

Blueprint Section Every Month

# RADIO AGE

" The Monthly Hour



Real Blueprints of a Two-Stage Tuned Impedance Reflex and a Tuned Plate Regenerator.

The True Story of America's Strangest Radio Entertainer.

"Why a Musical Director Never Smiles;" Other Studio-Land Features.

How to Make a Four-Tube Neutro-Reflex; All the Latest Hook-ups.



MEET YOUR BROADCAST FAVORITES

TK 6590 R2

# ZENITH RADIO



Super-Zenith VII—  
the ideal radio set  
for the fine home



**They Cost More**  
**But They Do More**



Super-Zenith X

## Each station comes in at the same point on the dial, *always*

You don't need to be a "radio engineer," and you don't need to have three hands, to operate the new Super-Zenith. Tuning is controlled by *two dials only*—so perfectly adjusted that each station comes in always at the same dial settings. *It never varies.* Powerful locals may be on full blast, yet, if you like, you can tune them out completely, choose the distant station.

Those who know and appreciate truthful tone reproduction find in the new Super-Zenith an unfailing source of delight. Their pleasure is all the greater from the fact that even when silent the Super-Zenith lends to its surroundings charm and distinction.

Write to us for the name of the nearest dealer from whom you can obtain a demonstration of this outstanding marvel of the radio world.

Dealers and Jobbers: Write or wire for our exclusive territorial franchise

### ZENITH RADIO CORPORATION

Executive Offices: 332 South Michigan Ave., Chicago  
ZENITH—the exclusive choice of MacMillan for his North Pole Expedition  
—Holder of the Berengaria Record

**T**HE complete Zenith line includes seven models, ranging in price from \$95 to \$550.

With either Zenith 3R or Zenith 4R, satisfactory reception over distances of 2,000 to 3,000 miles is readily accomplished, using *any ordinary loud speaker.* Models 3R and 4R licensed under Armstrong U.S. Pat. No. 1,113,149.

The new Super-Zenith is a six-tube set with a new, unique, and really different patented circuit, controlled exclusively by the Zenith Radio Corporation. It is NOT regenerative.

**SUPER-ZENITH VII**—Six tubes—2 stages tuned frequency amplification—detector and 3 stages audio frequency amplification. Installed in a beautifully finished cabinet of solid mahogany—44 1/2 inches long, 16 1/4 inches wide, 10 1/2 inches high. Compartments at either end for dry batteries. Price (exclusive of tubes and batteries) . . . . . **\$230**

**SUPER-ZENITH VIII**—Same as VII except—console type. Price (exclusive of tubes and batteries) . . . . . **\$250**

**SUPER-ZENITH IX**—Console model with additional compartments containing built-in Zenith loud speaker and generous storage battery space. Price (exclusive of tubes and batteries) . . . . . **\$350**

impossible with single-unit speakers. 2nd—Zenith Battery Eliminator, distinctly a Zenith achievement. Requires no A or B batteries . . . . . **\$550**  
Price (without battery eliminator) . . . . . \$450  
All Prices F. O. B. Factory.

**Zenith Radio Corporation**  
Dept. 1C  
332 South Michigan Avenue, Chicago, Ill.

Gentlemen: Please send me illustrated literature giving full details of the Super-Zenith.

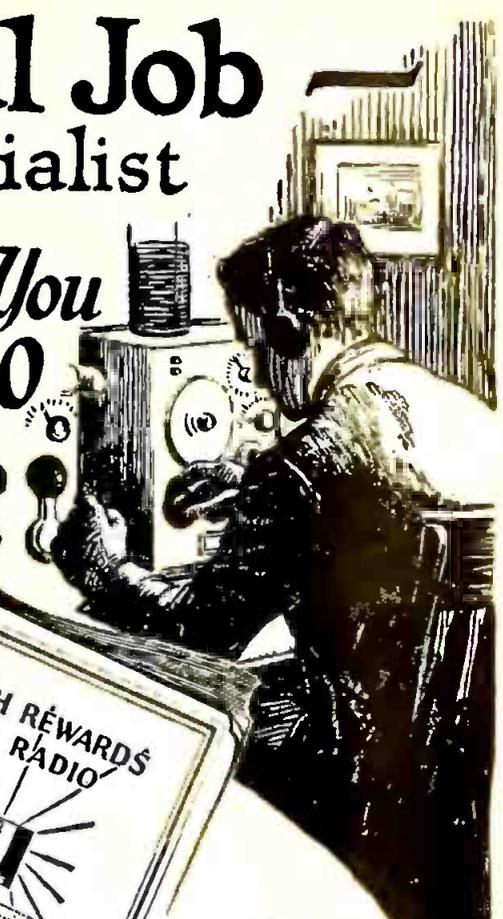
Name .....

Address .....

X—Contains two new features receivers. 1st—Built in, patented, Loud Speakers (harmonically speakers and horns), designed to h and low pitch tones otherwise

# "Tune In" on a Real Job and Get the Pay of a Specialist

*This Free Book Will Show You How to Earn \$1,500 to \$10,000 Yearly as a Radio Expert*



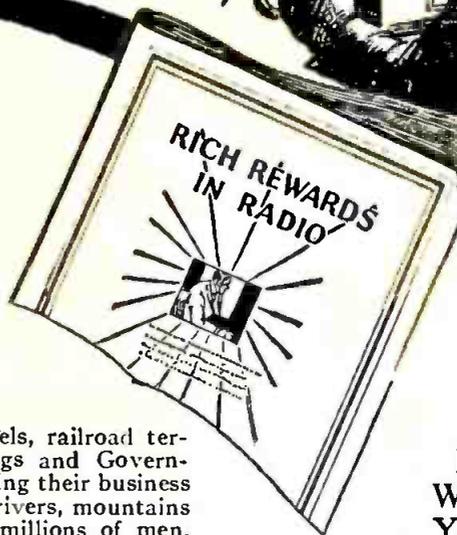
THE man who would be a success in business today must be a specialist. The market is already crowded with clerks, stenographers, accountants and detail men of every description. And as the number of applicants increases, the pay and opportunities diminish. Not that these men are unnecessary, for their work is important and essential. But the competition has always been keen in general work of this kind and it is bound to increase in proportion to the number of good men available.

## Radio Needs Trained Men

There is perhaps no other field today where specialists are needed more than in Radio. Trained men are required in every branch of this fascinating, profitable profession. And the opportunities are great—almost without limit! Radio has swept across the face of the whole earth with a speed as surprising as it was sudden. Almost overnight it jumped into the front rank of the world's leading industries. Yet it is here to stay—and grow. For that reason Radio needs good men. It is ready to treat them right and pay them well. And for the men who "get in" NOW, the best is none too good.

## Get Into This Big Paying Profession

Consider for a moment the possibilities of Radio. The shores of every continent are dotted with transmitting and receiving stations. Practically every vessel is now equipped for communication with land and other ships. Hotels, railroad terminals, public buildings and Government stations are flashing their business messages 'cross cities, rivers, mountains and seas. At night, millions of men, women and children are "listening in" to music, speeches, news, important events and business reports, broadcast for their amusement and education. Factories, stores, banks, laboratories, business houses and newspaper offices are employing Radio experts in every branch of the profession. Yet the demand for good men is far greater than the supply. If YOU are sick of plugging along in the daily grind of monotonous office routine—held down by the thousands of men who are doing the same work as you—get out of the rut into this big paying profession.



**This FREE BOOK Will Tell You How**

ing men, in their spare hours at home, for every important branch of the big Radio industry. To any man who is eager to better his condition and make a place for himself in this fascinating and profitable profession, we will gladly send a copy of this timely, helpful, book—*absolutely free*. It is called "Rich Rewards in Radio" and it will open up a chain of opportunities that you will do well to carefully consider.

You assume no obligation whatever in sending for this interesting, helpful book. It is yours for the asking—FREE. For that reason you can hardly afford to miss it. Ask for a copy today and learn the tremendous opportunities that are open in Radio, how we are preparing men at home to take advantage of these opportunities, and how we aid them in securing the kind of positions that lead to independence and success, "Tune in" on a real job—mail the coupon for this Free Book today—and then "stand by" until it arrives by return mail. It will PAY you! National Radio Institute, Dept. 53CB, Washington, D. C.

