceivable interest wants to broadcast, simply because radio is the best means of publicity yet devised. It would not be nearly so bad if every one wanted to start a newspaper because the printing of one newspaper does not get in the way of the printing of another; but in radio only so many can operate at one time. When this physical condition, which unfortunately the scientist cannot alter, is generally realized, people will perhaps be at least as willing to hold back from erecting stations as from starting newspapers. Not for every one who has a message for the public starts a newspaper; he usually uses for his purpose the newspapers already existing.

Overcrowding the Ether. The thing that most stands in the way of radio perfection just now is this overcrowding of the ether because too many kind souls aspire to serve the public through the ownership of broadcasting stations. If America is not convinced from her own experiences in the way of radio traffic jams, what is happening in

Europe may supply proof that there must be iron-handed limitation of the number of stations. There is today serious interference among the broadcasting stations of Europe; to cure this by giving every station a separate frequency would require that broadcasting have all the waves from 500 to 2000 kilocycles (500 to 150 meters), and in addition all those from 100 to 375 kilocycles (3000 to 800 meters). To seriously suggest this would be to propose, in essence, that broadcasting monopolize the whole of radio; away with the amateurs, away with ship communication, away with radio aids to navigation. Such a proposal is unthinkable. Faced by this, a conference of the radio engineers of Europe, which just met at Geneva, has taken the bold step of agreeing and declaring that the only solution of broadcast station congestion is to get rid of some of the stations. Whether America, through the forthcoming Fourth National Radio Conference, will take so drastic a step remains to be seen, but it is clear that a definite program of some kind must and will be adopted to preserve radio from the choking of the ether channels.

Another present limitation upon radio perfection, also arising out of the hitherto unlimited freedom of broadcasting, is its commercialization. Listeners are beginning to be uneasy over the too rude intrusion of soap, bombons and typewriters in the midst of otherwise beautiful programs. The ruthless hand of commercialism is seen also in the occasional announcement that a performance has to be interrupted because of a demand for exorbitant royalties from the holder of copyright on some musical selection. The problems and imperfections of this class which confront radio are serious at the moment, and the exact solution cannot be seen, but there is no question that time will solve them.

Except for the type of difficulties I have mentioned, most of the limitations of radio are being steadily overcome by scientific and technical progress. It is the radio engineer who forges the keys to radio paradise for an ever-growing number of people. At present there is only a small area, a few miles, around each station in which the radio waves reach the listener with ample intensity, undisturbed by atmospheric (static) and electrical interference. Technical progress will bring about increases of power and a proper distribution of the broadcasting stations until this same grade of reception prevails quite generally. It will at the same time provide proper separations of frequency and distance so that these stations will not interfere with each other or with the small stations operated for local purposes.

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Continued on page fifteen

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PHONE TREMONT 6037 PHONE EDGEcombe 2528

## ANNOUNCEMENT

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### SERVICE

Our One Year FREE Service Policy Insures Your Continued Satisfaction.

### AUTHORIZED DEALERS

STROMBERG-CARLSON — ZENITH  
BOSCH AMBOROLA — FADA  
ATWATER KENT — WARE  
FRESHMAN — RADIOLA

### TERMS

Are So Conveniently Arranged As To Meet With The Circumstances Of Every Home.

**ATWATER KENT**



**MODEL 20**  
THE most widely used Radio Receiver. Moderately priced and known for its reliability. \$80. Less accessories. A person hears it, sees it, buys it and then enjoys it in his own home. Atwater Kents encased in Pooley Cabinets on display.

### NEUTROLETTE

A 5-tube Neutrodyne constructed to give maximum results. A Radio Receiver guaranteed to give permanent satisfaction. Less accessories \$85. Other models including beautiful period furniture on demonstration.

### Radiola

**MODEL 25**  
THE famous R. C. A. Receiver meets the demand of the broadcast listener, with respect to selectivity, range, tone and volume. No antenna is required and all batteries are contained within the cabinet. Price \$165—less batteries.

### Stromberg-Carlson

"Its Performance Is Equal To Its Beauty"

**HERALDED** throughout the country as the greatest achievement in radio construction. Model 601 on display.

**COMPLETELY** self contained—this famous Receiver being offered at an exceedingly low price. \$125.00 Complete.

### New and Improved FRESHMAN MASTERPIECE



A FIVE tube Receiver with built-in loud speaker, equipped with the best standard accessories—\$95 Complete.

541 E. TREMONT AVE. MAIL ORDERS 3567 BROADWAY (146th)  
ACKNOWLEDGED

## Zoo-m-i-n-g High



from the kick-off, the ball arcs down the field and thuds into eager arms.

The big game is on. Tens of thousands will see it from the stadium but hundreds of thousands can and will hear it via Radio. Play-by-play, the story will throb thru the air.

—That wonderful pass.  
—A half-back circling the end.  
—That deceptive delayed buck.  
—The full-back ripping the line wide open.  
—That fumble and quick recovery.

For the whole story—hot from the Grid-Iron—complete, clear, uninterrupted, it's no secret that you ought to use

## Cunningham RADIO TUBES

in every socket of your receiver.

Since 1915—Standard for all sets

Types CX-301A, C-299, CX-299, C-11, CX-12, CX-300, CX-220, CX-112, CX-310, CX-316B, CX-313

In the Orange and Blue Carton

*R. J. Cunningham Inc.*

Home Office 182 SECOND STREET CHICAGO  
SAN FRANCISCO NEW YORK

**Yes, We have**  
Philco Powers and Radio A&B Batteries

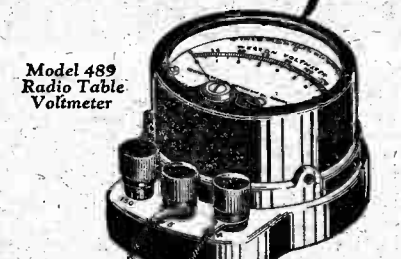
Headquarters for Victoreen and Browning Drake Kits  
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132 Church St., N. Y.  
Phone Walker 1750-1751

## FORMICA

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THE FORMICA INSULATION CO.  
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## for RADIO Economy



## WESTON

Meets every need of the amateur experimenter and the careful operator who insists on the utmost of reception and the longest life from tubes and batteries. Also affords a means for testing continuity of any parts of the receiving set circuits.

Drain on batteries is insignificant because of the especially high internal resistance of Weston Voltmeters.

Weston Electrical Instrument Corporation

301 Western Avenue, Newark, N. J.

STANDARD THE WORLD OVER

WESTON  
Flowers since 1888

## The Oldest Radio House

—Downtown—

Authorized Agents for

**ATWATER KENT**

**De Forest**

**CROSLLEY RADIO**

**Radiola**

**Fred-Eisemann**

Eagle Neutrodyne

Garod Terms 10 Days

**WIRELESS**

**ECERT**

179 Greenwich St.

(Corland) 5275

Mail Orders filled on receipt of Money Order







# Herald Tribune Daily Broadcasting Programs for Week Ending November 14

9 a. m.—**WJZ-NEW YORK CITY-455**  
9:00 p. m.—Thomas's hour; stories; music; comic stories.

11 a. m.—**St. Thomas's Episcopal Church**  
12:30 p. m.—Rev. Irvell Sunday, concert.  
1:30 p. m.—St. George's Episcopal Church, music.  
4 p. m.—St. George's, Episcopal Church of Music, vocal solo, violin.  
Rebecca Pharo, soprano; George Bagdaarian, tenor.  
4:30 p. m.—Outposts of Peace, Literary Verses, by Edgar Surrenti.  
7 p. m.—Concert from Park Avenue Baptist Church.  
8 p. m.—Nathan Abas' Concert.  
8:30 p. m.—Dextra Male Chorus.  
9:30 p. m.—Concert from St. John's Hall, Orchestra, vocal recital.  
10 p. m.—Concert, concert quartet.

10 a. m.—**WJY-NEW YORK CITY-405**  
8:15 p. m.—Bernard Levittov's Concert.  
10 p. m.—"Reminiscences of a Reporter," W. G. C. G.

9 a. m.—**WEAF-NEW YORK CITY-492**  
9:30 p. m.—"Sunday Hymn Ring."  
10:30 p. m.—Constitutional service, addresses by the Rev. Wesley Megaw; Alda and the Children.  
3:45-5:30 p. m.—Men's conference from St. Francis.  
6:30 p. m.—Address by Dr. S. Parkes Cavanagh, Gloria Trumpeters.  
8:45-7:30 p. m.—Addresses given at 200th anniversary of the City of New York at Newspaper Club.  
7:30 p. m.—Concert, program Capitol Theater Family.  
10-10:15 p. m.—Atwater Kent Hour, piano, violin, soprano, John Power, pianist.

9 a. m.—**WJW-NEW YORK CITY-316**  
9:30 p. m.—Program from Warner's.  
8:30 p. m.—Opera, "La Forza del Destino."  
10:30 p. m.—New York City Christian Endeavor.

2-3 p. m.—**WJY-NEW YORK CITY-381**  
3 p. m.—Poplar song review.  
3:20 p. m.—Dr. Stratton recited Bible Class.  
4 p. m.—Address by Judge Ralston.  
7:30-8:15 p. m.—Calvary Baptist Church.  
10:45 p. m.—Janasen's Orchestra.

12 midnight—**Richman Opera City-526**  
8 p. m.—Comerstone ceremonies Caledonian Hospital, songs and choral.  
9:30 p. m.—**WJY-NEW YORK CITY-316**  
2:45 p. m.—Body talk.  
3:15 p. m.—"The Music of the Religions."  
3:45 p. m.—Bible reading to music.

9:45 p. m.—Vesper services.  
10:15 p. m.—Church service.  
10:45 p. m.—Church service.  
11:15 p. m.—Church service.  
11:45 p. m.—Church service.  
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**MONDAY**

15 p. m.—Charles D. Isaacson's concert; Misses Myrtle Quatman, Lorna Lee, Joseph Disch.

**WMCA—NEW YORK CITY—341**  
5:30 p. m.—Cosmopolitan Trio.  
6:00 p. m.—Brins Glendon's Orchestra.  
7:35 p. m.—Oleott Vail's Studio Orchestra.

**WMCA—NEW YORK CITY—273**  
5 p. m.—Artillery Band.  
6 p. m.—Madison's Orchestra.  
7:00 p. m.—Bossett Lumberjacks.  
7:30 p. m.—Radio program.  
7:55 p. m.—Don Josaf's Mariners.  
8:30 p. m.—The Radio City Orchestra.

**WLWJ—NEW YORK CITY—588**  
7:30 p. m.—The Radio City Orchestra.  
8:00 p. m.—Francis P. Duffy; benediction.

**WBBS—STANISLAND, N. Y.—473**  
10 a. m.—Walters' Orchestra.  
10:30 a. m.—Fred Twaroschek, tenor.  
11 a. m.—Bible lecture, W. N. Woods.  
11 a. m.—Fred Twaroschek, tenor; Orchestra.  
12 p. m.—Church singers.  
2:40 p. m.—Violin duet.  
3:10 p. m.—Choral singings, F. W. Frantz.  
3:45 p. m.—Church singings; violin duet.

**WGBB—FREETOWN, N. Y.—244**  
10:40 a. m.—Church services.

**WGCF—NEWARK—282**  
10 a. m.—Charles Fryxman, pianist.  
8:05 p. m.—Arline Felker's Entertainment.  
8:15 p. m.—The Radio City Orchestra.  
8:30 p. m.—Isabelle Henderson, soprano.  
8:50 p. m.—Frank Kallman, tenor.  
9:20 p. m.—Leslie Leitch, tenor.  
9:50 p. m.—Syvya Schatz, pianist.  
10:15 p. m.—The Radio City Orchestra.  
10:30 p. m.—Richman's Entertainers.

**WOO—PHILADELPHIA—508**  
10:45 p. m.—The Radio City Orchestra.  
2:30 p. m.—Musical exercises opening Sunday school.  
3:00 p. m.—Sacred recital.

**WIP—PHILADELPHIA—508**  
7:15 p. m.—Evening concert.  
8:30 p. m.—Ben Stad's Symphony Orchestra.  
9:30 p. m.—The Radio City Orchestra.

**WFI—PHILADELPHIA—395**  
4:30 p. m.—Chapel service.  
5:15 p. m.—Evening concert.  
8:05 p. m.—Atwater Kent hour.  
8:30 p. m.—The Radio City Orchestra.  
9:20 p. m.—Arcadia Concert Orchestra.

**WCAU—PHILADELPHIA—278**  
8:00 p. m.—The Radio City Orchestra.  
8:30 p. m.—Radio church service.  
8:45 p. m.—Paul Tuck, soprano.  
9:15 p. m.—Recital.  
9:30 p. m.—Pennsylvania Stock Orchestra.

10:15 p. m.—Jaffe's Colegrans.  
10:30 p. m.—The Radio City Orchestra.  
11 a. m.—Morning service.

**WCAU—NEW YORK CITY—462**  
6:45-7:45 a. m.—Health Exercises.  
7:45-8:45 a. m.—Helen E. Christie.  
11:05 a. m.—Cameron Ensemble, pianist.  
11:15 a. m.—The Radio City Orchestra.  
11:30 a. m.—Columbia University Lecture.  
12:00 p. m.—Market and Weather Reports.  
12:15 p. m.—The Radio City Orchestra, with laying of the cornerstone of the nave of the Cathedral.  
1:30 p. m.—The Radio City Orchestra, with Speakers: Governor Alfred E. Smith, Ethel Root, Redd Foxx, and the Rev. S. Parkes Cadman, Sir Campbell Stuart and Bishop William T. Manning.  
2:00 p. m.—The Radio City Orchestra, with musical program by the Cathedral and Trinity Church.  
2:15 p. m.—The Radio City Orchestra.  
2:45 p. m.—"Music," Ethel Peyser.  
3:00 p. m.—The Radio City Orchestra.  
3:15 p. m.—The Radio City Orchestra.  
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11:45 p. m.—The Radio City Orchestra.  
12:00 p. m.—The Radio City Orchestra.

**WJZ—NEW YORK CITY—455**  
10 a. m.—Women's Hour.  
11 a. m.—The Radio City Orchestra.  
12 p. m.—Meyer David's Music.  
1:30 p. m.—The Radio City Orchestra.  
2:00 p. m.—The Radio City Orchestra.  
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11:00 p. m.—The Radio City Orchestra.  
11:30 p. m.—The Radio City Orchestra.  
12:00 p. m.—The Radio City Orchestra.

**WGBS—NEW YORK CITY—367**  
10 a. m.—Timely talks with Teresa.  
10:10 a. m.—Jack Cohen, pianist.  
10:20 a. m.—The Radio City Orchestra.  
10:30 a. m.—The Radio City Orchestra.  
10:40 a. m.—The Radio City Orchestra.  
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11:40 p. m.—The Radio City Orchestra.  
11:50 p. m.—The Radio City Orchestra.  
12:00 p. m.—The Radio City Orchestra.

**WAAW—NEWARK—243**  
11 a. m.—Happy hour.  
12 p. m.—The Radio City Orchestra.  
1:30 p. m.—The Radio City Orchestra.  
2:00 p. m.—The Radio City Orchestra.  
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12:00 p. m.—The Radio City Orchestra.

**WIP—PHILADELPHIA—508**  
8 p. m.—Artist recital.  
8:30 p. m.—The Radio City Orchestra.  
9:00 p. m.—The Radio City Orchestra.  
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11:00 p. m.—The Radio City Orchestra.  
11:30 p. m.—The Radio City Orchestra.  
12:00 p. m.—The Radio City Orchestra.

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# Eastern Standard Time

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| 10:30 p. m.—Galaxy stars.  |  |  |  |
| 11:05 p. m.—Theater orchestra.   |  |  |  |
| <b>WOR—BUFFALO, N. Y.—319</b>  |  |  |  |
| 9:30 p. m.—Dinner music.   |  |  |  |
| 9:30 p. m.—Dutch Masters' program.   |  |  |  |
| 9:30 p. m.—Allen's Saxophone Band.   |  |  |  |
| 9:30 p. m.—News.   |  |  |  |
| 9:30 p. m.—Super music.  |  |  |  |
| <b>WMAU—ROCHESTER, N. Y.—274</b>   |  |  |  |
| 3:30 p. m.—Harmann Theater Orchestra.  |  |  |  |
| 3:30 p. m.—Theater organ.  |  |  |  |
| 3:30 p. m.—Edna Mae Theater orchestra.                                       |  |  |  |
| 7:30 p. m.—Weather forecast; market.   |  |  |  |
| 9:30 p. m.—Weather forecast; market.   |  |  |  |
| 9:30 p. m.—Father and son night; instrumental vocal selections, short talks. |  |  |  |
| 10:30 p. m.—Cornelius Cornellus Burns.                                       |  |  |  |
| 10:30 p. m.—"Anthracite Coal Substitute."                                    |  |  |  |
| Professor E. A. Pesenden.  |  |  |  |
| 11 p. m.—Campus Serenaders, soloists.  |  |  |  |
| 11:30 p. m.—Campus Serenaders.   |  |  |  |
| 8-9 p. m.—Murray Whiteman's Serenaders.                                      |  |  |  |
| <b>WCAN—MANFRIEUX, CONN.—275</b>   |  |  |  |
| 7:25 p. m.—Market reports.   |  |  |  |
| 7:25 p. m.—Daily farm news course.   |  |  |  |
| 7:45 p. m.—Program of music.   |  |  |  |
| <b>WCAN—MANFRIEUX, CONN.—476</b>   |  |  |  |
| 6:30 p. m.—Dinner music.   |  |  |  |
| 7:30 p. m.—"Good Factories and Farms."                                       |  |  |  |
| 7:45 p. m.—Dinner music.   |  |  |  |
| <b>WAAR—PROVIDENCE—306</b>   |  |  |  |
| 10 a. m.—Market exchange.  |  |  |  |
| 1:05 p. m.—Studio program.   |  |  |  |
| 3 p. m.—Berry spring time.   |  |  |  |
| 4:15 p. m.—Berry spring time.  |  |  |  |
| 8:30 p. m.—American Led Cross.   |  |  |  |
| 10 p. m.—Grand Opera Company.  |  |  |  |
| <b>WEEL—BOSTON—349</b>   |  |  |  |
| 6:45 a. m.—Morning walk.   |  |  |  |
| 7:45 a. m.—Morning walk.   |  |  |  |
| 8 p. m.—Happy Hawkins' Orchestra.  |  |  |  |
| 9 p. m.—Talk A. J. Philpot.  |  |  |  |
| 10:30 p. m.—Forecast; weather report.  |  |  |  |
| 11 p. m.—Big Brother Club.   |  |  |  |
| 11:45 p. m.—Levey A. Bennett, violinist.                                     |  |  |  |
| 12 p. m.—Anonymous Orchestra.  |  |  |  |
| 12:30 p. m.—Program of music.  |  |  |  |
| 10 p. m.—Orchestra and band.   |  |  |  |
| <b>WBZ—SPRINGFIELD, MASS.—290</b>  |  |  |  |
| 10:30 a. m.—Bible reading.   |  |  |  |
| 12:15 p. m.—Organ recital.   |  |  |  |
| 1:30 p. m.—Columbia Pictures.  |  |  |  |
| 2:30 p. m.—Copley Plaza Trio.  |  |  |  |
| 3:30 p. m.—Radio play.   |  |  |  |
| 5:30 p. m.—T. D. Cook's dinner dance.  |  |  |  |
| 7:30 p. m.—Talk.   |  |  |  |
| 8:30 p. m.—Suzanne Pike, soprano; Franklyn Adams, baritone.                  |  |  |  |
| 9:30 p. m.—Columbia Pictures.  |  |  |  |
| <b>WBZ—SPRINGFIELD, MASS.—333</b>  |  |  |  |
| 10 a. m.—Women's hour.   |  |  |  |
| 11:05 a. m.—Talk.  |  |  |  |
| 12:30 p. m.—Athletic Affairs talk.   |  |  |  |
| 1:30 p. m.—Meltonella Beardsley, pianist.                                    |  |  |  |
| 2:30 p. m.—Joanne's A. Dalr, soprano.  |  |  |  |
| 3:30 p. m.—Bernard Levittov's ten music.                                     |  |  |  |
| 4:30 p. m.—Financial summary.  |  |  |  |
| 5:30 p. m.—Financial summary.  |  |  |  |
| 6:30 p. m.—Musical variety concert:  |  |  |  |
| "Nature of Sound and Light," Professor H. Sheldon.                           |  |  |  |
| "The Best of Both Worlds," by Frank Dale, of the Herald Tribune.             |  |  |  |
| 8 p. m.—Vanderbilt Orchestra.  |  |  |  |
| 8:15 p. m.—Musical.  |  |  |  |
| 9 p. m.—New York Edison hour.  |  |  |  |
| 11:45 a. m.—Maria Samuell, pianist.  |  |  |  |
| 10:30 p. m.—Mayflower Orchestra.   |  |  |  |
| <b>WEAF—NEW YORK CITY—492</b>  |  |  |  |
| 6:45-7:45 a. m.—Music.   |  |  |  |
| 11 a. m.—Maria Samuell, pianist.   |  |  |  |
| 11:10 a. m.—Lecture.   |  |  |  |
| 11:45 a. m.—Maria Samuell, pianist.  |  |  |  |
| 12:25 a. m.—Motion picture forecast.   |  |  |  |
| 1:45 a. m.—Maria Samuell, pianist.   |  |  |  |
| 12 (noon)—Market and weather reports.  |  |  |  |
| 3 p. m.—Joseph Biera, baritone.  |  |  |  |
| 4:15 p. m.—Phonograph record.  |  |  |  |
| 4:30 p. m.—Women's program.  |  |  |  |
| 5:30 p. m.—Dinner music.   |  |  |  |
| 7 p. m.—Florence Johnson, contralto.   |  |  |  |
| 7:10 p. m.—Columbia University lecture.                                      |  |  |  |
| 8 p. m.—David Sarnoff, president.  |  |  |  |
| 8:30 p. m.—"Financial Events," Dudley  |  |  |  |
| 8:10 p. m.—Ross Gorman's Orchestra.  |  |  |  |
| 8:30 p. m.—"The Gold Dust Twins."  |  |  |  |
| 9:30 p. m.—"Auction Bridge Instruction."                                     |  |  |  |
| 10:30 p. m.—Vincent P. Carosso's Orchestra.                                  |  |  |  |
| 11:12 p. m.—Meyer Davis's Orchestra.   |  |  |  |
| <b>WGES—NEW YORK CITY—316</b>  |  |  |  |
| 10 a. m.—Timely Talks with Terese.   |  |  |  |
| 10:30 a. m.—Home Dance program.  |  |  |  |
| 10:30 a. m.—Household talk.  |  |  |  |
| 10:30 a. m.—Helen Armstrong songs.   |  |  |  |
| 11:30 a. m.—Home Dance program.  |  |  |  |
| 1:30 p. m.—Scripture reading.  |  |  |  |
| 2:30 p. m.—Joanne's A. Dalr, soprano.  |  |  |  |
| 3:30 p. m.—Gertrude Seidenman, pianist.                                      |  |  |  |
| 4:30 p. m.—Industrial Conditions in Egypt.                                   |  |  |  |
| 5:10 p. m.—Betty Nemerson, Aida Wysocki.                                     |  |  |  |
| 6:30 p. m.—Driving lessons.  |  |  |  |
| 7:30 p. m.—Betty Nemerson, Aida Wysocki.                                     |  |  |  |
| 8:30 p. m.—Betty Nemerson, Aida Wysocki.                                     |  |  |  |
| 9:30 p. m.—Betty Nemerson, Aida Wysocki.                                     |  |  |  |
| 10:30 p. m.—Betty Nemerson, Aida Wysocki.                                    |  |  |  |
| 5:30 p. m.—Anna Balchay, soprano.  |  |  |  |
| 6:45 p. m.—Chris McElroy, tenor.   |  |  |  |
| 7:30 p. m.—Gariballa Arrigo, tenor.  |  |  |  |
| 8:30 p. m.—Hoover Lumberjacks.   |  |  |  |
| 9:30 p. m.—Pentecost.  |  |  |  |
| <b>WKCB—BROOKLYN, N. Y.—240</b>  |  |  |  |

BZ—SPRINGFIELD, MASS.—33  
p. m.—Leo Reisman's Ensemble.  
m.—Market report.

7:05 p. m.—To be announced.  
8:00 p. m.—Mrs. John H. Fauser, soprano.  
8:30 p. m.—Alondra Minstrel.  
9:30 p. m.—The Musical FIASH—268  
10:30 a. m.—Radio chat; music.  
11:00 p. m.—Maria and weather reports.  
12:30 p. m.—"Story Teller."  
1:15 p. m.—Lionel Lincoln Orchestra.  
3:30-9 p. m.—Vocal selections.  
4:30 p. m.—"The Blue Bird" songs.  
10 p. m.—To be announced.  
10:30 p. m.—Program from WEAF.  
11:00 p. m.—The ASHLEY Orchestra.  
10 a. m.—Women's Hour from WJZ.  
10:30 p. m.—The ASHLEY Orchestra.  
1 p. m.—New Willard Orchestra.  
2 p. m.—Show Shopping. Leonard Hall.  
7 p. m.—Shoreham Orchestra.  
8 p. m.—Musical recital.  
9 p. m.—"Edison Hour."  
10:30 p. m.—The ASHLEY Orchestra.  
10:30 p. m.—W. Spencer Tupman's Orchestra.  
**OKA—PITTSBURGH—309**  
6:15 p. m.—Dinner concert.  
7:30 p. m.—"The Blue Bird" songs.  
7:45 p. m.—"Modern Music," Dr. L. P. M.  
8 p. m.—Musical selections by Little Symphony Orchestra.  
9 p. m.—Little Symphony Orchestra; church quartet.  
**OKA—PITTSBURGH—461**  
6:30 p. m.—Dinner concert.  
7 p. m.—Uncle Kaybee.  
7:30 p. m.—Program from WEAF.  
8:30 p. m.—"The Gold Dust Twins."  
9:30 p. m.—Grand opera.  
10:30 p. m.—Grand opera.  
**OKA—CINCINNATI, OHIO—253**  
6:30 p. m.—Dinner concert.  
7 p. m.—Blinning's Ramblers.  
8 p. m.—The Emersons.  
**WTAM—CLEVELAND—390**  
6 p. m.—Organ recital.  
7 p. m.—Organ recital.  
8 p. m.—Radio artists.  
9 p. m.—Radio artists.  
**WSAL—CAIROVILLE—326**  
8:45 p. m.—Dinner concert.  
9 p. m.—Eveready hour.  
9:30 p. m.—"The Blue Bird" songs.  
10:30 p. m.—Concert from studio.  
**WV—KNOXVILLE—WAT22**  
8:30 p. m.—O. Henry play.  
9 p. m.—Orchestra.  
9:30 p. m.—Lunch-Master program.  
10 p. m.—Formica Orchestra.  
10:30 p. m.—"The Blue Bird" songs—423  
11 p. m.—Dance music; songs.  
12:30 p. m.—"The Blue Bird" Howard's Entertainment.  
**WIR—PONTIAC, MICH.—517**  
7 p. m.—Orchestra; soloists.  
7:05 p. m.—Church clinics; announcements.  
8:00 p. m.—Caroline Andrews, soprano.  
10:42 a. m.—Address by the Rev. Dr. C. M. Cadmus.  
10:42 a. m.—Reverend Hohlmeier, tenor.  
11:00 p. m.—Chicago.  
10:59 a. m.—Bugle call to silence.  
11:00 p. m.—Two minutes silence; taps.  
11:20 p. m.—M. J. McLaughlin.  
11:05 a. m.—Home service talk.  
11:20 p. m.—M. J. McLaughlin, barytone.  
11:30 a. m.—Columbia University lecture.  
11:30 p. m.—Chapel.  
11:30 p. m.—Market and weather reports.  
12:30 p. m.—Ray and Polio Orchestra.  
4:45-5:15 p. m.—Dance with musical accompaniment.  
6:00 p. m.—Dinner music.  
6:00 p. m.—"Peace," Channing Poleick.  
6:30 p. m.—Organ recital.  
7:30 p. m.—U. S. Army Band.  
8:00 p. m.—Don Ron Bugles.  
8:30 p. m.—"The Blue Bird" songs.  
8:30 p. m.—Waterman's Point of Progress.  
9:30 p. m.—The Blue Bird.  
11:12 p. m.—Ben Bernie's Orchestra.  
**WEBB—NEW YORK CITY—361**  
8 p. m.—Red and Andy Melody Boys.  
8:45 p. m.—Philp Krumholz, tenor.  
9:00 p. m.—The Blue Bird.  
9:30 p. m.—The Roth Trio.  
**WHN—NEW YORK CITY—361**  
8:15 p. m.—The Blue Bird.  
8:45 p. m.—Musical program.  
9:00 p. m.—The Blue Bird.  
9:25 p. m.—Jack Smith, barytone.  
9:45 p. m.—Uncle Robert's Pals.  
10:00 p. m.—The Blue Bird.  
10:30 p. m.—Dinner music.  
10:45 p. m.—The Blue Bird.  
11:00 p. m.—Heien Carner, pianist.  
11:15 p. m.—Lefebvre.  
11:30 p. m.—Luth Rath, songs.  
11:45 p. m.—L. Wolfe Gilbert and Abel Baer, songs.  
12:00 p. m.—Talk.  
12:15 p. m.—Helen and Jerome, songs.  
12:30 p. m.—Ridgely's Serenaders.  
12:45 p. m.—Ridgely's Serenaders.  
1:00 p. m.—Silver Slipper Orchestra.  
1:15 p. m.—Melody Orchestra.  
1:30 p. m.—The Blue Bird.  
12:30 a. m.—Ted Lewis's Orchestra.  
**WNYC—NEW YORK CITY—522**  
11:15 a. m.—Decorative Floors, Pendergast.  
11:30 a. m.—Morning concert.  
11:45 a. m.—Joe Schmitt's recital.  
12:00 p. m.—Lunch-Master program.  
3:30 p. m.—Seventh anniversary of singing armistice.  
4:00 p. m.—Celebration, from Central Park Invocation. Songs by school children.  
4:15 p. m.—Lecture.  
4:30 p. m.—Prayer.  
4:45 p. m.—Radio high spots.  
5:00 p. m.—Piano selections.  
5:15 p. m.—Organ recital; market.  
5:30 p. m.—Theater orchestra.  
5:45 p. m.—Organ recital; market.  
6:00 p. m.—Theater orchestra.  
6:15 p. m.—Organ recital; market.  
6:30 p. m.—Theater orchestra.  
6:45 p. m.—Organ recital; market.  
7:00 p. m.—Theater orchestra.  
7:15 p. m.—Organ recital; market.  
7:30 p. m.—Theater orchestra.  
7:45 p. m.—Organ recital; market.  
8:00 p. m.—Theater orchestra.  
8:15 p. m.—Organ recital; market.  
8:30 p. m.—Theater orchestra.  
8:45 p. m.—Organ recital; market.  
9:00 p. m.—Theater orchestra.  
9:15 p. m.—Organ recital; market.  
9:30 p. m.—Theater orchestra.  
9:45 p. m.—Organ recital; market.  
10:00 p. m.—Theater orchestra.  
10:15 p. m.—Organ recital; market.  
10:30 p. m.—Theater orchestra.  
10:45 p. m.—Organ recital; market.  
11:00 p. m.—Theater orchestra.  
11:15 p. m.—Organ recital; market.  
11:30 p. m.—Theater orchestra.  
11:45 p. m.—Organ recital; market.  
12:00 p. m.—Theater orchestra.  
12:15 p. m.—Organ recital; market.  
12:30 p. m.—Theater orchestra.  
12:45 p. m.—Organ recital; market.  
1:00 p. m.—Theater orchestra.  
1:15 p. m.—Organ recital; market.  
1:30 p. m.—Theater orchestra.  
1:45 p. m.—Organ recital; market.  
2:00 p. m.—Theater orchestra.  
2:15 p. m.—Organ recital; market.  
2:30 p. m.—Theater orchestra.  
2:45 p. m.—Organ recital; market.  
3:00 p. m.—Theater orchestra.  
3:15 p. m.—Organ recital; market.  
3:30 p. m.—Theater orchestra.  
3:45 p. m.—Organ recital; market.  
4:00 p. m.—Theater orchestra.  
4:15 p. m.—Organ recital; market.  
4:30 p. m.—Theater orchestra.  
4:45 p. m.—Organ recital; market.  
5:00 p. m.—Theater orchestra.  
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11:45 p. m.—Organ recital; market.  
12:00 p. m.—Theater orchestra.  
12:15 p. m.—Organ recital; market.  
12:30 p. m.—Theater orchestra.  
12:45 p. m.—Organ recital; market.  
1:00 p. m.—Theater orchestra.  
1:15 p. m.—Organ recital; market.  
1:30 p. m.—Theater orchestra.  
1:45 p. m.—Organ recital; market.  
2:00 p. m.—Theater orchestra.  
2:15 p. m.—Organ recital; market.  
2:30 p. m.—Theater orchestra.  
2:45 p. m.—Organ recital; market.  
3:00 p. m.—Theater orchestra.  
3:15 p. m.—Organ recital; market.  
3:30 p. m.—Theater orchestra.  
3:45 p. m.—Organ recital; market.  
4:00 p. m.—Theater orchestra.  
4:15 p. m.—Organ recital; market.  
4:30 p. m.—Theater orchestra.  
4:45 p. m.—Organ recital; market.  
5:00 p. m.—Theater orchestra.  
5:15 p. m.—Organ recital; market.  
5:30 p. m.—Theater orchestra.  
5:45 p. m.—Organ recital; market.  
6:00 p. m.—Theater orchestra.  
6:15 p. m.—Organ recital; market.  
6:30 p. m.—Theater orchestra.  
6:45 p. m.—Organ recital; market.  
7:00 p. m.—Theater orchestra.  
7:15 p. m.—Organ recital; market.  
7:30 p. m.—Theater orchestra.  
7:45 p. m.—Organ recital; market.  
8:00 p. m.—Theater orchestra.  
8:15 p. m.—Organ recital; market.  
8:30 p. m.—Theater orchestra.  
8:45 p. m.—Organ recital; market.  
9:00 p. m.—Theater orchestra.  
9:15 p. m.—Organ recital; market.  
9:30 p. m.—Theater orchestra.  
9:45 p. m.—Organ recital; market.  
10:00 p. m.—Theater orchestra.  
10:15 p. m.—Organ recital; market.  
10:30 p. m.—Theater orchestra.  
10:45 p. m.—Organ recital; market.  
11:00 p. m.—Theater orchestra.  
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11:30 p. m.—Theater orchestra.  
11:45 p. m.—Organ recital; market.  
12:00 p. m.—Theater orchestra.  
12:15 p. m.—Organ recital; market.  
12:30 p. m.—Theater orchestra.  
12:45 p. m.—Organ recital; market.  
1:00 p. m.—Theater orchestra.  
1:15 p. m.—Organ recital; market.  
1:30 p. m.—Theater orchestra.  
1:45 p. m.—Organ recital; market.  
2:00 p. m.—Theater orchestra.  
2:15 p. m.—Organ recital; market.  
2:30 p. m.—Theater orchestra.  
2:45 p. m.—Organ recital; market.  
3:00 p. m.—Theater orchestra.  
3:15 p. m.—Organ recital; market.  
3:30 p. m.—Theater orchestra.  
3:45 p. m.—Organ recital; market.  
4:00 p. m.—Theater orchestra.  
4:15 p. m.—Organ recital; market.  
4:30 p. m.—Theater orchestra.  
4:45 p. m.—Organ

**THURSDAY**

**THURSDAY**

**WJZ—NEW YORK CITY—455**

10 a. m.—Women's program.  
11 a. m.—News.  
12 p. m.—Nathaniel Abrah's luncheon music.  
2, 4, 5, 7:30, 7:40 and 10:30 p. m.—News.  
6:30 p. m.—The "Hollywood Canteen."  
7:43 p. m.—Bernhard Levittow's Orchestra.  
8:47 a. m.—Market quotations.  
9:50 p. m.—Financial summary.  
10:30 p. m.—University course.  
7 p. m.—Bernhard Levittow's Dinner Or.  
8 p. m.—U. S. Army Band.  
9 p. m.—Helen Howlison, soprano.  
10:30 p. m.—Ben Glaser's Orchestra.

**WEA—NEW YORK CITY—405**

10 p. m.—Vocalists' quartet.  
8:15 p. m.—"The National Horse Show," Joe Moss.  
7:45 a. m.—"Health Exercises" to WEA, WEEL, WCAP.  
10:30 p. m.—"Music Hour"; speakers' music.  
10:30 p. m.—Market and weather reports.  
11 p. m.—Charles Phillips, pianist.  
4:30 p. m.—Alma Westmont, soprano.  
4:30 p. m.—Charles Phillips, pianist.  
4:45 p. m.—Talk.  
6 p. m.—Mid-week services: Federation of Churches; address by Rev. Arthur Bruce Moss.  
7:30 p. m.—Serenaders.  
8:30 p. m.—"The Fourth Annual Race." "The Hootery."  
8:30 p. m.—"Touring," George Cooley.  
9:30 p. m.—"The Fourth Annual Race before the Fourth Annual Radio Conference."  
9:30 p. m.—Music.  
10 p. m.—The "Zipper".  
11:10 p. m.—Wincent Lopez's Orchestra.

**WGSR—NEW YORK CITY—316**

10 a. m.—Timely talks with Teresa.  
11:10 a. m.—"The Music of the Holy City."  
10:20 a. m.—Furniture talk; songs.  
10:40 a. m.—"Flowers and Gardens"; songs.  
10:50 p. m.—Songs.  
1:35 p. m.—Rosalee Blanchard, Walter.  
1:40 p. m.—Leonard Garfunkle, pianist.  
2 p. m.—Nat King's Orchestra.  
2 p. m.—Words from the "Milk and Honey."  
3 p. m.—Uncle Geebee.  
6 p. m.—Pearl Bailey animal impersonations.  
6:40 p. m.—"What the World is Doing."  
7 p. m.—Harry Voltaire hour.  
8 p. m.—Dance orchestra.  
8:30 p. m.—Billie Holiday, Walter Allerton.

|                           |                      |
|---------------------------|----------------------|
| Charles Jones, "Salesman- | 12:30 p. m.—Concert  |
|                           | 2-3 p. m.—Concert or |

[illegible]

m.—Dinner concert.  
m.—Program from WEAJ.

|                               |       |   |    |    |   |
|-------------------------------|-------|---|----|----|---|
| 8                             | 10    | <b>WKEO—LANING—300</b><br>7 p. m.—Band, glee club, artists.                   | 10 | 10 | Songs; address by Joseph Thompson.<br>8:15 p. m.—Drum and Band Corps. |
| 8                             | 8:15  | p. m.—Band, glee club, artists.   | 10 | 10 | 10:25 p. m.—Lawrence Metkalf, witness.                                |
| 7                             | 7     | <b>WTC—RICHMOND—400</b><br>8:45 p. m.—(238 meters)—Musical features.          | 10 | 10 | 10:30 p. m.—Police alarms; weather.                                   |
| 7                             | 7     | p. m.—Classical.  | 10 | 10 | <b>WENY—NEW YORK CITY—350</b>   |
| 11                            | 11:10 | p. m.—Dance music.  | 10 | 10 | 10:30 a. m.—Reducing exercises.                                       |
| 1                             | 1     | <b>WVAC—CHICAGO—448</b><br>7:40 p. m.—La Salle Orchestra.                     | 10 | 10 | 10:45 a. m.—Health address.   |
| 7                             | 7:30  | p. m.—Broadway musical songs.   | 10 | 10 | 10:45 p. m.—Gardening; "Timology."                                    |
| 7                             | 7:40  | p. m.—Travel talk.  | 10 | 10 | 10:45 p. m.—Transcendental "Telephony."                               |
| 10                            | 10:20 | p. m.—Musical program.  | 10 | 10 | 10:45 p. m.—Harvey Corbett, "Adventure."                              |
| 7                             | 7:15  | p. m.—Classical.  | 10 | 10 | 10:45 p. m.—Francis X. Yoda, "Superstitions."                         |
| 8                             | 8     | <b>WLS—CHICAGO—345</b><br>8:30 p. m.—"The Captive Days of Italy."             | 10 | 10 | 10:45 p. m.—Anita Dunn, soprano.                                      |
| 8                             | 8     | <b>KYW—CHICAGO—336</b><br>8 p. m.—Musical program.                            | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 8                             | 8     | p. m.—Concert program.  | 10 | 10 | 10:45 p. m.—Jack Smith, songs.  |
| 8                             | 8     | p. m.—Revelin Club.   | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 2                             | 2     | <b>WISN—MILWAUKEE—370</b><br>8:15 p. m.—Dinner concert.                       | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 8                             | 8     | p. m.—Dance selections; theater bits.   | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 8                             | 8     | <b>WGN—CHICAGO—370</b><br>7:30 p. m.—Classical hour.                          | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 7                             | 7:30  | p. m.—Classical hour.   | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 11                            | 11:30 | p. m.—Musical features.   | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 7                             | 7     | <b>WVMA—CHICAGO—217</b><br>7 p. m.—Artists.                                   | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 7                             | 7     | p. m.—Musical features.   | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 7                             | 7     | <b>WENR—CHICAGO—266</b><br>7 p. m.—Dinner concert.                            | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 7                             | 7     | p. m.—Dinner concert.   | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 8                             | 8     | <b>WQJ—CHICAGO—448</b><br>8 p. m.—Dinner concert.                             | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 8                             | 8     | p. m.—Rainbow Skyline.  | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 2                             | 2     | <b>WCBQ—DAN, ILL.—345</b><br>8 p. m.—Clarinet quartet and quartets.           | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 7                             | 7     | <b>WCF—CHICAGO—345</b><br>8:30 p. m.—Program from WEAF.                       | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 10                            | 10:30 | p. m.—Crescent Orchestra.   | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| <b>WEDNESDAY</b>              |       |   |    |    |   |
| <b>WJZ—NEW YORK CITY—455</b>  |       |   |    |    |   |
| 10                            | 10    | a. m.—News service.   | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 1:15                          | 1:15  | p. m.—Arwin Abrams's Orchestra.   | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 4:05                          | 4:05  | p. m.—Louis Danz and orchestra.   | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 4:30                          | 4:30  | p. m.—Joseph Knecht's Orchestra.  | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 5:32                          | 5:32  | p. m.—Market quotations.  | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 5:52                          | 5:52  | p. m.—Market quotations.  | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 6:30                          | 6:30  | p. m.—N. Y. University confere: "Success."                                    | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 6:50                          | 6:50  | p. m.—Variety professions; Prof. James B. Lough.                              | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 8                             | 8     | p. m.—Dinner orchestra.   | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 8                             | 8     | p. m.—Edison hour.  | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 8                             | 8     | p. m.—Armistice Day program; U. S. National Anthem; "The Memory of the Dead." | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| <b>WVMA—NEW YORK CITY—341</b> |       |   |    |    |   |
| 8                             | 8     | p. m.—Scott Vail's String Ensemble.   | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 8                             | 8     | p. m.—Brunt's Orchestra.  | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 7:50                          | 7:50  | p. m.—Violet Kaye, "Happy Girl."  | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 7:50                          | 7:50  | p. m.—Majestic String Ensemble.   | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 8                             | 8     | p. m.—Services from Northminster Church.                                      | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 8                             | 8     | p. m.—Joseph Watshel, tenor.  | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 8                             | 8     | p. m.—Frank Wadsworth, "Your Job."  | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 8                             | 8     | p. m.—Lundy Smith's Orchestra.  | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 11                            | 11    | p. m.—Entertainers.   | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 11:30                         | 11:30 | p. m.—Jack Smith, songs.  | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| <b>WBBH—NEW YORK CITY—275</b> |       |   |    |    |   |
| 2                             | 2     | p. m.—Dave Brown's Orchestra.   | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 2                             | 2     | p. m.—Marion Doran, soprano.  | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 2                             | 2     | p. m.—Tommy Doran and orchestra.  | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
| 1:15                          | 1:15  | p. m.—Emma Kniesels, songs.   | 10 | 10 | 10:45 p. m.—Majestic String Ensemble.                                 |
|                               |       |   |    |    |   |

—Elizabeth Baumann, 1  
—Jack Wehrten, Paul E

9:30 p. m.—Y. M. C. A. program, Glee Club.  
10:00 p. m.—Norman Seaton, pianist.  
10:10 p. m.—Paul Lowenkron, violinist.  
10:20 p. m.—Norman Seaton, pianist.  
10:30 p. m.—Arrowhead Orchestra.  
**WNYC—NEW YORK CITY—536**  
6 p. m.—Dinner music.  
7 p. m.—Market high spots.  
7:10 p. m.—Dance program.  
7:30 p. m.—Police alarms; weather.  
7:45 p. m.—Dance orchestra.  
7:55 p. m.—Dance orchestra.  
8:10 p. m.—Haskell Proper, saxophone.  
8:20 p. m.—Footlight chorus, Coster.  
8:35 p. m.—Samuel Gray, baritone.  
8:45 p. m.—Gedney and Magee, banjoists.  
9:00 p. m.—Samuel Gray, baritone.  
9:15 p. m.—New York Zither Trio.  
9:30 p. m.—Haskell Proper, saxophone.  
10:10 p. m.—"Trend of the Times."  
10:30 p. m.—Police alarms; weather.  
**WNYC—NEW YORK CITY—561**  
12:30 p. m.—Lexington organ, recital.  
3:15 p. m.—Lexington Orchestra.  
6:40 p. m.—Sunshine Lull, Billy B. Van.  
7:10 p. m.—Sunshine Lull, Billy B. Van.  
7:30 p. m.—Music.  
8:00 p. m.—Claretta Chateau Shantay.  
8:30 p. m.—Guardian Entertainers.  
9:00 p. m.—Jimmy Clarke's Entertainers.  
9:10 p. m.—Quintet.  
10:30 p. m.—Kentucky Orchestra.  
10:40 p. m.—Warfare Orchestra.  
11:30 p. m.—Rodeo Orchestra.  
12:30 a. m.—Ted Lewis's Orchestra.  
**WNYC—NEW YORK CITY—569**  
10:30 a. m.—Reducing Exercises.  
10:45 a. m.—Mrs. Rose Berry, "Painting."  
11 a. m.—"New Books."  
11:15 a. m.—"Musical Courier Says"  
Footlight chorus.  
4:15 p. m.—Afternoon program.  
7:00 p. m.—"Whose Birthday To-day?"  
7:10 p. m.—Footlight chorus.  
7:15 p. m.—Commerce of the day.  
7:20 p. m.—Chef Cretaux chaus.  
7:30 p. m.—Geoffrey, "The Song."  
7:45 p. m.—Dr. George J. Fisher.  
8:00 p. m.—Concord.  
8:30 p. m.—Radio questions and answers.  
8:45 p. m.—Lille's jokes.  
9:00 p. m.—Talk, lecture, Bernberger.  
9:15 p. m.—Lorra Lee, songs.  
9:30 p. m.—The "Big" Symphony.  
9:35 p. m.—Bill Rice's songs.  
9:45 p. m.—Reste.  
10:00 p. m.—Crowell's Classic.  
10:10 p. m.—Volga Trio.  
11 p. m.—Radio and Theater.  
**WMCA—NEW YORK CITY—341**  
6 p. m.—Oleott Vahl's String Ensemble.  
6:30 p. m.—Robert Sofer, pianist.  
6:45 p. m.—Dejeu, "The Song."  
7:15 p. m.—Lecture program.  
7:30 p. m.—Lecture program.

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|--|--|--------------------------------|---------------------------------------|--------------------------------------|--|----------------------------------|--|--|
| <b>WPG-ATLANTIC CITY-300</b>               |  |                                | <b>WJY-NEW YORK CITY-405</b>          |                                      |  | <b>WKBO-CINCINNATI-422</b>       |  |  |
| 8:35 p. m.-Organ recital.                  | 6 p. m.-Dinner music.                      | 11 p. m.-Dance music.          | 8:30 p. m.-Henry Burling; Henry Kaye. | 8 p. m.-Ross Gorman's Orchestra.     | 8:45-7:15 a. m.-Gym class.               | 7 p. m.-Dinner concert.          | 9 p. m.-Alexander Dellerson, barytone.   |  |
| 8:45 p. m.-Vocal and instrumental recital. | 7 p. m.-Mariboro State Trio.               | <b>WTI-PHILADELPHIA-395</b>    | 9 p. m.-Minnie Well, pianist.         | 8:30-11 p. m.-Program from WEAF.     | 10:20 a. m.-Beauty talk; songs.          | 9:15 p. m.-Idalla Hare, soprano. | 9:30 p. m.-Idalla Hare, soprano.         |  |
|  | 7:30 p. m.-Swanée Orchestra.               | 10:30 p. m.-Solos.             | 9:30 p. m.-Catherine Harvey, soprano. | <b>WNA-BOSTON-280</b>                | 10:40 a. m.-Housefurnishing talk; songs. | 9:30 p. m.-Book review.          | 9:30 p. m.-George Kohlmeyer's Orchestra. |  |
|  | 8 p. m.-"Storage Batteries," H. B. Shontz. | 10:40 a. m.-Home Service Talk. | 10 p. m.-Charles Dethorn, Hawaiian    | 10:30 a. m.-Bible readings.          | 1:30 p. m.-Scripture reading.            | 9:15 p. m.-Dance music.          |  |  |
|  |  |                                | 9 P. M.-Charles Dethorn, Hawaiian     | 10:30 a. m.-Yvonne C. Chapp, talk.   | 1:35 p. m.-Lillian Jesso, soprano.       |                                  |  |  |
|  |  |                                |                                       | 10 p. m.-South American Troubadours. | 3 p. m.-William Burke, tenor.            |                                  |  |  |
|  |  |                                |                                       |                                      | 3 p. m.-Marion Adams, soprano.           |                                  |  |  |
|  |  |                                |                                       |                                      | 3 p. m.-William Burke, tenor.            |                                  |  |  |

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**WEEH-TAERTTOWN, N. Y.—273**

8 p. m.—Services.

10:30 p. m.—Musical program.

10:30 a. m.—Reducing exercises.

10:45 a. m.—New books in review.

11 a. m.—Charlotte Rueliau, songs.

11:15 a. m.—“Musical Courier” says—

8:30 p. m.—Talk, John Loughran; re-

8:30 p. m.—Rudolph Joskowitz, violinist.

8:30 p. m.—Ford and McLean.

11 p. m.—Dance music.

7:10 p. m.—Julie Wintz's Collegians.

“Idioms.”

8:45 p. m.—Dick and Flo Bernard, songs.

9 p. m.—Sam Siegel, mandolin.

9:15 p. m.—Captain Anton Heinen, “Air-Play.”

WWJ-Detroit-353

8 p. m.—Billy Cohen's Hotnots.

8 p. m.—Orchestra and soloists.

9 p. m.—Program from WEAF.

4 p. m.—Radlovics, Mrs. Owen Kildara.

4:30 p. m.—Volly Endries, contralto.

6:45 p. m.—Murray Schwartz, pianist.

7:45 p. m.—Evening services.  
 9:15-10:15 p. m.—Atwater Kent hour.  
**WHAM—ROCHESTER, N. Y.—278**  
 4:30 p. m.—Henry Rogers, pianist.  
 7 p. m.—"Whose Birthday Day-to-day"  
 8:15 p. m.—Concert orchestra.  
 8:30 p. m.—Artist recital.  
 9 p. m.—Stanley Theatre Movie Review;  
 orchestra; organ recital.  
 10 p. m.—Allan Concert Trio.  
**WOR—BOSTON, MASS.—312**  
 4:15 p. m.—Henry S. Eldor of music.  
 4:15 p. m.—Brayton Eddy, "Water Ani-  
 mals."  
 8:15 p. m.—Allan Concert Trio.  
 9:30 p. m.—News Bulletin.  
 10:15 p. m.—Julius Seebach, barytone.  
 10:30 p. m.—Allan Concert Trio.  
**WOR—PORTLAND, ME.—317**  
 7 p. m.—Jean Goldkette's Orchestra; solo-  
 ists.  
 8:30 p. m.—Hock and Jerome, songs.  
 9 p. m.—Bai Masque Orchestra.  
 7:30 p. m.—Health Talk, Dr. H. H.  
 Rubin.

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|                                    |                                    |                                    |       |      |     |               |                       |                                     |                       |             |       |      |        |                         |  |
|------------------------------------|------------------------------------|------------------------------------|-------|------|-----|---------------|-----------------------|-------------------------------------|-----------------------|-------------|-------|------|--------|-------------------------|--|
| 1:30 p. m.—Concert.                | 8:15 p. m.—Music "Travelogue."     | 10:15 p. m.—James Loughrey, tenor. | 10:30 | WGWS | 318 | Arrowhead     | 9:10                  | WOKO                                | 233                   | Dance music | 11:30 | WGR  | 219    | Vicent's Lovers         | 9 p. m.—Musical program.                         |
| 2 p. m.—Variety musical program.   | 8:30 p. m.—Vernahlie.              | <b>WHAR-ATLANTIC CITY-275</b>      | 10:30 | WIP  | 508 | Dance music   | 9:35 p. m.—Orchestra. | 9:35 p. m.—Daddy Winkum's Rhyme Ma- | 9:35 p. m.—Orchestra. | 11:30       | WGBH  | 213  | Forham | 9 p. m.—Midnight revue. |  |
| 8:45 p. m.—"The Boat," Dr. Holton. | 8:45 p. m.—"The Boat," Dr. Holton. | 2 p. m.—Seaside Trio.              | 10:48 | WNVC | 526 | Harry Ash's   | 10:00                 | WVAB                                | 432                   | Joe Ray's   | 12:00 | WGCP | 232    | Connie's                | 10:15 p. m.—"Marriage and Divorce," Mr. McMahon. |
| 8:45 p. m.—"The Boat," Dr. Holton. | 8:45 p. m.—"The Boat," Dr. Holton. | 7:30 p. m.—Fashion review.         | 11:00 | WVAF | 432 | Meyer Davis's | 10:30                 | WGBZ                                | 333                   | Joe Ray's   |       |      |        |                         | 11 p. m.—Orchestra selections.                   |
| 8:45 p. m.—"The Boat," Dr. Holton. | 8:45 p. m.—"The Boat," Dr. Holton. | 8 p. m.—Seaside Trio.              | 11:00 | WVAF | 432 | Meyer Davis's | 10:30                 | WGBZ                                | 333                   | Joe Ray's   |       |      |        |                         | 8:30 p. m.—Rock and Jerome songs.                |
| 8:45 p. m.—"The Boat," Dr. Holton. | 8:45 p. m.—"The Boat," Dr. Holton. | 8 p. m.—Seaside Trio.              | 11:00 | WVAF | 432 | Meyer Davis's | 10:30                 | WGBZ                                | 333                   | Joe Ray's   |       |      |        |                         | <b>WGN-CHICAGO-370</b>                           |
| 8:45 p. m.—"The Boat," Dr. Holton. | 8:45 p. m.—"The Boat," Dr. Holton. | 8 p. m.—Seaside Trio.              | 11:00 | WVAF | 432 | Meyer Davis's | 10:30                 | WGBZ                                | 333                   | Joe Ray's   |       |      |        |                         | 8:30 p. m.—Orchestra selections.                 |
| 8:45 p. m.—"The Boat," Dr. Holton. | 8:45 p. m.—"The Boat," Dr. Holton. | 8 p. m.—Seaside Trio.              | 11:00 | WVAF | 432 | Meyer Davis's | 10:30                 | WGBZ                                | 333                   | Joe Ray's   |       |      |        |                         | 10:50 p. m.—Orchestra selections.                |
| 8:45 p. m.—"The Boat," Dr. Holton. | 8:45 p. m.—"The Boat," Dr. Holton. | 8 p. m.—Seaside Trio.              | 11:00 | WVAF | 432 | Meyer Davis's | 10:30                 | WGBZ                                | 333                   | Joe Ray's   |       |      |        |                         | 10:50 p. m.—Orchestra selections.                |
| 8:45 p. m.—"The Boat," Dr. Holton. | 8:45 p. m.—"The Boat," Dr. Holton. | 8 p. m.—Seaside Trio.              | 11:00 | WVAF | 432 | Meyer Davis's | 10:30                 | WGBZ                                | 333                   | Joe Ray's   |       |      |        |                         | 10:50 p. m.—Orchestra selections.                |
| 8:45 p. m.—"The Boat," Dr. Holton. | 8:45 p. m.—"The Boat," Dr. Holton. | 8 p. m.—Seaside Trio.              | 11:00 | WVAF | 432 | Meyer Davis's | 10:30                 | WGBZ                                | 333                   | Joe Ray's   |       |      |        |                         | 10:50 p. m.—Orchestra selections.                |
| 8:45 p. m.—"The Boat," Dr. Holton. | 8:45 p. m.—"The Boat," Dr. Holton. | 8 p. m.—Seaside Trio.              | 11:00 | WVAF | 432 | Meyer Davis's | 10:30                 | WGBZ                                | 333                   | Joe Ray's   |       |      |        |                         | 10:50 p. m.—Orchestra selections.                |
| 8:45 p. m.—"The Boat," Dr. Holton. | 8:45 p. m.—"The Boat," Dr. Holton. | 8 p. m.—Seaside Trio.              | 11:00 | WVAF | 432 | Meyer Davis's | 10:30                 | WGBZ                                | 333                   | Joe Ray's   |       |      |        |                         | 10:50 p. m.—Orchestra selections.                |
| 8:45 p. m.—"The Boat," Dr. Holton. | 8:45 p. m.—"The Boat," Dr. Holton. | 8 p. m.—Seaside Trio.              | 11:00 | WVAF | 432 | Meyer Davis's | 10:30                 | WGBZ                                | 333                   | Joe Ray's   |       |      |        |                         | 10:50 p. m.—Orchestra selections.                |
| 8:45 p. m.—"The Boat," Dr. Holton. | 8:45 p. m.—"The Boat," Dr. Holton. | 8 p. m.—Seaside Trio.              | 11:00 | WVAF | 432 | Meyer Davis's | 10:30                 | WGBZ                                | 333                   | Joe Ray's   |       |      |        |                         | 10:50 p. m.—Orchestra selections.                |
| 8:45 p. m.—"The Boat," Dr. Holton. | 8:45 p. m.—"The Boat," Dr. Holton. | 8 p. m.—Seaside Trio.              | 11:00 | WVAF | 432 | Meyer Davis's | 10:30                 | WGBZ                                | 333                   | Joe Ray's   |       |      |        |                         | 10:50 p. m.—Orchestra selections.                |
| 8:45 p. m.—"The Boat," Dr. Holton. | 8:45 p. m.—"The Boat," Dr. Holton. | 8 p. m.—Seaside Trio.              | 11:00 | WVAF | 432 | Meyer Davis's | 10:30                 | WGBZ                                | 333                   | Joe Ray's   |       |      |        |                         | 10:50 p. m.—Orchestra selections.                |
| 8:45 p. m.—"The Boat," Dr. Holton. | 8:45 p. m.—"The Boat," Dr. Holton. | 8 p. m.—Seaside Trio.              | 11:00 | WVAF | 432 | Meyer Davis's | 10:30                 | WGBZ                                | 333                   | Joe Ray's   |       |      |        |                         | 10:50 p. m.—Orchestra selections.                |
| 8:45 p. m.—"The Boat," Dr. Holton. | 8:45 p. m.—"The Boat," Dr. Holton. | 8 p. m.—Seaside Trio.              | 11:00 | WVAF | 432 | Meyer Davis's | 10:30                 | WGBZ                                | 333                   | Joe Ray's   |       |      |        |                         | 10:50 p. m.—Orchestra selections.                |
| 8:45 p. m.—"The Boat," Dr. Holton. | 8:45 p. m.—"The Boat," Dr. Holton. | 8 p. m.—Seaside Trio.              | 11:00 | WVAF | 432 | Meyer Davis's | 10:30                 | WGBZ                                | 333                   | Joe Ray's   |       |      |        |                         | 10:50 p. m.—Orchestra selections.                |
| 8:45 p. m.—"The Boat," Dr. Holton. | 8:45 p. m.—"The Boat," Dr. Holton. | 8 p. m.—Seaside Trio.              | 11:00 | WVAF | 432 | Meyer Davis's | 10:30                 | WGBZ                                | 333                   | Joe Ray's   |       |      |        |                         | 10:50 p. m.—Orchestra selections.                |
| 8:45 p. m.—"The Boat," Dr. Holton. | 8:45 p. m.—"The Boat," Dr. Holton. | 8 p. m.—Seaside Trio.              | 11:00 | WVAF | 432 | Meyer Davis's | 10:30                 | WGBZ                                | 333                   | Joe Ray's   |       |      |        |                         | 10:50 p. m.—Orchestra selections.                |
| 8:45 p. m.—"The Boat," Dr. Holton. | 8:45 p. m.—"The Boat," Dr. Holton. | 8 p. m.—Seaside Trio.              | 11:00 | WVAF | 432 | Meyer Davis's | 10:30                 | WGBZ                                | 333                   | Joe Ray's   |       |      |        |                         | 10:50 p. m.—Orchestra selections.                |
| 8:45 p. m.—"The Boat," Dr. Holton. | 8:45 p. m.—"The Boat," Dr. Holton. | 8 p. m.—Seaside Trio.              | 11:00 | WVAF | 432 | Meyer Davis's | 10:30                 | WGBZ                                | 333                   | Joe Ray's   |       |      |        |                         | 10:50 p. m.—Orchestra selections.                |
| 8:45 p. m.—"The Boat," Dr. Holton. | 8:45 p. m.—"The Boat," Dr. Holton. | 8 p. m.—Seaside Trio.              | 11:00 | WVAF | 432 | Meyer Davis's | 10:30                 | WGBZ                                | 333                   | Joe Ray's   |       |      |        |                         |  |

|                                      |  |   |  |                              |  |                              |  |                                |  |                                |  |                                      |  |                                    |  |
|--------------------------------------|--|---|--|------------------------------|--|------------------------------|--|--------------------------------|--|--------------------------------|--|--------------------------------------|--|------------------------------------|--|
| <b>WJAB—PROVIDENCE—308</b>           |  | 10:15 p. m.—Popular Songs.                |  | <b>WFG—ATLANTIC CITY—300</b> |  | 8-9 WMAK 266 M. Whiteman's   |  | 10:30 WHN 361 Dance music      |  | 10:30 WHN 361 Dance music      |  | 7-00 WNYC 526 Dance music            |  | <b>WOR—NEW YORK CITY—233</b>       |  |
| 10:20 p. m.—Capitol Theater Family.  |  | 10:30 p. m.—Rose Dreeben, "Poet Peasant." |  | 4:30 p. m.—"Tea music."      |  | 8-05 WHN 361 Roseland        |  | 10:30 WJZ 455 Ben Glaser's     |  | 8-00 WJZ 455 Dance music       |  | 8:20 p. m.—Chari of Thomee, pianist. |  | 8:15 p. m.—Bertha Penco, soprano.  |  |
| 10:15 p. m.—Atwater Kent.            |  |   |  | 6:45 p. m.—Organ recital.    |  | 8-50 WGBB 244 Bill Wybrand's |  | 10:30 WRC 469 Meyer Davis's    |  | 10:30 WRC 469 Meyer Davis's    |  | 8:50 p. m.—Lulu Weyant.              |  | 8:35 p. m.—Charles Reed, tenor.    |  |
| <b>WEE—SPRINGFIELD, MASS.—283</b>    |  | 10:45 p. m.—Florence Gertinger, pianist.  |  | 7 p. m.—Dinner music.        |  | 7 p. m.—Dinner music.        |  | 11-00 WMCB 341 Ernie Goolsby's |  | 11-00 WMCB 341 Ernie Goolsby's |  | 8-30 WRNY 259 Ben Bernie's           |  | 8:50 p. m.—Billy Thelard, pianist. |  |
| 10:55 p. m.—Church service, choir of |  |   |  |                              |  |                              |  |                                |  |                                |  |                                      |  |                                    |  |
| <b>WEDNESDAY, NOVEMBER 11</b>        |  |   |  |                              |  |                              |  |                                |  |                                |  |                                      |  |                                    |  |
| 6-00 WJAB—347 Providence             |  |   |  |                              |  |                              |  |                                |  |                                |  |                                      |  |                                    |  |
| <b>WENR—CHICAGO—306</b>              |  |   |  |                              |  |                              |  |                                |  |                                |  |                                      |  |                                    |  |
| 7 p. m.—Dinner concert.              |  |   |  |                              |  |                              |  |                                |  |                                |  |                                      |  |                                    |  |

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## College Prof. Makes Electron Sing for WGY's Radio Audience

The possibility of creating a new musical instrument by utilizing the photo-electric effect was brought out by Dr. Peter I. Wold, professor of physics at Union College, when he introduced the radio audience of WGY to the song of the electron. The demonstration occurred during the fourth of a series of talks on the electron.

As shown in the accompanying illustration, a photo-electric cell was connected to the broadcast circuit, and a disc with many rows of per-

## Engineers Tussel With Elements to Broadcast Chimes

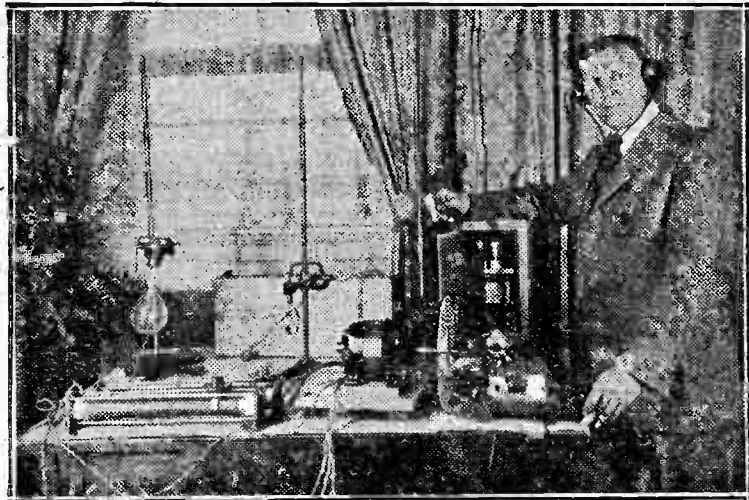
Although the average listener may not realize it as he sits comfortably at home before his loud speaker, often the radio engineer is tussling with the elements to send forth the program which the listener takes as a matter of course. Frequently in broadcasting outside events rain, hail and even the wind has to be considered. Recently, when broadcasting the carillon of the Park Avenue Baptist Church, the engineers were nearly swept to their deaths from the roof of the church when attempting to place several microphones there to pick up the sound of the bells.

Any broadcasting of bells is a difficult engineering feat, for the reason that if the microphones are placed too near the bells the vibrations of the clappers will cause an unpleasant sound to be transmitted. On the other hand, if the microphones

are placed too far from the chimes or carillon, as the case may be, extraneous noises enter into the broadcast and ruin the effect. In practically all of the broadcasts of bells thus far attempted the roof of the church beneath the tower which supports the bells has been found to be the most satisfactory place for the microphones. In the case of the premier broadcasting of the new carillon of the Park Avenue Baptist Church great precautions had to be taken by WJZ's engineers. This group of bells, the largest of their kind in the world, are hung in a tower, the smaller bells at the top and the heavier lower down, where a firmer foundation is found. Placing the microphone was a big problem. High in the tower only the higher pitched bells registered with the heavier tones in the background. At a lower level the rumble of the deep bells monopolized the microphones with the higher bells jingling in the background. Again, the roof of the church proved to be the solution, and here was where the elements did their work.

On the night of the first broadcast an eighty-mile an hour gale swept the roof of the edifice, and the placing of the "mics" was a dangerous feat with a long drop to the street awaiting a single misstep. After the microphones had been placed the wind howled around the diaphragms, keeping up a constant accompaniment to the playing of the carillon. Again the engineers ventured forth on the roof, this time carrying blankets, coats and other pieces of material which were heaped up around the sensitive microphones and deflected the wind. But there were not enough to fully protect the "mics," so they shed their overcoats and added them to the pile of protecting cloth and the broadcast went on. And so the next time you sit comfortably at home and hear your favorite program give a thought to those who toil to make all this possible, and be a little more thankful for your radio set.

**Colored Leads Save Tubes**  
There is less chance of "blowing" tubes if "code wire" or colored leads are used to make the battery connections.



Dr. Peter I. Wold using his apparatus for making electrons sing. At right is the photoelectric cell and left is the light. At rear is the amplifying unit.

separations was placed between the cell and a light source. The photo-electric cell is coated on its inside surface with metal potassium, which is very sensitive to light. At the center of the cell is a plate of tungsten. A battery of 135 volts has its negative terminal connected to the potassium coating and its positive terminal to the tungsten plate. When light falls on the potassium coating electrons are given off and travel to the tungsten plate, thus constituting a current. By means of a motor the disk with circular rows of holes was rotated between the light and the cell. When the disk was revolved slowly a low-pitched note was given off, rising gradually as the speed of the disk increased.

the ingenious experimenter would need only to have rotating discs with rows of holes of the right numbers and arranged so that the light could pass through the holes to the photo-electric cell. Any row or combination of rows could be uncovered by small slides operated from a keyboard, and the loudness of the notes might be controlled conveniently by regulating the brightness of a lamp. A loud speaker could be used to convert the electrical vibrations into sound vibrations. One of the important features of the photo-electric cell is that it is practically instantaneous in its action. It does not require time to build up, as in the case of some other electric musical instruments.

**"Rox" With New Members**  
His "Gang" on Wednesday "Rox" and his "Gang" will be heard during the coming week on Wednesday night from 9 to 10, to be broadcast by WEAF and a chain of stations direct from the studio at 195 Broadway, New York City.

"The Gang" many of whom are members of the old group, such as Doug Stanbury, "Gambly," Frank Moulton and Florence Mulholland, has been augmented by many new entertainers, including Duke Zellman and his orchestra, Jack Oakley, barytone; Joseph Wetzel, tenor; Adrien da Silva, tenor; Max Terr, accompanist; Olive Cornell, coloratura soprano (formerly a member of the WEAF Grand Opera Company); Phoebe Crosby, soprano; Jessica Dragonette, soprano; Frederic Fradkin, violinist; Joseph Stopak, violinist; Geoffrey O'Hara, noted singer-composer, and others.

Beginning Thursday evening, November 26, "Rox" and his "Gang" will be heard regularly through WEAF and a chain of stations.

**Brass Fixtures Should Be Used**  
The use of brass machine screws and nuts is recommended for fixed condenser connections.

## Radiola

THE famous R. C. A. Receiver meets the demand of the broadcast listener, requiring no antenna and having all batteries contained within the cabinet.

Price \$183 COMPLETE LESS BATTERIES

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TERMS, \$3 PER WEEK

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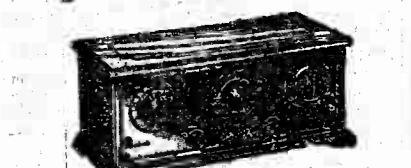
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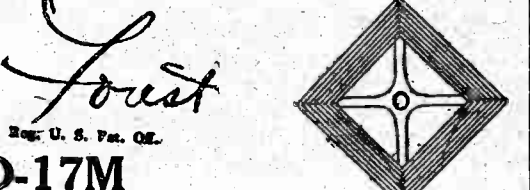
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**ATLAS LOUD SPEAKERS**  
5.95  
List Price \$25.00

Just Arrived! 40 More!



**De Forest D-17M**  
Every one of these sets is factory guaranteed, bearing serial numbers. Mahogany cabinet; built-in speaker; battery compartment; loop included.  
List Price \$180 while they last  
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5 Tube Kits  
Self-balanced low-loss tuned radio frequency kit for 5-tube set  
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**Magnavox**



**MODEL M-4**  
Convenient in Size  
A tremendous sacrifice at this price.  
List Price \$25 **9.85**

**New UX 201A 2500**



**TUBES**  
Bakelite Tipless  
Fit Standard Sockets  
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**MODEL R-3**  
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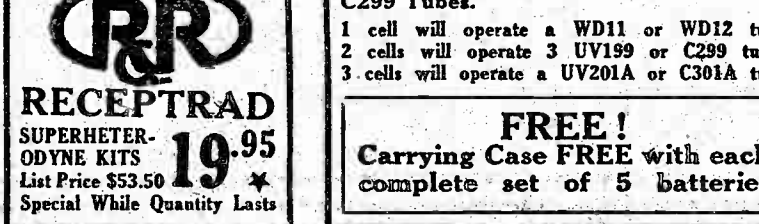
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SUPERHETERODYNE KITS  
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# THE NEW YORK HERALD New York Tribune RADIO MAGAZINE

SECTION TWELVE

SUNDAY, NOVEMBER 15, 1925

16 PAGES

## Radio Problems Discussed at Capital

### Sec. of Commerce Summarizes Fourth Conference Recommends Work of Committees

By HERBERT C. HOOVER\*

WE have just completed the Fourth National Radio Conference in Washington. As I have been the chairman of that conference, I have been requested to report the results of the conference to the radio listeners, for you are the people most vitally concerned in its conclusions. You, the listeners, were represented at the conference through listeners' clubs in different parts of the country and through the radio press, who to a great degree reflect your views. The conference also included representatives of the broadcasting stations; it included representatives of the manufacturers of equipment; it included representatives of many government departments, that is, the army, the navy, agricultural, postoffice, the merchant marine and the Department of Commerce; it included representatives

of neighboring foreign governments. Some 600 men and women left their homes and business affairs in all parts of the country to spend three days in hard work, searching for solution of many radio problems.

The major subject of this whole three-day conference was interference. In the practical terms of the listener interference is the different howls, growls, noises and whistles that come along with programs. We know from the experience of the last few years in this new art that many of these noises can be done away with, but the doing away with them takes us into a dozen varied difficult fields. It involves questions of legislation by Congress to further control the traffic in the ether. It involves treaties with foreign governments to eliminate interference of code signals from their ships at sea and to co-ordinate the broadcasting in foreign countries with our own. It involves many complicated and complex questions in the operation of broadcasting stations. It involves co-operation from the electric light and power companies, that electric currents will not go astray. It involves co-operation of the listeners themselves that they shall keep their own receiving sets so that they do not occasionally make them into sending sets, and thereby disturb their neighbors.

"All radio listeners know that messages over the radio are carried on a specific wave length. They also know that there is only a certain band of these wave lengths from about 200 to 650 meters which can be used for telephone broadcasting. Many of you, perhaps, do not realize the enormous amount of commercial and other radio work that is carried on outside of the broadcasting band.

"But in a certain number of paths over which broadcasting messages can travel from the station to the ears of the listener; and only one of these paths can be used by one station at one time, unless they are a long way apart. Some of these paths are used by our neighbors in Canada for Canadian stations, and ours have come to be an integral part of a single network. To speak in actual figures for all the broadcasting in the United States there are practically eighty-eight wave

By EDGAR H. FELIX

ATTACKING with marked courage and decisiveness the complex problems now facing radio broadcasting, the Fourth Annual Radio Conference, held in Washington last week, formulated the basic principles upon which the development of the art shall be founded. Briefly, it advocated heroic measures to reduce the number of broadcasting stations, it established the basic principle that public service and not private ambition shall determine the extension of the broadcasting privilege, it condemned the manufacture of radiating receivers, it deprecated the use of radio broadcasting for direct advertising, it recommended the removal of broadcasting stations from congested districts and it defined a sound principle upon which the differences between holders of copyrights and broadcasters may be settled.



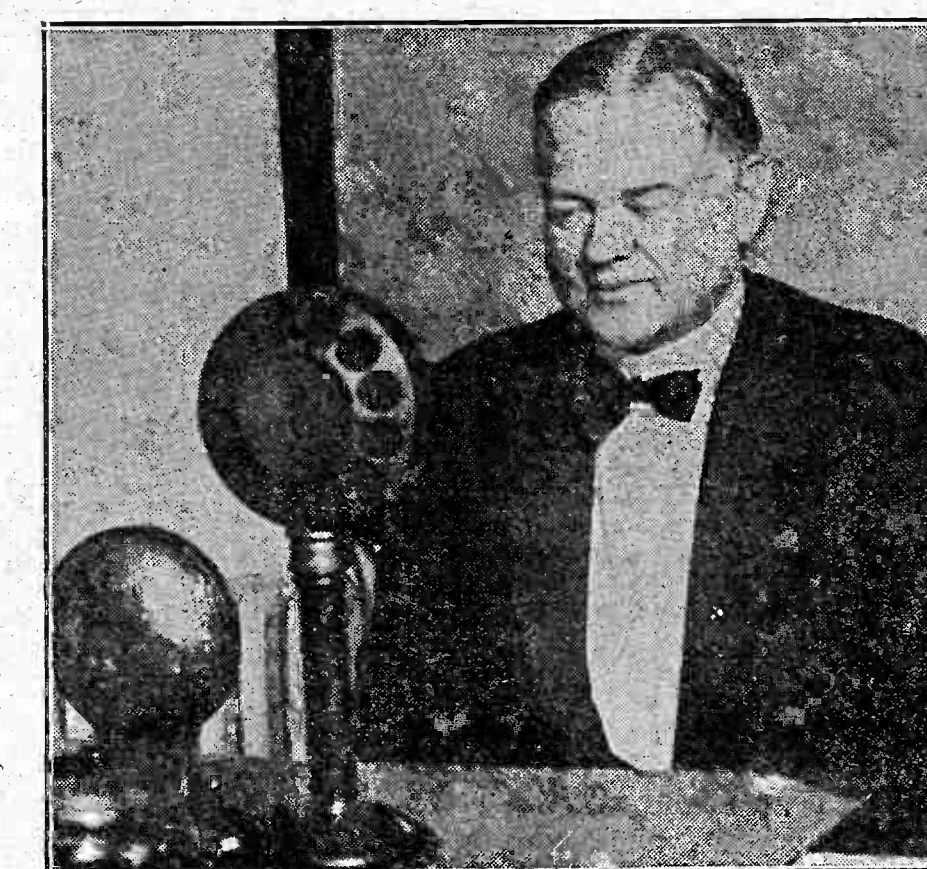
Group of radio conference delegates pictured in the patio of the Chamber of Commerce of the U. S. building at Washington, D. C., where the sessions of the conference were held.

there are now pending before the Department of Commerce over 175 applications for new licenses. . . . Hereafter it has been possible to duplicate channels geographically to a large extent among those using 500 watts, but, with the increase of power, this system becomes more and more difficult, for the borderland of interference is wider spread. . . . It is a physical fact that we have no more channels. It is not possible to furnish them under the present state of

technical development. It takes no argument to demonstrate that eighty-eight wave lengths (and no more are available) cannot be made to serve innumerable stations, no matter how ingenious we may be in arranging time divisions and geographical separations."

The recommendations of the committee on operating regulations, under the chairmanship of Major General Charles M. Saltzman, which grappled with this problem, were accepted with almost entire unanimity by the conference. The committee reported "that the band of frequencies now assigned to broadcasting is overcrowded, causing serious interference. Therefore, the committee recommends, in the interest of public service, that no new stations be licensed until, through discontinuance, the number of stations is reduced and until it shall be in the interest of public service to add new stations."

As a substitute for the doctrine of "freedom of the air," under which licenses were granted to all who applied, until the present congested condition of the ether arose, the committee formulated a new doctrine "that public interest, as represented by service to the listener, shall be the basis for the broadcasting privilege." As a precaution to prevent the erection of stations for which there are no wave lengths available, a resolution was adopted by the conference requiring a permit from the Department of Commerce before actual construction is begun. Representatives of several such stations, erected despite warnings from the Department of Commerce that there would be no wave lengths available for their use, made impassioned pleas before the conference, pointing to the injustice occasioned by the fact that their large investment in broad-



Hon. Herbert C. Hoover broadcasting his address at the close of the 4th annual National Radio Conference from his office in the Chamber of Commerce of the U. S. Building, Washington, D. C.

lengths which can be used at the present development of the art, and we now have nearly 600 broadcasting stations clamoring for their use.

"The air to-day is overcrowded. And even worse, we are faced with the desires

Perhaps no single problem received greater attention than the present intolerable conditions of overcrowding now disturbing broadcast listeners. In the words of the Secretary of Commerce, within whose jurisdiction all problems of radio communication lie, "of the 578 stations 197 are using at least 500 watts of power, and

(Continued on page four)

(Continued on page four)



# Collecting a Bogus Note Via Radio

By Using His Radio "Invention" J. Y. Hampton Collects What Was Thought To Be a Worthless Obligation Thirty Years After It Was Issued

By C. K. THEOBALD

The first installment of this story told how Aleck Smartley, robbed J. Y. Hampton of \$3,000 by playing him with liquor and then giving him a bogus note for his money. After this incident Smartley was not heard from until thirty years later, when George Hampton found him manufacturing radio apparatus in Chicago. As the note was of no value, Hampton planned to extract \$3,000 with interest at 10 per cent from Smartley by some other means. He and his son went to Chicago and assumed the names of J. Yerger Jamison and S. S. Smith. Jamison established himself as a patent lawyer and Smith obtained employment with Smartley and led the latter to believe that he had invented a non-static receiver.

This installment of the story starts with Smith about to demonstrate his invention to his employer and patent attorney.

SMITH led his companions up a creaky flight of stairs, then along a musty-smelling hall to the rear of the building, where he opened a padlocked door.

"This is my shop," he explained, relocking the door when the three had entered the room. "And this," he added proudly, pointing out an instrument on a table in the middle of the room, "is my non-static radio receiver."

The instrument referred to, as Smartley and the patent attorney viewed it, was not out of the ordinary, and the set was externally connected to a loud speaker of popular make. But most unusual was a silver looking ball, probably six inches in diameter, suspended in the aerial just above the instrument. The entire surface of the sphere was thickly studded with small, round-head projections, resembling a ball of yarn made into a pin cushion.

"It's the ball that does the trick, gentlemen," the inventor announced with pride. "That and what's inside of it—together with a peculiar circuit within the set. And now," turning to Smartley, "we'll hook up your set first, on the table here, by the side of mine and compare the reception of the two instruments."

Smith at once proceeded to make this "hook-up," removing the aerial and ground wires from his own instrument and connecting them to Smartley's.

"I'll remove the silvered ball now," he explained, speaking rather more to the patent attorney, who had just completed another spell of coughing, than to Smartley. "The ball, as you know, Mr. Jamison, is the static collector and will not function on Mr. Smartley's set without changing the interior circuit. And now," to Smartley, who stood willing to be convinced, "you had better tune in yourself, being familiar with your set."

"Little chance of picking up anything on such a night," Smartley complained, though he sat down gracefully enough for one of his importance, and began to tune in.

"The static was worse than bad. It was deafening. However, after considerable and patient manipulation of the dials, Smartley reached a point where he could bring in Zion City and Memphis at will. But such popping and cracking and spluttering was there, that the sacred music in Zion City was much like the jazz band from WMC. He tried a few more stations, with no better results, and finally gave up in disgust.

"That was good, Mr. Smartley," Smith encouraged, "considering the weather. Now let's see if I can do any better on my set." He was expertly changing connections from one set to the other as he spoke. Smartley the while trod in a complete circle around the instrument, inspecting it from all angles, but it gave out no secrets. J. Yerger Jamison, his cough having subsided as his expectation arose, followed Smartley's lead.

## The Invention Works

At the first turn of the dial when Smith began to tune in the silvery sphere above his instrument became alive with miniature lightning, the vivid little flashes silently chasing one another in zigzag fashion around the globe.

"There's your static, Mr. Smartley," Smith explained with a knowing smile.

"That is as near as it will ever get to my instrument."

He moved another dial and there issued from the loud speaker a slight grating noise, followed by a violin solo that came in as clear as a bell. Now he brought in half a dozen other stations in as many minutes—lectures, jazz, bedtime stories, instrumental and vocal selections, all under perfect control.

Here was real reception, the like of which Aleck Smartley had never heard before, though Mr. Jamison seemed to take it as a matter of course. No squeaking, no howling, no crashing from static, even with the incessant flashing of lightning outdoors. Moreover, there was no interference when Smith, by way of experiment, turned on a high-tension spark coil within a few feet of the instrument.

"Do I win?" Smith shut off the dials and looked from Smartley to Jamison with a what-did-I-tell-you air of self pride.

"You do," Smartley admitted, "and I, like to make arrangements with you to finance the invention."

"I'd like to get in on it myself if I had the money and the ethics of my profession did not forbid it." Mr. Jamison concluded this interjection with another brief period of coughing.

"I appreciate your offer," Smith replied, addressing Smartley, "but I have promised George Ogle to give the Consolidated Radio Association first consideration."

Aleck Smartley was plainly disturbed in mind, though he held a poker-playing face. Here, he thought, was a fortune before his eyes and about to slip through his fingers. Without a doubt C. R. A. with their millions behind them, would gobble up this invention without undue loss of time. As yet the device had not seen the patent office, and this emaciated J. Yerger Jamison had in his possession all data pertaining to it—even the rough sketches and the first conceived ideas of the inventor.

## Smartley Puzzled

Smartley could not fathom the principle of the thing, the remarkable performance of which he had just heard. Even though he did know the secret and should steal the idea, he must first be able, in the event of future litigation, to show first conception of the device. He must obtain those papers, and he thought he saw a way: he recalled the incident of Jamison's thievery in the drugstore downstairs, and his own experience in knavery placed him in a good position to believe that a man who would steal a little would steal more.

In their drive back to the city, Smith having been left at home, Smartley took immediate opportunity to feel his companion out.

"Lucky dog, this Smith, eh, Jamison?" he led off with. "He'll make more out of this invention than you and I could accumulate if we had several more lives to live."

"I'll say he's lucky. Here am I, sixty, broken in health and should have sufficient money to retire on, when along comes a man who will pay me in fees a few paltry dollars to help make him a millionaire at thirty. But so it goes!" And Mr. Jamison coughed out a sigh.

"Perhaps," Smartley suavely suggested, "you, like most of us, have not taken full advantage of your opportunities—or you do not see your opportunities when they confront you."

"Meaning just what, Mr. Smartley?" From the tone of Jamison's voice, Smartley felt that he could safely make a bold suggestion. "I mean," he asserted that opportunity is knocking at your door this very instant—and at mine. Why should you not make more than your fees in this particular instance, when you have the power to put me in control of Smith's invention?"

Just here Mr. Jamison took occasion to cough more severely than ever. "I don't quite see this fortunate turn of affairs confronting me," he equivocated, when he had again caught his breath. "It would have to be a fifty-thousand-dollar opportunity to enable me to retire. I am open to a proposition involving that amount of money, which I will be glad to have you

explain later on—say, to-morrow evening after supper, in my office. Just now I think I had best get out of this wet weather, if you will be good enough to drive me to my rooms."

The following morning, in his office, Aleck Smartley felt that he might well congratulate himself on having so shrewdly discovered that Jamison was open to a shady proposition. Also, he felt entitled to two drinks of pre-war liquor instead of his customary one. Then he went through his mail, to discover another letter addressed to S. S. Smith. He lost no time in sitting the envelope.

"My dear old chum," Smartley read, "it is a great pleasure to inform you that C. R. A. is so favorably impressed with your invention that I have been empowered to enter into negotiations with you for an outright purchase, with royalty remunerations attached. We can do nothing, of course, until you have applied for patents, and I will be in Chicago next week to give you all necessary aid in this direction."

"Sincerely your friend,

"George Ogle."

Once again Smartley took a drink of whisky to his own success, this time on having been lucky enough to intercept this important bit of news.

"This is Tuesday," he reflected, "and this George Ogle will be here next week—possibly Monday. I must get busy and bring matters to a quick close with Jamison."

## Jamison and Smartley Plan

When Smartley arrived at Jamison's office that night he found the door closed and he began to fear that the patent attorney may be too ill to keep his appointment. His fears were groundless, however, for after the lapse of half an hour his quarry came coughing down the corridor.

The usual commonplace greetings over and the office door locked behind them, Jamison conducted his guest into a disorderly little room, the door of which was marked "Private." When they were seated near a large table littered with drawings, letters, small models and what-nots, Smartley plunged at once into the matter in hand.

"We were speaking of opportunities last night," he began, "and now we—" "We are just a pair of crooks," Jamison curtly interrupted, much to his confederate's surprise. "Let us be plain. There is no longer any need to chase the devil around a stump. You intimated last evening that you desire control of Smith's invention. I need money to regain my health; you want fame. State your proposition briefly and plainly."

"My dear Jamison!" Smartley effused, "you're a man after my own heart. I see that we are going to do business quickly. My proposition is simple: I have learned from Smith that you are in possession of the secret of his invention, including all drawings, sketches and certified dates of his first conceived ideas. These documents will be worth to me—er—thirty-five-thousand dollars," with which he had his wallet half way from his pocket.

Jamison waved the purse aside. "Not so fast, Smartley," he said. "We have met here for the express purpose of stealing Sam Smith's invention, and I don't propose to have you steal fifteen-thousand dollars from me. Particularly not when the invention will be worth millions to you. I told you last evening that I could not retire on less than fifty thousand. If you are not prepared to give me that much in cash—no incriminating checks," he declared with unmistakable determination—"I do not care to waste any more breath on the subject."

Smartley waited impatiently until the disturbance had subsided. "I did not quite understand," he lied glibly, "that fifty thousand would be your price. But I give you that much with me. I'll give it," he agreed reluctantly, for he had found it necessary to borrow beyond his means that morning in order to raise the amount.