## This Will Bring It

NATIONAL RADIO INSTITUTE, Dept. 53CB, Washington, D. C.

Without any obligation on my part, please send me a FREE copy of your book, "Rich Rewards in Radio." Also tell me how your Free Employment Service will help me secure a position, and send me details of your special short-time offer.

Name.....  
 Street.....  
 City..... State.....

**Pay Increases Over \$100 a Month**  
 I am averaging anywhere from \$75 to \$150 a month more than I was making before enrolling with you. I would not consider \$10,000 too much for the course.  
 (Signed) A. N. Long,  
 120 N. Main Street,  
 Greensburg, Pa.



**Doubles Salary**  
 I can very easily make double the amount of money now than before I enrolled with you. Your course has benefited me approximately \$3000 over and above what I would have earned had I not taken it.  
 T. Winder,  
 731 Bedford Ave.,  
 Grand Junction, Colo.



**From \$15.00 to \$80.00 a Week**  
 Before I enrolled with you I was making \$15 a week on a farm. Now I earn from \$20.80 to \$44.20 a year, and the work is a hundred times easier than before. Since graduating a little over a year ago, I have earned almost \$4000 and I believe the course will be worth at least \$100,000 to me.  
 (Signed) Geo. A. Adams,  
 Route 1, Box 10,  
 Tamaqua, Pa.



## You Can Qualify at Home Easily and Quickly

On land and sea, the news of the world's progress is flowing under the skilled fingers of Certified "Radio-tricians"—men who are well-paid, honored and respected for their specialized knowledge and important work. A short course of training at home for the enjoyable work of Radio, will quickly enable you to be independent, to travel and see the world if you wish, or establish yourself in a permanent position in your own town. Radio will take you out of the rut of a bare existence, into the enviable standing of a specialist—with unlimited opportunities for honor, power, wealth and satisfaction. It will make you a doer of real things, a vital force in the world and an important factor in your own community. Start to train NOW for a Radio position, while the profession is growing. You can start TODAY—in your spare hours at home. The National Radio Institute is train-

# RADIO AGE

The Magazine of the Hour

Established March, 1922

WITH WHICH IS COMBINED RADIO TOPICS

Volume 4

January, 1925

Number 1

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Radio Age is published monthly by RADIO AGE, Inc.  
Member: Audit Bureau of Circulations.

Executive, Editorial and Advertising Offices  
500 N. Dearborn Street, Chicago, Ill.  
Publication Office, Mount Morris, Ill.

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Final Advertising forms close on the 20th of the 2nd month  
preceding date of issue

Issued monthly. Vol. 4, No. 1. Subscription price, \$2.50 a year.  
Application made for transfer of second class entry from the post office at Chicago,  
Illinois, to the post office at Mount Morris, Illinois

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## A Chat With the Editor

MR. MANTON DAVIS, of the Radio Corporation of America, diverts us with a letter in which he expresses the suspicion (baseless) that advertisers have been led to believe they were advertising in WIRELESS AGE, when, as a matter of fact, they were dealing with RADIO AGE. Mr. Davis even threatens to call out the agile R. C. A. legal department and cut our heads off.

RADIO AGE and WIRELESS AGE are two separate and distinct publications, the former published in Chicago and the latter in New York. We do not make this statement because we think an announcement necessary to avert confusion of names so different as these. We make this extremely obvious distinction because we do not want Mr. Davis to think that there is anything in the advertising or editorial departments of WIRELESS AGE that RADIO AGE wants, much less would employ sharp practice to obtain.

Radio Corporation of America controls WIRELESS AGE. It is published by Wireless Press, Inc., of New York. RADIO AGE is owned by RADIO AGE, Inc., of which the undersigned is President. RADIO AGE is not interested directly or indirectly in the manufacture or sale of any radio product and is serving as official organ for nobody.

The writer has been a newspaper editor for a quarter of a century. He was war correspondent at the French front for the Chicago Tribune. He was special correspondent in Russia, China and Japan for the same newspaper for two years after the war. He is now editor of a newspaper radio section, which on one day of each week, has the largest radio circulation in the world. Also he is editor and chief stockholder of RADIO AGE.

Most earnestly he hopes that the radio public will not make the error of thinking this magazine has any association with the periodical controlled by our friend with the agile legal department.

*Frederick Smith*

Editor of RADIO AGE.

No. 772  
45-volt  
large  
vertical  
Price  
\$3.75



No. 766  
22½-volt  
large  
horizontal  
Price  
\$2.00

*Dry "B" Batteries  
are more economical  
and more dependable  
than any other  
source of plate  
current!*

**\* Cut your operating cost**

THIRTY years' experience in the manufacture of dry batteries has enabled us within the past two years to steadily and greatly improve dry "B" Battery quality. Eveready "B" Batteries are now from two to three times better than ever before.

Eveready "B" Batteries will long outlast any others, and are the most economical and dependable source of plate current. These are strong statements, but they have been proved by tests in our own and in independent laboratories. Check them for yourself on your own radio set. Get Eveready "B" Batteries.

There is an Eveready Radio Battery for every radio use.

Manufactured and guaranteed by  
**NATIONAL CARBON COMPANY, INC.**  
 Headquarters for Radio Battery Information  
 New York San Francisco  
 Canadian National Carbon Co., Limited, Toronto, Ontario

**EVEREADY**  
**Radio Batteries**  
 —they last longer

# RADIOTORIALS

Right Here's Where We Call the Bluff of a \$33,000,000 Radio Crowd

**R**ADIO Corporation of America has gone into the United States Patent Office and filed formal objection to registration of the title, RADIO AGE, which title has been used and owned by the publishers of this magazine since the spring of 1922. The Radio Corporation, with fine insight into delicate legal and business discriminations, alleges that the title, RADIO AGE, is an infringement on the title of "WIRELESS AGE," a publication which Radio Corporation controls.

This initial step toward trying to grab the name of RADIO AGE and give the name to its own organ was preceded by threats made to the publishers of this magazine. We were warned that if we did not surrender the name of our magazine, a name in which we have generously invested labor and money, Radio Corporation would turn loose its legal department on us. That means a threat of bringing us into federal court. On the side of Radio Corporation would be almost unlimited millions, tremendous influence in quarters where "pull" is most useful, and an absolutely false presumption of law and facts.

Radio Corporation knows, and its legal department knows, that it has no shadow of a right to act on such a violent hypothesis that RADIO AGE as a name infringes on "Wireless Age." Lawyers know it; the publishers of RADIO AGE know it, and before we have finished the radio public is going to know it.

If we were in the position before the American people that Radio Corporation occupies, we would not have taken this action in the Patent Office. If we had been the Radio Corporation, we would not have sent our agents to Washington to try to wrest away a magazine title from its rightful owners, but we would have sent them to Washington to meet the charges that have been filed there by the Federal Trade Commission, a bureau of the United States government. We would have been devoting all of our effort and our appropriation for legal talent to the effort of disproving the charge that we were a trust and that we were restraining competition, thus working a hardship upon twenty millions of radio fans.

We do not know whether or not a radio trust exists, but if there is such a lawless combination in restraint of radio commerce, the fans who are spending \$350,000,000 for radio merchandise this year should, and probably will, find a way to express their opinion of it.

Or, if we had been Radio Corporation, instead of reaching out into the Middle West to strong-arm a magazine that has been persistent and vigorous in up-building interest in radio, we would have sent our agents to Richmond Hill, N. Y. We would have looked up Al Grebe out there at his big new broadcasting station and we would have told Al that we were heartily ashamed that the Radio Corporation had brought a suit against him; a suit so devoid of legal justification that it was thrown out of court before proceedings were fairly started.