"Then I can afford to waste more breath," Jamison continued. He arose and went to the safe, returning in a few moments with a handful of papers.

"These sketches and drawings," he explained, handing the package to his fellow conspirator, "are Smith's first conceived ideas of his device. Look them over."

## Smartley Obtains the Papers

Smartley spread the papers on the table and examined them carefully, noting that each and every sketch and all descriptive matter had been properly witnessed and sealed with the signature of a notary.

"With these documents destroyed," the patent lawyer informed, "Smith wouldn't stand a ghost of a chance in a lawsuit to establish his rights."

"Simple as A B C," Smartley averred, though he did not quite understand it, "but I never would have thought it possible if I had not seen and heard it last night."

"Simplicity is the backbone of all great inventions," said Jamison. "And now"—he paused to gather up the documents from the table and slip a rubber band about them—"before I hand you this in exchange for your money I want to give you some advice, which is part of every service I render my clients. First, fire Smith. Do this as soon as he comes to work in the morning. Give him a month's pay instead of notice. Let your other employees know—all of them—that you have discharged him because he has been trying to steal a valuable radio invention on which you are working. You can realize that this would prove of much value in court should future litigation arise, which event I do not at all anticipate. Secondly, make copies of Smith's invention—and make them with your own hands. Have some crooked notary—you should know best where to buy one—date your copies prior to Smith's, and have him properly, however wrongly, sign and seal them. Then immediately destroy Smith's documents. Next, board the fastest train you can catch for Washington and hire the best attorney you can find there to rush your official drawings into the Patent Office. This done, you can make your model and be sitting pretty."

Not once from the time he had first surreptitiously opened S. S. Smith's letter until the present psychological moment did Aleck Smartley entertain any doubt but that he was well on the way to fame and fortune. He had seen revealed in the sketches which this dishonest patent lawyer had just shown him the simple secret of a remarkable radio device. True, he did not understand it, but he had radio experts in his employ who would.

Reasoning thus, Aleck Smartley did not hesitate to hand over to J. Yerger Jamison \$50,000 in good United States money and receive in return a packet of papers which would, he felt sure, soon materialize into one of radio's greatest wonders. A few hours later J. Yerger Jamison and S. S. Smith, both previously and properly christened Hampton, were comfortably seated in the smoker of a south-bound passenger train, leaving the Windy City behind them at the rate of fifty miles or so an hour.

"Here is something I overlooked, George, in our coup with Smartley," John Hampton remarked with a sigh of mock regret, tendering his son an open letter. "I forgot to mail it in Chicago. Read it," he requested. "It's the last letter that the late J. Yerger Jamison ever wrote—and probably ever will."

"My dear Mr. Smartley," the erstwhile inventor read, "I trust you will pardon my oversight in overlooking last evening some very important details concerning the non-static radio receiver. I can only blame my negligence on the distressing state of my health, which now, thanks to the magic power of sudden wealth, I have quite fully and permanently regained. It is a pleasure to give you this tardy information now."

"To function best the receiving set should be electrically connected to a high-grade phonograph. The loud speaker, though apparently connected with the receiving set, is really in direct electrical contact with the talking-machine adapter."

"I must not forget to mention that the

(Continued on page six)

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Alfred Graham & Co.  
London, England  
Patentees

**30 years' experience created it**  
HEAR this latest masterpiece of the originators and oldest makers of loud speakers. It leads throughout the world in sales and has won the favor of musically critical people because of unrivaled clarity and deep, full-like tone.

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The choice of the big majority of leading set manufacturers. Write for folder of complete line. For sale by leading dealers.

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**Don't Miss This—**  
Tune in on WMC at 10.30, Sunday Evening and Hear  
**Bernays Johnson**  
AND THE  
**Daven Orchestra**  
Something new in Radio

**Stay in Your Own Back Yard**  
And Other Antiques Tuesday  
"By the Light of the Silvery Moon" and "Dear Old Rose," two old time popular ballads of a decade or so ago will be the numbers which the famous "revivalists," "Goldy" and "Dusty" have unearthed for their half hour of entertainment on Tuesday at 8:30 p. m., broadcast by WEA and nine other stations (WEEI, WFI, WCAE, WGR, WJ, WOC, WOR, WCCO, KSD).

From the repertoire of old Negro and minstrel songs they have chosen "Georgia Lullaby," "Stay in Your Own Backyard," two old "mammy" songs which were written long before the days of Al Jolson, and "I'm My Daddy's Only Son."

## New Reproducing Device Presented At Aeolian Hall

Before a distinguished audience of scientists, musicians and men and women prominent in society, the panatrope, a new musical reproducing instrument which is said for the first time to utilize the electrical principle of reproduction of sound, was presented at Aeolian Hall Wednesday, November 11, at 4 o'clock. The panatrope has been perfected by scientists of the Radio Corporation of America, the General Electric Company, the Westinghouse Electric and Manufacturing Company and the Brunswick-Balke-Collender Company.

Dr. Goldsmith, who spoke to the audience, described the instrument as follows: "The mechanical method of phonograph recording has been superseded by the panatrope by electric recording. Here an entirely different method is used. The singer stands in front of a device which is analogous to the finest broadcasting microphones. This extremely accurate telephone transmitter produces electric currents which are amplified by vacuum tubes like those in a radio receiving set, and the final output of these vacuum tubes operates a most precise cutting tool which makes the master record. Note the absence of the sound-distorting horn and the fact that the energy for cutting the record no longer comes from the voice of the singer, but on the contrary from the electric generators or batteries feeding the vacuum tubes. Every one knows how perfect such a system can be from our experiences with high-grade broadcasting stations. Electric recording, therefore, is the only suitable method of making sound records for public use, and the electrically cut record represents an entirely new grade of performance. So much for the recording end of the panatrope system."

"On the reproducing end of the panatrope there are used entirely new devices. In the mechanical phonograph we have had what was known as a sound box and a horn. The sound box has a diaphragm or a sheet of thin material which is vibrated by a lever attached to a needle which rests in the record groove. All the energy for vibrating the diaphragm comes from the record itself via the needle. The sound produced by the diaphragm passes through and is influenced by the horn. Even the best of horns is not omniscient nor equilateral. And the volume of sound which can be reproduced in this way without serious distortion is limited."

"In electrical reproduction of sound, therefore, we do not depend upon the record to supply the energy to produce the sound, but we leave that (as we should) to the power plant, or the batteries. And all the capabilities of modern amplifiers and loud speakers for the production of high-quality music of any desired volume are here utilized for the first time."

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## 275 Meters Is the Most Popular Wave

More radio broadcasting stations are operating on 275 meters (1090 Kc) than any other wave length. There are twenty-six in all. One has a power of 5,000 watts, twelve have a power of 500 watts or more and thirteen use less than 500 watts.

The most powerful station operating on this wave length is WORD, the People's Pulpit Association, Batavia, Ill. The lowest power station is WOCL, the Hotel Jamestown, Jamestown, N. Y., which has a power of 15 watts. Stations operating on 275 meters are located in twenty-one different states. Louisiana has three stations operating on this wave length, and New York, Pennsylvania and Illinois each has two stations. The remaining seven stations have one station each.

The next most congested wave length is 250 meters (1200 Kc), on which twenty-four broadcasting stations are operating, five of which employ 500 watts or more.

## Brooklyn Radio Fan Solves DX Problem

A Brooklyn radio fan has solved one of the most embarrassing problems that confront proud owners of de luxe receivers.

It is one of the mysteries of radio that fifty stations might come rolling in one night and the very next evening reception at any great range is unsatisfactory or quite impossible. This circumstance is not the fault of the apparatus or the operator in most instances. It is due to atmospheric conditions and applies more to the summer than the winter. However, even in the winter many nights are a great deal superior for DX than the average. "And," the fans hum in chorus, "those are the nights the neighbors aren't here to listen to the radio. When they come everything is not so good."

Here is how the Brooklynite has achieved a wonderful reputation for DX success, according to the story told the Freed-Edemann Radio Corporation.

He has no regular evening for radio entertainment, his friends knowing that his work sometimes engages his attention at night, and therefore he is forgiven for late telephone calls to come over for "a bite," or a phinche game, or the like—all excuses for displaying his art in tuning in WGN, WSB, WCO, WOAW and points further West, down South and far North. And rarely if ever does he fail on visitors' nights—thus attaining a unique position in fandom.

This is his secret: "Select a test station about 300 to 500 miles away that is consistently heard, weakly or strongly, early in the evening. Mine is KDKA. If KDKA is heard only with the headphones at 7 o'clock I know that it will be a comparatively poor night in radio. If KDKA comes booming in like a local, I know conditions are right and will pick up twenty to forty other stations by midnight or before. Then I phone the crowd, and they troop in to hear, probably as opening number WLW or WSAI, then WMB, and so on. Ordinarily I hear these stations and others every night, but unless they come in extra volume I cannot thrill the folks, and so I do not ask them around until KDKA is whining in—and, of course, with the DX season on that happens about six nights a week!"

"So get your test stations and see how it works in your part of the country."

**Buffalo Has One of Smallest Radio Broadcasting Stations**

One of the smallest practical broadcasting stations and one which works six days a week is in use at the King Quality Products radio plant at Buffalo, N. Y., and possibly duplicates of it are in use by this time in other localities. It was put in service to meet an insistent demand for morning broadcasting.

At the King plant it is necessary to begin giving receiving sets their final tuning up early in the morning before any of the large broadcasting stations with their varied programs are on the air. To meet the difficulty Howard A. Gates, in charge of one of the King laboratories, built a miniature broadcaster, mounting it on a panel eight and one-half inches square, and this is now used, attached to a photograph for moving testing.

The station has a wave length of from 250 to 400 meters and a range of about a block. However, this range is sufficient since the aerials for the King testing department are

on the roof just above the final test room.

Since the installation of this baby broadcasting station several King dealers have been so impressed with the idea that they have built similar ones in order to give early morning demonstrations as well as comparative tests of various receiving sets. An added advantage is that the dealer in a dealer's store may listen to both the original matter being broadcasted and its reception by the King set at the same time.

## Radio Supervisor Thanks the P. S. Co. of N. J. for Their Help

Arthur Batcheller, United States supervisor of radio for the second district, New York, has sent a letter to R. N. Conwell, transmission engineer of the Public Service Electric and Gas Company, a part of which follows:

"I note with interest the success which your engineers have had in locating and eliminating many interferences affecting broadcast reception. I believe your company was one of the first to engage in this important work and that your activities in this connection have been voluntary, your main objective being that of rendering public service. The work of your company is indeed most commendable and for two years I have included in my annual report the name of your company as one of the active public service electric companies which have volunteered to take up this work.

"I take this opportunity to express to you my fullest appreciation of the

splendid work you have done in this connection and I am sure that the broadcast listeners feel greatly indebted for the good you have accomplished."

## A New Design Inductance Coil

A new design of low-loss coil has recently been produced by the Reichmann Company, of Chicago, known as the Doughnut Coil. The new coil was developed and designed by Frank Reichmann.

The principle it operates under is new to the radio broadcast field. The coil, which is wound in a rather peculiar manner, is intended to confine all its magnetic lines of force to the field of the secondary coil included in the mounting. It is said the peculiar type of winding produces a good radio of resistance to inductance and minimizes energy losses in inductance. It is also said the doughnut coil will not have to be placed at different angles to insure stable and selective operation, because there is no intercircuiting between the coils.

The new coil may be employed anywhere in a radio receiver where a tuning inductance is required.

## 2000 Patent Applications

There are more than 2,000 applications for radio patents now pending at the United States Patent Office in Washington.

## Vernier for Detector

Often a vernier attachment on the detector rheostat will aid distance and clarity to the reception of a regenerative set.

## Radio Exchange

Rate, 40 cents a line. Ads. accepted until 12 o'clock noon Friday.

PHONE PENNSYLVANIA 4000

### Parts and Equipment

#### SEND IT BACK

After 30 days' trial if you do not consider it the biggest buy of the season, return it for a full refund. No questions asked. The results it will give over so-called "cheap" batteries, make it a real money saver. Your purchase price plus transportation costs refunded without question. It has been in effect over 3 years. (The publishers of this ad can verify this and advise as to its being lived up to.) The "HAWLEY" complete 90-volt assembled battery, 12 cells, 22½-volt, \$2.95; 40-volt, \$2.25; 67½-volt, \$1.25; 112½-volt, \$1.25; 180-volt, \$1.25. Contains the most famous closed cell, 90-volt battery in the world. Shiny live processed alkaline elements (not the dirty brown type guilting cheapies), and the experience of building such sets, the originators of this type, have been obtained from the field of first-hand experience. Tested and approved in various right laboratory tests, such as: Popular Radio Laboratory, etc. Knock-down kits minus slant-banded case at \$1.95. Great savings. Incidentally these kits include material for supporting cells and real complete ready-to-go material. Order direct—no middle man. 8-page folder of simple, complete instructions, written by the originator, showing the assembly, charging, etc., with every line real complete ready-to-go. "Hawley" B battery (with charging clips and plug), \$2.75. Sample cell, 60-volt, assembled \$1.75. Write for folder of complete line. For sale by leading dealers.

#### SIX SEVENTY-FIVE

WILL BUY A 100 VOLT KNOCKED-DOWN EDISON ELEMENT. WITH NEW TYPE CONNECTOR. STOKES BATTERY INCLUDING CABINET. PARTS FOR ALL MAKES OF EDISON STORAGE BATTERIES CARRIED IN STOCK. SEND FOR LITERATURE AND LIST OF DEALERS. BATTERY CO. 146 WEST 68TH ST. PHONE TRAFALGAR 3232.

FOR \$5 you can build a GOOD "B" Element for \$4. A complete instruction set, Ferrand, 800 E. 38th St., Paterson, N. J.

BUILD rechargeable B Battery, 100-volt, with 60-volt, assembled \$1.75. Royal Storage Battery Co., 124 W. 54th.

BUILD YOUR OWN "B" Battery, Nickel and Iron elements and all supplies. Roberts, 1123 Myrtle av., Brooklyn.

ELECTRODYNE CO., 2212 8th Ave., specialists in 35-75-Pm Condensers. Harlem 2048.

FOR EXCHANGE

RADIO SETS, Parts and Jewelry bought and sold. King, 531 6th av., Bryant 3128.

DOES YOUR RADIO GIVE YOU Trouble? S. J. B. RADIO EXPERT. Will adjust your set and solve your problems. Charges reasonable. Phone KIPATRICK 6042.

BATTERIES FULLY CHARGED, 26c. Called for and delivered. Batteries rented and repaired. 210 West 108th St. Battery Service, 888 1st av. (60th).

INSPECTION, installations, repairs, in radio since 1920. Reasonable rates. Edson, Dayton 1821, 1809 West Farms Rd.



**Judge by Performance**  
Do not buy a more expensive set until you hear the

**TRINITY**  
SIX

**\$50**  
(LESS ACCESSORIES)

Its splendid appearance, phenomenal performance and astonishingly low price are explained by the fact that

**TRINITY SIX is the First Radio Set Built by Production Engineering Methods**

Radio design, manufacturing procedure—and value—are revolutionized in Trinity Six.

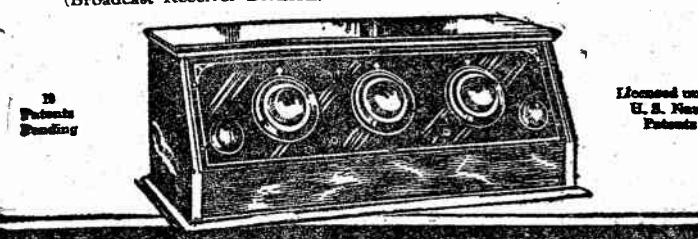
Before Trinity Six could be offered to the public at the astounding price of \$50.00, our modern factory had to be equipped with special automatic machinery.

There is not a single item (with the exception of one or two small patented parts) in the Trinity Six on which you pay more than one manufacturing profit. That is one reason why, at \$50.00, Trinity Six is unequaled by sets costing \$100.

Another reason is that elimination of dozens of hand-soldering operations, with their possibilities of electrical trouble, also eliminates hand-labor costs, which make many sets expensive and unreliable.

Free booklet, "The Value Only Beacon Can Give," sent on request, gives description of exclusive Beacon construction, with full specifications.

Sold only by "Trinity" Dealers. Manufactured by  
**BEACON RADIO MFG. CO.** 325 Berry St., Brooklyn, N. Y.  
(Broadcast Receiver Division)



Time in on Trinity Six hour, Station WRNY, every weekday, from noon until 1 o'clock

**Buy with confidence**  
**Dubilier Devices**



**Micadon**—the standard fixed condenser of radio.  
35c to 75c



**By-Pass Condenser**—smoothes out fluctuations of "B" battery current.  
75c to \$3.75



**Ducon**—the standard antenna socket plug.  
40c and 65c



**Metaleak**—the accurate resistance unit.  
40c and 65c



**New Filter Condenser**—for use with battery eliminators—for high voltage loads.  
\$1.25 to \$7.00

**Dubilier**  
CONDENSER AND RADIO CORPORATION

If you want to buy, sell or exchange your radio sets or parts the Radio Exchange will help you.

## British Listeners Find They Enjoy Classical Music

By Frank J. McEniry  
News Bureau, Station KOA

Is musical taste and appreciation being uplifted and are radio listeners swinging over to the classics?

"Yes!" is the emphatic answer of Percy A. Scholes, widely known music critic of the British Broadcasting Company, with headquarters in London, who is on a tour of America.

"For example," he observed, "we read in musical history that Beethoven was born in 1770, but for thousands he was only born in 1900 or 1910, when phonographs or reproducing pianos came into our homes. And for millions more Beethoven was only born in 1921, 1923 or perhaps as late as 1925, when many of us first acquired radio receiving sets."

Substantiating the experience of staff members at KOA, Denver, he pointed out that marked changes in the public attitude toward music of a higher standard have taken place within recent months.

"Introduction of broadcasting was the greatest event in the history of the art of music," he continued. "That America should have developed such manifold broadcasting activities is matter for congratulations. Our British experience is sure to be the American experience—give listeners plenty of fine music and they will learn to like it."

Less than eighteen months ago, he recalled, English radio enthusiasts by the hundreds charged that Bach, Beethoven and Wagner were acceptable to "highbrows" who like to swank about their superior tastes," but were not suitable to tired workers.

"Likewise, it appeared that the average listener had little or no time for music by composers with unpronounceable names ending in 'sky,' as one listener expressed it. A great many persons demanded a few 'nice sentimental songs' or some 'honest American jazz.'"

"These attacks have virtually ceased," he continued. "At last British listeners are learning to admire works of classical composers, music that has artistic impulse. On the other hand, they are not averse to what we call 'amusement music,' the sort that enjoys a life of about two years and then falls into oblivion."

As music critic for the British broadcasting organization, Mr. Scholes's duties consist principally of a fortnightly review of the leading musical events of London. This is broadcast from the London station, linked with all other stations of the country, and requires approximately fifteen minutes. In addition, critics of books, dramas and films are heard at regular intervals.

**Songs, Pep Meetings, Frat**

**Dance in "College Night"**

One of the most unusual continuity programs ever arranged by the Eveready impresario, Mr. Paul Stacy, in which Graham McNamee, sporting announcer, will describe part of an imaginary football game, will be "College Night," to be staged in the studio of WEAJ on Tuesday at 9 p. m. and broadcast by WEAJ and the usual chain of stations, including WEEL, WFL, WCAE, WGR, WWJ, WTG, WOO, WJAB, WCCO, KSD and WSAI.

The "scene" of the hour will be laid in a typical college town on the eve of a great intersectional football game at which representatives of all large colleges of the East and West are present. Snatches of college songs from the dormitories, pep meetings, a dinner dance in one of the "Frat" houses and street scenes in which "frat" fights and warring depict the enthralled one after the other, will be presented then shifts to the stadium for the last few minutes at the thrilling close of the game, which will be described by Graham McNamee in his inimitable style just as if he were actually present. The part that the "Red Grange" or one of the team plays in the final result will be revealed on Tuesday night.

Radio in its infancy in Finland, the number of receiving sets used in that country having grown, during 1924, from very few to approximately 5,000. Germany is the chief source of supply for the Finnish radio market. A small amount is also imported from England, Sweden and other European countries. Radio dealers and enthusiasts in Finland appreciate the quality of American-made radio equipment.

## Radio Should Try Gary's Optimism, Says Jewett

Those individuals who at the present time happen to be leaders in the radio world would do well to take a leaf out of Judge Gary's book, according to Edward H. Jewett, president of the Jewett Radio and Phonograph Company.

In a discussion of recent radio development and its immediate future, Mr. Jewett described the spirit of pessimism that has recently crept into the field.

"This pessimism is only a state of mind and has no foundation in fact," he said. "The industry would be much better off if it were imbued with such a spirit as Judge Gary gives to the steel industry."

"If any segment of the business world ever had reason to be happy it is radio."

"Its progress up to date has been little short of marvelous."

"Its future is doubtless beyond one's imagination."

"I can think of no other industry which has so captured the hearts as well as the minds of the public."

"No other industry is talked about as much, written about as much or possessed of such a wonderful publicity medium as radio possesses in its own broadcast."

"Everything is in its favor and yet there has latterly crept into the industry this spirit of pessimism. Its existence is so utterly unfounded on any real, basic cause that its source can be traced only to one point. Therein one finds reason to brighten up."

"Radio, not unlike other new industrial developments, attracted quite a few get-rich-quick persons. They brought nothing but self-desire to the industry; they hoaxed the merchants and the public through their selfishness and specious merchandise, and now they find their game is run."

In my opinion the pessimism existing to-day in radio is to be traced directly to this brand of parasites. They find their game is up; they certainly regret it, and they are talking loud enough to make others believe that all radio is in the same boat they find themselves in.

"It is not true. Radio's future was never so bright as it is this autumn, and it is going to get brighter all the time. Radio is young and youth will not despair."

International Radio Week  
To Be Held Next January

Radio interests the world over are already beginning to focus their attention on International Radio Week, to be observed January 24-30, 1926, when it is expected that many startling disclosures in the business methods and scientific advance of the industry, of interest to every country, will be made known to the world.

Leaders behind the movement to weld the nations of the world into a common bond of understanding for the progress of radio, declare that the principal results it is hoped to accomplish will be to unify business methods for simplifying export and import, and to compare the scientific advance of radio as it applies to the various countries, with the idea of allowing one nation to profit by another's experience for the benefit of all.

Many organizations have already come out with whole-hearted support of the movement. Among the first of these was The Radio Manufacturers' Association, which contributed a check for \$500 as an initial donation toward the support of International Radio Week. It is planned during the week to conduct many broadcasting tests of an international nature, which are expected to develop new possibilities in this feature of the science and to draw the radio fans of the various countries into closer connection.

International Radio Week will have the endorsement of the official heads of many nations, and will be observed annually.

**Davis Saxophone Octet**

**Playing in Cincinnati**

The Davis Saxophone Octet, whose director, Clyde Doerr, hopes to wipe out the stigma usually attached to the blaring saxophone, is now doing missionary work in Cincinnati, for its music is now being broadcast every Tuesday evening at 7:30 through WSAI, as well as WEAJ, New York; WCAE, Pittsburgh, and WOO, Philadelphia. This will occur on November 17.

"The Timmons B-Limiter has passed the acid test of daily average use for more than a year in thousands of homes."—Newark, N. J., Call.

In the Timmons B-Limiter you buy a B battery eliminator that is time tested. Thousands are now in successful use. Fans are writing us daily telling of better reception and greater distance through the use of the B-Limiters.



**Timmons Radio Products**  
Corporation  
Germantown, Philadelphia, Pa.

**4 Big Improvements in Amplification!**

Write for Autoformer Hook-Up Bulletin

**THORDARSON**  
Autoformer



Three-Minute Registered  
**All Frequency Amplifier**  
It Gives You

1 Full amplification of those bass notes hitherto largely "lost"

2 Greater clarity on all notes

3 Improved reception of distant programs

4 Better volume control

Latest development of the world's oldest and largest exclusive makers of transformers. For those who wish the finest reproduction of programs to be had. May be used with any set in place of regular audio hook-up. Autoformers are \$5 each at dealers. THORDARSON ELECTRIC MFG. CO., CHICAGO

**FORMICA**  
Formica panels, base panels, winding tubes, terminal strips are used by the overwhelming majority of the leading set makers. You are sure of the quality of a set insulated with Formica.

When you build your own set insist on Formica panels and tubes. Panels are sold in neat individual trade marked envelopes by all leading parts dealers.

**THE FORMICA INSULATION CO.**  
50 Church St., New York, N. Y.

# A Four-Tube Radio Receiver Which Employs One Stage of R. F. Amplification

The Author Claims Excellent Volume and Selectivity With Only Two Controls

By GEORGE M. MEYER

HOW would you like to build a four-tube set that would give volume almost equal to any five-tube receiver on the market? It can be done. The receiver about to be described may be constructed without the use of "low loss" parts or trick wound coils. It is an excellent receiver and as for volume and clarity of reception, nothing more could be desired. An actual test of this outfit over a period of about one year resulted in the writer adopting this circuit for his own radio set, which is at present connected up in a discarded victrola cabinet, the shelves having been removed for the housing of the set and B battery eliminator described in the New York Herald Tribune Radio Magazine March 15, 1925, by the writer.

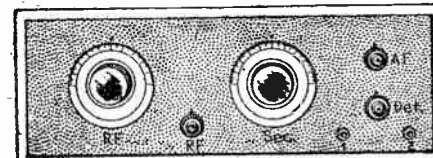
In order to use a small panel for this two-control outfit to enable it to fit in the cabinet of the talking machine, the amplifier circuit was placed in back of the radio-frequency and detector apparatus. This called for deep baseboard. The front panel measured eighteen inches long and seven inches high. Small strips of wood were screwed to the sides of the former music compartment so the set on the baseboard could be removed. This was done so changing the tubes or battery connections could be easily accomplished.

The circuit makes use of a stage of radio-frequency amplification which seems to supply tremendous volume to the detector tube.

### Radio-Frequency Circuit

It is the writer's opinion that greater radio-frequency amplification per stage can be obtained when the circuit is tuned in single circuit fashion; that is, with a condenser connected in series with the antenna tuning coil rather than across a coil having an untuned primary winding. In past experience with receivers employing a stage of tuned radio-frequency ahead of the detector results have shown that greater amplification of radio-frequency currents is possible with the series circuit. In fact this type of circuit has been known to produce as much amplification as two stages of tuned radio-frequency employing condensers shunted across secondary coils and non-tuned primaries. It is for this reason that this four-tube set will produce as much volume and receive as much DX as some five-tube tuned radio-frequency receivers.

Special couplers or coils are not necessary.



A suggested panel layout

sary, as the two coils in this receiver may be home-made. Below is a list of the parts required to complete the set:

- One panel.
- Two .0005 variable condenser.
- Two .00025 grid condenser with mounting.
- One four megohm leak.
- One .002 fixed condenser.
- One tube 3 inches diameter, 4 inches long.
- One tube 3 inches diameter, 4 1/4 inches long.
- One pair of audio transformers.
- Seven binding posts.
- Four sockets.
- Two single jacks.
- Two 20 ohm rheostats.

One 10 ohm rheostat.  
Two 4-inch dials.

A careful selection of the parts is essential: Those having a wide reputation and well known to sets builders should be chosen. Obtain the best parts money can buy and be sure of a good set of vacuum tubes. Have them tested before using.

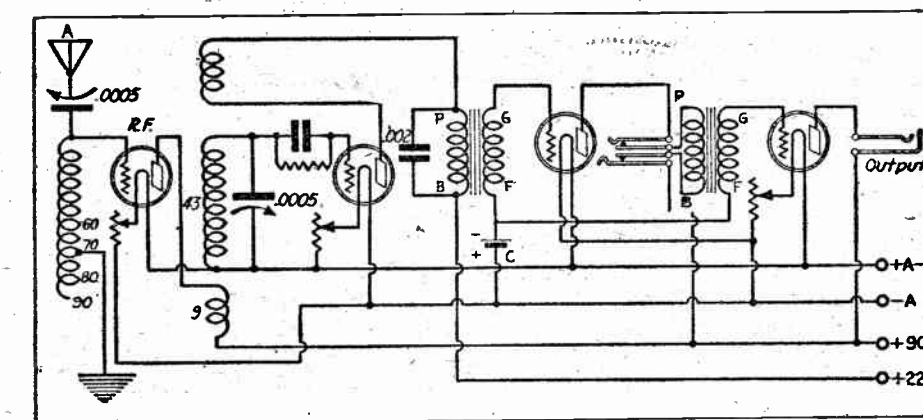
### Battery Wiring

Designers of some of the highest class receiving sets have specified flexible stranded copper wire for all filament and plate battery connections. These leads

The latter may be mounted on brass brackets or by means of small blocks of wood fastened to the baseboard.

The secondary of this coil is shunted by a .0005 variable condenser. The reversed winding is in the plate circuit of the radio-frequency tube. The end nearest the secondary connects to the B battery of the detector tube. The outer end connects to the plate terminal of the radio-frequency amplifier tube. After the set has been tested, it may be well to try reversing these connections.

The nine-turn winding which follows the direction of the secondary is connected in the plate circuit of the detector tube.



Wiring diagram of a four-tube R. F. receiver herein described

are all bunched together and tied to keep them out of the radio-frequency circuit. The wires running to the sockets, binding posts and rheostats should be kept near the baseboard of the set. A receiver wired in this fashion will not be subject to squeals or high pitched notes common to a great many home-made sets in which the A and B battery circuit is allowed to traverse the tuning circuit.

This flexible stranded rubber-covered wire is appearing at many radio shops. If it is not available, use flexible lamp cord and strip the outer cotton covered insulation off until the rubber shows. This is a trifle larger in diameter than is used in practice, but will answer the purpose. The set may not appear to be wired as neatly as if bus bar wire were used, but it will probably work better.

### Secondary Tuning Coil

The secondary tuning coil which feeds the detector tube should be carefully made and wound tightly with No. 24 D. C. C. or D. S. C. copper magnet wire. There are three separate windings on this coil, one for the plate of the radio-frequency tube, the secondary and the plate coil of the detector circuit. The tube should be three inches in diameter and four and one-half inches long. Start about half an inch from one end and wind nine turns of wire, being careful to prevent the wire from coming unwound. Fasten each of this small winding through small holes made in the tubing.

Then in the reverse direction wind the secondary coil with forty-three turns of wire. Leave one-quarter of an inch between the first winding and the secondary. Remember the secondary coil is wound directly opposite to the nine turn coil. Both ends of the secondary winding should be fastened through holes in the tubing. Skip a half inch and wind nine more turns of wire in the same direction as the forty-three turn winding. You now have completed the coil. It may be mounted in back of the secondary tuning condenser and placed at right angles to the antenna coil.

If the antenna coil is mounted upright from the base (as shown in the sketch) the coil with the three windings should be mounted parallel to the baseboard. The two coils should be a half inch apart.

### Audio Amplification

In building this receiver the writer chose a good set of transformers and used the old reliable transformer coupled audio amplifier circuit. The quality of reproduction on the loud speaker is entirely governed by the audio amplifiers. Should poor transformers be used distortion may be expected. Never neglect this part of the receiver, but use good transformers. It is a foolish move to purchase two poor transformers. The writer suggests getting a 5 or 6 to 1 ratio for the first stage and a 3 or 2 to 1 for the second stage.

A C battery seems to be in style, and so one has been included in the circuit. It will improve reception as well as prevent excessive drain on the plate batteries. Ninety volts of B battery will require a C battery of 4.5 volts. If one of the new RCA power tubes is used in the last stage a great increase in volume over the 201A will be obtained.

There is no use putting in a jack for the detector tube, as headphones are very seldom used. A jack has been provided after the first stage of audio so reduced volume on local reception may be obtained. Two stages are not always necessary except for the weaker stations. The jack for the first stage is of the closed circuit type, connected as shown in the diagram.

The output jack for the last stage is of the single circuit type. The plate of the last stage tube is connected to the upper contact of the jack and the B battery 90 volts to the other terminal. It is sometimes necessary to place a .002 fixed condenser across the output terminals of the last stage jack. This is recommended for those who use cone type speakers.

### Tuning Controls

A word or two of explanation concerning the tuning of this receiver is given to enable those who have constructed similar outfits to obtain the best of results. There are but two controls as far as actual tuning is concerned. One of these to the

left of the panel is employed to tune the first stage of radio-frequency and the antenna circuit. The second tuning condenser is used to tune the detector circuit. This adjustment is in control of the wave lengths and may be called the "station selected," as it is used to pick out the stations. If the set has been properly constructed, this tuning dial should be fairly sharp on all stations. It may be logged; that is, the dial settings may be taken down on a card and used for future reference. The readings should never change unless the station is assigned another wave length.

### Antenna Coil

The radio frequency coil is wound on a three-inch tube about six inches long. No. 24 double cotton or silk-covered wire is required for the winding. The entire coil contains ninety turns of wire, with four taps take-off at intervals. Start the winding about half an inch from the end of the tube, and before taking the first tap, wind fifty turns of wire. Make a loop or twist which may be cleaned later for connections. Continue winding the coil in the same direction until the seventieth turn. Take another twist and proceed to the eightieth, where another tap is taken. Finish the coil at the ninetieth turn and leave a short end for connecting the bus bar wire.

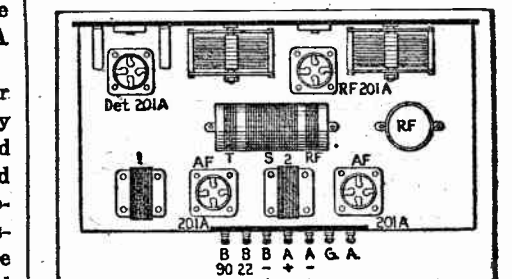
Two small brass braces can be screwed to the bottom of the coil for holding it in an upright position on the baseboard. A block of wood may be fastened to the sides of the form and this screwed to the baseboard in place of the brass braces. The coil should be rigid. Clean the tap twists and run a little solder down the wires to keep them stiff and in shape for tapping purposes.

This coil should be placed directly in back of the aerial tuning condenser and about an inch away. The .0005 variable condenser which tunes this coil is connected to the top turn. This should be made to the fixed or stationary plates of the condenser, in order to avoid any possible "body capacity." The rotary plate connection goes to the antenna binding post on a strip at the rear of the baseboard.

The top of the coil also connects to the grid terminal on the radio-frequency tube socket. Make the lead as short as possible and direct to the socket, avoiding bends and fancy shaped wires.

The socket should be a good one, preferably of glass construction with heavy springs, or a good sturdy composition socket. Side-wiping socket spring prongs are good.

The antenna series condenser aids in bringing about resonance between the primary radio-frequency circuit and the detector circuit. The adjustment of this dial may not be so critical as the other dial across the secondary tuning condenser. It may be well to experiment



How parts may be arranged behind the panel

with the taps on the coil winding. Pick out a tap which will give a dial reading on the antenna condenser which takes in wave lengths between 200 and 550 meters. It is difficult to state offhand which tap will be correct. Once the proper turn is located the lead wire to the condenser may be fixed permanently. In some cases, however, it will be found more efficient to try a few less turns when tuning to some of the stations around 250 meters or thereabouts. Too many turns may cause tuning on the shorter waves to be a trifle sharp for some persons. It is possible to log this dial as well as the other.



# Sec. of Commerce Summarizes Conference

(Continued from page one)

and demands of nearly 200 new broadcasters who wish to erect stations and to force their way into the already congested lanes. There are now more vehicles on the road than there is room for and more are crowding it. Unless something is done the whole traffic will be jammed.

"This was the primary problem with which the conference had to deal. It is the cause of major interference. It faced it boldly. It looked at it solely from the attitude of the listener, exclusively from the viewpoint that it was the duty of every one to think and act with one goal in view; that is, that a clear, intelligible valuable signal, free from conflict with other stations, should reach the ear of the listener."

"The conference declared that the public interest, as represented by service to the listener, should be the basis for every broadcasting privilege. And it therefore determined that it would ask the Congress of the United States to enact legislation in your interest to the effect that there must be a legal limit upon the total number of broadcasting stations until the art further develops new channels."

## Manufacturers at Conference

"I take pride in the fact that in this conference, made up as it was not only of representatives of the listeners, the amateurs, the great newspaper and magazines of the United States, but of the manufacturers and broadcasters, with millions of dollars invested in their enterprises and at stake in this situation, not a dissenting voice was raised against the resolution by which they formally recognized that your interests are dominant in the whole situation."

"It was significant to me that the resolution which so declared was introduced and advocated by a high official of one of the greatest radio companies in the United States, and I want to assure you that this resolution represents the real sentiment of the conference. It is honest and it is sincere."

"I think, therefore, that if I were asked what are the two outstanding results of the conference, I would say that they lie, first, in the recognition of the listeners' dominant interests in radio, and second, as a corollary, in the determination that the amount of interference must be reduced. That means fewer stations and better ones, or at least no increase in numbers, and it must result in more efficient service and better programs. This request to Congress was that these stations are to be under strict governmental regulation; that each one shall obtain his license from the Department of Commerce, and before he does so he must demonstrate that his operation will serve the public interest. His license may be canceled or revoked at any time for violation of its terms or infraction of law. He must conform to law and regulations. He must perform the

service which he had promised or his life as a broadcaster will end.

"It may be that we shall hear a great deal about freedom of the air from some of the people who want to broadcast and who will not be able to show that their desires accord with your interests. But there are two parties to freedom of the air, and to freedom of speech, for that matter. There is the speaker and the listener. Certainly in radio I believe in freedom for the listener. He has much less option upon what he can reject, for the other fellow is occupying his receiving set. The listener's only option is to abandon his right to use his receiver. Freedom cannot mean a license to every person or corporation who wishes to broadcast his name or his wares and thus monopolize the listener's set."

"We do not get much freedom of speech if fifty people speak at the same place at the same time, nor is there any freedom in a right to come into my sitting room to make a speech, whether I like it or not. So far as opportunity goes to explain one's views upon questions of controversy—political, religious or social—it would seem that 600 independent stations, many competing in each locality, might give ample opportunity for great latitude in remarks. And in any event, without trying out all this question, we can surely agree that no one can raise a cry of deprivation of free speech merely because he is compelled to prove that there is something more than naked commercial selfishness in his purpose."

"The ether is a public medium, and its use must be for public benefit. The use of a radio channel is justified only if there is public benefit. The dominant element for consideration is in the radio field and always will be, the great body of the listening public, millions in number."

## Distinction Wiped Out

"At the outset of the conference, I think there was some fear on the part of the small stations, which serve chiefly local communities, lest they were to be crowded out by the larger and more powerful stations. There was some feeling as between the Class A stations on the one side and the Class B stations on the other. It was soon found that any such fear was groundless. The distinction between Class A and Class B is wholly arbitrary. It goes back to ancient times in radio history of four years ago when the favorite occupation of the broadcaster was the transmission of phonograph music. Some of the more progressive stations declared that there was a higher form of entertainment and they were put into a separate class, designated as Class B, on the condition that they would provide better programs."

"The conference, therefore, resolved to wipe out this arbitrary distinction between the two classes. From now on, all stations will be on the same basis. There is to be only one test, if Congress passes the necessary legislation, that is, service to the listener and this test will be applied to every station, big or little. There is full recognition of the fact that many of the smaller stations perform a real service to their communities which can be given in no other way and there is no desire on the part of anybody to disturb them."

## Wave Band Unchanged

"It was suggested that we might make room for more stations if we widened the broadcasting band. Your instruments would not cover new stations outside the present band, and if this suggestion were adopted it would mean that we should have to invade the band which has been assigned to amateurs, of whom there are thousands. The conference agreed with me that radio has a useful contribution to the fine development of the American boy. None of us wish to minimize his position in growing American life and therefore the conference confirmed here his province."

"While the recommendations of the conference should ultimately result in tremendous betterment to broadcasting, we must not expect radical improvement too soon. The conference was merely an advisory body. It had no final power. It expressed the views of every one interested in radio. Before most of its recommendations can become effective they must be enacted into law by the Congress of the United States. I hope that this legislation will be given us by Congress at its next session. I hope, likewise, that it will impose regulation only to the extent absolutely essential. It has been the pride of the radio industry that it has been largely self-governing and I believe this condition may well continue. I know of no finer example of the true spirit of American industry than the voluntary recognition by the men engaged in radio communication of the public interest in their enterprises. That sentiment has characterized radio since its birth."

"Radio has grown up in the spirit of service. It has been the world's greatest example of self-government in business. It has needed no czar, no iron hand of control. There is, of course, a return in publicity to be had from broadcasting. Broadcast stations are not and do not necessarily claim to be philanthropists. They like the great magazines and newspapers, are a great public service. Let us give the broadcast managers their full meed of praise for having created and freely given to us a radio service better than in any country in the world."

"The problems of those radio listeners,

isolated from the city communities, were especially considered in the conference. Methods were recommended by which we can secure an extension and improvement of the service to our farmers. There is no greater purpose of radio than to bring to our farmers a mass of information that may be of use to them in the conduct of their work, but it is of equal importance to bring into their homes the majority of those things by way of entertainment which have for so many years been limited to those who live in the towns."

"The navy must have wave lengths by which they communicate with their ships at sea. They must have wave lengths by which they communicate with their aeroplanes in the air."

"The army must have wave lengths by which they communicate with forces in the field and with their airplanes. We must have wave lengths assigned for international telegraph, for we are now in daily radio communication by code with every important country in the world. One of the greatest services radio has performed is communication between ships and shore and between ships at sea. Radio has enormously reduced the loss of human life at sea, and we must provide full facilities for that at all times. There has been a very wonderful invention called 'the radio compass' which takes the place of the old magnetic compass by which ships have been navigated for centuries. We must provide wave lengths for use on the ships."

"We must bear in mind that radio broadcasting is the birth of the last five years and that our previous conferences have been largely concerned with trying to get the service established; to create an effective service that could reach every home. The agency is now established. When I called the first conference only thirty people were present. There were then only two or three broadcasting stations and only a few hundred thousand listeners. To-day there are nearly 600 stations and about 25,000,000 listeners. The problem of the present conference was to perfect that service."

## Must Be Legislation

"In general the conference, representing every phase of this question, was unanimous that there must be new legislation to give more control in the protection of public interest and in the perfection of the service. The conference recognized that radio has introduced a new element in the American life, that it possesses great values in home entertainment, in education and the spirit of religious thought; that it contains a great moral purpose not only to bring many new things into the lives of our people but to cement them together in a greater common understanding, and that the obligation of the industry is to provide these services."

## Fourth Conference Recommends Important Changes

(Continued from page one)

casting equipment is useless without a wave length. But so crystallized was the sentiment of the conference against the licensing of a single additional broadcasting station that it refused, by a nearly unanimous vote, a proposed amendment which would permit the Secretary of Commerce to license broadcasting stations provided channels could be found which would not cause 'appreciable interference.'

## No Wave Length Changes

All recommendations for the broadening of the broadcasting band by invading the amateur territory were met with firm opposition on the part of both amateurs and radio manufacturers. Proposals were made by representatives of broadcasting stations seeking licenses that the broadcasting band be extended downward to 150 meters, but it was contended that this would render obsolete radio equipment of immense value now in the hands of listeners and multiply the problems of receiver design without providing a sufficient number of broadcasting channels to meet all of the applications now pending. Another alternative—further divisions of time so that several stations can use the same channel at different hours—was condemned by the conference as being a wasteful duplication of equipment and personnel without commensurate improvement of broadcasting service."

The adoption of these various measures by the conference is considered by those competent to judge the situation as a momentous step forward in the improvement of broadcasting conditions. Secretary Hoover's remarks at the opening of

the conference aptly set forth the situation when he stated that "we hear a great deal about the freedom of the air. But there are two parties to freedom of the air and to freedom of speech for that matter. There is the speaker and the listener. Certainly, in radio, I believe in freedom for the listener. He has much less option upon what he can reject, for the other fellow is occupying his receiving set. The listener's only option is to abandon his right to use his receiver. Freedom cannot mean a license to every person or corporation who wishes to broadcast his name or his wares and thus monopolize the listener's set."

## Listener vs. B

"We do not get much freedom of speech if fifty people speak at the same place at the same time, nor is there any freedom in a right to come into my sitting room to make a speech whether I like it or not. So far as opportunity goes to explain one's views upon questions of controversy, political, religious or social, it would seem that 678 independent stations, many competing in each locality, might give ample opportunity for great latitude in remarks."

One of the measures which it is expected will reduce heterodyning of carrier waves, which evidences itself in the receiving set by a continuous whistle, is the enforcement of a plea, made by John V. L. Hogan, one of the foremost radio engineers of the country, for closer adherence to assigned frequencies. Many of the conferees cited instances of disregard of

wave length assignment either by reason of defective transmitting equipment or careless adjustment of controls.

The committee on allocation made no changes which have bearing on the broadcasting situation. Amateurs of the Hawaiian Islands, however, may resent the loss of the upper half of their transmitting band in favor of a commercial inter-island radio telephone service. This was vigorously opposed by the amateurs until it was pointed out by engineers that these wave lengths, from 171 to 200 meters, are the only ones upon which reliable commercial communication can be had. Upon assurance that no other encroachments upon their field were contemplated, the amateurs yielded graciously. Other changes in wave-length allocations concerned only government and marine services.

## Interest in Copyright

A tense interest was maintained in the deliberations of the committee on copyright relations to broadcasting, which conducted its fiery deliberations under the able chairmanship of Wallace H. White. The copyright situation is fraught with tremendous significance. The very foundations of broadcasting will be threatened if the demands of copyright holders, who were represented by Mr. E. C. Mills, of the American Society of Composers, Authors and Publishers, should become too heavy for broadcasting stations to bear. Defending the broadcasters was Mr. Paul B. Klugh,

executive chairman of the National Association of Broadcasters.

Up to this time many stations have taken out short term licenses for a blanket fee and it is alleged that the constantly increasing fees demanded have brought the situation to a crisis. The conference was not empowered to settle these questions, but the committee handling this problem outlined a principle of settlement of differences which may ultimately furnish a satisfactory conclusion to this long standing argument. So important is this matter to the future of radio broadcasting and so ably did the committee set forth the situation, that it is quoted in full:

## Copyright Report

"Whereas, There can be no continuation of broadcasting unless musical compositions are made available to broadcasters upon a fair, equitable and permanent basis, and

"Whereas, An insistent demand from the public requires that music be made the principal part of broadcast entertainment, and

"Whereas, Practically all of this music is held by copyright proprietors and is not available to broadcasters except on prohibitive and unstable terms, and

"Whereas, The broadcasters recognize the right of the copyright proprietors to compensation for the use of their compositions and are willing to pay a fair and equitable maximum fee for each broadcast

(Continued on page six)

## News and Notes of the Radio Trade

### B Battery Construction

It has been announced by the National Carbon Company, makers of Eveready batteries, that a new "layer-bill" method of battery construction, the result of years of intensive development work, will soon be utilized in the larger sizes of radio B batteries manufactured by that concern. It is claimed that the new type batteries, some 30,000 of which have been tested under service conditions during the last two years, give from 85 to 60 per cent longer life than cylindrical cell types of the same overall dimensions.

### New Condenser

A new type of variable condenser is being manufactured by the Allen D. Cardwell Manufacturing Corporation. It affords SLF tuning but retains the standard or semi-circular shaped plates. This condenser, known as type E, secures straight line tuning by using plates whose thickness is tapered, so that as the plates are revolved they tend to dovetail more closely, due to the variable thickness of both stator and rotor. This fundamental idea will afford all the conveniences of straight-line tuning without increasing the overall of the standard condenser in any way.

### Sets on Display

The new line of Federal Ortho-Sonic receivers is being exhibited at all the principal radio shows throughout the country. There are nine Federal Ortho-Sonic models comprising a variety of artistic cabinet styles. Loud speaker sets contain the Federal loud speaker unit.

### Rapid Rise of Sales

According to a statement issued by the Charles Freshman Company, Inc., manufacturers of the Freshman Masterpiece receiving sets, the sales for the month of October, 1925, approximated 60 per cent of the entire amount of business done in the year 1924. The net sales of the company for September, 1925, were an increase of more than 300 per cent over the corresponding month of 1924 and the net sales for October, 1925, were almost twice those of the preceding month.

### New Additions to Staff

J. Louis Reynolds, for five and a half years with the transmission engineering department of the American Telephone and Telegraph Company, is now in charge of the technical activities of the Sleeper Radio Corporation in Long Island City. Mr. Reynolds is a graduate of the Sheffield Scientific School of Yale University. He is best known in the broadcast field for his work when in charge of station WJAF's remote broadcasting features, particularly for the transmission from the Capitol Theater. Allen McLean, also formerly with the A. T. & T., will assist Mr. Reynolds.

Robert Hertzberg, who is well known as a radio writer, is the new publicity director of the Sleeper Radio Corporation. Mr. Hertzberg has done considerable work on radio for several newspapers.

### Clever Window Display

A very effective window display has been on view during the last week at the electrical appliance store of Charles W. Down at 711 Eighth Avenue. Mr. Down had a Ferguson eight on view with a live "wax figure." The lighting effects were clever and the display has attracted a great deal of interest.

### "The Larkinities" Program

An excellent varied program has been prepared by "The Larkinities" for their broadcasting from WJAF, WEEI, WGR, WOC, WFL, WWJ, WCAE, WCCO, WSAI, WTAG, WJAR and KSD on Thursday at 8 p. m. It will include selections from "The Pink Lady," "Lohengrin" and Finner's "Indian Love Songs," played by the orchestra, as well as "Off in the Silly Night," by the male quartet, and "Sentimental Me," a tenor solo by Franklin Bauer, tenor of the quartet, who is also tenor soloist at the Park Avenue Baptist Church, in New York City.

### Only 550 Active Stations

Of the 1,180 broadcasting stations which have been "on the air" since September, 1921, only 550 are active to-day.

## Remarkable Bargains

# Radak

The Famous Nationally Advertised Licensed Regenerative Armstrong Patent



Manufactured by Clapp Eastham Co., the oldest manufacturers of Radio Equipment in the world. Every one of these sets fully guaranteed by the manufacturers.

RESULTS—ANYTHING WITHIN 1,500 MILES  
Genuine Bakelite Panel—handsomely engraved.  
High grade cabinet.  
Circuit—Armstrong regenerative double tuner.  
Tubes—3—either dry cell or storage battery.  
Battery cable ready to attach to batteries.  
No posts or wires on front of cabinet.  
Only two controls—very simple to operate.

**SET ONLY**  
**\$11.98**

Sets are in original Sealed Factory cartons. These prices are for cash only.

# Federal

MODEL 59—List Price \$177.00



**OUR SALE PRICE**  
**\$29.95**

4 TUBES, STORAGE OR DRY CELL  
The receiver comprises one stage of radio detector and two stages of audio frequency amplification with a control which allows the degree of amplification to be varied between wide limits. Genuine Mahogany Cabinet, 15 in. high, 22 in. wide, 11 in. deep. Panel and dials genuine Bakelite. Antenna—A primary condenser switch provides for adjustment of the receiver to suit any type of antenna from the indoor wire to the larger outdoor antenna system.

**NOTE**  
The Federal is a ten million dollar (\$10,000,000) corporation, and the Federal is one of the best sets on the market.

**FREE** including in the purchase of this set we will give ABSOLUTELY FREE a \$7 Federal Head Set and an 80c PHONE PLUG.

**SPECIAL**  
Farrand The New Junior Type  
**\$16.50**

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AMBASSADOR  
Straight Line Condenser  
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**SPECIAL**  
BALKITE TRIPLE CHARGER  
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**SPECIAL**  
FRESHMAN "B" ELIMINATOR  
SOLD ON 15 DAY FREE TRIAL BASIS with BULB  
**\$22.50**

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Visit our Myrtle Ave. Store  
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ALL STORES OPEN EVENINGS  
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**WE'LL FILL YOUR ORDER PROMPTLY**

**DEALERS** GET IN TOUCH WITH US FOR SPECIAL PRICES ON THESE SETS AND ANY OTHER RADIO SETS OR PARTS

# AMSCO VERNIER DIALS



## Gives Finesse To Your Fingers

**REDUCE** the smallest turn you can give and ordinary dial to one-thirtieth, and you get an idea of the micrometer accuracy of the new Amsco Vernier Dial.

You will get new pleasure from your radio set—new distance records—new stations, if you put these dials on in place of ordinary dials.

A few turns of a screw driver does it.

The price is only \$1.50. At reliable radio dealers everywhere.

**AMSCO PRODUCTS, INC.**  
Broome and Lafayette Streets, N.Y.C.

# Ferguson

The Gold Standard of Radio Receivers

THE LADY of the house will welcome the FERGUSON Model "Eight" into the library among the cherished heirlooms—as a permanent addition, for her critical ear and eye will at once recognize it as a true musical instrument of charm and graceful dignity.

You will appreciate its ingenious super-craftsmanship; its ability to deliver "volume" with tone quality on even the distant stations.

At Your Authorized Ferguson Dealer's

Rance Corp., 86 Church St., Distributors

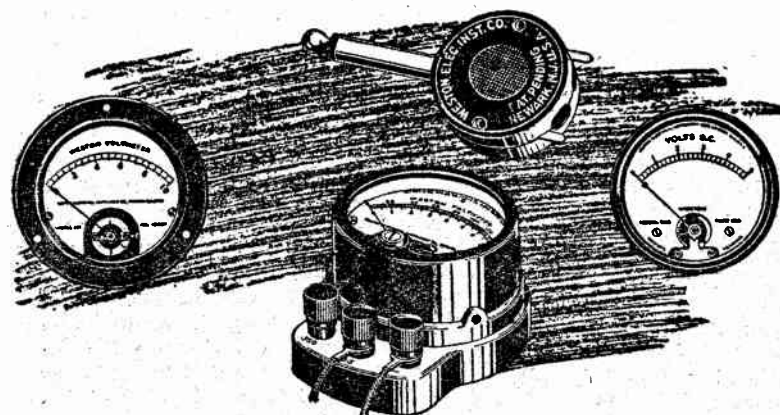
**One Tuning Control—**  
Calibrated in Meters!

Simply choose your program, turn up its exact wavelength, and in comes your station!





## WESTON quality radio products



## Give you NEW Radio Pleasure

WITH these new Weston quality products, specially designed and built for radio service, you secure a new pleasure in radio operation.

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**5-Tube Set Complete**  
DESIGN. RIGID CONSTRUCTION  
A HIGH QUALITY SET OF BEAUTIFUL  
Including 5 tubes, A and B, but  
teries, loud speaker and complete aerial  
equipment, all of STANDARD GUARAN-  
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**"STANDARD" NEUTRODYNE**  
THE WORLD'S FAMOUS 5-TUBE SET, Rendering  
Sweetly the Voice, Violin and Other Music in Fullness  
Richness. No Squeals or Howls. Best Long Dis-  
tance Getter Known.

**RECORD BREAKER NO. 145**  
CHAS. GOODENOUGH, 1223 Michigan Ave., New York, says:  
Your standard, which I bought about 2 1/2 years ago, is still giving the same marvelous  
results. I am getting every night when I tune for the far West, stations like KGO,  
Los Angeles, KFL, a small Rocky Mountain station, usually considered hard to get.  
I am getting it very often. I have in my log 180 distant stations to which I can tune  
most any time. I am getting Chicago station at 3 o'clock in afternoon. Also San Juan,  
Puerto Rico; KGO, Oakland, Calif.; KPO, San Francisco, Calif.; PWX, Havana, Cuba,  
and most of the Canadian stations. I am still using the first set of tubes that came  
with the set.

Other Sets Like Six-Tube Royal Neutrodyne. Also  
DE LUXE CONSOLE CABINETS TO  
SATISFY EVERY TASTE AND PURSE

**ATLANTIC & PACIFIC CORP.**  
THE PIONEER RADIO  
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JAMAICA STORE 9034 BUELLIN BOULEVARD  
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**THE ROBERTS ALKALINE  
"B" BATTERY**  
For more power, greater efficiency and  
dependability. Rechargeable—it cannot  
wear out. Buy one to-day.

Type A, 100 Volts..... 21.50  
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Desists write for terms:  
**ROBERTS BATTERY CO.**  
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**THE BIGGEST \$56.00 BUY**  
THE FAMOUS  
5-TUBE T. R. F. SET  
"EXEL" \$56.00  
Complete.....

Nothing Else To Buy  
Set, 4 Gen. R. C. A. Tubes,  
1 Gen. R. C. A. Power Tube,  
A & B Batteries, Aerial and  
Loud Speaker.

**DYNAMIC RADIO STORES**  
178 Greenwich St., cor. Dev., N. Y.  
5 Wiloughby St., at Borough Hall,  
Brooklyn

## Nine Committees Report to Washington Radio Conference

(Continued from page seven)

under any circumstances enter the forbidden field of censorship.

As to the specific matters referred to this committee, we respectfully submit the following report:

It is the opinion of this committee that:

(1) Existing Federal statutes are inadequate to permit proper administration of radio communication activities.

(2) The Congress of the United States is empowered by the statutes

a license to operate a broadcasting transmitting station, the character of which is to be defined in the act, shall be not to exceed five years, with the privilege of renewal for like periods, and provided further, that the Secretary may suspend or revoke any license for failure to maintain regular operation of a transmitting station without just cause.

(7) That the act should define the following terms, to wit: Commercial stations, broadcasting stations, ama-

### Table of Wave Length Allocation

| Kilocycles     | Meters        | Type of Transmission  | Service  | Remarks                                    |
|----------------|---------------|-----------------------|--|--|
| 85-120         | 2156-2499     | CW and ICW            | Government only.   |  |
| 120-153        | 2499-1960     | CW and ICW            | Marine and aircraft only.  | Non-exclusive.                             |
| 153-165        | 1960-1817     | CW and ICW            | Point to point, marine and aircraft only.  |  |
| 165-190        | 1817-1578     | CW and ICW            | Government.  | Non-exclusive.                             |
| 175            | 1713          | CW and ICW            | Point to point and marine only.  | Non-exclusive. (See petrol. Br. cast. &c.) |
| 190-229        | 1578-1304     | CW and ICW            | Government only.   |  |
| 229-235        | 1304-1276     | CW and ICW            | Univ. and college. Experimental only.  | Non-exclusive.                             |
| 245            | 1224          | CW and ICW            | Government.  | Non-exclusive.                             |
| 275            | 1090          | CW and ICW            | Government.  | Non-exclusive.                             |
| 285-400        | 1052-600      | CW and ICW            | Marine, coastal and government only.   |  |
| 300            | 1000          | CW and ICW            | Beacons only.  |  |
| 343            | 874           | CW and ICW            | Government only.   |  |
| 375            | 800           | CW and ICW            | Marine only.   |  |
| 410            | 731           | CW, ICW, spark        | Marine only.   |  |
| 425            | 706           | CW, ICW, spark        | Marine only.   |  |
| 445            | 674           | CW and ICW            | Government.  | Non-exclusive.                             |
| 454            | 660           | CW, ICW, spark        | Marine only.   |  |
| 500            | 600           | CW, ICW, spark, phone | Calling and distress and messages relating thereto only.   |  |
| 500-550        | 600-545       | CW, ICW, phone        | Aircraft and fixed safety of life sta.   | Non-exclusive.                             |
| 550-1500       | 545-200       | Phone                 | Broadcasting only.   |  |
| 1500-2000      | 200-150       | CW, ICW, phone        | Amateur only.  |  |
| 2000-2200      | 150-133       | _____                 | Point to point.  | Non-exclusive.                             |
| 2250-2300      | 133-130       | _____                 | Aircraft only.   |  |
| 2300-2750      | 130-109       | _____                 | Mobile and government mobile only.   |  |
| 2750-2850      | 109-105       | _____                 | Relay broadcasting only.   |  |
| 2850-3500      | 105-85.7      | _____                 | Public toll service, government, mobile and point to point communications by electric power supply utilities and point to point and multiple address message service by press organizations. |  |
| 3500-4000      | 85.7-75.0     | _____                 | Amateur, army, mobile, naval aircraft and naval vessels working aircraft only.   | Non-exclusive.                             |
| 4000-4325      | 75.0-69.3     | _____                 | Public toll service, government point to point, and point to point public utilities.   |  |
| 4325-5000      | 69.3-60.0     | _____                 | Relay broadcasting only.   |  |
| 5000-5500      | 60.0-54.5     | _____                 | Public toll service only.  |  |
| 5500-5700      | 54.5-52.6     | _____                 | Relay broadcasting only.   |  |
| 5700-7000      | 52.6-42.8     | _____                 | Point to point only.   |  |
| 7000-8000      | 42.8-37.5     | _____                 | Amateur and army mobile only.  | Non-exclusive.                             |
| 8000-9050      | 37.5-33.1     | _____                 | Public toll service, mobile, government point to point public utilities.   |  |
| 9050-10000     | 33.1-30.0     | _____                 | Relay broadcasting only.   |  |
| 10000-11000    | 30.0-27.3     | _____                 | Public toll service only.  |  |
| 11000-11400    | 27.3-26.3     | _____                 | Relay broadcasting only.   |  |
| 11400-14000    | 26.3-21.4     | _____                 | Public service, mobile and government point to point.  | Non-exclusive.                             |
| 14000-18000    | 21.4-18.7     | _____                 | Amateur only.  |  |
| 18000-18100    | 18.7-18.6     | _____                 | Public toll service, mobile and government point to point.   | Non-exclusive.                             |
| 18100-26000    | 16.6-5.25     | _____                 | Experimental.  |  |
| 26000-40000    | 5.25-4.89     | _____                 | Amateur.   |  |
| 40000-401000   | 4.89-0.7498   | _____                 | Experimental.  |  |
| 401000-4010000 | 0.7498-0.7477 | _____                 | Amateur.   |  |

to enact legislation necessary to provide such adequate administration.

(3) Present conditions and the public interest require that such legislation be enacted.

Your committee therefore recommends that Congress do enact such legislation, incorporating therein the following principles:

(1) That the administration of radio legislation shall be vested in the Secretary of Commerce, who shall make and enforce rules and regulations necessary to the proper administration of the provisions of such legislation.

(2) Such administration shall be exercised by the Secretary through the officers or employees of the Department of Commerce, except that the Secretary may appoint such boards or committees as he may consider necessary or desirable to assist him in an advisory capacity in the administration of problems of national scope.

(3) That the doctrine of free speech be held inviolate.

(4) That no monopoly in radio broadcasting shall be permitted.

(5) That the legislation shall contain provisions for due appeal from final decisions of the Secretary of Commerce to the appropriate court.

(6) Except in the case of governmental stations, the Secretary shall be empowered to classify all stations and to fix and assign call letters, wave length, power, location, time of operation, character of emission and duration of license.

Provided, further, that the term of

teur stations and experimental stations.

(8) That the Secretary shall have the power to revoke or suspend any license whenever he shall determine that the licensee has violated any of the terms of his license, regulation of the Secretary, Federal radio law or international treaty.

(9) That rebroadcasting of programs shall be prohibited except with the permission of the originating station.

(10) The Secretary of Commerce shall be empowered to make and enforce such rules and regulations as may be necessary to prevent interference to radio reception emanating from radio sources.

**Cuban Consul General to Discuss Cuban Exposition**  
Senor Felipe Taboada, Cuban Consul General, in New York, and chairman of the Cuban Exposition which opens to-morrow at the Pennsylvania Hotel and closes next Saturday, will broadcast over Station WMCA during Cuban Night at the McAlpin Hotel, on Thursday, at midnight.

The following night, at 6:45 p. m., Senor Taboada and ex-President Zayas, of Cuba, will broadcast from the same station. Both will talk on the importance of the Cuban Exposition to Americans.

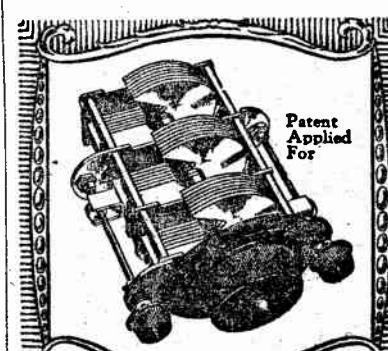
**Aerials for Crystals**  
Crystal receiving sets do not give satisfactory results when used in connection with indoor aerials.



**Brandes adjustable Table-Talker goose neck horn for more mellow tone**

The Table-Talker is a small horn (22 in. high) finished in brown.

**Brandes**  
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Control the air with one dial. Equip your set with a **United Scientific Laboratories Compensated Multiple Variable Condenser**

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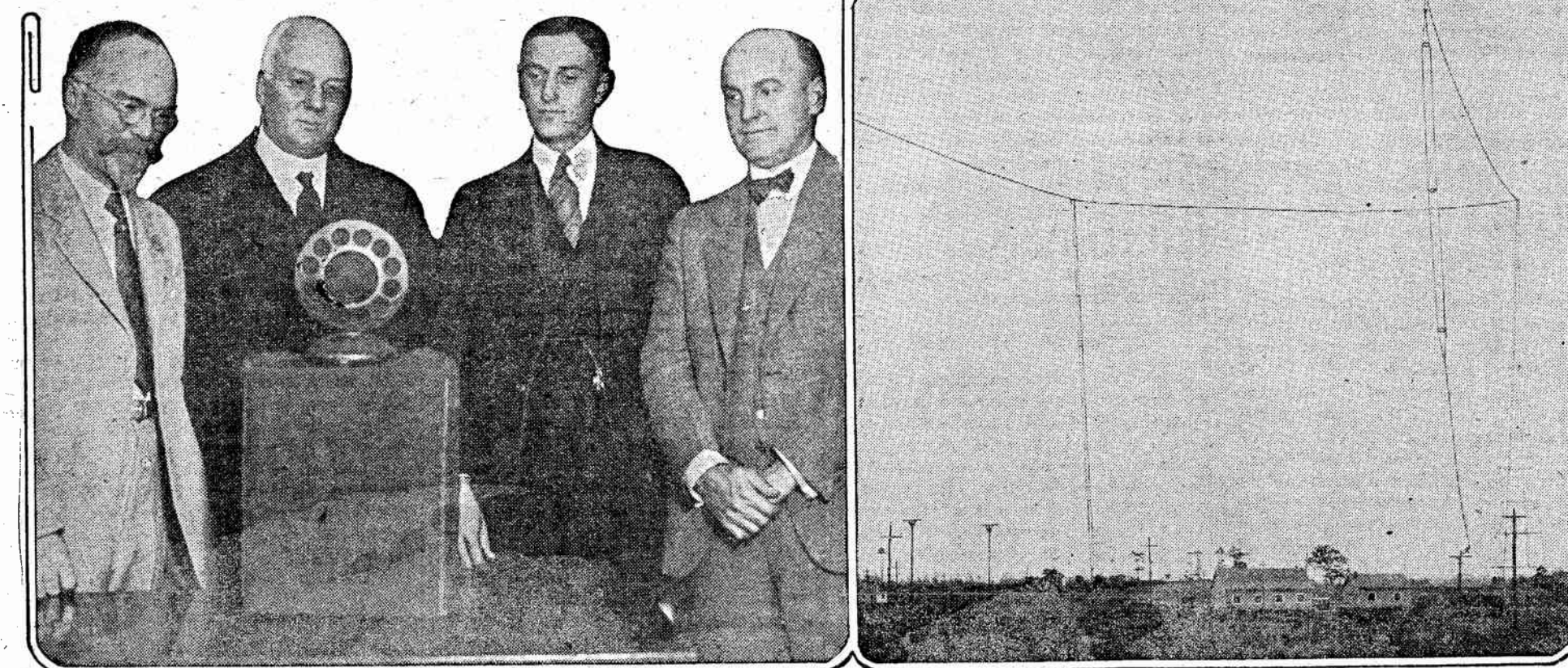
**BACH RADIO CO.**  
BETTER RADIO CONCEPTS  
601 West 145th Street  
PHONE BLDG. EDGCOMB 2731

## Up-to-the-Minute News of Radio in Pictures



Miss Raymonde C. Almira, New York society girl, builds her own radio receiver.

(At right) Children at the Sydney, Australia city mission, hearing their first radio concert.



Lecturers of the air college faculty. N.Y.U., left to right: Prof. Horne, Dear, Lough, Prof. Sheldon and Prof. McCune

Antenna system at Station WGY used in comparative tests on horizontal and vertical radiation



# Elementary Information for Radio Novices

## The Electrical Circuit and Its Measurements

By JAMES W. H. WEIR

Technical Editor, The National Stockman and Farmer

This is the fourth of a series of twenty-four lectures for the radio layman which is being broadcast through KDKA, the Westinghouse Electric and Manufacturing Company station of East Pittsburgh, Pa.

WITH the study of the electric circuit we actually enter the portals of practical radio, due to the fact that, no matter where electricity is used, there must exist a complete electric circuit if electricity is to flow. In its simplest form the electric circuit consists of two things—namely, a source of electrical supply and a pathway over which the supplied electricity may travel. To those unfamiliar with electricity it is helpful to liken the simple circuit to a closed pathway of pipe running into and out of a pump, which is inserted to circulate the water. In this case the pump takes the place occupied by the unit supplying the electricity and the pipe replaces the wire pathway.

Now, the creation of electric power originates from either of two sources. First, it may be obtained from a dynamo whose operation depends on the magnetic effect of the electric current; secondly, it may be obtained from batteries of chemical cells. For the present we shall confine ourselves to the chemical cell only, as the dynamo takes little part in the operation of the simple radio receiving set.

### Chemical Batteries

The production of electricity by chemical means was discovered long before the dynamo, and for many years the chemical means was the only source of power supply. Naturally, the cost of producing electricity for commercial use by this method was very high. In radio, however, despite the cost, it is often more advantageous to use batteries, as there are but few sets on the market capable of operating without them, and such sets are exceedingly high in price.

In our electric circuit then we will use

a battery of chemical cells as the source of power. Inasmuch as we are dealing with radio let us consider the circuit of the vacuum tube filament. This circuit is composed of a battery, a switch, a pathway of wire, a rheostat and a vacuum tube. The switch represents the break and make in the metallic pathway to and from the battery. Its purpose is to open and close the circuit, permitting the current to flow to light and extinguish the filament of the tube. The rheostat is a resistance or opposing force to the current flow from the battery and is used to control the temperature of the filament.

Let us picture the circuit for a moment. A wire is attached to one terminal of the battery and connected to one side of the tube filament. The other side of the tube filament is then connected to one side of the rheostat. From the other side of the rheostat a wire is led to one side of the switch and finally from the other side of the switch a wire is connected to the remaining terminal of the battery. The flow of electricity does not commence until we throw the switch, thus completing the wire pathway. The filament of the tube opposes the flow of the electric current to such an extent that it becomes hot to the point of incandescence, and in this condition it is said to be lit.

### Electric Circuit

Such is the fundamental construction of any electric circuit. Keep in mind that it always embodies, first, a source of electrical supply, and second, a metallic pathway, over which the electricity may flow. The pathway will more than likely include the apparatus upon which the electric power operates, a means of control, and a make-and-break arrangement, which is known as a switch.

Now in radio, as well as in the study of electricity, it is often of value to know how fast the current is flowing, the amount of push behind it and the opposition to its flow. The work entailed in making these measurements has been ex-

tremely simplified by means of voltmeters and ammeters. In spite of this, however, all radio fans should be acquainted with the basic principles of determining these measurements. These principles are all to be found in "Ohm's Law."

Before taking up "Ohm's Law," however, it will be necessary for us to learn a little regarding the units in which electric power and energy are expressed. Let us go back a moment to our water pipe system. At this point insert a water motor in the water circuit, in addition to the pump. Now, the power necessary to operate this motor will depend on the flow of water through it, the opposition afforded by the size of pipe and the pressure acting between the inlet and outlet of the motor. In the case of the water circuit the rate of water flow is measured in gallons per second, while in electricity the rate of current flow is termed amperes per second. The pressure in water in the water pipe circuit is measured in pounds per square inch, while in electricity it is measured in volts. The amount of power in the water system is usually designated in terms of horsepower, while in electricity it is measured in watts or kilowatts. Energy in the water analogy is measured in horsepower hours, while in electricity it is measured in kilowatt hours.

### Professor Ohm's Discovery

If the pressure in our pipe line is increased the flow of water through it in gallons per minute is increased. Professor Ohm found that an increase in voltage applied to a given conductor or wire path would also cause a strictly proportional increase in the current flow. Applying this discovery he worked out a series of rules which I shall now give you:

(1) To find the resistance in any electrical circuit divide the pressure by the current flow or rate.

(2) To find the voltage in any electrical circuit multiply the resistance by the current flow.

(3) To find the current flow in the circuit divide the pressure by the resistance. To simplify these rules the pressure is termed voltage, the resistance ohms and the rate of current flow amperes.

The power furnished by electricity to any electrical apparatus depends on the amount of current flow and the pressure or voltage. In other words, if we multiply the volts by the amperes we get the power in watts. To be more specific, if a motor takes five amperes and operates on 110 volts it uses 550 watts. The cost of electrical service is based on kilowatt hours. For instance, if the motor used three kilowatts of power per hour in eight hours it would use twenty-four kilowatt hours.

### Practical Problem

Now, let me give you a practical problem illustrating the use of "Ohm's Law." Let us go back to our vacuum tube circuit. The battery we are using, let us say, is rated at six volts. Assuming that the resistance of the rheostat, the conductor and the vacuum tube totals twenty-four ohms, what will be the current flow in amperes? Applying the third section of "Ohm's Law," which states that the number of amperes flowing equals the voltage divided by the number of ohms resistance, we have six volts, divided by twenty-four ohms, or twenty-five hundredths amperes. The power being used is six volts times .25 amperes, or 1.5 watts.

Of course, to operate a radio set all this calculation is unnecessary, but it is always well to be familiar with the law of Ohm. Every radio set owner should be provided with a voltmeter and an ammeter in order that the strength of his batteries may be determined from time to time, as this procedure will guarantee perfect reception at all times.

Next week we shall learn a little more about alternating current and will begin our study of the phenomena surrounding the propagation of the radio waves.

as at present; that rebroadcasting of programs without consent of the original broadcasting stations should be prohibited by law, that legislation should be passed which permits appeal from decisions of the Secretary of Commerce to an appropriate court, and numerous other significant proposals.

### Firms Represented

The proceedings of the conference were marked by a spirit of co-operation and fair consideration to the numerous diverse interests involved. Representation was accorded to broadcasting stations, radio magazines, newspapers having radio sections, press associations, organizations of broadcast listeners, commercial radio companies, manufacturers of radio apparatus, amateur organizations, radio trade associations and governmental departments.

### Collecting a Note Via Radio

(Continued from page two)  
"static collector"—the silver ball affair—is operated by a high-tension spark coil connected with the aerial.

"To obtain the best illusionary effect all external wires should be concealed and the phonograph and spark coil should be nowhere in evidence.

"I sincerely trust that you will not think me presuming on your ignorance in giving you the foregoing information. Incidentally, and in conclusion, an old friend of yours requests me to send you the inclosed note, which, through some slight oversight on your part, you did not pay thirty years ago. You will no doubt be pleased to observe that the note is marked 'Paid.'"

"Cordially yours,  
"J. YERGER JAMISON."  
George Hampton laughed as he returned the missive to his father. "That's what I call rubbing it in, J. Y. What are you going to do with the letter?"  
"Mail it, together with the note, when our train makes the next stop."  
THE END

## AMATEUR KICKBACKS

The Fourth National Radio Conference closed last Thursday evening without hampering with the amateur wave band assignments, thanks to Hiram Percy Maxim, the representative of the American Radio Relay League and the transmitting amateur.

The argument favoring no change of wave length assignments was that the amateur succeeded in operating so well during the past year that there was no need for change in wave bands for this fraternity of experimenters.

The conference did decide, however, that radio manufacturers should discontinue the manufacture of regenerative receivers. Apparently nothing was said about what wave lengths, prohibition of this type receiver was to be effective. For broadcast reception, where the requirements of the receiver are to receive modulated signals, this is an exceedingly excellent idea.

It is said that interference caused by radiating receivers is one of the greatest problems in radio broadcast reception. Now it will be eliminated. However, we are wondering if this will apply to amateur wave lengths. The amateur will be almost lost without a regenerative receiver. As a matter of fact at the present time this is the only type of set adapted to his work. Receivers which are not regenerative are difficult to handle in short waves where the quickest possible means of covering the entire wave band in the shortest length of time is required for successful operation. The fact that the amateur employs a receiver which is capable of radiating will not interfere with the reception of broadcast signals.

However, if this regulation applies to amateur bands the amateur will find a means of making a receiver that will not radiate and will be equally efficient for his needs.

2LZ recently remounted his transmitter and is operating on both 150 and 75 meters. He succeeds in working stations to the north and south of him with regularity, but has difficulty in reaching the west. His transmitter employs one five-watt tube.

2XBF is evidently keeping a late schedule, as we have heard him on the air on several occasions during the last week. He seems to handle all messages which are given to him with remarkable speed. He receives them during the day at XBF and relays them at night at his own station, 2ZB.

2CQZ is operating on both 40 and 180 meters. At the present time he is rebuilding his short wave transmitter.

After buying two perfectly good five-watt tubes, 2LZ had the misfortune of dropping one of them. The remaining tube is being used on both 175 and 80 meters, and excellent results are being obtained.

The consistency with which American amateurs have been reporting the reception of stations in foreign nations marks, in our mind, the opening of an excellent DX season in which almost unbelievable things will happen as far as amateur radio is concerned. Already the static has faded as if overpowered by its enemy Jack Frost.

On both the 40 and 80 meter bands British, French and other amateurs located in the western portion of Europe may be heard as early as 5 o'clock in the evening. This insures regular communication, because most American amateurs are home for dinner about this time and usually find a few minutes afterward to "pound brass."

However, if one desires to communicate with amateurs located in the southern Pacific waters he will have to be an early riser, as their stations are seldom heard before 3 o'clock in the morning. (It may happen that some amateurs do not come home till this hour.) In spite of the hour we have heard amateurs communicating with Australia and New Zealand amateurs quite frequently.

Communication can be maintained until the sun comes above the horizon and seemingly blots out these distant signals with its rays.

2BIR, who recently put a forty-meter set in operation, has worked his first foreign station. At this writing we do not know the call letters of the station, but we do know that it is French, and BIR is quite elated.

## Five Men at WKRC Have Same Name

"Eugene" is not a common name, by any means, but when five men are together every night in one studio with the same name, there is some confusion. Station WKRC, the K del Radio Corporation, has five "Eugenes" at their station; Eugene Mittenfiori, studio director; Eugene Perazzo, musical director; Eugene Schmidt, tenor soloist of the Cincinnati Conservatory of Music; Eugene Wesselman and Eugene Huber, operators. And so they have been given a number; Eugene Mittenfiori is "Number One," and so on down the line. The five "Genes" challenge any other radio station in the world to produce five men with the same name, even though the name be "John," who are permanently at the studio and on programs.

## School Classes to Recite to Microphone in Education Week

The week of November 16, is known as American Education Week, and Station WJZ will co-operate with the Board of Education of New York City in bringing the subject of education into the homes of the radio audience. To this end the hour of 2 to 3 in the afternoon of the week of November 16 has been turned over to the Board of Education by the station for their use, and educational programs will be presented. The Board of Education has arranged to bring to the studio entire classes, and recitations will be held there just as they are in the schools. By this method the radio audience will have the opportunity to listen in on the daily lessons being taught in the average public school in the city, and at the end of the week should have a better understanding of the type of education the children are receiving. Each day of the week has been given a particular topic, and classes reciting on that day will discuss the

day's topic. The topics in their correct order, starting with Monday, are as follows: Constitution Day; Patriotism Day; School and Teacher Day; Conservation and Thrift Day; Know-Your-School Day; Community and Health Day and For God and Country Day.

Monday, November 16—Program in charge of Dr. Benjamin Veit, district superintendent of junior high schools. Music and class recitations by pupils of junior high schools in New York City.

Tuesday, November 17—Class recitation by pupils of Richmond Hill High School; junior high school orchestra; lecture by Alfred C. Bosom.

Wednesday, November 18—Program in charge of Hugo Newman, principal of New York Training School for Teachers, and program by pupils of his school.

Thursday, November 19—Flushing High School Orchestra; talk by the Hon. George J. Ryan, president of the Board of Education; class recitation in Agriculture by pupils of New-

town High School; "Agriculture in New York Schools," by Burton Haynor, chairman of agriculture department of Newtown High School.

## Violin and Organ Recital to Follow St. George's Vespera

Violin solos by Miss Mozelle Bennett, the soloist of St. George's Church at 4 o'clock this afternoon. In addition to Mascagni's *Intermezzo*, which Miss Bennett will play as a part of the service, a violin and organ recital will follow immediately after the vespers with Mr. George Kemmer at the organ. At this time Miss Bennett will play the *Melodia* of Gluck, arranged for violin by Kreisler and "The Old Refrain." Mr. Kemmer's organ solo will be "Thee Is Joy," by Bach.

## Radio Golf

"Radio Golf is an exercise of skill and of the efficiency of the set plus a gamble on the radio weather," says Secretary Hoover.



## The real solution to the tuning problem!

MAKE your radio a 1926 model. Replace your present Dials with Rathbun Straight Line Frequency Converters which spread all stations within the range of your receiver uniformly around the whole circle of 360°. All stations are a uniform distance apart on these new Converters. This is the ideal tuning condition.

Why be satisfied with Dials or Condensers which are limited to 180° or only half the dial? Why stop at 180° when there are 360° in the circle? There are no gears with their back lash, no friction with its slippage in Rathbun Straight Line Frequency Converters—only two moving parts, a variable cam and a lever. Easily and quickly installed on any set—it is not necessary to cut Condenser shafts or drill panels.

The Rathbun Straight Line Frequency Converter is one of the few really new things in Radio during the past three years.

Don't forget that we build the Rathbun Single Hole Mounting Condenser with genuine Bakelite ends. This year's models are all enclosed with transparent pyralin dust bands which preserve their high efficiency for life. Small, light, rugged, handsome and none lower loss or higher in efficiency. Reasonably priced.

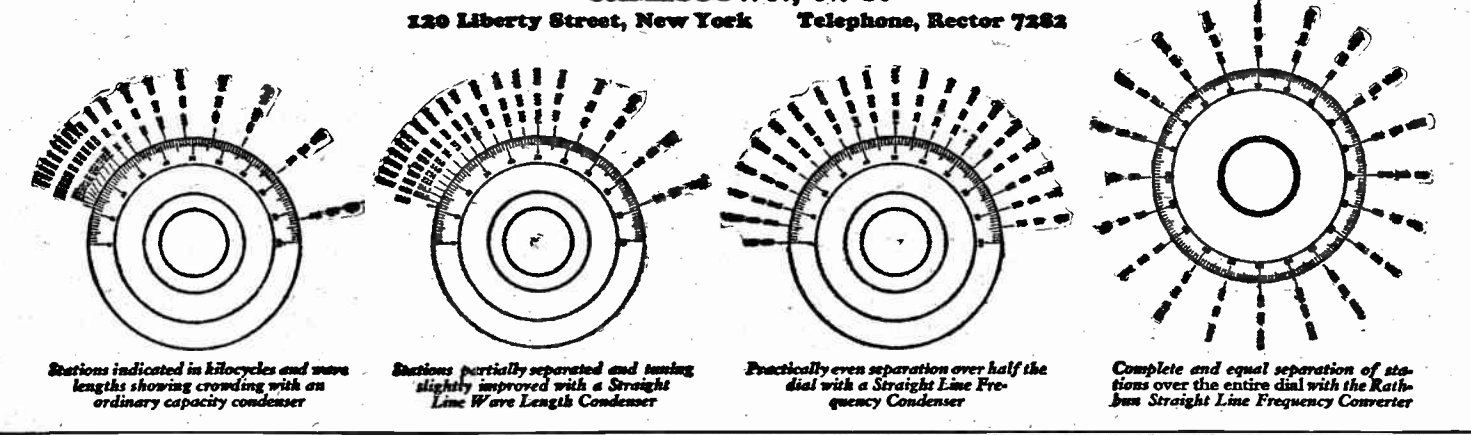
Ask your dealer for Rathbun Straight Line Frequency Converters. If he has not yet stocked them, he will quickly obtain them for you.

PRICE \$3.50

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|                     |                        |                           |   |   |  |          |
|---------------------|------------------------|---------------------------|---|---|--|----------|
| WKRC-CINCINNATI-326 | WFBH-NEW YORK CITY-273 | WCAC-MANSFIELD, CONN.-275 | WRC-WASHINGTON-469<br>10 a. m.-Women's Hour from WJZ. | WHN-NEW YORK CITY-361<br>2:15 p. m.-Jimmy Clark's Entertainers. | WIP-PHILADELPHIA-508<br>6:45 a. m.-Setting-up exercises. | THURSDAY |
|---------------------|------------------------|---------------------------|---|---|--|----------|

ercises.  
ercises

## NEW YORK CITY

|             |                                   |             |                                     |
|-------------|-----------------------------------|-------------|-------------------------------------|
| 6:05 p. m.  | -Dinner music.                    | 11:00 a. m. | -New York Times.                    |
| 6:30 p. m.  | -Dinner music.                    | 6:45 a. m.  | -New York Times.                    |
| 6:30 p. m.  | -Program for children.            | 7:00 a. m.  | -Margaret Hamilton, soprano.        |
| 6:45 p. m.  | -Albany Strand Theater Orchestra. | 7:15 a. m.  | -Heathcote Exercises.               |
| 7:30 p. m.  | -Book of Knowledge program.       | 11:25 a. m. | -Margaret Hamilton, soprano.        |
| 8:15 p. m.  | -School and Teacher Day.          | 11:30 a. m. | -Columbia University Orchestra.     |
| 8:30 p. m.  | -Dinner music.                    | 12 noon.    | -Martha and Weather Radio.          |
| 8:45 p. m.  | -Dinner music.                    | 12:15 p. m. | -Pieria Florida plant.              |
| 9:00 p. m.  | -Dinner music.                    | 12:30 p. m. | -Chick, soprano.                    |
| 9:15 p. m.  | -Dinner music.                    | 4:30 p. m.  | -Pieria Florida plant.              |
| 9:30 p. m.  | -Dinner music.                    | 4:45 p. m.  | -Chick, soprano.                    |
| 9:45 p. m.  | -Dinner music.                    | 6:00 p. m.  | -Dinner Music.                      |
| 10:00 p. m. | -Dinner music.                    | 7:00 p. m.  | -Mid-Week Services: Dost.           |
| 10:30 p. m. | -Euke Duo.                        | 7:30 p. m.  | -Rev. W. H. Acker.                  |
| 10:45 p. m. | -Frankie Brown, songs.            | 7:30 p. m.  | -Serenaders.                        |
| 10:55 p. m. | -Oranwump Orchestra.              | 7:45 p. m.  | -Serenaders.                        |
| 11:00 p. m. | -Dinner music.                    | 8:00 p. m.  | -"Furling, George Cool.             |
| 11:15 p. m. | -Dinner music.                    | 9 p. m.     | -Address by President.              |
| 11:30 p. m. | -Dinner music.                    | 9:15 p. m.  | -Coolidge at the House of Congress. |
| 11:45 p. m. | -Dinner music.                    | 9:30 p. m.  | -The Zippers.                       |
| 12:00 p. m. | -Dinner music.                    | 11:30 p. m. | -Vicent Lopez of Orchestra.         |
| 12:15 p. m. | -Dinner music.                    | 11:45 p. m. | -New York City.                     |
| 12:30 p. m. | -Dinner music.                    | 12:00 p. m. | -Women's Hour.                      |
| 12:45 p. m. | -Dinner music.                    | 12:15 p. m. | -New York City.                     |
| 1:00 p. m.  | -Dinner music.                    | 11:05 a. m. | -Be Your Own Decor.                 |
| 1:15 p. m.  | -Dinner music.                    | 12:00 p. m. | -Nathaniel.                         |
| 1:30 p. m.  | -Dinner music.                    | 12:15 p. m. | -Educational Program.               |
| 1:45 p. m.  | -Dinner music.                    | 12:30 p. m. | -Educational Program.               |
| 2:00 p. m.  | -Dinner music.                    | 12:45 p. m. | -Educational Program.               |
| 2:15 p. m.  | -Dinner music.                    | 1:15 p. m.  | -Rev. Joseph Margolin.              |
| 2:30 p. m.  | -Dinner music.                    | 1:30 p. m.  | -Bernard Levin's Music.             |
| 2:45 p. m.  | -Dinner music.                    | 1:45 p. m.  | -Bernard Levin's Music.             |
| 3:00 p. m.  | -Dinner music.                    | 2:00 p. m.  | -Financial summary.                 |
| 3:15 p. m.  | -Dinner music.                    | 2:15 p. m.  | -Financial summary.                 |
| 3:30 p. m.  | -Dinner music.                    | 2:30 p. m.  | -Financial summary.                 |
| 3:45 p. m.  | -Dinner music.                    | 2:45 p. m.  | -Financial summary.                 |
| 4:00 p. m.  | -Dinner music.                    | 3:00 p. m.  | -Financial summary.                 |
| 4:15 p. m.  | -Dinner music.                    | 3:15 p. m.  | -Financial summary.                 |
| 4:30 p. m.  | -Dinner music.                    | 3:30 p. m.  | -Financial summary.                 |
| 4:45 p. m.  | -Dinner music.                    | 3:45 p. m.  | -Financial summary.                 |
| 5:00 p. m.  | -Dinner music.                    | 4:00 p. m.  | -Financial summary.                 |
| 5:15 p. m.  | -Dinner music.                    | 4:15 p. m.  | -Financial summary.                 |
| 5:30 p. m.  | -Dinner music.                    | 4:30 p. m.  | -Financial summary.                 |
| 5:45 p. m.  | -Dinner music.                    | 4:45 p. m.  | -Financial summary.                 |
| 6:00 p. m.  | -Dinner music.                    | 5:00 p. m.  | -Financial summary.                 |
| 6:15 p. m.  | -Dinner music.                    | 5:15 p. m.  | -Financial summary.                 |
| 6:30 p. m.  | -Dinner music.                    | 5:30 p. m.  | -Financial summary.                 |
| 6:45 p. m.  | -Dinner music.                    | 5:45 p. m.  | -Financial summary.                 |
| 7:00 p. m.  | -Dinner music.                    | 6:00 p. m.  | -Financial summary.                 |
| 7:15 p. m.  | -Dinner music.                    | 6:15 p. m.  | -Financial summary.                 |
| 7:30 p. m.  | -Dinner music.                    | 6:30 p. m.  | -Financial summary.                 |
| 7:45 p. m.  | -Dinner music.                    | 6:45 p. m.  | -Financial summary.                 |
| 8:00 p. m.  | -Dinner music.                    | 7:00 p. m.  | -Financial summary.                 |
| 8:15 p. m.  | -Dinner music.                    | 7:15 p. m.  | -Financial summary.                 |
| 8:30 p. m.  | -Dinner music.                    | 7:30 p. m.  | -Financial summary.                 |
| 8:45 p. m.  | -Dinner music.                    | 7:45 p. m.  | -Financial summary.                 |
| 9:00 p. m.  | -Dinner music.                    | 8:00 p. m.  | -Financial summary.                 |
| 9:15 p. m.  | -Dinner music.                    | 8:15 p. m.  | -Financial summary.                 |
| 9:30 p. m.  | -Dinner music.                    | 8:30 p. m.  | -Financial summary.                 |
| 9:45 p. m.  | -Dinner music.                    | 8:45 p. m.  | -Financial summary.                 |
| 10:00 p. m. | -Dinner music.                    | 9:00 p. m.  | -Financial summary.                 |
| 10:15 p. m. | -Dinner music.                    | 9:15 p. m.  | -Financial summary.                 |
| 10:30 p. m. | -Dinner music.                    | 9:30 p. m.  | -Financial summary.                 |
| 10:45 p. m. | -Dinner music.                    | 9:45 p. m.  | -Financial summary.                 |
| 11:00 p. m. | -Dinner music.                    | 10:00 p. m. | -Financial summary.                 |
| 11:15 p. m. | -Dinner music.                    | 10:15 p. m. | -Financial summary.                 |
| 11:30 p. m. | -Dinner music.                    | 10:30 p. m. | -Financial summary.                 |
| 11:45 p. m. | -Dinner music.                    | 10:45 p. m. | -Financial summary.                 |
| 12:00 p. m. | -Dinner music.                    | 11:00 p. m. | -Financial summary.                 |
| 12:15 p. m. | -Dinner music.                    | 11:15 p. m. | -Financial summary.                 |
| 12:30 p. m. | -Dinner music.                    | 11:30 p. m. | -Financial summary.                 |
| 12:45 p. m. | -Dinner music.                    | 11:45 p. m. | -Financial summary.                 |
| 1:00 p. m.  | -Dinner music.                    | 12:00 p. m. | -Financial summary.                 |
| 1:15 p. m.  | -Dinner music.                    | 12:15 p. m. | -Financial summary.                 |
| 1:30 p. m.  | -Dinner music.                    | 12:30 p. m. | -Financial summary.                 |
| 1:45 p. m.  | -Dinner music.                    | 12:45 p. m. | -Financial summary.                 |
| 2:00 p. m.  | -Dinner music.                    | 1:00 p. m.  | -Financial summary.                 |
| 2:15 p. m.  | -Dinner music.                    | 1:15 p. m.  | -Financial summary.                 |
| 2:30 p. m.  | -Dinner music.                    | 1:30 p. m.  | -Financial summary.                 |
| 2:45 p. m.  | -Dinner music.                    | 1:45 p. m.  | -Financial summary.                 |
| 3:00 p. m.  | -Dinner music.                    | 2:00 p. m.  | -Financial summary.                 |
| 3:15 p. m.  | -Dinner music.                    | 2:15 p. m.  | -Financial summary.                 |
| 3:30 p. m.  | -Dinner music.                    | 2:30 p. m.  | -Financial summary.                 |
| 3:45 p. m.  | -Dinner music.                    | 2:45 p. m.  | -Financial summary.                 |
| 4:00 p. m.  | -Dinner music.                    | 3:00 p. m.  | -Financial summary.                 |
| 4:15 p. m.  | -Dinner music.                    | 3:15 p. m.  | -Financial summary.                 |
| 4:30 p. m.  | -Dinner music.                    | 3:30 p. m.  | -Financial summary.                 |
| 4:45 p. m.  | -Dinner music.                    | 3:45 p. m.  | -Financial summary.                 |

## NEW YORK

[illegible]

NEW YORK CITY

|             |                              |             |                          |
|-------------|------------------------------|-------------|--------------------------|
| 7:40 p. m.  | WUAB—PITTSBURGH—461          | 9:30 p. m.  | —The Allen Ritz Band     |
| 7:45 p. m.  | —Police reports              | 10:00 p. m. | —Police reports; weather |
| 7:50 p. m.  | —Police reports and talks    | 10:30 p. m. | —Police alarms; times    |
| 8:30 p. m.  | —Pooley concert              | 10:30 p. m. | WKRY—NEW YORK CITY—      |
| 8:40 p. m.  | —Roxey's Gang                | 10:30 p. m. | —Advantages of Pi        |
| 8:45 p. m.  | WADQ—CINCINNATI—OHIO—558     | 10:45 a. m. | —Advantages of Pi        |
| 8:50 p. m.  | —Percussion Quintet          | 11:00 a. m. | —Advantages of Pi        |
| 9:20 p. m.  | WPAM—CLEVELAND—450           | 11:15 a. m. | —Musical Courier Say     |
| 9:30 p. m.  | —Dinner music                | 12 noon     | —Hour                    |
| 9:40 p. m.  | —Organ recital               | 4:15 p. m.  | —Philharmonic Society    |
| 9:45 p. m.  | —Dance music                 | 4:30 p. m.  | —Symphony Society        |
| 9:50 p. m.  | —Dinner                      | 4:45 p. m.  | —Jewish Chorus           |
| 9:55 p. m.  | WSEAR—CLEVELAND—390          | 7 p. m.     | —Whose Birthday To-day   |
| 9:55 p. m.  | —Dinner                      | 7:00 p. m.  | —Telegraph sports        |
| 10:00 p. m. | —Community fund              | 7:10 p. m.  | —Commerce                |
| 10:05 p. m. | WKRO—CINCINNATI—422          | 7:15 p. m.  | —Opera notes             |
| 10:10 p. m. | —Dance music                 | 7:20 p. m.  | —Chorus                  |
| 10:15 p. m. | —Pop music                   | 7:30 p. m.  | —Jewish Seligman         |
| 10:20 p. m. | —McKay's Dance Orchestra     | 7:45 p. m.  | —Kwans Family Chorus     |
| 10:45 p. m. | WSAI—CINCINNATI—320          | 8:00 p. m.  | —Concert                 |
| 10:55 p. m. | —Star Talk                   | 8:30 p. m.  | —Radio questions and     |
| 11 p. m.    | —Popular program             | 8:45 p. m.  | —Life's jokes            |
| 11:10 p. m. | —Star program                | 9 p. m.     | —Alec Chis on philosophy |
| 11:20 p. m. | WLW—CINCINNATI—423           | 9:30 p. m.  | —Essays on philosophy    |
| 11:30 p. m. | —Dinner                      | 9:45 p. m.  | —Bill Rieles             |
| 8:30 p. m.  | —National Radio Farm Council | 9:45 p. m.  | —Chorus Theater          |
| 8:40 p. m.  | —Concert                     | 10 p. m.    | —Volgs Trio              |
| 10:30 p. m. | —Mary Chase, soprano         | 10:10 p. m. | —Radio City Players      |
| 11 p. m.    | —Pop concert                 | 10:30 p. m. | —Radio City Players      |
| 11:30 p. m. | —Male quartet                | 10:45 p. m. | —Radio City Players      |
| 12:15 a. m. | —Trio concert                | 10:50 p. m. | —Radio City Players      |
| 12:30 a. m. | —Trio concert                | 11:00 p. m. | —Radio City Players      |
| 12:45 a. m. | —Trio concert                | 11:10 p. m. | —Radio City Players      |
| 1:00 a. m.  | —Trio concert                | 11:20 p. m. | —Radio City Players      |
| 1:15 a. m.  | —Trio concert                | 11:30 p. m. | —Radio City Players      |
| 1:30 a. m.  | —Trio concert                | 11:40 p. m. | —Radio City Players      |
| 1:45 a. m.  | —Trio concert                | 11:50 p. m. | —Radio City Players      |
| 2:00 a. m.  | —Trio concert                | 12:00 a. m. | —Radio City Players      |
| 2:15 a. m.  | —Trio concert                | 12:10 a. m. | —Radio City Players      |
| 2:30 a. m.  | —Trio concert                | 12:20 a. m. | —Radio City Players      |
| 2:45 a. m.  | —Trio concert                | 12:30 a. m. | —Radio City Players      |
| 3:00 a. m.  | —Trio concert                | 12:40 a. m. | —Radio City Players      |
| 3:15 a. m.  | —Trio concert                | 12:50 a. m. | —Radio City Players      |
| 3:30 a. m.  | —Trio concert                | 1:00 a. m.  | —Radio City Players      |
| 3:45 a. m.  | —Trio concert                | 1:10 a. m.  | —Radio City Players      |
| 4:00 a. m.  | —Trio concert                | 1:20 a. m.  | —Radio City Players      |
| 4:15 a. m.  | —Trio concert                | 1:30 a. m.  | —Radio City Players      |
| 4:30 a. m.  | —Trio concert                | 1:40 a. m.  | —Radio City Players      |
| 4:45 a. m.  | —Trio concert                | 1:50 a. m.  | —Radio City Players      |
| 5:00 a. m.  | —Trio concert                | 2:00 a. m.  | —Radio City Players      |
| 5:15 a. m.  | —Trio concert                | 2:10 a. m.  | —Radio City Players      |
| 5:30 a. m.  | —Trio concert                | 2:20 a. m.  | —Radio City Players      |
| 5:45 a. m.  | —Trio concert                | 2:30 a. m.  | —Radio City Players      |
| 6:00 a. m.  | —Trio concert                | 2:40 a. m.  | —Radio City Players      |
| 6:15 a. m.  | —Trio concert                | 2:50 a. m.  | —Radio City Players      |
| 6:30 a. m.  | —Trio concert                | 3:00 a. m.  | —Radio City Players      |
| 6:45 a. m.  | —Trio concert                | 3:10 a. m.  | —Radio City Players      |
| 7:00 a. m.  | —Trio concert                | 3:20 a. m.  | —Radio City Players      |
| 7:15 a. m.  | —Trio concert                | 3:30 a. m.  | —Radio City Players      |
| 7:30 a. m.  | —Trio concert                | 3:40 a. m.  | —Radio City Players      |
| 7:45 a. m.  | —Trio concert                | 3:50 a. m.  | —Radio City Players      |
| 8:00 a. m.  | —Trio concert                | 4:00 a. m.  | —Radio City Players      |
| 8:15 a. m.  | —Trio concert                | 4:10 a. m.  | —Radio City Players      |
| 8:30 a. m.  | —Trio concert                | 4:20 a. m.  | —Radio City Players      |
| 8:45 a. m.  | —Trio concert                | 4:30 a. m.  | —Radio City Players      |
| 9:00 a. m.  | —Trio concert                | 4:40 a. m.  | —Radio City Players      |
| 9:15 a. m.  | —Trio concert                | 4:50 a. m.  | —Radio City Players      |
| 9:30 a. m.  | —Trio concert                | 5:00 a. m.  | —Radio City Players      |
| 9:45 a. m.  | —Trio concert                | 5:10 a. m.  | —Radio City Players      |
| 10:00 a. m. | —Trio concert                | 5:20 a. m.  | —Radio City Players      |
| 10:15 a. m. | —Trio concert                | 5:30 a. m.  | —Radio City Players      |
| 10:30 a. m. | —Trio concert                | 5:40 a. m.  | —Radio City Players      |
| 10:45 a. m. | —Trio concert                | 5:50 a. m.  | —Radio City Players      |
| 11:00 a. m. | —Trio concert                | 6:00 a. m.  | —Radio City Players      |
| 11:15 a. m. | —Trio concert                | 6:10 a. m.  | —Radio City Players      |
| 11:30 a. m  |                              |             |                          |

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| 11 p. m.—Midnight review; "Club."                                | 12 midnight—                                      |
| 12 to 8 a. m.—"WGN Chicago-370"                                  | 2 p. m.—New YORK CITY—                            |
| 8 to 9 a. m.—Dinner music.                                       | 2 p. m.—Studio program.                           |
| 9 to 10 a. m.—Dinner hour.                                       | 2 p. m.—Edwin K. talk.                            |
| 10:30 a. m.—Dinner music.  | 2 p. m.—John Gerhard's Orchestra.                 |
| 11 a. m.—WQJ Chicago-447   | 2 p. m.—Radioverses, Mary Owen R.                 |
| 11 p. m.—Bathhouse.  | 2 p. m.—Ira Chiles.                               |
| 11 p. m.—Musical program.  | 2:30 p. m.—Billy Cohen's Hotshots.                |
| 2 a. m.—Music.   | 2 p. m.—70.                                       |
| 2 a. m.—WEBB Chicago-270   | 2 p. m.—Stanley's Society Secans.                 |
| 2 p. m.—Dinner concert; songs; talk.                             | 2 p. m.—Majestic String Ensemble.                 |
| 2 p. m.—Dance.   | 2 p. m.—Helen D. H. H.                            |
| 12 to 3 a. m.—Dance music; impromptu review.                     | 2:35 p. m.—Entertainers.                          |
| 7 to 8 a. m.—WLS Chicago-345                                     | 2 p. m.—NEW YORK CITY—                            |
| 7:15 p. m.—1 a. m.—Organ; story; new music hour; Ford and Glenn. | 2 p. m.—Herbert Link, pianist.                    |
| 8 to 9 a. m.—WENY Chicago-366                                    | 2:15 p. m.—Rose Gogchar, pianist.                 |
| 9 to 11 p. m.—Popular program.                                   | 2:30 p. m.—Laurie.                                |
| 11 to 2 a. m.—Middle.  | 2:35 p. m.—Doyle Sisters.                         |
| 2 a. m.—WMAQ Chicago-148   | 2:45 p. m.—Lester Krants's.                       |
| 2 p. m.—Organ recital; story.                                    | 2:50 p. m.—NEW YORK CITY—                         |
| 2:10 to 3 p. m.—Northwestern lecture.                            | 2 p. m.—Dorothy MacDonough.                       |
| 3:30 p. m.—Mrs. E. Kresmann, soprano.                            | 2 p. m.—Lester Krants's.                          |
| 10 p. m.—WMAQ Players.   | 2:30 p. m.—Talk.                                  |
| 11 p. m.—WVTV Chicago-400  | 2:45 p. m.—Dorothy MacDonough.                    |
| 11 p. m.—Classical program.                                      | 2:55 p. m.—Instrumental talk.                     |
| 8:45 p. m. (238 meters)—Alamo Orchestra.                         | 3 p. m.—Northwestern lecture, Dr. Joseph McMahon. |
| 9 p. m.—"Coke" recital.  | 3:10 p. m.—Instrumental talk.                     |
| 10 a. m.—Your Hour League.                                       | 3:15 p. m.—Organ recital.                         |
| 10:30 p. m.—WQK Chicago-217                                      | 3:30 p. m.—STATEN ISLAND, N. Y.—                  |
| 11 p. m.—Artists.  | 3 p. m.—Edwin K. pianist.                         |
| 11 p. m.—Artists and orchestra.                                  | 3:40 p. m.—Herald Male Quartet.                   |
| 11:30 p. m.—WVST Chicago-454                                     | 3 p. m.—Sunset.                                   |
| 11:45 p. m.—College of the Air.                                  | 3:40 p. m.—Herald Male Quartet.                   |
| 8:45 p. m.—WOC Duquoin-484                                       | 3:45 p. m.—Ward.                                  |
| 8:45 p. m.—Chicago concert.                                      | 3:50 p. m.—RICHMOND HILL, N. Y.—                  |
| 10 p. m.—Program same as WMAQ.                                   | 12 noon—Musical program.                          |
| 11 p. m.—Musical program.  | 2 p. m.—WALTON, N. Y.—                            |
|  | 2:30 p. m.—Happy Hour program.                    |
|  | 2 p. m.—Fred Smith's Orchestra.                   |

Continued on next page.



## Radio Fans and Blueprints

The Skill, Judgment and Integrity of the Organization Back of the Print Responsible for Efficiency

By LIEUT. VICTOR GREIFF, M. I. R. E.  
Designer and Consulting Engineer, Receptrad Products

WHILE the radio fan has been a favorite of the jokesmiths, it is a matter of common knowledge that the average man finds in the building of his own radio set a wonderful hobby with a wonderful reward at the end of it and that, while the home-made radio set a bare year ago was a humorously crude affair, to-day amateurs are building themselves the most advanced and powerful sets and producing results never before thought possible. Back of this and responsible for it is the widely popular radio blueprint, and back of the blueprint there is a world of scientific endeavor, production and service. The respect of the fan for the blueprint is notorious and sometimes amusing. One sometimes receives a letter asking for an explanation of an accidental spot on the print. The fans literally worship the white line with fanatical zeal. Now, why is this and where is it leading?

The experienced radio set builder tells the beginner to "follow your print and make clean splices and your set will work." In the days of crystal sets and one-tube "bloopers," directions used to read something as follows: "Sixty-four turns on a 3 1/2 tube, tap every four turns," and sometimes this was interpreted literally, as Haennigsen shows in a cartoon, where the amateur was tapping his coil with a hammer. But those days are passed, and as the radio art develops, more efficient windings, parts and specialized units are demanded, until to-day, thousands of fans build readily from specialized parts receivers that would have taxed the facilities of a Navy Yard five years ago. This could not be accomplished were it not for the growth of a large volume of general radio literature plus a highly developed technical service back of the radio blueprint; for the performance of these powerful circuits is dependent upon the exact properties of the units. The blueprint shows the circuit and the assembly can go no further; production control, research laboratory and information service behind the blueprint are to be thanked for the coordination and quality performance of the set.

In the aristocratic super-heterodyne hook-up service "back of the blueprint" meant the design of a coupler that would operate freely at all wave lengths without adjustment; accurately tuned filters for the long wave lengths unknown outside of naval radio stations and university laboratories; measurements of wave lengths that could not be checked by any local, standardizing laboratories, requiring the development of original standards and the development of new types of transformers. Of course, the transformer for radio or audio is the simplest device to connect and from which the most is required in a number of ways. The amplifying transformer must be designed for different tubes, different battery connections, different intensities of incoming signals, different wave lengths, varying in different cases from two hundred meters to twelve thousand meters, and bands of musical tones from the lowest to the highest in order to obtain the foremost requirement of the listener—true reproduction of tone, no matter what the power of the circuit.

The keynote in all the functions back of the blueprint is much the same requirement that has made amateur photography possible; that is, latitude. The blueprint and the parts together must give results under the widely varying conditions that are possible outside the laboratory, and here is where the skill and judgment of the designer are really shown. Hundreds of circuits have been proposed together with complete instructions for building the popular and powerful reflex and super-

heterodyne circuits; but the amateur's chance, whether he be beginner or expert, is immensely greater when he uses a co-ordinated set of carefully tested parts and the connection blueprint for them with organization skill and service behind them. This is the secret of the increasing popularity of the super-heterodyne and reflex circuits—the skill, judgment, integrity and facilities of the organization back of the blueprint, which are responsible for the success of the highly efficient circuits of to-day and to-morrow.

## New Broadcasting Set for WFI

Station WFI, Strawbridge & Clothier, Philadelphia, has just installed the latest and most improved type of Western Electric broadcasting outfit. This is the first installation of this new type of equipment in the East, the only other one in the country being in Chicago, at Station WLS. The height of the new masts is 170 feet. The distance between masts is 232 feet. The length of the antenna is 200 feet. The new features incorporated are apparatus for the suppression of harmonics, changes which permit transmission of the lower frequencies of the musical scale with greater fidelity, and elimination of the motor-generator hum to a point that is considered practically negligible.

The oscillator circuit is coupled to a second tuned circuit, which is comprised of the antenna and a variable tuning inductance, to adjust the antenna circuit to the primary or oscillator frequency. Under these conditions the harmonics are not transferred to the antenna circuit, hence are not radiated.

## Knowledge of Code Brings Aid to Disabled Launch

Knowledge of the Continental code and quick thinking on the part of R. M. Klein rescued nine men stranded in a disabled power launch off the Long Island coast last week. The party had been on a fishing trip for two days off the New Jersey shore aboard the Brown Betty and were on their way back when the engine went dead. A nasty choppy sea confused by a long swell was running before a stiff wind. Desperate efforts to repair the engine failed. The launch was about six miles southeast of Long Beach. Night was fast approaching. It was at this stage, when things looked pretty bad, that Mr. Klein brought his knowledge of the telegraphic code, learned in his early amateur days and kept up during his connection with F. A. D. Anderson, Inc., as general manager. Before him was the horn of the launch. Grasping the button, he started sending out the SOS call over the troubled waters. The piercing shriek of the Klaxon was heard by a fishing boat, which quickly placed a towline on the launch and pulled it into Sheepshead Bay.

Andre Peyre at WEBJ "Flying for the Movies" will be the first radio talk in this country to be made by a famous woman aviator. Mlle. Andre Peyre, dainty French aerial dare-devil and holder of a number of women's airplane records, has no intention of trying to induce young girls to leave home to join her new profession. On the contrary, when she talks at WEBJ on Tuesday she will almost guarantee to straighten the permanent waves of her listeners when she tells of her airplane thrills.

**RCA** Radiola Super-Heterodyne, Radiola 3A, Radiola 3, Radiola Bal. Amplifier in stock  
De Forest D 12, latest model in stock  
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1122 Madison Ave., at 84th St.  
Butterfield 0450 Closes 7 P. M.  
8 E. Fordham Road  
Kellough 6995 Closes 10 P. M.

## New York Amateurs Form A New Radio Division

The Second District Executive Radio Council has just been advised by the A. R. R. L. that its efforts to have a separate traffic division to comprise the entire second radio district have been officially approved at a recent board of directors meeting of the league. This announcement is the culmination of several months of parleying and work by the council on behalf of the amateurs of the second district, which it represents, to secure their own traffic and league organization.

Heretofore the second district was a part of the Atlantic Division and had no official vote in A. R. R. L. amateurs. With the formation of the new division, however, amateurs of this district will have full sway in their new division. The name "Hudson Division" has been officially designated for this new division, which will go into operation on September 1. This is the first time since the organization of the league that such a change in geographical division formations has been undertaken. Candidates for the new division manager will be announced at a later date.

## Cornish Male Chorus To Be Broadcast by Station WJZ

The afternoon broadcast of the Radio Bible Class by station WJZ to-day will include an unusual radio feature in the program to be presented by the Church Community Chorus, under the direction of Clarence W. Allen, for the famous Cornish Male Chorus will make its radio debut in America at that time. The Cornish Male Chorus, every member of which is a native of Cornwall, England, has an international reputation as religious and classical singers, and its appearance in the program which is broadcast by WJZ through the courtesy of the Greater New York Federation of Churches will constitute their first radio appearance.

## WJZ Will Broadcast G. A. R. Convention

In an effort to reach all of the Grand Army veterans the country over and post them with news hot from the convention which will be held in Boston, officials of that military organization have granted exclusive broadcasting rights to Westinghouse Radio Station WJZ. Arrangements between the Westinghouse company and the G. A. R. were made with William L. Anderson, national patriotic instructor of the G. A. R. The convention will be held the week of August 10, and every event of interest which transpires during its session will be sent out into the air by WJZ for old veterans and sons of veterans unable to be in actual attendance.

## Veteran Speakers to Confess

"Some Confessions of a Veteran Speaker," the title of an address by Warren C. DuBois is a feature of WEAF's program on Thursday evening. Mr. DuBois is an instructor in public speaking at New York University.

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# HAYNES

## Across the Pacific with a Haynes Simplified Super-Heterodyne

From Mandurama, New South Wales, Australia, across the Pacific Ocean to Oakland, California—a straight-line distance of over 7,000 miles—is the latest record of the Haynes Simplified Super-Heterodyne.

Using an aerial loosely coupled to a loop, Mr. R. J. Fagan, of "Sunny Ridge," Mandurama, brings in Station KGO on the loud speaker with considerable volume. This reception is remarkable, of course. No radio receiver can be expected to operate consistently over a distance of 7,000 miles. But the record does show what the Haynes "Super" can accomplish under the best of conditions.

Mr. Fagan's letter telling of his reception is on our bulletin board. Come in and read it.

## Read "SUPER SUCCESS" By A. J. Haynes

"Super Success" is the only complete story of the Super-Heterodyne in one volume. It contains the information gathered by Mr. Haynes, Associate Institute of Radio Engineers, during a year's experimentation with twenty different "Supers."

"Super Success" makes clear the theory, construction and operation of the "Super." The book contains a quantity of heretofore unpublished information which is invaluable to every radio fan. The first edition is going fast, but copies may still be had at 25 cents each.

HAYNES-GRIFFIN RADIO SERVICE, INC.,  
41 West 43d Street (between 5th and 6th Avenues), New York 18, N. Y.

# GRIFFIN

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THE STANDARD 5-TUBE SET  
THE BEST AND MOST POPULAR NEUTRODYNE IN THE WORLD WITH OUR UNCONDITIONAL GUARANTEE FOR ONE YEAR.  
Every part is DESIGNED TO MATCH, and the set is BALANCED TO PERFECTION.  
Designed for both indoor and outdoor aerial.  
RECEIVES LONG DISTANCE ON INDOOR AERIAL  
clearly and loudly. Tunes very easily, and always "picks up" stations on the SAME DIAL READINGS.  
By actual comparison the MOST EFFICIENT NEUTRODYNE made, regardless of price.  
You can pay more, but the BEST RESULTS are obtained with an A & P NEUTRODYNE. **\$65**

**KNOCK-DOWN**  
SPECIAL A & P KIT FOR 5-TUBE NEUTRODYNE  
All parts are carefully constructed in our factory of the best materials obtainable, and are individually guaranteed. NEUTRO coils have silk covered wire wound on genuine BAKELITE. No shellac or varnish, which introduces losses. Panel is drilled and engraved set of diagrams included. EVERY part that is needed to BUILD this A & P NEUTRODYNE is included in this KIT at the REMARKABLY LOW PRICE of **\$25.95**  
Postage Extra  
All parts to BUILD one like our STANDARD NEUTRODYNE.....\$32.50  
Cabinet Extra

**IMPROVED SUPER-HETERODYNE**  
THE FAMOUS A & P 8-TUBE SET  
The important features of this famous instrument are that it receives LONG DISTANCE on the LOUD SPEAKER without the use of any ANTENNA WHATSOEVER, like a LOOP—either EXPOSED or CONCEALED, or GROUND. The only connections are from the set to the batteries.  
Its operation is remarkably simple—only two dials control the tuning. LOCAL STATIONS can be Cut Out for distance even at the slightest difference in wave length.  
FREED FROM INTERFERENCE BY CODE OR WEATHER CONDITIONS.  
It is the only set of its kind that reproduces MUSIC and SPEECH with just as CLEAR TONE as performed. Everyone who listens to this instrument agrees that it plays with a finer tonal quality than they have ever heard. It is as though you were present at the performance. A GREAT SET! **\$150**

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# THE NEW YORK HERALD New York Tribune RADIO MAGAZINE

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SECTION NINE

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## What Women Think of Radio in the Home

The Radio Receiver Should Be Considered as Family Equipment; Suggestions for Program Valuable to the Housewife; More Home Material Wanted

By MRS. CHRISTINE FREDERICK



SOME time ago an enraged woman got a divorce because she said hubby had become a raving radio fan, who forgot he had a wife or that his home was not a laboratory.

What has radio done to the home, and what do we wives think about it? The funny papers have made us believe that the men and boys of the family never give the poor radio receiver a rest and that wifery can't pry hubby away from it for an evening out. The learned professors are solemnly of the opinion that hubby is "sublimating" himself away from wine, women and song via radio, and is now the most domesticated animal in captivity.

But why assume that the men and the flappers of the family are the only ones who get anything out of radio? Why not consider radio as a family equipment and look into the subject of what Mrs. Radio Fan is thinking about the little black box and its magic properties? After all, she is the one who has to sweep up the dirt and work over the rug on which the battery acid leaked!

Well, I'll tell you what we women think who have studied this new thing which has come into the home. We think it is a piece of household equipment which ranks with the sewing machine or the washing machine; ranks far higher, in fact, than anything that has ever been put into a home. But we think that, man-like, the people who run the radio business have rather overlooked the woman end of it—the home possibilities of it. After all, there are others than men and boys in the family, and the women folk are in the home all day long. Moreover, it is the woman in the home whose isolation is the most pronounced, and who, therefore, has most to gain from radio. Men have contacts in their daily work and a change of thought and ideas, whereas women have

not. Isn't it time, then, that the full round of possibilities of radio are looked at and that women be given the share of radio attention that the situation calls for?

## Home Cooking Lessons by Radio

Out in Chicago, at my suggestion, a great public utility company which desired to interest more women in home cooking began to broadcast cooking talks at 11 o'clock in the morning, with the result that the idea was a big success. Now these talks are a daily feature, and what's more, women take study courses in cooking by radio and receive certificates after having "passed" in this study course. There are special memorandum books supplied to women listeners-in, and the broadcast recipes are written into these memorandum books. "Radio teas" were also started in the afternoon hours, so that women could listen in and feel themselves part of a group. These radio teas have been huge successes, literally hundreds of thousands of women "attending" them.

I mention this instance of advanced service to women to prove that we have only begun to tap the home possibilities of radio. After all, jazz isn't everything! And the fun of tuning in stations far away is, after all, short lived. I suppose men used to play with telephones like that when they were first installed—thrill over how far away they could talk. But the telephone got down to its real business of daily service after a while, and so must radio. We must have good, useful stuff coming by radio during the day—something women can get value from.

What are the possible and practical adaptations of radio to the home? Many features now being broadcast seem extremely unsuited to an extensive audience; while some touch on such important sub-

jects that I feel they would render much greater value to the home if given in a continuous series and at a regular hour, thus developing automatically expectant listeners-in. If I knew, for example, that there would be a "first aid" lecture at 4 p. m. on each Thursday for successive weeks, or a household talk given every morning at 9, my interest would be more keen; and with a number of such series operating the listeners would segregate themselves into groups anticipating a particular feature and thus develop a cumulative interest. In short, the sooner radio broadcasting adopts the definite schedules of subjects and hours common to institutions, or always found in a Chautauqua program, the more greatly will the public benefit.

## Suggested Radio Programs

Taking for granted that the instruments used and the broadcasting facilities to be developed will be within the reach of every one, I believe that the following outline of subjects would answer the needs of the majority of women and families and provide them with a service which will put them in touch with the world of thought, progress and amusement.

- 1—Physical Education:
  - a Daily "setting up" exercises.
  - b "First aid" instruction.
  - c Health talks.
  - d Beauty hints.
- 2—Junior Features:
  - a Little children's hour.
  - b Woodcraft and animal stories.
  - c Adventure and history tales.
  - d Activities of Boy Scouts and Camp Fire Girls.
- 3—Household Interests:
  - a Housekeeping and cooking.
  - b Market reports.
  - c Care and hygiene of children.
  - d Home decoration and furnishing.
- 4—Cultural Topics:

- a Correct English.
  - b Musical programs.
  - c Drama and book reviews.
  - d Fashion and dress discussions.
- 5—Social Interests:
- a Current events.
  - b Public affairs and politics.
  - c News of sports.
  - d Worship services.
  - e Home finance and thrift.
  - f Club and organization activities.

I have suggested "setting up" exercises as a daily radio feature because I think it will answer the oft expressed wish that we could bring the gymnasium spirit into the house. Every one agrees that we should all perform daily gymnastics, but which of us finds pleasure in taking exercise alone? And it is a well known fact that we cannot derive full benefit from something we do not enjoy doing. It will be easily possible to broadcast the instructions for such a drill as guided by the voice of a physical director. A most desirable period would be between 6 and 7 a. m., repeating at fifteen minute intervals so that different families could have a choice as to the most convenient time. It would not be difficult to set an alarm clock for the exact hour at which the entire family preferred to wake up and participate as a group in this stimulating drill. The first sound coming from the radio might well be the bugle reveille: "Ta tah ta ta tah-ta tum!" followed a moment later by the greeting and command, "Good morning, everybody! Now for a good start. Snap in! All together now, hands on shoulders—place—one, two, three, four!" etc.

The popularity and value of "first aid" instruction was proved by the active interest in it even after the war. Radio will be able to make vivid and helpful to still greater numbers of people lessons on the

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# A Six-Tube Portable Radio Receiver of Excellent Design

A Small Size Suitcase Contains the Set and All Accessories

By FRANCIS J. ARMSTRONG

IN THE early days of broadcasting, when the programs consisted principally of the playing of a few phonograph records, the reading by the wireless operator from some book of history or selections played by an unknown artist simply to fill up the allotted time, the listener certainly had to be a "radio bug" to sit through more than one program.

But now, when the air is full of intensely interesting entertainment from the solo by a noted soprano to the "news as it happens" or from speeches by the world's famous men to the broadcasting of the current sporting events, the average person is brought to a realization that radio has become an important part of his daily life.

The mechanical genius who found sheer joy in the working of the apparatus, regardless of the program, is giving way to the discriminating person who listens to

only seventeen inches long, fourteen inches wide and only five and one-half inches thick.

Within the case is an ingeniously arranged set from speaker to batteries and loop, available for instant use. Any portable set to be of real value must be as powerful and as selective as its more cumbersome brothers, and the restriction of space makes the problem of design and construction much more difficult than in the production of ordinary sets where bulk is not a serious consideration. For instance, the elimination of outside roof antennas is only possible by the use of

with the horn at times pointed away from the listener. The pivoting cover, on the contrary, permits the finest adjustment to be made at the touch of a finger and quite independent of the position of the case.

## Simplicity Necessary

Simplicity, not only of operation but of maintenance, is greatly desired by the rapidly growing class of radio owners who care nothing for the method of reception, but only for the results. An interesting example of the degree to which this type of owner has been considered by the designers is the automatic battery connector, which permits the changing of the battery cells without disconnecting a single wire, and makes impossible the reversing of positive and negative poles. This feature will be appreciated particularly by women, as they can change batteries themselves without expert assistance.

## Battery Problem

In many portables the smallest size batteries are used, but in this set the medium sizes were found to give more satisfaction.

The "A" battery problem was difficult to solve, principally because of the variety of types of batteries available for this work. After many endurance tests, all of the small sized cells, such as flashlight and "C" batteries, were discarded as being

quality was the dominating keynote in designing this set, the best of each piece of apparatus was used regardless of cost. This fact will be recognized by an examination of the following list of material used:

## Parts Used in Set

1. The tuning condenser is a Hammarlund.
2. The radio-frequency transformers used are Duratrans.
3. The fixed condensers used are also made by Dubilier.
4. The audio-frequency transformers are Amertrans.
5. The rheostat and potentiometer used are of Federal manufacture.
6. The tube sockets are the latest of the non-microphonic type, and manufactured by the Benjamin Electric Company.
7. Loud speaker is an English unit, the ampion, made by Alfred Graham Company, England.

Not only have the best parts been used throughout but electric connections between these elements are carefully made by fine spaghetti-covered heavy wire with soldered, nickel plated terminal lugs at every connection, firmly secured by lock washers. Lock washers were found to be a necessity, particularly in a portable set where the machine receives considerable handling.

The finish on the outside of the case is the best grade of du Pont fabricoid and makes a handsome suitcase.

The circuit used is the old standby transformer-coupled, three steps of radio-frequency, tube detector, and two transformer-coupled audio steps. Patents are pending on the unique features described.

The radio dealer at the present time is faced with a problem to which he should give deep consideration. The good merchandiser wishes nothing but satisfied customers. The question therefore comes up as to what set should the dealer recommend to the average customer—a self-contained portable, or the more cumbersome stationary set? The average person cannot afford and does not want two sets. But every one, at some time or other

## Proper Connections for Ammeters and Voltmeters

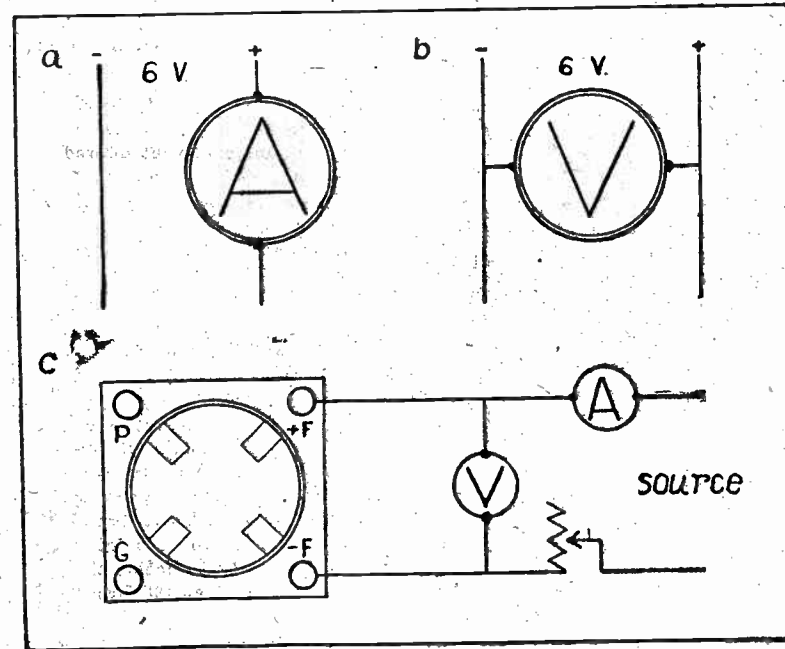
At one time or another radio fans wish to have either a voltmeter, an ammeter or both. These instruments are either to be placed on the line of a set and are to be permanently connected to the receiver or are to be used as external trouble shooters. In either case it is well for the prospective purchaser of these instruments to know just how they should be used and how to connect them in a circuit.

First, the ammeter. The connecting of an ammeter in a circuit is always the same, no matter whether the amount of current to be measured is one-millionth of an ampere

negative—or by designating the post as negative that has no identifying marks upon it.

In connecting a voltmeter in a circuit containing many tubes it must first be decided whether the voltage of the entire circuit is to be measured or just the voltage across one filament. If just the voltage impressed upon one tube is to be measured, then connect the voltmeter as per Fig. c. But for the entire circuit, connect the voltmeter to the "A" battery posts.

The circuit given in Fig. c for the ammeter is for measuring one tube's ampere only. For use on all tubes the ammeter should be connected in



or one million amperes. The ammeter is always connected in series with the source of current before it gets to the load. For simplicity the diagram given accompanying this story shows how to use the instruments on a six-volt battery for use in a radio set.

Every ammeter has two terminals. These two are marked as to polarity. That is, one of them is marked with either a plus sign or stamped "Positive." This terminal is connected to the positive battery lead, and the other terminal is connected to the circuit. Thus in Fig. c it will be seen that the ammeter is in series with the positive "A" battery lead.

The voltmeter is used to determine the voltage, or potential difference, in a battery, in a circuit or in part of a circuit. It is always connected across the circuit, whether the voltage under measurement be large or small. This is shown in Fig. b.

The voltmeter also has two terminals that are marked positive and negative. The positive is marked by a plus sign or the word "Positive." The negative terminal is easily found by looking for the terminal marked positive—the other is naturally the

series with the positive "A" battery binding post and the rest of the circuit. That is, the "A" battery positive lead goes first to the ammeter and then to the filaments of the tubes.

The scale reading for an ammeter will depend upon the amount of current flowing in a circuit. For testing the drain of a set employing one UV-102A tube the scale reading can be as low as one-half an ampere. The same for a WD 11 or 12. For a 159 tube no ammeter is necessary. To find the correct scale reading necessary multiply the number of tubes to be used by the filament rating (amperes) given to the tubes by the manufacturer, and then get an ammeter with a scale reading a little higher than the product obtained from the above multiplication.

The choice of the voltmeter for scale reading will depend upon the filament voltage of the tubes used.

For UV-201A tubes a ten-volt meter is correct, for WD 11 or 12 tubes a two-volt scale reading and for UV-109 tubes four or five volt scale reading. This does not vary, no matter how many tubes are to be used in the circuit.

## A New Rechargeable Storage B Battery

The demand for rechargeable wet storage B batteries has produced a number of such types during the last few months. The latest of these is the Gray Electro-Chemical Company, of Bayonne, N. J. A special

method of treating the metal elements which, it is claimed, indefinitely prolongs their life, is the result of eighteen months' research work by Dr. F. C. Gray and Paul Wandell.

The manufacturers, who express faith in their product by giving a two year guarantee to each purchaser, make the following claims for the Gray battery:

It can be short-circuited, overcharged, or charged in reverse direction, nor inflammable. Severe vibration does not harm the battery. The plates do not buckle or warp with excessive rates of current. There are no acids used. A greater range of distance in radio reception is obtained. It is absolutely noiseless in operation. It can be shipped dry charged and can be made ready for use within ten minutes after unpacking.

## Horse Races To Be Broadcast by WJZ

For the first time since horse racing became a favorite sport track enthusiasts will be able to follow the progress of the horses, even though they are miles removed from the track, during the forthcoming international races at Belmont Park and Aqueduct on September 4 and 27, for through the co-operation of Major August Belmont and the Westchester Racing Association Station WJZ of the Radio Corporation of America will broadcast running descriptions of both races direct from the Belmont and Aqueduct tracks.

Epinard, the famous four-year-old which Pierre Wertheimer has recently brought to this country, and which is now in training for the series of three races scheduled for the early fall, will be the star attraction of the first racing broadcast in history, and the best horses of this country will be "seen" in competition with the foreign favorite by radio listeners. J. Andrew White, who has described every type of sporting event which the radio has so far carried to the distant fans, will be at WJZ's microphone in the judges' stand, and direct Western Union wires, specially installed for the event, will carry his voice to the broadcasting studio on West Forty-second Street, New York, where it will be "put on the air."

## A Novel Method of Tuning In Broadcasting Stations

DX fans who require the entire evening to call the roll of the nation's broadcasting stations will be envious of C. B. Edwards, of Kingston, R. I., who has discovered a method of bringing in three stations at once. If three stations may be brought in at one time it will be possible to log all the stations in the country in just one-third the time, and as result the DX fans will get their much needed rest. In a telegram to WGY Mr. Edwards reported the radio hash of the following ingredients: "Three acts of 'Pollyanna' from WGY, a KDKA concert from East Pittsburgh and a prize-fight from WBZ, Springfield, were all received by me on a crystal-to-night simultaneously."

## Determining Cost of Broadcasting Congress

Major Joseph O. Mauborgne, who was selected by Secretary of War Weeks to co-operate with a representative of the Navy Department in an investigation of the feasibility of broadcasting Congress, already has started the task of determining the cost of installing and maintaining radio equipment at the Capitol. While Major Mauborgne will not make his report until Congress meets in December, he is convinced the proposal is entirely feasible. The appointment was made by Secretary of War Weeks as a result of the Howell resolution which was passed during the closing days of the last session.

## Radio in Chicago

The radio inspector of the Ninth District is quoted as stating that there are approximately 90,000 radio receivers within Chicago and its forty-mile radius. As there are about 700,000 homes in the same territory, this estimate would indicate that there are 60,000 homes in Chicago and vicinity which are potential purchasers of radio receivers.

## RUSONITE BLOWOUT PREVENTOR

At Last! Economical Tube Insurance. 50 CENTS INSURES YOUR TUBES AND SETS. PREVENTS BLOW OUT OF TUBES. PREVENTS EXCESSIVE VOLTAGE OR SHORT CIRCUIT RISKS. Order from your dealer or from Rusonite Products Corporation, 15 Park Row, New York.

## KELCOIL SIX DOLLARS

GETS MORE STATIONS LOUDER AND CLEARER THAN ANY COIL ON THE MARKET

SYCO RADIO PRODUCTS CORP. 440 Drexel Bldg., Philadelphia

**Captain Creed at WEAF**  
Captain Percy Redfern Creed, famous newspaper magazine writer and special correspondent to the London Daily Mail, will address WEAF's audience on Thursday evening on the subject of "International Polo and the Coming Matches." Captain Creed was educated at Marlborough College, the famous old English school, where he held a classical scholarship for five years. He was a member of the school cricket eleven for two years and in 1892 made 211 runs for Marlborough College against the famous Rugby School, which is still a record. From Marlborough he went to Trinity College, Cambridge, and qualified as a university candidate for the army.

**Hartford to Have a New Broadcasting Station**  
The New York Herald Tribune Radio Magazine is informed that the Travelers' Insurance Company, of Hartford

**From Coast to Coast**  
vacuum arresters have protected principal Railway Signal Systems, Police and Fire Circuits, and RADIO for 18 years

**Safety demands the BRACH Vacuum Arrester**

**COBURN RADIO SERVICE**  
17 JOHN ST., NEW YORK, N. Y.

**COBURN DUO-FLEX**  
Something Different

This remarkable set can be heard on demonstration.

It combines to a marked degree the necessary elements of a perfect set—clarity, selectivity, sensitivity, volume and distance. It is simple, too, having only 2 controls. It contains 3 tubes—C-201A, 2 large 45 V. "B" Batteries, 6-40 Storage Battery, Sonora Speaker and Aerial Equipment. It is enclosed in either solid oak or mahogany cabinet, 7x21. This set is guaranteed to meet with your entire approval in all respects or your money back, and includes free service for one year.

Price complete with storage battery... \$110

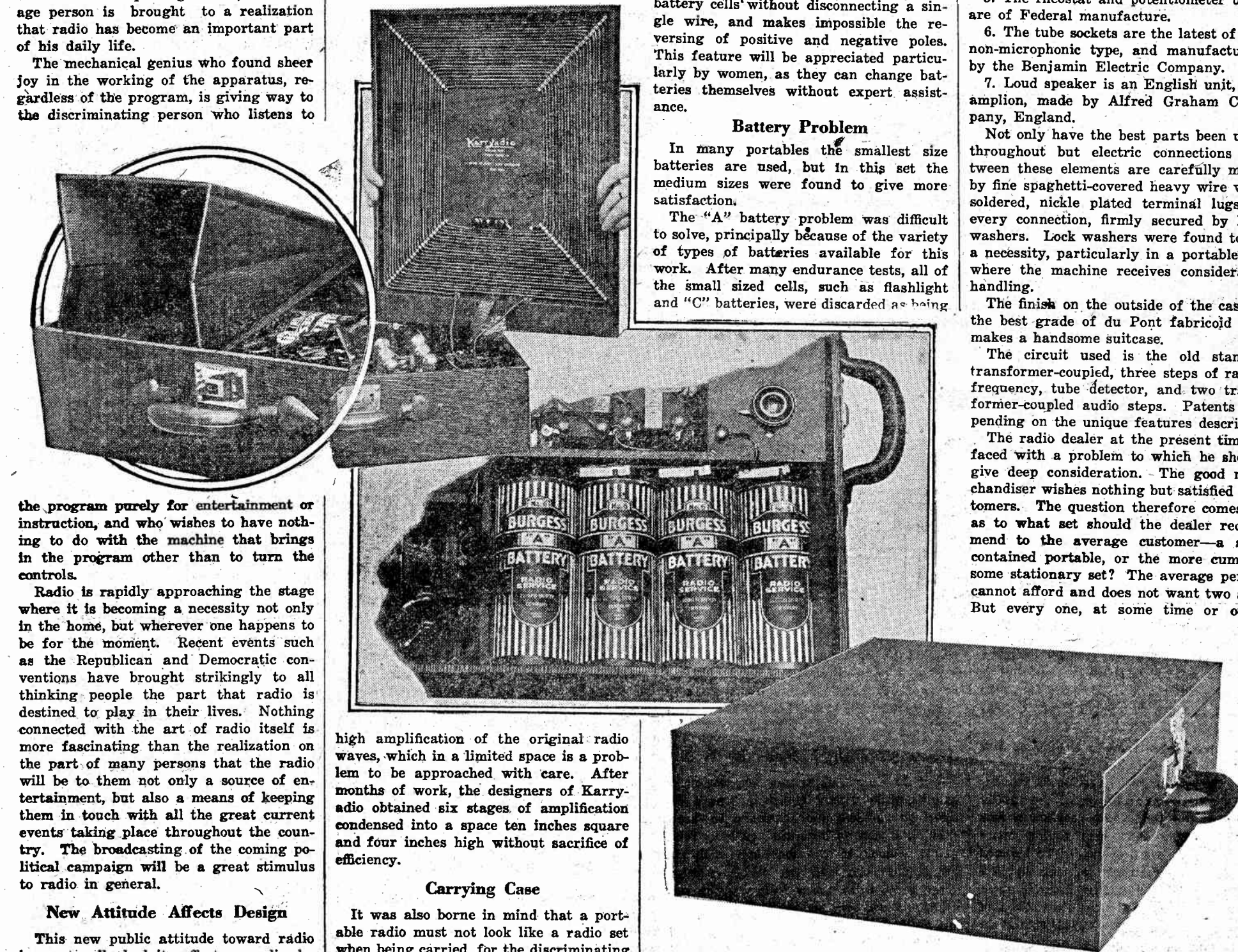
Price complete with dry cells... \$100

## Radio Exchange

Rate, 35 cents a line; minimum, 3 lines. Apat caps and white space only display permitted. Ads. accepted until 4 P. M. Friday.

PHONE PENNSYLVANIA 4000

| Parts and Equipment  | Service  |
|--|--|
| IMITATED but never equalled. Put together a "Hawley" rechargeable "B" storage battery. Former experience required. They come in knock down units consisting of large size tested Edison elements, special heavy flat bottom glass cells (not range type round bottom flat tubes that cause electrical leakage), special annealed nickel wire, pure rubber rubber gaskets (not the impure brittle kind), special rubber stoppers to keep dust and dirt out and stop evaporation, full strength chemical electrolyte (not adulterated). In fact, everything for the actual construction of battery. An eight page illustrated folder showing simple putting together, making of charger and charging tree with all orders: 24 volt unit, \$2.95; 45 volt, \$5.25; 40 volt, \$3.95; 100 volt, \$9.95; 120 volt, \$11.50; 135 volt, \$12.75; 150 volt, \$13.50; 200 volt, \$17.50. All units are sold on an unconditional guarantee or your money refunded with out any ifs or ands. Certain features contained in these batteries are controlled by patent pending rights owned exclusively by me for use only to purchasers. Special 100 volt cabinet, made of pure white wood throughout, containing perforated insulating material for support of cells (not holes drilled in wood), at \$2.75. Complete sample cell, the "FREE TESTS" also "A" batteries at attractive prices. Order direct or write for my literature and guarantee. All orders shipped same day as received. TESTED EDISON ELEMENTS, 30 PER PAIR. B. T. SMITH, 21 Washington Ave., Danbury, Conn. | REPAIRS GALORE!<br>5-TUBE NEUTRODYNE... \$24.95<br>6-TUBE JOURNAL... \$19.95<br>7-TUBE JOURNAL... \$19.95<br>2 1/2 VOLT (all batteries) LARGES... \$2.95<br>2 1/2 VOLT (all batteries) SMALL... \$2.95<br>NEW TUBES ALL TYPES, \$1.95<br>EACH TUBE FULLY GUARANTEED<br>(M. & L. RADIO SH. GUARANTEED<br>a Harrod Pl. Opp. L. I. Depot. Bklyn.<br>Mail order (no stamps). Even evenings |
| WAVE METERS CALIBRATED.<br>From Precision Standard.  | PHONES... SETS<br>REPAIRED<br>Phones magnetized while you wait.<br>Old sets remodeled up to date.  |
| HIGH FREQUENCY RESISTANCE<br>Inductance, and Capacity Measurements.  | Unfinished work completed.<br>All work guaranteed. No return for R. C. ROY'S STORE.<br>100 West 42nd Street, Cor. 8th Ave.<br>OPEN EVENINGS. BRANT 5585  |
| DESIGNING AND TESTING<br>of Transmitting and Receiving Apparatus   | Radio<br>for building storage "B" batteries.<br>Genuine non-corrosive. Made by H. BOKER & CO., INC.<br>101 E. 42nd St., New York City.   |
| ROSSITER, TYLER & McDONELL<br>62 Vesey St. Cortlandt 2515.   | WHOLESALE RETAIL   |
| SPECIALIST ON NEUTRODYNE<br>REFLEX REGENERATIVE<br>Sets built to your design; workmanship guaranteed; price very reasonable.   | For Sale<br>ADD THREE STAGES OF RADIO FREQUENCY to your set. Radio A. R. set by Westinghouse. Radio A. R. set (wave lengths from 800 to 700 meters), will increase volume and bring in distances on loud speaker. Can operate with loop. Brand new. Full directions. LIST \$50.00. SALE PRICE \$25.00  |
| Full line of tubes, parts and accessories.   | FERRAR RADIO CO., 449 E. W. N. Y.<br>ELECTRODYNE, five tubes, \$135. "Expert-built" by Marconi assistant. Don't buy an apology set. 201 Jay Street, Brooklyn.  |



## New Attitude Affects Design

This new public attitude toward radio has naturally had its effect on radio designs, and the manufacturers are realizing that radio is not comparable to the phonograph, but is more closely related to the newspaper and telephone. In fact, it would not be stretching the imagination to say that the future might see some connection between the telephone and the radio.

However, the present buyer of a radio set is faced with the problem of selecting the apparatus that will best keep him in touch with the daily changing program, no matter where he may be, in his city or country home, office or even touring in his motor. This changing demand on the part of the radio public has stimulated the development of complete radio receivers in portable form, which development, with its consequent elimination of roof antennas, has in turn increased the demand for radio sets in general.

The portable radio, as perfected under the trade name, "Karryadio," has now made its appearance in form suitable to be carried about ready for immediate reception of the broadcast of the hour.

Karryadio is a completely equipped receiving set made by the Armley Radio Corporation, so compact as to be entirely self-contained in a suitcase measuring

high amplification of the original radio waves, which in a limited space is a problem to be approached with care. After months of work, the designers of Karryadio obtained six stages of amplification condensed into a space ten inches square and four inches high without sacrifice of efficiency.

## Carrying Case

It was also borne in mind that a portable radio must not look like a radio set when being carried, for the discriminating buyer does not like to be made conspicuous or to attract attention to himself through a case which with its outside controls radiates "there goes a radio set." This fact was always kept in sight by the designers with the result that no unsightly controls mar the beautiful lines of the case.

A characteristic of well designed luggage is its thinness, which permits carrying with the least inconvenience and fatigue. The experienced traveler will welcome the extreme reduction in this dimension obtained in the set by its collapsible sound amplifier, which gives the equivalent of the ordinary "loud speaker" in volume but occupies little space when folded up.

Another feature which makes an instant appeal is the remarkable simplicity of the loop aerial. Realizing that the set must be at all times available for instant use, all forms of detachable loops were discarded and a loop antenna built into the case cover so arranged that it pivots for directional reception as soon as the case is opened.

The loop itself would have been as efficient if placed in an ordinary hinged cover, but its adjustment would have necessitated movement of the entire case

inadequate, and the ordinary dry cell decided upon.

As UV-199 or C-299 tubes are used, three batteries in series are required for proper voltage. Two sets of three, making six altogether, made the best combination, but brought the weight of the entire machine up to the point where the user might find it too cumbersome. Three cells, therefore, were specified, but the unique idea was adopted of providing a reserve cell, which allows the working of the cells in rotation, thus giving each cell a chance to recuperate and greatly prolonging its life.

Dry cells are similar to humans in this respect. If both are not overworked and have a chance to rest much greater work and longer life are assured. In the factory tests it was found that four cells rotated at one-half hour intervals, so that no one battery had more than one and one-half hours continuous service, lasted as long as six batteries in the circuit all the time. The automatic battery connector makes it easy to change the batteries from time to time.

Regardless of the form in which a radio set is assembled, the highest quality apparatus must be used throughout. And as

wishes for a set which can be readily carried from place to place. Perhaps, merely moving from one apartment to another, or perhaps, for use on the weekend trip, or the months spent in the country.

Certainly, the ordinary stationary set is not readily portable, but the portable receiver can easily fulfill the requirements of the stationary set if nothing is lacking to make it a regular machine.

Karryadio has been equipped with an antenna and ground connection so that it may be used with an outside antenna and give as good results as the larger and more cumbersome stationary sets.

Portable radios in general are coming to be recognized, not as a fad, but as a real necessity. If one happens to be in the country without a phonograph and a new record comes on the market it can always be obtained later and replayed at will; but a speech, for instance, by a great man over the radio, if not heard at the time of broadcasting will be lost in so far as the personality of the man is projected in his voice. Reproduction of the speech in cold print cannot be as satisfactory. Only a portable radio can be relied upon to be ever present for such occasions.



## Broadcast Bands Are Crowded

Interdepartmental Radio Committee Doing Its Best to Curb Interference, but Broadcasters Increase in Number

By THOMAS STEVENSON

WASHINGTON.—In the absence of legislation authorizing the Secretary of Commerce to regulate radio, all government departments are co-operating to keep interference down to the lowest possible minimum and promote harmony among the broadcasters.

The center of these activities is the Interdepartmental Radio Advisory Committee, a body of which the general public has heard little or nothing. The committee was organized in April, 1922, by Secretary Hoover in order to work out an agreement among the government departments as to the use of certain frequencies recommended for government broadcasting by the first national radio conference. In the beginning the committee dealt only with broadcasting, but successive methods developed the desirability of extending the scope to include a wider field, which was accomplished in January, 1923.

The committee is composed of members from the various government departments interested in radio activities. The chairman of it is Judge S. B. Davis, solicitor for the Department of Commerce, and the secretary is L. E. Whittemore, radio expert of the Bureau of Standards. Meetings are held on alternate Friday mornings, at which reports are received and discussed from its subcommittees which have been presented for study. The committee has several standing subcommittees, such as those on technical problems, operation, mobile radio, government policy and legislation and material for broadcasting.

It has been the general policy of the committee to leave final decisions

with the departments. Its recommendations have no binding effect and it does not of itself undertake new duties. In spite of this, the Interdepartmental Radio Advisory Committee exercises a big influence on radio activities. It co-operates with Chief Radio Supervisor Terrill, who is a member of it, in straightening out tangles resulting from misunderstandings among broadcasters.

The seriousness of the broadcasting situation can only be realized when a study has been made of the allocation of wave lengths to the various types of stations. Here are the present allocations above 75 kilocycles (below 4,000 meters), to commercial, government and private radio stations: As readily can be seen, unless harmony prevails among the broadcasters, serious interference will result. Most of the wave lengths are now crowded to capacity. The amateurs are dissatisfied with their present allocations. With the increased use of radio on commercial ships, more wave lengths are being required for them. The government radio stations are now doing a larger business than ever before and they are demanding more wave lengths. New broadcasting stations are licensed every week and all of the wave lengths allocated for that purpose are crowded to capacity.

This is one of the immediate problems to which the Interdepartmental Radio Advisory Committee is giving its thought and attention. While the members of the committee are convinced that the real solution of the problem would be additional legislation, they are doing their best in the meantime to keep things running smoothly. (Copyright 1924)

| Frequency, Kilocycles | Wave Length, Meters | Use   |
|-----------------------|---------------------|---|
| 75-94                 | 4,000-5,130         | 13 government, 5 commercial   |
| 95-120                | 5,166-2,499         | Government exclusive, 20 land stations, 31 ship stations                              |
| 121-150               | 2,478-2,000         | Commercial point to point, 109 commercial   |
| 150-230               | 1,579-1,304         | Government exclusive, 43 land stations, 109 ships                                     |
| 230-235               | 1,304-1,277         | Universities, 4 stations  |
| 235-250               | 1,277-1,200         | Marine phone, Government exclusive, 18 ship stations                                  |
| 250-275               | 1,200-1,093         | Marine phone, 12 ships on 1,100 meters  |
| 275-285               | 1,093-1,050         | Mississippi-Warrior service, 4 point to point stations                                |
| 285-315               | 1,050-962           | Marine phone, Also 1 point to point station   |
| 315-325               | 962-922             | Radio beacon, 13 stations   |
| 325-375               | 922-800             | Government exclusive, 4 land and 800 ship stations                                    |
| 375-445               | 800-674             | Marine phone, Radio compass   |
| 445-550               | 674-550             | Marine phone, Government exclusive, 50 land and 25 ship stations                      |
| 550-1,350             | 550-222             | 2,700 commercial ships, 38 shore stations   |
| 1,350-2,000           | 222-150             | Also foreign ships, 548 broadcasting stations   |
| 2,000-2,100           | 150-143             | 17,000 amateur stations, 232 experimental stations, 39 technical and training schools |
| 2,100-2,300           | 143-130             | 31 point to point commercial, 8 government land stations, 1 point to point commercial |

## Ilo, International Radio Language

O. C. Roos, of Boston, president of "Rails," makes these statements about Ilo:

"It may interest your readers to learn that, so far, the following radio-telephone broadcasting stations are working with CKAC, 'La Presse,' Montreal, to educate the radio public in Ilo, the perfect radio auxiliary international language: KYW and WMAQ, Chicago; WNAC, Boston; WBZ, Springfield; WGR, Buffalo; WGI, Medford Hills; WLW, Cincinnati; PWX, Cuba. Many others are joining the army."

"The following lists are well known radio engineers and officers of 'Rails' (Radio Auxiliary International Language Society): E. F. W. Anderson, chief radio engineer, Radio Corporation of America; Major General G. O. Squier, inventor 'wired wireless' and 'line casting'; John S. Stone, a great mathematician and radio inventor; John Hays Hammond Jr., inventor of battleship and torpedo control by radio and of the 'scrambled' system of radio; George Lewis, assistant to Powell Crosley, radio manufacturer; John V. L. Hogan, author of 'Outline of Radio,' which is to be translated into Ilo. Two of these lists have been past presidents of the Institute of Radio Engineers, of which I was a founder. The amateur interest is represented by Irving Vermilya, running three stations in New Bedford, Mass., and 'getting across' easily. The Supervisor of Radio, 1st District, United States, Mr. C. C. Kolster, is an officer."

## International Radio Week

By Powel Crosley Jr., Executive Chairman

International Radio Week, to be held November 23 to 30, will serve a twofold purpose. First, it will mark the rapid progress made by the industry during the last year, and second, it will be the means of uniting the radio interests of the world in a great international exposition. Reports received at this time indicate that virtually every country interested in radio will aid in the forthcoming event, with a view to showing the keen interest being taken in the science and to prove the world-wide power of wireless communication.

It will be a period when the nations of the Eastern and Western hemispheres which now enjoy the benefits of radio will indicate in unmistakable terms by the observance that the industry has not only been one of great commercial interests, but also that it has been an invaluable influence in bringing the nations of the world in closer relationship, as well as affording people in all walks of life, of every class, creed and color, a medium destined to entertain, edify and instruct. As executive chairman, the writer cannot urge too strongly that every co-operation be given the International Radio Week committee for the success of the forthcoming event. By strengthening the foundation now laid its perpetuity will be assured for the benefit of mankind, who regard radio as one of the greatest achievements in the world's history.

## The New Week on the Radio

By Pioneer

ALTHOUGH the new week does not boast of many new features, we find enough of the old ones to make it interesting. On Monday night we have the broadcast by WOR of the concert given by the newly formed Newark Philharmonic Band. This is WOR's first experience with outside broadcasts, but we have found that they are making a very creditable job of it and it compares quite favorably with the Goldman Band broadcast through WJZ. The Goldman affair, by the way, will be continued on Friday night of this week and an all-Wagner program will be played.

Some of the other stable features that will be continued through the new week are the New York Philharmonic and the concert from the New York University Summer School of Music. The former will be broadcast on the night of the 13th and the latter on the night of the 12th. The Philharmonic concert should have a trifle more than the usual interest attached to it, for the final elimination contest for the soloist will be carried out. Six contestants who have been chosen from a large number of applicants will be entered in the contest. We have no advance data relative to the program of the University, but they have been so consistently good in the past that there is little risk in holding that they will continue to remain good.

This afternoon the Cornish Male Chorus, which sings sacred and classical music, will broadcast from WJZ in connection with the program given by the New York Federation of Churches. The publicity man at WJZ would have us believe that this chorus is known from Palestine to California, but we don't share his thoughts. We are quite sure, however, that the singing of the chorus will be enjoyable for those who like sacred music.

We don't know of a lecturer who has been more interesting on a large number of occasions than George LaVal Chesterton. Chesterton, being English, usually talks about things English. On Thursday night he chats about the "Slums of London."

We have found Chesterton's expression richly imaginative, and any normal being with a little interest in the world of affairs can spend fifteen or twenty minutes with him, feeling that a good investment was made.

Aside from the Newark Philharmonic Band Concert, WOR's mixture for the week is a little lean. We cannot find one outstanding event on it. In fact, if we are to consider the fact that Holly McCosker has discontinued his "I See by the Papers" for the hot weather, WOR's program is a bit worse than it has been for the last few weeks. The new program is full of all manner of talks and lectures about things of little interest. Yascha Fishberg, violinist, appears to be about the best musical event offered aside from the Philharmonic band. Next on the list we would place the concert orchestra of the S. S. Levitan. That will broadcast on Wednesday night.

On Monday evening the U. S. Marine Band will play again through WEAF. This band actually plays in Washington, but WEAF's wire transmission is so perfect that one would think it was in the studio of this first-class broadcaster. If we were ever forced to admit our conclusions as to who is the best technical broadcaster we would have to do a lot of thinking and listening to decide that the honor did not rest at 195 Broadway.

Cello recitals at WEAF have always proven so restful and so delightfully entertaining that we always like to mention them beforehand when they appear with the advance data. The Rev. Hans Dresse will play his cello on Tuesday night. WEAF has never failed to treat the radio master instrument with the respect that it deserves.

We also notice that May Breen and her syncopators will be at WEAF on Tuesday night. Here is another disappointment-proof event. On Wednesday night Sybil Fagen, who in our humble estimation is radio's greatest whistler, will be at WEAF. Whistling is perhaps about the most difficult kind of music to broadcast, so easily is it distorted by the microphone. However, Sybil Fagen's work has been consistently pleasing.

There is not another single thing in WEAF's new program that we would mention in this column without a feeling of guilt.

# An Explanation of the Difference Between AC and DC Current

A Simple Description of Elementary Generators for the Two Types of Commercial Electrical Energy

By GEORGE HOPPERT

IT SEEMS very difficult for most writers to explain clearly the difference between alternating and direct current. Not so long ago I read an article giving the definition of alternating current as follows: "An alternating current is one which does not have a

that it intercepts or "cuts" lines of force of a permanent magnet, an electric pressure or electro-motive force (emf) will be set up in the wire. This electro-motive force or voltage will depend on three factors—the speed at which the wire is revolving, the length of the wire and the

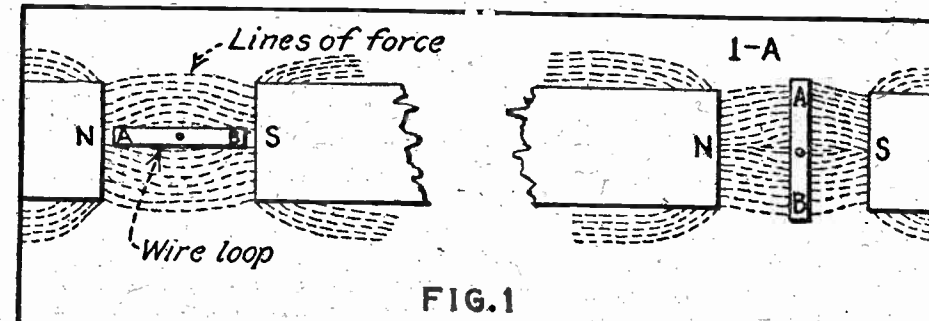
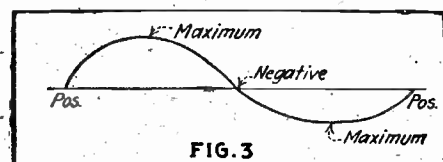


FIG. 1

steady now." Partially this is true, but we also have a fluctuating direct current which, according to the above definition, would become an alternating current. The purpose of this article is, therefore, not only to give an understandable definition, but also to show the reason for the difference between the two kinds of electricity.

Where electrical energy is required for heavy duty, such as house lighting and for power purposes, it is obtained by revolving coils of wire in a magnetic field. Where the current drain is comparatively small, as in your radio set or automobile, it is obtained from either primary (dry) cells or secondary (storage) batteries.

Certain bodies (especially iron and steel) have the property of attraction or repulsion known as magnetism. Where no external energy is used to induce this magnetism, the metal possessing it is known as a permanent magnet. Every magnet, permanent or temporary, has two poles, a north pole and a south pole. The polarity of a magnet can easily be determined by suspending it so that it can move freely and by allowing it to come to rest. One end will always point toward the north. This end is called the north pole; the opposite end is called the south pole.



Now, if we take two of the permanent magnets and bring them together we will find that the north pole of one will attract the south pole of the other and vice versa, but that if we bring the north poles of both magnets together there is no attraction, but rather a repulsion. Every magnet, whether permanent or temporary, has what is known as a magnetic field. This magnetic field is the area in which its magnetism exists and it can be determined by the old test with a bar magnet, a piece of paper and some iron filings. The magnet is laid on a table and the paper placed over it. The iron filings are then sprinkled over the paper. By touching the edge of the paper rather sharply the filings will fall into an arrangement showing exactly the magnetic field of the bar magnet. It will be noticed that the filings arrange themselves in lines, and these lines are known as lines of force of the magnet.

A current of electricity flowing through a wire is surrounded by lines of force just as in the bar magnet. When a coil of wire is wound around an iron bar, or better still, a bundle of soft iron wires, and current passed through it, these lines of force will pass through the bar as well as around the entire coil of wire and the bar becomes strongly magnetized. When a magnet takes this form it is called an electro-magnet and retains its magnetic property only as long as the current is flowing through the wire.

### Current Production

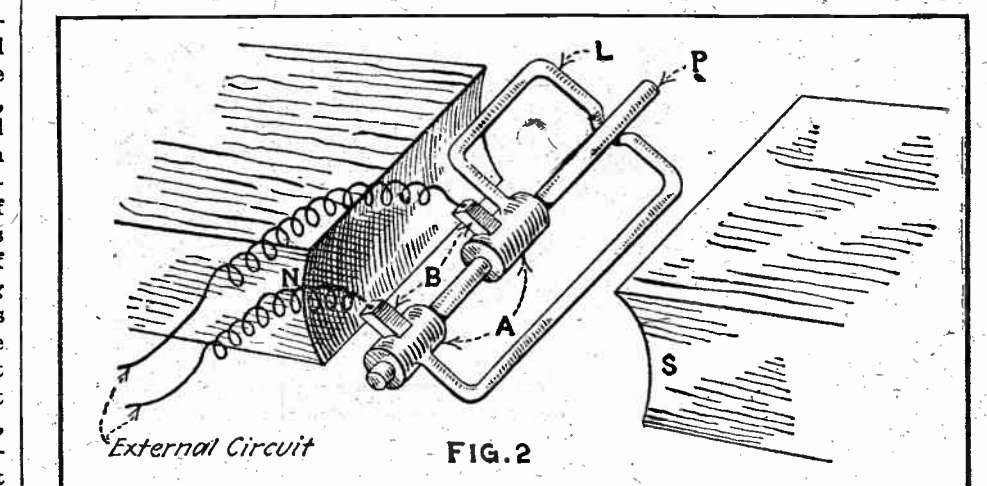
It was shown in the last paragraph that it is possible for a body to become a magnet by intercepting and collecting "lines of force" set up by a current of electricity flowing through a coil. This is also true if the process is reversed; i. e., if a wire is rotated in a magnetic field so

tact with the wire. However, in most instances, for practical reasons, the magnets are stationary.

In Fig. 2 we have an illustration of the very simplest form of alternating current generator. L is the wire loop fastened to the axis P so that it can be revolved between the poles N and S of the magnet. The ends of the loop are connected to the rings A, which are known as "slip-rings," and to these the external circuit is connected by brushes B. When the loop is turned both sides will cut the lines of force passing between the poles of the magnet and generate an emf which will cause a current to flow in the external circuit. In the position shown the loop is not cutting any lines of force, as has been previously explained.

A quarter of a revolution further on the sides of the wire are in the center of the poles of the magnet and the emf wave is at its maximum point. From this point, for a quarter of a revolution, it will decrease until it reaches zero, then the direction is reversed and it increases to negative maximum, from which it decreases to zero again. At this point a complete revolution of the loop has been made. The direction of the current in the external circuit was reversed every half revolution.

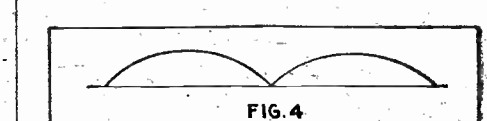
Fig. 2 shows what happened in the ex-



ternal circuit when the loop was revolved. The complete curve is a cycle or an alternation. The horizontal line is known as the "base-line" and represents the zero of emf. During the first half of the revolution the current was flowing from positive to negative and during the second half of the revolution from negative to positive.

In order to obtain direct current from this machine it is necessary to employ a device called a commutator. The commutator used for this machine would consist of two metal segments in place of the two slip-rings A as shown in Fig. 2. They are in the form of half a slip-ring and are insulated from each other, generally with mica. To these the ends of the loop are connected. Two brushes rest on this commutator directly opposite each other

and, of course, the external circuit is connected to the brushes. When the loop is revolved the two segments of the commutator move around so that at the position where the loop is not cutting any lines of force, i. e., the vertical position, the brushes touch both commutator segments. When this point is passed the brush which was formerly in connection with one of the segments and consequently with one end of the loop is now connected to the other segment or other end of the loop and vice versa with the other brush. So that the direction of the current, which has been reversed in the loop, will remain the same in the outside circuit. Fig. 4 shows the current wave generated by this machine in one revolution.



The part of a generator furnishing the

lines of force is called the field and the part which cuts these lines of forces and generates the pressure is called the armature. Of course, commercial apparatus assumes a very different appearance from the very simple model illustrated in Fig. 2, but it operates on exactly the same principle. The armature in a large generator consists of coils of wire wound around an iron core. The field is excited with electro-magnets, the electrical energy either being fed by the generator itself or from an outside source. Because an alternating current would change the polarity of the field magnets, only direct current generators are "self-excited," i. e., electro-magnets operated by their own current. You can see now why it is impossible to charge a storage battery on alternating current without some sort of rectifier in the circuit because, due to the reversals in the current flow as much energy would be taken out as was put in.

In your radio set alternating current is flowing right up to the grid of your detector tube. After the detector tube you have a pulsating direct current which varies with the variation of the incoming signal. While this is a varying current, it is not alternating, as one would be led to believe from the definition given at the beginning of this article. The chief difference is that though the pulsating direct current may also have a "wave" similar in appearance to the alternating current line, the direct current wave never goes below the base-line, which in alternating current indicates a reversal of the flow.

This may, and I hope it will, settle a number of questions that have arisen since the radio fan was compelled to become further acquainted with the mysteries of alternating and direct current. It might be well to add that the only way we can secure a steady flow of direct current is from a battery, primary or secondary, and even the slight variations are caused by local action within the battery itself. These variations, however, are very slight, and for ordinary purposes it can be assumed that the flow is steady.

## Regeneration Can Now Be Measured

The Bureau of Standards has devised a method of calculating the amplification produced by the "tickler" method of regeneration. This discovery, in the opinion of experts, marks another milestone along the road to a perfect radio-receiving set.

The importance of the discovery can be estimated only when the necessity of amplification is understood. Amplification is needed to strengthen weak signals, and also to operate a loud speaker. Obviously, if amplification can be calculated in advance, it will result in clearer signals, as too much amplification is just as bad as not enough, since distortion results.

Hitherto, while it was well understood how to amplify radio signals by regeneration in electron tube circuits, there were very few data on the amplification produced by this method of regeneration.

"The amplification of received radio signals by regeneration in electron-tube circuits is well known," said the Bureau of Standards in announcing the discovery. "One method of regeneration is the feeding back of alternating current power by means of inductively coupled coils in the two circuits, from the plate circuit to the tuned circuit connected to the grid of the electron tube. This method has been used extensively in modern radio-receiving sets

and is known as the 'tickler' method of regeneration. However, very few quantitative data have been available on the amplification produced by this method of regeneration.

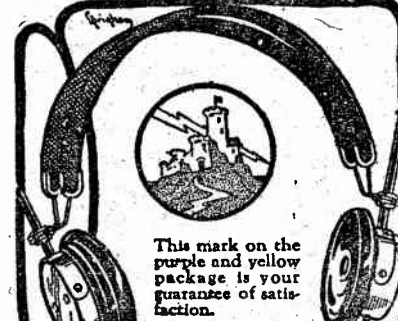
"By means of a simple alternating-current theory an equation has been derived from which the amplification produced by inductive feedback can be calculated. This equation shows that regeneration can be considered as producing a reduction in the resistance of the tuned circuit and so increasing the current. The equation derived was completely verified by experiment."

An unusual feature about the discovery is that a woman participated actively in the experiments. Dr. C. B. Jolliffe and Miss J. A. Rodman, of the Bureau of Standards, are given credit for the discovery.

Another step is being taken by the government which, it is believed, will eventually lead to the standardization of all radio equipment. The Bureau of Standards is conducting a series of tests to determine the most acceptable types of dry cells for use by government purchasing officers. The government has already formulated specifications for a standard receiving tube and is compiling data on transmitting tubes. In announcing the dry-cell tests the Bureau of Standards said:



William Rand, "Radio on Wheels," wins prize in Bradley Beach parade



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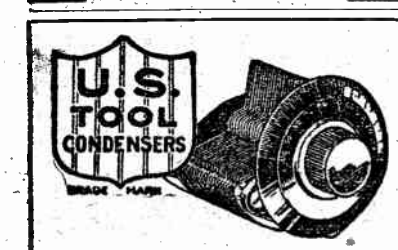
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# What Every Fan Should Know About Radio Receiving Circuits

There Are Few Standard Circuits but Many Variations

By SIDNEY ELBER

## PART III.

WHEN we enter the field of regenerative circuits and begin discussing their histories and adventures in radio wonderland, we are taking up a most interesting subject. Regenerative circuits in general are so very flexible and pliant that we could rant here about a thousand and one so-called different circuits and still have enough material left for several weeks of incessant chatter. The writer is limiting the present article to only the best known of our present-day arrangements, to prevent confusion and to save time.

It must be definitely understood that the basic and underlying action of all regenerative circuits was first discovered

in the aerial circuit is without question the favorite trick resorted to by all circuit chasers. In the variometer set this is done easily enough by replacing the regular vario-coupler by a fixed one having a primary (P) of a few turns (not more than fifteen) placed on the same tube as the larger secondary winding (S). This gives us Figure 3. The result is the elimination of one control without an appreciable loss in signal strength.

As far as can be recalled, Lawrence Cockaday was the first to use such an arrangement and to make it known publicly. Not only did he chop off the primary, but he also mounted the variometer bodily against the end of the secondary, thus obtaining regeneration by straight tickler feed back as well as by plate tuning. This was a clever stunt and worked out very nicely.

The untuned primary-variometer re-

doubtedly served its purpose as a simple concert receiver. Of course, there is nothing startling about it. The plate variometer is still present and is not even disguised. The tuning circuit is most unpretentious. It uses only a tapped coil and a variable condenser, which tune the aerial and grid circuits at the same time, as in the RC set.

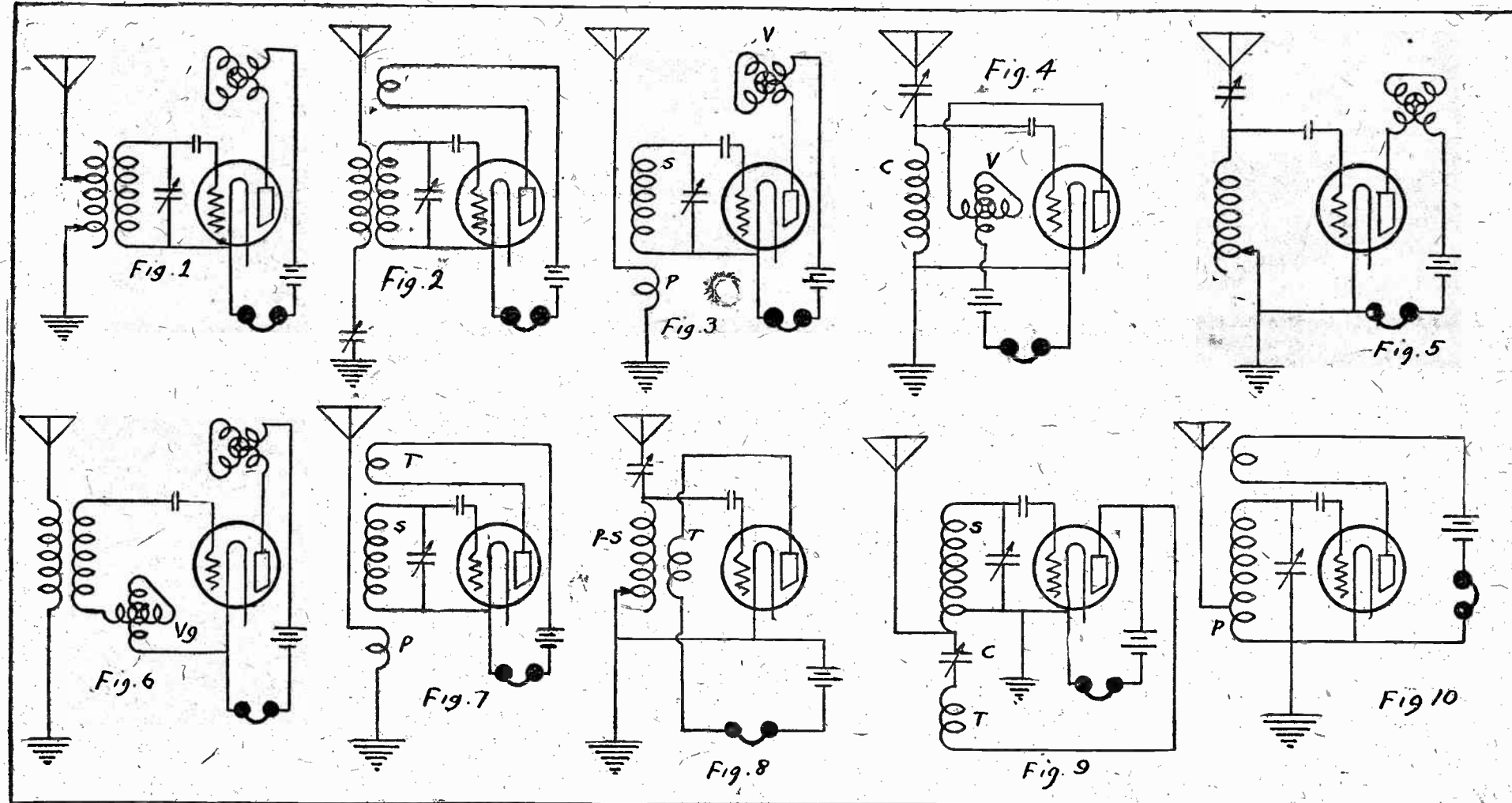
### Variometer or Condenser

It has been mentioned that the variable tuning condenser across the secondary of the vario-coupler in a variometer regenerative can be replaced by another variometer similar to the one already present by inserting it in the wire leading from the top end of the secondary to the grid. This gives us the two-variometer receiver.

Nothing is gained by this substitution, except in the matter of appearance. Ex-

a dozen other tuning coils, with the red, white, blue, pink and baby-blue wire? They are all exactly alike and all use the same circuit, the one shown in Figure 7. There is the untuned primary, P, wound next to the secondary, S, with a rotating tickler, T, fitted to the secondary end of the winding form.

These coils are widely used, for they work so smoothly and satisfactorily. Well, why shouldn't they? It is generally acknowledged that the tickler method of regeneration is the best one; add to the tickler dial only another for a tuning condenser, and you have a set that will bring in, with the aid of only one stage of audio amplification everything that is worth hearing in the broadcast field. It will not be quite as reliable on distance as the more complicated radio frequency sets, but it will pull the DX'ers in all right, and pull them in nicely. This circuit by the



by Armstrong. The work of the many scores of incidental experimenters did not even start until Armstrong made known his own investigations. It is true that much important development work was accomplished by the later men, and all credit is due them for it, but there also have been many palpable fakers who unabashedly labelled the labors of others as their own. The writer does not wish to invite libel suits by openly mentioning names, but the reader can peer between the lines and draw his own conclusions. Murder will out, anyway.

As mentioned in a previous article, the variometer and tickler regenerative methods have been most freely adapted to "new" sets. Two definite sets, the variometer-vario-coupler and the three-coil honeycomb (Figures 1 and 2), because of the length and time they have been used and known, will be regarded here as the foundation ones from which the variations are obtained. These receivers were employed long before broadcasting became the gigantic service that it is to-day, so the wisdom of their choice as criterions for younger affairs will not be questioned.

### Variometer Circuit

Let's start with the variometer outfit. The regenerative action results from the presence of the variometer in the plate circuit, so that fixes that instrument. All the changing must be done on the grid side of the tube; in other words, in the tuning circuit.

Getting rid of the tuned primary coil

generator worked beautifully and was widely copied. One shameless radio fan took one of Cockaday's receivers, carried it to a not so distant town, and convinced a young and unsophisticated radio editor that it was his very own brain child. Said fan got a lot of free publicity, but it didn't last long. Murder, etc.

### Single Circuit

The circuit of Figure 4 may look vaguely familiar to quite a few persons. It should, for it is the fundamental circuit of the one-time famous and now departed "RC" set. (May it rest in eternal peace and solitude!) Regeneration was produced in it by a variometer (V) in the plate circuit, also coupled to the grid (G). The big dial up on top turned both the variometer rotor, and also the aerial tuning condenser. Why, we don't know. The combination was not a particularly wonderful one, as the tuning was broad and the regeneration adjustment rather coarse.

This was a single-circuit set—"single" because the aerial and tube circuits were combined and used the same tuning devices. Its one advantage was its simplicity of operation, but even this was superficial. It was so simple that everything came in at once on it.

The circuit of Figure 5 is similar to that of Figure 4, but the mechanical positions of the parts are different. This is, or rather was, a popular circuit among New England fans. It was introduced about two years ago, and at the time un-

perience has proved that there is nothing to choose between condenser and variometer tuning; the advantages and disadvantages of each method just about balance, as do the actual results, which count more than anything else.

Now not so long ago the writer read with amazement in a Western paper one of the boldest and most foolish radio stories he has ever seen. Some local radio "engineer" (so the credit line said) apparently had devised, after long and tedious labor, a marvelous and epochal receiving circuit which would do everything but sprinkle the front lawn. After wading through several columns of autobiographic wishwash we finally came to the description of the circuit, and, lo and behold! it made use of two variometers, a vario-coupler and the usual accessories! The claim for originality was made on the sole fact that the secondary tuning variometer, instead of being placed between the secondary and the grid, were most brilliantly installed between the secondary and the filament. This is about as different from the first scheme as the dancing of one Tiller girl is from that of any one of her partners.

Tickler feed back circuits are not one bit less changeable than variometer ones. Again there is the tendency to eliminate the aerial tuning circuit, and instead of finding the helpful, movable primary coil of the honeycomb set, we find five and ten turn untuned primaries.

Who hasn't seen the "Ambassador," "Air King," "Yankee," "Uncle Sam" and

way, is not "three circuit," as one ignorant manufacturer seems to think. It is "two circuit."

Other tickler circuits can be recognized easily enough. In Figure 8 is the old single circuit with a vario-coupler and a variable condenser. This squealer is now about obsolete. It brings in a lot of interference and generates almost as much itself for others. Its passing is not mourned.

Figure 10 shows a circuit similar to that of Figure 7, but not as good as it. The bottom of the secondary winding is used as a primary instead of a separate coil. It is seen around occasionally.

### Reinartz Tuner

Figure 9 commands immediate respect. It is the Reinartz, not Reinhardt, Reinartz, Rheinhardt, or Rinehart, and it probably created more furor in its time than any other. Truthfully, it is not an original circuit either, but to rush to the defense of Reinartz, it must be stated that that prolific experimenter fully acknowledged the fact that his circuit was but an adaptation of the Weagant system of shunt tickler feed back when he first described it in QST.