Or if we had been in Radio Corporation's place, we would have called together sixty independent radio manufacturers of the United States and would have given those independent manufacturers an explana-

tion of Radio Corporation's great good fortune in having through one of its subsidiary companies, been privileged to manufacture receiving sets under license granted by the government while the sixty independent manufacturers could not obtain a similar privilege. We would have explained to the sixty independent manufacturers and to the American public how it happened that it required eighteen months for the independent manufacturers to obtain a ruling that they were entitled to the same advantages from the confiscated German patents as was Radio Corporation.

We would have sent our agents down to Elgin, Illinois, and told Charlie Erbstein that he could have the broadcasting equipment he publicly declares the "Four Horsemen" refuse to sell him because he is against radio monopoly, either in manufacturing, selling or broadcasting.

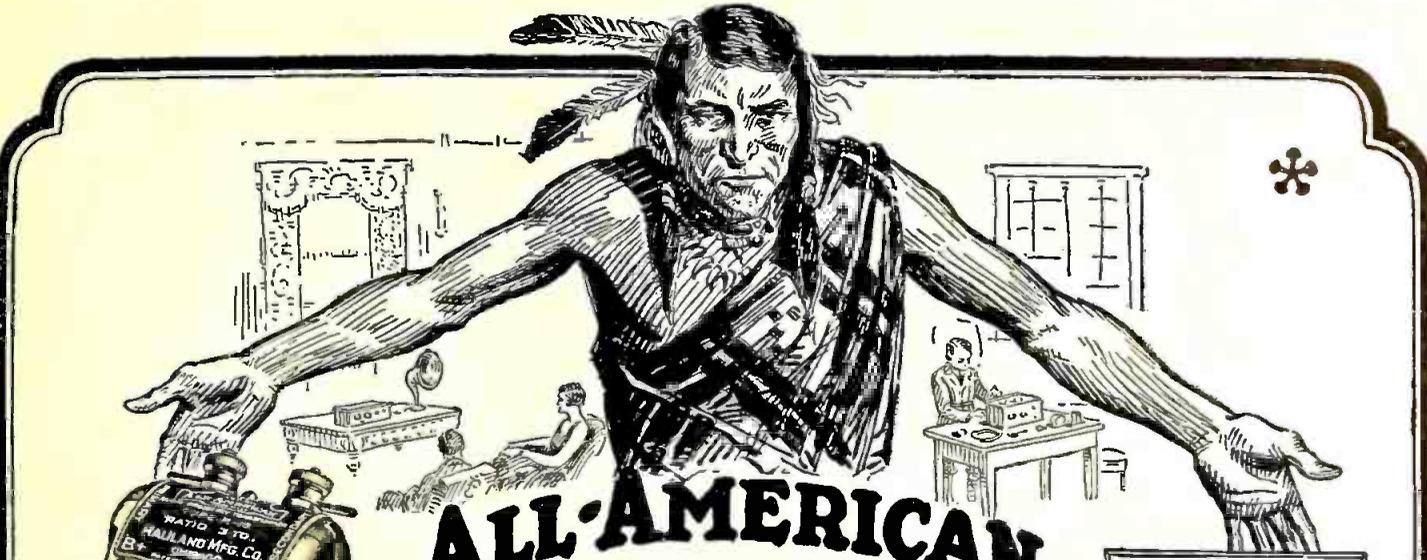
RADIO AGE is against monopoly also. With deepest respect for the law and with profound faith in the fairness of the people's verdict in any issue where the public is fully informed of the facts, we are going to do our best to maintain what the constitution guaranteed us—a free press.

It is a worthy saying that truth in promotion implies honesty in manufacture. It is obvious that a corporation that is hopeful of building up good will for itself and its product by threatening continuously to turn loose its high-priced lawyers on manufacturer, dealer, editor and publisher, is afflicted with aggravated optimism.

It is possible that Radio Corporation may be successful in making off with the name of this magazine. Even so, it would not be a vital blow. A rose by any other name would smell as sweet. It is possible that almost a quarter of a million readers would still read this magazine if it were called RADIO—Something else. And we are not so sure that manufacturers of radio equipment would not still favor us with their advertising. We even harbor the thought that we might have more readers and more advertising after the facts become known. Readers and advertisers are like that sometimes.

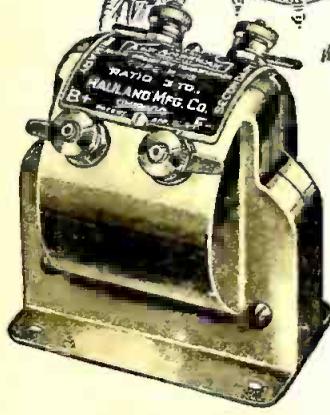
The Owner-Editor of RADIO AGE was a newspaper correspondent at the front with the American Army in France. He was the first American to reach Berlin after the Armistice was signed. He was in the midst of the Chinese rebellion in 1920. He later described the anti-American outbreak on the Yangtse and he was in Siberia watching Kolchak make the last stand against the Bolsheviks. He assisted two other Americans in the rescue of Dr. A. L. Shelton, Christian Missionary, kidnapped for ransom by Yunnan bandits and held captive for two months near the Tibet border. He has been a newspaper editor and foreign correspondent for a quarter of a century. He thrives on action.

He knows newspaper editors all the way from the Maine border, where they smuggle rum, to the California border, where they smuggle Orientals. He is going to organize a proof press and let every newspaper in the United States know what transpires in this Radio Corporation matter. And maybe we can induce Charlie Erbstein to broadcast it. Let's go!



# ALL-AMERICAN

## Fills Every Radio Requirement



**If You Want to Improve Your Present Set** ~



**If You Want to Build a High Grade Receiver** ~



Install genuine ALL-AMERICAN Audio Transformers. Two of these instruments, fitted into any set not already equipped with them, will give the receiver greater loud-speaker volume with remarkable purity of tone. ALL-AMERICAN Transformers are so designed that they amplify fundamentals and harmonics equally, throughout practically the entire audible range. Hence, voice and tones are reproduced *faithfully*.

The standards of precision to which ALL-AMERICANS are made, have led to their adoption as standard equipment on all the better sets.

Insist upon ALL-AMERICANS: the Audio Transformers which, through sheer merit, have become the largest selling transformers in the world. 3 to 1 Ratio, \$4.50; 5 to 1 Ratio, \$4.75; 10 to 1 Ratio, \$4.75.

Use ALL-AMERICAN Super-Fine Parts, and you can have an intermediate-frequency receiver embodying all the most advanced features known in Radio.

Super-Fine Parts are easily installed. No critical adjustments are necessary. Operation is smooth and flawless. And every part is ALL-AMERICAN—if you are a Radio Fan you know what that means! Sets built with Super-Fine Parts are unsurpassed for selectivity, range, volume, and tone quality. Practically any station in the country can be brought in on the loud-speaker. Interference from local stations is completely eliminated. Reliability is assured through ALL-AMERICAN precision in manufacturing. Super-Fine Parts represent in a very real sense the *ultimate* in radio broadcast reception. Price, \$26.00

### ALL-AMAX JUNIOR

An All-American One-Tube Reflex  
This is the ideal set for the youthful beginner in Radio. It comes completely mounted on panel and baseboard, and can be easily wired in one delightful evening with the aid of clear photographs and a 43-page instruction book. Easy to tune—as selective as a multi-tube set—has "crystal" tone quality—volume enough for speaker operation. It brings in far-distant stations, and tunes out the locals.  
Price, complete (semi-finished) \$22.00



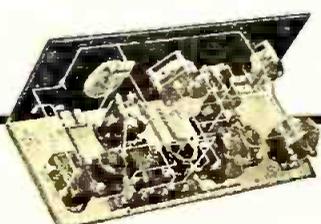
### The Radio Key Book

Will help anyone to hear farther and better. Contains practical hints for the set builder—tested hookups—diagrams of All-Amax and other circuits. Sent for 10 cents, coin or stamps

**RAULAND MFG. CO.**  
2680 Coyne St., Chicago  
Pioneers in the Industry

### ALL-AMAX SENIOR

An All-American Three-Tube Reflex  
A complete receiver of the highest type. Great range and selectivity are provided by three stages of tuned and SELF-TUNED Radio Frequency Amplification. A crystal detector and two stages of Standard ALL-AMERICAN-equipped Audio, insure speaker volume on distant stations, with undistorted tone quality. Completely assembled—full directions for wiring.  
Price, complete (semi-finished) \$42.00



*Largest Selling Transformers in the World*



J. Matheson Bell,  
President Ozarka, Inc.

# I have trained 2274 men \* to make big money in Radio

*I can do the same for you*

**W**HO were these men? They came from all walks of life. I have just looked up the record of ten of them. One school teacher, one railroad man, one drug clerk, one die-maker, one electrician, one insurance man, one farmer's son, one travelling salesman.