The tickler coil in the Reinartz is connected across the plate circuit rather than in series with it, as in the other sets just described. It is usually kept fixed, the regeneration being controlled by the condenser C.

(The next installment will deal with audio-frequency amplifier circuits, which all radio fans are interested in.)

## Neutrodyne And the Thief

Somewhere in New York there is a disillusioned crook bitterly bemoaning his luck. In fact, so far as he is concerned, all the joy has been taken out of his business. It happened this way: Harold Stein, general manager of "Foto Topics," was called to Newark, N. J., to get a neutrodyne receiver from the Eagle Radio Company to be photographed for the catalogue purposes of that concern.

Stein put the set in his automobile and drove to his office in New York City. He got out, carried the set into the lobby of the building, together with some other bundles, and laid it on the floor, near the hall man, while he spoke to an acquaintance who had accosted him. As they were talking a stranger entered the hall, picked up the receiver and exclaimed:

"Oh, all right, I'll take it along!" The hall man, hearing the remark, thought the stranger was with Mr. Stein and did not interfere. The intruder quickly disappeared in the crowd on the street with his precious bundle. As soon as he had discovered his loss Stein called up a police station, and a general search for the man was instituted. But the set was a dummy used for catalogue photographing purposes only. It had no insides. What the thief said when he examined his loot would undoubtedly make your vacuum tubes flicker.

## Broadcast Recital Brings Collector

Alphonse Bohrer, the well-known composer and pianist, whose WJZ recitals have been among the outstanding features of the winter radio programs, returns to the radio audience in a special radio recital from that station on Monday evening. Mr. Bohrer has had an unusual series of consequences from his past radio concerts, for immediately after he concluded his last appearance before the WJZ microphone a bill collector dashed into the studio with a bill of \$2.45 which he claimed was a year overdue. Bohrer fortunately had paid the bill by check, and was able the next day to show the alert agent his canceled check. In the evening of the WJZ broadcast just previous to that one Mr. Bohrer received a telephone call from a friend of his boyhood days whom he had not seen or heard from for over fifteen years. Mr. Bohrer plans to leave by motor car for Canada immediately upon concluding his program on the 11th, for he is not sure just what result this concert may bring forth.

## Violoncellist at WEA

The eminent violoncellist Rev. Hans Dressel will play a solo concert as the leading feature of WEA's program on Tuesday evening. Mr. Dressel was born in London, where his father was professor of the piano, and from him he received his early musical training. He soon mastered the rudiments of music and appeared at an early age as a pianist at both public and private recitals.

## Radio Editors To Operate WEEL

WEEL, the new 500-watt broadcasting station of Edison Light, Boston, will open early in September. It will transmit on a wave length of 303 meters. Two Boston radio editors who for many months have been telling broadcasters how to run their stations will now have an opportunity to practice what they have preached, for they will have complete charge of the policy and operation of WEEL.

Charles Burton, radio editor of "The Herald-Traveler," will be superintendent of the broadcasting department of Edison Light. Lewis S. Whitcomb, better known as "Whit," radio news editor of "The Boston Post," will be director of publicity and assistant superintendent of broadcasting.

Bob Emery, formerly of Amrad, will be program director of the new station. He will be assisted by E. Lewis Dunham ("Uncle Eddie"), who was his assistant at WGI, and by Miss Marjorie Drew, who was chief clerk of WGI's broadcasting department. Clarence V. Purcell will have charge of the technical and operating end of the station. Edison Light's official initials, E. L. I. for Edison Electric Illuminating Company, are incorporated in the call letters—WEEL.

## KPO Adds French Lessons To Scholastic Program

Quick to see the advantages of radio education, both to rural and urban populations, Edna K. Barker is offering another foreign language course to the KPO listeners-in. The radio course in Spanish, which rose so rapidly in favor under Mrs. Barker's organization and direction, was the first of its kind ever given on the air and proved to be highly practical. The coming classes in French, however, are already more popular with the general public as well as with educators and students of economic and social life.

The KPO French course commences at 8:20, Pacific time, August 20. Tune in and take it. Write in and receive the free material. Send your stamped, self-addressed envelope to Edna K. Barker, or Ada Morgan O'Brien, Station KPO, Hale Bros. Inc., San Francisco. The course is free.

## WGY Will Broadcast On Wednesday Evening

The usual silence of station WGY, Schenectady, N. Y., every Wednesday night will be abolished on August 13. Fans who can tune in on this station will be provided with an unusual musical program. The Filipino orchestra of the U. S. S. Leviathan and a radio address by Captain Herbert Hartley will be broadcast from 7:30 to 9 p. m. At 9 p. m. a concert by the New York Philharmonic Orchestra will be broadcast, in conjunction with WJZ, from the Lewisohn Stadium, College of the City of New York.

## Summertime Radio Has Big Season

The campaign conducted by the Radio Section of the Associated Manufacturers of Electrical Supplies to make the summer of 1924 a radio summer by the improvement of equipment, service and programs, has brought a flood of letters to broadcasting stations throughout the country reflecting the increased hold which radio has taken upon the public and the better quality of reception this season as compared with the warm months of 1923.

One of the interesting developments disclosed in these communications is the vogue of "Radio Parties." In thousands of the smaller communities the announcement of an exceptional broadcasting program is seized upon as the occasion for a gathering of neighbors and friends for an evening of music or for an informal dance.

Due to the notable improvements in receiving apparatus as well as the greater power and range of many broadcasting stations in the United States, the usual summertime atmospheric disturbances have interfered but little with the enjoyment of radio reception. Letters from public officials, educators and clergymen emphasize the fact that, in addition to these entertainment features, radio has become an indispensable public service. The broadcasting of the Democratic and Republican national conventions came in many quarters as a revelation of the power and destiny of radio in the home.

# RADIO for summer days

Below are listed Manufacturers and Dealers who can supply your wants.

GO WHERE THE CROWD GOES!

## COLUMBUS SHOP

22 East 125th St., Near Madison Ave.  
874 COLUMBUS AVE.

WE HAVE A FOLLOWING!—Because

we have never been out of stock on advertised merchandise, never have refused to refund money, nor have we ever made a promise that wasn't kept.

**TRADE IN YOUR OLD SET FOR A NEW DE FOREST D12—NOW ON DISPLAY**

Liberal Allowance Made on All Sets

GENUINE RCA 201A TUBES \$2.59

WITH RACK & PURCHASE

**STANDARD MERCHANDISE SALE**

U.S. Battery \$2.00  
Current Tap 10 day free trial

Engraved Binding Post Strips \$1.50  
43 p.l.v. Cond. 1.45  
Hydrometer .29  
Light Arrest .38  
Star Sockets .19

**GENUINE FISCHER**

79c

Varimeters Couplers

**Storage Batteries:**

Yale \$9.75  
Yale 50-110-12-75  
Yale 120A-15-75

**Batteries**

Eveready and Burgess in stock.  
B.K.P. 22 1/2 v. 75  
B.B.P. 45 v. 1.75

1,000 Other Items Too Numerous to Mention

### Radio Headquarters

WASHINGTON HEIGHTS

Are you waiting for the perfect radio receiver? Well, it has arrived. Let us demonstrate in your home any evening the new DE FOREST D 12 WONDER SET.

Other standard sets in stock

BACH RADIO CO.

De Forest Dealer  
601 West 145th St.  
Between Broadway and the Drive  
Telephone Building  
Tel. Broadway 4402  
FOR THE BEST IN RADIO SEE US

AIR-KING

DISTANCE and selectivity are a sure thing when you build your set around AIR-KING!

The AIR-KING is a three circuit tuner—the most efficient type of tuner made. It is 150% non-radiating, wound with Lite wire on genuine Bakelite forms. Only six wires to connect and NO switch points.

YOUR DEALER HAS FREE HOOK-UPS

Metropolitan Distributors  
RELIANCE RADIO SUPPLY CO.  
57 Day Street, New York  
Mid. by EXCELSIOR RADIO CO.  
222 Grand St., Bklyn., N. Y.

RADIO TUBE EXCHANGE

ALL TUBES REPAIRED AND GUARANTEED TO DO THE WORK

W. D. 11 or 12  
U. V. 199-200-201A  
U. V. 302 required \$2.50  
RADIO TUBE EXCHANGE, 200 B'way, N. Y.  
All Mail Orders Given Prompt Attention  
Orders Sent Parcel Post C. O. D.

RADIO TUBE EXCHANGE

If you want to buy, sell or exchange your radio sets or parts the Radio Exchange will help you.

### Shall I Buy A Radio This Summer?

Some thousands of prospective radio fans are asking themselves this question. From their friends they have "caught the bug" and are thoroughly determined to have a set of their own, but are laboring under the mistaken impression that they won't need it until the fall season sets in. Much more than in previous years the summer of 1924 offers entertainment for those who are privileged to listen to things in the air.

The recent national Republican and Democratic conventions were enjoyed by many thousands who never before had come to a realization of what a wonderful miracle radio really is. There is no question that thousands of new recruits were added to the ever growing list of fans to whom life would be dull and incomplete without their radio.

Even more thrilling than the conventions will be the campaign speeches. These warm weather days are stirring days in the political field, where party lines are being strained and broken.

Entertainment for those interested in sports is also plentiful. Baseball scores from the big leagues and prize fight returns are among the attractions in the athletic world.

All things considered, if one is contemplating a radio at all, there is everything to justify getting it now.

A glance at the following list of things available by radio now will further support this conclusion.

Things You Will Miss by Not Having a Radio This Summer

Presidential campaign speeches, baseball scores, prize fight returns, church services, camping and motor talks, hotel dance orchestras, Philharmonic and Goldman concerts, dinner music, hot weather food suggestions, children's programs and fashion talks.

### FOR BETTER RADIO CABINETS

Manufactured to order in all sizes—of every description.

Can supply dealers or jobbers with any quantity. Factory capacity 4,000 per week.

Mail Orders Promptly Filled.

MANHATTAN ART RADIO CABINET CO.

553 W. 53rd St.  
Tel. Columbia 6375, N. Y. C.

BRING US YOUR BROKEN OR BURNED OUT RADIO TUBES

All makes repaired. Regular prices without tube, \$2.25. Written guarantee with each tube. Mail order. Promptly filled. RADIO TUBE MFG. CO., 154 Nassau St., N. Y.

## Lego Wonder

Fixed Detector

for REFLEX & CRYSTAL SETS

Something entirely new.

100% SENSITIVE

10 IMPORTANT FEATURES READ THEM CAREFULLY

- 1—No parts to replace or wear out.
- 2—The use of a NEW MATERIAL that effectively eliminates distorted and interrupted reception, and substantial clarity and increased volume.
- 3—Absolutely 100% sensitive. No searching for sensitive spot.
- 4—Glass encased, it is immune from sun and dust.
- 5—Especially designed to withstand high voltage or reflex circuits.
- 6—Solidly constructed throughout. It is practically everlasting.
- 7—It is ALWAYS READY—no adjustments of ANY kind needed.
- 8—As good looking as it is efficient. High nickel-plated, throughout, and attractively designed. It enhances the appearance of any set.
- 9—Constructed so that it is thoroughly VIBRATION PROOF.
- 10—Carefully tested, approved and unconditionally guaranteed by its makers.

For sale by All Dealers 90c. or Sent Postpaid Insured \$1.00

Lego Corp., 225 W. 77th St., N. Y. C.

### Long Island Radio Shop

139 Ashland Place, Bklyn  
At Long R. R. Station.

WE SPECIALIZE IN

1—2—3—4

TUBE ERA REFLEX SETS

These sets give finest results during summer months. No static. No distortion. The Cole Collapsible Loop with operate a 4-tube Era Set. (Come in and hear it!)

For best concerts tune in the MUNICIPAL RADIO BROADCASTING STATION

One-Knob Journal Set Complete .....\$18.50  
All R C A Tubes. \$3.10

For best prices on radio supplies and sets come to the

Municipal Radio Company

No. 1 Park Place, N. Y.  
Tel. Barclay 0382

## RADIO

SEND FOR OUR COMPLETE MONEY SAVING CATALOG

TIMES SQUARE AUTO SUPPLY CO. INC.

MAIL ORDER DEPT.

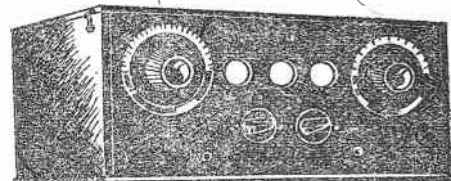
1743 BROADWAY at 36th STREET  
NEW YORK, N. Y.



**Ludwig Baumann**  
does not charge interest!

**75c weekly**  
pays for this  
**D. X. Special**

Vacation  
Model **RADIO SET**

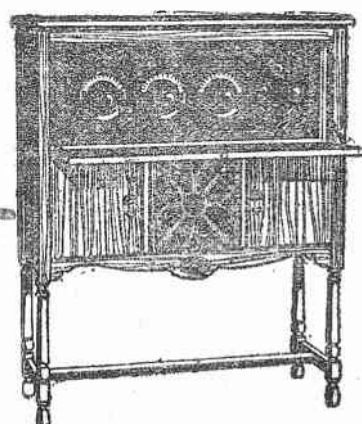


**\$59**  
Complete

THIS is a remarkably fine set at such a low price—and consists of a 3-tube set complete, ready to tune in—with tubes, batteries, loud speaker and plug. No Interest Added for Credit.

**\$2.50 weekly**  
pays for this

**Pathe**  
5-Tube set  
in a De Luxe  
CABINET



THE greatest radio bargain we have ever offered. A wonderful outfit, consisting of the famous Pathe 5-tube Phusiformer Set, constructed in a beautiful art cabinet and built-in loud speaker. Tubes and batteries extra.

**\$149**

**Ludwig Baumann & Co**

Open Until 9 o'clock Saturday Night.

35 St. to 36 St. on 8th Ave.

Harlem: 144 West 125 St. Newark: 49 Market St. 351 Broad St.

The text of The Herald Tribune Radio Magazine is the best on the subject published by any newspaper. The amateur is given really instructive articles on how to build and the advanced fan finds his proper diet in selected scientific articles by well-known authorities.

It publishes about the right amount of human interest stories and contains the largest proportion of text matter, in relation to advertising, of any Radio Section in any newspaper.

## Last Week on the Radio

By Pioneer

We accumulated so much interesting correspondence last week that it is impossible to find space for but a very small portion of it in this column. Those who do not find their opinions aired can anticipate the appearance of their letters in next week's space.

Our first letter has been received from Elbert B. Hamlin, who does not agree with us concerning WJZ's "Financial Developments":

"Sir: I venture to comment upon a paragraph by you in The Herald Tribune of July 13, in which you criticized 'The Financial Developments of the Day' as broadcast by WJZ.

"I doubt if you can realize the value of this broadcasting to a large number of people. You say that it can be of interest only to those engaged in the brokerage business. I doubt if it is of any interest to that class of persons, because they have their tickers. But it is of interest to a large number of us who are actively interested in financial matters and who like to know what has happened before we get our newspaper for the full details the following morning. With an apology for the contradiction, the 'small changes' are of interest from day to day, whether one is an active or an occasional trader or investor. A person's interest is where his treasure is, and to be able thus to get reliable information is not only of interest but of value. Broadcasting needs more 'meat and taters' to appeal to the man who pays for the equipment; the entertainment appeals more to the other members of the household. This financial feature is one of the few that appeal to the business man. To establish stability broadcasting must have more rather than less of such material. Before writing this I have asked the opinion of fourteen people locally. Of these twelve use this service more or less regularly and offered to write WJZ to this effect. I have frequently myself made purchases or sales because of it. Its broadcasting does not detract from the sales of newspapers, because one must always get details from the papers. It stimulates rather than decreases sales of newspapers. As, for example, I have often heard a bit of news the details of which I may not find in one paper, and have then bought another paper to find it. To people who have already read their evening paper on the way home from business this feature might not appeal, but such people are the minority of listeners. I therefore solicit your encouragement of this feature and those similar thereto. Very truly yours,

"ELBERT B. HAMLIN."

When we wrote our criticism of "Financial Developments of the Day" we felt quite sure that some people profit by it, but we wondered if the number was sufficiently large to justify the amount of time consumed daily in the broadcasting of this event. After reading Mr. Hamlin's letter we have decided that WJZ had better continue with its work and not mind our cantankerous rantings, for if the event attracts the attention of a few people who derive as much service from it as Mr. Hamlin's position should be secure. To us, however, it simply increases the notoriety of broadcasting, for we read all of our financial news in the morning paper, and we find that it is quite as complete and authoritative as that offered from this source.

We have made a habit of reporting on the condition of static in the daily column. Not that it helps the matter in the least, but some people like to compare notes. Here is one comparison:

My Dear Pioneer:

Noting your experience with static and other things, and comparing with my own, I conclude that static is, as General Hancock said of the tariff, a local issue.

Your receiving station is about twelve miles from mine, yet often when you complain of static I have none, and again when you note "heavily stillness of the ether" I receive crashes denoting disturbance. I sometimes think flashes from the third

rail of the Long Island Railroad may be a cause, and that you, too, may have some third rail interference. Code interruptions are much less than last year. Occasionally one breaks through every wave length.

I have a 3 tube, vintage of 1922, but since replacing tubes with 201A I get New York, Newark and Philadelphia as loud as I can bear the headphones on the one tube receiver, not using the two amplifying tubes (all except WJZ, which comes in badly and requires amplification). WJZ seems all right from the same location on the one tube. I shall hereafter note the hours of disturbance and compare with your reports.

Respectfully,  
H. B. SALISBURY.

Many letters like the above have been received, and in some cases we are actually reprimanded for having mentioned that there was any static at all. Perhaps this is our own fault as much as the fault of the writers, for we have neglected to mention that static is not strictly universal. Like thunder showers, it is more often local, and when we complain about it it does not mean that the entire country is laid open to its abuse. In fact, uptown New York may have a great deal of static trouble while the downtown section gets off scot free. We are certainly glad to note that the present writer, whose letter is printed above, appreciates this fact. We can only hope that those who doubted our word will have occasion to read it.

We have received a very encouraging letter from Alfred E. Caddell, secretary of the American Radio Association. We say encouraging because it shows that the association is alert to its function in protecting the interests of radio listeners. Here is the copy of the letter referred to:

New England Steamship Company, Pier 14, North River, New York City. Gentlemen: The American Radio Association, a national organization of listeners-in, is in receipt of many complaints of code (QRM) interference which have been lodged by experienced operators and traced directly to your ships plying Long Island Sound and to the land station in Brooklyn with which they work. Broadcasting stations go to great expense to send out good programs, but while this code is being sent it is absolutely useless for any one within a range of twenty to fifty miles of Long Island Sound to try to enjoy broadcast programs.

Undoubtedly you know that there is a national regulation that specifies that all communication must be carried on with the least power possible, but qualified observers who have logged this sound traffic report that your operators use a considerable excess of power. And this, combined with the obsolete spark system employed, results in a very coarse, poorly tuned signal that blankets the upper scale of broadcast wave lengths and hushes up the finest programs.

The American Radio Association is bending every effort to bring about better broadcast reception, and we respectfully ask that you co-operate with the ARA to put an end to this abominable nuisance. There is no excuse for its continuation and it simply must cease—we would, of course, like to see you stop it voluntarily. One way to better conditions immediately would be to instruct your operators to use their heads in carrying on traffic and keep it off the air in the early evening hours if they cannot help trespassing on broadcast wave lengths.

A copy of this communication is being sent to Herbert Hoover, Secretary of Commerce, and to the newspapers, for the situation warrants action. However, in the event that you remedy the present intolerable conditions, the fullest publicity will be given your efforts. Yours very truly,  
ALFRED E. CADDELL,  
Secretary.

In addressing a letter of this nature to this particular concern we believe that the first gun has been fired in the battle of interference and that the courage displayed by the A. R. A. has been commendable. The A. R. A., let us mention, is a non-commercial body of broadcast listeners who pay \$1 a year for the privilege of having a part in the activities of the association. Since these activities have to do with matters like the above, every listener should be proud to share them. Numbers count, too.

## "Fooling With The Radio"

Probably one of the commonest expressions heard in American households to-day when the whereabouts of father or son are sought, is, "Oh, he's fooling with the radio."

It is fortunate for the new art that he is. There is more in the phrase than is realized. Radio owes a larger part of its development to this so-called "fooling" than can ever be estimated—not only "fooling" by father and other novices, but by experts and engineers.

It is easy to understand how a man who has been busy in a store or office all day is glad to get home at night and "fool with the radio." It makes him forget the cares of the day. But it is not quite so easy to understand why radio experts and research men who have worked at top speed all day on radio problems of one kind and another start in as soon as they have had their dinner at night to "fool with the radio" at home.

"Radio widows" may not all agree, but, of course, the real answer for their "strange" conduct is that they are impelled by the urge of experimentation. To members of their families who are waiting to go to the "movies" or to be taken out in the car they are simply "fooling with the radio," but in reality they are conducting the practical experiments from which so many of the improvements of the last five years have resulted. They are eternally striving to make the set work better, to make it simpler, to eliminate minor difficulties, to increase its range, and, above all, to perfect the quality and purity of tone. It is the never-ending quest for perfection which is bringing radio, in common with all other great public utilities, to new stages of efficiency and usefulness.

Recently great strides have been made in simplifying the control of modern sets. A well known four-tube reflex set has only one knob to tune with, and a new station can be brought in by every turn of a few degrees on the dial.

"Radio widows" and the general public need not waste any sympathy on either experts or amateurs who sit up half the night "fooling with the radio." The wife of the chief engineer of an important transformer manufacturer which maintains one of the leading research laboratories in the industry told the writer recently that her husband stays up till 12 and 1 o'clock several nights a week experimenting with the set in their home.

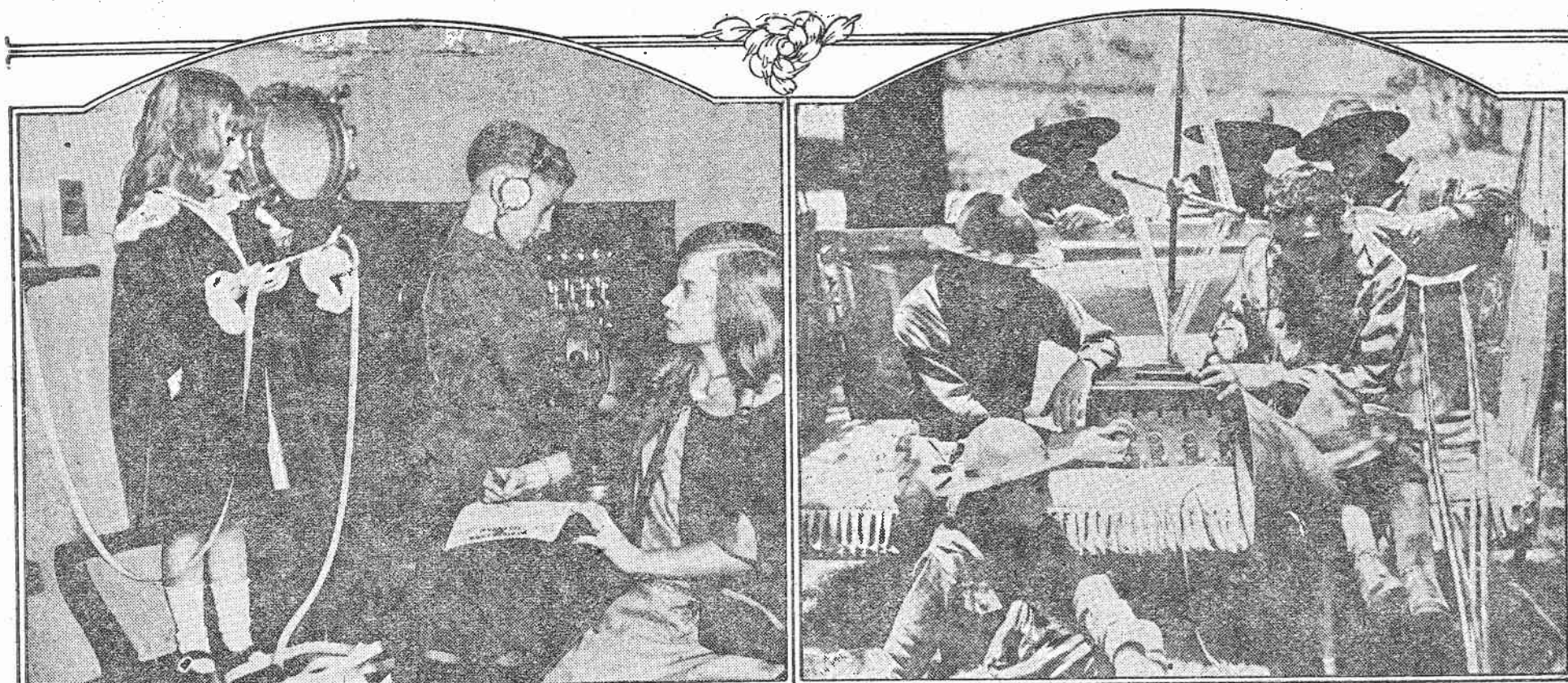
"But I do not feel sorry for him," she observed. "It does not tire him. It is not the actual amount of work which one does that tires. Fatigue and happiness in one's work do not go together. In fact, I do not think my husband gets as tired as some men who work far fewer hours, but who do not have work which so absorbs all their faculties and creative instincts. Probably the reason that Edison can live on so few hours of sleep a night is that his trained brain, working on problems which interest him so deeply, operates with a degree of fatigue far below the average person's."

Pre-eminent among the problems of radio development on which novices and research experts alike are now working is improving the clarity and purity of tone in receiving sets—to secure amplification without distortion. Without good tonal quality any set, whatever may be its range of power, falls short of the ideal of perfected operation. Accurate and pure reproduction of the voice or of the musical instrument in a radio set depends, in the last analysis, upon proper amplification, in which the sound is multiplied but not distorted.

### Elimination Contest From WJZ

An event of no small importance in the New York musical world will make the stadium concert by the New York Philharmonic Orchestra, which stations WJZ, New York City, and WGY, Schenectady, are to broadcast simultaneously on Wednesday, one of unusual attraction to the radio audience, for on that date the final elimination contest for soloist of the Philharmonic will be incorporated in the regular stadium concert. The six soloists who will be heard by the listeners are the ones selected from hundreds of applicants, having been chosen after a series of eliminations which has lasted all summer, and represent the foremost of the young artists of this country.

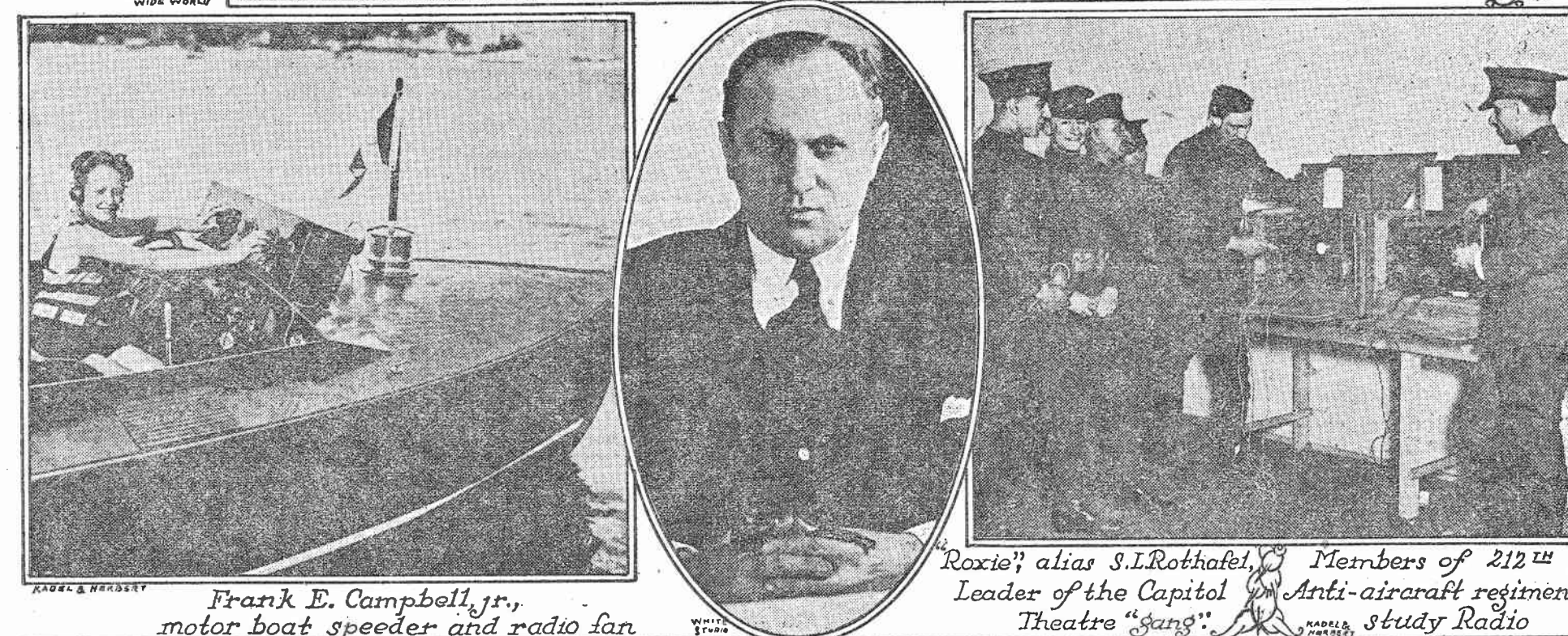
## Up-to-the-Minute News of Radio in Pictures



The Erbstein children operate father's broadcasting station near Elgin, Ill.

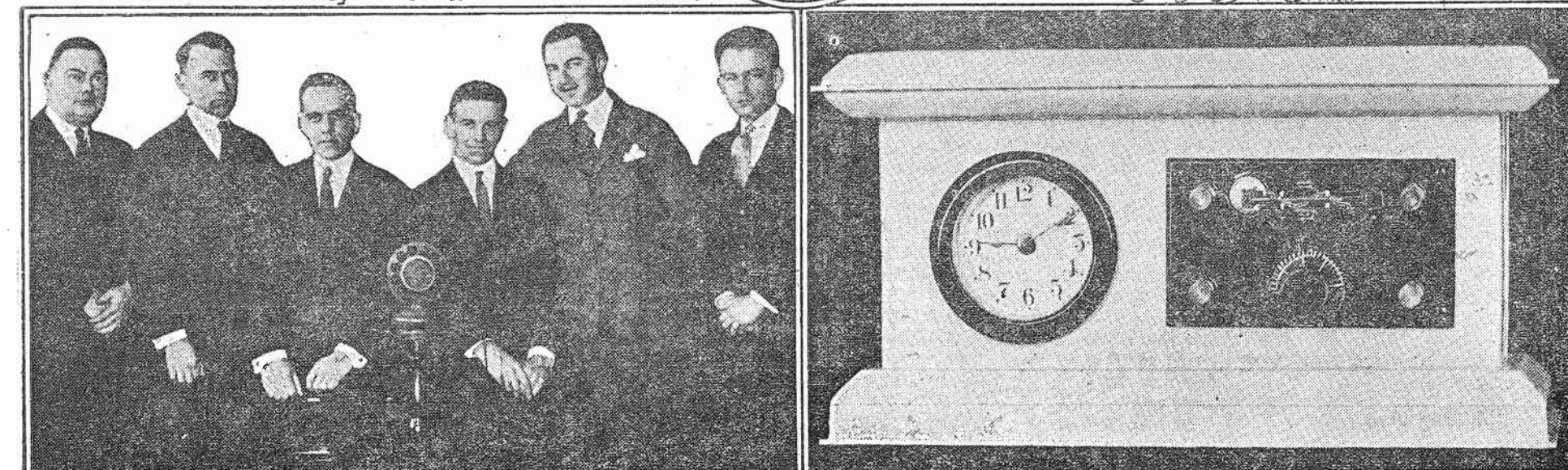
"Radio Central," Walter Reed Hospital, Washington D.C., serves 900 Head Phones and three Loud Speakers.

Crippled Boy Scouts appreciate Radio



Frank E. Campbell, Jr., motor boat speeder and radio fan

"Roxie," alias S.L. Rothafel, Members of 212th Leader of the Capitol Anti-aircraft regiment Theatre "Jang" study Radio



The Announcers at Station WGY, Schenectady, N.Y. Combined Clock and Crystal Radio Receiver for Travelers



A DEPARTMENT OF  
POPULAR DISCUSSION  
OF TECHNICAL POINTS,  
USUALLY CONSIDERED  
TOO INTRICATE FOR  
GENERAL EXPLANATION.

## BEHIND THE PANEL

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R. P. CLARKSON

MARTH

IT IS often quite a shock to any one of us to learn how simple things are fundamentally, especially in those matters, such as radio, which are presented to the public. There must always be an initial period when the public is waking up to the subject, and in that period the glamour and marvel of it all is so stressed that it becomes increasingly difficult to undo that sort of impression. No doubt all scientific things are wonderful. All new things appear marvelous and the less the observer knows about them the more he is mystified. The more he is mystified, the greater the marvel to him.

Some self-constituted authority listed the "seven wonders of the world" some years ago, setting down such things as Niagara Falls, the Pyramids of Egypt, the Hanging Gardens of Babylon, the Colossus of Rhodes, the Great Wall of China and such things, as I recall them from memory, mixing together natural wonders with man-made wonders. Then only recently, in a contest conceived by "The Scientific American," a list of scientific wonders of the world was compiled by the public votes, and in this list, I believe, were only mentioned man's inventions, such as the airplane, wireless telegraphy and telephony, the X-ray and others which I have forgotten. By our own lack of intellectual breadth, or, to put it more bluntly, we don't realize our own ignorance. We are mystified by anything complex because we don't take the time nor the trouble to resolve it into its individual parts. To use an old saying, "we can't see the trees because of the forest." We frequently put the accent in the wrong place.

### Magician's Skill

We appreciate Houdini and marvel at the things he does because we don't understand them, but reason tells us they must be simple and easily explained. The thing we should marvel at is his wonderful skill in doing them and in fooling us. The fact that a sleight-of-hand performer can stand openly and do a thing, and, in spite of being keyed up with every sense alert, we can't see him do it is most astounding, but the answer is simple. As they express it at the side shows, the hand is quicker than the eye.

Familiarity surely breeds contempt as these things witness. What can be or is more marvelous than the simplest things of life? What is more mysterious, for example, than fire, probably the first great contribution to civilization when primitive man sometimes, somewhere seized a burning brand from the forest fired by a lightning flash and fed its flame as he carried it back to the tribal home and there continued to keep it burning? What a magnificent courage it must have taken to do this, and what a growth must have occurred in that tribe, for now there was heat as the winter snows came, and no necessity for going southward in the fall. Now there was light during the long, dark night. There was protection from wild beasts. By and by when by accident some food was spilled into and rescued from the fire, cooking started.

It is not hard to understand why there became a race of fire worshippers. Those who live in the open to-day come very near to glorifying fire.

### Making Fire

Yet time went on for centuries, and if the fire went out there was no way of starting it except by borrowing a burning coal from another fire somewhere. Then

it was noticed that sparks from striking stones resembled the sparks from the fire, and presumably some men became skilled in lighting pith that way. Friction was found to develop heat and we find the twirling stick developed. These things show brains. They show reasoning from cause to effect.

Even in old New England days there was no further progress in fire making. The flint and steel and tinder box were king, and the borrowing of burning coals from a neighbor a mile or two away was not uncommon. Then matches made their appearance. I'd like to write a prospectus for a match factory. Think of being a partner in the making of those little scratch sticks, for want of which untold millions must have died in ages past. Yet probably not ten people who read this page have the slightest idea of what happens when you strike a match, except that you may get a flame. Most of you gentle readers don't care what happens. All you want is a light.

Radio is rapidly getting to that same standpoint. The great buying public are beginning to care less and less about how marvelous radio is and beginning to think along the lines of what will radio do and how well will it do it, and what shall I buy for the most complete satisfaction? The buyer is more critical in the matter of quality. He wants results for every dollar expended.

### What Is Wanted?

That opens the door to a discussion of

## What Women Think of Radio in the Home

Continued from page one

care of the sick, what to do in case of slight accidents, or any "first aid" information which it is just as necessary to know in order to handle the emergencies of everyday peace time living as it was in days of war. Health talks would cooperate in and strengthen the orders of the Department of Health, not only in habits of daily hygiene but particularly in periods of epidemic where advance precautions, made emphatic by the personal command of health officials via radio, would do much toward lessening any serious spread of the disease.

While considerable provision from the very first has been made for entertaining little children with a bedtime story hour there is still much opportunity to satisfy the needs of the older boy and girl. Topics like woodcraft, camp life, electricity, chemistry and directions for many mechanical constructions which the boy is eager to make at home would be keenly listened to and would exert a marked educational influence on the young mind. Short talks of adventure, biographies of famous characters living or dead, deeds of mythological heroes, would all stir the imagination if retold by the magic voice of the wireless.

No one but a woman knows how wearisome is the daily problem of "What shall we have for dinner to-night?" A pleasant, intelligent voice over the air making suggestions is sure to be welcome. "It's rather hot and sultry to-day," I can hear such a voice say, "and why not, therefore, try a meat aspic to-day? In case you don't know what a meat aspic is like, I'll tell you how to make one. The men will like it"—and so forth. And on another occasion this broadcaster could tell women what they perhaps have not noticed, that there's a glut of peaches in the market and they're cheap. "Why not make some peach pie?" she'll say. "I heard a wonderful recipe from a famous pie cook the other day"—etc., etc.

As a matter of fact, I speak from experience, because I've radio broadcast just such material myself, and have had splendid response from it. It's all in the way it's done and the practical nature of the help you give—also the voice you

what the buyer wants and what can radio give him to-day. Are we going to have in radio the same problem as the railroads have? Are we going to have short haul sets and trunk line outfit? Are we going to have the country divided into districts and the same programs from one district to another just as on the vaudeville circuits?

Assuming that some day we are going to secure quality reception, and I am frank to say that we have a long way to travel in that direction, must the set break through the local barrier and pick up distance, or will it be sold as an entertainment proposition and with three or four or a dozen local stations the owner will be satisfied?

The direction in which radio progresses from now on depends entirely upon the answers to these questions. The science and scientific discoveries to be made in radio will depend largely upon what the public wants. If local reception is all that will be demanded this year, next year and the years to come, the problem to be attacked is, first, quality, and second, economy of operation. After those matters will come simplification, especially of controls, and then the artist-designer will step in and beautify it all.

### Distance Reception

If cutting through the local programs to reach out to the far distant stations is continually to be desired, something brand new will have to be developed. We have not yet scratched the surface on distant

reception. Personally, I believe that distant reception is the whole lure of radio to millions of listeners. I have been in dozens, perhaps hundreds, of homes and I have had mail running as high as 3,000 letters in one month. I have taken counsel with many buyers and prospective buyers, and more than a majority of times have I heard them distinctly say, "I don't want distance. I want good reception of our nearby programs." In New York they'll add, "We've got the best stations in the country, and they have good things every night. I guess we'll be satisfied with home stations."

Yet I have never seen a set of any kind whatever installed for any person, man, woman or child; rich or poor; old or young, but what immediately after showing how the set is operated, tuning in a nearby station and listening awhile, some one says, "Can you get so and so on this? How far will it receive?" and a multitude of similar questions, ending up in an endeavor to haul in some station a thousand miles or more away. Moreover, I have never seen a customer satisfied until he had received distance, and I have never seen an owner show off a set to friends without pulling in distance or apologizing for the set, or offering some alibi.

If this distance-getting is essential we are bound to see several years more of struggle, dissension, legal entanglements, freak circuits and spasmodic buying, unless in some way the ironing out of the broadcasting tangle itself shows the way to the listener-in.

### Skilled Operation

I hold no brief for any manufacturer. I have no connection with any of them, and have never had nor have I now any financial interest in any set or circuit whatever. I don't care whether one tube or ten is used in a set or whether this, that or the other scheme becomes popular. For that reason I can say without reservation that I do not believe we are anywhere near the ultimate result in broadcasting reception. No set will fulfill the requirements of the bulk of purchasers, and yet I do not know of any set on the market that will not give entire satisfaction in the hands of an experienced operator. It is this necessity for skilled operation that must be obviated in the set of the future.

I believe the success of the neutrodyne in the past was due to the fact that purchasers believed that all you needed to do was to set the dials and the door to distance would open itself. There is no reason why the super-heterodyne, properly constructed, shouldn't operate in the same way, but it didn't, probably due to the number of tubes and the necessity for all of them to be good, which they weren't. Neither of these sets as developed will beat a good regenerative set in the proper hands, but either of them would be more satisfactory to the average handler.

Just what place the reflex principle will have in the future it is impossible to tell. It doesn't seem to produce the results it should do theoretically. Maybe the trouble is in the tubes, as it seems to have been in all other circuits. Certain circuits seem to require certain tube characteristics for reasons gradually becoming more or less well known. The development of the reflex idea was probably less for the purpose of saving tubes than for the purpose of saving the current the extra tubes required, and, with the low-current consuming tubes, this advantage grows less.

## QUESTIONS & ANSWERS

This Week's Most Interesting Questions

M. H. McGee—I am contemplating the construction of a receiving set of either five or more tubes. Please give me your opinion on a five-tube neutrodyne as compared with a seven or eight tube super-heterodyne.

Answer—This is something which is almost impossible to do and give justice to the many receivers of each type that are now in use and giving satisfaction. However, the general faults and advantages of each set will be given and then you may choose for yourself.

The main fault of the super-heterodyne is to get one to operate as well as it is claimed to operate. The number of tubes, the parts and the battery drain are all drawbacks, and the big problem of getting parts that will operate efficiently goes a long way in making the set unpopular. In our opinion, unless the transformers are wound at home and tested with a wavemeter to make them all alike, and unless it is built with each stage shielded from the others, then the neutrodyne is the better; also consumes a lot of B battery current.

The advantages of the super are the two tuning controls, the loop aerial, the fairly accurate calibration of dials, providing the batteries are kept up, and the fact that when a distant station is tuned it comes in usually loud enough to enjoy.

The faults of a neutrodyne are that a set is liable to become denatured, with a consequent distortion of signals and difficulty of tuning; they must be operated on an aerial and consume a lot of B battery current.

The advantages of the neutrodyne are the ease of tuning, selectivity and volume. It is easier to construct than the super, providing the parts used are of good manufacture and instructions used followed to the letter.

With the above information it should be possible for you to pick the set you wish to build. Suggest, however, that no matter which one is chosen only the best parts be used in the construction and that care be taken in the assembly and wiring.

### Push-Pull Amplifier

J. T. C.—I wish to build a push-pull amplifier and would like to know whether it is necessary to have one stage of amplification before the push pull amplifier or not?

Answer—It is advisable that a stage of straight audio-frequency amplification be placed before a push-pull amplifier in order that full benefit from the push-pull amplifier be obtained.

### Oscillation

N. Jordan—I have made a wavemeter using a dry cell tube as an oscillator, but find that the tube does not oscillate very strong and, even when it does, only in spots. How can this be remedied?

Answer—Some dry cell tubes are, unfortunately, difficult to get in an oscillating condition. To make them oscillate it will be necessary to connect a piece of flexible wire to the grid post of the socket and another to the plate post. Then these two are twisted together. These pieces of wire should be three inches long. Tape the finished connection and be sure that the ends of the wires do not touch. It is best when using this form of oscillator force that the flexible wires be fastened permanently to the baseboard of the set to prevent a change in calibration. Remember when using a dry cell tube of the dull emitter class that constant oscillation will decrease the life of the tube materially.

### Transformer Connections

J. Smith—I have an audio frequency transformer that has had the connection markers removed and therefore cannot use it because I do not know how to connect it in a circuit. The primary and secondary are clearly marked, but which terminal is which is not.

Answer—The primary coil is connected as follows: The outside or end of the primary coil is connected to the plate of the tube. The inside, or start, of the coil is connected to the B battery positive. The outside, or end, of the secondary coil is connected to the grid of the second amplifying tube, and the outside, or start, of the secondary coil is connected to the filament negative.

## KDKA to Transmit Broadcasts to VDM, S. S. Arctic

The steamship Arctic sailed recently from Quebec on a voyage to Etah, Greenland, carrying a full complement of special radio equipment suitable to pick up special broadcasts from KDKA, East Pittsburgh, Pa.

The Arctic is carrying two Canadian Westinghouse special receivers, one of which is for delivery to Donald Mix, radio operator of the McMillan expedition, somewhere along the Greenland coast. The other set is for use aboard the Arctic. Both are designed to receive special signals which will be transmitted from the new experimental station of the Westinghouse Electric and Manufacturing Company every Monday night from 10:30 to 11, Eastern standard time.

In addition to its receiving equipment the Arctic is supplied with three transmitting sets, one standard 1/4 kw. 600 meter spark set, one 1 kw. 2,100 meter ICW set and one 2 kw. 120 meter ICW set.

The call letters of the Arctic are VDM and it will operate on a wave length of 120 meters. Through the efforts of Commander C. P. Edwards, in charge of the Radiotelegraph Branch of the Dominion of Canada, a complete schedule of transmission has been arranged. Communications for the Arctic and the parents of the two radio operators on board will be sent to KDKA for transmission.

When the Arctic arrives off the coast of Greenland she will have been in constant communication with the East Pittsburgh station. It is expected that when the ship reaches Greenland she will be able to get in touch with Donald Mix, radio operator with the McMillan expedition, either on his 2,100 ICW set or on his 600 meter spark set. Then KDKA's signals can be relayed from the Arctic to the Bowdoin. It is expected that the two boats will be able to carry on in this manner until the special set can be delivered to the Bowdoin, after which KDKA will transmit direct both on CW and on voice to the McMillan ship.

To insure that communication from the Arctic may be received in civilization, it has been arranged to equip two of the Hudson Bay Company boats, the Bayeskine and Nascoptic, with Canadian Westinghouse special receivers, designed not only to pick up KDKA's special wave, but also the signals from the Arctic. It is hoped by this means to relay messages from the Arctic through the Hudson Bay Company's boats to the Labrador coast stations and then on to G. A. Wentz, of the Canadian Westinghouse Company, at Montreal or straight through to KDKA. It is anticipated that the Arctic, through its transmitting equipment, will be able to keep in communication with KDKA, although it is quite possible that the ship's signals may be lost.

The Arctic is in charge of Captain J. W. Bernier, Canada's veteran Arctic explorer. Captain Bernier, though seventy-two years old, is one of the most active men aboard ship, and when going through ice packs he directs the operation of the ship from the crow's nest, which is ninety-two feet above the deck level.

The radio operators on board are William Choat, chief operator and J. Finnie, assistant operator. Mr. Choat is one of the best known radio amateurs in Canada and was intrusted with the mission of carrying on the Arctic's communication because of his long service with the amateurs.

The Arctic is a three-masted schooner with an auxiliary steam engine. She was designed particularly for polar expeditions. The hull is 36 inches thick, consisting of an outer layer of 12 inch pitch pine, the second layer of 12 inch green heart and an inner layer of 12 inch oak. Between the various layers are 6 inches of heat insulating material. Between the decks there is about 6 inches of cork insulation to prevent heat radiating from the vessel.

In addition to the Canadian Westinghouse Company's short wave set the Arctic is carrying a large amount of mail for McMillan, with special letters from the officials of the Canadian Westinghouse Company which will give operator Mix full instructions regarding short wave reception.

### 547 Broadcasters Now

A list compiled on August 1 shows 547 broadcasting stations in the United States, as compared with 530 on July 1, 1924.

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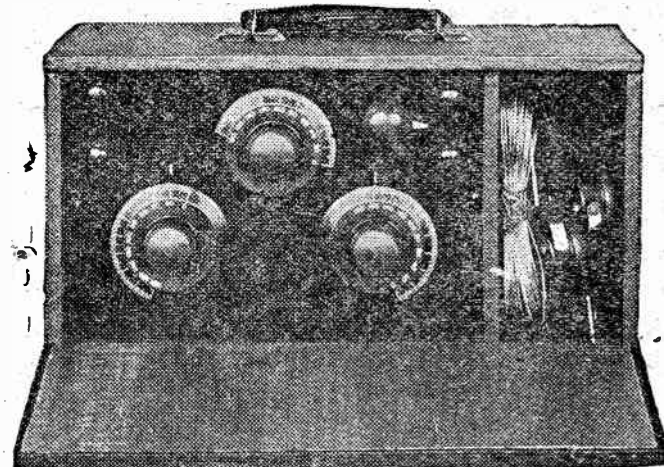
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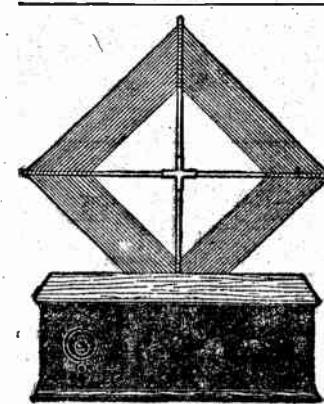
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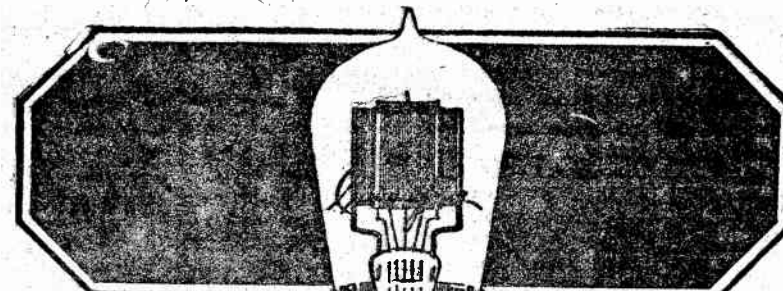
Everything needed for the set is in the box. The only accessories to get are tubes, batteries, loud-speaker and cabinet. You can put it together in one evening and have a set as good as anyone's—a famous 4-TUBE ACME "REFLEX." You can hear everything on a loudspeaker and have "all the year 'round radio."

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## AMATEUR KICKBACKS

By EVERETT M. WALKER, 2CDR

THERE has been a remarkable increase in interest in the shorter wave length all over the world since last fall, when amateurs first began to work across the ocean and many other distant points by means of their use. Since the amateur demonstrated what could be done on the high frequencies commercial companies, experimenters and governments have shown a new interest in them. For this reason the amateur was invited to participate in their investigations. The governments of the United States, Canada, France and Italy asked them to co-operate in short-wave tests. The amateur, always hungry for new experiences, has proved to be of great assistance in this, as in every case, and will probably continue to be.

This coming winter he will again have an opportunity to show his ability when the Canadian government's exploration steamer, the Arctic, equipped with a transmitter to operate on 120 meters, is frozen in the ice where the sun sinks behind the horizon for many months at a time. Now that the amateur has been allotted the use of four new short wave bands it ought to be an easy matter not only to keep in communication with the Arctic but to carry on tests with amateurs and governments in all parts of the civilized world. Make it your duty to keep posted on the schedules of these important tests.

2CUA is using a new W.E. 50-watt tube with 1,000 volts of rectified AC on the plate. With three thermocoupled amperes going in the antenna reports have been received from England and all districts but the seventh.

Another station doing good work is 2CJ. The present transmitter is built on the style of a Western Electric broadcast transmitter. Two sets are mounted on a panel 5 feet 6 inches high and 24 inches wide. The low-power transmitter, which is used for local work, employs three 5-watt tubes with "S" tubes as a rectifier. The larger one uses two 50-watt tubes and a "sink" rectifier to supply the DC plate voltage. The high power set has provisions for a 250-watt tube, which may be installed before the cold weather sets in.

A station that hasn't been heard for some time is 2AZA. Rumor had it that he was trying to get a CW set in operation, but as yet we have not heard the call on the air. When are you coming back, OM? We miss your snappy flat.

2KA is another station that obtains good results from spark coil CW. He may be heard most any time of the evening working local stations as though he had no less than a 50-watt tube.

2BNI has been heard on his old spark a number of times of late. It sounds like old times to hear it, but what happened to that nice CW set you had working for a while, OM?

The station of John M. High Jr., located at Riverdale, N. Y., better known to the amateur as 2GR, is now using a new remotely controlled one-kw. CW transmitter. He has been heard in Hawaii, France, Holland and England, as well as working every state in the Union.

2CWO and 2CLA are doing some very fine DX and traffic handling of late. They have worked the Pacific Coast a number of times. In both cases the power does not exceed 100 watts.

2CRT installed a new phone set employing two five-watt tubes in parallel. Although the station has been in operation only a short time fairly good results have been obtained. He also has good modulation.

2AGD has been having considerable trouble in getting his transmitter to operate on a legal wavelength. However, after many stunts were tried the set "perks" fine on 190 meters.

2BAW is using sixty-cycle AC on the plate of his fifty-watt tube again. He seems to be able to raise the local stations much better but doesn't seem to be doing as good DX as he did with his chemical rectifier. He

says things have gone completely wrong, his radiation has dropped from five amperes to two and his rectifier refuses to work at all. He is going to rebuild his whole transmitter and hopes this will remedy the trouble.

A new station at Governor's Island operating under the call of 2MO has been recently opened. The station is owned by a captain of the Signal Corps and is operated by Ted Wilson 2IK, formerly a second operator at 2BBB. From reports, good results are being obtained.

We understand that 2BT and 2ADK have been visiting amateur stations in the Middle West, of which 2ATO was one, as well as many others. Both these stations will be on the air with renewed interest after they return.

Another station doing good work with low power is 2AEL. He seems to be on the air almost any time of day and is working 'em in fine style. That station also has a good clear note.

2XBF has been doing some fine work in daylight with his CW and ICW set. He has a good ICW note that sounds something like an audio frequency oscillator. Is that what you use OM?

2ACD has been heard occasionally handling traffic in fine style. We understand the transmitter has been overhauled and it is expected that some excellent results will be obtained this coming fall.

At times static seems to be pretty bad, but in spite of this every one is doing his best to keep the messages moving. FB, keep up the good work.

Another Brooklyn station back ready for the coming DX weather is 2AX. His CW has plenty of kick and will probably carry well. He was heard handling traffic in good style the other evening.

The amateur no longer has to work on the narrow band of 150 to 200 meters. The new wave lengths assigned to them are 75 to 80 meters, 40 to 43 meters, 20 to 22 meters, 4 to 5 meters. These bands are to be restricted to CW transmission only and there will be no more quiet hours on wave lengths of 80 or below. On the new short waves it is required that the coupled type transmitter be used. It is also necessary to have your license changed so as to enable you to operate below 80 meters.

If a few more amateurs would equip their stations with a good short-wave low-loss tuner there would not be so many failings to raise the station known as CQ. There would be more stations worked and the result would be better traffic reports.

With two five-watt tubes 2BEO finds not the least bit of difficulty in carrying on two-way communication with amateurs in the first and third districts in daylight. FB OM.

The last 2CEV has begun to assemble his new CW set. He says all that is needed now is the tubes and a new antenna system. Let's hope he gets them soon, as the sooner they are obtained the sooner the spark goes. FB OM sure glad to hear it.

A ninth district station heard in the second district with an awful punch is 9DRG. The transmitter employs a single fifty-watt bottle with 1,200 volts of rectified AC on the plate.

9NQ is still pounding through with his old spark set. He is using an old half KW transformer with an old "sink" gap. It sounds fine for spark these days, but it is expected that a CW set will be in operation by fall.

On May 31, 9DP worked a Japanese ship that was signing the call of JUPU. The ship was working like fifty miles west of San Francisco. 9DP was using three fifty-watt tubes in his transmitter and 8,000 volts on the plate.

SAGP was heard to say he has a new mast built of lath and 2 x 2 posts. With a new antenna he has made many new D records for his station.

The American Radio Relay League has decided to comply with the request of the Second Radio District Executive Council that the territory included in the 2d Government Radio District be removed from the Atlantic Division of the A. R. R. L. and caused to constitute a new division, the Hudson Division. The result of this change will be that the policy of the amateurs in the Second Radio District will be governed by the members of the A. R. R. L., located in New York City. While this is probably the desire of the majority in this district inasmuch as a vote was taken by the A. R. R. L., there is some question as to whether it is the best for amateur radio.

New York City may be one of the greatest cities in the world and may contain some of the greatest men and industries, but it could not be called the greatest farm district, nor the greatest amateur radio district. In the opinion of the writer and many other prominent amateurs in the Second District, a majority of the amateur stations that carry on radio relay work are located in rural districts, and a district governed by the radio clubs of Greater New York will be unable to meet the needs of these stations as well as the Atlantic Division, which was governed by men operating under the same conditions as the majority of the active stations in the division.

What seems to be the best and probably only solution to the above outlined conditions is that the amateurs in small towns throughout New York and New Jersey form radio clubs and have themselves represented in the Second Radio District Executive Council. In this way it should be possible for the operators of active amateur stations throughout the division to make known their desires.

Dear 2CDR—Just a few words to let you know how the first district fellows are getting along. I had some spare time last week, and I thought I might drop around to some of the stations in Connecticut during my brief stay in Bridgeport. I am of the opinion that I couldn't have found a better bunch of amateurs anywhere in the country. They sure did treat me fine, and wherever I went I was received cordially. There was one funny thing I noticed everywhere, and that was that most all the first district men knew more about second district news than some of the men in our own district. By the way, the paper they read for the amateur news is The New York Herald Tribune, and they say it is the berries.

The OM to whom I am indebted for my good time in the first district is 1AVV. He is using a five-watt tube with 500 volts on the plate in a coupled Hartley circuit, and is doing remarkable work, being heard in England and working every district in the United States and some in Canada. The old boy had some trouble with the B. C. L.'s on account of key clicks, but straightened the matter out by coupling his heretofore uncoupled Hartley.

1IV is another station doing fine work with a 50-watt tube and 1,000 warming the plate. England, France, Holland and all United States districts worked tells his own story of good operating. Another station using a coupled Hartley circuit.

1AGJ just changed his address, and so hasn't got the best going yet. Come on, OM, don't allow the back yard garden to keep you away from the air.

1AVT is another station temporarily off the air because of insufficient funds. The OM has a position as radio engineer now, and soon expects to be on with as much power as he can dig up. HI!

1AJP has a fine station—among the best I have ever seen. I am sorry I couldn't meet him, but what I have seen of his station from the outside tells me it must be very fine, indeed. I met many others, but I can't think of them just now, so I guess that is all the first district news I have for you. Here is some "dope" on my own station:

2AAJ has been off for some time because of the loss of his huge store, age, which went dead with use. The battery was a contribution received from 2BBB, and take my word that anything that old boy 2BBB gives away isn't worth taking. HI! I will thank him, nevertheless, as the battery saw some service. The station will be on the air, with the good will of God, in about a week. A five-watt tube, with as much on the plate as I can get, will be used. 78's.

HARRY DOTTLER, 2AAJ.

## England to Canada By Marconi's New "Beam" System

LONDON.—The greatest interest is attached here to the announcement of Postmaster General Vernon Hartshorn in the House of Commons that the government is prepared to co-operate with the Marconi company in the development of directional wireless. This is considered a striking victory for Senator Marconi and his "beam" system.

The arrangement provides that Marconi is to be allowed to erect in Great Britain a station for communication with Canada by short-wave, lower-power, directional telegraphy. Marconi's experiments with the beam ray have convinced him that it is faster and cheaper than the high power stations, besides providing comparative secrecy and avoiding "jamming." Now the British government is going to give him a chance to prove his claims.

Australia and South Africa seem inclined to co-operate and to share Marconi's confidence that the beam system will make the high power station obsolete. India is more conservative and appears to favor the high power station.

Postmaster General Hartshorn seems to think that the beam system will only work well at night and that it will be mainly used for the transmission of "deferred matter." In his view the gigantic high power station that the British government is building at Rugby is still indispensable.

It is generally admitted that the intensity of wireless signals tends to diminish in sunlight hours. But Marconi would not accept this limitation of the possibility of his favorite beam ray. He considers that his experiments from Poldhu, Cornwall, have done much to refute this fallacy and the notion that large intervening tracts of land interfere seriously with short wave transmissions. His experience goes to show that short wave transmissions are dependable even in daylight.

Then, of course, there is the controversy as to whether the beam system is going to put the Rugby plant out of business before it is finished. The Postmaster General says no. He considers it absolutely essential that Great Britain should possess at least one first class wireless station capable of communicating directly with the most outlying parts of the British Empire and able to broadcast messages simultaneously to ships and stations in all parts of the world.

Dame Clara Butt recently had the honor of being the first to sing directly to all Great Britain. Her voice was broadcast from her new high power station, 5XX, at Chelmsford, without lower power stations acting as middlemen.

It was not a complete success and there is little danger of the supercession of local stations for the present. Atmospheres interferred so much with the reception in London, Cardiff and Newcastle that land transmission soon had to be used, but as far north as Aberdeen, in Scotland, the concert was heard without interference. A wave length of 1,600 meters with a power of 16 kilowatts was employed.

Marconi's first experiment in transatlantic wireless, which took place at Signal Hill, Newfoundland, is to be represented in the Wembley Pageant. The scene will reproduce as faithfully as possible the eventful trials Marconi made in December, 1901. G. S. Kemp, who assisted Marconi in the Signal Hill experiments, will take the same part at Wembley that he did at Newfoundland, more than a score of years ago.

## India to Have Powerful Broadcasting Station

A new and powerful wireless station will soon be erected in India to be connected with the imperial wireless chain, according to a report to the Department of Commerce from Vice-Consul W. H. Scott at Bombay. The station will be erected by a company which has just organized under the name of the Indian Telegraph Company, Ltd., with a capital of 30,000,000 rupees (about \$2,000,000). The report stated that F. M. Chinery & Co. of Bombay, are organizing the project and have obtained all rights from Marconi's Wireless Telegraph Company, Ltd., of London. The proposed station, it is said, will be one of the most powerful in the world and able to transmit messages all over the globe.

## The Deresnadyne Tuned R. F. Circuit A New Type of Tuned Radio Frequency That Gives Good Results

By JAMES E. CARTIER

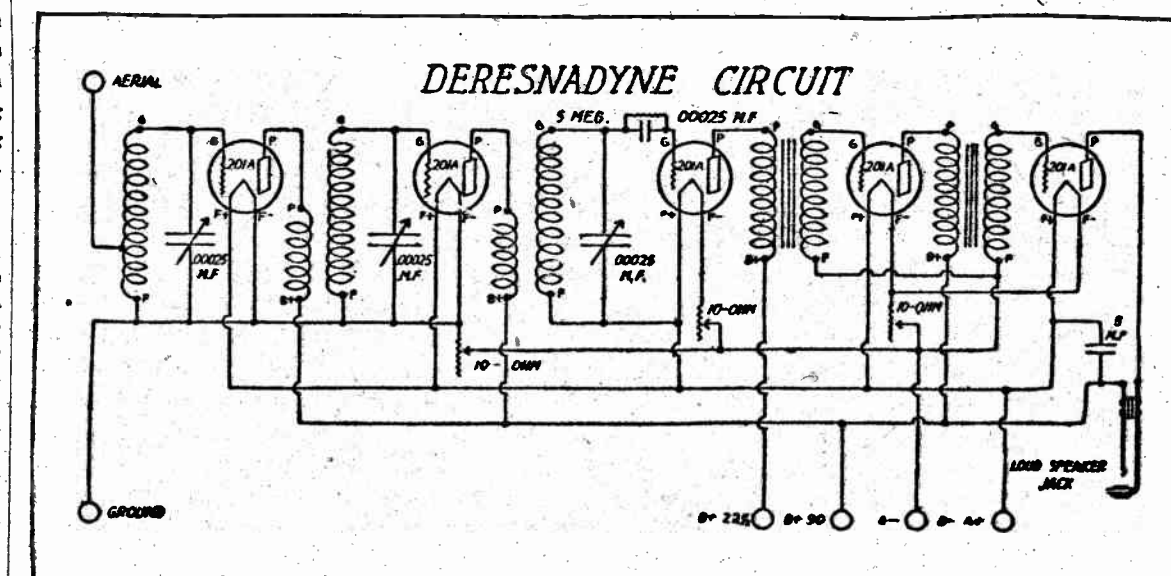
AUTOMOBILE buyers in the past were satisfied with a performance of forty miles an hour. To-day they demand sixty miles an hour, together with other factors, such as smoothness and quietness of operation.

The radio fan of yesteryear was satisfied with a receiver that would

is highly selective, is quiet in operation and has a quality of reproduction that is superior to previous forms of tuned radio-frequency circuits, and it is at least the equal in ability to reach out and bring in the distant signals with great volume. The circuit will not oscillate. This is accomplished through proper designing, proportioning and placing of the apparatus rather than by the ad-

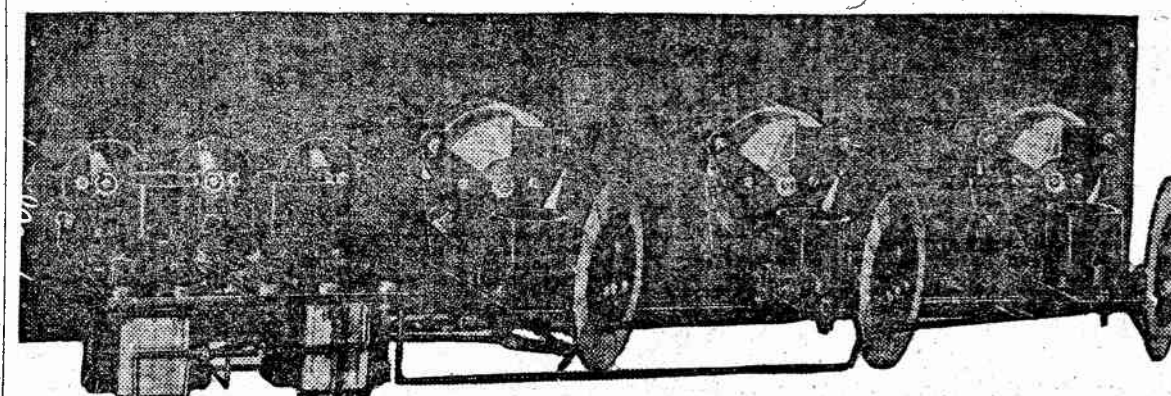
How Transformers Are Wound

The transformers for the Deresnadyne are wound on flat spider web forms, four inches in diameter. An uneven number of slots should be cut in the form radiating out from a hub in the center, consisting of a circle 1½ inches in diameter. The primary winding consists of seven turns of No. 28 double silk covered wire. The secondary winding con-



pull in a long distance station occasionally with volume sufficient to operate a loud speaker. The fan of to-day is seeking not only improved range and volume but also the additional qualities of quietness, absence of howls and squeals, and faithful reproduction.

The obvious trend of development in radio is in the direction of tuned radio-frequency amplification. A number of difficulties have confronted the engineer in the perfection of this form of amplification due to the inherent coupling between the elements of the vacuum tubes,



the transformers, and the wiring of the circuit itself.

Straight radio-frequency amplification has hitherto been very unstable, and the various methods employed to prevent oscillation have served to complicate the construction and operation of the circuit. At the same time the use of the additional apparatus often distorted and reduced the strength of the signal, and decreased the selectivity of the circuit.

## New Circuit Appears

The Deresnadyne receiver introduces a new principle in radio reception that seems to possess decided advantages over present types of tuned radio-frequency circuits. The circuit is the product of nearly two years of experimental work on the part of E. A. Beane, radio supervisor for the ninth district, and E. B. Andrews, of the Andrews Radio Company of Chicago.

The receiver is absolutely stable and is free from howls and squeals,

The plate circuit, which includes the primary of the transformer, is designed so as never to approach too closely to resonance at broadcasting wave lengths. The transformers are also placed with relation to one another, so that the proportions and interrelations throughout the set eliminate oscillation over the entire wave band to be covered.

The construction of the set is within the range of a novice. The rear panel view will give a fairly good idea of the manner in which the apparatus is arranged. The transformers are mounted on a bakelite shelf which is bracketed on the back of each of the tuning condensers. The shelf should extend to the rear of the cabinet. A transformer should be mounted on the rear of each shelf in a vertical position with its plane set at an angle of approximately 55 degrees from that of the front panel. The windings of all three transformers should run in the same direction.

## Tennis Championships

To Be Broadcast

A novelty in radio programs and an interesting sports feature as well have been arranged for WEA's listeners for the afternoons of August 15 and 16, when the semi-final and final matches of the national women's tennis championships will be broadcast, beginning at 4 p. m. These matches will take place at the West Side Tennis Club stadium, Forest Hills, L. I. A tennis expert, whose name will be announced at a later date, will give a vivid description of the lightning game. It is also announced that the semi-final of the

## Sava Tcherny at WJZ

Refuses Publicity

The title of "unique broadcasting artist" certainly belongs to a young foreign violinist who is to play before

In winding the coils, the primary and the secondary may be wound on together, that is, seven turns are wound on with the wire double, then fifty-five turns are wound on with only a single wire; the primary having been cut off at the seventh turn. The outer end of the secondary is connected to the grid, the inner end to the filament close to the tube socket. The outer end of the primary winding is connected to the plate, the inner connection to the 90-volt plus terminal of the B battery.

The three tuning condensers should be mounted 5½ inches from center to center on the panel. The audio-frequency amplifier is standard and does not differ from that used in other radio receivers. UV 201-A or C 301-A tubes may be used throughout, or a UV 200 may be used for a detector. A C battery of from two to six volts may be used in the audio amplifier to reduce the B battery consumption.

The Deresnadyne is a remarkable set for clear, clean, natural reception and was selected by me after testing out four other sets of different makes."

## Democrats to Use

Radio in Campaign

Clem L. Shaver, new chairman of the Democratic National Committee, is enthusiastic about the idea of using radio in the national Presidential campaign. He has announced that he will inquire into the possibilities of so arranging the tour of John W. Davis through the West as to reach a maximum audience by radio with a minimum of speeches. If the Davis-Bryan campaign can be so adjusted, it will take these candidates only to comparatively few centers throughout the country and the surrounding environs will be appealed to through the ether.

## Uses Neutrodyne In Fading Tests; Gets London

The marked tendency of radio transmitting stations to "swing" off their scheduled wave length in regular periods has been detected in a novel manner by Joseph Otis Pierce, a chemical engineer of Cincinnati. The cause of "swinging" and "fading" has been a puzzle to scientists ever since continuous waves were first produced.

The receiver used by Mr. Pierce is located in an exceptionally bad spot close to a large electric power house. He employs an aerial consisting of two wires, each fifty feet long, running north and south, with the lead in from the northern end. The set is a Garod neutrodyne, on which he received 2 LO, London, England, during the trans-Atlantic tests last winter.

In his letter regarding "swinging," Mr. Pierce says: "The instrument is particularly selective and will cling to one station like a crab. When tuning is set just between two stations this set will sound one station for a while and then automatically swing over to the other station and cut out the first, it will then swing itself back to the first station, and so on, but has never sounded two stations together. These changes will take place at intervals of forty seconds and show a remarkable degree of selectivity."

In addition to reporting his latest experiences, Mr. Pierce sends some excerpts from his notes taken at the time he heard London. These show a remarkable critical analysis of the timber of the British orchestra as judged from reception in Cincinnati. His statement follows:

"I picked up the orchestra concert from the Hotel Savoy, London, England, on a wave length of 880 meters between 6 and 6:30 p. m., central standard time. I do not have the record of the date, but it corresponded with the newspapers of that date, and as the incident was immediately reported to Mr. Bolles, of the Bolles-Brendam Company, Cincinnati, there is no question that my reception was synchronous with the foreign program. This program came in loud and clear on the phones and also on the loud speaker. All four tubes were used and with a little further adjustment the strong basses could be heard just as clearly as the violins and flutes. The general tone of the orchestra was a little different from what we are used to in America, probably due to the fact that they use the English concertina and have four or six of them playing with the other instruments. This gives the orchestra an organ-like quality which is very pleasing. There were no noises and no distortion.

"This program was heard just at supper time, and after hearing the concert for thirty minutes I turned it off and went down to supper. The tone was quite uniform, there being no fading or sudden increases in volume.

"The most difficult tones for a set to pick up are the bass tuba and the string basses of the orchestra, owing to the low frequency of their vibrations. In a large number of good sets you will fail absolutely to hear the bass instruments; not so with the Garod. The neutrodyne, produced the low tones of the basses just as clear and just as natural as it did the high tones of the violins in the previously mentioned test, giving the proper balance to the top and bottom of the production.

"The neutrodyne is a remarkable set for clear, clean, natural reception and was selected by me after testing out four other sets of different makes."

## Democrats to Use

Radio in Campaign

Clem L. Shaver, new chairman of the Democratic National Committee, is enthusiastic about the idea of using radio in the national Presidential campaign. He has announced that he will inquire into the possibilities of so arranging the tour of John W. Davis through the West as to reach a maximum audience by radio with a minimum of speeches. If the Davis-Bryan campaign can be so adjusted, it will take these candidates only to comparatively few centers throughout the country and the surrounding environs will be appealed to through the ether.







# Both A and B

## radio power from your house current

Philco "A" and "B" Socket Powers are plugged right into a lamp or wall socket. They transform your alternating current into smooth, hum-free, direct current necessary for your radio.

One switch controls everything—"A" power, "B" power, even the radio set itself. Snap it "ON" and you get a strong, uniform flow of both "A" and "B" power. Snap it "OFF" and your power is shut off—your radio is silent—and current begins gently feeding back into Socket Power "A" from your light wires.

No more recharging to think about—no more bother and expense of disconnecting worn-out dry cells and replacing them with new.

Equal y important—there are no tubes to burn out—no high voltage transformers—no moving parts—no hum—no distortion—no falling off in reception. As dependable as your electric current and turned on exactly like an electric light.

Once you connect Philco Socket Power to your radio you never need change a single wire. You forget all about getting wires mixed and burning out tubes. You forget that radio is mysterious and technical. You just enjoy it.

Sold and demonstrated by leading radio and music stores and by Philco Dian and Grid Battery Dealers.

Philadelphia Storage Battery Company, Philadelphia

New York Office—824 Liggett Building, 41 E. 42nd Street  
(Phone: Vanderbilt 1051)

# PHILCO RADIO A AND B SOCKET POWERS

Philco also builds rechargeable batteries, unique because they may be permanently connected to your radio and safely charged in your living room without changing any wires. Easier (and far cheaper) than the periodical renewing and rewiring of dry cells.

Philco Standard "B" Battery—a complete Adam-brown mahogany-finish replacement for 90 volts of dry cells. Only \$19.85!

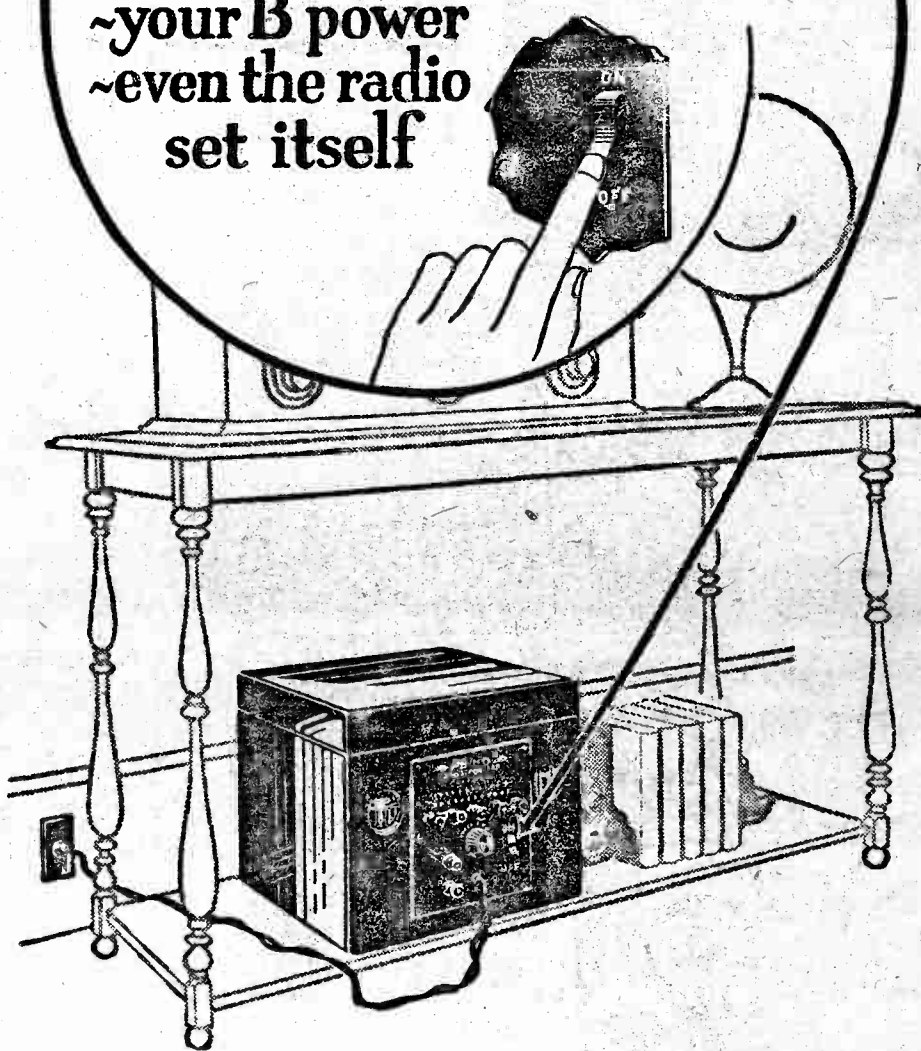
To avoid getting a stale battery, ask for a Philco Dynamic also for your automobile

Philco "A" Batteries in acid-tight glass cases—for dry cell tubes, \$8; 6-volt tubes, \$15. Built-in charge indicators. In rubber cases subtitled mahogany color. \$14.85 and up.

Philco Radio Batteries are built Dynamic—DRY but CHARGED. Their life doesn't start until the dealer pours in the electrolyte. You can't get a stale Dynamic Philco.

This switch controls everything

~your A power  
~your B power  
~even the radio set itself



For dry cell (3 volt) tubes

Buy Philco Socket Power Type "AB" as pictured above. Both "A" and "B" power built into one handsome brown mahogany-finish case—controlled by one switch. No hum—no distortion. Costs only one cent per day to operate. Supplies as high as 130 volts of "B" current. Ideal for both old and new models of Radiola Super-Heterodyne.

Simplicity itself to use. Connect to your radio once for all. Plug into a light, wall or base socket. The one Socket Power switch then controls everything—"B" power as well as "A." You even leave the radio set switch "ON" at all times. No dry cells to replace—no thought about recharging. Easy as turning on an electric light.

For 50-60 cycle 105-125 volt alternating current..... \$65.00

For storage battery (6 volt) tubes

Buy Philco Socket Powers Type "A" and "B" in individual cases. Either "A" or "B" may be used alone, but for the greatest possible convenience use both together.

Plug Socket Power "B" into the built-in receptacle on Socket Power "A." Plug "A" into a light, wall or base socket. Turn the "B" switch and the radio switch "ON" and leave them on permanently. The switch on the "A" then controls everything. To use the radio, snap this "A" switch "ON." When through using the radio snap it "OFF." A touch of your finger does everything. Nothing to think about but the one "A" switch.

Socket Power "A" for 50-60 cycle 105-125 volt alternating current, \$42.50  
Socket Power "B" for 50-60 cycle 105-125 volt alternating current, \$47.50

# THE NEW YORK HERALD New York Tribune RADIO MAGAZINE

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SECTION SIX

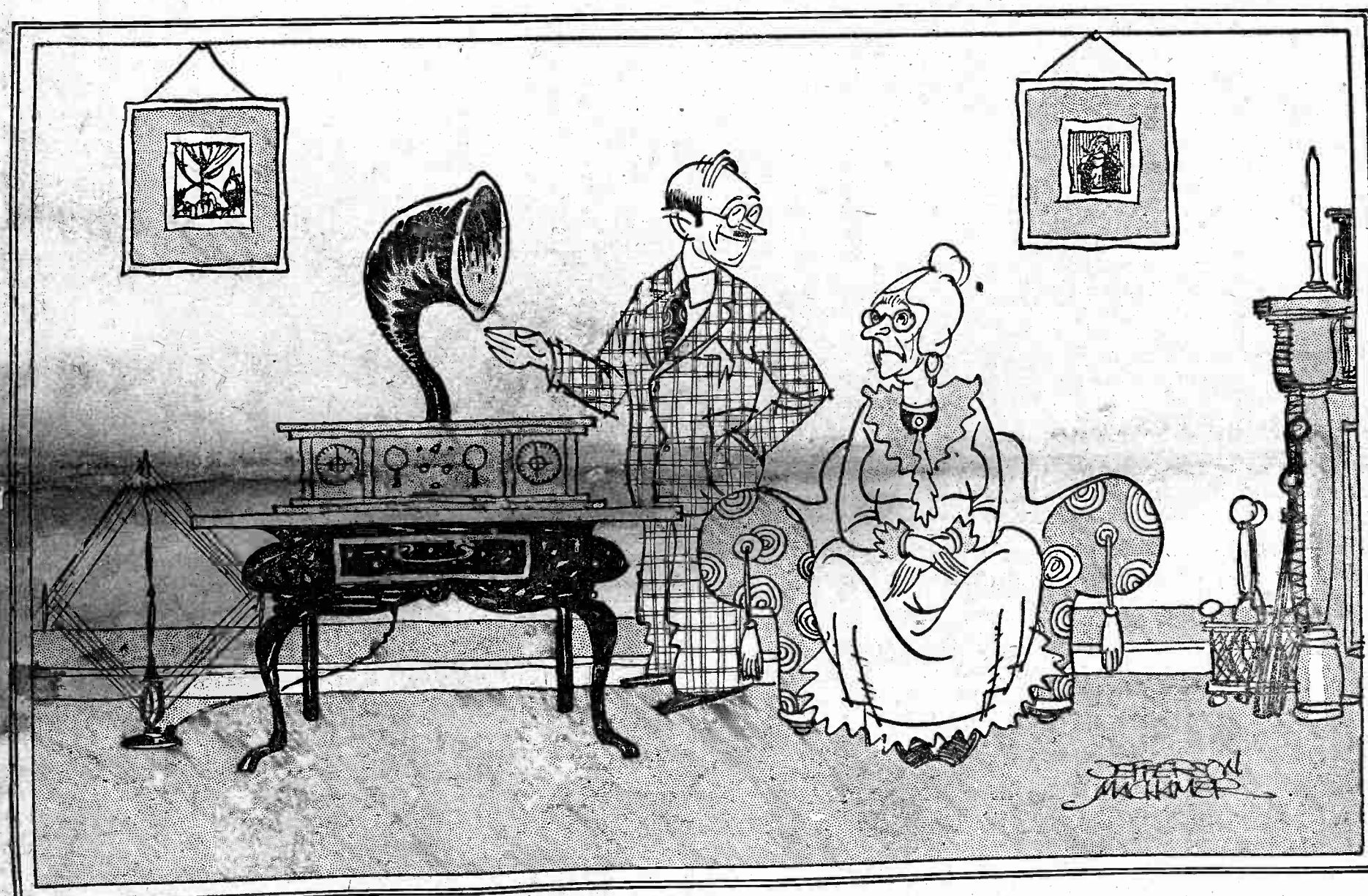
SUNDAY, OCTOBER 11, 1925

16 PAGES

## Mr. Bink's Radio

The Author Discusses Feelingly the Different Types of Radio Fans and Radio's Effect on Grandma and Caesar, the Wailing Dog

By ELLIS PARKER BUTLER  
Author of "Pigs Is Pigs," Etc.



Then I'll try the celebrated Boomeray Marine Band of 108 pieces and she'll say: "It ain't no use—it ain't no use—it don't sound to me like nothin' but a dog yowling!"

IT WAS, unquestionably, a wonderful thing when radio became no longer a mere knit-sweater affair but could be bought in a box and brought home like a dozen fried oysters or a pint of ice cream.

By "knit-sweater affair" I mean that sort of radio that comes through the air with a message that is about as interesting to the average man as is the page in the women's magazine telling how to knit a sweater. You know how that goes—"Knit four, purl three, skip one, knit two, purl three, skip two—" and so on for line after line.

The old-style radio used to come—and still comes—that way. "Dah-he-de-dah-dah-de-dah." "Code," is what the technical fellows call it, and it still spits in your ear now and then when you are trying to hear Patagonia or Peru or Peoria.

The "spitter" we have most of here near New York is the one Mr. Binks calls "Navy Yard." Whether it is the Navy Yard or not I don't know, and—as far as that goes—neither does Mr. Binks, but that is what he calls it.

The Navy Yard—if it is the Navy Yard and if you have Mr. Binks's sort of "take-home-a-radio-in-a-box"—lurks at the far side of the dial. The concerts are mostly

at the near side of the dial. Now and then "Navy Yard" gets lonely at the far side and comes sneaking over to the concert-and-lecture side, but it knows it does not belong there and it says "dah-de-dah" in a faint little voice and goes away again. Then, sometimes, Mr. Binks says—to show off, perhaps—"That's Navy Yard," and, just to show you, he swings his dial hand to the far end of the dial and "Navy Yard" is right at home there.

"ZANG—ZANG—A—ZANGY—ZANG!" "Navy Yard" shrieks then, spitting sharp pointed gravel into your ear as if shooting it out of a machine gun at three yards' distance, and Mr. Binks grins and says: "That's Navy Yard, sending code. May be talking to a battleship in the Indian Ocean or the China Sea. Strong, ain't it?"

Then Mr. Binks shifts back to the near end of the dial, and you get: "tull Annie Laurie, I wuh-hu-hud-la-hay-me-he doun-un-hund dee," or, faint and far, that beloved refrain: "Thee-A-tan-tah Ridge-nall." Dong-dong-dong! or, from Ridgewood, the cheery announcement: "The next number on our program, played by the Hit-Em-in-the-Eye Jazz Six, of Brooklyn, New York, is the 'Don't-Bite-Your-Garter-If-You-Have-False-Teeth' Fox Trot."

For radio has become all things to all men. You can tune in at one white line on your dial and be asked to support the movement for supplying second-hand curl-

ing irons to the suffering natives of Zanzibar, or move on to the next white line and hear "And little Tootsie took the hand of the great big bear and went into the wood-chuck's house," or move to the next white line and hear "This is WVJ signing off. One minute, please. Good-night!" You can hear anything from a symphony orchestra of 300 pieces to a frightened amateur playing "Dood-dah, doo-dah," on one of these jewsharps that bites the tongue that caresses it. It's wonderful.

And Mr. Binks thought so. Mr. Binks was an enthusiast. It is one of the amazing things about radio-in-a-box that every one who possesses one is an enthusiast. A man can buy a phonograph or a grand piano or an elephant and be quite calm and normal about it. He can say "Yes, this is my elephant. He's fair to middling. He isn't a Jumbo, by any means, but I'm rather fond of him in some ways," and let it go at that, but for some reason a man can't own a radio-in-a-box without getting all keyed up and excited and telling his neighbors and—in a general way—behaving as if he had discovered the moon and had to call everybody to come and see it, and brag about it, and feel fussed if any one seems to think it isn't a perfectly wonderful moon and the greatest thing ever discovered. That's the kind of enthusiast Mr. Binks was.

And that is all right, too. It is a wonderful thing to sit down and turn a couple of knobs in your own home in Westcote, L. I., and hear a tiny, squeaky little voice, somewhat like a feeble mouse gnawing a cake of very hard ice, say "This is Kansas City." But I ask you, as man to man, is a man who happens into a shop and buys a radio outfit as he would buy a pound of cheese entitled to swell up and strut around as if he had invented radio and patented it and given it alone and unaided to a waiting world? The answer seems to be "Yes." The ayes have it, so to speak. That is just what a man does seem entitled to do and feel. That's how I did and felt about the box of radio I brought home. Until Binks bought his and swelled and bragged and jawed until I was ashamed of him.