How much are they making? \$50 to \$500 a week. The \$50 men are mostly those who give me their spare time. A great many of my representatives start that way.

How much did they know about radio at the start? Very little, in many cases nothing. Lack of radio knowledge is not a handicap. In fact, I rather prefer the man who hasn't delved too deeply into radio theory. We have our own methods—they are successful—and the man with nothing to unlearn makes the biggest success of our plan.

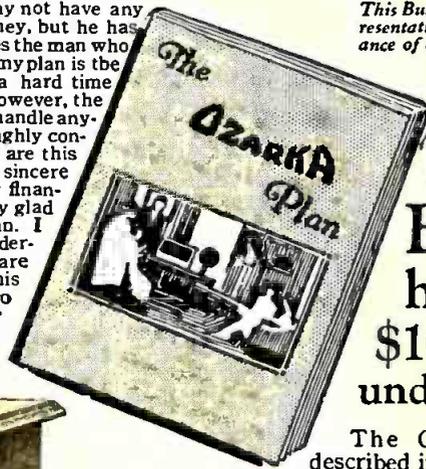
Many of the men who have made the biggest money selling Ozarka instruments never sold anything before in their lives. Sales experience naturally would be of some value, but it is not absolutely necessary. Unlike other articles, a radio instru-

ment does its own talking. Your demonstrations are given during the evenings, which is possibly your spare time. In the hands of the man who knows the instrument it will deliver its best, and you can safely put it in competition with any instrument on the market today, regardless of its price.

The man I want is known in his community as upright and reliable—a man whose word is as good as his bond—a man who has lived in his community long enough so that his fellow men know him and know the real type that he is. He may not have any considerable amount of money, but he has a little; in fact, in many cases the man who is particularly interested in my plan is the one who is having rather a hard time making ends meet. He is, however, the type of man who would not handle anything unless he was thoroughly convinced of its merit. If you are this kind of a man and are really sincere in wanting to improve your financial conditions, I will be very glad to tell you of the Ozarka Plan. I can train you to make considerable more money than you are now making. I have done this with 2274 men in the past two years, and I will do it for you if you will do your part.



*This Button identifies Ozarka Representative in your city—your assurance of complete radio satisfaction*



## This large Book tells how to make \$100 per week under Ozarka Plan

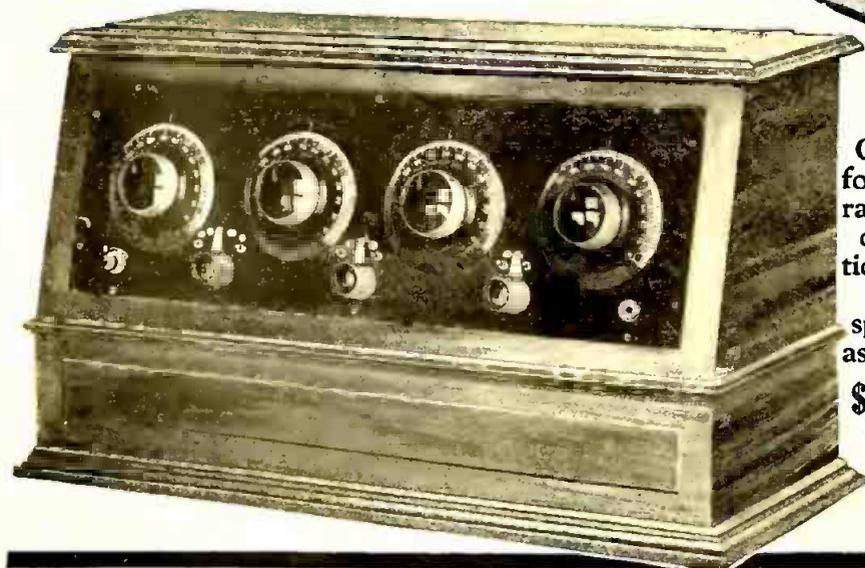
The Ozarka Plan is fully described in a large illustrated book.

I will send a copy to men who are willing to tell me fully about themselves.

The Ozarka book is a true story of life, of men, of why they fail, and how they succeed. It tells how men are carving out futures for themselves in this fascinating business of radio.

In territory not now covered, I want the right man. If you feel qualified and are willing to put forth the necessary effort to obtain a splendid, profitable business of your own, write me and say "Send your Ozarka Plan Book No. 100." It may be the turning point in your life. Don't fail to mention the name of your county.

**Ozarka four tube radio for operation with loud speaker as low as \$39<sup>50</sup>**



## OZARKA, INC.

871 Washington Blvd., Chicago

# RADIO AGE

## The Magazine of the Hour

M. B. Smith  
Business Manager

A Monthly Publication  
Devoted to Practical  
Radio

Frederick A. Smith  
Editor

## First Super-Stations Licensed— NEW Wavelengths a PROBLEM

WASHINGTON, D. C.—What to do about the reallocation of wavelengths to broadcasting stations as recommended by the Third National Radio Conference at Washington? What to do is right, for although the Conference adjourned over two months ago, the conferees blissfully going respective ways feeling their recommendations had solved the situation, little as yet has been accomplished.

In fact, they have left at Secretary Hoover's doorstep a problem as compared to which the solution of a Chinese cross-word puzzle would be easy. Two months' time is not ordinarily considered a long period when it is remembered that Rome was not built in a day, but the way in which things are popping in radio, sixty days' delay is the equivalent of years in other fields of endeavor.

Far from being able to afford relief to existing broadcasting stations in this period of drifting, the situation is becoming more complicated by the fact new broadcasting stations are springing up like mushrooms.

### How It Started

THE pressure upon the officials at the Department of Commerce is terrific. W. D. Terrell, Chief Supervisor of Radio, to whom the immediate solution is entrusted, attacking the Class "B" station situation as a starting point, lost no time putting the Radio Conference recommendations up to the government district radio inspectors throughout the country with instructions for them to get into touch with owners of stations.

And then the trouble began!

So discouraging have been the reports received from certain of these inspectors—key men, in fact—that the plan of the Conference now appears to be as far from being carried out as the day the recommendations were agreed upon.

In fact, unless miracles are performed in the congested broadcasting areas, I do not believe the present plan can ever be carried out, and I base this prediction upon a talk I had with a high government official who summed up the situation as follows:

The third radio conference recom-

By ROBERT D. HEINL

### New Broadcasters "Stump" Conferees

mended an extension of the Class B band of wavelengths from 288 down to 280 meters and the removal of Class C stations from the wavelength of 360 meters, giving to Class B stations the entire band from 280 to 545 meters.

### Transfers Planned

Steps have already been taken to transfer the Class C stations to either A or B and to shift the Class A stations

between 280 and 286 meters to the band below 280 meters.

The continuing committee proposed by the conference to reallocate the broadcasting wave lengths prepared a plan covering the Class B stations as they existed or were contemplated on October 22nd. It was necessarily tentative, it not being definitely known at that time how many stations would have to be provided for or how difficult it might be for the owners to comply with the plan. This plan was referred to the supervisors of each district to be submitted by them to the owners of the stations involved to ascertain what difficulties might arise as to particular stations, and to prevent as far as possible any hitch in its adoption.

### New Troubles Arise

THREE or four of the districts have already reported that the plan is acceptable. The other districts, however, are experiencing considerable difficulty because of the additional new Class B stations not contemplated and consequently not taken into consideration when the plan was prepared.

There are forty-seven Class B wavelengths available for the entire United States, even if two stations are put on each wavelength, which means undesirable division of time. There are only ninety-four operating channels.

At the present time, there are sixty-four Class B stations in operation.

The Bureau has been advised that seven Class C stations and fourteen Class A stations are preparing to enter Class B. In addition to this, there are nineteen stations under construction or proposed, which are planning to enter Class B, giving us a total of 104 Class B stations to be provided for on ninety-four duplicated channels.

Many of these had not been heard of at the time of the conference. Thirteen of these Class B stations are west of the Rocky Mountains, and if the power of these stations is not increased considerably, they can probably use the wavelengths now being used on the Atlantic Coast, as they have been doing for the past eighteen months. If this can be continued it will leave ninety-one Class B



(Photo by  
Harris  
& Ewing)

W. D. Terrell, the Government's chief radio supervisor, on whose shoulders rests the burden of reallocating the maze of tangled wavelengths. He also is assisting Secretary Hoover in apportioning the first assignment for increased power.

stations to be placed on the ninety-four channels, assuming that none of them obtains a separate wavelength and that all must divide time at least two ways.

**Because of the increase in new Class B stations mentioned above, it is necessary to give new consideration to the plan now in the hands of the supervisors and complete remodeling may be necessary. The fundamental difficulty is that stations are increasing so rapidly that no general plan can have anything like permanence.**

#### Department Swamped

**WASHINGTON, D. C., [Special]** The Department of Commerce is so busy these days trying to fit half enough wavelengths to twice too many stations, that complaints of interference do not elicit very hearty or quick responses. This is unavoidable, officials say, so fans must content themselves with the fact that the Department radio chiefs are snowed under with requests for Class B wavelengths.

With only fifty-three available wavelengths designated by the conference for about sixty stations, the government is now asked to allocate them to 110 B stations. There are sixty-four B Stations already operating, and forty-six either under construction or contemplated, making the application of the original allocation plan practically impossible. Despite difficulties in numbers, there are local situations to be met, and although four of the supervisory districts are apparently fixed up, other supervisors are having difficulties similar to the trouble at headquarters in Washington; too many Class B stations for a division of time on the available wavelengths. Either an entirely new plan will have to be developed, with less space between the channels used, or more wavelengths will have to be secured from other services. An alternative would be to have stations divide time three ways, which it is hoped may be avoided.

Imagine if you can the howl at headquarters when the writer asked when the new list of wavelength allocations would be available. He is not permitted to quote the replies, but they varied all the way from six months to a year, with requests for a method of redistributing them.

The Department is working on a new plan of allocating wavelengths, and expects to try the method out by tests fairly soon to see if the scheme is practical. It is hoped that by the first of the year that a satisfactory distribution will be in operation, but nothing definite can be said at this writing.

With the coming of the Winter months, with better radio reception and more listening-in, Department of Commerce officials point out that super-sensitive sets which are not super-selective must be cured, if interference is to be avoided

and trouble in reception minimized. The fans themselves can better reception, it is believed, by improving their sets and learning to operate them properly. Due to this fact, the Departmental supervisors and inspectors may be expected to refuse to consider complaints unless sets are described. There is nothing doing if poor receivers are used. If a receiver is like a sponge, absorbing everything, the Department could do nothing to relieve interference unless it caused all except one station to close.

There are thousands of non-selective crystal sets on the market and in use, which are impractical for anything but local reception where one station only is on the air at a given time. If a set is not a two or more circuit set, it will probably pick up everything. Practically all crystal sets are of the single circuit variety. In this way many small sets pick up a lot of preventable interference, such as the so-

again a possibility of enactment of much needed radio legislation in the passage of the so-called White bill, named after Congressman Wallace H. White, Jr., of Maine. The bill, which was originally introduced by Mr. White in the first session last February, now includes the features of a Senate bill of slightly more limited scope. The bill has been favorably reported to the House by the Committee on Merchant Marine and Fisheries. During the last session, Congressman Greene of Massachusetts, chairman of that committee, requested from the House Rules committee a special rule which would make it in order for the House to consider the radio bill out of regular order and under limited debate, which would expedite action.

In view of the urgency of the legislation, it is expected Mr. Greene will renew the request at this session and if so it is anticipated that the Rules committee may grant it. If this rule can be secured, proponents of the bill are confident it would pass by a comfortable majority. The measure would then go to conference for Senate action on the additions made by the House.

#### First "Supers" On Air

**MIDDLE** Western fans are now getting their first taste of "super-power" with the advent of WTAM, the Willard Battery Station at Cleveland, O., into the ranks of high-power broadcasters.

WTAM came on the air about the first of December with increased wattage, presumably 1,500 watts. Fans living in the vicinity of Cleveland report that very close tuning was experienced with WTAM's new power, but others with weaker sets said they were unable to tune the station out.

In many cases a wave trap helped to eliminate WTAM, depending on the position of the receiving aerial.

In New York State and in the Chicago district, WTAM came in with loud speaker volume on three tubes in every instance, and most fans who were questioned reported that WTAM could be "heard all over the house," so strong was the apparatus. However, fans three hundred or more miles from WTAM reported it could be tuned out by turning the dial three or four points, so no interference was caused in that respect.

In Chicago it was found that WTAM could barely be heard when WEBH, on 370 meters, or WGN, on 360 meters, were broadcasting. WTAM has a 390 wavelength.

From preliminary reports, then, it appears that small sets located near the super-power stations will be the ones to suffer most, and unless they adjust their sets or equip them with a wave trap, it is unlikely they will be able to tune out the strong broadcasters.

The Government is watching initial experiments closely, in accordance with its promise that super-power will be abolished if interference is excessive.

### MORE STATIONS INCREASE POWER

**FOUR** more Class "B" broadcasting stations which applied for increased power up to 1,500 watts were licensed temporarily last month under the regulations providing that no additional interference shall be caused.

Increased power has been authorized for KYW, the Westinghouse radiophone at Chicago; WBZ, owned by Westinghouse at Springfield, Mass.; KFI, owned by Earl C. Anthony at Los Angeles, Calif.; and WEA, of the American Telephone and Telegraph Company, at New York City. The first station so licensed was WTAM, at Cleveland, Ohio.

This puts five of the Class "B" stations in a position to broadcast at an increased range. Many radio experts believe that this arrangement will result in better broadcasting, "if" it does not blanket neighboring stations.

called man-made interference from legitimately operated and electrically driven machinery and apparatus.

Many manufacturers using electric power and apparatus emitting electrical interference are trying to eliminate their radiations, so as to decrease the broadcast listener's troubles. But it often costs considerable money and is frequently unsuccessful.

By the use of simple wave traps, considerable local interference from other stations and electrical devices may be eliminated, it is pointed out. So it is up to the fan to aid his brother fans and the Government by improving his own set. Some fans will find that by using a two-circuit set or a tuner that they can select either of two local stations operating simultaneously, with a reasonable separation between their wavelengths, as is used in the present wavelength assignment. Otherwise they will find it impossible to listen in when two or more stations are operating at once. Unless fans learn to tune their sets, they will get even the amateur stations on the short waves below 200 meters.

Before you complain the next time, be sure your set is a reliable one and that it is operating properly, and that you have taken the usual precautions to prevent the necessity of writing to government inspectors.

#### Radio Legislation

With Congress in session, there is

# Results with Radio Frequency

## R. F. Amplification Best for Distance, But Fan Must Get the Right Transformer

By ARMSTRONG PERRY

**E**XPERTS agree that for DX work in radio a good radio-frequency amplifier is needed. They have to agree, because it can be and has been proven, mathematically, experimentally and in practice among radio users, that radio-frequency amplification increases the weak signals to a greater degree than the stronger ones. Naturally, the signals from distant stations are the weakest, other things being equal, therefore they are to be helped most by radio-frequency amplification.