Yes, nearly all the men I know are that way about radio—except one. Dodson Bates is different. Dodson Bates is a stout, red-faced man, and he has one of these small, wiry wives that I call pin-prickers. Always pricking and prodding otherwise comfortable husbands to do this and do that. And for twenty-three years, every Sunday morning, just when Dodson Bates had settled down with the Sunday newspapers, his wife would begin prodding and pricking him to get ready to go to church. For twenty-three years, every Sunday morning, Dodson Bates did go to church, too, and sat in the pew fighting to keep his eyes open during the long sermon, and suffering as only a man does

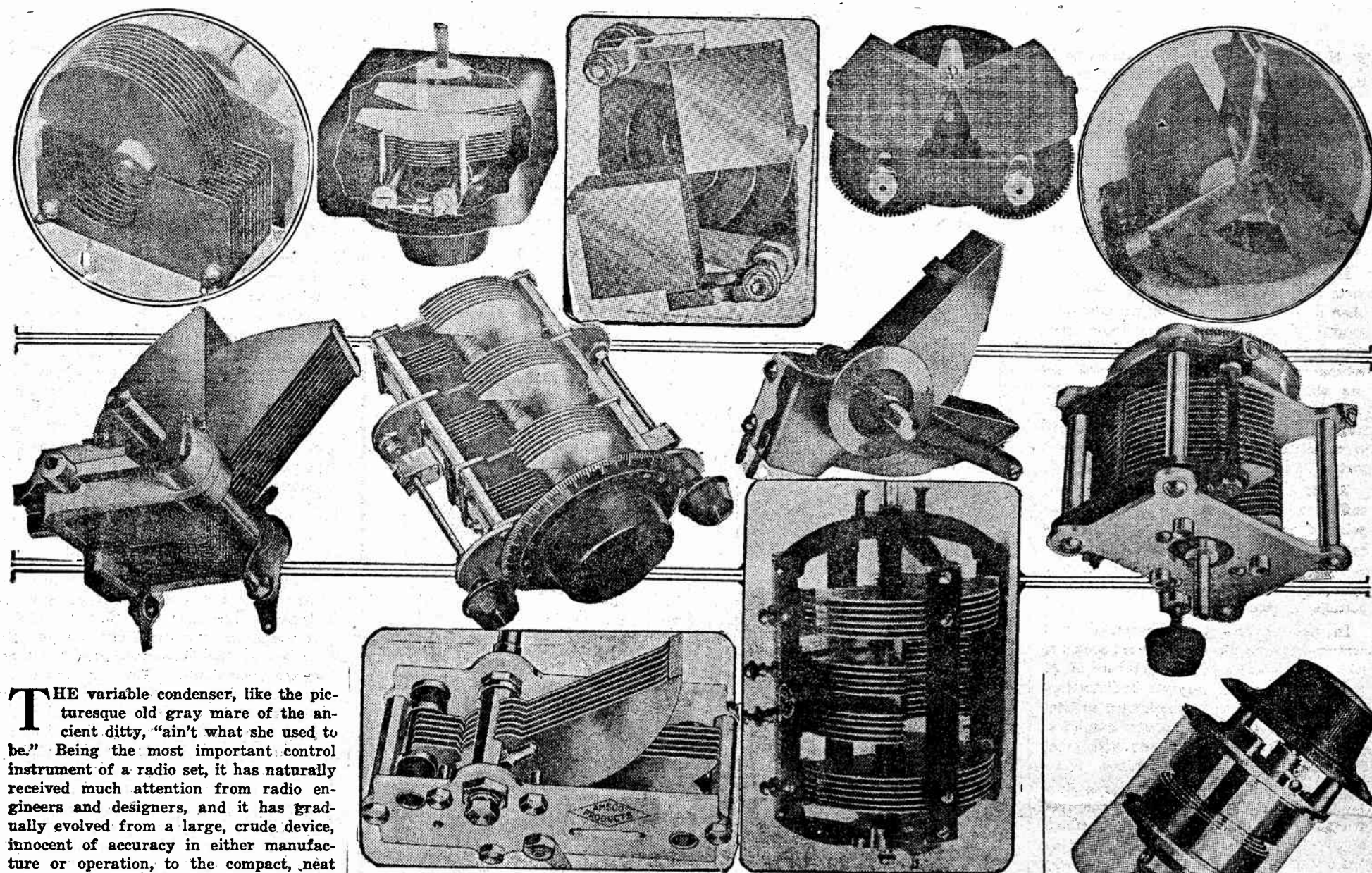
(Continued on page six)



# Interesting Information on the Mechanical Evolution of Variable Condensers

New Types Employ the Same Fundamental Principle of Construction, but Are Greatly Improved

By ROBERT HERTZBERG



Some examples of new condenser design

THE variable condenser, like the picturesque old gray mare of the ancient ditty, "ain't what she used to be." Being the most important control instrument of a radio set, it has naturally received much attention from radio engineers and designers, and it has gradually evolved from a large, crude device, innocent of accuracy in either manufacture or operation, to the compact, neat little affair of to-day which is assembled to factory requirements of infinitesimal thousandths of an inch, and which operates with uncompromising precision. Just how much it has been improved and refined can be seen from an examination of the instruments available on the market at the present time.

It is necessary to classify the various types, for the total number of instruments is great to the point of confusion. They all display the same fundamental idea in construction; that is, the employment of two adjacent metal surfaces closely spaced in air or other insulating material, but not actually touching, and with some means of regulating the total active area of facing plates; however, the effect is achieved in four different mechanical fashions, so each must be considered individually.

The first system involves the use of a closed saucer of molded insulation, divided into two sections by means of a sheet of mica. Small wells in the sides of the disk hold mercury in such a fashion that when the knob of the device is turned the two portions meet each other but remain unmixed because of the intervening mica. The more mercury in the facing wells the greater the capacity, and vice versa.

This particular type of condenser is mentioned only as a matter of interest. Being highly sensitive to jars and other vibratory disturbances, it never was a success, and enjoyed but a short-lived vogue about two years ago.

## The Tube Type

The second type makes use of round metal tubes, usually brass, telescoping into each other, but not actually touching. The larger tube remains stationary, while the other, arranged on a suitable slider, rack and pinion, or screw, travels in and out of it, the capacity increasing as they separate. This is known as the "Billi" type of condenser.

Condensers of this type were widely used many years ago on ship radio receivers, but it was not until within the last few months that the construction was applied to broadcast apparatus. There is now being made a very novel and unusual condenser embodying the principle. However, instead of two straight tubes being

employed, there are two brass spirals, wound up like the springs of a clock; one is fixed to the frame of the instrument, and mounts against the back of the panel in actual service, while the other is attached to a round plate which allows it to mesh and unmesh with the first spiral by means of a heavy screw passing through the centers of both spirals and out through the front of the frame.

The device incorporates the straight line frequency principle and a 350 degree dial; that is, the movement from minimum to maximum capacity is made through a complete turn of the dial instead of a half, giving a fine vernier effect. The action is smooth and free of back-lash, the weight of the moving member being perfectly balanced.

## The Book Type

The third classification embraces the "book" type. The designation is derived from the fact that the active metal plates, instead of meeting each other with surfaces parallel and in the same plane, fold together like the leaves of a book. There are only two plates, one fixed in such a manner that it is at right angles to the panel when the condenser is mounted, and the other moving on a hinge and opening away from the far edge of the first. The position of the adjustable plate is controlled by a heart-shaped cam operating against the tension of a spring which tends to keep the plates separated. The capacity varies inversely in proportion to the distance between the plates.

The book-type condenser is extensively used by one of the largest radio manufacturers in the country. It works effectively and is both cheap and simple in construction.

The fourth category is by far the most important, as it comprises the majority of the condensers made to-day. It is the meshing plate class, and in it are found scores of instruments of interesting variety.

In its oldest and most common form the meshing plate condenser consists of two spaced stacks of semi-circular metal plates. One stack is stationary, while the

other is built onto a round shaft and arranged in such a fashion that its plates enter between the fixed plates, but at no point touch them. The capacity is thus varied simply by turning a knob attached to the end of the round shaft. The stator plates are clamped between two heads of some insulating material like hard rubber or bakelite, which also serve as bearings for the protruding ends of the rotor shaft.

In this elemental form the meshing plate condenser has survived through twenty years of service, a record which in itself is proof of the design's general desirability. It is still giving good service, but it has undergone extensive mechanical improvement, as the following description of some of the 1926 models will indicate:

First there is the grounded frame, "low-loss" type. This species is instantly recognizable because of its all-metal frame and usual skeleton appearance. The entire support of the instrument is of metal, the stator plates being insulated from the rotor and the rest of the metal work by means of small pieces of insulating material strategically placed at such points where the electric "field" of the condenser is weakest and least troublesome.

## Mechanical Schemes

The number of these condensers is legion. A thick book could be filled with the details of the various ingenious mechanical schemes devised by the engineers to hold the parts together. One instrument is built inside a heavy U-shaped yoke, with a single small strip of insulation, preventing short circuit between the rotor and stator. A good many "low-loss" condensers are assembled between two skeleton work end frames, with the insulation inserted between the latter and the end plates of the stator unit. Several makes provide a single strong forward frame with a heavy forward bearing, and leave the back entirely open. Still another type is drum-like in appearance, with four-pronged end frames held together by four narrow strips of insulation, from which in turn the stator plates are suspended. Some condensers are limited in movement to a half circle,

others are continuously rotatable. Some have built-in verniers in ratios as high as 200:1. Some are equipped with balancing counter-weights. Some are built of brass, most of them of aluminum and one of silver-plated brass.

An important variation of the meshing plate condenser is found in the twin rotor type. Here there are two sets of square plates, both movable. In one make they are actuated by two meshing bakelite gears of equal size, one of which in turn is operated by a third small gear coupled to the external control knob. As the knob is turned the two gears move in opposite directions and either close or open the square plates. In a second make the plates are actuated by short levers which travel in two grooves cut spiral shape in an insulating disk, the disk being revolved in turn by the outside dial. The spiral of this shape that a movement of the disk causes a smooth opening or closing action on the plates.

## 360 Degrees Rotation

These unusual condensers provide 360-degree scale movements, freedom from back-lash and absolute removal of "live" current-carrying metal from the panel and from the operator's hand.

In two other meshing plate condensers rotary movement of the plates is replaced by linear movement; that is, one set remains stationary, but the other slides in and out of it. In one of the instruments the plates are built at right angles to their mounting frame, with the moving ones next to the panel. A threaded shaft attached to the end of the latter plates passes through the center of a special knob threaded to receive it. As the knob is turned the shaft moves in and out, carrying the plates with it and thereby varying the capacity. In the other type the plates are parallel with the panel. The moving unit is operated by a rack and pinion system, the small gear

(Continued on page 12)

**KENNEDY**  
Radio  
**Planstiehl**  
**Howard**  
**Thermodyne**  
**GLOBE**  
**Derešadyne**  
**ADLER-ROYAL**  
**MURDOCK**  
**MU-RAD**  
**Valley**  
**Silver-Mark**  
**QZARKA**  
**ULTRADYNE**  
**Newport**  
**LEICH**  
**NUNN-LONDON**  
**KUSTOMBLIT**  
and many others

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## Football Games To Be Described by Carlin, McNamee

The WEAF twin announcers, Phillips Carlin and Graham McNamee, will alternate each Saturday in broadcasting descriptions of the WEAF schedules of the important intercollegiate football games, employed for the first time in sports, announcing a new technique of co-operative observing and announcing. On Saturday, October 17, beginning at 2:45 p. m., Phillips Carlin will be at the microphone at the Yankee Stadium to describe the Army-Notre Dame game, while McNamee will work with him in observing the details of the play.

WEAF has the unique distinction of having two announcers equally capable of handling a sports assignment, and the advantages of having both on the scene are many. In the first place, since both are experienced announcers and know what is necessary for a vivid description of the game, the one acting as observer will be able to pick out the essential details much more effectively than the ordinary observer who might be carried away by the excitement of the game or by a feeling of partisanship. Next, since each will see all the games on WEAF's schedule, the familiarity and knowledge of the teams will grow accumulatively with each succeeding game. For example, two weeks after the Army-Notre Dame game, Carlin will announce the Yale-Army contest, and so will be extremely familiar with the Army line-up.

It is evident that the success of the announcing will be practically dependent on both men. The man at the "mike" will observe the distance gained and the type of the play, while the observer will pick out the name of the man carrying the ball, the opponent who tackles him and the other details necessary for a clear understanding of what is going on.

Phillips Carlin, whose description of the Davis Tennis Cup Matches last year, and one of the football games, demonstrated his ability as a sports announcer, and whose voice is familiar to hosts who have heard the Silvertown Cord Orchestra, "The Happiness Candy Boys," "Ipana Troubadours," "The Bossert Voyagers" and other WEAF features, has a voice which the casual listener often confuses with Graham McNamee's. In this series of games the listener will have an opportunity to clear this confusion.

## Musicians Need Not Fear Radio Rivalry

Radio's role in furthering the cause of good music in America has won the praise of musicians.

The composer-critic, William Smith Goldenburg, of Cincinnati, makes this broad statement: "Professional musicians have much less to fear from radio competition, I believe, than they seem to think. The motion picture did not supersede the spoken drama. In fact, opinions to the contrary notwithstanding, the theater of America never has thrived as it does to-day, in spite of the increasing number of houses devoted exclusively to the silent drama."

Mr. Goldenburg, in a letter to the Freed-Eisenmann Radio Corporation, further states:

"Vocal and instrumental virtuosi who broadcast frequently will find their prestige heightened, their clientele surprisingly widened, when they go on tour. The legion of radio listeners constitutes a potential army of music lovers. Through appreciative development, accomplished via radio, they may be attracted to the concert auditorium."

"Radio broadcasting never will take the place of the concert hall, for nothing can quite compensate for the loss of personal contact with the artist, but radio can be made a great educational factor in the cause of music; the quality of radio entertainment can be raised to a high artistic standard that will entitle it to the consideration of serious-minded folk who prefer cultural entertainment to trivial amusement. That this purpose is nearing consummation cannot be doubted when such artists as Reinold Werrenrath sing for millions of radio fans."

"The messages of the great composers of music, heretofore available only in the larger cities, by means of radio now reach into the remote places. Through hearing such concerts as that which was broadcast Sunday night, millions of listeners, unacquainted with fine music, are laying the foundation of a liberal

musical education. Radio is just another instrument for the artist to employ, for the listener to enjoy. "Thanks to radio I experienced concert hall enjoyment in my own drawing room, and I heard a great artist like Werrenrath, although he was miles distant. There may not be such a thing as a miracle, but radio approaches close."

"An honest confession is good for the soul. From a critic it is an admission signifying a change of heart, but I freely repeat, and without equivocation boldly proclaim, that radio broadcasting and reception have reached that degree of perfection that interests me. Radio is reaching out into the lofty places where I shall hope to spend much time with it."

## L. I. Amateur Gets South Sea Island

Amateur radio Station 2GY, of Garden City, N. Y., using only a single five-watt transmitting tube, received and acknowledged a long message from Commander S. C. Hooper, former Director of Communications, United States Navy, from the U. S. S. Seattle off Tahiti, a distance of approximately 9,000 miles, at 2 a. m., September 14, according to a statement made public last week. After relay, directed to a friend in Boston, the amateur station relayed additional messages which were forwarded to their destinations.

Although transmission across the Pacific by amateur radio is becoming a frequent occurrence, the communication direct from the South Sea Isles to Garden City is unusual in two respects. Using only a single five-watt tube, the acknowledgment traveled 3,000 miles over land, as well as 6,000 miles across the Pacific, a somewhat more difficult feat than transmission entirely over water.

Station 2GY is powered with heavy duty B batteries intended for reception purposes, instead of drawing its current from house current mains. The use of batteries eliminates one of the great difficulties in very short wave communication in that fluctuations in plate voltage are eliminated, resulting in a steady, unvarying signal at far-away points. When current is drawn from power lines the voltage fluctuations cause fading, which interferes with reception over great distances.

2GY is the same station which was reported by Hugo de Meyer, operating a Belgian amateur station, BK2, at Brussels, while the American station was using but five watts of power, which is but one-fiftieth of the energy used by the average electric station.

## Enamel Aerial Wire

Enamelled aerial wire has been proved by many tests to be the best for use in building aersials. Bare wire becomes coated with soot, which causes certain electrical losses, and fabric-covered wires absorb moisture that also causes losses. The wire used should be of the best grade copper. Stranded wire of the same size as ordinarily round wire is theoretically better, but in actual receiving practice it is hard to tell its superiority.

## Life of Storage Battery

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## New Booklet for the Radio Amateur

An interesting contribution to current radio literature has just been made in the publication of a twenty-page booklet by the King Quality Products Company, of Buffalo. It is called "The Radio Quest," and comes from the pen of Frank A. Hinnens, member of the Institute of Radio Engineers. In the booklet Mr. Hinnens confines himself to the greater steps that have been taken in the improvement in radio reception, and does not confuse the mind of the lay reader with any discussion of the less important details in improvement that have come in such great number during the last few years. The booklet is intended primarily for the amateur, and the man who has only the vaguest idea of how reception comes about, with the more important principles. Technical terms and descriptions are avoided. The booklet is published in convenient pocket size and is for free distribution. Copies will be sent on request to the King Quality Products, Inc., Rano Street, Buffalo, N. Y.

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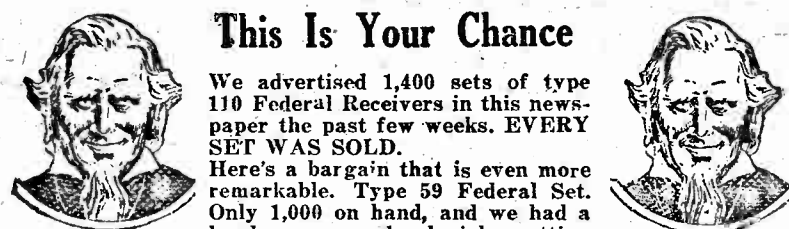
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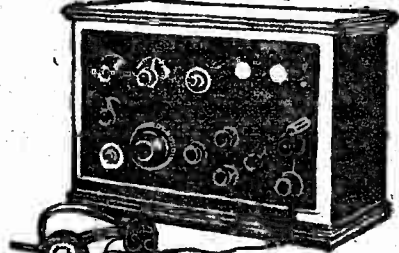
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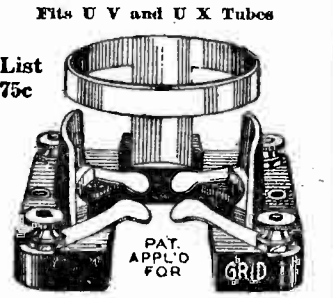
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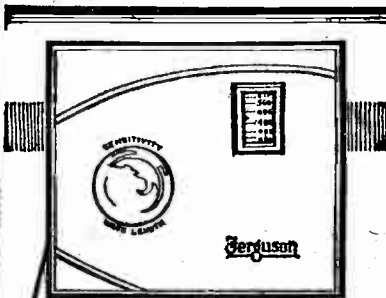
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## Improper Arrangement of Parts Results in Poor Selectivity

S. L. F. Condensers Improve Tuning; Ratio of Coils Length and Diameter Important; Methods of Eliminating Body Capacity Effects

H. N. Henderson—What will cause a radio receiver to have poor selectivity and operate poorly in general? Answer—There are many possible reasons why a set will not function properly, most of which lie in the general layout of the apparatus. One of the most common faults in construction of the home-built radio receiver is the improper location of the apparatus.

First, we have the home-built coil, which usually has a far greater diameter than necessary. Coils with a large diameter usually have a large external field. The field of such coils will usually come in contact with some other instrument that has nothing to do with the field of the coil, such as a variable condenser. This results in stray currents flowing about the circuit of the receiver in places where they are not desired. As a result poor tuning is obtained.

It seems to be the general opinion that the proper ratio between the length of the winding of a coil and the diameter should be between 1:1 ratio and the theoretical ratio of 1:2.45. Coils having ratios between these two standards will not have an extremely large field. Also by locating the coils and instruments in the set two or more inches apart stray currents may be reduced to a minimum. Incidentally, such placing of the apparatus will greatly reduce "body capacity" effects.

Another mistake often made in the construction of home-built radio receivers is trying to cram the instruments in small quarters and the use of metal fixtures for the mounting. A safe rule to follow is keep each piece of apparatus at least two inches or more away from its neighbor. Coils and other inductances in the radio-frequency circuit should be placed as far to the rear and away from other pieces of apparatus as possible.

**Straight-Line Frequency Condensers**  
F. J. Watson—What advantages are gained by the use of straight-line frequency variable condensers for tuning a radio receiver?

Answer—The main advantage of this type of condenser is that it does not crowd stations operating on the lower end of the broadcasting range in a few degrees on the condenser dial. In other words, it broadens the tuning on the higher frequencies. The reason for this is obvious. At the high end of the scale of the broadcasting band of wave lengths there are fewer kilocycles to the meter than at the low end of the scale. Inasmuch as selectivity is based on kilocycle variation, it is not difficult to see that the straight-line frequency condenser would tend to broaden out the number of degrees between stations operating on 250 meters or thereabouts.

**Coil Ratio**  
F. N. Shroder—What is the proper ratio between the length and diameter of a coil for maximum value of inductance?

Answer—For maximum inductance the ratio between the length of the coil and the diameter is theoretically 2.45 to 1. However, it seems to make little difference whether the coil is exactly this ratio in actual practice. Some manufacturers make their coils with a ratio of 3:1, while others with a ratio of 1:1. For ordinary radio broadcasting purposes a coil between these two latter ratios will operate satisfactorily.

**Secondary Tuning**  
G. B. Gray—What capacity variable condenser should be employed for tuning the secondary of a three-circuit tuner?

Answer—The proper size of a condenser depends largely on the type of coil with which it is used. A well designed coil may be made to cover the broadcast wave bands with .00035 mfd condenser connected in shunt with it, while a poorly designed coil may require a condenser of .0005 mfd for the broadcast band. However, in most cases the former capacity will suffice.

**Transmitting Regulations**  
D. M. Walters—Is a novice allowed to construct a small transmitting set and operate it while he is learning the code?

Answer—In no case is one allowed to use a transmitting set without a license. Two licenses are required. One for the station and another for the operator. The former gives the station a legal call, while the latter insures that the station is in competent hands while on the air. Further information may be obtained from the Radio Supervisor's office at the Custom House, New York City.

**Coil Data**  
W. L. Nash—What size should the coils of a three-circuit tuner be for covering the entire broadcasting range?

Answer—The primary coil or antenna coil should have about thirty turns wound on a 2½-inch diameter. The secondary should consist of about sixty turns wound on a 3-inch diameter tube. For covering the broadcasting range, if this coil is of the low-loss type, a 17-plate variable condenser (.00035 mfd) should be employed for tuning. The tickler coil should have about fifty turns of fine wire wound on a 2½-inch tube. The coils should all be wound in the same direction. For the primary and secondary No. 18 or 16 wire will answer the purpose. The tickler need not be a low loss coil and No. 30 wire will therefore suffice for this purpose. The tickler should be variably coupled to the secondary. Although it is not necessary, the primary coil may also be variably coupled to the secondary. By coupling this coil it is possible to obtain more selective tuning.

**The Blocking Condenser**  
H. C. Kent—What is the purpose of a blocking condenser in the radio receiver circuit?

Answer—This condenser allows the passage of radio frequency currents, but breaks the circuit for high voltage battery current. These condensers usually have a capacity greater than .001 mfd and may be fixed. There is no advantage in having them variable, as this condenser is usually not a part of the tuning circuit.

**Capacity Effects**  
G. L. Smith—Will metal shielding eliminate capacity effects in a regenerative receiver? Should each instrument be shielded separately or should one shield be employed for the entire receiver?

Answer—A metal shield in a radio receiver will reduce hand capacity effects to a minimum. It has, however, been found that in a well designed and constructed set, hand capacity effects are absent.

Either of the two methods in the above question will accomplish the purpose. In either case the shields should be connected to the ground terminal of the set. It must be remembered that shielding in a regenerative receiver tends to increase the capacity between the ground and the instruments, with a result of a slight sacrifice in efficiency.

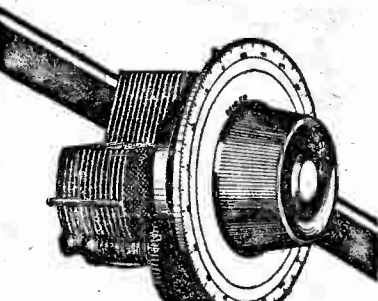
**Connection of Condenser**  
K. V. Fisher—Should the stationary or rotary plates of a low loss variable condenser be connected to the grid terminal of the detector of a regenerative receiver if the stationary plates are insulated and the rotary plates grounded to the frame of the instrument?

Answer—In a condenser of the above design when used to tune the secondary circuit of a regenerative receiver, the stationary plates should be connected to the grid, and the rotary plates to the grid return to the filament of the detector.

**Coupling**  
H. N. Kreger—What is the difference between inductive and conductive coupling?

Answer—Just as the name implies, inductive coupling is where circuits are coupled by induction. That is, two coils are placed in such a manner that the external field of the coils intersect and thereby causing induction between the two. Conductively coupled circuits are those which are coupled by a direct connection.

A typical example of the former type of coupling is the primary and secondary circuit of a three-circuit tuner. The antenna (primary) is coupled to the grid circuit (secondary). An example of the latter type is the single circuit receiver. The antenna and grid circuits are both tuned by means of the same coil.



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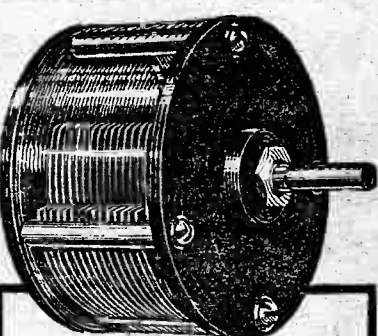
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# Something New in Audio Frequency Amplification for Radio Reception

The Author Claims Complete Absence of Distortion When Receiving From a High-Class Station

By A. DINSDALE

Member, Radio Society of Great Britain

IN THE early days of broadcasting in this country the craze among broadcast listeners was all for noise, and yet more noise, the quality of reproduction receiving no attention at all. Happily, these days are over. Nowadays every one strives to improve the quality of his reception, so that the output of his loud speaker shall resemble as faithfully as possible the input sounds at the microphone end of the circuit.

In an endeavor to achieve this end all sorts of corrective devices have been applied to the usual forms of transformer-coupled A. F. amplifiers, and tubes have been worked well within their limits—i. e., volume has been reduced. Extensive use has also been made of resistance and capacity as a means of coupling A. F. stages, for, as is well known, this method of coupling introduces no appreciable distortion if properly arranged and handled.

Resistance-capacity coupling, however, suffers from the disadvantage, from the point of view of the impecunious, that the same degree of amplification per tube cannot be obtained as with transformer coupling, and a higher value of B battery voltage is necessary.

In view of the above remarks, it is strange that no particular effort seems to have been made by manufacturers of A. F. transformers to produce a distortionless instrument, or by designers to produce some alternative means of amplification which will combine purity with great volume, using a minimum of tubes.

Great advances have been made in England, both in the matter of improved transformers and in alternative methods of amplification, and in the present article the writer will endeavor to describe a very promising A. F. amplification circuit.

### Pierce's Trigger Circuit

The underlying principles of the new circuit are covered by two British patents, one being due to G. W. Pierce and the other to E. W. B. Gill. Pierce's original circuit is shown in Fig. 1, and Gill's modification of it in Fig. 2.

Referring to Fig. 1, it will be seen that the method of coupling the two tubes is by means of a battery, the positive terminal of which is connected to the plate of the first tube, while the negative terminal

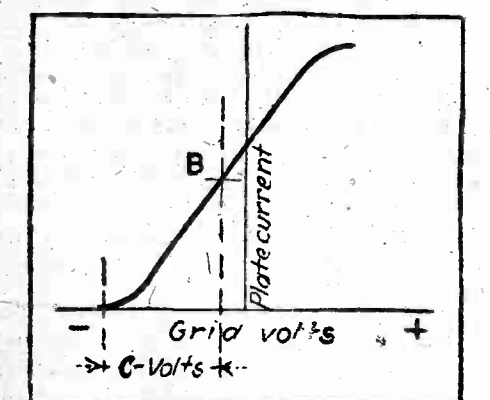


Figure 5—The characteristic curve of the second tube prior to the arrival of a signal. Point B is the operating point at a negative potential on the grid.

is connected to the grid of the second tube. Since the completed circuit of this battery goes through the plate-filament path of the first tube, the actual voltage applied to the grid of the second tube depends upon the conductivity of the first tube.

Thus, as signals arrive on the grid of the first tube, varying its conductivity, so the potential applied to the grid of the second tube is varied, and corresponding changes of plate current occur in its plate circuit, and, consequently, in the telephones connected therein. In this way, therefore, it will be seen that a kind of trigger action results, the incoming signals impressed on the grid of the first tube producing effects which cause great changes in the plate current of the second tube.

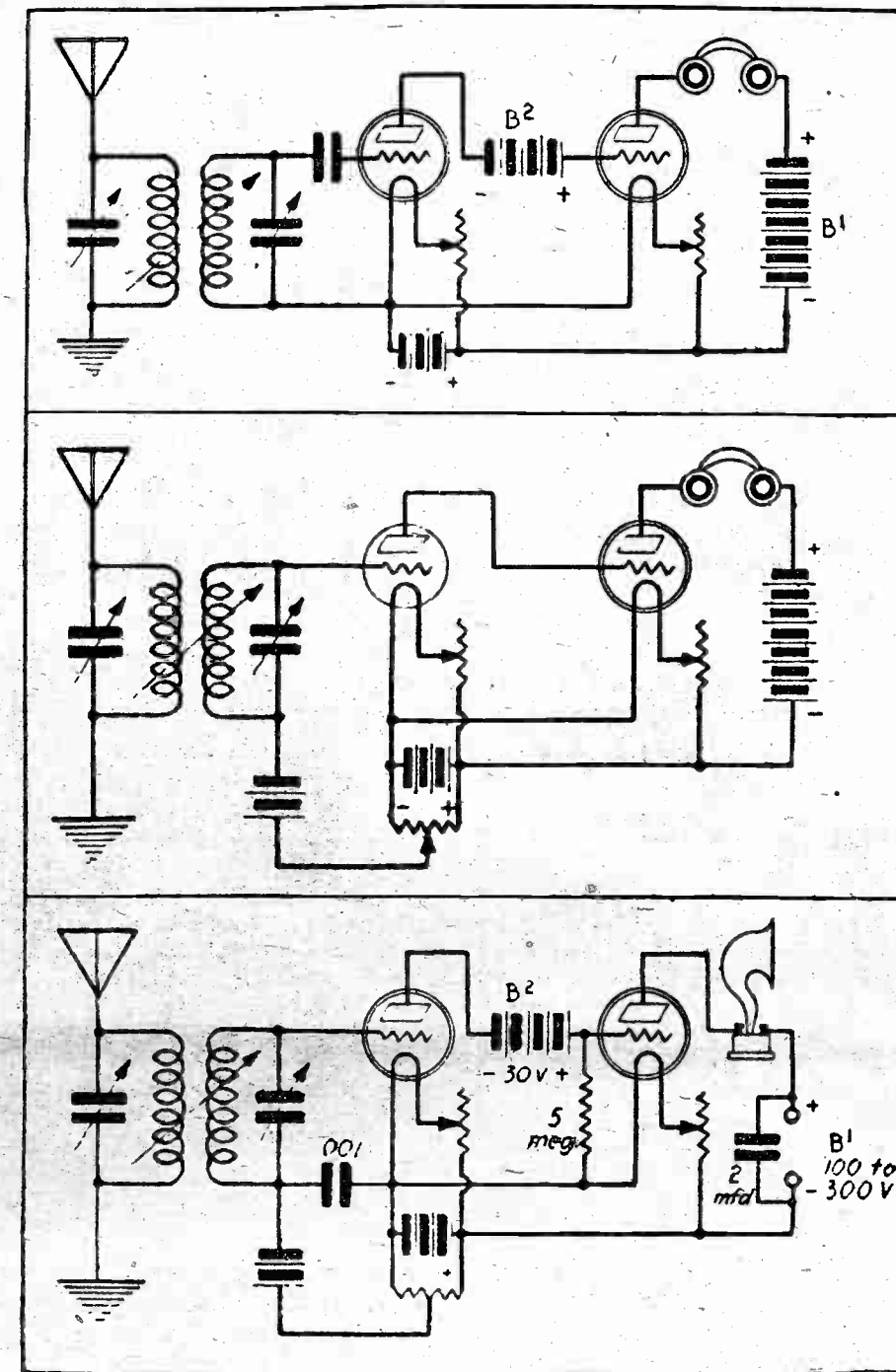


Figure 1—Top: Pierce's original circuit. Figure 2—Middle: Gill's modification of the circuit shown in Figure 1. Figure 3—Below: The circuit combining the trigger action with the limiting action.

Gill's circuit, shown in Fig. 2, is very similar to Fig. 1, the only differences being that the battery between the plate of the first tube and the grid of the second has been eliminated, and potentiometer control of the grid of the first tube has been added.

The important point in connection with this circuit is that as the voltage on the grid of the first tube is increased, so the plate current of the second tube is reduced. This follows because, as the conductivity of the first tube is increased, so the grid of the second tube becomes more negative, and all users of negative grid bias know that increasing the biasing voltage results in reducing the plate current.

### Prince's Modification

A circuit combining the trigger action of Pierce's circuit with the limiting action of Gill's circuit is due to Major C. E. Prince, and is shown in Fig. 3. This circuit has been used on telephony with considerable success, and is therefore of interest to all readers of an experimental turn of mind. The theoretical considerations of the circuit are as follows:

We will assume that the grid of the first tube (Fig. 3) has been made sufficiently negative by means of the potentiometer and grid bias to render the tube non-conductive. This means that the battery B2 is open circuited. The grid of the second tube is, therefore, to all intents and purposes, free and will have impressed upon it some fairly high and steady value of negative potential, the exact value of which will depend upon the characteristics of the tube in use.

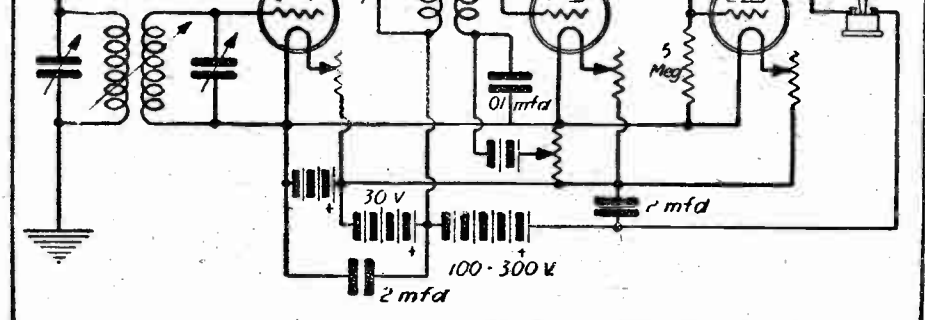


Figure 6—A three-tube circuit which has one stage of R. F. amplification

tory B2 is concerned. A current from B2 will flow through the circuit, and the effect of this will be to greatly increase the negative potential on the grid of the second tube. This large increase in negative bias will cause a correspondingly large reduction in the plate current of the second tube.

The action of the two tubes is shown graphically in Figs. 4 and 5. In Fig. 4 the point "A" on the characteristic curve shows the condition of the first tube when the grid is initially made negative prior to the arrival of any signal.

Fig. 5 shows the characteristic curve of the second tube, "B" being the operating point at the negative potential obtained on the grid prior to the arrival of a signal. When the first tube is made conductive by the application of signal voltage to its grid an increase of "C" volts in the negative bias impressed on the grid of the second tube will cause the plate current to drop to zero, as shown.

### Choice of Tubes Important

The trigger action of the circuit can easily be comprehended when it is considered that with the normal currents carried by the first tube (i. e., when no signal is arriving) the plate-to-filament resistance is comparatively low in comparison to the filament-to-grid resistance of the second tube. Thus, as soon as the first tube becomes conductive practically the full voltage of the battery B2 is applied between the filament and grid of the second tube and its plate current falls to zero.

It is therefore possible by this means to arrange for a reduction in plate current which will be many times greater than any plate current change which could be effected by applying the original signal voltage directly to the grid of the second tube.

It necessarily follows, then, that in order to obtain maximum results the normal plate current of the second tube should be as large as possible. It follows also that since at the end of each signal impulse the grid of the tube will be left with an excessive negative charge upon it means of escape must be provided, so that the grid shall immediately return to a fit

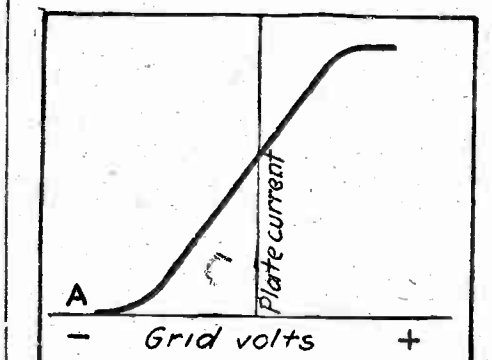


Figure 4—Point A on the curve shows the condition of the first tube when the grid is negative before the reception of a signal

state to deal with the next signal impulse. This may be arranged by introducing a grid leak, as shown in Fig. 3.

It will be apparent that much of the success of the trigger action will be dependent upon a sharp and sudden change in the first tube from a non-conducting to a conducting state. This requirement can be met by employing a tube with a sharp bend at the bottom of the characteristic, and any tube designed to act as a detector answers this requirement. Naturally, the sharper the bend of the characteristic the better, and the sharpest bends can be obtained from soft tubes. A soft tube, therefore, is recommended for carrying out this particular function, while a small power tube (say 5 watt) is recommended for the amplification stage.

As the trigger of a rifle requires a certain definite minimum amount of energy to pull it off and release the enormous power contained in the cartridge, so does the circuit under consideration require a

(Continued on page four)



# A Two-Tube Reflex Radio Receiver Which Will Not Howl

By Adding Audio Frequency Amplification Loud Speaker Volume May Be Obtained

By PETER MOMBELLO

MOST reflex sets have failed to give satisfaction because no provision had been made in the design of the coils to prevent howling when the set was in resonance. In cases where more than one tube was used, necessitating more than one circuit, the usual type of coils caused feedback, due to their stray fields. Naturally if it is possible to design coils having a very concentrated field, then interstage coupling, feedback and such troubles can be done away with. This is accomplished by the coils used in this set, the forms of which will make a very efficient radio-frequency set if two stages of RF are used. The constants, of course, will not be the same as those given for this set, but the windings will be identical.

The astatic windings are used, the simple form of which is shown in Figure 1. This may be used if desired and a cardboard tube used as the form with a slot cut at the proper place. But for the most efficient results a combination of the basket weave and astatic windings is used, as shown in Figure 2. The coils in that case will be of the best low-loss type for this receiver.

The coil winder used to make these coils must have an even number of pegs, preferably fourteen. This insures the same number of pegs on each side so that it will be the same as the basic winding using the slot in the cardboard tube. The winder should have an inside diameter of 3 1/2 inches.

## Method of Winding

The method of winding is clearly shown in Figure 2, but a little explanation is necessary. Start the wire at Point 1 and wind in the direction of the arrows. The

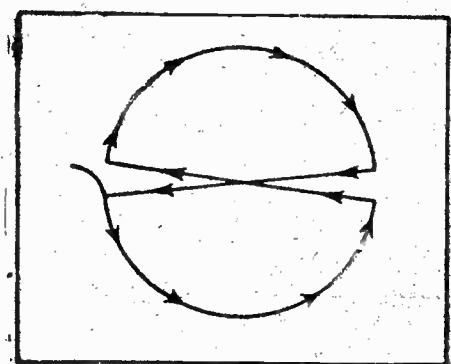


Figure 1—Simple form of astatic winding

method of winding is over two, under one, over two, etc., until the Point 2 is reached. Then the wire is passed to Point 3 and the process repeated, over two, under one,

which the wire is passed to Point 1, thus completing one turn. At this point the second turn must not coincide with the first, so that the wire is passed over only one peg, then under one, then followed by the regular process until the wire is stretched to 3. At this part there must not be any coincidence, so that the wire

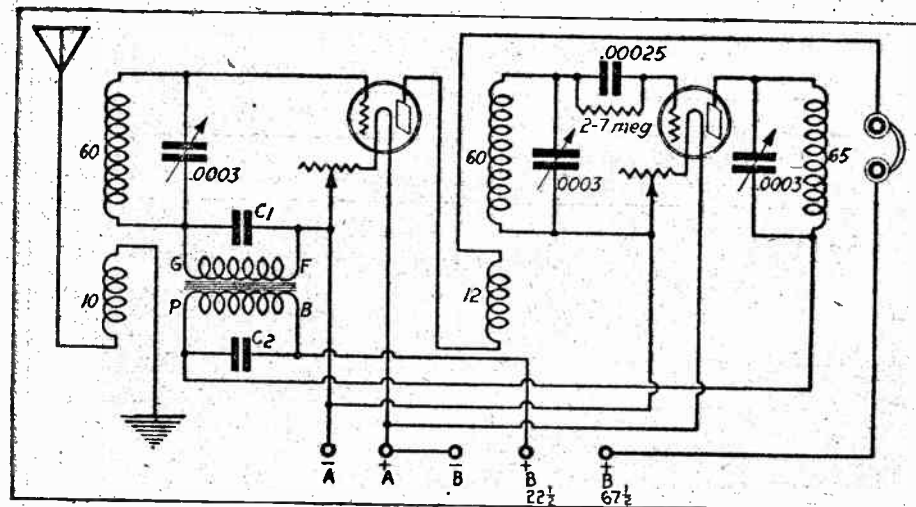


Figure 3—The wiring diagram for the receiver herein described

over two, etc., until Point 4 is reached, at goes over only one peg instead of two like the turn under it. This may sound complicated, but it can be very easily explained. When the corners 1 and 3 are reached, the builder should notice the previous turn. If the wire passes over two pegs in the previous turn, then he must make the next turn go over only one peg. Conversely if the wire goes over only one peg in the previous turn, then the next turn must go over two pegs. This principle is carried in every turn of the coil. If the wire inevitably coincides at the corner, then a mistake has been made in the round part of the coil in the last turn. This method immediately checks up mistakes in the winding as soon as they are made. Even without practice this winding procedure is easy once the principle is grasped.

These coils have all the advantages of low-loss coils and they have the added advantage of a concentrated field so that no leakage can take place through several coils of this type when used in a set.

## Constants of Coils

For use in this receiver three such coils must be made having the following constants as shown in the diagram in Figure 3. The first coil has ten turns No. 18 DCC wire on the primary and sixty turns No. 20 DCC on the secondary. The second coil has twelve turns No. 18 DCC on the primary, same number as the first coil on the secondary. The third coil has sixty-five

turns No. 20 DCC, there being only one winding.

The relation between the secondary and the primary on the coils will depend entirely on the location in which the set is operated. If great selectivity is not needed the primary may be interwound with the secondary. The No. 18 and No.

20 wire are held together in the hand and wound simultaneously. When the required turns for the primary are wound the wire is brought down temporarily to the bottom of the coil winder, and the secondary wire is continued by itself until its required turns are completed. This is the best method of winding, but for selectivity the primary and secondary must be wound by themselves and then separated by one-half inch or more to obtain the required degree of selectivity. In this latter case a few wooden pegs are left in the windings to give them support and maintain the separation. These pegs should be long and even so that the coils may be made to stand upright on the baseboard.

The set as shown was designed for ear-phone reception, but a loud speaker may be used provided the necessary amplification is first added.

The following parts will be needed to make the tuner alone. The best pieces of apparatus should be used throughout: One pound No. 20 DCC wire, one-half pound No. 18 DCC wire. Three low-loss .0003 variable condensers.

One audio-frequency transformer, 6:1 ratio. Two rheostats to fit tubes used. One panel, 7x18 inches; one baseboard, 8x16 inches. Three medium ratio dials. Two .002 fixed condensers. One grid condenser and leak. Nine initial binding posts. Two sockets.

is found. Then the value of the plate condenser is increased. Station may be logged on the first two dials. The last dial need not be logged, since this controls the volume.

The panel arrangement may be made neat by putting one of the variable condensers in the center and the other two on the extreme left and right of the panel. The two rheostats come on a lower level near the baseboard between the condensers. The coils are placed upright behind their respective condensers and as far apart as possible from one another. Care should be taken to see that the so-called "slot" in the astatic windings is in the same line for all the coils running from left to right, parallel to the plane of the panel. The two sockets are placed in a plane behind the coils and in a line with the rheostats. The audio transformer is mounted behind the first rheostat. The binding post strip is placed in the back center with the post pointing outward through the back of the cabinet.

When wiring the set either large enameled copper wire or bus bar may be used. All battery connections should be made first. The grid and plate wires should be as high up as possible and at right angles to each other. To avoid hand-capacity effects connect the rotor of the condensers to the low potential or filament.

If there is sufficient capacity effect between transformer windings, the removal of condenser C2 may sometimes improve reception. This should be experimented with. Condenser C1 is usually necessary.

On the question of tubes for this set, the UV-199 are recommended because of their slight tendency to oscillate, due to their small internal capacity.

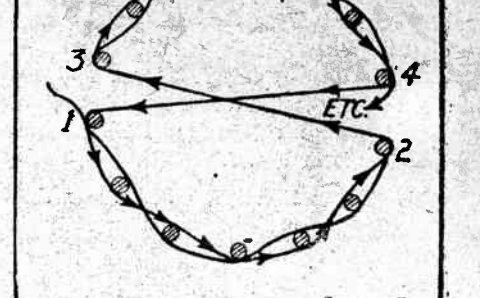


Figure 2—Method of winding the combination astatic and basket-weave coils

is found. Then the value of the plate condenser is increased. Station may be logged on the first two dials. The last dial need not be logged, since this controls the volume.

If, in operation, it is found that signals are so strong that paralyzation of the power tube results, this may be corrected by reducing the output energy from the detector circuit. De-tuning or dimming the detector filament will accomplish this.

Another way out is to alter the value of the power tube grid leak till a value is found which prevents paralysis. Alteration of the potential of B1 will also assist in achieving the same result.

If the circuit is switched on for the first time with a loud speaker in circuit it will very likely appear to be quite dead, and nothing will alter this condition till some station providing the correct amount of signal strength to operate the trigger is tuned in. For this reason it is advisable to tune in first with headphones in the detector circuit.

Once the correct adjustments have been found the circuit will suddenly jump to life in a most startling fashion.

Considerable experimentation may be necessary at first in order to find the correct adjustments of all the circuits and

(Continued on page six)

## Manufacturer Says Radio Increases Desire to Travel Reports 400% Sales Gain in September

Radio leaders contend that radio has accomplished more in support of the movement to "see America first" than the combined propaganda of cities, railroads and educational agencies in the past to encourage people to visit the scenic centers of the United States rather than to rush to Europe at first opportunity. Above all, radio has instilled a deep interest in other places, and men and women who have had no previous desire to take trains and steamers are now anxious to see for themselves the localities from which they have heard musical programs.

"Thousands upon thousands of radio listeners, who in the past have regarded Atlanta, Denver, Detroit and scores of smaller places simply as spots on the map," declares Joseph D. R. Freed, president of the Freed-Eisemann Radio Corporation, "are visiting, or will visit at first chance, the cities in which the broadcasting stations they hear are located. So I assume from statements made to me by scores of friends who have developed an intensive desire to travel through hearing about these cities by radio.

"California and Florida are, of course, centers of special interest at all times, but radio has been of the utmost assistance in their drives to bring Easterners and Northerners to their sunny skies. Any fan, almost will admit that he 'never heard of' some of these towns which are now being so well advertised by radio. Look at the roster of stations and you will find places that in the past were unfamiliar names.

"This situation is a splendid thing for the country, bringing all sections closer together in mutual admiration and respect. What we hear by radio leads us to seek further information, and thus we may truly regard radio as 'the university of the air.'

"Just as most of us are keen to find out, in early life, particularly, what the inside of a watch looks like sometimes with disastrous results, so people are not content to hear music from a distant city, they want to see that city."

## WLWL to Shield Church From Field of Their Antenna

The high resistance of the ground connection at Station WLWL, the Paulist League station in New York City, has made it necessary to shield the church from the field of the antenna system.

This has been accomplished by running a cable along the gable of the church roof and at equal distances down the side running strands of No. 14 copper wire parallel to the top cable. These wires are connected together by means of copper strips, and the entire system is connected to the ground.

It is hoped by the engineers of this section that when this shielding system has been completed it will materially reduce the resistance of the earth connection, which has caused trouble in making the set operate efficiently.

## Next Subject of Health Talk Will Be "Louis Pasteur"

Louis Pasteur, probably the greatest figure in the history of medicine, will be the subject of the "Tower Health Talk" to-morrow at 8:45 p. m., given by Dr. Lago Galdston through WEAF, WEEI and WCAP.

The life of Louis Pasteur is as dramatic as that of any general or military character. His life struggle to prove to the world and his fellow scientists the truth of the germ theory of disease was replete with thrilling incidents. It resulted in the conquering of the dread rabies, smallpox and was the beginning of the process of the vaccination which in the last five years has resulted in a practical diminution of the danger of diphtheria by the diphtheria immunization process.

Besides taking the horror out of the operating chamber by antiseptic methods and being the father of modern bacteriology, Pasteur was also instrumental in wiping out the destructive cattle and sheep disease which was rampant in his native land, France, and checked the disease which was ruining the famous wine grapes.

## Testing Batteries

Contrary to the popular notion, dry batteries should not be tested with an ammeter, but with a voltmeter. The test should be made while the tubes are turned on. Each cell of A battery should test at least 1.1 volts and each 22 1/2 volt block of B battery should test at least 17 volts.

## Radio Manufacturer Reports 400% Sales Gain in September

Charles Freshman Company, Inc., manufacturers of the Freshman Masterpiece receiver, report gross sales for the month of September, 1925, of \$690,708.89, as against \$163,830.38 for the month of September, 1924—an increase of over 400 per cent.

The company further reports an enormous amount of unfilled orders, and at the rate that orders are being entered it is believed that sales for each of the next six months will show a corresponding increase.

Although the company recently opened a large new factory in the Bronx, New York, and another large factory in Chicago, negotiations are now under way to triple the present Chicago facilities. As soon as this latter arrangement is consummated the company will use the Chicago factory for its central shipping point, thus relieving the New York factories of the burden of shipping to the Central states. Additional factories are planned in the near future in San Francisco and Toronto, Canada.

## Toscha Seidel's First Radio Concert To-night From WEAF

Toscha Seidel, famous Russian violinist, will be featured during the second "Atwater Kent Radio Hour" and will play in the studio of WEAF this evening from 9:15 to 10:15 p. m. This is the first time in radio history that weekly concerts by Metropolitan Opera stars and other leading artists of the musical world have been given for radio broadcasting. The first concert was given the preceding Sunday evening by Reinald Werrenrath, famous American barytone.

These recitals are exactly the same as would be given in a concert hall with the artist playing several groups of solos with piano or organ for accompaniment. On this evening Arthur Loesser will assist at the piano and organ. Mr. Loesser, besides accompanying Mr. Seidel, will play two piano solos. The chain of stations linked with WEAF for the broadcasting of this concert will be WCAP, Washington; WJAR, Providence; WEEI, Boston; WCAE, Pittsburgh; WSAI, Cincinnati; WWJ, Detroit; WOC, Davenport; WCCO, St. Paul; Minneapolis; WGR, Buffalo, and WOO, Philadelphia.

## Radio to Get Hoover's Speech At R. R. and Utility Conference

The speech of Secretary of Commerce Herbert C. Hoover on "Why the Public Interest Requires Local Rather Than Federal Regulation of the Electrical Public Utilities" will be broadcast direct from the Hotel Mayflower, in Washington, D. C., at 8 p. m., on Wednesday, by WEAF and a chain of stations, including WEEI, WCAP, WJAR, WOO, WCAE, WSAI, WGR, WTIC, WCCO and WCTS. Secretary Hoover is speaking at the conference of the National Association of Railroad and Utilities Commissioners, at which representatives of the Interstate Commerce Commissions of each state attend, and which is the most important meeting of the year in determining the policies in connection with the public utilities.

## Selections of Gypsy Camp Fire Music in Harry Horlick's Hour

Harry Horlick, with his A. and P. Gypsies, will introduce some of the selections which he imported from Europe during the last summer in his hour of music to-morrow, broadcast at 9 p. m., by WEAF and six other stations. Besides these pieces, for which written scores are used, there are many gypsy numbers used by these artists for which no music is necessary, the musicians playing the pieces entirely from memory. These selections are of the type which would be heard around the camp fire of a troupe of wandering gypsies and are the distinguishing features which characterize these unusual hours given every Monday night.

## Members of International Dance Orchestra All Veterans

Every member of the International Dance Orchestra, which plays under the direction of Edward Behringer at WEAF, saw action in the American Army during the war. They have changed their program from shrapnel to saxophones and will broadcast a series of dance tunes, beginning at 8:15 Tuesday evening.

## Missionary to Build Sets

Receiving sets are to be distributed by a British missionary to natives in the South Sea Islands. Cocoanut palms, 80 to 90 feet high, are to be used for aerial masts.

## Dr. S. Parkes Cadman on "The Fate of Europe" This P. M.

The Rev. S. Parkes Cadman will speak on "The Fate of Europe" for the men's conference in the Bedford Branch Y. M. C. A., Brooklyn, N. Y., and the radio audiences of WEAF, WEEI, WCAE, WSAI and WCTS to-day. Every Sunday from 3:45 to 5:30 p. m. these stations broadcast the sessions of the men's conferences, now starting on their twenty-second season.

Dr. Cadman has recently returned from a two months' tour of Europe, where he attended the International Church Conference in Stockholm. He possesses a keenly analytical mind

## and is an extremely eloquent speaker, holding the attention of both his visible and invisible audiences, so that his ideas on the future of the European situation should prove of great interest.

In speaking of the church conference Dr. Cadman states that it accomplished much in helping to find the facts that are keeping the nations apart, and that it was the beginning of a process of reintegration which will ultimately bind the nations in peaceful and lasting harmony. It was the first time he had met his German brethren in the ministry since the war, and the welcome in their country and Denmark was most cordial.

## Oriental Dances To Be Directed by Composer

An unusual hour of real Oriental music under the direction of the composer, Alexander Mahoof, will be a feature of the program at WEAF at 10 p. m. on Friday. Mr. Mahoof, a Syrian composer, is recognized as a foremost authority on Oriental music, and a special orchestra will give a program of his own pieces. The hour opens with his "Egyptians," followed by "The Call of the Sphinx," an Oriental waltz; "Saloma" and "Fatima," which, as their names indicate, are Oriental dances.

# DERESNADYNE II

A superlative 5-tube receiver at little more than a cheap set

FOR those who want a radio receiver second to none the Deresnadyne will settle the question of which radio set to buy. It does not choose between tone quality and volume, nor between distance and selectivity. It combines them.

The Deresnadyne is remarkable for its purity of tone. And tone is what counts after you've owned a set a while. It is non-oscillating—extraneous noises are absent.

The Deresnadyne is remarkable for its selectivity. In this respect it acknowledges no superior.

The Deresnadyne is remarkable for distance. Operating from Chicago where the interference is very great, owners have reported the reception of Calgary, Havana, Los Angeles and Springfield, Mass., in one evening.

The Deresnadyne is remarkable for volume. During International week, operating from Chicago, it brought in European stations loud and clear over the loud speaker.

The Deresnadyne is not a Neutrodyne. It is not a Heterodyne. It is different in principle as well as results.

DERESNADYNE II, illustrated above, makes available to those who already own battery and speaker equipment the same performance as Deresnadyne I and III, which operate from the light socket. Specially priced at \$125.

DERESNADYNE III—a complete 5-tube receiver operating from the light socket. Deresnadyne III is the last word in radio convenience. It is equipped with permanent guaranteed power units and operates from the lighting circuit. Built-in loud speaker. All equipment included in the cabinet. Price complete with matched tubes—\$285.

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**Deresnadyne**  
Radio Receiving Set

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BRANCH OFFICE • J. P. RAINBALT, 30 CHURCH STREET, NEW YORK CITY



# Cunningham RADIO TUBES

## Are the Sentinels

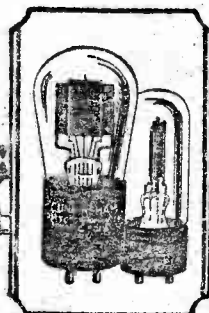
—ever alert  
—always on duty

which guard radio reception from  
tone distortion and discord.

Enlist them for long faithful service  
in every socket of your broadcast  
receiver.

Since 1915—  
Standard for all sets

Types C-301-A, C-299, C-300, C-11, C-12  
In the Orange and Blue Carton



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### "Our Laboratory Has Tested and Approved the Timmons B-Liminator"

Radio Broadcast

Think of the tests that Radio Broadcast  
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subjected the B-Liminator to before put-  
ting their OK on it.

In writing of these tests, Keith Henny,  
Director of Radio Broadcast Laborator-  
ies, said that during the entire 600-hour  
tube test, the B-Liminator delivered max-  
imum output without the slightest drop  
in voltage.

This is equal to more than six months' severe use on your set. And the tube was apparently as good as new.

Seventeen other radio publications and newspapers have put their OK on the B-Liminator. Many of them stressed the improvement in tone, others volume, others sensitivity, and still others the added distance it gave to most sets.

Let us send a folder, telling the results of these tests. Ask your dealer for one. He carries B-Liminators in stock.

**\$28.50 with special tube**

**TIMMONS**  
Radio Products Corp.  
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If you want to buy, sell or exchange your  
radio sets or parts the Radio Exchange will  
help you.

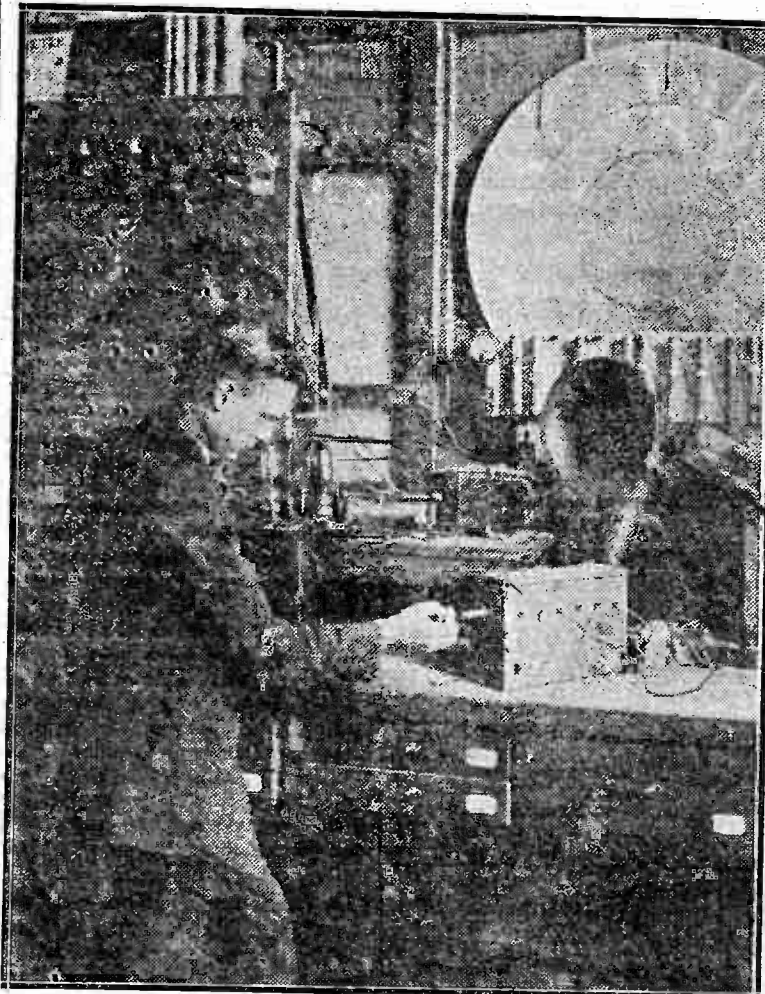
## The Sound Caused by Electrons To Be Broadcast by Prof. Wold

ELECTRONS fired by a decomposing chemical element will speak to the audience of WGY. The radio listener will thus have an opportunity of getting acquainted with a particle so small that countless millions of them could meet on a pin point and not be over-crowded.

The opportunity of listening to the electron will be given during the first of four talks on the electron, its habits and uses, to be delivered Tuesday evening, October 13, by Professor Peter L. Wold, head of the physics department of Union College, Schenectady, N. Y. Professor Wold's first talk will be on the discovery of the electron. The subjects of the other

audible to a large public. This "speed" of decay is hardly speed in the accepted sense because the process in the case of a little piece of uranium would require five thousand million years to complete, and at the end of that time the original piece of uranium would have lost a few percent of its weight and left some metallic lead.

The experiment, in connection with Professor Wold's address, will be conducted with uranium, a highly radioactive element. The moving charges of the electrons from a small piece of uranium will be directed toward a small, tight metal chamber enclosing two charged electrodes and will go through the metal walls into the air



By means of this apparatus listeners of WGY will hear the voice of the electron during an address on electrons by Dr. Peter L. Wold, head of the department of physics of Union College. A small piece of uranium, a radio-active element, is held before a tight metal chamber enclosing two charged electrodes. The uranium, which is in a constant state of disintegration or decay, gives off electrons which ionize the air between the electrodes. This ionization is detected by a type of radio amplifier system and becomes audible through a loud speaker directly or may be carried to the broadcasting station control room and passed through the usual stages of amplification and finally put on the air.

talks to follow on successive Tuesday evenings will be "Measurements on Electrons," "Effects of Electron Discovery on Scientific Theories" and "Sources of Electrons and Their Practical Applications."

In their investigations of the composition of matter, as fundamental theories undergo change, scientists of the research laboratory of the General Electric Company have developed apparatus whereby the electron, the smallest known particle of matter, becomes audible and it is a comparatively simple matter for the radio engineer with the equipment now at hand so to amplify the sound of the single electron, that it may be heard hundreds of miles away.

There are a few very complicated or heavy elements which are decaying or going to pieces so fast that the process is measurable, can be made visible and by the apparatus developed by the scientists of the General Electric Company, can be made

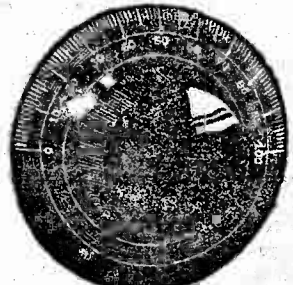
inside. The omitted ions from the uranium will ionize the air between the electrodes, and this ionization will be detected by a type of radio amplifier system and conveyed to the control room of WGY, where it will be again amplified and carried on to the radio transmitting apparatus to the ears of those tuned to the station.

"Craig Kennedy on the Farm," First of New Series by A. Reeve Shhh! Quick! The earphones! Arthur B. Reeve, alias Craig Kennedy, speaks from WOR on Saturday evening. The celebrated father of the fiction detective will confide to a million or more radio listeners, some inside stuff concerning "Craig Kennedy on the Farm," where he seeks refreshment for his soul in the peaceful countryside. We have an advance tip to the effect that even in these rural scenes Kennedy continues to find full opportunity for the exercise of his peculiar talent.



Above is pictured the new Splitdorf "Polonaise" Receiver. It is a five-tube set employing two stages of tuned radio-frequency amplification, a detector and two stages of audio-frequency amplification, which sells at a price within the means of the average buyer. It is attractive in appearance and has a metal panel with a crackle finish.

## Kurz-Kasch Aristocrat "Aligns rite—Holds tite"



As soon as you see a Kurz-Kasch dial you will at once be struck with its beauty and workmanship.

On examining it you will at once appreciate the practicability of the split bushing method of mounting.

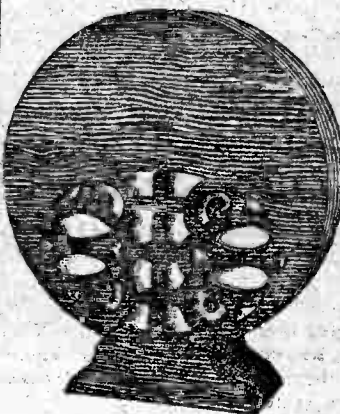
After you have looked at other dials you will realize why over two hundred radio manufacturers have standardized on Kurz-Kasch products.

Kurz-Kasch has this in mind: Products that last on the radio.

Ask your dealer for Aristocrat E-Z-Tune, the key to simplified tuning. Aristocrat dials, knobs, potentiometers, rheostats, sockets. If he can't supply, write:

The Kurz-Kasch Company  
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## "Built Like a Violin"



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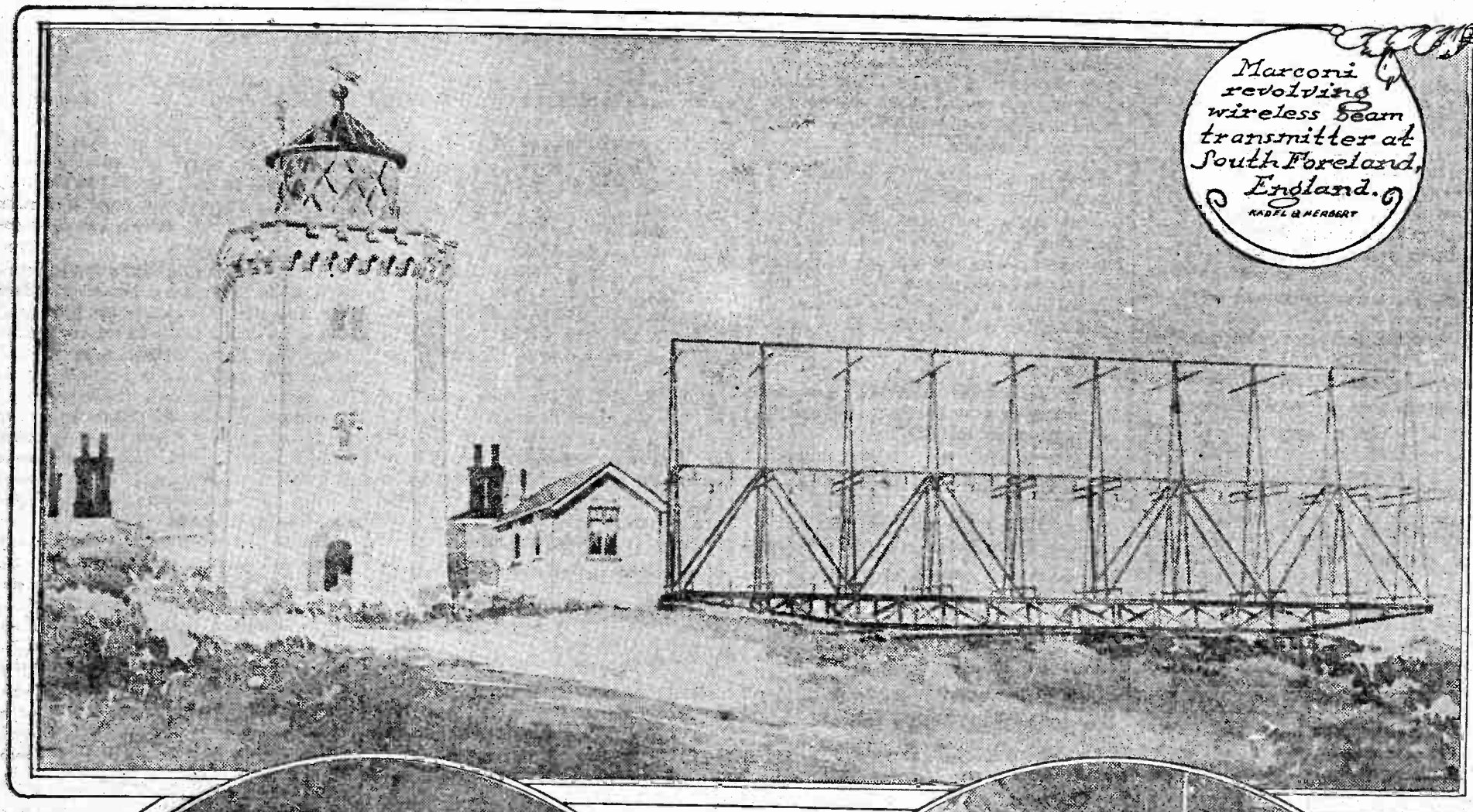
Waage "B" Eliminator  
Cleaner and Better Than Batteries  
JUST THINK OF IT!

ONLY  
\$26.00

(WITHOUT TUBE)

Use your old 201-A tube that will not operate in set but still lights. Works better than "B" BATTERIES. Saves Money and Trouble.  
Full Wave B-Eliminator  
FOR 500-550 TUBE \$35.00  
Guaranteed. Money back if not satisfied.  
Mail orders promptly filled.  
**A. H. WAAGE**  
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# Up-to-the-Minute News of Radio in Pictures

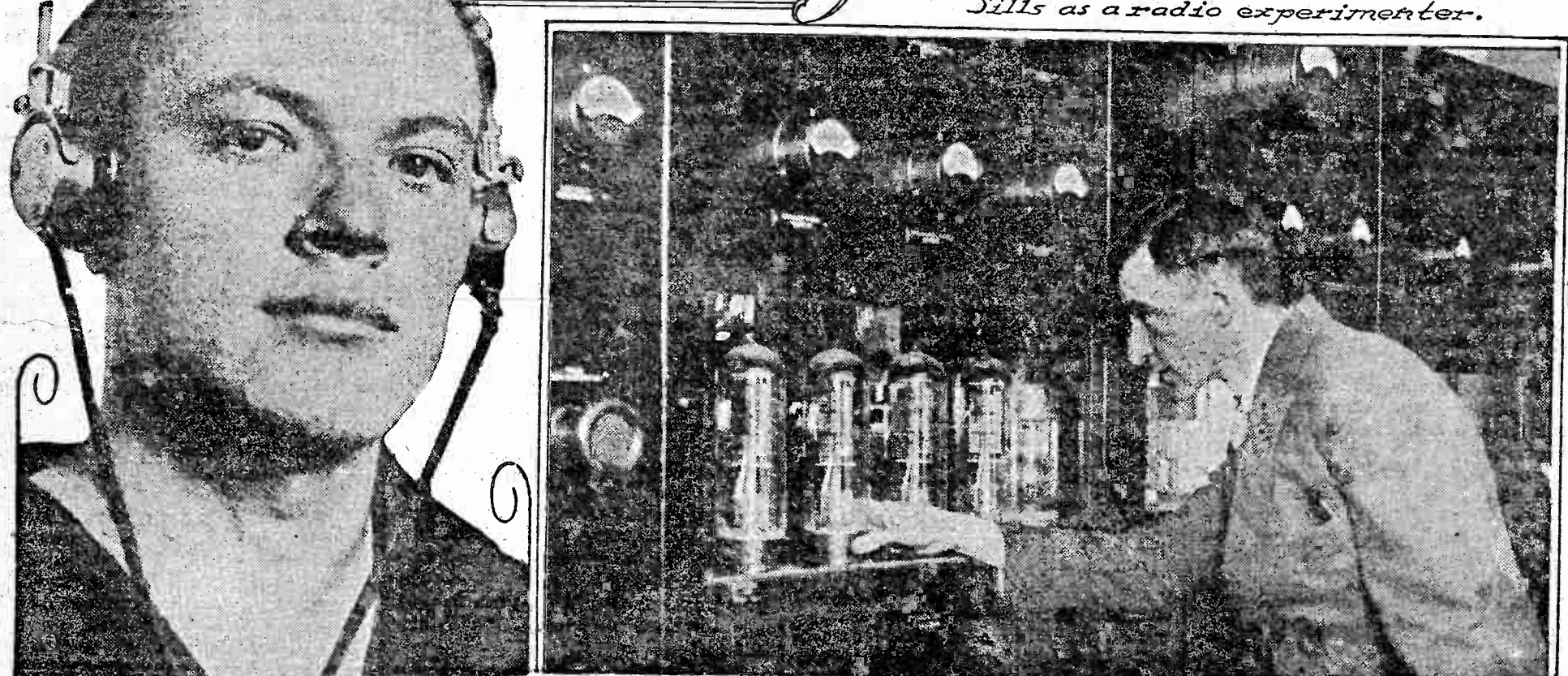


Marconi  
revolving  
wireless beam  
transmitter at  
South Foreland,  
England.



Graham  
McNamee,  
of Station  
WEAF, receives  
a gold cup as the  
most popular radio  
announcer.

The unguarded Hour, a film now being  
produced in New York, includes Milton  
Sills as a radio experimenter.



Radio man James Herrin, who received  
at the submarine base, New London, the  
news of the S-51 disaster. His good work  
earned him a promotion.

The modulator panel  
at Station  
WLWL, New York.



# Mr. Bink's Radio

who has played eighteen holes of golf Saturday afternoon and then read until 1 or 2 a. m. and who has to sit and listen to a sermon in a hot church.

About the middle of the twenty-fourth year Dodson Bates's wife passed on to a better climate, and it was when she had been an angel for about six months that I managed to coax Dodson Bates to come to my house and listen to my radio. I had to coax him for two months, and then he came reluctantly, and all we got that night was static and squeals. Dodson Bates came five times and all we got was static and squeals, and he got plumb disgusted and said he wouldn't have one of those radio machines in his house for a million dollars. He said he could not be hired to have one, and nobody could get him to listen in again for any amount of money.

That's how things were when we were coming out from town one afternoon on the 5:15 train, and four of us were playing 500—Bink and Dodson Bates and Joe Minch and I—and Joe Minch happened to mention that he had just bought a radio outfit. He said it was one of the sort that is built like a phonograph cabinet, like a Victrola.

"And it's wonderful," he said. "Why, last Sunday I sat there in my own living-room and heard a whole church service, right direct from the church."

Dodson Bates looked up instantly. "With the sermon?" he asked. "Could you hear the sermon, too?"

"Absolutely!" Joe Minch said. "Clear as anything. Every word."

"And your radio is built like a Victrola? About four feet high, say?" asked Dodson Bates, getting more and more excited.

"That's right," Joe Minch told him. Dodson Bates threw down his cards and got out into the aisle.

"What's the matter?" I asked.

"Matter!" Dodson Bates exclaimed. "Matter? I'm going to get off this train at the next station, and I'm going back to town and I'm going to buy one of those radio machines like Joe Minch's. Yes, sir! I'm going to have it sent to my house and I'm going to rig it up, and next Sunday morning I'm going to turn on the sermon and pull my biggest and easiest easy chair up to that machine, and I'm going to put the ear things on my ears and sit down in that chair and put my feet on top of that radio cabinet and go to sleep! And every Sunday morning for the next twenty-four years I'm going to turn on that sermon and sleep right spang through it from start to finish!"

And I shouldn't wonder if he did. He has always been very bitter about sermons.

## Talking About Bink

But what I wanted to say was that some of these people do annoy a radio enthusiast dreadfully. I remember what Dodson Bates told Joe Minch about me. Time and again, as I have told you, I invited Dodson Bates to my house to hear my radio, and he said to Joe Minch:

"This is how it works. Ellis comes to me and he begins grabbing about getting concerts and talks from Honolulu and the moon and further—from San Francisco and Poduk and Chicago and forty-eleven other places. And every night, too. He just goes home about 10:30 p. m. and turns the knobs and hears the King of Siam and Galli Curci and Napoleon Bonaparte and Skagway and Havana and Patagonia, all as clear as a bell and just as if they were in the next room. So I let him coax me to go and hear it. So I go. He sits me down on a sofa and says: 'Now! Now we'll see what we get!' And he turns sixteen knobs and all I hear out of the thing are grunts from some pig yard and then a couple of cats screeching on a back fence, and then one of the pigs gets caught under a gate and squeals bloody murder. That keeps up from 10:30 o'clock till 1:30 a. m., and then he says, 'I'll just use the ear phones until I get tuned in right.' So he puts on the ear phones to his ears and twists the knobs, and all at once his face lights with a glow of utter bliss and he turns his eyes to the ceiling and whispers with awe, 'Chicago! Chicago!' And he hands the ear things to me and I put them on and what I hear is, 'Past! Past! Ugh! Ugh! Yeow!' Some old cats and dogs and razor-back hogs. Ain't it awful?"

Some of your friends are like that always, but I know only two other individuals quite as unsatisfactory as Dodson Bates. One is my grandmother and the

(Continued from page one)

other is Mr. Bink's dog. Grandmother is a dear old soul, but she has never been able to get any satisfaction out of my radio whatever. I'll put her in a chair in front of my horn and shout—we have to shout at grandmother at the tops of our voices, she is so deaf.

"Now, grandmother, this is the great tenor; Rosario Bossi."

Grandmother will listen. She will keep herself up and strain her ears and fold her hands, across her stomach and close her eyes and just concentrate for all she is worth, and in a minute she will say:

"It ain't no use, Ellis; it ain't no use—it don't sound to me like nothin' but a log yowling."

Then I'll try her with the celebrated Boomeray Marine Band of one hundred and eight pieces and she'll say:

"It ain't no use, Ellis; it ain't no use—it don't sound to me like nothin' but a dog yowling."

Then I'll try grandmother with Galli Curci or Maria Forlona or Ethel Bethel

Butts or whatever great soprano happens to be singing that night, and all grandmother says is:

"It ain't no use, Ellis; it ain't no use—it don't sound to me like nothin' but a dog yowling."

That is mighty discouraging to a man who loves his radio and is eager and tremulous to have all his family and friends enjoy it, but, after all, a grandmother is a grandmother and you have to treat her kindly. As I said to Bink:

"Even if a grandmother does make mean remarks about a man's best radio efforts, he can't take her out and shoot her for it, as if she was a dog. But," I said, "if I had a dog like yours I certainly would take it out and shoot it."

Bink's dog—it is the other individual that does not appreciate radio—is what I would call an anti-radio hound, if I did not call it something worse. I don't know what is the matter with that dog unless it has invented a new disease that might be called radiophobia. The dog—his name is Caesar—is a large, yellowish dog with

sad eyes and burrs in his tail, and I think the trouble with him is that his liver over-amplifies and gives forth too much of the static he seems to be full of. As soon as Bink or any of Bink's family goes to the radio receiver, Caesar gets as close as possible in front of it, or behind it, or under it, if he happens to be in the cellar, and raises his head and rolls his eyes and opens his mouth and utters a loud, long, tremulous wail that is like the wail a soul in torture would utter if it was an especially loud utterer and in especially painful torture.

Caesar's wail begins with a sad but gentle wail, increasing and becoming sadder and sadder until it shakes the house and makes the dishes rattle in the house next door. Then Caesar pauses for breath and begins again and tries to beat all records for sadness and blood-curdlingness and loudness—and does it. Then he pauses for breath again and does it again, louder than before. People who hear Caesar wail to the radio a couple of times want to rush out and commit suicide before they have to hear him wail again.

And it does not seem to make any difference what comes out of the radio horn; one thing is as good as another to Caesar. A high-class soprano solo and a wad of static and a lecture on baked beans are all the same to Caesar. A link of fat code that sounds like sausages frying and a few remarks by a Boy Scout person are both equally disagreeable to Caesar. A broadcast fox trot from Denver that says nothing but the "Thum-thum-thum" of the drum, and a thousand-dollar-a-night barytone from Newark give him equal pains in his howler. No matter what is turned on the etheric waves seem to penetrate to Caesar's secret inwards and make him let loose all the agony of soul that has been accumulated by all his ancestors since the time of Adam and Eve. I told Bink quite frankly that if I had a dog like that I would shoot him. But Bink is fond of the dog.

On this particular night Bink came over to my house and dear old grandmother was sitting in front of my loud speaker saying:

"It ain't no use, Ellis; it ain't no use—it don't sound to me like nothin' but a dog yowling."

I saw a look of fiendish triumph come over Bink's face: the look of a man who thinks he has a better radio set than yours.

"I don't wonder," he said. "That set of yours never did sound like anything but a dog yowling. Miserable loud-speaker you've got. Now mine!"

## Grandma and Bink

He turned to grandma and shouted at the top of his voice:

"Grandma, you ought to come over and hear my radio. I've got a good radio. Not like this. I say NOT LIKE THIS. I say, come over and hear mine."

"I'd be pleased to," grandma said. "This one never sounds to me like anything but a dog yowling."

So there she went after all the trouble I had taken for weeks and weeks to make her enjoy my radio, trotting over to Bink's house.

He took her in the living room and set a chair for her and eased her into it, and she folded her hands across her stomach and closed her eyes and leaned back in the chair. Bink picked up a newspaper and looked at the broadcast programs, and that dog of his—that miserable anti-radio hound, Caesar—got up and walked over to the loud speaker and put his tail between his legs and raised his nose and got ready to pour forth his agony in sound. Then Bink went over to grandma and shouted to her:

"I'm going to get WKX first, grandma," he shouted. "WKX. I say I'm going to get WKX first. Singing! I say it will be singing! It's Ethel Bethel Butts singing, grandma. It's Ethel Bethel Butts, the great soprano, singing. From WKX."

"Yes, yes! I hear you," grandma said. "Ethel Bethel Butts, the soprano, singing." So Bink walked over to his radio and turned on the knobs. It was a bad night—a static night—and nothing came out but spits and fizzles. But that was enough for Caesar. He sat down on his haunches and elevated his nose and yowled ten times louder than a steam siren and forty times as sadly. And in an instant two big tear drops welled into grandma's eyes and trickled down her dear old cheeks and she gave a sigh of satisfaction and said:

"My, my! I hear her perfectly. Ain't she got a lovely sweet, sad voice?"

## The Evolution of Condensers

(Continued from page two)

which meshes with the flat rack holding the moving plates being fastened to a shaft on which the usual external dial is screwed.

The "straight line frequency" condenser, so much in the public eye at the moment, is one whose plates are of such shape that when the instrument is properly matched to a correctly designed coil the broadcasting stations are spread evenly over the dial according to their kilocycle (frequency) figures. The effect is accomplished by cutting away either the rotary or stationary plates in a certain geometric fashion.

The regular condenser using semi-circular plates is said to be of the "straight line capacity" type, its capacity, independent of its effect on the rest of an associated circuit, varying directly according to its setting. Thus, if the capacity is a certain amount at a dial reading of 10, it is twice as much at 20, three times as much at 30, and so forth. There is also a "straight line wave length" condenser, similar in its plate shape to the straight line frequency condenser, which, when used under the proper conditions, separates wave length figures evenly over the dial just as the latter distributes the frequency figures.

## S. L. F. Type Popular

Practically every condenser manufacturer is making an S. L. F. condenser to meet the popular demand. One very prominent firm, however, believes that true straight line frequency conditions are difficult of attainment in actual practice with coils selected at random, and that S. L. F. condensers possess mechanical defects, so instead of marketing an S. L. F. condenser it offers a unique dial which gives a straight line wave length effect with an ordinary straight line capacity condenser. The same company does have, though, a condenser whose rotary plates are cut away slightly to furnish a more gradual capacity increase at the lower end of the scale than its standard model permits.

Many of the new condensers can be obtained in nests of two, three and four statvars with a common rotor, for use in controlling several tuned radio-frequency stages at once. Some of the single condensers are so built that they can be connected in tandem if desired, the makers supplying special supporting brackets and coupling joints for the purpose. Others have special little pulleys provided on their shafts so that they can be turned together when mounted separately on a panel by means of a fish-line coupling.

Many of the other improved details of condenser construction as exemplified in the latest models can be given only slight mention. There are conveniences such as one-hole panel mounts; reduced over-all sizes; dependable gear and friction verniers; stronger pig-tail connections and better wiping contacts; absence of troublesome back-lash; 360-degree scale movement, etc.

In general, the improvements that have been made have been mechanical, but improvements in electrical efficiencies have

invariably resulted at the same time. So widespread has the betterment been that even the very cheapest affairs display highly acceptable characteristics; it is difficult, in fact, to purchase a really poor condenser nowadays.

## Radio Exhibits at Electrical Show

Everything new electrically, from the latest innovations in electro-therapeutics to electric kitchenmaids, from four-wheel tractors to curling irons and from the most advanced discoveries in the radio world to the newest fireless cooker, will be publicly exhibited and demonstrated in the Grand Central Palace October 14 to 24.

Electrical authorities are united in the opinion that this year's exposition will be the most comprehensive electric show ever held. The last year has seen remarkable strides in the invention and perfection of electrical devices. Indeed, so many devices have been developed recently that, together with the new models of electrical equipment already well known to the public, three entire floors of the Grand Central Palace will be occupied by the exposition.

The radio exhibits alone should make the coming electrical exposition the most comprehensive and the most interesting ever held, according to Arthur Williams, vice-president commercial relations of the New York Edison Company. "The radio exhibits in this year's show will be the most extensive ever shown in one place," Mr. Williams states. "Several of the most important of these exhibits will be under the direction of the radio division of the navy and the Signal Corps of the army. Indications are that every type of radio device now in use anywhere in the world, from the simple crystal set to the newest devices for transmitting photographs by radio, will be publicly demonstrated."

## Something New in Audio Amplification

(Continued from page four)

component values, but, once these have been found, they need never be altered, and the set will henceforward be foolproof.

Using only a detector and one small power tube, loud speaker signals can be obtained which will be audible 100 yards away or more, for a modulated output of seven milliamperes or more can be obtained. The crystal purity of the reproduction given by this unique circuit is truly remarkable, and will surprise those who have become used to the imperfections of iron-core transformer coupled A. F. amplifiers.

The absolutely complete absence of distortion when receiving from a high-class broadcasting station is almost uncanny, and will serve to prove to doubters that the modern loud speaker is by no means so imperfect as it is generally made out to be.

## Qualitize YOUR RADIO SET!

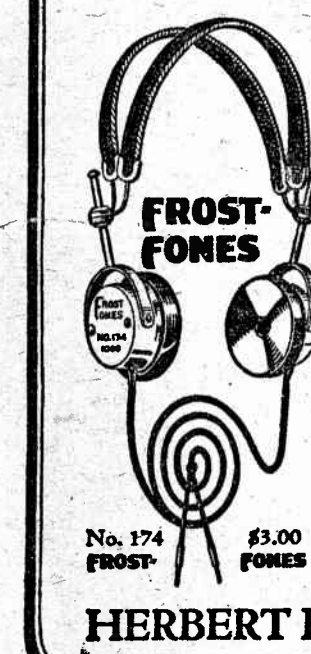
YOU can't use a 1920 Model Radio Tube in a 1926 Model Radio Set and expect to get maximum performance. Qualitize your Radio Set! Brightson True Blue Radio Tubes insure your getting maximum set performance because:

1. True Blue Tubes are absolutely uniform—each tube is perfect—operating at maximum efficiency.
2. True Blue Tubes last two to three times longer than ordinary tubes—special filament gives longer filament life.
3. True Blue Tubes are non-microphonic—they operate noiselessly without shock-absorbers.
4. True Blue Tubes have silver contacts and non-conductive bakelite bases. There are no corrosion or conductive losses.

Price \$3.50 each  
BRIGHTSON LABORATORIES, Inc.

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For Clearest Reception  
No other loud speaker offers you clearer reception of broadcast voice and music than does MUSETTE, the FROST-RADIO Loudspeaker with the silver voice from the bakelite bell. Your dealer can supply you. Order from him today. Musette, Black Crackle Finish, list . . . \$12.50

FROST-FONES  
Best for Your Radio Receiving Set  
Also a full line of accessories and parts—Plugs, Jacks, Adapters, Extension Cords, Rheostats and Potentiometers.

HERBERT H. FROST, Inc., Chicago

If you want to buy, sell or exchange your radio sets or parts the Radio Exchange will help you.

World Radio History

## Two Chicago Hotels Install Receivers In Guests' Rooms

Radio means so much to many people, once they become "addicted" to it, that it has lead many hotels throughout the country to supply radio service for their guests.

It was after considering many plans and types of sets that such hotels as the Drake and the Blackstone, in Chicago; the new Roosevelt, in New York; the Copley Plaza, in Boston; the Benjamin Franklin, in Philadelphia, and others adopted the Operadio.

The set is entirely self-contained. This means that there are no outside connections to be made—not even aerial or ground. The instrument uses six tubes, which means that the guest can obtain as great a volume as can be desired. When the instrument is delivered the radio man, or in some cases the bell-boy delivering it, shows the guest how it is operated. This takes but two or three minutes. He shows, for instance, that the little meter on the panel is to be used as a guide when turning on the current, so that too much will not be turned on. He then demonstrates that all that is necessary is to turn the two controls in unison to change from one program to another. This is all there is to it. To turn the instrument off, the guest merely has to turn the little wheel to the left.

In the big cities selectivity is a very important consideration because of the proximity of several broadcasting stations. In Chicago, the powerful Drake Hotel-Tribune broadcasting station is on the roof of the Drake Hotel. With many sets it is literally impossible to tune out this station, but the Operadio met this severe test of cutting out this station, WGN, and tuning in others.

Thus, the guest who has occasion to travel can spend a quiet evening in his room, and at the same time enjoy wonderful programs from the leading radio stations. The great demand for this radio service in the hotels which adopted it, is the best indication of the desire on the part of the traveling public to enjoy radio even when away from home.

## List of Morning Features of Special Interest to Women

At 10:45, on Columbus Day, the Betty Crocker Gold Medal Home Service Talk will tell of an "Aristocratic Vegetable." Two worth-while addresses will be made: Dr. Harry J. Carmen, professor of history at Columbia University, on "Causes of the Discovery of America," and Mr. Winter Russell, prominent New York lawyer and an eloquent speaker, on "The Will Spring."

Tuesday will bring a musical program, a lecture by Mr. Kemble under the auspices of the Board of Education, and a motion picture forecast on the new "movies" by Adele Woodard, president of the National Motion Picture League. On Wednesday Betty Crocker will continue her menus, "To Eat and Grow Thin." Besides a musical program there will be a talk for mothers and a health lecture.

During the Housewives' Hour at WEAF on Thursday Mrs. Lilly Hawthorn Wallace, writer, lecturer and food specialist, well known to the American woman for her practical and helpful methods of teaching, will speak on "Goodies for the Halloween Celebration." This will be of help in planning halloween parties. Vee Lownhurst, popular pianist, will play. Mary E. Pennington will speak under the auspices of the National Association of Ice Industries on "Household Refrigeration."

On Friday Betty Crocker will tell how to make a "Waffle Breakfast." The second talk in the series by Mrs. Charles Gregory, New York State Chairman of the New York State Federation of Women's Clubs, will be "The Homes of New York," a plea for better homes. Mrs. Rollin Lynde Hart, formerly Miss Helen Harrington, of the Coburn Players and a lecturer of note, will continue her series of talks under the auspices of the United Parents' Association on "Ourselves and Our Children."