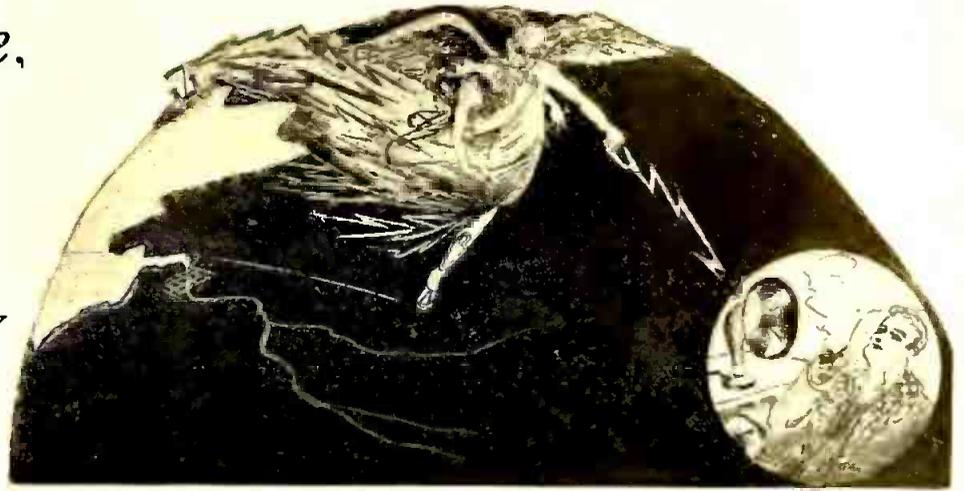
A necessary part of an efficient radio-frequency amplifier for use with wavelengths within the broadcasting band is a transformer, through which the amplifier tubes are coupled together or the last amplifier tube coupled to the detector. For longer wavelengths, resistance coupling may be used with good results, but resistance-coupled amplifiers are not usually satisfactory for wave lengths below 1,000 meters.

If amplification of power were the only thing to be accomplished, the construction of a radio-frequency amplifying transformer would be comparatively simple. Six stages of amplification will make a loud speaker roar like a factory whistle.

### Sounds Must Be Intelligible

**I**T will vibrate a loud speaker's diaphragm so powerfully that it will throw a stream of air strong enough to blow out a match. But all amplification when applied to currents carrying the characteristics of voice or music, causes some distortion, and the radio-frequency amplifying transformer will make sounds unintelligible unless it is constructed and operated with the greatest nicety. It distorts less than the audio-frequency amplifier but either is a difficult piece of apparatus to design and build.

Perhaps the greatest problem that confronted the builder or user of radio-frequency amplifying transformers for short wavelengths was the difficulty of obtaining a transformer that would amplify equally over a wide range of wavelengths within the broadcasting band. It was not very difficult to produce one that had a very good peak somewhere. If the user, fishing for a DX station, happened to catch one whose wave corresponded to the frequency at



Above is an artist's picturization showing how Radio Frequency reaches out and helps the "DX" listener to amplify weak signals which he could not get otherwise. If the set-builder or buyer gets the right R. F. transformers, they will bring him all signals within the range for which they were constructed.

which the transformer was most efficient, he had something to tell the neighbors. But he might fish in vain for a much nearer and more powerful station without ever getting it. This made radio-frequency amplification unpopular at the start, except with experimenters who appreciated what a great future it had if properly developed.

Long before radio broadcasting began, P. D. Lowell, of the Radio Laboratory of the United States Bureau of Standards, started experiments on the amplification of short waves. Brent Daniel of the Bureau took up the work after Mr. Lowell had established the fact that a radio-frequency transformer could be built that would cover a fairly wide wave band. He developed the transformer just at the beginning of the broadcasting era. Imitators immediately began that old game of making "something just as good." The transformers that some of them built were developed hurriedly because the radio trade was growing rapidly and the loss of a day in getting into the patent office might mean the loss of a good many dollars. The radio education and experience of some manufacturers effectively prevented their making a successful imitation or substitute. The closest study of a piece of apparatus so apparently simple but really so intricate, by even an experienced radio man, cannot reveal at once all the knowledge of the device that was acquired by the man in whose brain it was born.

### Capacity Effects Hinder

**A**S stated in "The Principles Underlying Radio Communication," a book prepared by the Bureau of Standards for the Signal Corps, ". . . for short wavelengths, particularly for wavelengths of less than 300 meters, radio-frequency amplification is attended with much difficulty caused by capacity effects between different parts of the

circuit." The number of coils and turns of wire in a transformer make just so many component parts for condensers, unwanted, unwelcome, but impossible to be rid of. The experimenters at the Bureau met this difficulty in clever fashion.

Making use of the well-known fact that the combined capacities of condensers connected in series is less than the capacity of any one of them when operating alone, they wound both the primary and secondary coils in a number of groups. These were so spaced from each other and from the core that they formed a series of condensers with but a very small combined capacity. Even the wires that connected coil with coil were kept well separated, to minimize the capacity between them. This increased both the amplification and the range of wavelengths over which the transformer would operate.

The coupling between primary and secondary was found to be very critical. A change of a sixteenth of an inch altered the characteristics of the transformer. The spacing between the separate coils of the primary and secondary was even more critical. A difference of a thousandth of an inch between any two coils made a decided difference in the characteristics. To insure accuracy and permanency, each coil was placed in a slot machine and micrometered in a square tube of insulating material.

The size of the wire in the coils was found to be important, because the finer the wire, the closer together the turns will lie and the smaller the capacity between them will be. No. 38 wire was found to be the best. Beside this some human hair looks large.

The ratio of the turns of wire in the primary to those in the secondary was still another problem that had to be worked out with painstaking exactness. The radio novice is often intrigued by

the allurements of a high ratio. "Ten to one! Gee, ten times as much signal strength! Me for it!" Theoretically, it can be worked out something like that. In practice, the distortion and the difficulty of control nullify the theoretical advantage. The Bureau found that a 1 to 1 ratio between the windings gave very satisfactory amplification. (As the Frenchman said: "No doubt they are right, but God knows eet ees impossible!")

A ratio of 1 to 1-1.3 is the maximum. This is obtained not by additional slots and coils, but by additional turns of wire in the slots at the secondary end of the tube.

**Using Iron and Steel Cores**

**T**HE core was another problem. It had been known for a long time that iron-cored transformers would give better results for some purposes than air-core transformers. The core broadens the waveband over which the transformer is efficient. It also reduces the turns of wire necessary in the coils and the capacity that is so undesirable. But the use of iron or steel cores in radio-frequency amplifying transformers had not been considered as practical until the Bureau of Standards demonstrated that it was. Transformer action depends upon the building up and collapse of lines of magnetic force about the wires in the windings.

In order to get the desired increase of voltage which the iron core is capable of assisting, the core must reach the magnetic saturation point on every oscillation. In radio-frequency transformers, this means that the lines of magnetic force must penetrate and saturate the iron core a million times per second if 300-meter waves are being received. This is impossible unless the core is made up of exceedingly thin sheets. A thickness—or thinness!—of three and one-half thousandths of an inch was unsuccessful.

It had to be reduced to two thousandths before success was achieved. Seventy-five of these extremely delicate sheets of metal, or one sheet folded seventy-five times, makes up a core about the size of a square lead pencil. The core was well insulated to reduce losses.

It is a simple matter to describe

these details, but the government expert who worked them out had to build 127 complete transformers and put all their

best features together to produce the one he was after. When he finished it, he found he could bring in Kansas City on a two-foot loop, and K. C. is a long way from Washington. Dr. Rogers, inventor of submarine and underground radio devices, brought in broadcasts from England by using these transformers, long before the recent furore about hearing from the other side of the Atlantic.

Part of the job has been to compare the transformer developed by the Bureau with those produced by others. The curves tell the story. Three of them gave no sound at all in the phones

and then falls very slowly to 560, which is the upper edge of the broadcasting band.