De Witt Clinton Hall Concerts To Be Broadcast by WRNY  
WRNY announces that it will broadcast all the Charles D. Isaacson concerts at De Witt Clinton Hall, Sunday nights at 8:15 to 10:15. The opening event brings the Norfleet Trio, Cornelia Zucchari, operatic soprano; Lorna Lea, "The Love Song Girl," and others.

Charles D. Isaacson is program director of WRNY and his concerts under the auspices of the City of New York are now in their tenth year and have totaled over 4,000 in number.

The First Radio Set Built by Production Engineering Methods—Also the First "One-Profitee Receiver"

TRINITY  
SIX

\$50

Beacon Radio Mfg. Co., Inc., the Radio Receiver Division of "the world's greatest parts plant," announces to the radio public three of the outstanding achievements in the TRINITY SIX:

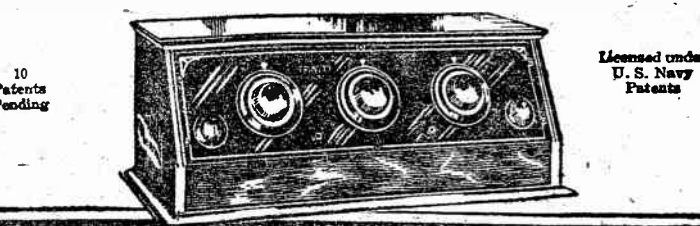
1. The elimination of the main cause of set trouble, even in the costliest receivers (connections soldered by inexperienced workers), is achieved by Beacon construction. The use of continuous 1/2-in. wide nicked phosphor-bronze strips, eye-letted to a canvas-bakelite sub-panel by special Beacon-designed machinery, eliminates practically all soldered connections in TRINITY SIX, saving labor for us, and trouble and money for the user.
2. The elimination of all profits to outside manufacturers, except those paid for raw materials, is another exclusive Beacon feature. Even the cabinet and panel of TRINITY SIX are "Beacon-Built" from raw stock. So, also, are the straight-line frequency condensers. Every special nut, bolt and screw in the TRINITY SIX is made by Beacon.
3. TRINITY SIX is the first production-engineered radio set. The Beacon receiver plant was planned and built solely to turn out the TRINITY SIX. Neither TRINITY SIX nor any part embodied in it is a side line of any other business. Beacon builds radio only.

## What Beacon Gives You For Fifty Dollars

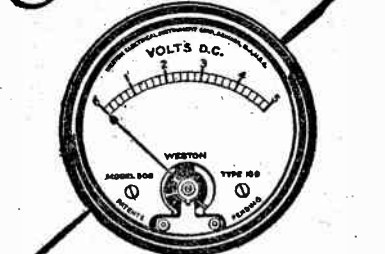
A six-tube set; two stages tuned radio frequency for distance; one detector stage, one stage transformer-coupled audio amplification for volume; two stages resistance-coupled amplification for clarity of tone; straight-line frequency condensers for easy tuning; filament-control jacks for head phones and speaker (which can be used together); solid bakelite used in dials, rheostats, grid leaks and resistances; special "B-Conomizer" (saves "B" batteries); canvas-bakelite socket-cushioning sub-panel; hand-capacity-eliminating front panel; mahogany-finished cabinet 28" x 11" x 13" with liberal space for "B" batteries and dry cells; five-cord colored battery connection cable built in set.

Write for full description and specifications, in our free booklet—"The Value Only Beacon Can Give." We will inform you of the TRINITY SIX dealer nearest your home.

Sold only by Trinity Dealers. Manufactured by  
BEACON RADIO MFG. CO. 323 Berry St., Brooklyn, N. Y.  
(Broadcast Receiver Division)



## The BEST from any set



WESTON  
Model 506 Panel  
Volts 2" Diameter

It insures the longest life in tubes and batteries, the most accurate tuning, distance, tone and volume. It gets the best from any set! Drain on batteries is insignificant because of high internal resistance.

Weston Electrical Instrument Corporation

301 Weston Avenue, Newark, N. J.

STANDARD THE WORLD OVER  
WESTON  
Promoted since 1888

\$3.00  
A YEAR  
Adds to  
Your Radio Enjoyment  
SAVE MONEY,  
MAKE NEW RADIO FRIENDS  
BY JOINING

"The Fraternity of Radio"  
and Wear This Button



WRITE AND ASK US TO SOLVE YOUR RADIO PROBLEMS  
WE ARE PLEASED TO SERVE YOU  
National Radio Service League, Inc.  
830 AEOLIAN HALL  
NEW YORK

BEST YET! shock-proof  
BRACH  
Radio Plugs

TALKING  
TAPE  
THE PERFECT RADIO AERIAL







# The Herald Tribune Daily Broadcasting Programs for Week Ending October 17

## Eastern Standard Time

[illegible]



### WGY to Use Super-Power Twice Each Week in Future

Listeners throughout the country will be able to make further observations on super-power, its advantages or disadvantages. WGY has been authorized by the Department of Commerce to use fifty kilowatts on its antenna twice a week for regular broadcasting. This authorization is granted subject to withdrawal if high power causes interference.

WGY is the first station in the country to use super-power in regular broadcasting, and it was the first station in the world to broadcast on fifty kilowatts. The regular programs of Saturday and Sunday evenings will be broadcast on super-power, beginning October 3.

Tests on high power through WGY heretofore have been made under the worst possible atmospheric conditions. The first series of tests were conducted in July, the second in August and the third were completed this week. It is expected that with the cooler weather of the fall, season greater distances will be possible and the effects of increased energy will be more pronounced generally.

Since the initial tests many changes have been made in the transmitter, and with the tests just completed an entirely new antenna system was used. Other changes probably will be made from time to time to transmitter and antenna as the engineers, aided by the observations of fans, find that transmission can be improved.

Super-power is only one phase of extensive developmental work in transmission which is being carried out by the General Electric engineers at the developmental laboratory. At this great laboratory, covering fifty-four acres of ground, engineers and research men are working on problems which it is hoped will result in improved transmission and ultimately in greater enjoyment of broadcast programs by the listeners.

Simultaneously with the work on super-power, engineers are experimenting with short and long waves. Transmitters and antenna systems have been devised for broadcasting on twenty meters and forty meters. There is another transmitter for 109-meter signals and a fourth for 1,660. All programs of WGY except noon and evening market reports and Sunday services are broadcast on all these wave lengths and reports are received from special stations throughout the country.

### Bureau of Standards Warns Dealers About Radio Batteries

The Bureau of Standards again warns that dealers and factory representatives must not use its name in connection with the sale of dry batteries for radio receiving sets.

"The attention has been called to the frequent misuse of its name in connection with the sale of dry batteries for radio receiving sets," says the announcement. "Claims have been made by some dealers and factory representatives that the superiority of their particular brands of batteries has been shown by tests made at the Bureau of Standards. Tests of batteries, including dry cell A and B batteries for radio use, are made at the bureau in accordance with government specifications. These tests are made to aid the departments of the government in the purchase of batteries and to help each manufacturer to improve his product. The bureau does not publish the results of its tests, nor does it inform any manufacturer of the results of its tests on other manufacturers' batteries. Therefore statements that any make or brand of battery is superior as shown by tests at the Bureau of Standards are unwarranted."

### Charles Garland, Song Writer, Becomes Director of WBBM

Charlie Garland, song writer, barytone and pianist, has been made both program and studio director of Radio Station WBBM, it was announced by Ralph and Leslie Atlas, co-directors of the station.

Garland has been with WBBM since early this year, and "appeared" over other Chicago radio stations, and was a "movie" organist in this city prior to that time.

He is the writer of the words and music of several popular songs, including "Mississippi Blues," his latest, "Sweet Mother Mine," and "Want a Little Love."

His latest contribution to radio is a series of radio musical comedies, which he is now writing to be put before the microphone of WBBM, beginning shortly.

### Banks Kennedy, Well Known Organist, Joins WOK Staff

Banks Kennedy, former organist at the Capitol Theater, Chicago, has signed up as a regular member of the staff of Station WOK. Kennedy's organ playing has long been considered a special feature of the program wherever he has appeared, and his initial performances for WOK give evidence that his popularity will continue.

### WSM Station at Nashville Has Woman Program Director

When WSM, the powerful new-type 1,000-watt Western Electric transmitter of the National Life and Accident Insurance Company, Inc., Nashville, Tenn., adds its voice to Dixie's broadcasters on Monday night, October 5, the station will be unique in that it will have in active charge of programs one of the few women program directors in the radio world.

Miss Bonnie Barnhardt, formerly of WSB Atlanta, Ga., has accepted the post of program director and radio editor of the Nashville station. Miss Bonnie is beloved of countless thousands of little folk and grown-ups for her Southern lullabies and bedtime stories.

The National Life and Accident Insurance Company is giving Nashville a mouthpiece by which the

### Radio Helps Develop Stars for the Stage

Radio continues developing stars for the stage. Last week while the famous Duncan Sisters, playing in "Topsy and Eva," were singing at station WGN, Chicago, they heard Vernon Rickard, the handsome staff tenor of the studio, rehearsing some ballads. They were so taken with the appearance, voice and dramatic possibilities of the young singer that after one try-out he was given a one-year contract with their company to sing the leading role. After filling Middle West engagements, the company goes to London. Rickard, since his graduation from Notre Dame University in 1924, has been assistant announcer and tenor soloist at WGN.

world will learn of the city often referred to as "The Athens of the South" because of its great educational institutions.

The National Company has followed the popular policy of adapting its call letters to its slogan "We Shield Millions," and the new station will operate on a wave length of 282.8 meters.

### Nighthawk Organizer Leaves Kansas City for WJR, Detroit

The "Merry Old Chief" is packing his bag and good cheer and moving eastward. He is leaving "The Kansas City Star's" station, where as one of the real pioneers he helped to put broadcasting on the map, and on September 28 he joins the staff of the new Jewett Radio and Phonograph Company's station, WJR, of Detroit and Pontiac, Mich.

The "Merry Old Chief," or Leo Fitzpatrick, as he is known outside the radio world, has a personality that has endeared itself to millions of listeners-in. To him is due the amazing growth of that popular radio organization known as the Nighthawks. There are now 250,000 of them, and the membership keeps on growing. He organized the Nighthawks, and his merry good nature has been the food on which the membership grew.

### WGY Programs Return This Week to Eastern Standard Time

WGY, the Eastern station of the General Electric Company, which advanced the time of its program one hour during the period of the year when daylight saving time was in effect in many communities, returns to Eastern standard time, with the program of the week of September

27. The evening musical program will start at approximately 7:30 o'clock, instead of 6:30 Eastern Standard time.

### WHEN WINTER COMES!

TWENTY-FIVE of the world's leading opera singers and other musical stars will enliven dreary winter evenings with their radio entertainment. All brought within the confines of your home with a

**Stromberg-Carlson**  
SPECIALS  
ATWATER KENT MODEL 22 \$115  
FADA Neutrolite Five Tube \$122  
DE FOREST MODEL D17 \$145  
RADIOLA SUPER METROLYNE 1445 Accessories \$116  
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OUR TERMS ARE UNUSUALLY EASY

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541 E. TREMONT AVE.  
Phone Tremont 6037  
Mail and Largest Radio Store in Chicago PROMPTLY FILLED

# THE NEW YORK HERALD New York Tribune RADIO MAGAZINE

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SECTION SIX

SUNDAY, SEPTEMBER 27, 1925

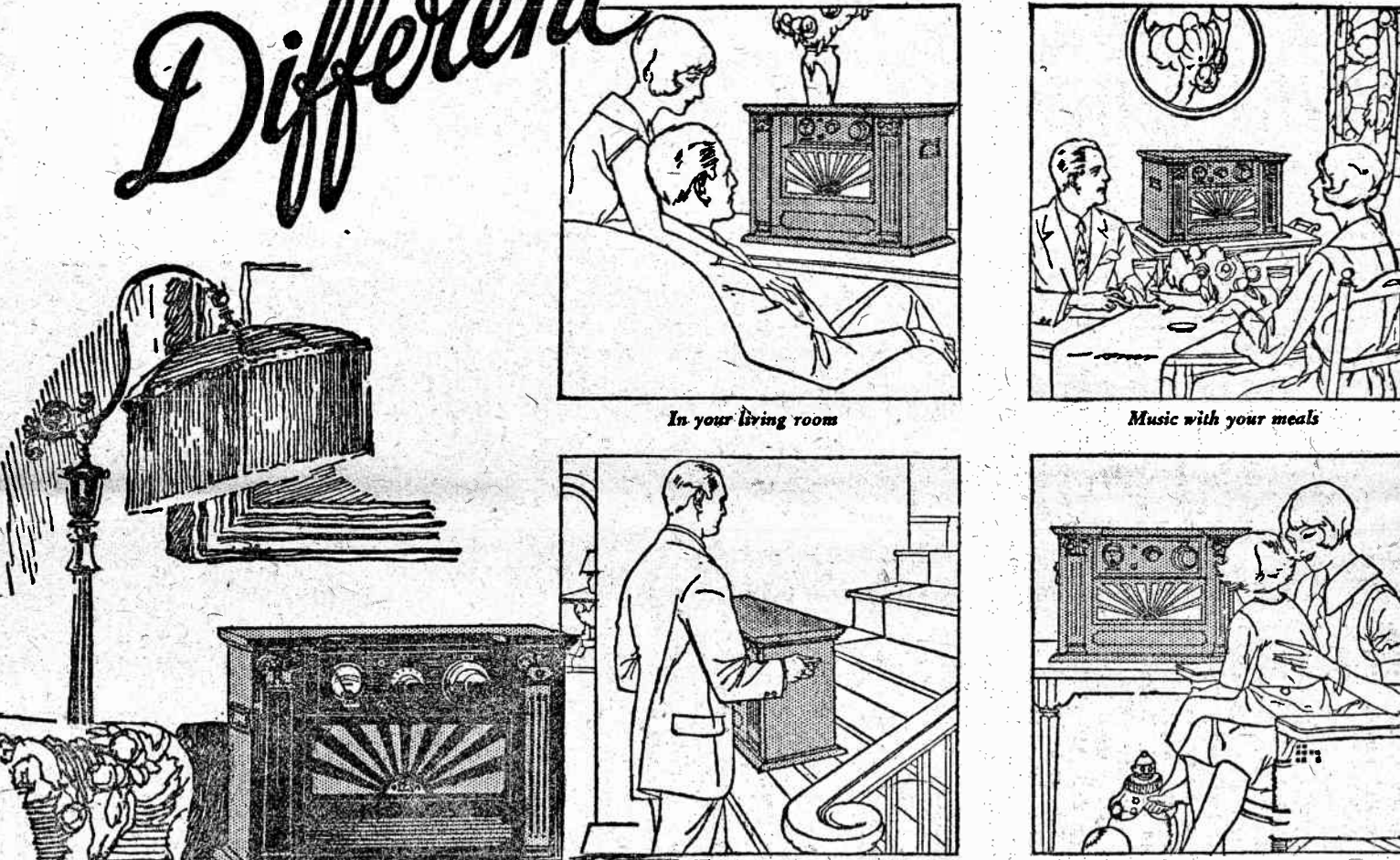
16 PAGES

## The Radio Discovery of the Century

Bill Johnson Devellops a Theory, Puts It Into Practice and Astonishes Two Fellow Fans; "So Simple as To Be Ridiculous," Says One

By EDWIN KEEN CORTRIGHT

*Different*



In your living room

Music with your meals

Upstairs or down

In any room in your home

### The CONSOLETTTE

Bringing Operadio Convenience in a Cabinet of Classic Beauty

The Operadio may be purchased in the mahogany Consolette model shown above, or in a smart looking carrying case, which may be closed and taken with you anywhere. For those who want the beauty of a furniture model combined with the convenience of absolute portability, a distinguished walnut cabinet—The Tudor—is available for housing the portable set in the home.

Prices without tubes or batteries. Portable \$160; Consolette \$180; Tudor Cabinet (for housing portable) \$68.

The Operadio idea was conceived sixteen years ago when J. M. Stone built the first successful self-contained radio receiving set, using a kite to carry the aerial wire aloft. The accompanying sketch was made from a photograph taken in 1909.



The advantages—in convenience and in performance—that have made the Operadio so phenomenal a success during the past two years, are now offered in the new Consolette, a semi-portable cabinet model.

The compactness of this jewel-like set makes it the ideal radio for home. The rich beauty of its dark mahogany case will appeal particularly to women.

Think of it! A completely self-contained instrument. No wires or connections; no visible touch to mar communion with the invisible. No

awkward horn, no ugly wet batteries to be seen. So clear, so perfect, so easy to tune. The radio which makes the whole world speak and sing and play to us!

And—no less important and desirable—a set you can pick up and carry to any part of the house. Always ready, always dependable—the very finest quality of radio reception you ever listened to.

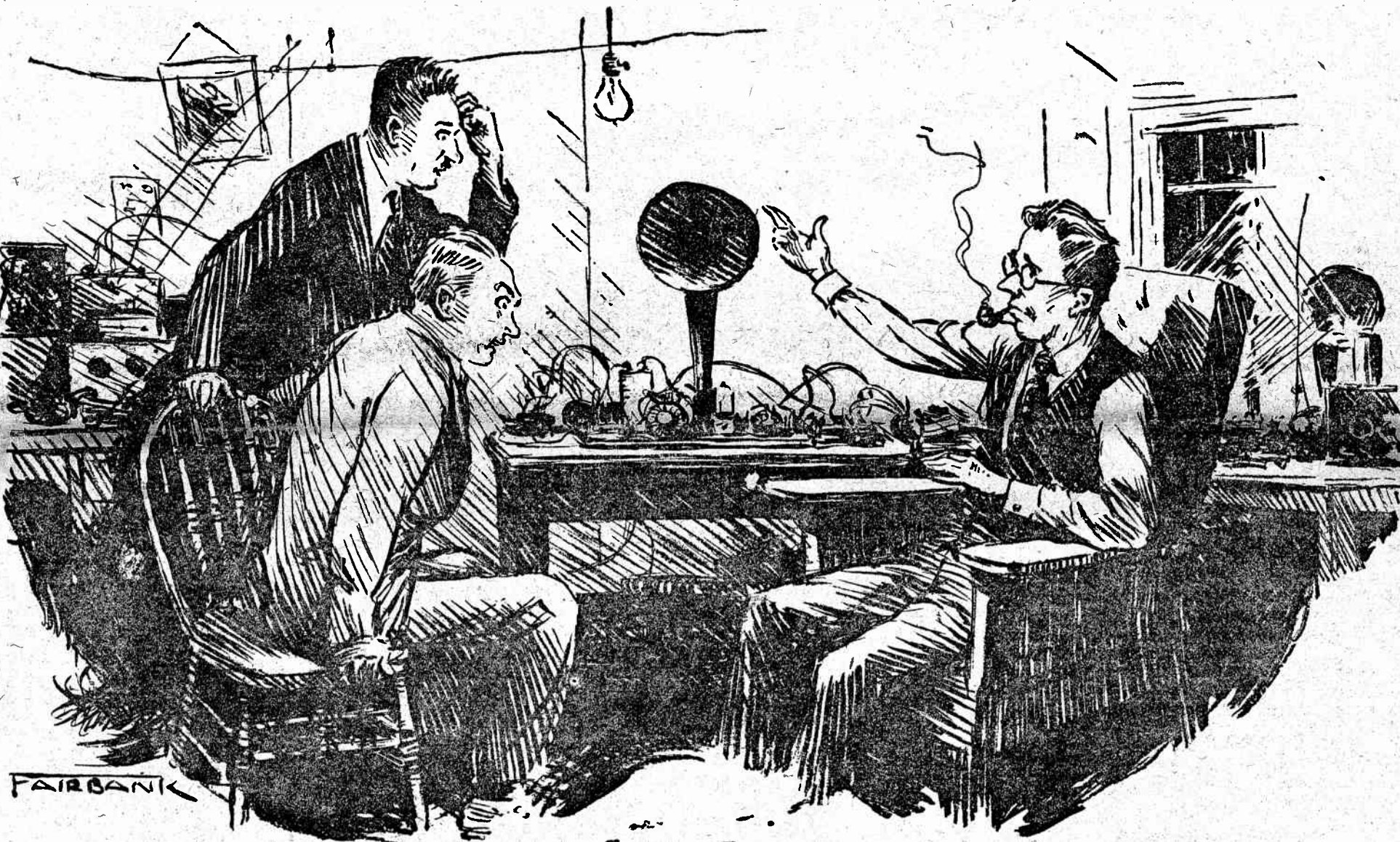
Hear this marvelous instrument at your dealer's. Or ask him to bring an Operadio to your home, where you may see how it enhances the beauty of your drawing room.

THE OPERADIO CORPORATION  
8 So. Dearborn St. Chicago, Illinois

# OPERADIO

The Original Self-Contained Radio

For further information call, write or telephone Operadio Sales Corporation, 1476 Broadway (Times Square), New York



"The effect of hearing this quiet inventor casually discuss the greatest discovery of the century was simply overwhelming."

WHATEVER the future outcome of this matter may be, Bill made it work. Of that there can be no doubt, and for its accuracy both Dick Parsons and myself will furnish affidavits. Whether or not it is true that after he secures his patents on the Johnson Electro-Conductive Switch there will be but one type of radio receiving set used in America must remain to be seen. How it was that Bill ever happened on the theory and how he worked out his idea must be left to better heads than mine to determine. The fact remains that Bill Johnson's one-tube set, equipped with his new switch, consistently brings in such stations as KGO, 2LO and PP.

From early boyhood Bill had always been known as a genius around his home town of Newton Center. At an early age his mechanical ability had been apparent. As he grew older his favorite delight became the overhauling of discarded flivvers and motorcycles. Be assured, in most cases, no matter how decrepit the tin Lizzie, Bill, by some mysterious means, would succeed in restoring much of its pristine vigor.

It was with the advent of radio broad-

casting, however, that Bill came into his own. Here it was he struck his pace; all his previous existence seemed as a trance in view of his present activity. Coils and condensers, inductances and capacities, henries and ohms, all were easy for Bill. Instinct and nature had so endowed his faculties and constructed his brain that for him every radio set was a case of love at first sight. Subconsciously Bill would grasp its technical merits and complications.

### Bill Is a Radio Bug

To estimate how many sets this radio marvel had constructed and repaired would be a most interesting study. To my knowledge he has built more than twenty-five sets for his personal enjoyment. At the present time, however, Bill is satisfied the ultimate has been reached and is convinced from now on most of the experimental work will be done in perfecting the television apparatus in connection with radio reception.

How readily that rainy, foggy evening comes to mind when Dick Parsons and I accepted Bill's invitation to inspect his new set! Only three months had passed since Bill had patented his double sec-

ondary coil, with one secondary giving increased voltage and one increased ampere. Consequently the current gossip of some new stunt developed by Bill served as a stimulant to our curiosity.

As we passed to the workshop on the third floor the sound of bagpipes met our ears.

"Black Watch pipers from 2LO," volunteered Bill.

Just then, turning the only condenser dial, he brought in the nasal tones of the Eiffel Tower announcer.

"Station PP," said Bill with a grin. "I guess they struck it right down at the hardware store when they said you had a new wrinkle, Bill," said Dick after a pause.

"Well, I don't know but that we have landed something out of the ordinary," Bill drawled; "but come closer and look it over."

Eagerly Dick and I pressed toward the set. There was very little to see. One variable condenser, one tube, a peculiar arrangement of four metallic strips near the terminals of a multi-cell battery and a loud speaker; that, substantially, was all. And to think that on this one-tube set we had just heard London and Paris! Amazement radiated from Dick's face. Shifting

the condenser dial, Bill swung from station to station across the United States, bringing in KGO with the clarity and volume of the locals.

As hour after hour went by our curiosity increased more and more. How on earth did he do it? Finally we demanded that Bill shut off the set and give us a detailed account of how he had happened on such a revolutionary change in radio construction.

Stretching himself out in the Morris chair, Bill began:

"Well, you see, for some time past I've had an inkling radio reception was not progressing along the correct path. Being considered an electrical development, it has been handled in the light of our electrical theories derived from our experience with dynamic electricity. As a matter of fact, radio is not an electrical development but an entirely new division of electrical phenomena. Consequently we have been all wrong in building radio apparatus designed from our knowledge of dynamic electricity.

"Heretofore all our efforts have been concentrated on taking a tiny electric current from the air; then, by means of coils, tubes and transformers, amplifying this minute signal until it has strength enough to operate a loud speaker."

While Bill paused, Dick and I ex-

(Continued on page four)







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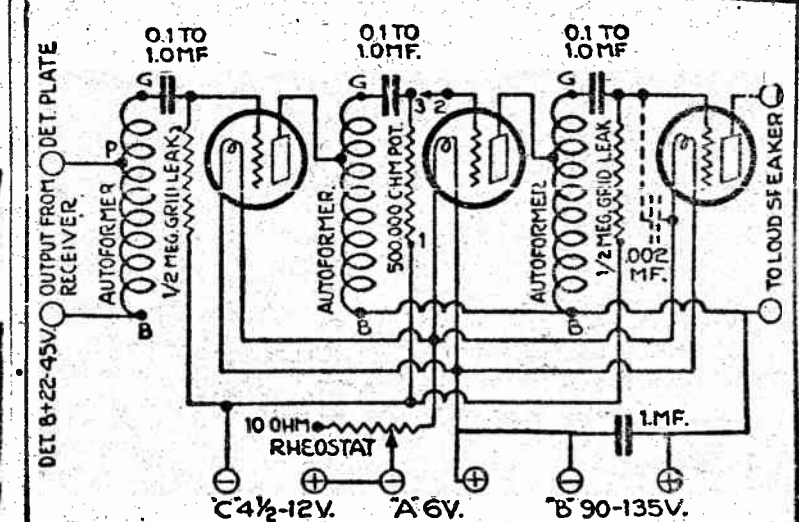
## An Impedance Amplifier

The demand of radio fans and manufacturers alike has been for an improvement in the quality of radio reception. Broadcasting stations have reached a stage of perfection where a crystal receiver or the detector stage of a tube set gives realistic and clear results.

The output of multibeam receivers, however, often lacks the full, rounded tones and the deep notes of the bass instruments. Amplification, to a more or less degree, has been at the sacrifice of tone and quality. This has been inevitable because many

choke coil for coupling, in place of the auto-transformer shown in the diagram, the plate lead is instead of being connected to the G terminal, as it is almost impossible to tap the secondary coil of a standard transformer. Tapping the coil is not absolutely necessary to obtain good results. If no old burned out auto-transformers are available a new auto-transformer can now be secured from any radio dealer. Full, clear notes and absolutely undistorted music will be had with this type of amplifier.

Jacks should not be used in this



WHEN USING REGULAR AUDIO TRANSFORMER SECONDARIES FOR AUTOFORMERS, WIRES MARKED 'G' AND 'P' CONNECT TO 'G' WIRE 'B' TO OTHER SECONDARY TERMINAL.

makes of audio-frequency transformers favor certain notes above others, and amplify them with greater volume to the partial exclusion of notes outside their range. The notes of the organ, tuba, bass viol, etc., below 100 cycles are amplified imperfectly or not at all by many transformers.

An excellent method to obtain amplification over the entire audible range is pointed out by the engineers of Centralab, Milwaukee. Standard audio transformers in which the primary windings have been burned out can be used for choke coils in a circuit similar to resistance amplification, but without the need of high battery voltages or as many stages to secure full volume.

In using the secondary of a standard type audio transformer as the

circuit. The surge of current caused by the sudden opening or closing of the circuit will frequently burn out the windings of the choke coil. Also the volume can only be controlled in steps, and in many cases the listener will want to get in between the second and third stages. This can best be accomplished by using a 500,000-ohm potentiometer in the grid circuit of the second tube. In this manner any desired degree of volume can be obtained and adjustments made without any annoying noises.

Three stages of this form of amplification will give slightly greater volume than two stages of transformer-coupled amplification, but the wonderful increase in tone quality makes the expenditure for another tube well worth while.

## Radio Programs

(Continued from page nine)

**WEAF—NEW YORK CITY—485**  
6:45-7:45 a. m.—Radio orchestra.  
7:45-8:30 a. m.—Ray Nichols' Orchestra.  
8:30-9:15 a. m.—Dinner music.  
9:15-10:00 a. m.—"Old New York."  
10:00-10:30 a. m.—Myrant Trumpet Quartet.  
10:30-11:00 a. m.—George G. Brown, tenor.  
11:00-11:30 a. m.—Claude Lapham, pianist.  
11:30-12:00 p. m.—Radio orchestra.  
12:00-12:30 p. m.—Adelphi Quartet.  
12:30-1:00 p. m.—Parnassus String Trio.  
1:00-1:30 p. m.—Adelphi Quartet.  
1:30-2:00 p. m.—Parnassus String Trio.  
2:00-2:30 p. m.—Marie O'Connell, soprano; James Haupt, tenor.  
2:30-3:00 p. m.—Leon Goldman, violinist.  
3:00-3:30 p. m.—Marie O'Connell, soprano; James Haupt, tenor.  
3:30-4:00 p. m.—Leon Goldman, violinist.  
4:00-4:30 p. m.—Alma Harris, pianist.  
4:30-5:00 p. m.—Robert Eisenbach, pianist.  
5:00-5:30 p. m.—Vincent Lopez's Orchestra.

**WJZ—NEW YORK CITY—455**  
1:15-1:30 p. m.—Irwin Abrams's Orchestra.  
1:30-1:45 p. m.—Scores racing (half hourly).  
1:45-2:00 p. m.—Amherst College vs. Princeton University football game.  
2:00-2:30 p. m.—New baseball racing.  
2:30-3:00 p. m.—Market reports.  
3:00-3:30 p. m.—Financial summary.  
3:30-4:00 p. m.—Baseball racing.  
4:00-4:30 p. m.—Scores racing results.  
4:30-5:00 p. m.—Tenor solos.  
5:00-5:30 p. m.—Radio orchestra.  
5:30-6:00 p. m.—Waldorf-Astoria Roof Orchestra.

**WMCA—NEW YORK CITY—341**  
6:30-7:00 a. m.—Oleto Valt's Ensemble.  
7:00-7:30 a. m.—The Apollons.  
7:30-8:00 a. m.—"What's Happening Now."  
8:00-8:30 a. m.—Leonard Hoenninger, barytone.  
8:30-9:00 a. m.—Leonard Hoenninger, barytone.  
9:00-9:30 a. m.—Erva Gies, soprano.  
9:30-10:00 a. m.—Ukulele Bob McDonald.  
10:00-10:30 a. m.—Ernie Golden's Orchestra.

**WNYC—NEW YORK CITY—525**  
12:30-1:00 p. m.—Police alarms.  
1:00-1:30 p. m.—Police alarms.  
1:30-2:00 p. m.—Baseball results.  
2:00-2:30 p. m.—Ralph Steffen, barytone.  
2:30-3:00 p. m.—Mildred Doran, violinist.  
3:00-3:30 p. m.—Stanley Silverburgh, musical.  
3:30-4:00 p. m.—Police Quartet.  
4:00-4:30 p. m.—Erma Avery concert, with Maribel Pratt, Norma Macaulay and Roger Bird.  
4:30-5:00 p. m.—Police alarms: weather.  
5:00-5:30 p. m.—Police alarms: weather.

**WOR—NEW YORK CITY—710**  
6:15-6:30 p. m.—Florence Rouda, songs.  
6:30-6:45 p. m.—Ralph Palmer, tenor.  
6:45-7:00 p. m.—Isabel Henderson, soprano.  
7:00-7:15 p. m.—Vladimir Tobolsky, barytone.

**WENY—NEW YORK CITY—530**  
12:30-1:00 p. m.—Luncheon entertainment.  
1:00-1:30 p. m.—Radio industry hour.  
1:30-2:00 p. m.—Pauline Brenner, songs.  
2:00-2:30 p. m.—Radio matinee.  
2:30-3:00 p. m.—Alex Chigirsky, pianist; Chris Mehan, tenor.  
3:00-3:30 p. m.—"Whose Birthday Today?"  
3:30-4:00 p. m.—Well sports and sports.  
4:00-4:30 p. m.—Commerce of the day.  
4:30-5:00 p. m.—Fairly tales.  
5:00-5:30 p. m.—Aunt Susan, songs.  
5:30-6:00 p. m.—Herman Schwartzman, pianist.

**WRBW—NEW YORK CITY—375**  
2:30-3:00 p. m.—Morton picture series.  
3:00-3:30 p. m.—Giuseppe Adams, violinist.  
3:30-4:00 p. m.—"Annie on the Radio."  
4:00-4:30 p. m.—Feminine news.  
4:30-5:00 p. m.—Studio feature.  
5:00-5:30 p. m.—Bernstein Trio.  
5:30-6:00 p. m.—Photographing the Family.  
6:00-6:30 p. m.—"Is Dancing Essential?"

**WBAB—BROOKLYN, N. Y.—340**  
6:15-6:30 p. m.—Dinner music.  
6:30-7:00 p. m.—Bible questions and answers.  
7:00-7:30 p. m.—Soprano, clarinet solos.  
7:30-8:00 p. m.—Musical program.  
8:00-8:30 p. m.—Dance music.

**WOB—NEWARK—405**  
6:45-7:15-7:45 a. m.—Gym class.  
7:15-7:45 a. m.—Dedicated exercises, Salaam Temple, Newark; Mayor Kendrick, speaker.  
7:45-8:15 a. m.—"Words Mispronounced."  
8:15-8:30 a. m.—Shelton Ensemble.  
8:30-9:00 a. m.—"Sporty" Bill W. They.  
9:00-9:30 a. m.—Flo Richardson's Orchestra.  
9:30-10:00 a. m.—Serenaders Quintet.  
10:00-10:30 a. m.—"The Van York Hour of Song," artists and quartet.  
10:30-11:00 a. m.—Serenaders Quintet.  
11:00-11:30 a. m.—Al Ritter's Orchestra.  
11:30-12:00 p. m.—"The Lost Atlantic."  
12:00-12:30 p. m.—Arthur Bachti violinist.  
12:30-1:00 p. m.—Arthur Bachti violinist.

**WAAM—NEWARK—263**  
7:15-7:30 p. m.—Blackstone Orchestra.  
7:30-8:00 p. m.—Alice Laurie, soprano.  
8:00-8:30 p. m.—Jolly Bill Steinko.  
8:30-9:00 p. m.—Thaddeus H. Colbeck, tenor.  
9:00-9:30 p. m.—Bloomfield Ridge Boys.  
9:30-10:00 p. m.—Manuel Ravell.  
10:00-10:30 p. m.—Bloomfield Ridge Boys.  
10:30-11:00 p. m.—Bloomfield Ridge Boys.

**WGCP—NEWARK—252**  
2:45-3:15 p. m.—Vocal and instrumental recital, race results.  
3:15-3:45 p. m.—Indianana Orchestra.  
3:45-4:15 p. m.—Indianana Orchestra.  
4:15-4:45 p. m.—Indianana Orchestra.  
4:45-5:15 p. m.—Indianana Orchestra.  
5:15-5:45 p. m.—Indianana Orchestra.  
5:45-6:15 p. m.—Indianana Orchestra.  
6:15-6:45 p. m.—Indianana Orchestra.  
6:45-7:15 p. m.—Indianana Orchestra.

**WFL—PHILADELPHIA—395**  
1:00-1:30 p. m.—Orchestra.  
1:30-2:00 p. m.—Navy Band.  
2:00-2:30 p. m.—Radio Show program.  
2:30-3:00 p. m.—Studio program.

**WLT—PHILADELPHIA—395**  
2:30-3:00 p. m.—Concert orchestra; recital.  
3:00-3:30 p. m.—Dance music.  
3:30-4:00 p. m.—Concert orchestra.  
4:00-4:30 p. m.—Grand organ; trumpet.  
4:30-5:00 p. m.—Dinner music.  
5:00-5:30 p. m.—Dinner music.  
5:30-6:00 p. m.—Dinner music.  
6:00-6:30 p. m.—Dinner music.  
6:30-7:00 p. m.—Dinner music.

**WIP—PHILADELPHIA—508**  
7:15-7:30 p. m.—Football game between University of Pennsylvania and Swarthmore.  
7:30-8:00 p. m.—Dinner music.  
8:00-8:30 p. m.—Dinner music.  
8:30-9:00 p. m.—Dinner music.  
9:00-9:30 p. m.—Dinner music.  
9:30-10:00 p. m.—Dinner music.  
10:00-10:30 p. m.—Dinner music.  
10:30-11:00 p. m.—Dinner music.  
11:00-11:30 p. m.—Dinner music.

**WJLA—ATLANTA CITY—475**  
7:30-8:00 p. m.—Lecture Period.  
8:00-8:30 p. m.—Lecture Period.  
8:30-9:00 p. m.—Lecture Period.  
9:00-9:30 p. m.—Lecture Period.  
9:30-10:00 p. m.—Lecture Period.  
10:00-10:30 p. m.—Lecture Period.  
10:30-11:00 p. m.—Lecture Period.  
11:00-11:30 p. m.—Lecture Period.  
11:30-12:00 p. m.—Lecture Period.

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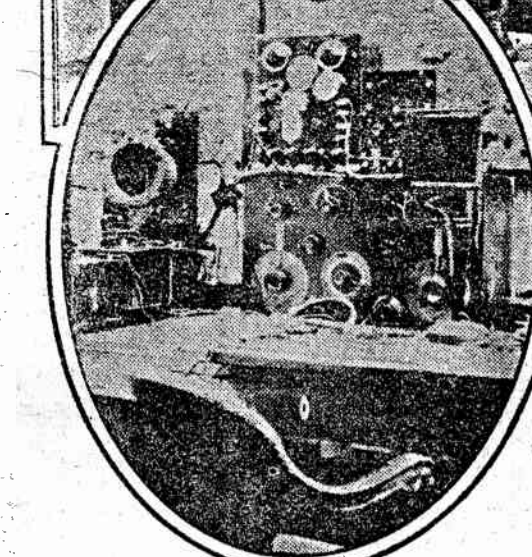
# The First Commercial Trip of the Leviathan Under the Stars and Stripes

Writer Depicts Thrill of Being One of the First American Operators Aboard the Liner

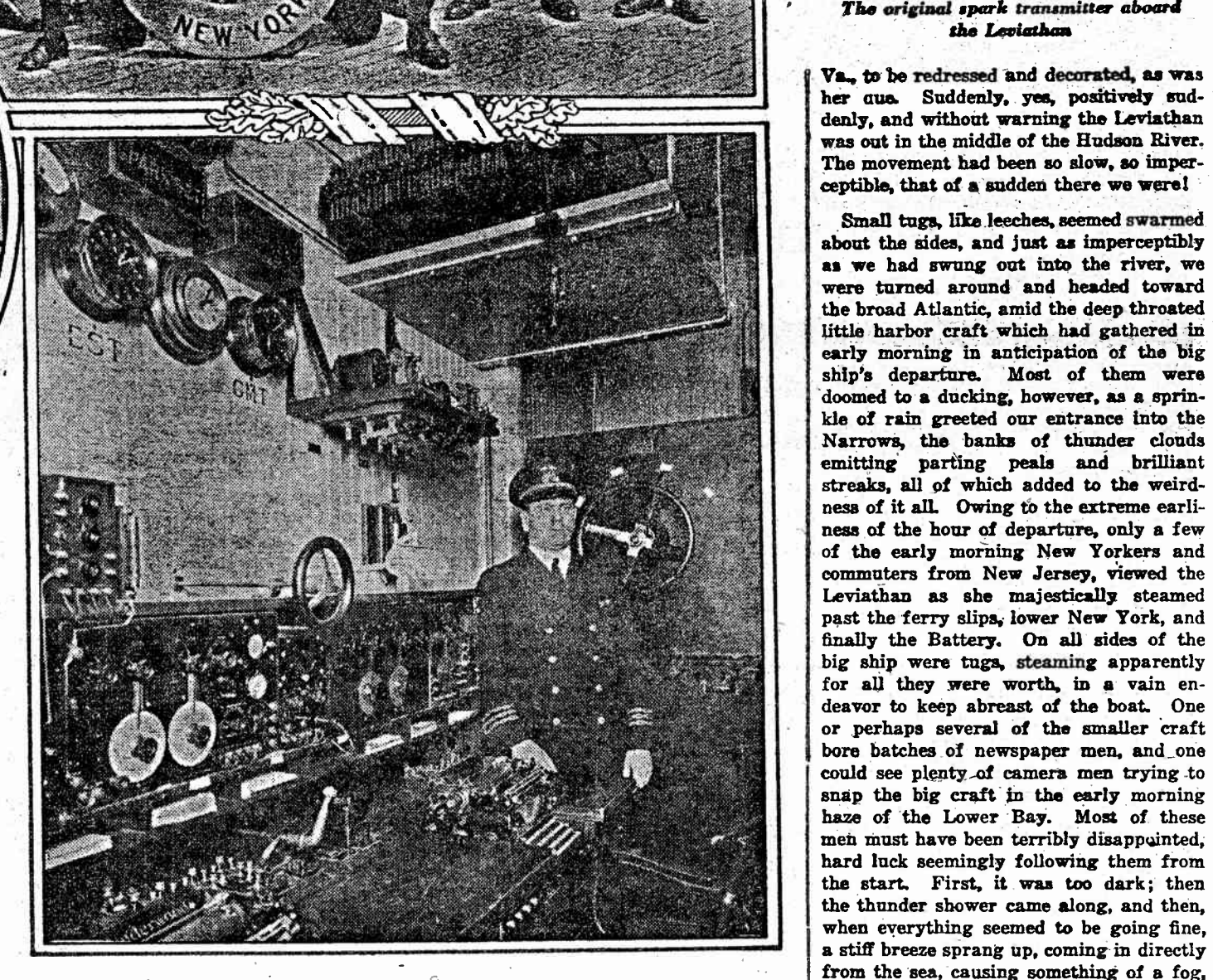
By ROBERT H. HORNING



The original spark transmitter aboard the Leviathan



German receiving equipment used during the voyage herein described



Above—The operating staff of the present-day Leviathan. Below—The radio room as it now appears. The panel in the background houses the tube transmitter.

THE Leviathan was actually slipping out of her berth in the North River. Without ceremony, the big craft slid as easily from her long resting place as she had slid in, years before, exploding rumors of long standing that she could never be moved; that she had so far rusted that her engines could never be turned over; that the mud had settled in about her hull, that this and that was so, well—she never could be moved, that was all. People actually believed all this, but she was moving and her own engines were moving her out of her berth.

This all happened on the rather dull and most unpropitious morning of April 7, 1922. The sun was hidden behind early morning thunder clouds which formed a serene background for the lofty lower New York skyline. So at two bells the ropes holding the mighty craft to her drab army dock in Hoboken were loosed, and without a quiver the former pride of the German merchant marine began to move. Slowly, almost imperceptibly, the pier began to recede, then faster and faster, and of a sudden the realization that the ship was in the center of the river.

**First American Crew**  
Thus began a voyage which will linger in the memories of each of the 1,000 members of the crew of the Leviathan. Each was an American, and each had a particular duty assigned him to perform. That was his part of the taking of that giant vessel on its first trip as a commercial vessel under the Stars and Stripes from the port of New York to the port of Newport News, Va. At Newport News is situated the plant of the Newport News Shipbuilding Company, to which the contract for redecorating and rebuilding the Leviathan had been let, after years of uncertainty as to the disposition of the craft.

Congress had at last consented to place the vessel in the active list. But in order to deliver the giant to the shipbuilding company there were certain obstacles to overcome.

The draft of the Leviathan is in the neighborhood of thirty-six feet, light. The harbor at Newport News, Va., could not permit a vessel of this draft to enter without first dredging a channel. This operation took months, and not without a considerable expense.

How was the Leviathan to be got into the harbor in the first place? To have towed a steamer of that size would have presented tremendous problems, always with the danger of the tow lines breaking and of leaving the huge craft at the mercy of the sea.

There remained, however, American ability to man and run the Leviathan under her own steam! The engines hadn't been turned over in years, true. The steam pipes would leak, the water pipes would leak, the electrical controls had to be thoroughly gone over, the oil steering apparatus needed attention, and there were a thousand and one other details.

As one of the first three commercial operators assigned to the Leviathan's radio staff it was our privilege to view the vessel after years of inactivity, following upon a mighty and most commendable war career. None of the ship's equipment had as yet been transferred to American manufacture, and each piece of apparatus still bore the German name plates, just as the Germans had installed them, prior to that memorable August of 1914.

It must also be admitted that a feeling of pride crept over one to know that both above and below and in each corner of that tremendous boat there was an American on the job, each thoroughly trained in his particular duty.

## Sails After Four Years' Rest

So, on April 7, 1922, just four years to the day since the entry of the United States into the World War, we of the radio department, and it might equally be said of the other officers and crew of the United States steamship Leviathan, that our hearts beat just a trifle quicker with the thoughts that the new pride of the American merchant marine had been entrusted to us, to take safely to Newport News,

## Halts for Fog

Most fortunately, the anchor went over just in time. Due to the breeze which had sprung up from the east, the fog lifted after a halt of perhaps two hours, and much as a curtain on the stage would lift to reveal the chorus, there were stretched out in front of us, hardly a quarter of a mile away, batches of small fishing dories, sprinkled here and there with larger excursion fishing smacks. These craft lay directly in our path, and though we may have wormed our way through them with-

(Continued on page four)



# The First Commercial Trip of the Leviathan

out incident—our whistle sounding regularly—it seemed well worth the while to have anchored, especially as the Leviathan is so enormously large.

Once the curtain of fog had lifted sufficiently to permit further safe navigation, the anchors were immediately hauled in and the trip resumed. There were numerous rumors aboard that Commander Bernard would try something at speed. These were soon dispelled when an official statement was reported giving the speed as eighteen knots, and that speed would be maintained throughout. The statement continued to state the motors as working perfectly, the steering apparatus working perfectly and everything as satisfactory. Unfortunately, the entire trip was made under leaden skies, and most uncomfortably cool ocean breezes. The entrance to Newport News, however, was happily accompanied with warm sunshine.

## Value of Radio Bearings

Due to the inability of the deck officers to observe the sun, or "shoot the sun," as it is popularly known at sea, in order to determine the exact position of the vessel, it was necessary to call upon the radio department for frequent bearings from the land compass stations. The land compass stations dot the shores of the United States and are maintained by the Navy Department. By means of these stations a vessel plying up and down the coast is constantly aware of its position, regardless of the weather conditions. The use of the radio compass stations is not necessary when the deck officers can observe the sun, or any of the more important stars. In foggy or inclement weather conditions the radio bearings, no doubt, have averted numerous collisions and have warned many a vessel commander of his proximity to shore. Commander Bernard was not taking any chances with his charge, judging by the number of bearings taken.

Inasmuch as the Leviathan was still under a Shipping Board classification, most of the messages received and transmitted were headed S. B., or Shipping Board, and indicated that they were "riding" free. Regardless of whether or not they were free, there were no words left out which may have confused the reading of those messages consequently each, sent or received, with the usual exceptions, numbered over 100 words. Most of these messages pertained to the condition of the tide, weather, channels, winds, barometric pressures and other information essential to the safe operation of a skiff the size of the former Vaterland.

After the ship had been successfully moored at its Newport News home Commander Bernard personally congratulated and thanked the radio personnel for the efficient and expedient manner in which they had handled messages to and from the vessel especially the radio bearings, upon which he had apparently relied so much and had set his course.

## Preparations Before Sailing

For two weeks prior to the actual sailing of the Leviathan we were told to hold ourselves in readiness for a mo-

ment's call. The delay in the actual sailing of the big ship was due to Newport News dredging operations which were undertaken to provide a channel which would permit the Leviathan to enter without fear of grounding. Even so, careful measurements of the tide had to be taken, and the entrance of the Leviathan into the harbor was carefully planned to take place at a certain time. How well this was planned is indicated by the fact that there was no delay whatsoever, from the rounding of the first sea buoy till the time the giant was finally berthed.

The call to duty aboard the Leviathan came on April 5, 1922. As was to be expected, the apparatus aboard consisted of a five-kilowatt Telefunken spark transmitter, with a sealed resistance at two kilowatts, which somewhat handicapped us, inasmuch as the big antenna had been dismantled and a dummy had been strung from the rear smokestack to the middle stack, this fairly short antenna probably feeling most of our antenna input directly back into the steel work of the ship. For receiving, the former Telefunken crystal receiver, with its myriad of different value coils, inserted to receive either long or short frequencies, acted as a last resort. For our more commercial and modern purposes, a navy type, long and short wave receiver, together with an open core type two-stage audio frequency amplifier, was utilized.

At our backs, mounted on the wall, was a small auxiliary half-kilowatt spark transmitter, of undoubtedly Telefunken manufacture. This machine was somewhat out of order and more or less dilapidated in condition. No attempt was made to put this machine in operation, since all of our combined energies were needed to clean the apparatus, which had had no care whatsoever for nearly three years. It was stated some of the officers stationed aboard during the ship's period of inactivity were in the habit of using the crystal receiver to listen in on some of the local radio stations.

The first arduous task which befell the radio man was that of cleaning off verdigris and other oxidation transforming highly polished copper leads into sordid black bars. This chore was accomplished with much rubbing with sandpaper and an eventual polishing rub-down. High overhead was the skylight through which the lead-in from the antenna entered, and directly underneath were some huge knife switches rigged up with ropes attached to handles and pulleys, reminding one somewhat of a barn with a hay hoist. These "jiggers" proved a most trying bit of apparatus to clean, but, like everything else, were eventually conquered, oiled and finally one could tug again at a handle and have the switches above open and close at will.

The room inclosing this mysterious apparatus resembled a butcher's refrigerator, just about as thick, and having handles just like those big brass things and little windows to peer through. Evidently intended to be soundproof. They were,

At our backs, as we sat facing the receiving equipment and desk, were the controls and telephone connections with the bridge and other departments of the ship. They were most conveniently located and were in perfect working order, as was the apparatus, although a trifle dusty. Power to run the transmitters was furnished by a German motor generator, located in a peculiar room, full of big motors, directly in back of the operating room. To get into this room one had to crawl on all fours through a small aperture. He then found himself in a dimly lighted motor room. Just what all the motors were for we never found out; in fact, it took considerable time to discover which one belonged to the radio department. They were all of German manufacture, and, naturally, hardly resembled anything we know even in outside appearance. Finding our machine to be in perfect running condition, we replenished its supply of oil and it was not necessary to revisit it again.

A neat hand-controlled reactance regulated the speed of the machine and a most clever German frequency meter indicated when the machine reached a 500-cycle pitch. Little black beads appear to rise from a straight line under the frequency indicating the velocity. A maximum radiation of nine amperes was noted in the antenna circuit at sea, although more were registered at dock in Hoboken. The steel pier was probably absorbing the extra current. Everything about the apparatus was thoroughly German. The Leyden jars, several in number, were several feet in height and much narrower than the American type. It must be said, however, that German apparatus is well built and designed with a view toward accessibility.

The personnel of the radio department of this memorable voyage consisted of Messrs. Kay, Newell and Horning, Kay acting as chief and deserving a lot of credit for efficiency. Before leaving New York watches were drawn, in which the 12 to 4 was drawn by Horning, the 4 to 8 by Newell and the 8 to 12 by Kay. Receiving watch was started at 12 midnight of April 6 while the ship still lay at her berth in the North River. Watch was closed shortly after her arrival at the pier in Newport News Shipbuilding Yards.

The entire trip was most enjoyable from all angles. The first night after leaving the city found Kay and the writer, after dinner in the main dining saloon, pacing the promenade deck, once around which is equivalent to a quarter mile. How many times we paced this deck is a conjecture; sufficient to state that the wind was tearing through most everything, and a most bracing sea air it was!

Upon entering the harbor of Newport News we were accorded a rousing reception, in which all the harbor craft joined in a vociferous welcome. We were met near the entrance by a fleet of tugs and several aircraft, and from the decks, looking shoreward, the entire city waterfront was, to put it mildly, simply lined. These

people realized that the contract garnered by the local shipbuilding plant was to prove a lifesaver for most of them. They are nearly without exception all workers in the shipyards, and work had been scarce for a long time. How well they did their job can be gleaned from a tour of inspection of the mighty Leviathan at her New York pier, near Eighty-sixth Street.

## Description of Photographs

In the views accompanying this article, the writer was fortunate in obtaining a recent photograph of the Leviathan's chief radio officer, Mr. Pickrell, who may be seen standing alongside of the very latest type equipment with which the vessel is equipped. Both long and short wave lengths are now used, together with a complete broadcast transmitter. Along the shelf in the foreground are the receiving instruments, direction finding equipment, and typewriters, by means of which the operators transcribe from code to words in one operation. To the right of Mr. Pickrell's head are located relays, while over his head is suspended a spark transmitter with its quenched gaps protruding. Directly in back is the high-powered tube transmitter which does most of the actual work in transmission. The radio room is located on the top deck, between the first and second funnels.

The group of officers standing on the promenade deck constitute the present day personnel of the radio department of the Leviathan. This is somewhat in contrast to the first trip with but three officers assigned to this duty.

It is interesting to note the difference in the apparatus. In April of 1922 all of the former German apparatus was still aboard and in use, as the accompanying photographs show. The view of the receiving apparatus shows an American Navy type long and short wave receiver, a De Forest navy type amplifier located atop the receiver. This was installed in as much as the German receiver visible on the left operated by the old fashioned crystal, and was not stable in operation. Over the top of the receiver are four large German high frequency meters mounted on the wall and indicate the power supply to the transmitter.

Though we would consider most of this apparatus of antiquity to-day, it was never out of order on the entire trip, and really did remarkable work. In the view of the transmitter the tuning helices of Telefunken manufacture occupy the most prominent view, though to the right may be seen the wave change over switch, and directly in back, like long four-inch pipes, are the Telefunken condensers. These are also known as Leyden jars, and are peculiar because of their length, about five feet tall. They are made of glass jars and coated with copper both inside and out. There were six of these large condensers.

It is possible to build a condenser with greater efficiency to-day, occupying a space of approximately half foot square and which is not breakable. Space and breakage of this necessary item is highly essential to a ship at sea.

# Nations May Discuss Wireless Problems at Paris This Fall

## The International Telegraph Conference at Paris and the Washington International Radio Conference Both to Discuss Same Problems

By P. E. D. Nagel

Assistant Chief Transportation Division; Chief Communication Division, Bureau of Foreign and Domestic Commerce, United States Department of Commerce

The United States government accepted the invitation of the French government to attend the International Telegraph Conference now in session at Paris and the following information has been prepared to show the relation this conference has to radio.

THE Paris Conference is a regular meeting of the International Telegraph Union of which nearly all of the principal countries of the world and most of the smaller countries are members. The United States is not a member of the union and is attending only on the direct invitation of the French government.

The International Telegraph Convention is a general treaty which has been enforced in one form or another since 1879 throughout nearly all the world, except, as I have said, in the United States. The treaty itself provides for further conferences to be held at intervals to make the necessary modifications, but due to the war there was no meeting between 1908, which was held in Lisbon, and the coming Paris meeting.

In general, the treaty is designed to provide standard methods for the exchange of cablegrams and telegrams throughout the world. The delegates are always government officials; that is, representatives of the signatory governments, but private operating companies are requested to attend and to make suggestions or recommendations, although the United States, not being a member of the Telegraph Union, is not bound by the treaty and its private cable and telegraph companies are not obliged to comply with it. The general provisions of the treaty are followed as a matter of business practice by the American companies themselves. It is obvious that there must be some recognized international standard so that a message originating in the United States will be treated the same way in any distant foreign country as would a message originating in any other part of the world, and conversely messages filed abroad must be treated in some standard method in the United States. This is the general purpose and the chief value of the telegraph treaty.

Now in regard to radio, at the time that the Lisbon conference was held—that is, 1908—the use of radio on a commercial basis was limited to messages between ship and shore to very few ships. In 1912 the first International Radio Conference at London produced an International Radio Convention along the lines of the telegraph convention and quoted verbatim many of the provisions of the telegraph convention. This radio agreement, however, related only to ship to shore communication, transoceanic radio telegraphy being then non-existent and radio telephony being unknown except as a laboratory undertaking.

Transoceanic radio telegraphy and radio telephony in all its forms have really come into existence only since the war. An attempt was made in 1920 to combine the radio and telegraph conventions in a single document with the title of the Universal Electrical Communication Union. For various reasons, however, unanimity of opinion could never be secured among the nations, and it was finally decided to hold the telegraph conference in Paris in accordance with the provisions of the telegraph convention and later to hold an international radio conference at Washington.

The decision to hold a telegraph conference, however, was reached considerably in advance of the arrangement for a radio conference, so that many national proposals for the modification of the telegraph convention which included various phases of radio. The handling of international messages at the present time involves the use of cables, telegraph lines and the use of telegraph stations for the same message in so many cases that it is difficult to make distinct rules for each part of the service.

In general, any world-wide treaty to govern either telegraph or radio is bound to be a long and complicated one. To determine how time in telegraph separates itself naturally into three parts, the first being governmental, political and economic in character, the second, matters of general policy and standard methods for the exchange of business, and the third purely technical operating questions. The third section of a technical nature would be very limited in a telegraph convention, but very extensive in a radio convention. As examples of regulations to these

# More Information On the Seven-Tube Super-Heterodyne

By Herbert N. French

Due to the widely varying reports received by me relative to results obtained on the 7-tube receiver I described in the New York Herald Tribune Radio Magazine, July 5, 1925, I feel that a few remarks are in order.

Some builders of this set state that it far surpasses any claims, and others that they can barely get locals. No one yet has reported merely indifferent results.

Some of the complaints are as follows: No distance. No volume on locals. Uncontrollable squealing. No squealing. Condensers do not tune. One neophyte was sure his tuner oscillated all night, but couldn't make it squeal!

My first and most important suggestion is to disconnect the two ends of the primary, or small winding, of the tuner (the secondary of which discharges to the detector tube), and connect them to the antenna and ground. We thus have an ordinary three-circuit tuner with two stages of audio-frequency amplifications, and trouble will be much more readily located. If the spiderweb form of tuner is used, or one in which the tickler moves only through a right angle, the tickler can be connected only through a right angle, the tickler can be connected only one way—the right way. If the detector refuses to squeal, reverse these leads. With such tuners, in which the tickler can be continuously rotated, the audio-frequency difficulties have been too frequently discussed to necessitate my going into them here.

If this connection works satisfactorily, and the condenser covers the wave-length range, reconnect the tuner primary as shown in the original diagram, and reconnect the primary of the second spiderweb coil, connecting antenna and ground to its loose ends. The builder should now read carefully the operating instructions I gave in my article. If the last three tubes have been checked as above, and are working satisfactorily, a local should be heard. In tuning the spiderweb's condenser for maximum squeal, swing it smartly back and forth, moving it less and less each time until the best setting is obtained. Then release tickler, at the same time readjusting the tuner dial, until clear reception is obtained.

If, on the other hand, no station can be heard, it is possible that the builder has connected the spiderweb wrong, an easy mistake to make, as it is difficult to distinguish the leads from the inside of this coil. Possibly the fixed condensers are shorted. Test in the usual manner. Check socket contacts and turn bulbs way up. As I stated in my article, it is almost impossible to go wrong, as fixed condenser, variable resistance and choke-coil values are not at all critical, and the wiring may be done any convenient way.

If your detective work has been successful up to this point, reconnect the primary and try all seven tubes. Undoubtedly most difficulties are caused by wrong spiderweb values for condenser sizes used. Also poor tubes or not burning them bright enough. The man who complained of uncontrollable squealing had, no doubt, too much tickler coil, with the result that his detector oscillated continually. The RF tubes cannot oscillate, so don't look there. It will save a lot of time and trouble to buy, ready wound, inductances designed expressly for the size condensers you are using. That element of uncertainty is eliminated, and other possibilities of trouble are few and easily met.

Let me repeat: This set is worth the trouble. Check up your wiring and parts carefully, and tune per instructions, and you will not regret the time spent.

## Amateur Makes Record

Gerald Marcuse, an amateur radio operator in Caterham, England, says he has talked from his home with a radio operator on board the United States cruiser Seattle while the vessel was approaching Australia, virtually half way around the world.

## Entertainment for Sick

By running wire from the receiving set to headphones in another room it is possible for persons some distance from the set to enjoy concerts. When confined to bed by illness or permanent injury this is an excellent means of bringing entertainment to the bedside.

# The handiest radio tool of all

A set of tools all in one wrench.

**"GRIP-IT"**  
SOCKET WRENCH  
Fits all radio nuts and screws—holds wire for soldering. This reaches in and grips where neither screw driver nor pliers can go.  
**\$1.00**  
If your dealer cannot supply you, send check or money order to  
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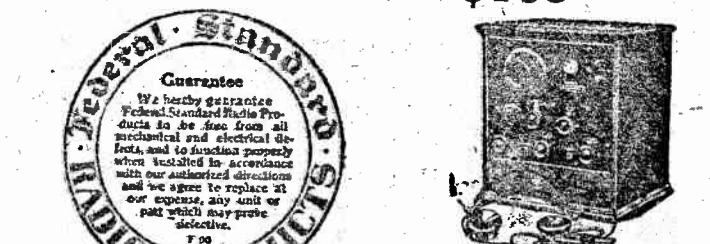
# "last Call"

an opportunity like this will never again be presented as long as you live. This is not just advertising talk, but a statement of fact which cannot be contested, disputed or doubted. Please note—we advertised 1,400 of these sets in The Herald Tribune the past few weeks. Hundreds bought from all over the country. They're going fast—very fast. First come, first served. This is positively the last time you'll be able to purchase at this remarkable price.

# Federal Standard RADIO Products

Please consider—The Federal is a Ten-Million Dollar Corporation (\$10,000,000) and the Federal is one of the best sets on the market.

THE NATIONALLY ADVERTISED  
**TYPE 110 RECEIVER, 3 TUBES**  
**LIST PRICE \$105**



Free! to you! Included in the purchase of this set we will give ABSOLUTELY FREE a \$7 Federal Head Set and a 90c Phone Plug.  
**Our Sale Price \$16.95**

**TO DEALERS** all over the country. Write, phone or wire at once for big money making proposition on the Federal sets advertised above and other Federal models. Get in on the ground floor. ACT NOW.  
ALL STORES OPEN EVENINGS  
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177 Myrtle Ave. BROOKLYN  
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Sets Come In Original Sealed Factory Cartons

Mail order promptly filled in order of receipt. Send no money now. Orders to 677 Myrtle Avenue, Brooklyn.

# AMPLION

The World's Standard Loud Speaker

30 Years have perfected and made it the finest loud speaker

ALL who hear The Amplion are won by its clear, life-like tone—the quality which has made it the world's largest selling loud speaker. The explanation is that The Amplion was evolved by the actual originators and oldest producers of loud speakers—over thirty years experienced! Long before radio became popular, their loud speakers were in use on over 12,000 ships of leading nations. Hear The Amplion—in comparison—at your dealer's. Or write for "Amplion Pedigree."

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DENMARK  
HOLLAND BELGIUM  
FRANCE SPAIN  
SWITZERLAND  
ITALY JAPAN  
SOUTH AFRICA  
NEW ZEALAND  
AUSTRALIA

# The Radio Discovery of the Century

changed glances, each eager to learn where this tide of thought was carrying the other.

"Did you read last week of that large blast at Chimney Rock Quarry?" suddenly queried Bill.

"Sure was some blast," commented Dick.

"Ten tons of dynamite were exploded when the foreman applied the current."

"But, Bill, why the dynamite in connection with radio?" I ventured.

"Not too fast, Jim; give me a chance," retorted Bill. "What I am anxious to get into your head is that the results of this dynamite blast were in no wise in proportion to the foreman's physical effort in applying the electric current to explode the dynamite. The electric current was simply the means by which the explosive force of the dynamite was liberated. Generally speaking, the force of the blast was dependent only on the amount of explosive used."

"Now, then, Jim, for the analogy between the dynamite and our radio. The former corresponds to the voltage impressed on the loud speaker and the electric current used to explode the dynamite is the tiny signal brought into your set

through the aerial. As you fellows well know, the number of watts required to operate a loud speaker with great volume is very small. In fact, an ordinary battery has sufficient energy to operate a loud speaker over a long period. Please notice, then, the entire problem resolves itself around the possibility of working out a switch device capable of opening and closing a battery circuit in the same ratio as the alternations or frequencies of the incoming signal."

"Bill," I insisted, "do you mean to tell me your set uses only that small battery unit standing there to bring in London and Paris?"

## Uses Mighty Little Juice

"I certainly do," asserted Bill. "In fact I am compelled to use a small shunting device to reduce the current sent to the loud speaker. What I want you to understand clearly, Jim, is the fact that I use the weak incoming signal simply as a means to operate my electro-conductive switch. As you have seen demonstrated, the switch is sensitive enough to operate on a signal received from Paris; after that it is simply a question of battery and

loud speaker size as to what volume can be produced. Give me the proper materials and I can make that London program heard all over Newton Center."

Frankly, beads of perspiration covered my forehead. Feeling mentally faint, I cast a helpless look at Dick. His lower jaw had fallen and he was staring at Bill in bewilderment. We were taken off our feet. The effect of hearing this quiet inventor casually discuss the greatest discovery of the century was simply overwhelming. Several moments of silence elapsed, then Dick recovered sufficiently to remark:

"Say, Bill, assuming what you say is true, where on earth did you discover a switch delicate enough to operate on a millionth of a volt?"

As Bill quietly knocked the ashes from his pipe, a broad beam of satisfaction settled on his face.

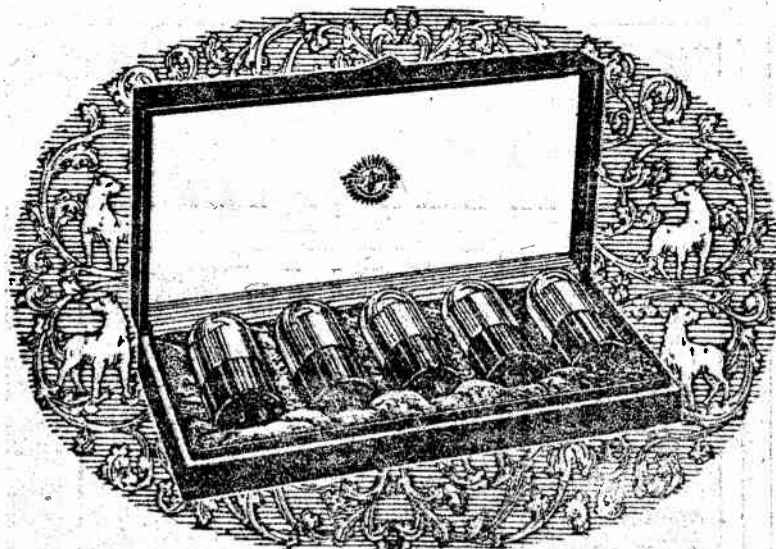
"Dick, have you ever heard of the wonderful apparatus these astronomers use? Their thermopiles are so sensitive they measure the heat given off by a candle two miles distant! Their spectroscopes, equatorial, in fact, all their instruments, operate with an accuracy of one in a million.

Can you suggest any reason why the same accuracy and sensitiveness cannot be obtained with radio apparatus?"

"But to get back to our story. Of course we all know that different metals possess different intrinsic characteristics such as weight, specific heat, melting point, coefficient of expansion and, most important from our point of view, different electrical conductivity. Several months ago the idea occurred to me that this quality of different electrical conductivities could be used as a basis for the switch I had in mind. Since then I have made literally hundreds of experiments in connection with the opening and closing of high frequency circuits through the juxtaposition of different metals with various conductivities. Certain results early in my experiments led me to believe I was on the right track. Had it been otherwise I can assure you discouragement would have conquered me. Later in my experiments I became convinced by the voltmeter action that cadmium and zinc were the proper metals for the positive terminals and ground connection. But how on earth to find the others? At length,

(Continued on page six)





## BRIGHTSON TRUE BLUE RADIO TUBES

WORD-OF-MOUTH endorsements have played an enormous part in making radio sales. The numerous technical radio terms combined with the plentiful claims for "marvelous, outstanding, wonderful achievements in radio" have left the radio purchaser in a daze amid a heap of radio literature. So he's gone to his neighbors and his friends and purchased radio equipment on their advice because he knew the value of their word.

When True Blue Tubes were first advertised as "The Finest Radio Tube in the World" no one could prove such a claim. It was necessary to have faith in the product.

Today an ever increasing army of True Blue users will testify to the truth in True Blue advertising. Ask your neighbor True Blue user—he knows the value of our word. Price \$3.50 each.

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THE FINEST RADIO TUBE IN THE WORLD

## JACK SHACK Two Unusual BARGAINS For Discriminating Fans



Mail Orders Promptly Filled. Include Postage.



## Federal Four Tubes

This set consists of 1 step of highly efficient Radio frequency, detector and 2 stages of Audio frequency. Bakelite panel, shielded metal cabinet and workmanship that only FEDERAL is capable of producing.

YOUR CHOICE \$23.95

Ware 3-Tube Neutrodyne

This set consists of WARE 3 tube dry cell set, with space for all batteries in cabinet. A two control Neutrodyne.

TIME PAYMENTS Arranged on all Sets Purchased at the Shack

FRESHMAN MASTERPIECE

HEADQUARTERS For all Freshman Sets and Eliminators, all types in Stock

Uptown Store 303 W. 42D ST. S. W. Cor. 8th Ave. Open until 11 P. M. Daily  
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"It's Guaranteed—If Bought at the Radio Shack"

If you want to buy, sell or exchange your radio sets or parts the Radio Exchange will help you.

## The Relation of Air and Atmosphere to Radio Waves

Radio Signals May Possibly Rise to Great Heights Above the Earth Before They Are Picked Up by the Antenna

By Howard G. Lapsley

RADIO reception tests in New York City and nearby vicinity have demonstrated the notably local characteristics of static. Broadcast programs that have been literally smashed to pieces have been received with but slight static disturbance in adjacent towns, and programs which were practically impossible of reception in these nearby towns were reported as being well received in New York. These contrary conditions obtained, not for short periods of three or four minutes, but for an hour or two. As these tests were made twenty to twenty-five miles apart by air line, and as the broadcasting was from New York City stations, two conditions have been demonstrated: First, that static disturbances are sometimes definitely localized; second, that static interference apparently affects reception from the air, rather than delivery into the air, of radio messages or music.

It is always easy to wander from the realm of physics into the realm of metaphysics and to turn from a page of definite data to a mystic dream of indefinite hypothesis, so we must wander off into the indefinite, when we ask: where does the radio message or music go, when it leaves the antenna of the broadcasting station, before it comes home to us on the headphones or loud speaker? Does it reach heaven before it reaches our ears? Of course the advertising illustrators picture the radio "flicking" from antenna to antenna, in direct and short courses. Maybe the impulse does take the short, straight course, but it is unlikely.

The path of least resistance is natural to electricity as well as man, so we may assume that radio impulses follow this course, and instead of zooming along the earth's surface, fly up into the thin, high ether, where there is little or no resistance.

Air is reasonably heavy on the surface of the earth and very, very light above it. Now, the question is, will radio impulses spend their slight strength, in piercing the thick surface stratum, or will they follow the line of least resistance and rise into the light air and free space above?

### Power of Radio Impulses

It is fair to assume that their course is usually vertical and not horizontal. It is true that radio impulses will penetrate practically anything. In coal mine experiments radio signals have been distinctly heard through fifty feet of coal strata, but the audibility has fallen off rapidly as this distance was increased. Also there is little or no directional control of radio signals, and, while they will penetrate, they also pick their own route. Some radio signals sent from Nauens, Germany, to Australia have apparently gone by way of the North Pole, while other signals have apparently gone by way of the South Pole.

Clear spots and dead spots of reception are of common occurrence, but the why and wherefore are more or less suppositious. The regularity with which the signals from certain stations surge and fade away causes one to wonder if all the messages and music we receive on our machines do not travel a long, arcing route through the high spaces before it reaches us.

The more one ponders on science, either pure or applied, the more one hesitates to make a statement with any air of finality, but it does seem to some listeners who have spent many hours at the midnight radio vigil, with acutely sensitive ears, that radio signals may possibly rise to great heights above the earth before, describing a parabola, they come down on our antenna, like a drop of dew, which we must magnify in our machines until we hear a recognizable splash of sound.

In this supposition may lie part of the answer to static and its tendency to be purely local. A careful study of your barometer may indicate 29.86, with severe static interference. The barometer near the sending station may indicate 30.04—a difference of 20 points. Another receiving set in an area where the barometer reads 30.04 may have no static disturbance. A close study of the barometer may give us more knowledge than we now possess about atmospheric electricity. The difference between mid-day and midnight reception may be accounted for by the theory that the heat of the sun's rays stretches the elastic belt of air around the earth's surface to twice its normal proportions, forcing the radio signal to reach twice the height that it reaches during the night before descending to us. On this assumption the average receiving set would get about half the distance

during the daytime which it is capable of at night.

If we accept the theory that radio signals start up vertically into space the question arises: What brings them back to earth and our earthly antenna? To every action there is an equal and opposite reaction, so there is some ethereal reaction which brings these man-made impulses back to earth. This reaction may be gravity, but it is difficult to conceive of gravity affecting either man-made or atmospheric electricity.

Air has the electro-chemical power to divide liquids and solids into the most minute particles. Air has the additional power to hold these particles in suspension almost indefinitely. Moisture may be in the air months before it descends as rain. Volcanic dust has been known to fall a year or two after the eruption which created it. Radio impulses are minutely divided forms of electricity to start with, and possibly they are still more minutely divided by the air or atmospheric electricity which they pass through. Electricity inherently resists all confinement and restriction. It seeks immediate action, whether controlled or uncontrolled. Electricity may not be life, but it is the antithesis of death, for life spells expansion.

Man produces electricity generally by means of heat. The air produces electricity by means of cold. Air resists the escape of heat from the earth.

### Cause of Static

In June, July and August—our hot months—the air, becoming warmer and warmer, rises to unknown heights. The frigid upper spaces resist the intrusion of this warmth into the domain of coldness, and it is driven back to earth forcibly, by lightning and thunder. Three-quarters of our thunder storms occur in these three hot months. Sometimes the sullen, sultry summer air is hotter than before the electrical storm, and sometimes it brings to earth, as spoils of the atmospheric battle, a little of the coolness of the upper regions. However, the so-called vacant spaces above us always appear to win the argument, and the hot defeated air vents its vengeance by undignified spittings and sputterings in the ear of the radio listener.

The sea of air at the bottom of which we live rises in sharp peaks and descends in deep valleys of high and low pressure. The radio signal if our conception of its rise is correct, having reached its maximum ascension, is forced back to earth. In the downward descent it must sink readily into these valleys of low-pressure space with little resistance, resulting in a strong signal, or, penetrating through a high peak of air with greater resistance, deliver to us a weak signal. A low barometric condition would indicate an air valley immediately overhead and a high barometer would indicate an air peak.

Diving toward earth in a parabola the radio signal would pass through vortices of low resistance and peak areas of high resistance, mixing in its course with atmospheric electricity which may entirely demolish or render unrecognizable the original electrical sound impulse.

When these peaks and vortices of air are fairly regular in area and alternate high and low resistance the radio signal comes through with what appears to be a definite, recognizable beat.

How high the arc may be which the radio impulse traverses before it fulfills its mission in our machines it is hard to conceive. Regardless of its course, however, present-day broadcasting depends for success on a happy union of atmospheric conditions as demonstrated by the barometer and thermometer.

## Cause of Poor Radio Reception Laid to Induction Noises

Radio reception has not yet reached that foolproof stage where it is only necessary to turn a switch to secure continuous satisfactory production.

How many times have you looked forward to some broadcast program of particular interest, only to be greeted by a flood of jumbled harshness belching from the horn of the loud speaker? It interferes with the program, it grates upon the nerves of the listener and tries the patience of those people who desire quality reception unaccompanied by this objectionable noise.

By understanding the reasons for the various noises, you may obviate disappointments and obtain a quality of tonal value that will be a continual delight, says the service department of the Fred-Kiesemann Radio Corporation.

Let us consider the sources of these noises.

First, we have the studio noises, which may be defined as those noises which originate at the broadcasting station. Noisy microphones cause a steady hiss which often blurs the voice of the artist. Programs picked up outside of the studio and carried overland by wire for broadcasting are usually excessively noisy by induction from neighboring wires—a steady, rushing sound, especially noticeable when the receiver is tuned to resonance, is caused by the generator which supplies the plate potential to the transmitter tubes. This noise is more or less pronounced on all stations, and continues until the broadcasting is finished and the stations sign off the air. When this occurs the rushing sound suddenly disappears.

Noise contributed by the ether medium may be defined as those sounds which are caused by electrical disturbances between the broadcasting station and the receiver itself. In this group are found the disturbing influences of high tension power lines, violet and X-ray machines, leaky transformers, electrically operated elevators, sparking motors and generators, trolley and elevated railway systems and telephone and telegraph wires. Electrical impulses from those undesirable sources usually occur at short wave lengths and are picked up by sensitive receivers. Static also comes in this class and is more or less prevalent throughout the summer months. Many satisfactory programs are suddenly broken up by a series of unfamiliar clicks and in many cases are interrupted entirely for short periods. These are caused by improperly operated regenerative and super-heterodyne receivers.

In the third class are the noises which are caused by the receiver itself or by the equipment which is used in connection with the same. Discharged B batteries become noisy and are usually the cause of a high pitched squeal when the receiver is operating on the second audio stage. These batteries should be discarded when their voltage drops below 34. Storage B batteries often cause the same trouble, even when the voltmeter reading is high. Squeals in this case are caused by one or more dead cells, which are usually not detected unless a voltmeter reading is taken of each individual cell.

Noises are sometimes caused by the vacuum tubes themselves. While identical in appearance, it sometimes happens that their internal elements are not rigidly supported, and any disturbance in the vicinity of the receiver may cause these elements to vibrate. This defect in construction produces a bell-like sound which may build up in volume and drown out the program. This may be overcome by shifting the tubes about in the sockets until a satisfactory combination is found.

### Of Possible Interest to a

### Good Looking, Lonely Girl

There is no apparent limit to what radio broadcasting is expected to accomplish nowadays. The other day a request came from a man in western Canada asking the station to find him a suitable wife. The only stipulations were that the girl should be good looking, and very lonely. Probably she needed previous experience with loneliness in order to be fitted for the life proposed for her.

WCCO is not prepared to admit that there is anything it cannot do, but for reasons of policy it had to decline the invitation to act as a matrimonial agency. But the request suggests infinite possibilities for the future.

# Up-to-the-Minute News of Radio in Pictures



School children of Willow Springs, Ill., broadcast from Station WLS, Chicago



Meeting of the Prince of Wales and the wife of President Alvear, of the Argentine Republic is broadcast



Rutherford Hayner, program director of Station WHAZ, Troy, N.Y.



British field wireless set used in sham battle on Salisbury Plain



Marconi's first receiving set now on exhibition in England



# The Radio Beginners' Series

By R. P. Clarkson  
(Copyright by the Author)

THERE was nothing radically new shown at the shows, as we predicted would be the case last spring. Storage and dry batteries for tube filament heating and for plate voltage are still the rage, but there were many types of devices for using the lighting circuit for tube operation. A number of sets were shown again, as many were a year ago, for operation from lighting circuits. In every case, however, such a set is merely some convenient and compact combination of the ordinary set, with one or more of the ordinary battery eliminators. It is a case of putting the whole works into one cabinet.

The thing which most impresses me in looking over commercial sets is the tendency to put everything in one basket, set, batteries, speaker. Some three or four years ago two or three manufacturers did this. In fact, back in 1920 there was a set which combined everything in a single cabinet, the first model (and the last, I believe) which that manufacturer brought out. That idea died out completely and was revived by the multitude of portable sets which came into being a summer or two ago. Strangely enough, several of the portable sets have abandoned the compact idea and home sets are fast taking it up. It seems to me that it has become more popular than the low price console type of set, the latter arrangement being reserved for high priced outfits.

## Modern Tendencies

Another tendency is to do away with the mechanical or machine appearance of the front of the set. In many cases everything is wiped off the front of the cabinet except the outlet for the speaker. In one case, and approximately in several others, the controls are hidden away in the scrolls and fretwork of the speaker mouth, so that the entire set looks like simply a cabinet speaker. In spite of this tendency there was a complete absence of freak cabinets, no sets disguised as clocks, lamps, lighthouses, Eiffel towers or Woolworth buildings. I'm sorry about this. I always had a desire to see some one bring out a set disguised as a train of cars and so arranged that you could crawl into the cab of the locomotive to work the controls, while the tender behind carried the storage battery, the smokestack gave out speech and trailing along one by one were the box cars, each carrying a block of B batteries, all connections being made through the track, and perhaps overhead trolleys.

In parts there was nothing new and little of interest. The tendency seems to be to make the regular standard stuff, but to make it better, more dependable, lower priced and sometimes a little more compact. There were coils wound on forms, self-supporting coils and coils imbedded in various materials, mostly transparent. Spaced winding is more frequently used. Large sized wire is even less used than a year ago. There was little appeal to the broadcast listener by any low wave material, although it showed occasionally. Loops have undergone no change, and it seemed to me, and I may be wrong about this, that there were fewer loop sets than at any show of recent years. I wonder if loops are not making the headway we expected. Certainly it is the ultimate aim to have a completely self-contained set, whether with batteries or lamp socket operation, and for this the loop is essential. Possibly the reason is the number of tubes required, unless reflex is used, and, strangely enough, the five and six

tube sets seem to be the limit, in spite of tubes cheapening in price.

## Changes in Sockets

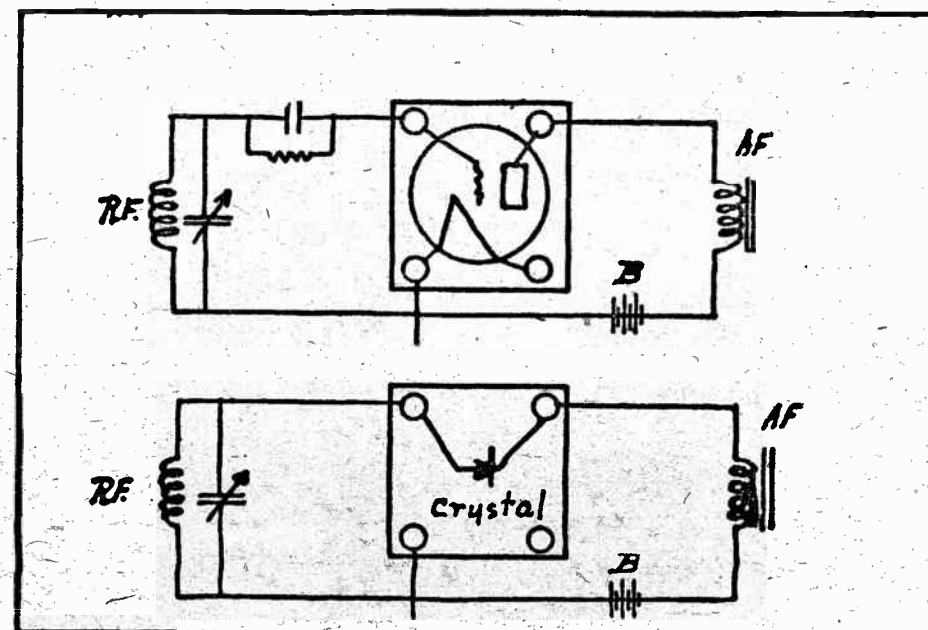
In sockets at last there are a number of radical changes, and mostly for the better. Interrupted bases, forming an air gap between plate and grid; elimination of the metal shell in favor of a narrow supporting ribbon; better support for the contact springs, and several minor changes, all spell greater socket values. To take a leaf from the stock market reports, we might say "Prices remain firm."

Rheostats, potentiometers, transformers, grid leaks, condensers, binding posts and small parts generally show no external change and no more than expected increased perfection in manufacture. Panels seem to be wavering. Metal panels and metal backed panels are talked of, but

don't all mold them, as they do loud speaker horns.

Speaking of loud speakers, few new models were shown. Horns are still in evidence and make up most of the models. Cones and barrels are constantly increasing, however, and decorative models are many. I saw only one cone type speaker in a self-inclosed set. Most of the sets where everything is in a single cabinet used the horn type, as do all of the cabinet speakers, I believe.

In dials I received the impression that every one was making a vernier type. There must have been twenty or thirty, all pretty much alike and all very attractive. One, at least, was devised to perform the astounding feat of changing a straight line capacity condenser into a straight line frequency type, by some method of friction cams or gears.



The method of substituting a crystal for a vacuum tube detector

hard rubber and phenolic compounds still seem to hold their own for the present. Subpanels of insulation are universal. Hardly any one builds on the base of the cabinet. Even the cabinets are molded in a few instances. I do not see why they

Condenser of the variable tuning variety were prominent, but sets, of course, over-shadowed parts. Straight line frequency and straight line wave length types were most frequent, but it did not seem to me that the majority of sets were using them.

## The Radio Discovery of the Century

(Continued from page four)

after many weary hours of work, a fortunate combination of cadmium, silver, lithium and zinc gave the desired result. The problem was solved.

"As for the remainder of the set, as you already know, it is simplicity itself, and that, gentlemen, in a nutshell is the story of the Johnson Electro-Conductive Switch."

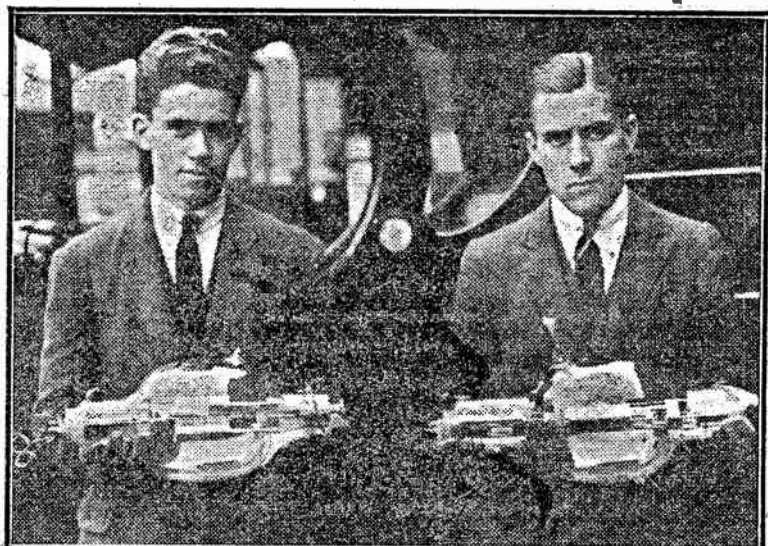
Dick drew a long breath and a look of relaxed tension crossed his face.

"Bill, your fortune is made."

"Well, boys," Bill smiled, "I wouldn't want it known, but the Inductance Corporation has made me an offer of one thousand grand per year during the life of my patents."

Congratulations Bill, we pulled on our coats after thanking him for a most interesting evening. As I left Dick in front of his home he remarked again on the simplicity of Bill's new switch.

"Dick," said I, "it strikes me the whole affair is so simple as to be ridiculous."



Two large transmitting vacuum tubes which are now on exhibition at Albert Hall, London, England. These are the tubes used at the new Station 5XX, Davenport. They are known as the Holybennus Electro Valves, have a power of 1 kilowatt, and cost \$260.

There are a tremendous number of gang condensers, where a single shaft activated anywhere from two to a half dozen rotors.

I think the general conclusion of observers is that to a large extent the shows from now on will be, like the auto shows, a yearly display of new models of sets. Of course, we all know that during the last two years the set business has grown from being 20 per cent of the business to being 80 per cent of the industry. The business has grown, too, and while parts are now only 20 per cent, the total value of parts sold yearly has increased. Parts sales to manufacturers have increased, but this is not taken account of here.

So much for the new parts and new tendencies. What about hook-ups? The answer there is the same. Not a new hook-up has raised its head in many moons. Commercial sets are all tuned radio-frequency. I say all. That isn't strictly true, but just an impression. Actually there are some regenerative sets, some reflex sets, some super-heterodynes. There is an occasional set using one or two stages of R. F. fixed transformer coupling, with perhaps one of tuned radio frequency.

With this condition we have no quarrel. It does not indicate anything at all. Many fans have the idea that because almost every one is making tuned radio frequency it must be best. But they have forgotten the patent situation. Admittedly the patent situation on circuits is hopelessly muddled, but the fact remains that if a manufacturer makes a set using regeneration or super-heterodyne he is almost sure to be mixed up in litigation because some one owns those patents and licenses are not granted. The tuned R. F. in its ramifications seems to be completely owned, and into this opening most of the manufacturers who have recently gone into set building have forged.

The fan who builds his own is not handicapped by any patent fear. He can make any set he likes so long as the patent owners maintain their present attitude, and the fan usually has something regenerative about the house. Many have super-heterodynes which they have made. Many have reflex sets. Many have crystal sets and thousands have four, five and six tube R. F. sets, tuned and untuned.

No matter what your set, the audio-frequency side of the detector is the same. That is, all audio amplifiers are identical, regardless of what detector and R. F. hook-up they are used with. We have finished with amplifiers until something new turns up. Now, let us turn to detectors.

For a detector you have two choices: a crystal or a tube. There are a number of different crystals and there are a number of different tubes. There is only one main crystal hook-up, of the crystal itself, but there are two ways of using the tube as a detector, one regenerative and one not. Wherever you use a tube as a detector and it is not regenerative you can substitute a crystal to advantage in some particular and to some disadvantage in other particulars. Any one using a tube as a detector should try a crystal. It can usually be done by taking out the tube and not disconnecting the socket, but connecting the crystal across from grid to filament, using a crystal which will stand the B voltage and short circuiting the detector grid condenser. The result will be as indicated briefly in the diagram.

The way to tell whether or not your tube detector is regenerative is to look in the plate circuit. If the plate terminal of the detector tube goes direct to the audio transformer without passing through some form of coil, such as a variometer or a tickler, then it is non-regenerative. In some sets, of course, it will go to the jack and then to the transformer. That is a mere convenience. No detector is regenerative without some form of coil in the plate circuit.

## How Electrical Terms Used in Radio Received Their Names

Units of Standard Value Called After Prominent Experimenters; Joseph Henry Responsible for Foundation of Present-Day Radio

By Sidney Elbert

ASK any radio fan if he ever heard of the words "volt," "ampere," "ohm," "farad" and "henry," and he will immediately respond with, "Sure; what radio bug who reads a radio publication hasn't?" Ask him if he ever heard of gentlemen by the names of Alessandro Volta, Andre Ampere, Georg Ohm, Michael Faraday and Joseph Henry, and he will look you blankly in the face and shake his head in negation. If given a moment or two to compare the words and the names, he will forthwith appreciate that there is some connection between the two apparently irrelevant questions.

The history behind the derivations of these five units of electrical measurement, so commonly employed in radio practice of all kinds, is but infrequently recounted, yet it invariably proves interesting to the radio enthusiast because it probably has been frequently puzzled by them. It incidentally brings to light some little known facts about the very earliest scientific knowledge of wireless communication and of certain phases of other epoch-making accomplishments.

Encyclopedic research yields the fact that the "volt," the unit of electrical pressure, was designated in honor of a famous Italian physicist named Count Alessandro Volta, who was born in 1745 and died in 1827. The Count, who received his title from the illustrious Napoleon Bonaparte because of his great discoveries, was one of the earliest experimenters with electricity, and is known to posterity as the inventor of the electric cell. This device, first called a "voltaic battery," he announced to the Royal Society of England early in the year of 1800, and following shortly thereafter a learned member of that erudite organization voiced the conviction that the "voltaic battery" was an alarm bell to experimenters in every part of Europe. It was more than that; it supplied the electricity for many of the startling inventions that changed the entire life of the civilized world. Volta's original battery in its fundamental aspect has survived through a century and a quarter of time, and even now high school sophomores immerse plates of zinc and copper in beakers of sulphuric acid as their first physics experiment in the generation of electricity.

Volta's Experiments As an interesting sidelight it might be mentioned that Volta was the first man to burn gases in a closed chamber by means of an electric spark. This he succeeded in doing just at the very time a handful of British colonists in a far-off land known as America were signing a brazen document called the Declaration of Independence; he little realized that he was giving unborn automobile engineers a dependable ignition system for self-propelling vehicles that would not appear for 125 years.

A contemporary of Volta was Andre Marie Ampere, a distinguished French scholar and physicist for whom the "ampere," or unit of electric flow, is named. Radio is indebted to Ampere for his observations on the relation of magnetism and electricity, and science in general for his theories on terrestrial electricity. He was the inventor of a device on which the construction of practically all modern electrical meters is founded. "Ohm's law," familiar to every man who passed through high school, is named for Georg Simon Ohm, a German scientist who followed slightly after Volta and Ampere. He evolved the law while experimenting with various metals to determine the ease with which they carried electricity, and it now serves as the basis for all electrical theory and measurement.

In the German's memory the "ohm" was adopted in 1881 as the unit of the resistance of electricity-conducting materials. The unit "mho" (pronounced "mooh"), so frequently seen in connection with vacuum tube ratings, is simply "ohm" spelled backward, and mathematically is the reciprocal of the ohm. The latter term is in everyday use as a designation for rheostats, potentiometers and grid leaks; for the last named the "megohm," or million-ohms, is more convenient for the rather high values encountered.

## Head Phone Ohms

Many people have the mistaken notion that the resistance of headphones is a measure of their quality. Actually radio headphones of 2,500 ohms resistance may be much better than others of 6,000 ohms resistance. The resistance is determined by the length, size and kind of wire used in their construction. Their performance is a matter of proper engineering design and the use of good materials.

## Connect in Series

Several speakers may be used at one time by connecting them in series. In this way dance music may be received sufficiently loud to be heard all over a dance hall of considerable size.

## How to Control The Volume of A. F. Amplifiers

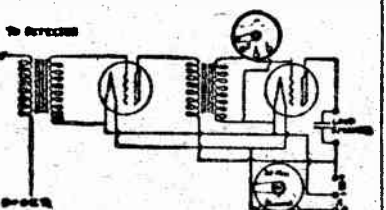
The general use of multi-tube receivers and superpower broadcasting stations has done much to eliminate the old system of using several jacks in a radio set. The latest receivers are using only one jack at the most, to which the loud speaker can be connected. Many of them are eliminating all jacks and providing binding posts in the rear of the set for the loud speaker connections.

The elimination of plugs and jacks is ridding receivers of two very common sources of trouble. Any receiver is better off without jacks, for that matter. Wiring is greatly simplified, capacity of the wiring is reduced, and the front panel is improved in appearance. The use of jacks where any audio transformer is used with high primary impedance, such as the high quality, low ratio audio transformers that are becoming more and more popular, is hazardous. The sudden surge of current caused by the opening or closing of a jack circuit is likely to burn out fine wire used in winding the transformer core.

A serious problem presents itself, however, when jacks are eliminated. The volume of the receiver must be controlled. If the rheostats are turned low, volume will be reduced, but at the expense of clarity. If turned too low, distortion results. Partially detuning the receiver, with the tubes operating at their most efficient setting of the rheostat, is often done. In this day of congested broadcasting, however, such a procedure will result in interference between stations.

Engineers have been working to devise means of softening the tone without destroying quality. Resistance across the primary and secondary windings of transformers are sometimes used, as well as a bank of fixed resistance in series with the output of the last tube, proving an entirely satisfactory except that poor regulation is secured. Best tone quality is maintained with a fixed resistance across the secondary of the transformer, and volume controlled by using a variable center contact like a potentiometer, connecting this contact to the grid of the next tube. Approximately 500,000 ohms puts the proper load on the transformer for best results, while the variable arm must have perfectly smooth regulation from zero to the maximum resistance.

A resistance such as the Centralab Modulator may be used for this purpose. This is supplied with three terminals, precisely like a potentiometer except that the resistance is a graphite ring upon which a metal disc is pressed to make contact.



At last! A "B" Battery Eliminator that has no hum, that will give complete satisfaction on all receiving sets and is within the MEANS of every Radio fan. JUST THINK OF IT! ONLY \$22.50 (without tube) One year old 20A tube that will not operate in set but still lights. Works better than "B" BATTERIES. Guaranteed. Money back if not satisfactory. Mail orders promptly filled. A. H. WAAGE 6 Reade Street, New York

## Mechanics Institute Opens Radio Class Again This Year

Again this year the radio class at the Mechanics Institute, 20 West Forty-fourth Street, will be in charge of R. P. Clarkson, well known to Herald Tribune readers through his Radio Beginners' Series. The Mechanics Institute School was started in 1920, and the present year is the 105th of its operation by the General Society of Mechanics and Tradesmen, which this year celebrates its 140th birthday. Tuition is free to any male employed during the day. Classes in all subjects taught opened this week, the first meeting of the radio class being Friday night at 7:30. A library of over 100,000 volumes is available to students and others. Application for information or enrollment should be made to the secretary by mail or in person at the institute building.

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your broadcast receiver from performing to the top-notch of its ability when every socket holds a Cunningham Radio Tube—which for ten years has demonstrated their quality and endurance to an ever increasing number of radio enthusiasts.

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See one at your dealer today.

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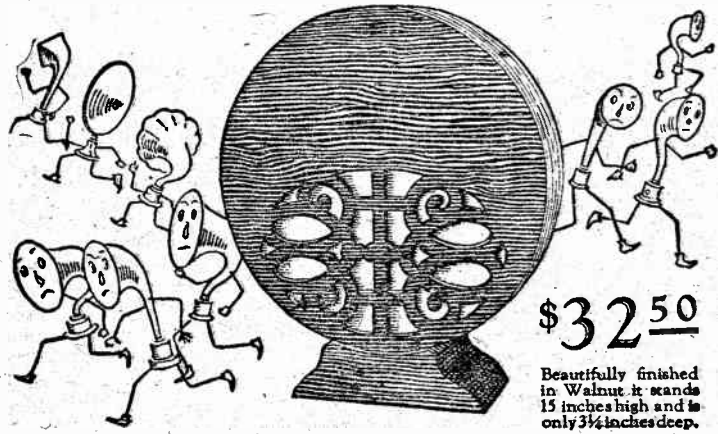
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Use the Radio Exchange Column if you want to Buy, Sell or Exchange anything in Radio



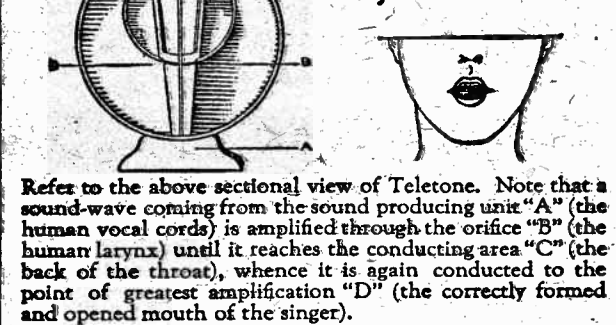
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Refer to the above sectional view of Telephone. Note that a sound-wave coming from the sound producing unit "A" (the human vocal cords) is amplified through the orifice "B" (the human larynx) until it reaches the conducting area "C" (the back of the throat), whence it is again conducted to the point of greatest amplification "D" (the correctly formed and opened mouth of the singer).

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## Cardinal Hayes Opens the New Paulist Fathers' Radio Station

There Is a Large Opportunity Nowadays for the  
Broadcasting Station to Offer Moral and  
Spiritual Service to Listeners

The following is an abstract from the address delivered by Cardinal Hayes on the occasion of the opening of WLWL, the new broadcasting station of the Paulist Fathers, New York City, September 24.

RELIGION to-night, in the dedication of this new station of the Paulist Fathers, WLWL, willingly and gladly wishes to pay tribute to science. Religion praises the Creator of the universe for the advance and broadening vision of science and rejoices that, in His providence, another page of the Book of Nature has been unrolled revealing to mankind the wonders of the radio. Religion and science reverence profoundly the truth that revelation after revelation of God's wonderful handiwork in creation will continue until the crack of doom.

To-night we offer a tribute of praise and gratitude to our scientists, to those devoted servants of truth who dedicate their lives to the advancement of human knowledge. Patiently, unselfishly, perseveringly, in the laboratory and the machine shop, on earth and sea, and in the air, they have toiled at their self-imposed tasks that all mankind might enter into the fruits of their labor and share the secrets of their new amazing knowledge.

Within the memory of this generation, physical science has contributed enormously to human comfort and health and life. Indirectly our discovery of the buried history and of the secret laws of the physical universe has brought us even greater benefits. Things seen, as St. Paul says, are an evidence of things unseen. Each fresh revelation of science makes it less and less reasonable to deny the existence of the Creator.

There is a further acknowledgment we must make. Among the most recent and most wonderful gifts of science comes the radio, and therefore the new station, WLWL, which we are opening to-day. As Cardinal Archbishop of New York, I congratulate the Paulist Fathers upon the great work which they have undertaken. I congratulate also the people of this immense city and, I may say, of this whole country of ours, upon the inauguration of an enterprise so admirable. May I add that in the building of this station the Paulists have shown themselves worthy sons of their founder; for nothing was more characteristic of the first Paulist, Isaac Hecker, than his readiness to utilize every new instrument of good. How his noble soul would rejoice to witness this scene—the dedication of the twin towers of steel that overlook the Paulist Church here at Fifty-ninth Street—as an agency for the spread of truth and wisdom!

Power vs. Responsibility  
Now, the possession of power always involves responsibility, and the gravity of our responsibility is measured by the greatness of our power. This is, of course, an old familiar principle of morals, but men may not yet fully appreciate the bearing of the old principle on the new situation.

Here, harnessed in our service and obedient to our command, is a force that seems to recognize no barrier and no boundary. It crosses land and sea in all directions; it penetrates every public auditorium and every private home, in the crowded centers of civilization and in the far away corners of the earth. The energy which can do this is immeasurably great; no less is the responsibility of those who use it. If for the spoken word and the printed page man must one day render an account, equally must he answer for the message which he broadcasts over the wide world to millions and millions of immortal souls.

We who employ radio, then, are responsible for our use of it. We must take care that we use it not for harm; but, further, we are strictly bound to use it for good, to make it fruitful. Whoever would be great must serve. He who has power must turn it to the welfare of his fellows. Let us consider what a broadcasting station such as this might aim to achieve.

Among the useful functions of a broadcasting station is that of contributing good, clean and wholesome entertainment for the individual and for the family. Harmless fun, athletic sports, games, puzzles—things such as these have their places in the average normal life. To promote

### 2 Stations Play Same Song at Same Time

One of the metropolitan radio audience happened upon an unusual coincidence in broadcast programs and in recognition of the feat demands the award of the "brown derby." His letter, which explains the incident in detail, is as follows:

"I was enjoying, on WJZ, an offering entitled 'June Brings Roses.' I tuned in on WEAF for a moment and heard June Brings Roses.' By tuning back to WJZ and humming the air in WEAF's tempo during the operation, I landed precisely on the same note at WJZ. I repeated, going this time back to WEAF with the same result. A difference of only a few seconds delay in WEAF's announcer from WJZ's permitted me to hear that each had been an encore. If you will be kind enough to check me up, and in the event that this occurrence was not manipulated, will you be good enough to award me the 'brown derby' for picking up the unusual in programs?"

Let it be said that the check-up has been made and that the incident was not intentional and the "brown derby" has found its proper owner.

We come now to a consideration which I trust lies close to the heart of every one of you—the service which radio can perform for our country as a whole. We have passing social and industrial problems to be solved. We have high ideals of patriotism and good citizenship which we must familiarize the young.

More important still, there are lessons of sympathetic understanding, of mutual good will, of tolerance and charity that all of us must learn. And here, perhaps more than in any other field I mention, this new broadcasting station should have a distinctive function. The history of the United States shows that in this climate intolerance and bigotry do not strike deep root or live long. Every fresh attempt to set class against class and religion against religion has perished quickly, has been soon forgotten. Yet I believe that in this respect also there is much progress still to be made, progress which I trust will be aided through the instrumentality of radio.

I am given to understand that you who are listening to me at this moment number quite certainly hundreds of thousands and in all probability more than a million. Consider the influence on you and on me of this present experience. Is it not clear that similar experiences, constantly recurring, will tend to affect the inner consciousness and then the external conduct of tens of millions of our fellow countrymen?

### Music as a Radio Sales Assistant

A radio program, coming in at the moment a set is being demonstrated, has a lot to do with making the sale, according to a prominent San Francisco radio dealer in a letter to KGO.

"When a customer comes to my store to buy a receiver," he wrote, "I always size him up to see if he is a 'jazz hound' or not, and when demonstrating a set I try to tune in the thing he likes. I have found that the man who dislikes jazz may refuse to buy if jazz happens to come along at a moment when he is still in doubt. A woman's talk on fashions or cosmetics may ruin the sale to a man, whose wife would be just as much upset by a man's talk on banking or sales psychology. I don't want any of that stuff in my house," is just as likely as not to be the verdict.

The best radio feature from a sales point of view to which customers may tune in is undoubtedly music, and music that is neither too high-brow nor too low. Music is not only pleasing in itself, but has the merit of being non-controversial and universal. It hurts no one and gives a certain amount of pleasure to everybody.

#### Loop Aerials

From the experience of radio engineers throughout the country it has been found that the average loop aerial is about 5 per cent as efficient as the average outdoor aerial. Indoor aerials are from 10 to 15 per cent as efficient.

#### Preventing Shorts

If there is a possibility of the rheostat shorting on the shield on the panel, cut a piece of mica and place between the rheostat and the metal shield.

## Popular American Broadcasting Stations

No. 10—WHAZ, Troy, N. Y.

UNIQUE among American broadcasting stations is radio station WHAZ at the Rensselaer Polytechnic Institution, Troy, N. Y., the first of the Class B stations established in a college, which observed its third anniversary Monday evening, September 14. It is unique not alone from the fact that it established in the early days of general broadcasting, February, 1923, the long distance transmission record of more than one third the way around the earth, nearly 10,000 miles to New Zealand, accomplished under a year for the last three years. This station has been heard with great fidelity and regularly, as more than 30,000 letters and messages attest, from coast to coast, from Alaska to Panama, and frequently in the Pacific Islands, West Indies, South America, England and Continental Europe.

This station had not been on the air many weeks when it became one of the first in America to be heard in continental Europe, France and Belgium, in November, 1922, and in Hawaii, at four points simultaneously, in December following. Two-way radio telephone communication

as Peru, first Far East program by Chinese, Japanese and Siamese students, first concert by all blind performers, the ringing before the microphone of the same bell with which Professor Joseph Henry in 1831 first transmitted signals at a distance by means of the electromagnet, forerunner of the telephone, telegraph and radio, and the first radio pageant on the sesqui-centennial of the Revolution were among many others.

Long distance transmissions from WHAZ are not mere chance "pick-ups," in which the call letters were made out laboriously and the rest reported hearing WHAZ programs on seven successive Monday nights last winter, and sixteen listeners in different English towns reported fairly complete logs of the program on the same night. A Boy Scout commissioner on a steamship en route to Cuba listened to a program he arranged before he sailed. A sea captain reported a complete program heard on shipboard in the South Seas, 5,000 miles from Troy. The postmaster at Wailuku, Hawaii, and a graduate with his family in the Hawaiian capital have entertained friends on more than one occasion with programs from WHAZ. Navy vessels often report concerts heard while passing through the Caribbean Sea; and on occasion the program has been reported from every state and territory of the Union, seven provinces of Canada, Cuba and Bermuda. "Personality" is put into the station by the program and participants rather than the announcer, who merely tries to make what is going on in the studio intelligible to the audience, and the programs are made as continuous as possible.

#### Student Broadcasts

Naturally the programs by the students of the Rensselaer Polytechnic Institute on the last Monday evening of each month, with a midnight program on the second Monday, have become a popular feature of WHAZ broadcasts, with the Symphony Orchestra, Campus Serenaders' Dance Orchestra, Glee Club and individual students participating. While the purpose of this radio program is not merely to entertain, it has done that so well as to receive the commendation of every type of radio listener through its always varied and unusual programs. Educational features find an important place in the broadcasts in a way that makes them interesting as well as instructive. Members of the faculty contribute practical and non-technical talks on subjects of current interest in the scientific and engineering field, and prominent speakers are frequently heard on topics of the day. The station furnishes no regular news, sports or market services.

Of the broadcasting apparatus it is sufficient to state that it is the standard Western Electric 500-watt outfit, complete in every detail, and was installed through a gift of the Roebelins, graduates of the Troy Tech, famous as builders of the Brooklyn Bridge. WHAZ is under the direction of Professor Wynant J. Williams, associate professor of electrical engineering in charge of the course in communication engineering, with a corps of instructor-operators, Harry B. Mimmo, Hiram B. Harris and Bertram H. Cramer Jr., each of whom has been engaged in radio experimentation from boyhood. In physical equipment station WHAZ is similar to many other leading broadcasting stations of the country. Its ideal location on the top of the big Sage building, one of the largest college electrical and mechanical laboratories in the country, at the crest of the beautiful hilltop campus, overlooking the Hudson River at the head of Tidewater navigation, 150 miles from New York, is most advantageous. The remarkable success of the station is credited chiefly to the superior skill of the engineering experts in charge of its operation. The studio is attractive and in excellent taste, its walls being covered with soft gray draperies, floor heavily carpeted and ceiling with a double perforated covering preventing reverberation. It is furnished with a fine piano and other necessary musical and pick-up devices. Ruth-erford Hayner has been the sole program director and announcer since the station was opened.

As an engineering college in which electrical and communication engineering is one of the major courses, Rensselaer Polytechnic Institute radio department has a remarkable equipment embracing practically every variety of apparatus. There are numerous long and short wave transmitters and receivers. Transmission and experimentation is almost continuous. The equipment includes the first wireless telephone equipment ever sold—an old DeForest set—by means of which Professor Williams delivered a lecture to students as far back as 1910, long before the general public knew anything of radio broadcasting. There is a Marconi wireless telegraph set of 1902, including a coherer of the original type, a German Telefunken system wireless outfit, and all the infinite variety of apparatus that has been developed in the intervening years down to the very latest improved devices. Many radio amateurs both in this country and abroad are familiar with the call letters of the institute stations, 2XAP, 2SZ and 2CDG.

There are several ways in which a panel may be shielded to prevent body capacity. One is by placing small metal disks on the rear of the panel directly in back of each of the tuning dials. These disks may be cut from aluminum and should be about 4 inches in diameter. It is also important that they be connected either to the ground or to the negative of the B battery. For more complete protection against body capacity effects the entire panel may be shielded with a metal plate or an "anti-capacity" panel, which is a hard rubber panel with a metal shield vulcanized in place, may be used. When any of these methods are used it is essential that none of the parts of the set come in direct contact with the metal of the shield, and also, if best results are to be obtained, the shield must be grounded.

## How Body Capacity Effects May Be Reduced in Sets

Every radio fan has heard of "body capacity" until he is tired of it, and it is safe to say that nearly every fan has had his own troubles with it. Most of them would have better luck if they had a better understanding of what it really is. What is this mysterious force that often upsets the finest tuning with unruly squeals, and what is the best way to prevent its effects?

Body capacity, or hand capacity, is the term applied to the property of the human body which makes it act as an electric condenser. Your body is not a good condenser. Compared to the variable condensers in a receiving set it has an extremely small capacity. The trouble is that even an extremely small variation in either capacity or inductance of a set can throw fine tuning out of adjustment.

Each time the operator's hand takes hold or lets go of a knob in the process of tuning the capacity of the set varies by a small amount, because some of the body capacity is communicated to the set while the hand is in contact with it. Then you know too well what happens.

A very fine adjustment of the total capacity of a set can be obtained with modern vernier knobs for rotating the parts of the condensers, which supply practically all of the capacity of the circuit. In the same way a very fine adjustment of the total inductance is obtained by rotating the parts of the coils which supply nearly all of the inductance in the circuit. Thus these two elements in the set itself can be very closely controlled. Body capacity, while small enough in itself, is quite beyond control.

Some radio enthusiasts, who can build anything from a pocket crystal set to a superheterodyne, do not know just why this adjustment of capacity and inductance values is so important in its effect on reception. The reason, technically, is that when these values are properly related to each other for any given wave length the equivalent resistance, or total resistance, of the circuit is at a minimum. As the voltage supplied to the set by batteries or lighting circuit is constant, minimum resistance means maximum current. With the maximum current flowing through the set you have reached the point of resonance—the point at which signals are strongest.

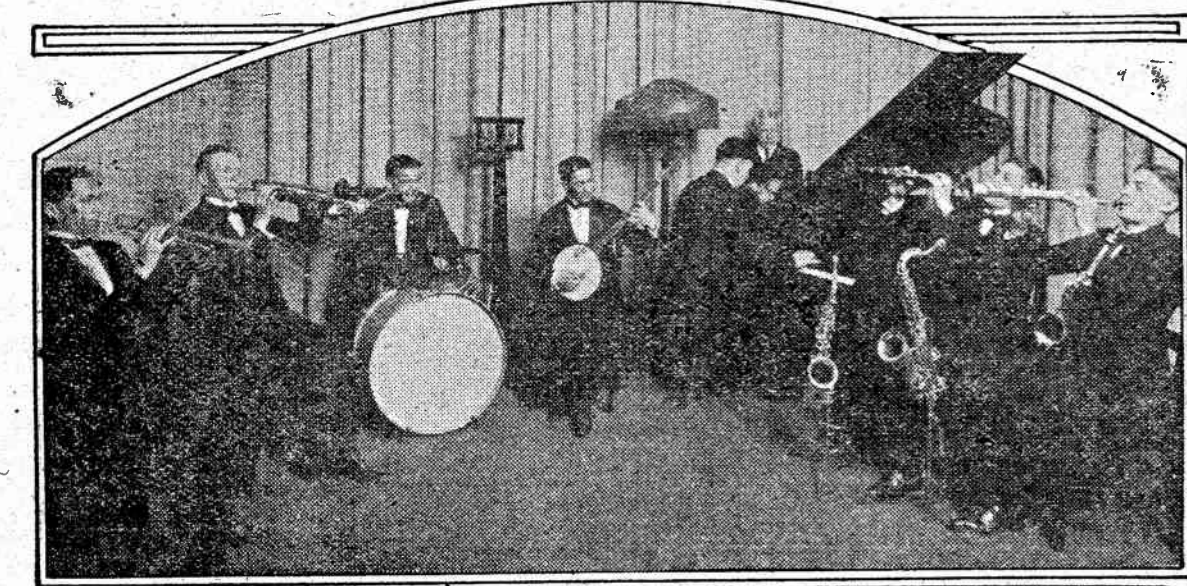
Attempts have been made to eliminate body capacity by various methods, but the most effective has been the protection of the panel, or, in some cases, of individual parts of the set, with a metallic shield.

In order to make shielding thoroughly effective care must be used in making connections in the circuit. The grid and plate terminals are most sensitive to body capacity effects. Keep the parts of the coil or apparatus to which the grid or plate is connected as far as possible from the panel. The filament circuit must be properly grounded.

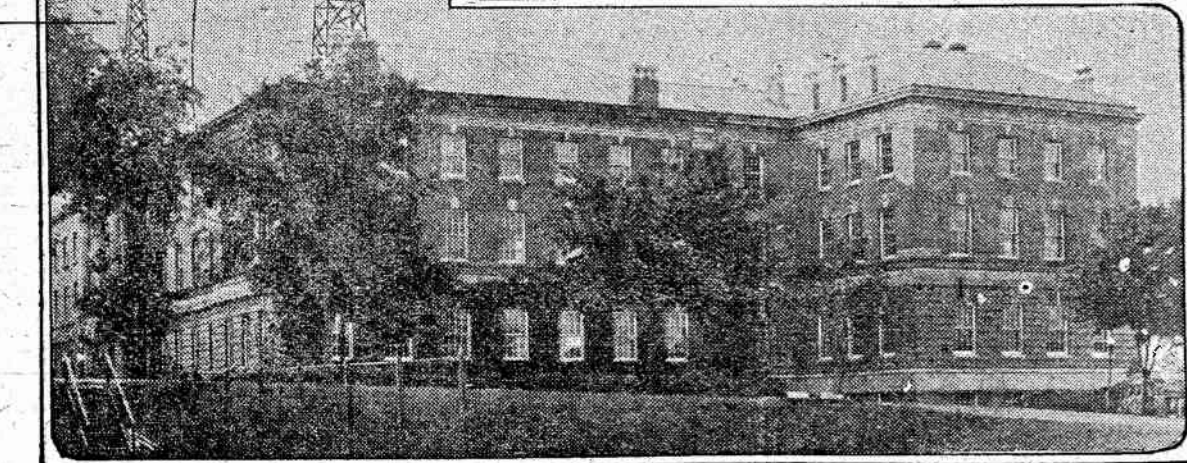
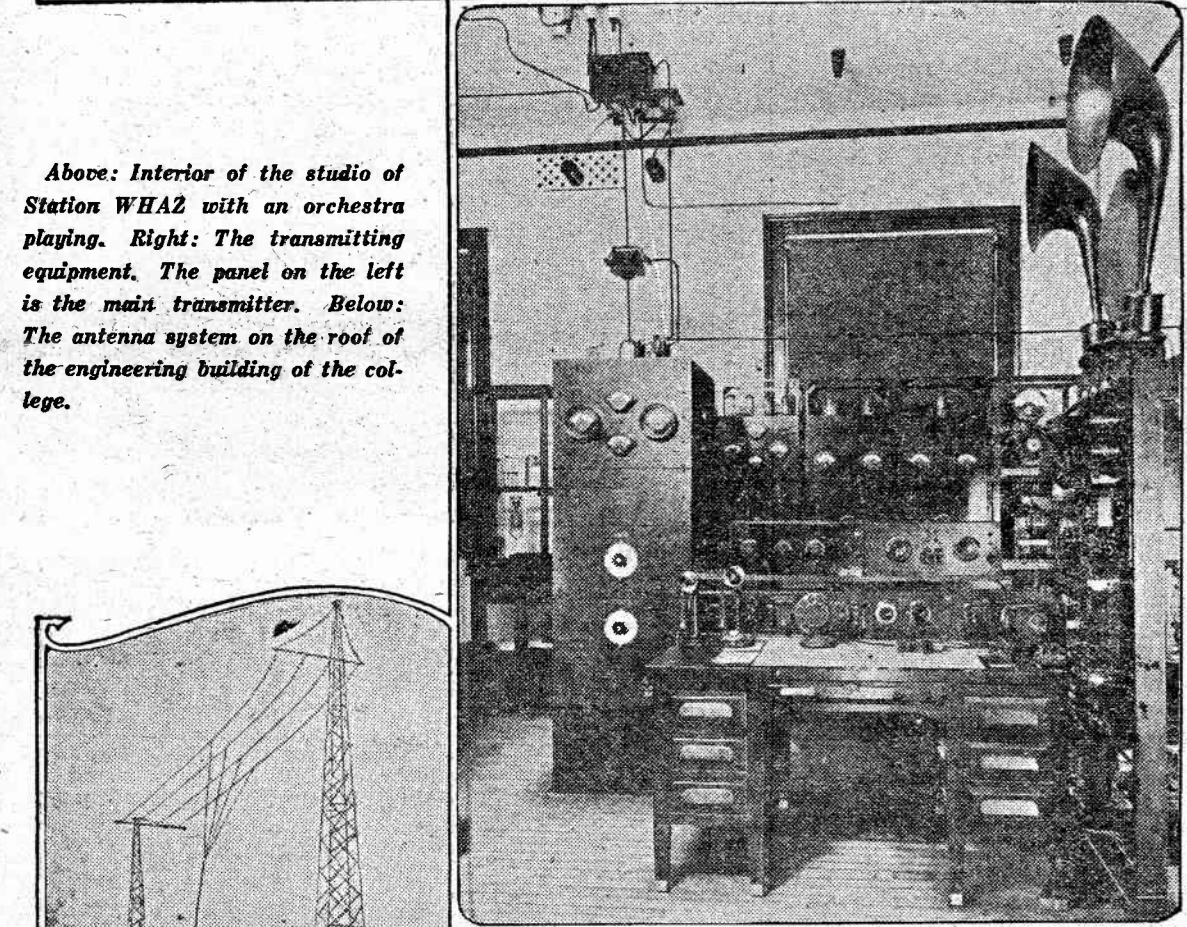
With a variometer in the secondary circuit, the stator end is connected to the grid; in the plate circuit the stator end is connected to the plate. Where a tickler is at the end of an inductance, which is the case with many variocouplers, the end of the coil farthest from the tickler end should be connected to the grid.

In locating the sockets keep the grid and plate terminals farthest from the panel and place the filament leads toward it, as they are not affected by body capacity. It is helpful to shunt the phones with a fixed condenser of .001 or .002 mfd. capacity, or, if amplification is used, to connect a fixed condenser across the plate terminal of the detector tube and the negative side of the B battery. In neutrodyne circuits it is very desirable to shield the neutrodyne transformers to avoid intercoil coupling.

There are several ways in which a panel may be shielded to prevent body capacity. One is by placing small metal disks on the rear of the panel directly in back of each of the tuning dials. These disks may be cut from aluminum and should be about 4 inches in diameter. It is also important that they be connected either to the ground or to the negative of the B battery. For more complete protection against body capacity effects the entire panel may be shielded with a metal plate or an "anti-capacity" panel, which is a hard rubber panel with a metal shield vulcanized in place, may be used. When any of these methods are used it is essential that none of the parts of the set come in direct contact with the metal of the shield, and also, if best results are to be obtained, the shield must be grounded.



Above: Interior of the studio of Station WHAZ with an orchestra playing. Right: The transmitting equipment. The panel on the left is the main transmitter. Below: The antenna system on the roof of the engineering building of the college.



every regular Class B broadcasting condition at its regular wave length of 379.5 meters and with only 500 watts power, but through a long series of unusual radio tests carried out by the electrical communication department of the oldest college of engineering and science in America, which celebrated its centennial last October. Although regularly "on the air" only from two to four hours every Monday evening, aside from its elaborate experimental work, this station has earned the title of the "Transcontinental and International Radiophone" from the fact that its broadcasts have spanned the continent for approximately forty weeks

more than 2000 miles overland, a feat not duplicated, was carried at the will of the operators between WHAZ, Troy, and CFNC, Calgary, Alberta, Canada, in January, 1923. The program director has always sought unusual programs and unique features in radio, as becomes a college experimental station, and by dint of numerous experiments has introduced many novelties, some now become regular features of radio programs. The first minstrel show broadcast was in the WHAZ studio, first Boy Scouts program, first program of old-time songs, one of the earliest radio plays and introduced the "Hearies," in which the play was re-written and adapted for radio as it is for the "movies," first all-Spanish program by Latin-American students which was heard as far south

an unintelligible jumble. Four successive broadcasts were heard in New Zealand. Chief Lone Eagle, of Eagle Bar Ranch, at Winnett, Mont., requested a special program by the Campus Serenaders, students' dance orchestra, and sixty Indians danced to the music at the ranch. A college fraternity at Hotel Atwater, Catalina Islands, danced to music from the Troy studio, and at another time a group of cowboys in western Nebraska. One graduate of the institute makes it a point to entertain the public of his native city, San Salvador, Central America, with student programs from his alma mater by means of a loud speaker. A Harry Lauder imitator notified relatives in Scotland that he would sing on a certain night, and they heard him. Receivers in the British Isles



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Orchestra.  
Fourteen

# Orchestras for Th

| WEDNESDAY, SEPTEMBER 30 |              | FRIDAY, OCTOBER 2 |                 |
|-------------------------|--------------|-------------------|-----------------|
| WEEL 273                | Selber's     | St. George        | 10:35 WN        |
| WUTC 476                | Dance music  | Steen Golden's    | 11:00 WM        |
| WMCA 341                | Serenaders   | Arrowhead         | 11:00 WG        |
| WLIT 385                | Dance music  | Serenaders        | 11:12 WE        |
| WRN 361                 | Roseland     | Rodeo             | 11:30 WH        |
| WRW 273                 | Koenig's     |                   |                 |
| WAHG 316                | Zimmerman's  | 7:30 WJY          | 405 I. Abrams   |
| WGCP 252                | Strickland's | 9:45 WNYC         | 526 L. Colonial |

|     |       |      |     |                 |                      |
|-----|-------|------|-----|-----------------|----------------------|
| 526 | 9:30  | WOR  | 405 | Al Ritter's     | 10 p. m. - Barry Co. |
| 841 | 9:30  | WIP  | 408 | Dance music     | 10 p. m. - m. -      |
| 816 | 10:30 | WJZ  | 455 | Dance music     | 10 p. m. - Sequoy    |
| 492 | 10:30 | WGBS | 316 | Wagor-Astoria   | 10 p. m. - AT        |
| 261 | 10:30 | WPG  | 300 | Dance music     | 1:30 p. m. - L       |
|     | 11:00 | WEAF | 492 | Vincent Lopez's | 1:30 p. m. - Cha     |
|     | 11:00 | WMCB | 451 | George Jones's  | 6:30 p. m. - BH      |
|     | 12:00 | WRNY | 259 | Ferrarie's      | 6:30 p. m. - Scors   |
|     | 12-2  | WAHG | 516 | Dance music     | 7:30 p. m. - Traym   |
|     |       |      |     |                 | 8:15 p. m. - Org     |
|     |       |      |     |                 | soprano.             |
|     |       |      |     |                 | 9:15 p. m. - m.      |
|     |       |      |     |                 | 10:30 p. m. - De     |

Moore, tenor.  
 Koeke, songs.  
 10 p. m.—"How to Succeed in Business Without Really Trying."  
**ANTIC CITY—530**  
 on music.  
 10 p. m.—"How to Succeed in Business Without Really Trying."  
 10:30 p. m.—Ruth Friedman, pianist.  
 10:35 p. m.—Ascot's Dance Orchestra.  
 11 p. m.—Donald McKay, critic.  
**WEBB—NEW YORK CITY—273**  
 12 p. m.—Red Lion Orchestra.  
 7:45 p. m.—Milton Yokeman, tenor.  
 8 p. m.—Rudolph Jonkowsky, violin.  
 8:30 p. m.—Adrian Phillips, contralto.  
 8:45 p. m.—Kenneth Connolly, soprano.

10 p. m.—John McNeally, soprano.  
 10 p. m.—Abbie Mitchell, spirituals;  
 Vincent de Sola, pianist.  
 10 p. m.—Two Hot Knights; Dick  
 Owen, entertainer.  
 10 p. m.—Margie La Valle, soprano;  
 Peter La Valle, guitar.  
 10 p. m.—Program from Warner's  
 Theater.  
 9 p. m.—Arrowhead Dance Orchestra.  
 Continued on Page Fourteen

## World Radio History



# Pre-Inventory RADIO SALE! Pre-Inventory

Extra Special During Sale!!

## SHERMA-FLEX KIT

A two-tube set that gets distance with volume on a loud speaker,

**FREE!** with this **KIT!**

**\$35**

1 Perfectone Speaker, list.....\$15.00  
2 6A5 Tubes (tested), list..... 10.00  
2 B Batteries, list..... 3.00  
1 7x14 Cabinet, list..... 4.00  
Total, given free.....\$32.00

## "LARGEST & MOST GENUINE RADIO SALE in HISTORY"

Standard and dependable merchandise at rock bottom prices. Specials galore! Tear out this ad and keep it for future reference. Sale continues till September 1.

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Made by TRINITY MFG. CO.  
114 Trinity Place, N. Y. C.

Is now in operation at our main store. This machine proves conclusively whether the vacuum tube will oscillate and work properly in the set. We guarantee every tube sold. Trade with us and be safe!

### SOCKETS



75c N. A. Ald, Standard 49c  
75c Murdock ..... 29c  
50c N. A. Ald (199)..... 29c  
1.20 Federal No. 21..... 75c  
1.00 Fada No. 118A..... 65c  
50c Nalco (199)..... 25c  
2.75 Nalco (triple)..... 95c  
1.00 Federal No. 16..... 59c  
75c Sunbeam ..... 39c  
75c N. A. Ald (W.D.11)..... 39c  
Hoosick Falls (W.D.11)..... 39c

### RHEOSTATS



75c Tillman ..... Now 20c  
1.25 Framingham ..... Now 59c  
75c E. D. Rheo ..... Now 29c  
1.50 C. H. Vern ..... Now 95c  
1.00 Pacent ..... Now 69c  
1.10 Federal ..... Now 69c  
1.25 Amsco ..... Now 69c  
2.00 King Vern ..... 89c  
1.00 Fada ..... Now 69c  
2.00 Bradleystats ..... Now 1.45  
1.50 Klosser Vern ..... 89c  
1.25 Acme ..... Now 69c

### TRANSFORMERS



\$6-7 Shermetran ..... Now \$3.25  
\$5 Acme (Radio & Audio) ..... \$2.65  
Supertran ..... Now \$2.95  
\$5.00 All American ..... \$2.95  
\$5 Erla (Audio & Radio) ..... \$2.95  
\$4.50 Thordarson (High) ..... \$2.65  
\$4.60 Cardon ..... Now \$3.45  
\$7.00 Amertran ..... Now \$3.95  
Akracy Audio ..... Now \$1.65  
Federal No. 65 ..... Now \$3.65  
Rasla ..... Now \$3.45

### COMPLETE KITS

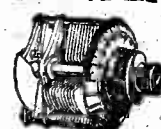
Build Your Own

Liberty Neutrodyne (5 tube) \$29.50  
Workrite Neutrodyne (5 tube) \$29.50  
90.00 Akracy (Super) ..... \$69.00  
65.00 Acmelex Kit Set ..... \$49.00  
Journal one knob ..... \$3.95  
55.00 Receptad Super Kit ..... \$39.50  
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26.00 Ultradyne Super Kit ..... \$23.95

### NEUTROFORMERS

24.00 Freed Eisemann ..... \$16.95  
20.00 Shamrock ..... \$14.95  
20.00 Columbia ..... \$14.95  
17.50 Workrite ..... \$12.95

### CONDENSERS



COMSCO VARIABLE COND.  
11, 13, 23, 43 plate.  
Take your pick ..... **95c**

SHERMAN (Kant Short)  
List 5.50 and 6.50. 26 pl. \$1.95  
and 46 pl. Your choice

R. C. VARIABLE (plain)  
11 pl. 17 pl. 23 pl. 43 pl.  
69c 79c 98c \$1.19

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11 pl. 17 pl. 23 pl.  
\$1.59 \$1.69 \$1.89

### HEAD SETS



3.50 Pacent ..... Now \$2.95  
8.00 Brandes Navy ..... \$4.95  
12.00 Master Baldwin ..... \$5.95  
12.00 Nath. Baldwin,  
type G ..... \$6.45  
7.50 Royalphone ..... \$2.95  
8.00 N. K. ..... \$3.95  
5.00 Murdock ..... \$2.69  
3.00 Scientific ..... \$1.95  
5.00 Blue Streak ..... \$2.85  
5.00 Frost ..... \$2.75  
7.50 Navy Phones ..... \$3.45  
Many more in this sale.

### LOUD SPEAKERS

15.00 Perfectone ..... \$7.95  
25.00 Atlas ..... \$14.95  
23.00 Western Electric  
(521 C. W.) ..... \$12.95  
30.00 Herald ..... \$18.95  
25.00 Liberty Horns ..... \$12.95  
17.50 Pathe ..... \$12.95  
Fibre Horns ..... \$2.95  
Globe Horns ..... \$3.95  
175.00 W. E. 14A ..... \$119.00  
25.00 Magnavox M1 ..... \$18.95  
40.00 Clapp Eastham ..... \$5.95  
100 Various Styles at Lowest  
Prices.

### PHONE PLUGS

1.00 Murdock ..... Now 65c  
1.00 Comsco ..... Now 45c  
1.25 Danstrom ..... Now 69c  
1.00 Weston ..... Now 72c  
1.00 Pilot ..... Now 39c  
40c Staput ..... Now 29c  
1.50 Ducon ..... Now 89c  
50c Pacent ..... Now 29c  
75c Waterbury ..... Now 24c  
Phone Cords, 5 and 6 feet,  
single and double (take  
your pick) ..... 25c

### VARIOMETERS



6.00 Baldwin ..... \$2.95  
3.50 Pathe ..... \$1.65  
6.50 Liberty ..... \$3.40  
6.50 Pearlco ..... \$3.95  
5.00 Fisher ..... \$1.95  
5.50 Columbia ..... \$2.45  
6.50 Pioneer ..... \$2.95  
3.50 Workrite ..... \$1.95

### PANELS

Amer. Hard Rubber  
7 x 10 ..... 60c  
7 x 12 ..... 70c  
7 x 14 ..... 85c  
7 x 18 ..... \$1.15  
7 x 21 ..... \$1.35  
7 x 24 ..... \$1.55  
7 x 28 ..... \$1.95  
Composition Panels  
7 x 10 ..... 29c  
7 x 18 ..... 59c  
7 x 24 ..... 79c

Good Service and Complete Satisfaction



MAIN STORE

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### CABINETS

7 x 10 plain.  
List 2.00 ..... 95c  
7 x 18 Mahog. fin.  
List 4.00 ..... \$1.95  
7 x 21 Mahog. fin.  
List 5.00 ..... \$2.45  
7x26 Mahog. finish-  
ed for Neutrodyne.  
List 7.00 ..... \$3.95

### B BATTERIES



EVEREADY  
22 1/2 Volt, small ..... .89  
22 1/2 Volt, large ..... \$1.45  
45 Volt, large ..... 2.95  
CYCLONE  
22 1/2 Volt, small ..... .65  
22 1/2 Volt, large ..... \$1.35  
45 Volt, large ..... 2.65  
RAY-O-VAC  
22 1/2 Volt, small ..... .89  
22 1/2 Volt, large ..... \$1.65  
45 Volt, large ..... 3.25

### VACUUM TUBES

Tested and Guaranteed  
All R.C.A. and Cunningham  
Tubes, \$3.65

### NOW OUT

The O. T. 8 tube (made by De  
Forest) (same as 201A)

### MISCELLANEOUS

4.50 Lanco Couplers ..... \$1.95  
1.50 48,000 Ohm  
Resistance ..... 69c  
18.00 Storage Battery, 80-  
100 amp., 6 volt. \$12.95

22 Beaver St.

4 John St.

## OUTDOORS WITH RADIO BY LELAND STOWE

I longed to forsake the city  
With its pavements baked by the sun,  
And I hied me to the mountain glades,  
Where hill streams rippling run,  
And there I camped in a shady grove  
Touched by the twilight's glow,  
And once we had our supper made—  
Set up the radio!

Oh, I rambled far of a summer month  
With a kit, a tent and a car,  
And wherever the nighttime found me  
I camped with the evening star;  
And many a virgin trail I found  
Whose ways few come to know,  
But every concert on Old Broadway  
I heard by radio!

Oh, I took me to the northern shore,  
Where the beach gleams long and white,  
And the surge of the sea sang in my ears  
And pavements were out of sight;  
I hiked and swam the whole day long,  
But when the sun was low  
I listened again to the songs of home  
Over the radio!

There was a time when I went away  
That I left the good behind,  
And speeches and orchestras and such  
Necessity forced from mind;  
But now I take them with me,  
No matter where I go,  
For a jazz band soles the mountain heights  
Upon the radio!



# THE NEW YORK HERALD Tribune RADIO MAGAZINE

SECTION NINE

SUNDAY, JULY 20, 1924

16 PAGES

## Radio Enhances All Vacation Pleasures



# Constructing a Unit From Which Any Circuit May Be Obtained

By Means of Phone Tips and Jacks Connections May Be Made Which Will Give Any Regenerative Tuner

By JAMES E. CARTIER

BECAUSE all radio magazines depend upon new things to keep the interest of the radio fans centered upon those magazines it is necessary for them to obtain and print articles describing new circuits, or old circuits revamped. And because of this demand for new circuits and other new things in the radio field, the radio men who are supplying the magazines with copy are continually experimenting with new circuits to place before the radio public.

As a consequence of all this experimenting better circuits are constantly being developed and given the fan to build and use. Many of these circuits are better than those being used by the fan. But to build the new set means a few new parts or at least a new panel. Therefore, the purpose of this article is to describe a method of making a set that can be changed to any circuit which the constructor may wish to have at any time. It also will be possible for the owner of such a set to develop his own circuits, as will be seen later on.

The only drawback to this set is the original cost, but when the changeability of the unit is taken into consideration the cost is really nothing, because the first cost can be the last cost. Of course, adaptations can be made to the set that will not be entered into constructionally herein but will be mentioned, and also those that will occur to the constructor in the course of construction.

## Panel Size

The panel for a one-tube unit of this type should be seventeen inches high by twenty inches long. If a two-step amplifier is to be incorporated into the unit, as will be suggested later, then increase the length of the panel to twenty-seven inches.

For a unit that will take care of nearly every regenerative circuit that could be thought of that would use standard parts two variable condensers, having a capacity of .0005 mfd. two large variometers and a standard variocoupler should be obtained. Another coupler having an untuned primary and fixed coupling should also be obtained as its uses are manifold. This may be made at home or procured at any radio store.

To make this unit at home use a three-and-one-half-inch tube for winding the primary, twenty turns, and the secondary, forty turns, coils on. The tickler coil should have thirty-six or forty turns wound on a tube that will rotate inside the other; about two and five-eighths inches is right.

## How Set is Used

Before drilling the panel the idea of the set will be given. The main idea is that no circuit is made in the set. Each part is mounted on the panel and connections to the terminals of each part are made to the panel by means of the phone tip jacks that can now be bought in any radio store. Thus each instrument is separate from the rest and can be connected to any other instrument by means

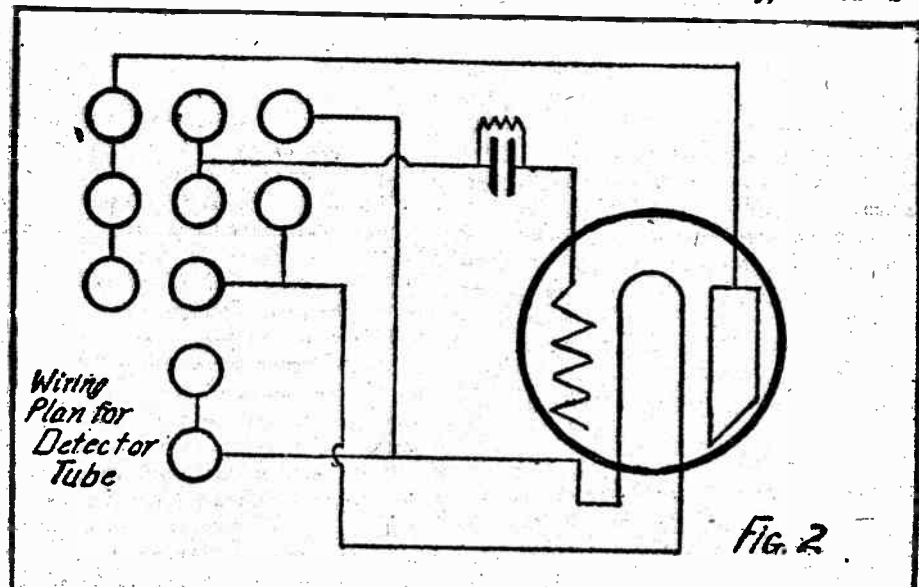
of only necessary to take another flexible lead and connect it to one of the phone posts and to the other variometer jack. This would place a variometer in the plate circuit of the detector tube.

Each instrument will have a certain number of jacks to make the required connections. For variable condensers two jacks will be necessary, for fixed condensers, two; for variometers, four; couplers, six, and for the special coupler mentioned, eight. Rheostats require two jacks, binding posts each one jack, two for the "A" battery posts.

The detector tube requires quite a few jacks, as will be noted. The plate, three; the grid, two, and the filaments, three jacks. For connectors between instruments a half pound of flexible stranded double cotton covered wire, equal to number eighteen B & S gauge in size should be obtained. Two phone tips are necessary for each connector. About ten connectors will be required for most circuits; it will be therefore advisable to make several extra ones. The length of each will depend upon its use. Those for battery and phone connections and other standard uses should be cut to fit the distance between the jacks and then used for that only. As these connectors will wear out in time, keep the extra wire on the spool to make new ones with.

## Mounting Parts

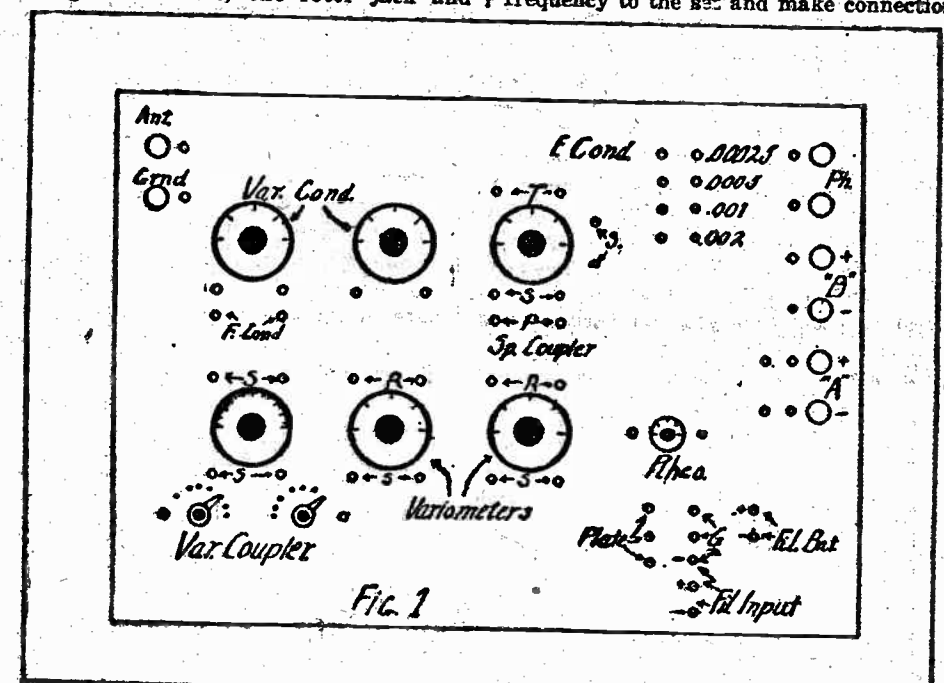
Mount the parts on the panel, as shown in Fig. 1. Then drill for the jacks, as suggested in the drawing, the jacks being represented by circles near the dials. Sometimes it will be necessary in some exceptional freakish circuits to use more



than the given number of connections to one instrument. In this case it will be simple to drill for another jack and connect it in parallel to those already in use.

In connecting up the variable and fixed condensers one jack is connected to the rotor plates and one to the fixed plates. The variometers should be changed from the way they are bought, so that they

figure. That is, the rotor and stator are separated and connected separately. When used in the circuit as straight tuning variometers, one rotor jack and

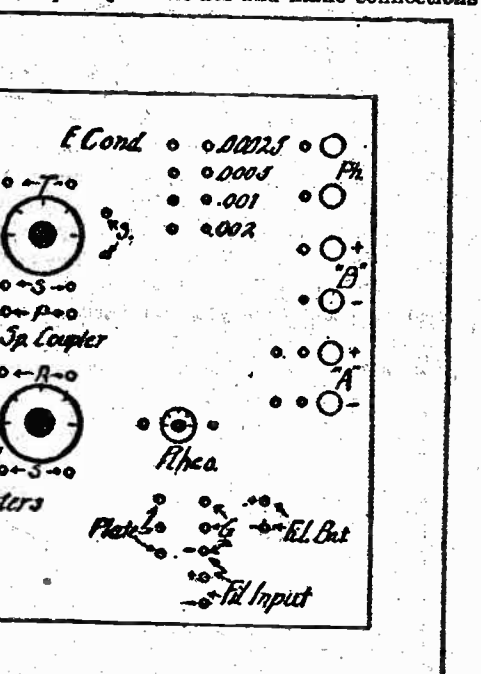


one stator jack are connected together, the other two jacks being used to connect the variometer in the external circuit.

Variocouplers are connected to six jacks, as shown. Four are connected to the rotor coil, named S in figure, and two to the switch levers. The switch points being soldered to the taps on the stator in the standard manner.

The special coupler has eight jacks, two for the primary, named P in figure; four for the secondary, named S in

figure. That is, the rotor and stator are separated and connected separately. When used in the circuit as straight tuning variometers, one rotor jack and



one stator jack are connected together, the other two jacks being used to connect the variometer in the external circuit.

Variocouplers are connected to six jacks, as shown. Four are connected to the rotor coil, named S in figure, and two to the switch levers. The switch points being soldered to the taps on the stator in the standard manner.

The special coupler has eight jacks, two for the primary, named P in figure; four for the secondary, named S in

## Detector Tube

The parts used in the set should be of the best. For the detector tube any type may be used. However, care must be taken to get the proper rheostat for the tube used and also that the proper "A" and "B" battery voltages are used.

The two-variometer circuit is very easy to construct from the set. We will use this as an example to show how the set is connected up. First, a connector is plugged into the aerial post, then the other end is plugged into the jack connecting to the ten-turn tap switch on the coupler. The ground post is connected to the unit tap switch in the same manner.

One jack of the secondary of the coupler is then connected to one of the rotor leads of the nearest variometer. A connector is used to connect one rotor and one stator together. The other jack to this variometer is then plugged into the jack connecting to the grid condenser and grid.

Another jack on the coupler secondary is then connected to the jack on the filament of the tube, either negative or positive, whichever works better for the tube used.

The other variometer has one jack connected to the plate and another to the phones, a connector being used to connect the rotor and stator coils as before. The other phone jack is then connected to the "B" battery positive.

The "B" battery negative is then connected to the "A" battery, either positive or negative.

The rheostat jacks are connected into the circuit with two connectors, one to the negative "A" jack and the other to the negative filament jack. The positive filament jack is then connected to the positive "A" battery jack. The set is then wired up and when the aerial, ground, batteries and phones are connected to their respective binding posts the set will be ready to bring in music.

In this manner it is easy to change the circuit in a few minutes to any one that the constructor desires to favor with his attention for a while. If one does not work well, then another one can be tried without much loss of time.

Before closing the article this author wishes to state that only the bare necessities for a simple set of this type have been given. It is for the constructor to add such improvements as he sees fit. Additional parts may be added at any time if the panel is made larger than that specified and plenty of space is left at the right hand end of the panel for them.

## The New Week on the Radio

By Pioneer

"WHO'S dat lady I seen you dis afternoon?" is the time-honored inquiry that will surely come from WOR on the evening of July 25. The Breaux & Tobias Minstrels will broadcast on that evening. We never have listened to them, but Hollywood McClecker swears that they are good, and we are consequently risking the mention.

For some reason unknown to us WOR has never broadcast out-of-studio events through the remote control system. Perhaps there is not a great deal of opportunity for such work in Newark. However, there is going to be an opportunity for it hereafter, for we are informed that Newark's recently organized Philharmonic Concert Band will play weekly in the Grand Brook Park. WOR, at last coming out of its studio shell, will broadcast the event on Monday nights, beginning this week. This should be more than a mild musical event if WOR's first attempt at outside work is successful, and we certainly hope that it will be.

Oriental music has not been over-broadcast, and for this reason we mention a concert to be given by the Philippine orchestra of the S. S. Leviathan. It will be a forty-five-minute program, and this should not be one minute too long for those who like a dash of the weird music of the East.

We have always said that it takes a good soprano to draw complimentary comment from us. Those who like soprano over the air—we don't—will probably enjoy Dorothy Hayden, soprano, who sings from WOR on Tuesday afternoon.

When Georges Carpentier and Gene Tunney have their clouting match on Thursday, July 24, Major J. Andrew White will be at the ringside to give his always interesting account of the fracas. This is an extra brilliant bright spot for the new week.

We do not hesitate in saying that the U. S. Marine Band offers the best music of the kind that we can expect to hear on the air. Although it plays in a park near the Potomac River in Washington, its notes seem to suffer little for their journey over the 200 miles of telephone wire connecting that point with WEAF's local studio. The band will give another program on Monday evening.

Serious listeners who like popular lectures on science might enjoy Professor Charles L. Harrington, who broadcasts "A Very Small Microbe and a Very Large Star" from WEAF Tuesday morning. This should be on the evening program, but we will probably have to listen to tips on the making of salad dressing instead.

Some time ago John V. L. Hogan, whom we would put down on a list of the ten best radio technical men in the United States to-day, broadcast a series of lectures on super-coated techniques for the less able of the listeners. He ended the series with a promise to return at a later date with data on interference and its prevention. Here is what WEAF's publicity man has to say about his final talk to be given from WEAF's studio on Friday night:

The final talk of the series by John V. L. Hogan, consulting radio engineer and past president of the Institute of Radio Engineers, before WEAF's microphone, concluded with a request for specific data regarding interference difficulties experienced by WEAF's listeners. These have yielded very valuable figures regarding the problems to be met before radio's ills are entirely cured.

The sources of greatest interference were spark telegraph signals which were rated as the worst sources of interference by 39 per cent of those complying with Mr. Hogan's request. Whistles came second, with 31.4 per cent, and cross talk (that is, interference from other broadcast stations), 29.6 per cent.

Radio listeners were also requested to indicate their second and third choice as to the most troublesome sources of interference. Whistles were the second cause of interference on 43 per cent of the questionnaire, spark on 37 per cent and cross talk on 20 per cent. Third choice was assigned to cross talk by 60 per cent, whistles by 22.5 per cent and spark by 17.5 per cent of those replying to the questionnaire.

The consistency of these figures is quite notable, spark interference holding first place in the first choice, second place in the second choice and third place in the third choice. Steps are being taken to reduce this source of interference to a minimum. Although whistles hold only second place in the first choice, the analysis shows them to be quite preponderant as the second worst cause of trouble. Educational campaigns are necessary to remove the cause of this source of interference.

When the first changes in wave length were made cross talk was, perhaps, the most serious difficulty, but improvements in the design of sets and increased experience on the part of those operating them has made this trouble rank third in both first and second choice.

Arrangements are being made with the principal radio telegraph companies for reducing the amount of traffic handled on wave lengths which are likely to interfere with broadcast reception. Considerable progress has been made and transmitters of coast stations located near metropolitan centers have been improved.

The wave length conference in Washington several months ago placed into effect a plan of wave-length distribution which has resulted in a great improvement in the interference situation.

A tabulation of Mr. Hogan's returns follows:

First place:

Sparks.....39 per cent

Whistles.....31.4 per cent

Cross talk.....29.6 per cent

Second place:

Whistles.....43 per cent

Sparks.....37 per cent

Cross talk.....20 per cent

Third place:

Cross talk.....60 per cent

Whistles.....22.5 per cent

Sparks.....17.5 per cent

This is a summary of over 5,000 individual votes, the letters having come from practically the entire Eastern half of the United States.

We have never heard of the Navy Band of the Virgin Islands, but WJY is to broadcast its music to-night and all of our navy bands that we have listened to make us willing to risk a guess that this will be worth hearing. What a big band season this summer!

There will be another New York Philharmonic Concert from WJZ on Tuesday night at the usual hour, 8:30.

WJY comes forth with another Omni-Oral program on Friday night. It is to be "Plantation Night" in seven episodes. We take "Plantation Night" to mean that negro songs will be in order. We can only hope that WJY will live up to the spirit of its promise by having only colored performers. Counterfeit dialect is a pitiful thing to listen to on the radio or any other place, for that matter.

Chelmsford, England, High-Powered Station on the Air

The B. B. C. high-powered station at Chelmsford, England, opened for experimental work on July 9. The hours of transmission provisionally fixed are 11:30 a. m. to 12:30 p. m.; 4 to 5 p. m. and 7:30 to 8:30 p. m. The morning and afternoon programs will be mostly speech, but it is hoped that some music will be played during the evening.

The wave length will be 1,600 meters. The power will be announced later; it will not be less than 15 kilowatts. The station call is 5-XX.

Listeners are cordially invited to write to this station and write to the British Broadcasting Company growing details of their results.

The B. B. C. reserves the right to cancel or change these arrangements in any particular, as it is to be understood that these transmissions are purely of an experimental character. They are not a part of the regular program.

E. E. Passmore at WEAF

## WGY Has a Portable Radio Transmitter

Few radio fans are aware that the same radio program may frequently be heard from Schenectady from three different General Electric stations operating on three different licenses and wave lengths.

The familiar station is WGY, which operates on a development class license on 380 meters. Then there is the short-wave station 2XI, which goes on the air with 107-meter waves, broadcasting the same programs that are put on the air from WGY. The third station, familiar only within a radius of fifty miles of Schenectady, and then only to owners of sets capable of picking up short waves, is 2XAZ, operating on 160 meters.

Transmitter Goes to Concert

2XAZ, like 2XI, is an experimental license. Station 2XI is licensed to use practically any power up to ten kilowatts, and has used that power successfully in long distance transmission on short wave lengths. 2XAZ is the portable radio station, using but 250 watts. Transmitting set and tower, the latter of a telescope type for portability through the streets of the city, are erected on an automobile truck. The truck is used in connection with what is termed remote control. When programs originate outside of the studio and within a radius of twenty-five miles of the transmitting station, the truck may be sent out to the scene of the program—church, theater or public hall. It is there connected to the amplifying unit, which in turn is connected to the microphone used to pick up speech or music. The portable station then transmits by radio the electrical impulses into which speech has been converted at 100-meter waves as received by a very sensitive receiving set and from that point brought by wire to the control room of WGY, where they are amplified and sent on the transmitting apparatus, which puts them on the air on a wave length of 390 meters.

The purpose of the portable set is to eliminate wire connection, the usual practice in remote control has been through hall or theater and the control room. In other words, there is a radio link in place of a wire link.

Experiments by 2XI on the short wave length and by the use of high power have produced some very unusual results.

In the early spring 2XI was heard on the Pacific Coast with loud speaker strength, and this when daylight existed over the greater part of the country.

WGY Sang to Johannesburg

The most extraordinary reception was that reported by N. Grant Dalton, an amateur, at Johannesburg, Transvaal, South Africa, who received, through 2XI, the entire performance of "The Mikado," broadcast on the evening of May 22. "The Johannesburg Star" to which Mr. Dalton in his daily report reported his reception, apparently doubted the young amateur, but the management of the publication was interested to such an extent that they cabled the General Electric Company, preparing to check the claims of Mr. Dalton. The South African heard 2XI from 2:45 to 5:30 a. m. his time.

Mr. Dalton stated: "It is the best reception I have ever had. It was the best I have yet experienced, both as regards clarity and strength. We noticed that the spoken word sounded muffled or husky. The same also applied to the choral singing, but the solo and duet voices were particularly good; throughout we could distinguish the text." The Johannesburg man also picked up 2XI April 22 and May 15. He used a four-valve set, one high frequency detector and two low frequency, but the absence of atmospheric was so marked that he was able to use an additional high frequency valve to build up the incoming signal.

Johannesburg is 8,043 miles from Schenectady. This is a record distance for the station. The reception was the more remarkable because of the warm weather at the transmitting end and the heavy static that has to be penetrated to reach southern Africa, now experiencing the winter season.

WOR Uses Remote Control

The first remote control feature to be broadcast by WOR will be sent over the air on Monday evening when the Newark Philharmonic Concert Band of fifty-two pieces plays a concert from Branch Brook Park, Newark, under the direction of Carl D. Bethel. The concert will be broadcast from 8:15 to 9:15 p. m. and will consist largely of operatic music.

Radio

For building storage "B" batteries, genuine non-corrosive, size No. 25, H. BOKER CO. INC., 191 Duane St., New York City.

Wholesale and Retail

EDISON Elements for "B" Batteries, 4c per pair.

AN other parts in stock. Mail orders filled. HOKER STORAGE BATTERY CO., 144 W. 6th St., Phone Columbia 1253.

Instruction

Automatic Reflex

The only circuit of Mr. Kild. Does not require any special parts. Send only 20 cents in stamps to cover drafting, mailing, etc. Box 113, 28 South St., N. Y. City.

Cabinets

FAMOUS EMPIRE CABINETS AND TABLES.

NEW LINE OF RADIO CABINETS. READY FOR YOUR INSPECTION. EMPIRE UNITED HAT BLOCK CO., 412 East 22d St., New York.

## Two-Way Test With Australia Planned

Having communicated in both directions with amateur radio telegraph operators, in South America, amateurs of the United States and Canada are now turning their attention to the Pacific Ocean for the purpose of engaging in a two-way radio contest with the experimenters in Australasia and New Zealand. Two ten-day periods, one in August and the other in September, have been set aside.

This test is being arranged by the American Radio Relay League at the request of C. D. MacLurean, president of the Australian Radio Relay League, in a determined effort to establish two-way radio contact with North American operators before the end of the year. All of the transmission will be carried on with very short waves.

While transmission on wave lengths in the vicinity of 100 meters is somewhat restricted from the standpoint of United States amateurs, it is expected that there will be a sufficient number of special licensed operators on the air to make the test successful. Many American amateurs are being heard in Australia on the short waves.

Announcement was made at the A. R. R. L. headquarters that the first transmitting period will be from August 10th through the 20th, and the second from September 7th through the 16th. Australian and New Zealand amateurs will listen from 3:00 to 3:30 a. m., E. S. T., and they will transmit from 3:30 to 4:00 a. m., E. S. T. Two-way work will be attempted daily starting at 4:00 a. m., E. S. T.

While the amateurs in the United States and Canada will be losing sleep in the early morning hours,

Code Brings Real DX

The object of most radio fans is to see how many distant stations can be received on a given number of tubes. The further away a station is that has been received the greater the thrill. For those fans who suggest that they study the code and get real DX. Those who know the code can regularly receive signals from the Eiffel Tower and from Nauen, Germany. Signals from Africa and other distant points can easily be picked up. Ships thousands of miles away can be copied at regular intervals. We ask you—where is there a greater thrill for the DX hound?

THE COBURN DUO-FLEX DELIVERS THE GOODS

Almost unbelievable volume is obtained on this set using only 2 tubes. In ordinary residential localities all speakers with more than 25 watt output may be heard on this set. This is due to the fact that the set is a standard circuit and is not a "one-of-a-kind" set. The set is used, and is a Federal Circuit. Giblin Industries General Radio Condenser

Double Condensers Patent Rheostats Giblin Transformers

Several of these sets have been sold to dealers who wanted something a little better and clearer on which to demonstrate speakers. That something. Think it over. Price \$115—complete, with Storage Battery.

1100 complete with Dry Cells

Radio Exchange

Rate, 35 cents a line; minimum, 3 lines. Agate caps and white space only display permitted. Ads. accepted until 4 P. M. Friday.

PHONE PENNSYLVANIA 4000

Parts and Equipment

ONE hundred votes for the "HAWLEY" knock-down rechargable "B" storage battery. The only Edison element storage battery sold on an unconditional guarantee or return of your money without any fee or and. With the exception of elements, these knock-down units are covered by pending patent rights owned exclusively by B. S. Smith, sole originator and planner of the "HAWLEY" knock-down battery. They are heavy glass jars (no test tubes in this) heavy perforated separators, special nickel wire, chemical electrolyte, rubber stoppers and tested large size Edison elements. An 8 page illustrated folder of models, and a complete set of charging and charging free with all unit orders. 22 volt unit, \$2.95; 45 volt, \$5.75; 90 volt, \$10.50; 135 volt, \$15.75; 180 volt, \$20.95; 225 volt, \$26.15; 270 volt, \$31.35; 315 volt, \$36.55; 360 volt, \$41.75; 405 volt, \$46.95; 450 volt, \$52.15; 495 volt, \$57.35; 540 volt, \$62.55; 585 volt, \$67.75; 630 volt, \$72.95; 675 volt, \$78.15; 720 volt, \$83.35; 765 volt, \$88.55; 810 volt, \$93.75; 855 volt, \$98.95; 900 volt, \$104.15; 945 volt, \$109.35; 990 volt, \$114.55; 1035 volt, \$119.75; 1080 volt, \$124.95; 1125 volt, \$130.15; 1170 volt, \$135.35; 1215 volt, \$140.55; 1260 volt, \$145.75; 1305 volt, \$150.95; 1350 volt, \$156.15; 1395 volt, \$161.35; 1440 volt, \$166.55; 1485 volt, \$171.75; 1530 volt, \$176.95; 1575 volt, \$182.15; 1620 volt, \$187.35; 1665 volt, \$192.55; 1710 volt, \$197.75; 1755 volt, \$202.95; 1800 volt, \$208.15; 1845 volt, \$213.35; 1890 volt, \$218.55; 1935 volt, \$223.75; 1980 volt, \$228.95; 2025 volt, \$234.15; 2070 volt, \$239.35; 2115 volt, \$244.55; 2160 volt, \$249.75; 2205 volt, \$254.95; 2250 volt, \$260.15; 2295 volt, \$265.35; 2340 volt, \$270.55; 2385 volt, \$275.75; 2430 volt, \$280.95; 2475 volt, \$286.15; 2520 volt, \$291.35; 2565 volt, \$296.55; 2610 volt, \$301.75; 2655 volt, \$306.95; 2700 volt, \$312.15; 2745 volt, \$317.35; 2790 volt, \$322.55; 2835 volt, \$327.75; 2880 volt, \$332.95; 2925 volt, \$338.15; 2970 volt, \$343.35; 3015 volt, \$348.55; 3060 volt, \$353.75; 3105 volt, \$358.95; 3150 volt, \$364.15; 3195 volt, \$369.35; 3240 volt, \$374.55; 3285 volt, \$379.75; 3330 volt, \$384.95; 3375 volt, \$390.15; 3420 volt, \$395.35; 3465 volt, \$400.55; 3510 volt, \$405.75; 3555 volt, \$410.95; 3600 volt, \$416.15; 3645 volt, \$421.35; 3690 volt, \$426.55; 3735 volt, \$431.75; 3780 volt, \$436.95; 3825 volt, \$442.15; 3870 volt, \$447.35; 3915 volt, \$452.55; 3960 volt, \$457.75; 4005 volt, \$462.95; 4050 volt, \$468.15; 4095 volt, \$473.35; 4140 volt, \$478.55; 4185 volt, \$483.75; 4230 volt, \$488.95; 4275 volt, \$494.15; 4320 volt, \$499.35; 4365 volt, \$504.55; 4410 volt, \$509.75; 4455 volt, \$514.95; 4500 volt, \$520.15; 4545 volt, \$525.35; 4590 volt, \$530.55; 4635 volt, \$535.75; 4680 volt, \$540.95; 4725 volt, \$546.15; 4770 volt, \$551.35; 4815 volt, \$556.55; 4860 volt, \$561.75; 4905 volt, \$566.95; 4950 volt, \$572.15; 4995 volt, \$577.35; 5040 volt, \$582.55; 5085 volt, \$587.75; 5130 volt, \$592.95; 5175 volt, \$598.15; 5220 volt, \$603.35; 5265 volt, \$608.55; 5310 volt, \$613.75; 5355 volt, \$618.95; 5400 volt, \$624.15; 5445 volt, \$629.35; 5490 volt, \$634.55; 5535 volt, \$639.75; 5580 volt, \$644.95; 5625 volt, \$650.15; 5670 volt, \$655.35; 5715 volt, \$660.55; 5760 volt, \$665.75; 5805 volt, \$670.95; 5850 volt, \$676.15; 5895 volt, \$681.35; 5940 volt, \$686.55; 5985 volt, \$691.75; 6030 volt, \$696.95; 6075 volt, \$702.15; 6120 volt, \$707.35; 6165 volt, \$712.55; 6210 volt, \$717.75; 6255 volt, \$722.95; 6300 volt, \$728.15; 6345 volt, \$733.35; 6390 volt, \$738.55; 6435 volt, \$743.75; 6480 volt, \$748.95; 6525 volt, \$754.15; 6570 volt, \$759.35; 6615 volt, \$764.55; 6660 volt, \$769.75; 6705 volt, \$774.95; 6750 volt, \$780.15; 6795 volt, \$785.35; 6840 volt, \$790.55; 6885 volt, \$795.75; 6930 volt, \$800.95; 6975 volt, \$806.15; 7020 volt, \$811.35; 7065 volt, \$816.55; 7110 volt, \$821.75; 7155 volt, \$826.95; 7200 volt, \$832.15; 7245 volt, \$837.35; 7290 volt, \$842.55; 7335 volt, \$847.75; 7380 volt, \$852.95; 7425 volt, \$858.15; 7470 volt, \$863.35; 7515 volt, \$868.55; 7560 volt, \$873.75; 7605 volt, \$878.95; 7650 volt, \$884.15; 7695 volt, \$889.35; 7740 volt, \$894.55; 7785 volt, \$899.75; 7830 volt, \$904.95; 7875 volt, \$910.15; 7920 volt, \$915.35; 7965 volt, \$920.55; 8010 volt, \$925.75; 8055 volt, \$930.95; 8100 volt, \$936.15; 8145 volt, \$941.35; 8190 volt, \$946.55; 8235 volt, \$951.75; 8280 volt, \$956.95; 8325 volt, \$962.15; 8370 volt, \$967.35; 8415 volt, \$972.55; 8460 volt, \$977.75; 8505 volt, \$982.95; 8550 volt, \$988.15; 8595 volt, \$993.35; 8640 volt, \$



## 2 RADIO NECESSITIES

In 1 Article  
At 1 PriceSHURETY  
LIGHTNING ARRESTOR  
AND LEAD-IN

The Only Article of Its Type

1. Furnishes a dependable and highly insulated ribbon type lead-in.
2. Easily attached without drilling woodwork or marring walls—neat and attractive in appearance.
3. Special weather-proof, sealed construction insures efficiency and permits out-door or in-door use.
4. Genuine Bakelite mounting prevents leakage.
5. This SHURETY combination meets every requirement of the Board of Fire Underwriters.

The SHURETY is \$1.50 at good radio dealers, or it will be sent anywhere prepaid upon receipt of price.

Manufactured by

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## Last Week on the Radio

By Pioneer

WE have noticed a very desirable improvement in broadcasting in the last few weeks. It is not an improvement that will revolutionize the art nor will it make a great deal of difference to the average listener, but it is one of those little things that will help to develop broadcasting as a more smoothly flowing source of entertainment. We refer to the pleas for correspondence. But a short time ago our announcers ended practically every verbal bow they made before the microphone with a solicitation. "We are sure that Mr. (or Mrs.) So-and-so would be glad to hear from his (or her) radio audience," etc., was the stock phrase used, and it finally became deadly monotonous. So much so, in fact, that we were driven to protest. Although we cannot credit ourselves with having brought about a reform in radio, we have noticed that our studio managers have taken steps in the matter and broadcasting appears to be well on the way to completely throwing off some of its cheapening trappings.

Last week, taken as a whole, was quite entertaining. In reflecting on past events we must keep the period of the year in mind, for that has an important bearing upon broadcasting programs. The meager supply of talent from which studio impresarios draw usually takes to the country. Yet we have noticed an improvement in broadcasting this summer over last summer. It has been more exciting and more entertaining all around. Of course, the summer has not passed yet, but it is a little late for the proverbial slip between.

We were pleased beyond words last week when a barytone who has noticed our somewhat disparaging remarks concerning the overworking of certain ballads asked us to supply him with a new list of songs. We look upon this as an important event which may greatly influence broadcasting. It may mean that "Tommy Lad," "Pale Hands," "Invictus" and a few of the other "favorites" will not be broadcast more than fifty times a week instead of two hundred times. We supplied the gentleman with a list gladly, and we shall be glad to do as much for any other barytone with enough sense to see that he is a nuisance to broadcasting if he insists on singing things that have long since become a bore.

Another gentleman asks us why we do not have more to say about the WOR programs. The number of times a station is mentioned in our column depends entirely upon its importance to the broadcasting scheme.

Sir: Is your typewriter upside down or has the heat affected it, so that you cannot list the call letters of our new baby station correctly? You have been calling it WCNV, while your eminent friend, A. C. N., has been calling it WNYC. Now, will you please straighten that typewriter out and put those letters in correctly, and have mercy upon them for they are only a baby learning to crawl. Wait until A. C. N. can get them ready, then you can start in. For no station can be perfect at the beginning as you know.

You also stated some time ago, that their wave length is too high and the ships interfere with it. Now for the love of Mike, take your set and tune it as Dr. Goldsmith said. Cut out a few kilocycles and then you will not have any trouble from ship code, for the writer, who lives in the Bronx, has a three-tube regenerative set and has no trouble from code at all.

You will also note, if you listened to WNYC last night that Mr. Cowan asked for our indulgence before we start to criticize, so therefore I think you ought to take the cue. By the way, this station will be able to give us music from bands that have not been broadcasted before, namely the best bands in the city, the Police Department and the Fire Department, so I must defend them and say that it is a real treat to hear something else than military bands and hotel orchestras. Why do you let a little paper like "The Bronx Home News" beat you, for they have been announcing the programs of WNYC for the past few days and your program has not even made mention of it?

Your old friend,

THE RADIO BUG.

We are not guilty of criticizing WNYC's program. We might have registered our none-too-compliment-

tary thoughts concerning the broadcasting of political propaganda, but our expressions that had to do with the programs were quite mild and reasonable. If Thomas Cowan (ACN) is given half a chance, he will make a broadcasting station of WNYC. If he has to accommodate too many of Mr. Hylan's subordinates on his programs, he is going to make a rank failure of his work.

M. C. Fry again flays the good natured Hollywood McCosker. We publish this with the hope that it will excite Hollywood into dispatching a stinging answer which we shall be glad to publish.

Sir: I see by your paper that Hollywood McCosker has successfully squirmed and that he has acquitted himself of all that had been charged "again" except the main counts in the indictment, to wit: that he is an imitator. To these counts he pleads guilty.

I presumed as much the first time I ever heard him "taking the air." Yet I have real admiration for his knack of getting by with the imitation stuff, and it wouldn't be fair to say that it's a cheap imitation, so I wish to repeat, more power to him. However, using his own words, "he might perhaps better distinguish himself" by use of original titles and less trite material. I, too, as a apprentice boy, have been the recipient of emoluments from my one time boss, but I wouldn't feel justified in that in appropriating the good will and trade names of said employer's business.

Yours for better broadcasting,  
M. C. FRY.

Earthquake Report  
By Radio Denied

Captain H. de A. Donisthorpe, representing the British Marconi Company in New York, which company controls the wireless installation on board the Italian steamer Duilio, states that the story about the radio equipment and telegraphist on board this steamer giving information as to an earthquake in New York having wrecked the Woolworth Building, which appeared recently in New York and other newspapers, had no origin in the wireless department of that steamer.

Mr. Franckie, the chief wireless officer of the Duilio never received any such communication regarding an earthquake and it can only be assumed that some foolish practical joker has been at work. Such a fabrication is both dangerous and stupid and at the same time might have lost an old employee of the company like Mr. Franckie, his appointment. Unfortunately, the origin of the story cannot be traced.

Captain Donisthorpe has in his possession all the radio bulletins which were received on the Duilio during her voyage and no such story as has appeared in the papers, is contained in them.

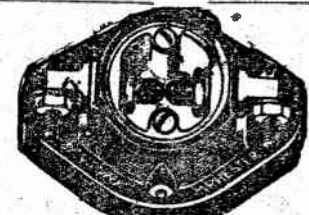
## Mark Strand Theater

Broadcasts Through WMAF  
Musical and special concert programs of the Mark Strand theater, New York, will be broadcast every Sunday night beginning at 7:15 o'clock. The first program was broadcast last Sunday night through Station WMAF at South Dartmouth, Mass. Over telephone wires and cables, the musical program was sent from the theater to 195 Broadway, New York, thence to Station WMAF, which is using a wave length of 364 meters and a 500 watt transmitter. Radio fans throughout the East should have no difficulty in picking up the programs.

G. J. Podyen of the American Telephone and Telegraph Company, New York, and his staff of assistants are in charge of New York details and are devoting their personal attention to getting perfect transmission.

## A New Phone Plug

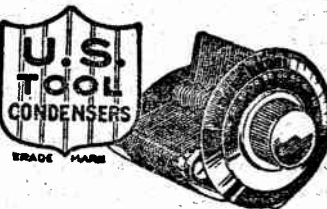
Under the name "Polyplug" a new phone plug for radio receivers has been placed on the market by the Polymet Manufacturing Company, New York City. It is of the simplest possible design and possesses features of convenience which should appeal to the fan. The phone tips are pushed into openings in the plug and the cords are criss-crossed in a tension slot, which prevents the tips from accidentally pulling out. There are no screws to tighten or loosen, and no necessity for taking the plug apart to insert the phone tips.

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POPULAR DISCUSSION  
OF TECHNICAL POINTS  
USUALLY CONSIDERED  
TOO INTRICATE FOR  
GENERAL EXPLANATION.

## BEHIND THE PANEL

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R. P. CLARKSON

HARTH

THAT the average radio set works at all is a never ending source of amazement to me! It is, of course, unique among the playthings of man in that it has no moving parts except those movable for adjustment or tuning. It is, to that degree, unlike the phonograph, player piano, automobile, motor cycle, bicycle or motor boat. These things are simplistic, themselves compared with a radio set and they deal with known things that you can see. With an automobile or a motor boat, for example, the fundamental problem is the gasoline engine. The requirements for its performance are a proper mixture of gasoline vapor and air and an electric spark at the right time. All of this is physical. You don't have to guess any of it. You deal in facts that you can verify. You can see the spark and when it occurs. You can see the gasoline and when it flows.

none was ever advertised—one the basis of low B battery renewal costs.

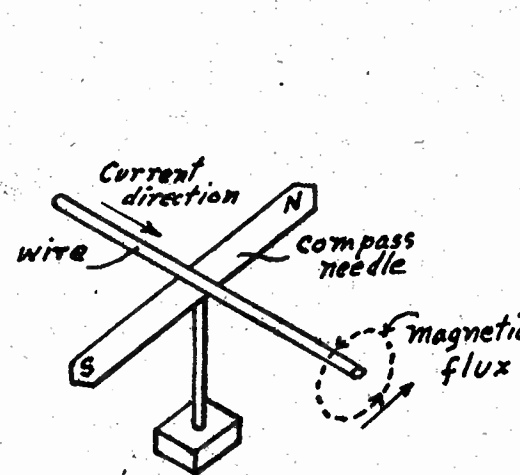
The one-fourth ampere tubes were hailed with delight as cutting down the cost of current for the radio set. They do cut the cost materially, but the A battery upkeep cost does not begin to compare with the B battery upkeep. Investigation of several thousand five-tube sets shows that the average B battery cost is about twice that of the A battery cost, even when allowing for depreciation, repairs and payments to a charging station for recharging and for rental of a loan battery.

There are, of course, all kinds of meters on the market of various types and for various purposes. Meters, like all measuring instruments, are devices which compare two quantities by showing their relative amounts, not their absolute values. Even a scale for measuring length en-

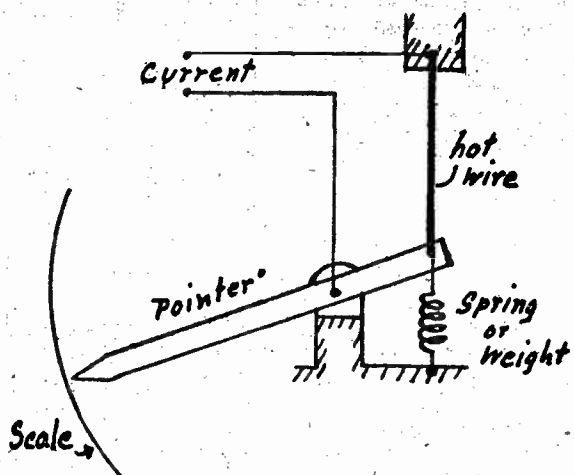
inclined to stop it, and when you can see for yourself what difference in economy there is between various devices and various adjustments you are inclined always to the most economical. When you can't see waste you become careless in spite of printed warnings. I think it was a town in Connecticut where the growth of the town was so great that the matter of water supply became serious. Any one could have water piped to his house and use all he liked at a flat sum per year or per quarter. When the water question took on this new aspect it was decided to put meters in each house, so that those who used more should pay more in proportion, and thus the town could find the money to extend the supply. This was done, but the surprising thing was that when the meters were installed the consumption of water dropped immensely, so that there was no need for

the force required to turn the needle through varying degrees may be readily measured. Knowing this force, we know the force of the field, and the strength of the current producing the field may then be very easily calculated. We do not need to do this, however, as we can place a scale on the device over which the needle can be arranged to move. Then, by sending currents of known strength through the wire, we can calibrate the scale by marking on it the position of the pointer and the strength of the current at that time.

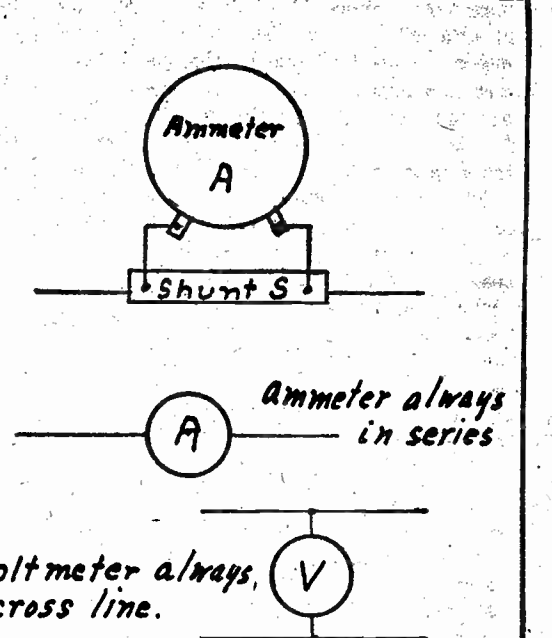
The use of a needle in an instrument of this kind requires that when no current flowing the instrument must be set so that the needle is along the wire. To do this the wire must be in the magnetic meridian, because the earth's field will attract the compass needle. In order to be more independent of outside forces the needle may be replaced by a coil and a stationary



THE GALVANOSCOPE



HOT WIRE METER

Ammeter always  
in series  
V  
Voltmeter always  
across line.

You can see the carburetor action and see the adjustment. You can see the engine go and can see what happens to it as various changes are made. But, go around any boat club in the spring of the year, or, in fact, almost any time, and watch the struggles and efforts made to start some motor boats. It is no unusual thing to work several days to make an engine run when the boats are first put overboard. It is no unusual thing to have to spend an hour or two any time to start a motor boat. Not always, of course, and not all boats, but the cases are not rare.