**The Heart of the Set**

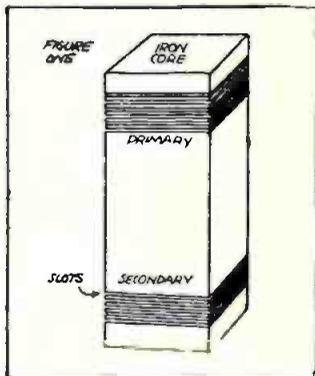
The point of the story is this: No matter how many stages of amplification you have, no matter how good a detector, tuner, or audio-frequency amplifier your set contains, the first tube and the first transformer control the oscillations of the entire set. If the transformer refuses to function at the wavelength of the station you are fishing for, you will not hear it—that's all! There are many radio-frequency amplifiers on the market and the manufacturers and dealers are mostly honest folks. They are not in the habit of emphasizing the weak points of their sets because there are too many strong points to talk about. It is up to the customer to say what band of wavelengths he wants to cover and make sure that the set he is considering will do the work he wants done. It is perfectly fair to ask for a demonstration before purchasing, or to purchase on approval.

One big advantage of the type of radio-frequency amplifier that had its beginning in the Bureau of Standards is that it is a plug-in proposition. The waveband of a receiver can be changed by taking out one transformer and plugging in another, as easily as the electric reading lamp on the library table can be plugged into the socket on the baseboard. By using the proper transformers, four or five stages of radio-frequency can be used, with easy control and the minimum of distortion. One stage multiplies by 10,000 the energy received through the aerial and two stages multiply it by 1,000,000.

Small, portable coil aerials can be used, with the advantage of their directional effects. Audio-frequency amplifiers will bring the sound up to the desired volume.

Mr. Perry will have another interesting article in the February RADIO AGE.

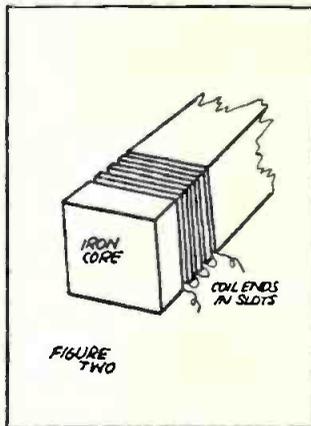
Incidentally, the Editor would like to know what our readers' experiences have been with Radio Frequency Transformers. What type of transformers gives best results and widest range on the broadcast band? Write us about it and we'll print the best letters.



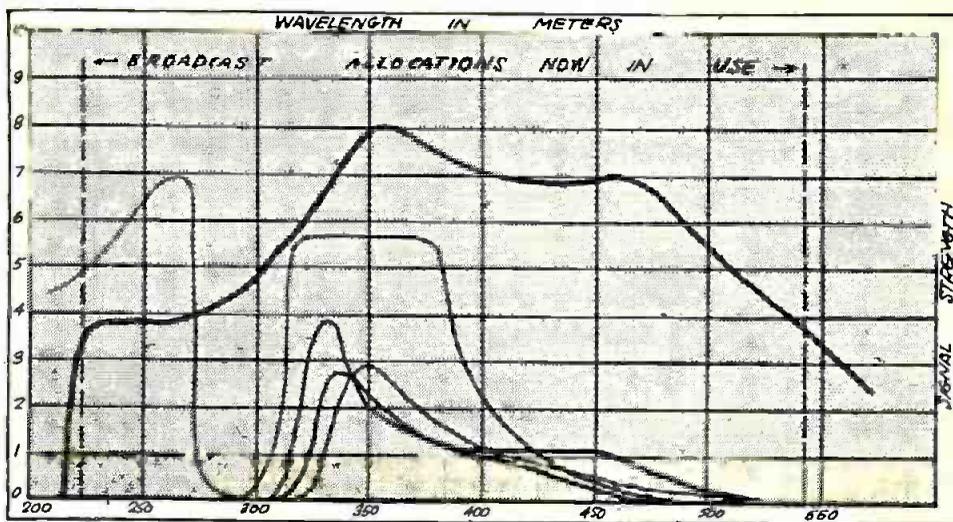
Slots are cut into each end of the tube, the windings being laid into these slots. The tube is closely packed with the iron laminations which form the core. Windings are of fine wire, and are connected from one to the other as above indicated.

on waves below 300 meters. Now that the broadcasting band is going downward, some folks are out of luck. One transformer had two good humps, like a camel, one at about 250 meters and the other at 350 meters. Unfortunately, the recent conference called by Mr. Hoover did not assign wavelengths to fit the humps of radio-frequency transformers. Another type of transformer gave a fairly high and broad peak from 320 to 360 meters.

Outside of that, nothing doing. Two others rose sharply out of the silence between 300 and 350 meters, then faded away. The one developed by the Bureau and used in this test begins going strong at 200 meters, is better at 300, reaches its peak at 360

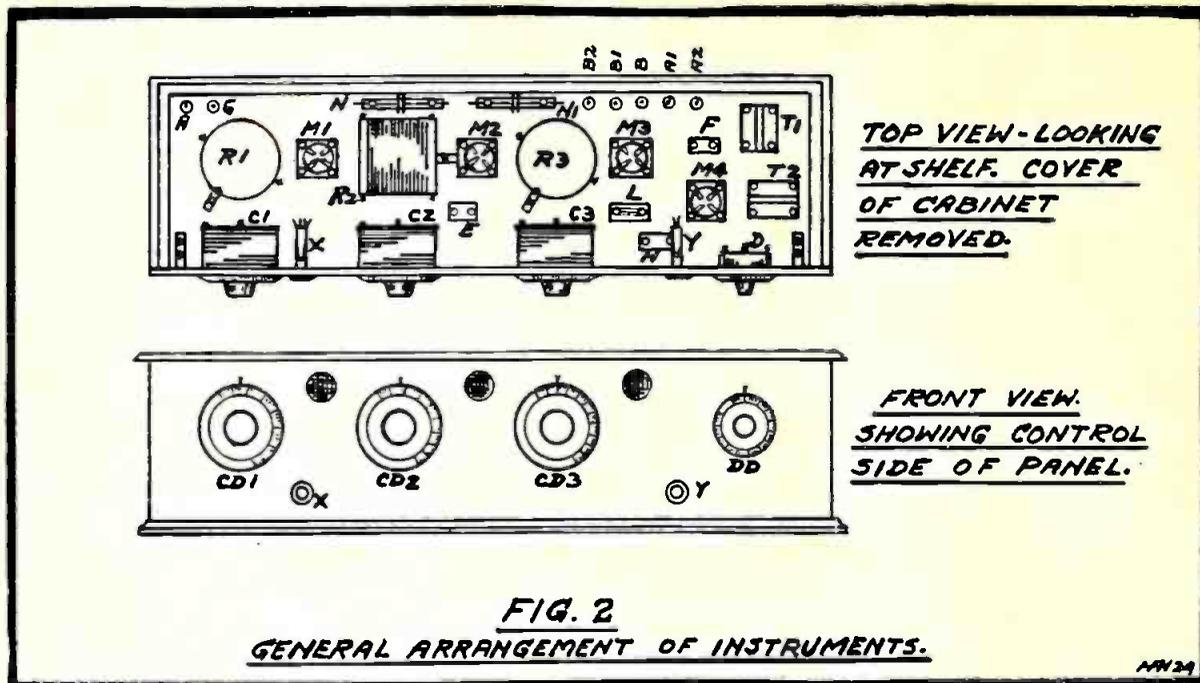


The turns of No. 38 wire are wound in slots in a series of continuous but divided coils. The windings slots are at opposite ends of the tubing as shown above.



A comparison between different RF transformers now in use. The heavy line indicates the best curve since it covers the broadcast band with a very satisfactory value of amplification. Two stages of amplification with UV 199s were used and all transformer curves were obtained under the same operating conditions.





Harmony and simplicity are the characteristic features of this *Neuro-Reflex* receiver. In appearance it looks like a *neurodyne*—in results it is its easy equal, with a smaller number of tubes.

The reflex circuit is simply an amplifying feature whereby each amplifying tube is used as a radio frequency amplifier and an audio frequency amplifier combined.

The circuit operates much the same as a straight radio frequency circuit up to the detector tube, but instead of the output side or plate of the detector tube being connected to the phones or to audio frequency amplifying tubes, it is returned to the input side or the grid of the radio frequency tube. The audio frequency current is thus amplified by the tube that is simultaneously amplifying the radio frequency current of the signal before it has reached the detector tube.