In view of these things, isn't it little short of miraculous that a radio set dealing in quantities and matters that can't be observed in any way by the human senses, subject to troubles that we can't perceive, affected by a multitude of conditions we know nothing of, having no action to be observed and corrected, reaching out for something the presence of which we can't determine and which, when it is present, is controlled and adjusted by other human beings in some far off stations—isn't it marvelous that such a device can be put in the hands of almost any one without education or training and often lacking entirely in intelligence, and the radio set performs nearly always to his or her satisfaction?

## Millimeter Needed

The meter most needed, it seems to me, on a radio set is a millimeter in the plate circuit of each tube or, as that is expensive, in the common lead from the B battery negative post, so as to measure the entire drain from the B batteries. I venture to say that if sets were sold on the consumption of B battery, which is the upkeep cost of most sets, just as cars are compared on the basis of miles per gallon of fuel, there are many varieties of radio sets which would disappear from the busy marts of trade. Who would choose a set consuming 60 or 70 milliamperes from the B batteries, as against another set using less than a third as much with as great an ordinary range of distance and substantially the same volume, even if the latter set cost more? Yet I venture to say that no set was ever sold—certainly

ables us merely to compare lengths, using for our standard some agreed upon length, such as what we call a foot or a yard or a mile. For comparison purposes, it makes no difference whether our scale is exactly a foot or a yard. We can get the relation between any two lengths we measure. To tell others, however, either our measure must be exactly a foot or we must know just how far short or long it is. The reading can then be multiplied by some number to give the correct result in feet, just as we can get the exact time from a watch that is slow or fast if we know how much it is out of the way.

I am inclined to think that there is a certain quality which may or may not be found in people we class as intelligent or in people we characterize as "dumb" which has no apparent connection with education or knowledge. This is a sort of perception, a combination of close observation and perfect freedom of responsive action. You see it in the worker around your car, your boat, your radio set. You see it in the young fellow who acquires a local reputation as a genius because he can fix any balky set. He simply goes ahead and makes the changes that suggest themselves to him without any thought of what difference those changes may make. While you and I are arguing with ourselves and have finally concluded the thing is impossible he has tried it and made it work. Radio sets work for him as well as or better than they do for us.

A still more surprising feature of radio sets is the fact that, although they deal with electrical phenomena and with unseen forces—things that we can to a certain extent measure but cannot otherwise perceive—it is rare, indeed, to find any kind of measuring instrument on any set built for public consumption. I presume cost is the thing that keeps the manufacturer from supplying instruments, and lack of knowledge of their value is what prevents the public from demanding them. It is a fact, however, that meters properly chosen will enable you to operate your set more economically for several reasons. When you see waste going on you are

any extension of the supply. The people could see that their pocketbooks were affected by leaving the water running.

No instrument can be considered as giving accurate readings at all times, no matter how good it is. Even the finest devices made have their calibration curves to give due allowance to temperature, humidity, pressure, nearness of other objects, drafts and many other effects, depending on the instrument and the degree of accuracy for which it is to be used. In the ordinary radio set great precision is not worth while. On the other hand, the instruments must be good enough so that they will give the same reading continuously under the same conditions. They must be, also, such that the instruments themselves do not consume so much current as to make the results misleading. The cheaper instruments are apt to be of this nature.

Electrical measuring instruments, of whatever nature they are, are merely devices for comparison of electrical currents by comparing the effects produced by the flow of the currents. We know that a current flowing has a magnetic effect. We know it has a heating effect. We know if the current passes through an electrolyte it has a chemical effect. Hence, our electrical instruments must utilize one of these three effects. The magnetic effect is most used and the instruments are called electromagnetic instruments. They are usually designed for either d.c. or a.c. separately. Those instruments depending on heating effect are called hot wire instruments and are usually independent of either the alternations or oscillation of the current. The third class of instruments, the electrochemical type, are not normally met with in connection with radio receivers.

In its elementary form each type of instrument is extremely simple. The electromagnetic type as shown is merely a compass needle which when placed in an electromagnetic field tends to point in the direction of the field. The stronger the current the greater the force which will tend to turn the needle in the direction of the field. The needle can be so arranged that it is turned against the pressure of a spiral spring to which it is connected, and

magnet used. This is the construction of the most accurate and sensitive galvanometers such as the D'Arsonval type, and is the practice in commercial instruments. The coil is suspended between the poles of the magnet, the field of the permanent magnet being unidirectional.

A hot wire instrument is of similarly simple construction and, with care, can be readily made in any one of a multitude of varieties. The idea is that a current sent through a wire will have a heating effect. The rise in temperature of the wire will cause an increase in its length proportional to the rise in temperature. This will cause a deflection by the pointer on the scale.

The instrument, which consists merely of a compass needle over which a wire passes, measures the presence of a current and is called a galvanoscope. When fitted with a scale it becomes capable of comparison effects and is called a galvanometer, the oldest instrument used for electrical measurement. Put in portable form it becomes an ammeter, if designed for current measurement, and a voltmeter, if for the measurement of electromotive force. As a matter of fact, all instruments measure current. Obviously, however, the current through any instrument having a constant resistance is proportional to the voltage at the terminals of the instrument, and if the instrument is calibrated for that purpose the reading can be in volts.

Ammeters, being always used in series in a circuit, always are of very low resistance, so that little power is wasted in them, and their use does not change the electrical characteristics of the circuit. Sometimes shunts are employed to accomplish this, the shunt being placed in the circuit and the ammeter arranged in parallel. With an ammeter of resistance A and a shunt of resistance S, the proportion of the total current going through the ammeter is S divided by A+S. Then the actual flow in the circuit is A+S divided by S multiplied by the ammeter reading.

Voltmeters, being always in parallel in the circuit, are made of very high resistance to prevent any great flow of current through them and around the part of the circuit with which they are in parallel.

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# General Directions for Checking, Adjusting And Operating a "Super"

Part II of an Article Describing a 45,000-Cycle Super-Heterodyne

By LAWRENCE R. BLACKHURST

IN THE July 6 issue of The New York Herald Tribune Radio Magazine general directions were given for building an eight-tube 45,000-cycle super-heterodyne. This article is a continuation of the former and gives information relative to checking, adjusting and operating the receiver described.

CONNECT the loop to the three binding posts on the left end of the panel. The center tap of the loop must be connected to the center binding post. One of the outside loop terminals should be connected to the top binding post and the other to the lower binding post. These two connections may be reversed without affecting the operation of the set.

The B battery unit may consist of two 767 Eveready 45-volt batteries connected in series. Connect the negative terminal of this unit to the binding post marked —AB, the positive 90-volt terminal to the binding post marked 90B and the 45-volt terminal where the two batteries are connected in series to the binding post marked +45B.

After this has been done and before the A battery has been connected, plug in the phones and the loud speaker in the jacks provided. Close the filament switch, located on the panel under the voltmeter, and turn the rheostat up a few degrees. Any deflection of the voltmeter indicates an error in the wiring of the filament or B battery circuit. If such an error exists the trouble must be located and eliminated at once. If the voltmeter is not deflected the A battery can next be connected to the terminals marked +45A and —AB, Fig. 6.

Again turn on the filament switch and note the voltmeter reading, which should be 4½ volts. If this reading is obtained the wiring of the A and B battery circuit is correct. If the meter should fail to read it is because the filament circuit is open. If the needle is deflected to the end of the scale the B battery voltage is shorted through the filament circuit.

The tubes can now be inserted. First see that the filament rheostat is turned to the off position and that the volume control rheostat on the right hand end of the panel is turned clear to the right; also that the filament circuit switch is open and that the terminals of all the tubes and the contacts in the sockets are clean. Close the filament switch and turn the filament rheostat until the voltmeter indicates a filament potential of exactly three volts. This value should never be exceeded, as doing so will shorten the life of the tubes and may cause permanent injury to their filaments.

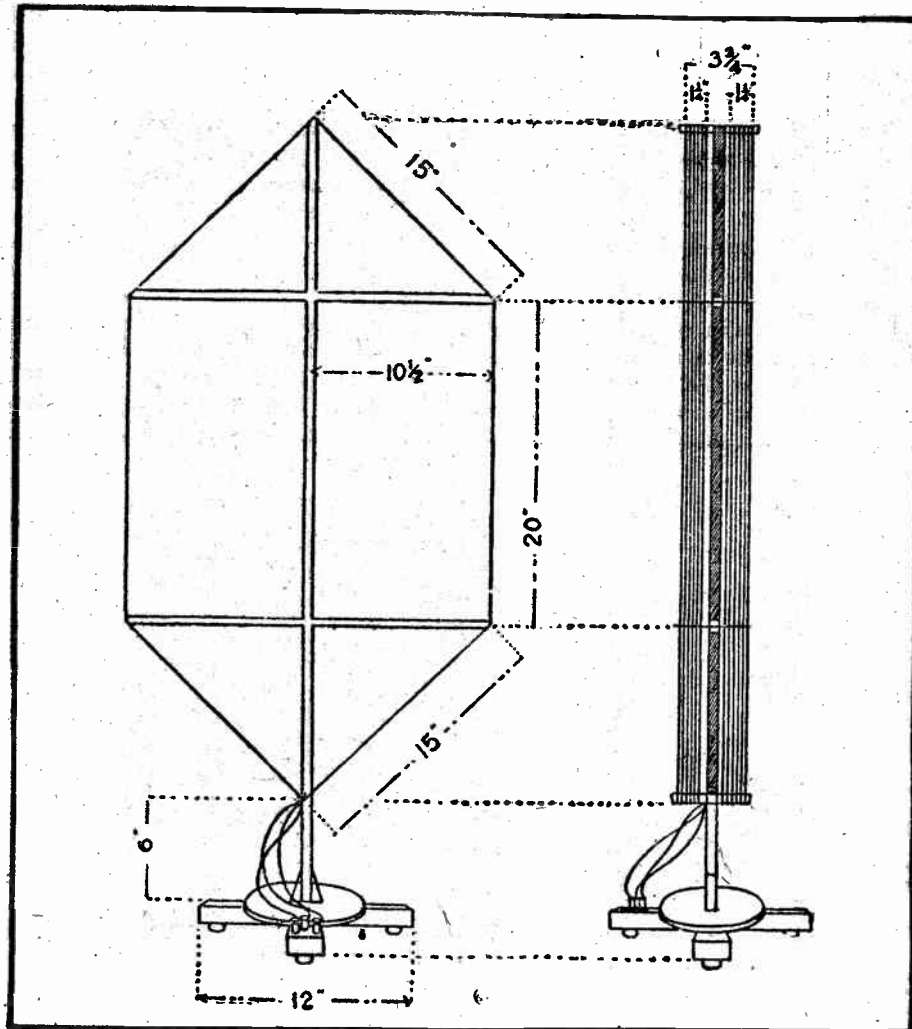
## Adjusting and Operating the Set

The set is now ready for an actual operating test. This should be done at a time when it is known that a broadcasting station of medium or high power is operating within a range of 100 miles. In normal operation there are only two variables to adjust, condensers C1 and C2. The rotor of the coupling unit and value of condenser C3 require initial adjustment, but, once set, will probably not need further attention. Set condenser C3 at the position for minimum capacity; that is, so stator and rotor plates are not interspaced. Its final adjustment follows later.

Set the rotor coil of the coupling unit half way between the maximum and minimum coupling positions. To locate a broadcasting station with the tuning controls set the loop condenser, which is the one at the extreme left end of the panel, to the five-degree position, then slowly turn the oscillator condenser from zero to 15 degrees. If no signal is intercepted change the loop condenser setting to 10 degrees and again slowly turn the oscillator condenser from 0 to 20 degrees. This process should be continued until a station is intercepted, changing the setting of the loop condenser about 5 degrees each time and slowly turning the oscillator condenser from a point at least 10 degrees below the loop setting to 10 degrees above the loop setting. When

tuning distant stations the same procedure applies, only it will be necessary to make loop settings every two degrees or even every degree if the signal strength of the station to be received is weak.

or spark transmitters it will often be found that one gives better results and less interference than the other. If the station received is within a radius of four or five hundred miles the ampli-



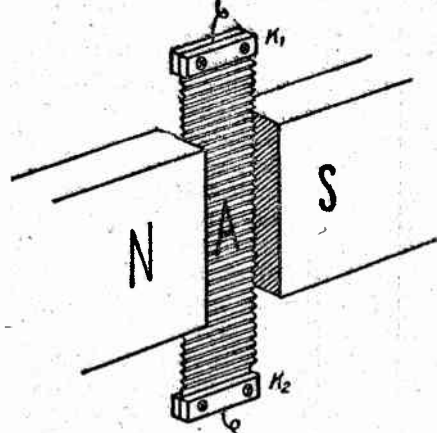
When a station is picked up it will be noted that it can be received at two settings of the oscillator condenser, the lowest one on the dial being the adjustment of the oscillator that gives a frequency 45,000 cycles higher than the frequency of the incoming wave. The setting highest on the dial is for the frequency of the oscillator that is 45,000 cycles below the frequency of the incoming wave. Signals should be received with about the same intensity at either of these settings, but sometimes under conditions of interference from other broadcasting stations

the intermediate amplifier will probably be so great that the audio-frequency amplifier tubes will be overloaded. This undesirable condition can be corrected by turning the volume control rheostat to the left until the volume is sufficiently reduced and distortion eliminated.

After one station has been received it will be fairly easy to pick up additional stations. Each time a station is tuned in its location on both the loop condenser and the oscillator condenser should be noted. This is important not only for

## Loud Speaker Operates on a Novel Principle

As the subject of loud-speaker design is very much to the fore at the present time and interests every one associated with broadcast receiving, the following notes on a recently produced loud speaker, operating on a somewhat novel principle, will



be of general interest, says "The Wireless World and Radio Review," London.

The apparatus here described is constructed by the well known firm of Siemens & Halske and has been developed in Germany by two engineers of that company, K. W. Wagner and Luschen.

Nearly every type of loud speaker which has been developed and is of practical value depends for its operation on some means of influencing a diaphragm, the diaphragm being controlled, either directly or indirectly, by the received speech currents.

In addition to having to set the diaphragm vibrating at frequencies corresponding to the frequencies of the speech currents, there is an expenditure of energy in overcoming the inertia of the diaphragm, and also in moving the mass of air which the diaphragm displaces in vibrating.

Professor Schottky, who has made a theoretical study of the problem, has proved that to obtain maximum efficiency the mass of the diaphragm must not exceed that of the air moved by it, and that it is preferable for the mass of the diaphragm to be less. Hence the necessity arises for the diaphragm itself to be extremely thin and light. In the present loud speaker an arrangement has been adopted which resembles the principle of the Sykes-Round microphone, for, instead of the more usual method of influencing a magnetic field by means of the speech currents and so controlling the movement of the heavy diaphragm, the speech currents are led through the diaphragm itself, which is placed in a powerful magnetic field. In the loud speaker illustrated herewith this principle has been adopted. Between the poles of the powerful electromagnet, N S, is stretched an extremely thin waved aluminum foil "A," and the output connections of the radio receiver or amplifier are made to K 1 and K 2. A current carrying conductor placed in the magnetic field is deflected vertically to the direction of the magnetic field, and consequently the aluminum foil will oscillate in a vertical direction at the rate of frequency of the currents passed through it.

tuning in the same station at another time, but to facilitate the location of stations whose wave lengths are known to be slightly above or below the station for which settings were recorded.

When a station at least 1,000 miles distant has been tuned in the rotor of the coupling unit should be adjusted to as near the minimum coupling position as is possible without causing a decrease in signal strength. Once this adjustment has been made the rotor may be locked in place with the set screw provided for that purpose and need never be changed again throughout the life of the oscillator tube. When a new oscillator tube is inserted in the socket it will be well to re-adjust the setting of the rotor.

The adjustment of condenser C-3 should be made while a station of low wave length, between 300 and 350 meters if possible and located at a distance of several hundred miles is being received. Under these conditions increasing the capacity of the condenser will cause considerable increase in signal strength. This capacity may be increased as far as possible without causing the first detector tube to oscillate or cause distortion of the received signal. When this adjustment is once made it can remain fixed for the reception of all stations on any wave length.

If, after carefully following these instructions for tuning the circuit, no signals can be received and at a time when it is known that a local broadcasting station is operating, a test should be made to determine whether or not the oscillator tube is oscillating. A good method of doing this is to touch the grid terminal of the oscillator tube or socket. If the tube is oscillating a click will be heard in the phones when the finger touches the terminal and again when it is withdrawn. If it is not oscillating a click will only be heard when the terminal is touched and not when the finger is withdrawn. Failure of the tube to oscillate may be due to incorrect wiring of the oscillator circuit; tube terminals may not be making contact with the socket prongs; or to the use of an old tube that is inoperative. Remedies for such conditions are obvious.

The range of reception depends largely upon the power of the broadcasting station. When the operator has become familiar with the tuning of this set little difficulty will be experienced in receiving 500 watt stations up to a distance of 2,000 miles. Under favorable atmospheric conditions the set is capable of reception across the continent.

## Shielding

When the set is to be operated in a radius of a mile or two of a high-powered broadcasting station it is sometimes found advisable to increase selectivity. Static such as is caused by high-tension lines, streetcars, elevator motors, etc., is also considerably lessened by shielding.

The entire inside of the cabinet may, in extreme cases, be shielded. The shielding should be No. 34 gauge brass or copper cut into exact sizes to fit bottom, ends, top and back and tacked into place with small flat head brads or brass tacks.

A template should be made to conform with the panel drillings used in mounting the panel instruments. Cut the holes in the shield sufficiently large to clear the condenser and rheostat shafts and any other parts that might cause short circuits. For the jack cut a 1-2 inch hole and insulate the jack from the shield with a thin fiber washer. Since the shield is connected with the negative A and B battery terminals extreme care must be taken to insulate all parts of the mounted apparatus that are common to any part of the circuit other than the negative battery leads below the rheostats.

## The Loop

While it is not essential that the exact form of loop shown shall be used, it is important that the general dimensions be adhered to as well as the number of turns and spacing between turns.

It is necessary to take off a center tap which connects to the center binding post on the panel. One of the outside loop terminals connects to the top binding post and the remaining one to the bottom post.

## QUESTIONS & ANSWERS

**Radio-Frequency Choke Coil**  
F. Robbins—I wish to construct a Reinartz receiver, and have procured all the parts for same, with the exception of the radio-frequency choke coil. Please give me the value of this coil. Will a honeycomb coil do?

**Answer**—It is possible to use a honeycomb coil of large inductance value, but it is suggested that you wind a single-layer coil of 250 turns on a tube two and a half or three inches in diameter. The wire used may be of any size that is handy, though the smaller the better, because it will not take up much room.

**Smooth Regeneration**  
A. Williams—I have a three-tube receiver that operates very well except for the fact that regeneration is rather difficult to handle. It will stop and start at the most inconvenient times. How can this be remedied?

**Answer**—This starting and stopping of oscillations probably is caused by the size of your tickler coil or the resistance of the grid leak. Suggest that you try fewer turns on the tickler and increase the resistance of the grid leak to some extent.

**Dead Batteries**  
A. B. Hanshof—I have a three-honeycomb-coil tuner with two stages of amplification. The set worked perfectly up until a week ago. Upon returning from a week-end trip I tried the set and there was no volume there at all. Charged the "A" battery, but no difference. Can you tell me what is wrong with the set?

**Answer**—It is highly probable that the "B" batteries in the set are dead. Suggest that you have them tested before you attempt making any changes in the set. Any radio store will test them for you.

**Adding Amplification**  
H. P. Boardman—I have a three-tube neutrodyne receiver. Will it be possible for me to add the resistance coupled amplifier, as described in the radio section, to this set?

**Answer**—The resistance coupled amplifier as described in the radio section may be added to any receiver.

**Five Audio Stages**  
J. L. Eyer—I have a four-tube set, three stages of audio-frequency amplification, to which I should like to add two more tubes in a separate audio-frequency amplifier. Is this advisable?

**Answer**—Five stages of straight audio-frequency amplification would be of no advantage, for many reasons, chiefly because distortion and tube noises would so garble the signals as to make them unintelligible.

**Tuning Coil Data**  
F. J. Eller—I should like to build the radio-frequency amplifier as shown in a diagram in Mr. Meyer's article printed on June 22. Please give me the constructional data on the tuning coil.

**Answer**—This coil consists of eighty turns of No. 22 single cotton-covered wire wound on a composition tube three inches in diameter. The coil should be tapped every ten turns.

**Loop Construction**  
G. M. Launsberg—I have a super-heterodyne receiver for which I should like to build a loop aerial. I have the form made. It is of the box type and is three feet in diameter. How many turns should I use, and what should the spacing be between turns?

**Answer**—The correct number of turns to use depends upon the size of the condenser employed to tune the loop. For a condenser having a capacity of .0005 mfd. twelve turns a meter diameter are put on a loop; that is, twelve or thirteen turns are used on a loop having a diameter of three feet. The turns should be spaced about half an inch apart.

**Efficiency Test**  
M. Blackburn—I have a receiving set and should like to test the efficiency of new parts in some way that will eliminate expensive testing equipment. If this can be done, please tell me how.

**Answer**—If your receiver is a regenerative set it is comparatively easy for you to get an approximate efficiency test of parts if care is taken in the testing. The way to test a part is to use the part now in the set as a comparison. Tune in a station. Make note of the tickler or variometer setting when station is at greatest volume; also leave coupling control "as is." Then try new part in circuit and again tune in same station as quickly as possible. Record plate control setting. The part giving the lower setting is the better of the two. If this test is made with care and all new parts properly wired it will be fairly accurate.

## Electromagnetic Principles

A Simple Explanation of the Magnetic Fields of Coils When a Current Flows Through Them

By L. G. Ingram

ELECTROMAGNETISM and electromagnetic induction are the two main electrical principles upon which radio communication is founded. For the student of radio telegraphy the importance of these two things cannot be too strongly emphasized. For a clear understanding of radio a good fundamental grounding of these two subjects should be obtained. Because of this these subjects will be taken up briefly but clearly in the next few articles of this series.

As was explained in the first article, if a wire carrying a current is placed close to a compass needle the needle will be materially affected by the wire as long as there is a current flowing through the wire. It has also been previously mentioned that a magnet suspended so that it is free to move will tend to place itself parallel to a given magnetic field. Hence it follows from the above experiment with the compass needle that the flow of current in a wire must have set up a magnetic field around the wire which has a definite direction.

If the current in a horizontal conductor is flowing toward the north and this wire is placed over a compass the needle will be deflected, so that the north pole of the needle is pointing toward the west. If the wire is under the compass the needle will be deflected toward the east. If the current is reversed, then the needle will take the opposite position in each case.

Thus, if the current flow in a conductor is away from the reader, then the lines of magnetic force around the conductor will be in the direction that the hands of a clock take. If the current flow is toward the reader the lines of force are anti-clockwise.

### Magnetic Field

The magnetic fields around two parallel conductors are either mutually attractive or repulsive, according to the direction of current flow in each. If the current in two parallel conductors is flowing so that in one the current flows towards the reader and in the other away from the reader, then the lines of force surrounding each wire are in opposition or repulsion, but if the current in each is flowing in the same direction, then the magnetic fields will aid each other and the lines of force will have not only the same direction but will combine and coalesce.

If a number of turns of wire are wound in a spiral, or helix, such as in an ordinary radio receiving or transmitting coil, the lines of force generated around each wire by a flow of current through the coil will unite. That is, the lines of force around each turn will unite with those of the adjacent turns.

This uniting of the lines of force tends to form several long lines, since the direction of current in each wire is the same. These long lines are said to pass through the entire helix. These lines pass out of the coil at one end and enter at the other end, as was demonstrated with bar magnets.

If the general direction of the lines of force inside this coil is from right to left, the left hand end will be a north pole, the other end being a south pole. The polarity of a coil can always be determined if the direction of current is known. The rule is as follows: If, when looking at the end of a coil the current flows around the coil in a clockwise direction, the end nearest the observer will be the south pole, the other end being the north pole.

### Definition of Solenoid

A helix consisting of a number of turns of wire through which current flows is known as a solenoid. And it can easily be seen from the above paragraphs that a solenoid has the same properties as a natural magnet, i. e., a north and south pole and magnetic lines of force.

The advantage of a solenoid over a magnet is that the magnetism of the solenoid can be placed under control. The strength of the magnetic field around a solenoid is proportional to the strength of the current

flowing through it and the number of turns of wire in the solenoid, but the magnetizing power of it can be increased from 200 to 2,000 times by the insertion of an iron core or a bar of soft iron within the coil.

If a direct current of unvarying strength is flowing through a solenoid the lines of force surrounding the coil will stand still when the flow of current is fully established. But if the rate of flow of current is increased or decreased the lines of force increase or decrease accordingly, or, as can be stated in another manner, as the current increases the lines of force move away from the wire, and as the current decreases the lines of force collapse upon the wire.

If a coil is wound around the legs of a horseshoe magnet and a current is made to flow through the wire, that leg of the magnet that has the coil through which the positive side of the battery or current generator is connected, will be the north pole. The other leg will be the south pole. The lines of force will come out of the north leg of the magnet and enter the south leg. If a small piece of soft iron is placed near the ends of the magnet and a current is flowing through the coil the piece of iron will be attracted forcibly to the magnet.

If a resistance is placed in series with one of the battery leads it will be found that as the resistance is increased from zero to a very high value the attracting power of the magnet is decreased as the resistance is increased. Thus demonstrating that the amount of current flowing through the coil controls the strength of the magnetic lines of force and the number of the lines emanating from the legs of the magnet. This also holds true in the case of a simple solenoid.

This property is utilized in practical work such as in large electromagnets and in the excitation of the magnets of a dynamo or motor.

If a tempered steel bar be placed inside a solenoid, through which a current is flowing steadily for a few seconds, it will be found upon removal that the bar has become a permanent magnet. The lines of magnetic force in the coil have magnetized the bar.

As the direction of the magnetic field around a conductor depends upon the direction of flow of current it is clear that if the current flowing through the above mentioned horseshoe magnet be reversed the polarity of the legs will be also reversed.

The strength of the magnetic field about a solenoid can be varied by fluxes of opposite direction. Thus, if two solenoids, wound in opposite directions, are placed in series with each other and a battery the fluxes will have opposite directions due to the different flow of current in each as the coils are wound opposing. And since the flux are different their magnetic fields are repulsive. Therefore if the two are telescoped the resultant magnetic field will be nearly destroyed.

The strength of the magnetic field can then be regulated by the variation of the telescoping of the coils. This property is made use of in the variometer that is so much in use to-day in the radio receivers.

### A Novel Vernier

It is a well known fact that when a set is tuned to exactly the wave length of a transmitting station the signal strength is at its highest value. To accurately tune a set, verniers are necessary. Small vernier condensers are helpful, but an even finer vernier is better. One of the simplest and most efficient verniers that can be used is the one that will be described herein. With this vernier one complete revolution of the dial through a ninety degree arc will give the same wave length variation as that given by a one degree variation on the tuning condenser or variometer.

This vernier consists of a loop of No. 14 double cotton covered wire made small enough to rotate inside the tube holding the secondary tuning coil. This loop should be mounted on a wooden shaft cut from a quarter inch dowel pin. The loop is connected in series with the end of the coil that it is nearest to. To operate the vernier the loop is rotated.

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## AMATEUR — — — KICKBACKS

By EVERETT M. WALKER — 2CDR

MAJOR GENERAL SQUIRE'S proposal to modify the standard telegraph code and method of current supply so as to speed up transmission over wire, cable and radio systems has received wide publicity in radio magazines and newspapers. The Squire proposal would differentiate between dots and dashes by varying the intensity or continuous wave alternating current, whereas the international Morse code varies correspondingly by the time element involved. The new plan modulates CW with a small amplitude to represent a dot, a medium amplitude for a dash and a large amplitude for a space. To employ this new system would make necessary a new code, new methods of operating and new types of sending and receiving apparatus.

If, however, it were to be adopted in commercial practice, it would eventually be used by the amateurs. For this reason it deserves general interest and is worthy of careful consideration.

2CTQ has been literally living on the air. He has been handling traffic with stations in all districts, with the exception of the sixth and seventh, on his small CW outfit. For local work phone is used occasionally and remarkable distances have been covered.

Of the New York City stations not much has been heard. However, traffic seems to be moving as well as ever. 2CWP is the outstanding figure, while 2KR and others are running him a close race. Neither 2UA nor 2PI has been heard from as yet, but they both expect to be operating shortly.

2CMK mourns the loss of a five-watt tube which went "west" while he was experimenting with his plate supply. However, he seems to be making the best of it and is heard as often as ever on the remaining tube. Apparently it has not decreased his DX range as he is still able to carry on two-way communication with stations in the fourth and fifth districts.

There is hardly an hour that goes by without hearing 2CWP. He does some fine work, too, handling a bulk of messages for New York City.

Another promising station, located in Newark, is 2CRD. The transmitter employs a single W. E. five-watt tube and the necessary apparatus to make it oscillate is arranged in a neat fashion. An efficient short-wave tuner is used for receiving and no trouble is experienced in copying all districts.

2KK, the former operator at WAAM and probably better known to the amateur fraternity by his husky old spark that was used for a number of years, has returned from the South, where he had been wintering. He is back on the air with a fifty-watt tube and has been doing some remarkable work considering the short time it has been in operation.

Another remarkable feat has been accomplished by a Brooklyn amateur. Much credit should go to 2CHY, who was heard in France by F 8CS. CHY uses only one five-watt tube and has been heard in every United States district but the seventh.—FB OM.

2AVW says as soon as he can get a position he will break forth with a high powered CW set, probably employing a 250-watt tube. At present only a five-watt tube with either 110 or a spark coil for plate supply is used.

Numerous stations have been hearing WNP, but none that we know of have worked him since 7DJ accomplished it last April. The latest report from 7DJ is he has been able to hear him most every night, but has been unable to communicate with him.

2BMR has increased power again. This time it is to the maximum amateur power. A 500-watt set has just been constructed and arranged in neat order. Good results have been obtained thus far.

2CKE, another old-timer, has returned to brass pounding again with new interest. He is still using the

same fifty-watt tube he used over a year ago, when last heard from. At present sixty-cycle plate supply is used, but a chemical rectifier and filter are in the course of construction.

Either it must be some fellow's locations or they must be exceptionally lucky. 8APR has worked several seventh district stations and was only using an amplifier tube! That is a record for miles per watt that will be hard to beat.

The call of 2CV has been assigned to a promising Brooklyn station. CV is operated by Irving Korenman, of 1465 Sixtieth Street, who is using two five-watt tubes in the Hartley circuit with an "S" tube rectifier. Reports on his signals will be greatly appreciated.

2MJ, one of Staten Island's oldest amateurs, has recently remodeled his transmitter and is back on the air. Only one five-watt tube is used and fairly good results have been obtained. Another feature of the station is a homemade ammeter which gives satisfactory readings.

2WR is still laboring hard to keep North Jersey on the map. He has succeeded in waking up a number of the old-timers who up to the present time had forgotten there was such a thing as radio. WR's own station is on the air most every morning and handles much of the Jersey traffic.

2EX is heard occasionally in spite of the fact he is kept quite busy at WJZ. He is still using a five-watt tube transmitter with a pure DC plate supply.

We understand that 2ADM is going to quit amateur radio for good. But you can't keep a good man down, and he probably will be with us again before next fall.

2GK is still on the job, working all districts with his 500-watt set. No foreign stations have been worked by him during the last few months, but it is hoped he will do so again before fall.

Some stations sure do work the west coast stations in fine style. 3QV has worked twenty of them so far with a single fifty-watt tube. He has also worked a number of foreign amateur stations. FB OM.

The policy of amateurs to maintain regular schedules is almost obsolete, but 8CEO is trying to revive it by working regular schedules with 4JR and 9DVW. CEO was also one of the stations that took an active part in the Pennsylvania Railroad tests.

The official relay station certificate of 8BKV was canceled because he did not know how to abide by the rules and regulations of the United States government and the requirements of the A. R. R. L. After numerous warnings he persisted in transmitting on 100 meters and signing the false call of 8XCW. Other stations should be careful to observe the regulations, or otherwise the same fate may befall them.

3APV is another station that does remarkable work with a lone five-watt tube. He may be heard carrying on two-way communication with amateurs at distant points almost any time in the morning.

We were rather surprised the other morning when we heard 9AUC say he was only using a UV-201A and radiating one-tenth of an ampere. He was loud, considering the power used. Both coasts have been worked, too. Mim.

A comparatively new station that is doing reliable work is 2CJ. This station was opened in Cranford, N.J., several months ago, and employs two special fifty-watt tubes in a 1DH circuit. "S" tubes have been installed within the last week, and better results were noticed almost immediately.

Another station that has not been heard in quite some time till recently, is 2B00. He is using two five-watt tubes and a good filter system. Probably this accounts for the reason this station reaches out so well.

## New Radio Concern Gives a Party for Radio Editors

The officers of the newly incorporated General Radio Manufacturing Corporation of New York City acted as hosts to a large group of radio editors and other newspaper men on the evening of July 15. The guests occupied a block of 135 seats at the Globe Theater and enjoyed the performance of "Keep Kool," in which an amusing radio skit was introduced by Johnny Dooley and members of the cast. After the show the party adjourned to the Park Avenue apartment of Lewis J. Selznick, where appropriate refreshments were served.

The General Radio Manufacturing Corporation is an amalgamation of twelve existing radio companies, the names of which have not as yet been disclosed. It has announced its purpose as one of broad character in the manufacture of radio receivers, tubes and parts, and expects immediately to assume an important position in the radio field. Warren S. Stone, president of the Brotherhood of Locomotive Engineers and head of the banking system now being established throughout the country by various labor unions, is chairman of the board of the new company. Lewis J. Selznick, prominent in the moving picture world, is president. Samuel R. Stone and Henry M. Shaw are vice-presidents. Mr. Shaw is a well-known figure in the radio industry as head of the Shaw Insulator Company and president of the Radio Trade Association.

In discussing the future of the new company Warren S. Stone said that the merger had been formed to share in what he believed to be the wonderful and immediate development of the radio industry.

"In my opinion," said Mr. Stone, "the expansion of radio will follow somewhat along the lines of that experienced in the automobile industry. Practically everybody is going to have a radio receiver. It also is possible that some day soon every home will be radio equipped. Just think of the wonderful comfort and advantage radio is to the shut-ins of all classes—bedridden and blind people, those temporarily in hospitals, cripples, people in isolated communities and, more especially, farmers. The possibilities of radio expansion are marvelous."

"I thought I knew Cleveland pretty well," continued Mr. Stone, "but I was surprised recently to learn when making certain inquiries that over 300 business concerns have been for some time in the habit of conducting a great deal of their correspondence by wireless. One of the elements included in our merger is the Wireless Telegraph Company, its business and all its patents."

"We also shall manufacture vacuum tubes for radio purposes. Mr. Shaw will be in executive charge of this department, over which Dr. Young will exercise engineering and technical supervision."


## Celebrates Fourth Anniversary In Radio Business

In celebration of its fourth anniversary in the radio business the Vim Electric Company, 66 Cortlandt Street, New York City, announced an anniversary sale beginning July 12 and continuing for a week. The results of this special event were so gratifying that the Vim company has decided to prolong the sale during the current week. This company, which it is claimed was the first radio business established on Cortlandt Street, has recently expanded so rapidly that it has been found necessary to enlarge its store facilities. A recent innovation in the company's sales department is the issuing of a guarantee bond with every purchase made. The Vim Electric Company also reports that its recent advertising campaign in the New York Herald Tribune Radio Magazine has produced orders from the Panama Canal Zone to Canada as well as in the metropolitan territory.

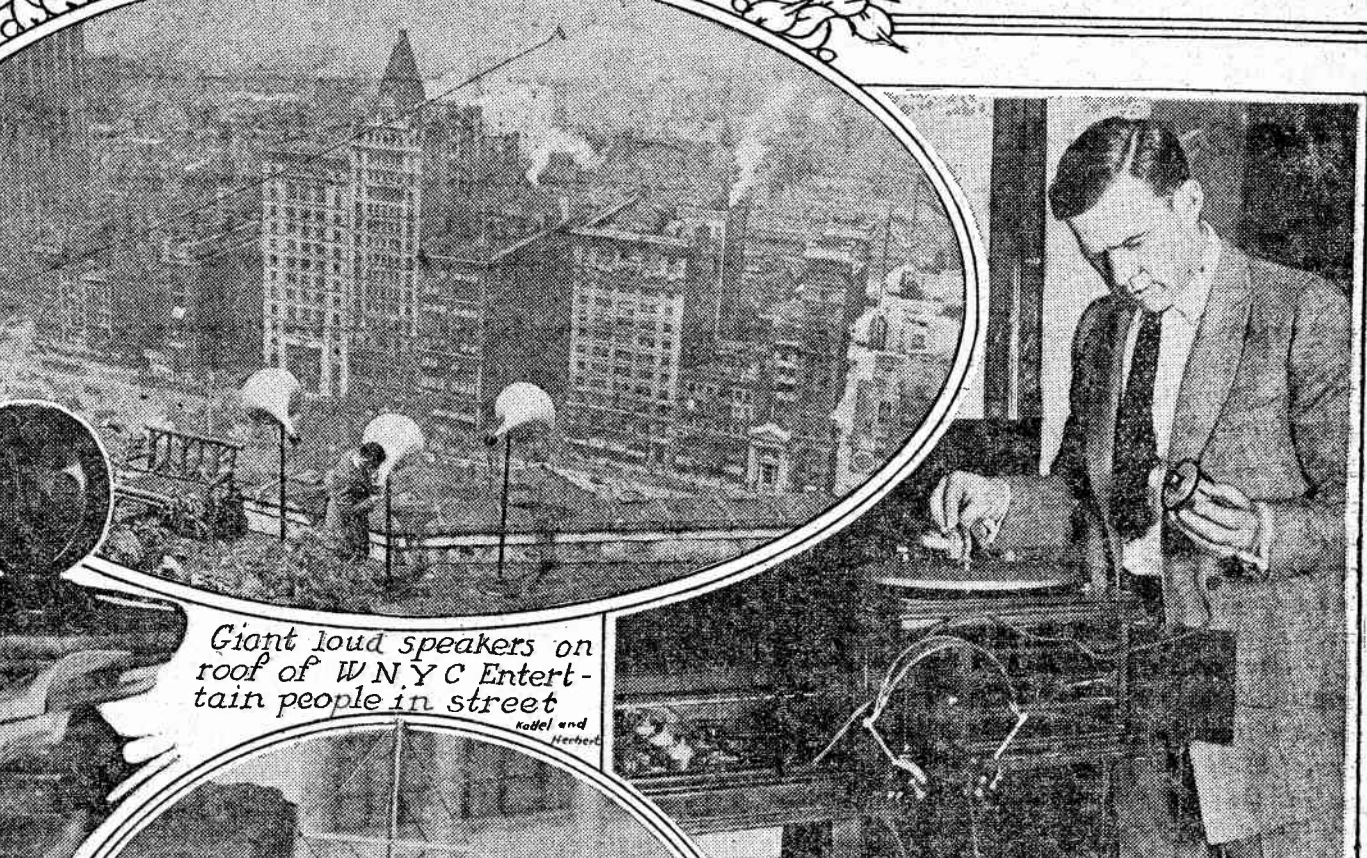
## Receiving Set Range

Because at one time or another radio fans have received stations 1,500 miles away they think that this is the receiving range of their set, and if asked what the range is they will give this mileage. This is the wrong way to estimate the range of a set. The proper method is to see how far the set can receive signals in the day time, between 11 o'clock in the morning and 4 o'clock in the afternoon. Stations that can be picked up regularly between these hours are the ones upon which the receiving range should be based.


# Up-to-the-Minute News of Radio in Pictures



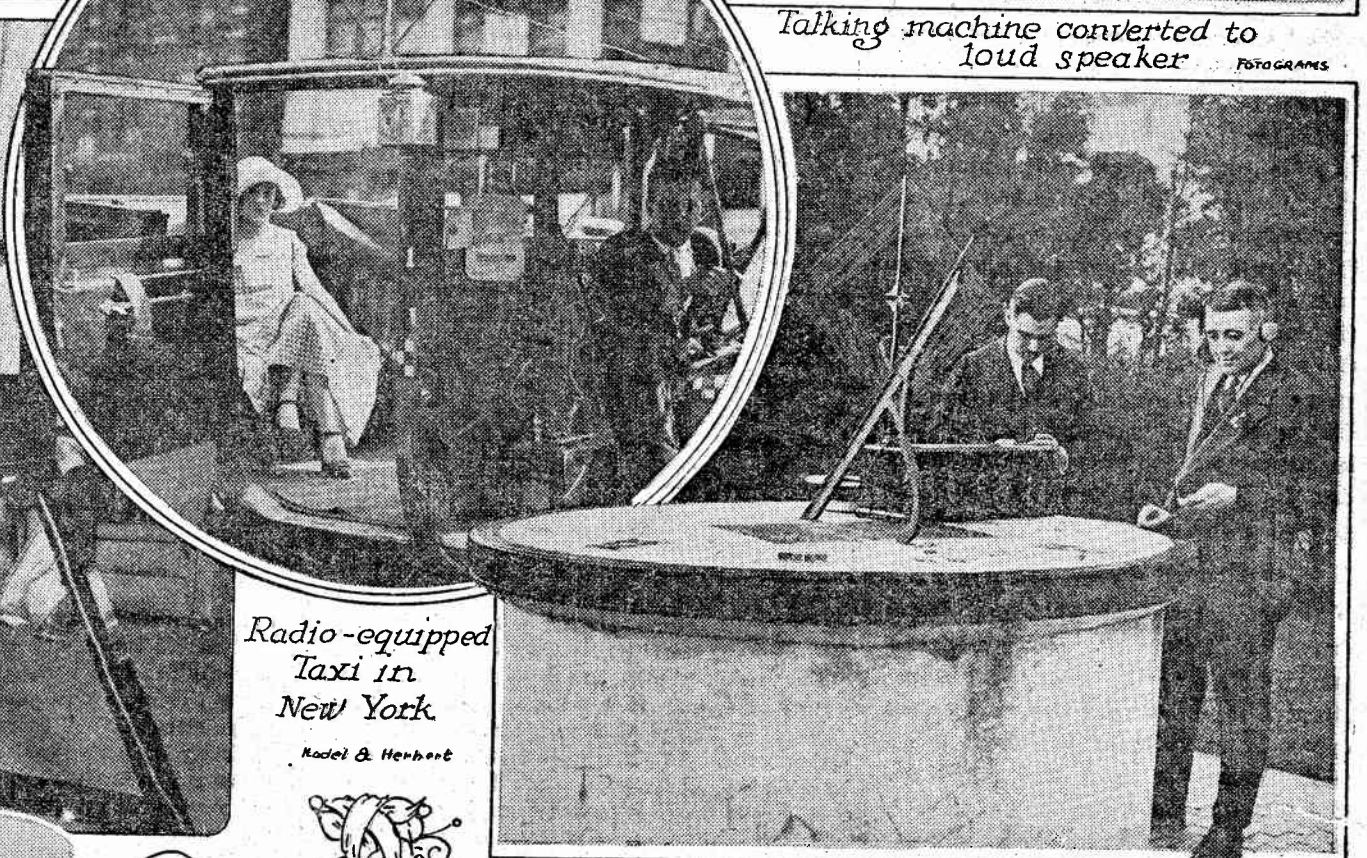
*Olivia Erbstein, ten years old, broadcasts bedtime stories from WTAS*



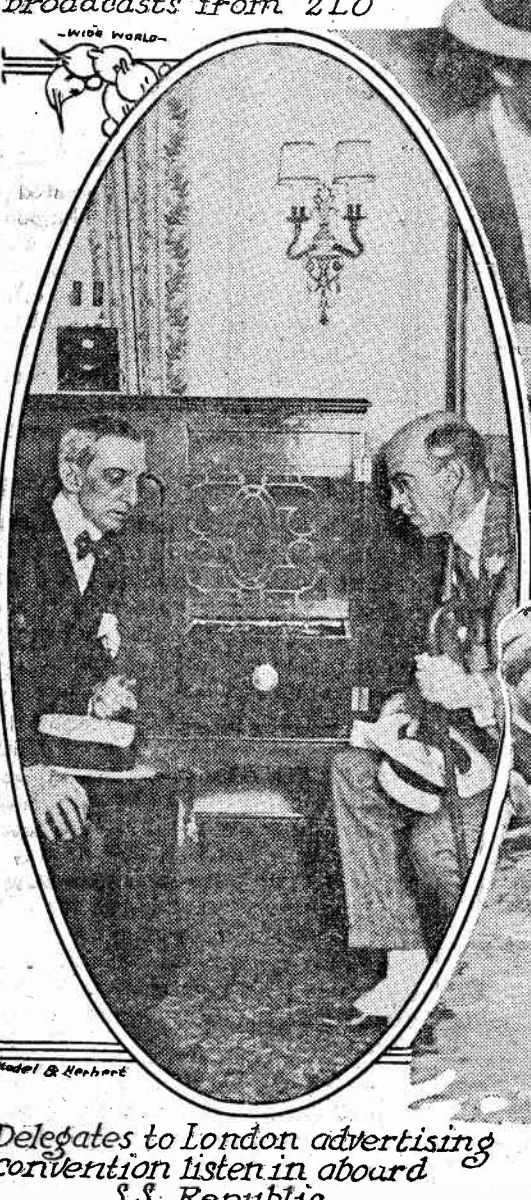
*Giant loud speakers on roof of WNYC entertain people in street*



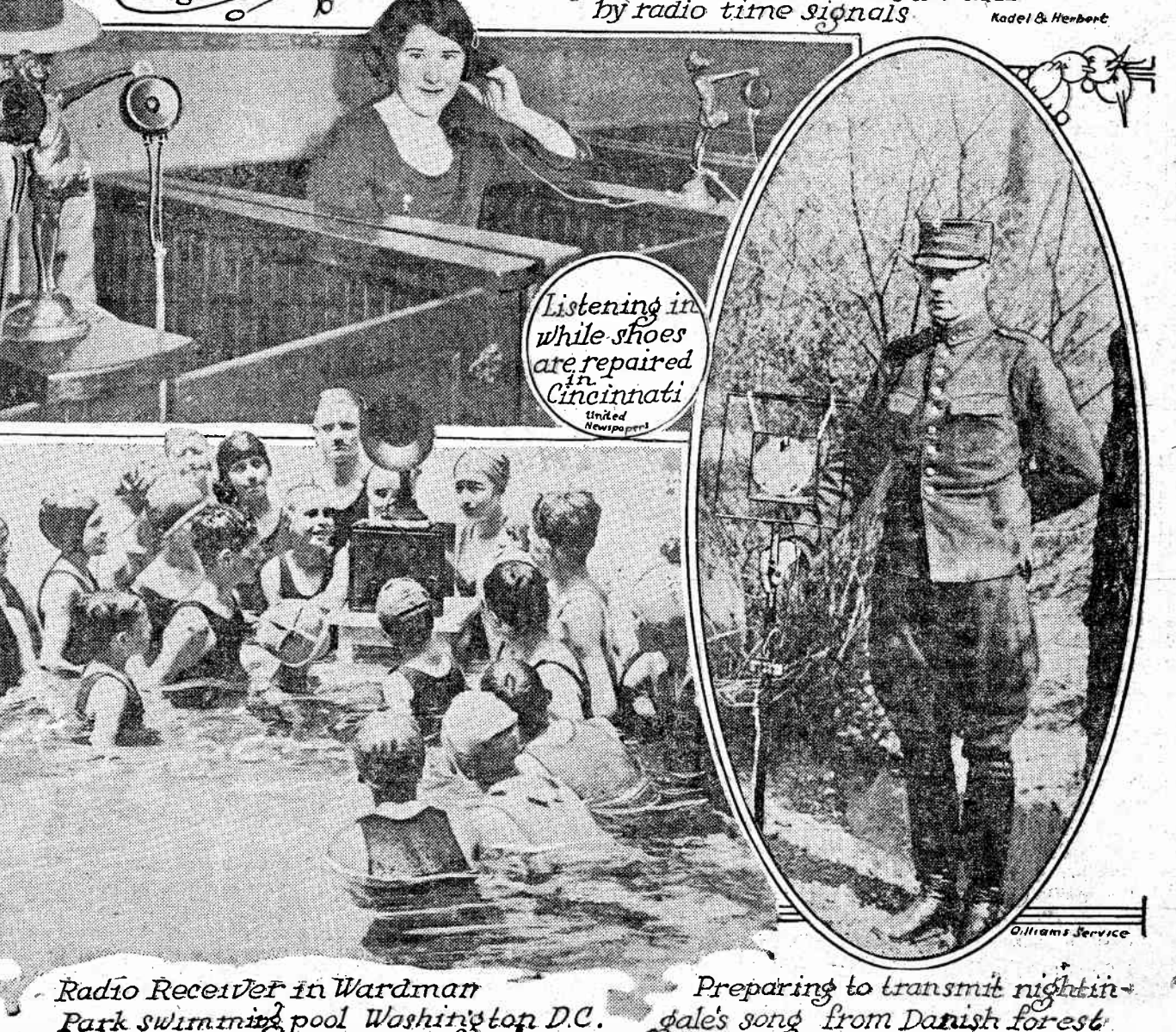
*Talking machine converted to loud speaker*




*Radio-equipped taxi in New York*




*Lengler, Tennis champion, broadcasts from 2LO*



*Capt. Jack Irwin checks a Sun dial by radio time signals*



*Listening in while shoes are repaired in Cincinnati*



*Radio Receiver in Wardman Park swimming pool Washington, D.C.*



*Delegates to London advertising convention listen in aboard S.S. Republic*



*Preparing to transmit night-gale's song from Danish forest*



# The Radio Telescope—Using an Indoor Loop for Directional Receiving

Coil Aerial Receiver Is Portable, Convenient to Install and Gives Directional Selectivity

By ALFRED N. GOLDSMITH, Ph. D.  
Chief Broadcast Engineer, Radio Corporation of America

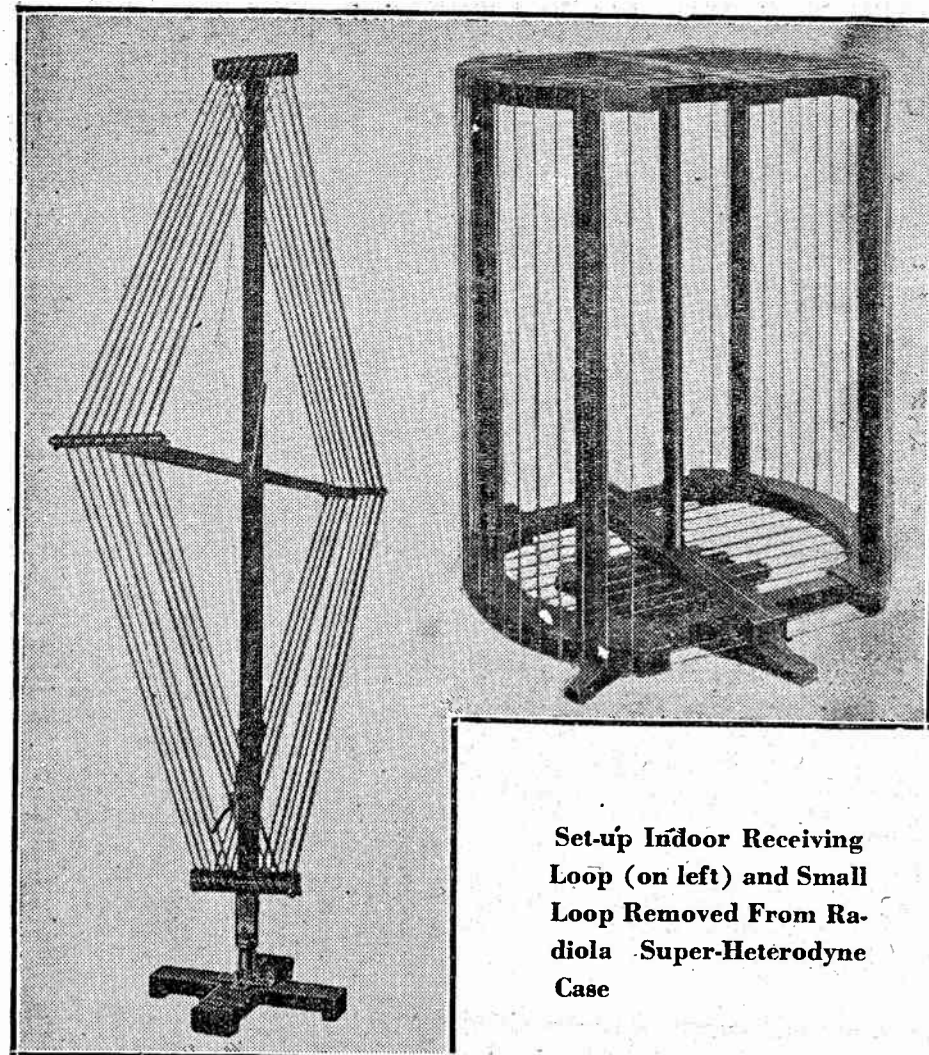
IT HAS been pointed out that radio waves are an invisible sort of light waves. They travel outward in all directions from the transmitting station just as the light from a powerful beacon reaches to all quarters of the horizon. For broadcasting purposes this is a great advantage since it enables the radio waves to cover all the territory around the transmitting station practically impartially. (There are some regions around a transmitting station which may be partially shielded from the radio waves by great groups of steel buildings, hills containing metallic ore deposits and the like, but otherwise the waves travel fairly indifferently in all directions and are capable of rendering equally good service at all points which are at the same distance from the transmitting station). It is this feature which gives radio broadcasting its peculiar adaptability for covering an area in contradistinction to wire communication, which, by its nature, is readily adaptable to the connection of two fixed points on land. While it is possible to transmit radio messages, particularly on the higher frequencies or shorter wave lengths, in particular directions, so that they can be received readily only within certain regions or sectors, yet this method of transmission has not been employed up to the present for broadcasting and it is not known whether it would prove practically useful in this field.

## Can Receive From Any Point

In view of the way in which radio waves travel in all directions, it is possible for an ordinary receiving station using a wire antenna to receive messages coming from any point of the compass. Every broadcast listener has noted and appreciated the fact that the concerts from cities in all directions can be received equally well on occasion. He has, however, also noticed that messages coming, say, from a land or ship spark station in one direction can easily interfere with concerts on a nearby frequency or wave length coming from a different direction. If one had available a form of radio receiver which could receive messages from a desired direction, instead of being open to reception of messages from all directions, it might be possible to eliminate undesired signals, and not, as usual, by tuning only, but by the use of this directional receiver.

Such a receiver, which would broadly receive messages from a definite direction and fail to respond at all to messages from some other direction, would be a convenient kind of "radio telescope" and would have interference-reducing capabilities. The simplest form of such a radio telescope is the loop or coil aerial. It consists of a number of turns of wire wound, generally, in square form for convenience and mounted on a frame which can be readily rotated. The side of the square is from about one foot to as much as five or six feet, but the smaller sizes are by far the more convenient. The terminals of the coil are connected in place of the "antenna" and "ground" connection, but an ordinary receiving set will generally not be satisfactory for use with coil aeriels because it is not sufficiently sensitive. As a matter of fact, the signal strength which can be delivered by a coil is only a small fraction of what can be obtained by a suitably proportioned antenna system of the straight-wire type, and the difference must be made up by the use of additional amplification in the form of several more radiotrons, since otherwise strong signals will not be obtained.

The accompanying drawing shows how the signal strength of a concert received



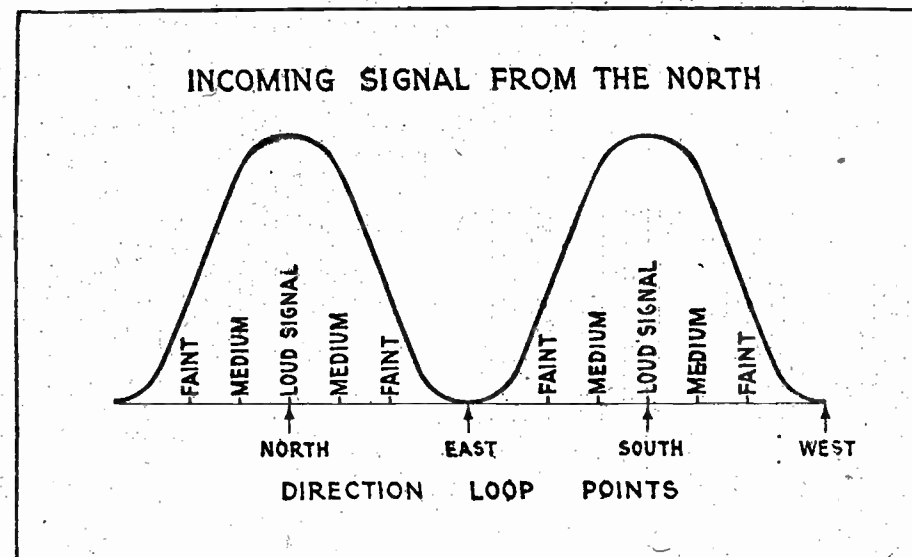
Set-up Indoor Receiving Loop (on left) and Small Loop Removed From Radiola Super-Heterodyne Case

on a coil aerial changes as the coil is rotated. It is supposed that the signal comes from the north. When the loop points north the signal is loud, and as the loop is rotated to the east the signal dies down until, when the loop points due east the signal in a well designed and properly used set of this type has almost entirely disappeared. As the loop is again turned to the south the signal comes back with full strength, to disappear once more when the loop is turned to the west. Three facts are at once evident:

1. The loop receives the strongest signals when it points in the direction of the incoming waves (which, at times, and especially in city locations, may not be the direction of the station which is being received, since the incoming waves may be swung out of a straight line of travel by obstacles or reflection).
2. The loop receives little or not at all when it points at right angles to the direction of the incoming waves.
3. It is possible to tell only the line of

a station loudly, as a matter of practical operation after having picked it up, is to swing the loop until the desired signal disappears, and then to swing it exactly at right angles to the disappearing position. This will be found a little more definite and positive than the more obvious method of pointing the coil by trial in the direction giving the strongest signal. In order to get rid of an undesired station the loop is merely swung until the undesired signal disappears. If the undesired signal comes from a very different direction this method will work; but if the desired and undesired signals come from nearly the same direction, this method of reducing interference will not be effective. Of course, normal tuning is also used to get rid of the undesired station.

The coil aerial receiver has the advantage that no antenna wires need be strung, either outdoor or indoor. This simplifies the installation of the set and enables it to be used in almost any desired location. In steel-frame buildings it is



How the signal changes when the coil rotates

direction of the incoming waves from the loop direction, but not the actual direction. Thus one can tell in the case just described that the signals are coming from the north or the south, but one cannot tell whether the true direction is north or south. Generally this indefiniteness will not cause any practical difficulty. Accordingly, the simplest way to get

advisable to keep such sets near the windows and not in back of steel columns or long sections of wall. Stronger signals are generally obtained in the more open locations. Coil aeriels also enable portable sets to be readily employed and transported, with minimum delay and inconvenience in setting them up and using them.

In ordinary antenna sets, because of the different sizes of the antennas employed in various installations, it is not possible to mark on the receiver exact settings for every frequency which will be correct for all users. Using the coil aerial, however, such universally applicable markings or calibrations become possible, with a resulting increase of convenience in the handling of the receiver.

The coil system of loop receivers may be either external to the set itself or it may be included in the cabinet of the set. A type of rotating loop of high efficiency which is used for external operation with Radiola Super-Heterodyne (and which is also permanently included within the cabinet of Radiola Super-VIII) is shown in the accompanying illustration. This loop is readily rotated by hand manipulation when placed outside the set, or is rotated by a geared control and knob on the operating panel when it is inclosed in the Radiola Super-VIII receiver cabinet. An internal loop, fixed in position, is included within the cabinet of Radiola Super-Heterodyne, and this is the smaller rectangular loop also shown in the illustration. It requires no manipulation. Occasionally the entire set may be shifted slightly to pick up some particular station which happens to be in an unfavorable direction in the usual position of the set. Generally this is hardly necessary.

## Loops Get Distant Stations

Another interesting point in connection with loop receivers is that it has been found possible by actual trial to listen to stations many hundreds of miles away, operating on practically the same frequency or wave length as a powerful local broadcasting station by utilizing the difference of direction only. We thus realize not only "tuning selectivity" of the ordinary kind, but also "directional selectivity."

A few rather curious and interesting effects will be found in the use of such receivers. In the interior rooms of steel-frame buildings it will sometimes be found that all signals seem to come from the same direction. The reception is fairly good, but the directions of all signals are the same. This is because the reception is chiefly from the magnetic fields of currents induced by the traveling waves either in the steel or in the electric wiring system of the building.

A nearby wire antenna of considerable length will increase the signal strength on a coil receiver when both are tuned to the same frequency. If the long antenna has a regenerative receiver connected to it, with the tickler or intensity control brought well up the scale, it will very greatly increase the strength of the signals on the coil receiver, because regenerative reception actually strengthens the local field of the incoming radio waves.

## Coil Receiver Overcomes Fading

Sometimes at night, and particularly in certain country locations, signals from stations roughly a hundred miles away fade markedly and vary rapidly in intensity. When using an ordinary long wire antenna receiver nothing can be done about the fading effect. With the coil receiver, however, it will sometimes be found that when such a signal fades rapidly, swinging the coil approximately 90 degrees to a new position at right angles to the original position will bring the signal back again. This is sometimes a useful way of following the fading effects of an incoming signal, since it has the advantage that it enables holding the signal at a critical moment—for example, when some important statement is being broadcast or when the station signature is being given.

In view of its portability, directional selectivity and general interest and convenience of installation, the coil aerial receiver or radio telescope is sure to be widely used in modern sets and to have a real sphere of usefulness.

## Amateur Radio Off for South Sea Adventure

CHICAGO, Ill.—Having penetrated the Polar regions with MacMillan, amateur radio is now about to take the opposite extreme and set forth on an adventure in the South Seas.

The auxiliary ketch, Big Bill, which is preparing to sail from this city in the interests of the Deep Waterways Commission on a two-year trip that will ultimately take it around the world, will have as its radio operator E. C. Page, of Evanston, Ill., a young amateur and member of the American Radio Relay League.

The selection of Page has been approved by Captain A. J. Dukan, who will be in command of the vessel, following his recommendation by local representatives of the A. R. R. L. He will have for his equipment radio apparatus capable of working on both commercial and amateur wave lengths, including the shorter waves. Page expects to communicate regularly with amateurs. The official radio call assigned to the vessel is WHU.

From a radio standpoint, much interest is being taken in the expedition, which is being organized and outfitted under the supervision of William Hale Thompson, former Mayor of Chicago. It will offer an opportunity to study the efficiency of the shorter wave lengths in the climate peculiar to southern waters.

The vessel, which has a crew of seven men, will proceed down the Mississippi River, through the Panama Canal, and from thence around the world. It is expected that in addition to operators in the United States, consistent radio communication will be maintained with amateurs in South America, Europe and Australia.

## New Zealanders Dance To KGO Orchestra

Although situated on opposite sides of the earth from each other, groups of radio listeners now sway, step and glide in unison to dance music played at KGO. This is shown to-day by letters received at the General Electric Pacific Coast station.

From Waimate, South Island, New Zealand, almost 4,000 miles south of the Equator, comes a letter of appreciation. "Every Sunday evening," writes F. D. Blackwood, "the family dances on the front lawn to KGO music reproduced by our loud speaker. We always look forward to hearing KGO, and there is a disappointed household when the atmospheric conditions are bad." Owing to nineteen hours' difference in time between New Zealand and the United States, music received by the Blackwood family Sunday evening is played at KGO Saturday night.

From the Far North, within fifty miles of the Arctic Circle, another letter has been received. "We have danced to music from KGO on several occasions," writes G. H. Hillman, of Candle, Alaska. "It is certainly great to have dance music carried into the Arctic." Mr. Hillman is the operator of the Candle radio station. "The wireless station installed here this summer," he continued, "is a new thing to people in this section. Most of them have not been outside for twenty-five years and it is hard for them to realize that KGO voices and music come from a distance of over 4,000 miles."

Station WHAR on the Air. Station WHAR, Atlantic City, N. J., placed its initial concert on the air June 26. The station, owned and operated by the Seaside House, of Atlantic City, has been experimenting for over a year with a small transmitter to determine the success of radio at the shore. The result was so gratifying that the present equipment was installed—a 200-watt Westinghouse type transmitter, licensed under the patents of the American Telephone and Telegraph Company. The wave length has been raised from 231 to 275 meters. Remote controls are to be installed in the city so as to broadcast events that have made the resort famous. WHAR bears the distinction of being the only radio station in Atlantic City. The following is the daily program, except Sunday and Wednesday afternoons: 2 to 3 p. m., instrumental music, Seaside House orchestra; 7:30 to 8 p. m., market reports, press news, etc.; 8 to 9 p. m., instrumental music, Seaside House orchestra; dance programs, late concerts and special features to be announced.

## Radio-Equipped Police Autos Catch Hold-Ups

Three separate gangs of hold-up men have been caught redhanded by the radio-equipped police automobiles of Detroit. These new cars, capable of a speed of eighty miles an hour, are in constant touch with the police broadcasting station KOP on a wave length of 286 meters.

The automobiles are remarkable in many respects, and were designed specially for police patrol work. Since their advent they have practically put a stop to all forms of hold-ups, due to their ability to get to

the scene of a crime within a few minutes after receiving the broadcast from KOP. In each of the three above instances a telephone alarm to police headquarters was promptly broadcast by radio to the police cars, and in all three cases they arrived at the scene of the attempted crime in time to apprehend the perpetrators.

The automobiles are equipped with special five tube neodyne receivers installed in the back of the front seats. The aerial is concealed in the permanent top, and the body of the car acts as a counterpoise ground. The neodyne system was adopted for this purpose after a series of exhaustive tests which, it is claimed, showed the superiority of the neodyne in sensitivity and selectivity

under the difficult circumstances involved. The neodyne receiver tested successfully went down to the low wave-lengths and gave clear, loud reception at full speed while the other local broadcast stations were operating. From outward appearances there is nothing to show the automobiles are unusual in any manner. This is due to the concealed aerial. The antenna consists of four wires stretched back and forth inside the automobile top, which is of the touring car type. Each of these four wires is nine feet long. The receiver is fastened permanently in its compartment back of the front seats and the batteries are located close to it. The windshield is seven-eighths of an inch thick, and is of bullet-proof

glass. Two gun-racks are installed in the cars fitted on the heel-boards of the front and rear seats. Sawed off shot guns are carried in them. The cars are maintained in patrol service twenty-four hours a day. The receiving sets are always adjusted to station KOP. Loud speaker reception is used solely, so that the crew can hear an alarm immediately it is broadcast.

Fritz Reiner at WJZ. Fritz Reiner, internationally famous conductor of the Cincinnati Symphony Orchestra, will direct the New York Philharmonic Orchestra as guest conductor in the concert on Thursday, which station WJZ will broadcast, commencing at 8:30 p. m.

# TREMONT RADIOPHONE CO.

541 EAST TREMONT AVE

## FIRST AND LARGEST RADIO STORE IN BRONX

### MID-SUMMER SALE

#### Big Reduction in Prices on All Standard Sets and Parts

BEFORE PURCHASING YOUR RADIO NEEDS ELSEWHERE, SEE US FIRST  
Our Expert Will Gladly Give You His Advice Free to Help You Construct Your Radio Set  
MAIL ORDERS GIVEN SPECIAL ATTENTION EASY PAYMENT PLAN

Unequaled for Clarity of Tone Volume and Long Life

201-A TYPE

**\$3.50**

GUARANTEED

## KEYSTONE VACUUM TUBE

The Keystone Radio Vacuum Tube is the result of the very latest research into the principles underlying vacuum tube construction. The Keystone Tube has a larger mutual conductance factor which insures greater clarity of tone than the ordinary tube. The Keystone Tube also has a larger amplification factor, which means much louder signal strength than the average tube. Operates equally well for radio or audio frequency amplification.

Has no vibrators, bulbs or moving parts, and is entirely noiseless.

**Balkite Battery Charger**

Price \$19.50

The charger may be used while the radio set is in operation. Without added attachments it may also be used to charge "B" storage batteries.

Amplify the MODERN way!

NOT until you listen to an amplifier built around MODERN Transformers can you experience that joy that radio brings when it is properly reproduced.

Insist upon MODERN Transformers. They are made in three types—the Ten to One, the Push-Pull, and the Four to One.

Send for the Book of MODERN Hook-ups  
We will gladly mail it to you FREE!

## AIR-KING WE RECOMMEND AND SELL

# Hartford Battery

DISTANCE and selectivity are a sure thing when you build your set around AIR-KING!

The AIR-KING is a three circuit tuner—the most efficient type of tuner made. It is 180° non-radiating, wound with Lib wire on genuine Bakelite form. Only six wires to connect and NO switch points.

YOUR DEALER HAS FREE HOOK-UPS

## FOR ALL RADIO USAGE

# TREMONT RADIOPHONE COMPANY

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Phone Tremont 6037

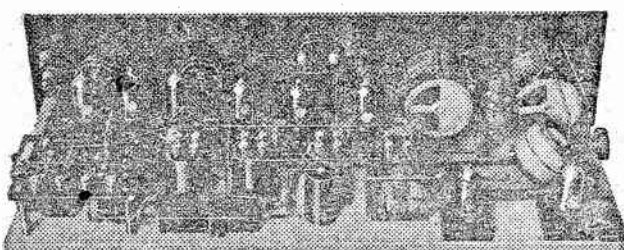


# Remler

## SUPER PARTS

for Best's 45,000 Cycle Super-Heterodyne

The 45,000 Cycle Super-Heterodyne Circuit is winning from amateur constructors and engineers alike the highest commendation ever accorded to a radio circuit. It is considered by all who have tested it the closest approximation to perfection in radio receivers yet developed.



Success in constructing this highly popular receiving set follows careful adherence to directions, including the selection of the proper parts. Its designer, Mr. G. M. Best, recommends

### Remler Super-Parts

because—

The Type 600 Intermediate Frequency Transformer and the Type 610 Tuned Stage Transformer work with maximum efficiency at a frequency of 45,000 cycles. Higher frequencies tend toward instability, lower frequencies may result in distortion.

The Type 620 Coupling Unit has been designed to work with maximum efficiency when used with the Remler Transformers. Remler Super-Parts are designed to give maximum efficiency when used with the C-299 Tube. Remler Super-Parts require no stabilizer.

Remler Super-Parts have been designed to form a complete Super-Set that is extremely simple to operate, ultra-selective and super-sensitive.

Dealers who have stocked Remler Super-Parts report a decided jump in sales. Dealers who are not yet acquainted with this business booster line will profit by getting in touch with the following distributors:

SPARTAN ELECTRIC CORP.  
99 Chambers Street

R. H. McMANN, INC.  
122 Chambers Street

E. B. LATHAM & CO.  
550 Pearl Street

NOYES ELECTRICAL SUPPLY CORPORATION  
33 Park Place



Type C-301A Price \$5.00

To the person contemplating the purchase or construction of a radio receiving set, selecting the most efficient, or the one best suited to his individual requirements may prove a perplexing task.

In the selection of vacuum tubes however, even the veriest novice can be fully insured against error by insisting upon standard tubes of known origin and established reputation.

Cunningham Radio Tubes are standard for every make and type of receiving set. They are the product of the most advanced research and experimental work by the engineers of the Research Laboratory of the General Electric Co.

There is a type of Cunningham Tube for every radio use. Your dealer will advise you the proper type for your receiving set.

Look for the orange and blue carton, the Cunningham signature, and the General Electric Co. trade mark.



San Francisco, Calif. New York Office  
Chicago, Ill. 30 Church Street, Room 312

## Radio Notes From England

LONDON ONE of the largest wireless frame aerials in Europe has just been put up on the roof of the tower of the handsome Bush Building, in which the offices of The New York Herald Tribune are located. It has been erected by the United States Shipping Board to conduct its business between London and the United States.

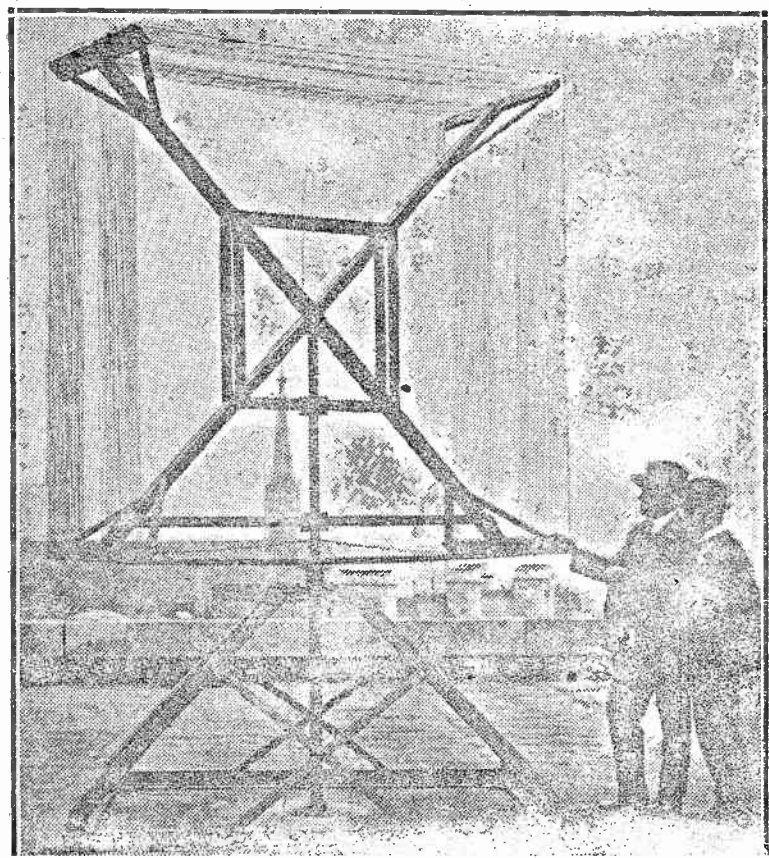
The loop was designed by R. H. Redmond, shown in the photograph with his beloved aerial. Mr. Redmond is European Radio Supervisor of the United States Shipping Board.

The aerial is eight feet by eight

feet, the existing methods that it furnishes the opportunity of conducting services between distant points that previously have had to be regarded as commercially impossible because of the huge outlay they involved, both in establishment and running expenses.

The Senator's revelations have redoubled the demands of the government's critics that it should say what it is going to do about the huge super-power station it is erecting at Rugby. The station will cost in the neighborhood of \$600,000, but if Marconi is correct, the system to be installed there is out of date and the money thrown away.

The Prince of Wales's speech before the Dominion Day dinner at the Hotel



and is wound round with forty-eight turns of aerial wire, measuring in all 1,536 feet. The receiving apparatus consists of nine valves and messages can be received from places 8,000 miles away.

The most talked of radio event of the week in London was Senator Marconi's speech on the possibilities of his "beam" system in the rooms of the Royal Society of Arts.

Four main advantages were claimed by the inventor of the wireless for his short-wave directional wireless telegraphy.

(1) Low power and inexpensive stations (short waves) will maintain direct high-speed services with the most distant parts of the globe.

(2) Far more words can be sent by them daily between England and the most distant parts of the globe than by the previously planned powerful and expensive stations.

(3) The system is directional and as only stations within a restricted angle of sector of the beam receive, this gives a comparative secrecy hitherto unobtainable.

(4) The economy in cost, small power and high-speed working should make possible a substantial reduction in telegraphic rates.

In the early part of June the station at Poldhu, Cornwall, on a 92-meter waves (21 kilowatts) signalled so clearly to Buenos Ayres—5,820 nautical miles—that the Argentine talk of equipping the new system as able to do in six hours more than twice what their present super-power station can do in twenty. And on May 30, when for the first time intelligible speech was transmitted from Poldhu to Sydney, Australia, the wave length was only 92 and the power 28 kilowatts, though Sydney is 189,000 wave lengths distant.

So, no wonder that Godfrey Isaacs, Marconi's right-hand man, says "today's higher power station with a power of, say, 1,000 kilowatts, will give way to one that will have a maximum power of only about 25 kilowatts. It is obvious that the cost of power alone is a matter of very material importance. My company has no intention of building any more high-power stations. According to our present view, our maximum high-power stations will not exceed 25 kilowatts. The cost, both in respect of capital and maintenance, is so markedly less than under

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## Municipal Station Obtains Oldtime Announcers

Radio fans in this city will soon become acquainted with the voice of an announcer who is known to his Washington friends as the man who "put the voice in The Voice of the Capitol." Roger Bruce Lum, senior announcer at WRC, whose voice is familiar to thousands of radio enthusiasts in Washington and the Eastern section of the country, has been appointed assistant program director at New York's new municipal station WNYC.

Lum will "sign off" at the Washington station for the last time at the conclusion of Tuesday night's program and begin his new duties in New York at WNYC on Friday. With him comes George Oliver, a member of the operating staff at WRC. Oliver will join the engineering force at WNYC.

Entering the radio game in its pioneer days as an operator at old station WJZ in 1922, when it was located in Newark, N. J., Lum has gradually climbed the ladder of success and will take over his more responsible position at the New York municipal station with the experience of a veteran. When WJZ was moved, in May, 1923, to Aeolian Hall, New York, Lum went along to do the announcing. Shortly after the opening of WRC in August of last year, Lum was transferred there, and has since that time had down the dual job of senior announcer and publicity representative.

The return of Lum and Oliver to New York will mark the reunion of a triumvirate of former members of the staff of old WJZ in its early days in Newark. Thomas H. Cowan, with whom Lum and Oliver worked at the old Newark station, is now superintendent of broadcasting at WNYC.

Wendell Hall's on Radio Honeymoon Tour now is a radio honeymoon trip. Mr. and Mrs. Wendell Hall, the bride and groom of the radio wedding on June 4 last, the simplicity and sincerity of which over 4,000,000 people enjoyed.

Following a month's outing in the Evered of northern Michigan, the Evered Red Head is answering the call of the microphone. His first appearance on radio since the wedding was at Station WLAG, Minneapolis, Minn.

This was the first stop on a honeymoon radio tour that will take the popular entertainer and his bride through the Canadian Northwest, the Pacific Coast and Hawaii. Mr. Hall still is under contract with the National Canadian Company, Inc., and his new tour is arranged in co-operation with them. Later in the year Mr. Hall will tour eastward over much of the radio territory which he covered alone the first part of the tour to his wedding.

The policy of this new station is to be a public service station. It is to be a place where people of all classes are to be allowed to express their views on any subject, regardless of creed or political preference. The station will be open for public school debates, for young musicians to make their debuts—in short, for any one having something to say or do that is of interest. Last, but not least, the station's programs will be governed entirely by the letters received from the radio audience.

Mr. Gimbel stated in an interview that to his knowledge there was no station now in operation that was in reality a public station that had no tax to grind, that governed programs by letters received, or which opened the studio and operating room to the public. This is the kind of station the new one will be. The studio and transmitting equipment are to be on the eighth floor of the Gimbel New York store and will be open to public inspection. Generators, control panels and the transmitter itself will be inclosed in glass. There will be a competent radio man on duty to explain the working of the transmitter and the function of its various parts.

The power of the station will be sufficient to cover a wide range and if necessary it can be increased. The transmitter is constructed by the Western Electric Company. The wave length to be used is 316 meters. It is expected that the station will be in operation in about four weeks.

## Gimbel Bros. Broadcasting Station

The New York store of Gimbel Brothers is to open a radio station under the direction of Ellis A. Gimbel Jr., which because of the director's experience in broadcasting and his police bids fail to surpass Station WIP owned and operated by the firm in Philadelphia.

The policy of this new station is to be a public service station. It is to be a place where people of all classes are to be allowed to express their views on any subject, regardless of creed or political preference. The station will be open for public school debates, for young musicians to make their debuts—in short, for any one having something to say or do that is of interest. Last, but not least, the station's programs will be governed entirely by the letters received from the radio audience.

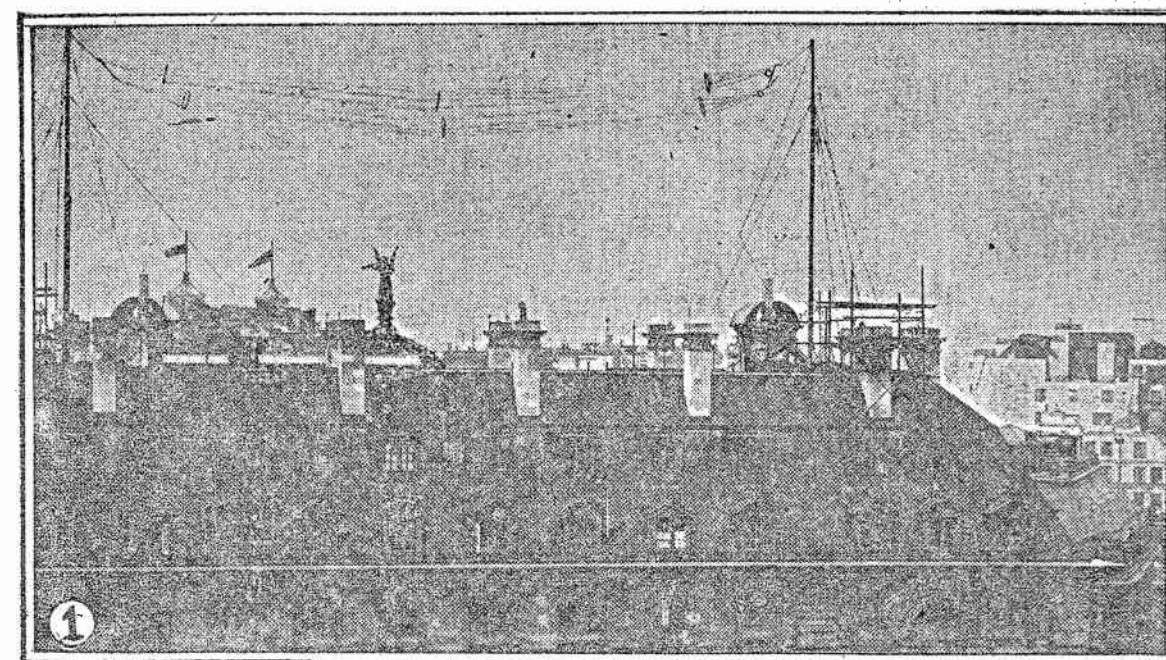
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# Broadcasting Is On a Sound Commercial Basis in Great Britain

The B. B. C. Pay Seven and One-half Per Cent Dividend

By CAPT. H. DE A. DONISTHORPE



BROADCASTING made its debut before the public of Great Britain some twelve months after this wonderful application of the science of wireless telegraphy had commenced entertaining the United States of America.

The British government, however, soon realized the infinite possibilities and potentialities of this new method of distributing intelligence, and the result of its perception was to place this science of broadcasting under the control of the state.

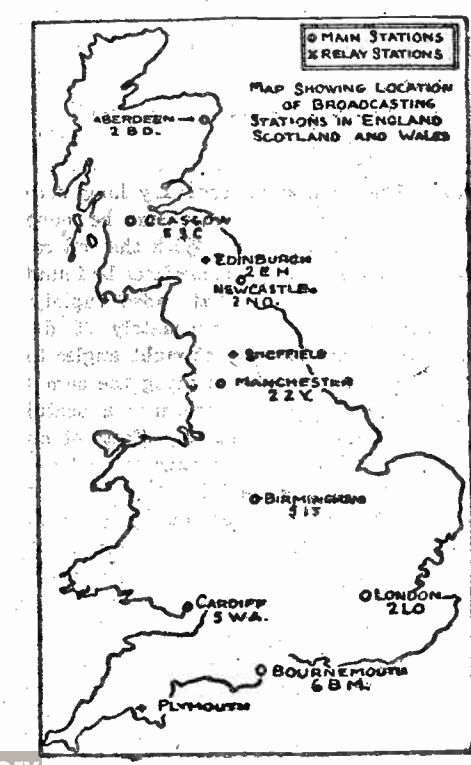
It is an undisputable fact that British broadcasting gained most valuable assistance from the experience obtained by the early broadcasting here in the States and efforts were made to combat the difficulties which were encountered during those early days in the life of this new form of public entertainment.

After due consideration and discussion originating in various conferences held by the government departments and interested parties, it was decided to place the care of establishing a service in England in the hands of a commercial company, known as the British Broadcasting Company (B. B. C.), which was to be directly under government control.

Since the advent of wireless all commercial radio has been in the hands of the British Postoffice and the wireless amateur was also under the care of this office. This department works directly under the jurisdiction of the Admiralty as far as radio matters are concerned, in order to prevent any interference being caused to the wireless service of the navy.

THE B. B. C. is composed of interests from six of the largest radio and electrical corporations of Great Britain, which naturally supply the installations.

At present eight transmitting stations have been erected at different points over the whole of Great Britain, which are so located as to insure that there



is no area not covered by the service. All of these stations can be connected together by telephone so they can all broadcast one program at once. This latter feature was found particularly useful when His Majesty King George V opened the Empire Exhibition at Wembley, as his speech was broadcast from all eight stations simultaneously, thus enabling all those of his subjects in England, in possession of radio sets, to hear his voice.

The B. B. C. has, in addition to these eight main stations, one or two minor relay stations which work directly under the control of one of the large stations, with which it is connected by wire, and broadcasts the same program as the master station. This insures areas not served efficiently by the main station of being able to obtain a permanent service, which it would not otherwise be able to do owing to some local effects of screening or blind spots.

The map shows how the stations are located in England. Naturally the first station to broadcast in England was installed at the capital in London. This station was located at Marconi House, Strand, and was allocated the now famous call letters 2LO (Fig. 1). The illustration shows the aerials on the roof of Marconi House, behind which can be seen the statue located on the top of the Gaiety Theater, and behind that again are noticeable the two flags on the government building, Somerset House, flying at half-staff in respect to the late President Woodrow Wilson, the photograph having been taken shortly after the death of the former President.

Figure 2 shows the interior of the studio at 2LO, which, it will be seen, is quite spacious. The microphone peculiar to the British Broadcasting Company is located in the center of the room, a close-up of which is shown in Figure 4. This microphone is of a special design and, it

will be seen, is suspended on a thick wadding of felt in order to take up any undesirable vibrations.

There has been evolved for the use at some of these transmitting stations a standard transmitter capable of handling 6 kilowatts. The actual apparatus embodied in this 6 k. w. instrument is shown in Fig. 3. The panels from left to right are as follows: First, the rectifying panel; second, the main drive, then the master oscillator, and, last, the modulating panel. Stations of this type are installed at Bournemouth, Cardiff, Glasgow, Newcastle and Aberdeen; the station at London (2LO) is, however, not of this standard pattern, but is of an experimental nature where new suggestions and inventions are tried out.

It is not intended in this article to go into the actual technical description of these transmitters, but it will suffice to say that they are of the usual design of radio telephone embodying one or two special features to take care of the variety of acoustics which the microphones are called upon to handle.

"From what source does this British broadcasting company derive its income?" This will be one of the first questions which will present itself to the readers of this article.

It certainly was a problem that required much discussion when this service was contemplated, as it was difficult to ascertain or foresee from whence sufficient funds would be forthcoming to de-

fray the initial cost of the transmitting stations, their upkeep, and last, but not by any means least, the program. This difficulty has been overcome in rather a subtle manner which does not rely on fees accepted for advertising over the radio, as no such form of publicity is permissible.

The scheme for supplying the funds is briefly as follows:

Every person who is in possession of a radio set must take out a receiving license from the postoffice authorities. This license costs about \$2 per annum, and a portion of the money so collected is handed over by the government to the British Broadcasting Company, while the remainder is maintained by them for overhead charges and costs of inspection to sets which are periodically carried out by their officials.

This sum alone would in itself be insufficient to cover all the demands on the British Broadcasting Company's purse, and a further scheme is in action where all the sellers of broadcast receivers pay to the company a small license fee on all apparatus sold. The apparatus sold all bears the company's seal, embodying the three letters B. B. C.

This is not, as might appear at first, a hardship to the seller, for as long as a broadcasting service is maintained the radio merchant will always have a market for his apparatus, which includes consumable stores, such as tubes. This arrangement has proved a great success, and after only running for about eighteen months the British Broadcasting Company has been able to show a good profit, even to the extent of paying its shareholders a 7 1/2 per cent dividend on their invested capital.

This fact alone is sufficient to indicate the wonderful impetus which broadcasting has received in Great Britain, and it will be noticed by any traveler on the English railroads that there is hardly a house now which is not adorned with a wireless antenna. The thought that the science of radio has been brought within the reach of all through the agency of broadcasting must give a vast amount of pleasure to the inventor of radio, Senator Marconi, and having due regard to the rapid progress of this art one hesitates to prophesy where its usefulness will stop.

### English Stations

|             |     |            |
|-------------|-----|------------|
| Aberdeen    | 2BD | 495 Meters |
| Birmingham  | 5IT | 475 "      |
| Bournemouth | 6BM | 385 "      |
| Cardiff     | 5WA | 351 "      |
| Glasgow     | 5SC | 420 "      |
| London      | 2LO | 265 "      |
| Manchester  | 22Y | 375 "      |
| Newcastle   | 2NO | 400 "      |

If you want to buy, sell or exchange your radio sets or parts the Radio Exchange will help you.