If receivers are connected to a radio frequency circuit before the detector tube, no signal will be heard, as they do not respond to a radio frequency current until it has been passed through the detector tube and changed to audio frequency, but they will respond to the audio frequency currents returned, or reflexed on these tubes from a detector tube, producing the same result as a straight additional audio frequency amplifier without the use of additional tubes.

### Construction Simplified

The parts used in building the set are clearly marked with a designating letter or number throughout this article and on the circuit diagram and construction drawings.

This method has been found to better enable the prospective builder to more easily distinguish each part and to connect them properly into the electrical circuit, although he may be entirely unfamiliar with electrical circuits and construction.

The first step in building the receiver should be to secure all of the instruments and material listed at the bottom of page 11.

WHEN the instruments have all been secured, they should be placed into the positions that they will occupy when mounted into the completed set. A cabinet of the right proportions can then be secured and a panel and shelf to fit the particular cabinet can then be determined. This procedure may save quite a bit of laborous re-arrangement later on.

### Placing the Apparatus

The first step in assembling the set will be to cut the shelf and panel to fit the cabinet. The shelf should be cut so as to clear the cabinet on all sides by at least a half of an inch when mounted on the panel. It is not absolutely necessary to have a composition shelf. A laminated wood shelf will do as well mechanically, but if possible a composition shelf is recommended, as it is easier to work and will not warp as wood will. Considerable loss is caused by the wood absorbing moisture during wet weather.

The next step will be to lay out and drill the shelf and panel for mounting the instruments. Figure 2 shows a general arrangement of equipment and can be followed with good results, but it is not essential, as any good layout will suffice if you bear in mind to keep the transformers placed so that they will not be inductively coupled. This is accomplished by mounting the radio frequency transformers (R1, R2, R3) on an angle of about 45 degrees or on opposite planes. They should be spaced at least four inches apart.

The audio frequency transformers (T1) should be placed at right angles to one another and as far apart and as far away from the radio frequency transformers as is practical. If this is not done, an inductive coupling effect will be produced. The little induced currents thus formed will cause many annoying howls and squeals in the receiver.

When the instruments are all placed in their permanent positions, the mounting holes should be centered in the panel and shelf with a sharp instrument. A nail that has been filed to a good point or an awl will do this very nicely.

### Drilling the Holes

THE instruments will then be removed and the shelf and panel drilled. Be careful not to press too hard on the drill as this will cause the edges of the holes to chip.

It is a good practice to drill

the holes for the condenser and rheostat shafts with plenty of clearance. A hole one-half inch in diameter is a good size, as it will be a safeguard against the binding of these movable shafts on the panel which would cause the dials to turn hard and make it impossible to tune the set critically.

When the panel is drilled, the front or control side should be rubbed with fine steel wool (size 000) until all of the scratches are removed, following this by finishing off with a fine piece of sand paper and machine oil until a dull velvet finish is obtained. The edges of the panel should be rounded off with a fine file and finished with fine sand paper to prevent chipping.

After the shelf and panel are prepared, the instruments should be mounted to each and the shelf fastened to the panel by the brass brackets shown in figure 5 as detail 3. Brass machine screws and nuts should be used throughout, as iron screws will produce little magnetic fields when near any inductance. These little induced currents also help to make the set noisy.

When the instruments have all been mounted to the panel and shelf and the shelf mounted to the panel, the set will be ready to be wired or connected up, but don't just wire it or connect it up; use as much care in doing this as you have in drilling the panel or building the transformers, remembering that a radio set is only as efficient as its most inefficient part. If the wiring is not carefully done, disappointing results will be obtained even though the instruments are the best.

Many people, in wiring a receiving set, make a fine looking job of it by arranging the wiring in nice straight runs and square corners, taking the longest way around like the bus work on the switchboard in a power station; but this is a very inefficient way to do it. It must be

remembered that the frequency of the current passing through the wiring of a radio set is measured in the thousands of cycles, while the current on the bus work of a power switchboard is seldom over sixty cycles.

The nice, long parallel runs will act as little condensers cutting down the efficiency of the set by increasing its internal capacity. It is also necessary that the power or low tension leads, battery supply leads, and high tension leads, grid, plate and antenna leads, be separated. Do not run a low tension lead parallel to a high tension lead for any distance. Keep the leads from the input side of the tube (the grid leads), as short as possible and away from the other leads. If this interferes with another lead, make the other lead longer.

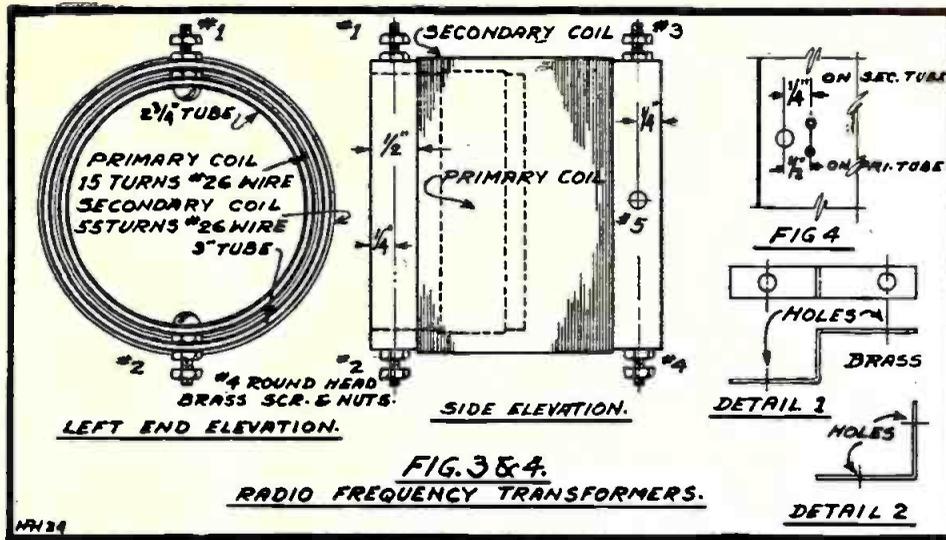
Bare copper wire either No. 12 or No. 14 is heavy enough to care for the currents passing through a radio receiver and will be stiff enough to support themselves when bent into the required shapes. Solder all wire connections and turn the binding post and terminal nuts down as tight as possible, as a loose lead causes a high resistance contact and is sometimes very noisy, especially if the set is subjected to much vibration.

If it is not desired to use a loop antenna or to make the set for the use of both the outside antenna and loop, the cutoff jack (X) and the wiring marked "X" will be omitted and the first radio frequency transformer (R1) connected to the condenser (C1) as shown by the dotted wiring.

If it is desired to use the loop antenna only, and not arrange the set for use with an outside antenna, the first radio frequency transformer (R1) and the cutoff jack (X) can be omitted and the two leads from the condenser (C1) shown dotted, run to the binding posts "A" and "C" instead of to the transformer as shown.

**The R. F. Transformers**

To build the radio frequency transform-



The dimensions and specifications for the radio frequency transformers are given in the above illustration. The primary fits immediately inside of the wall of the secondary winding tube, and is held in place with screws.

ers, R1, R2, R3, six pieces of composition tubing will be required, three pieces of three inches outside diameter, three inches long, and three pieces, two and three quarters inches outside diameter, one and one half inches long; eight No. 4 brass machine screws five-eighths of an inch long; thirty brass nuts for No. 4 machine screws and about one-half pound of No. 26 double silk covered magnet wire.

The three-inch tubes will have five holes drilled in each, to pass a No. 4 brass machine screw. These holes will be one quarter of an inch in from the end of the tube, as shown in figure 4. Two of these holes will be drilled on each end of the tube on opposite sides from one another and one midway between the two on the right end. We will call these holes No. 1, No. 2, No. 3, No. 4 and No. 5, as shown in figure 3.

The two and three-quarter inch tubes will have two holes of the same size drilled on the left end of each to pass a

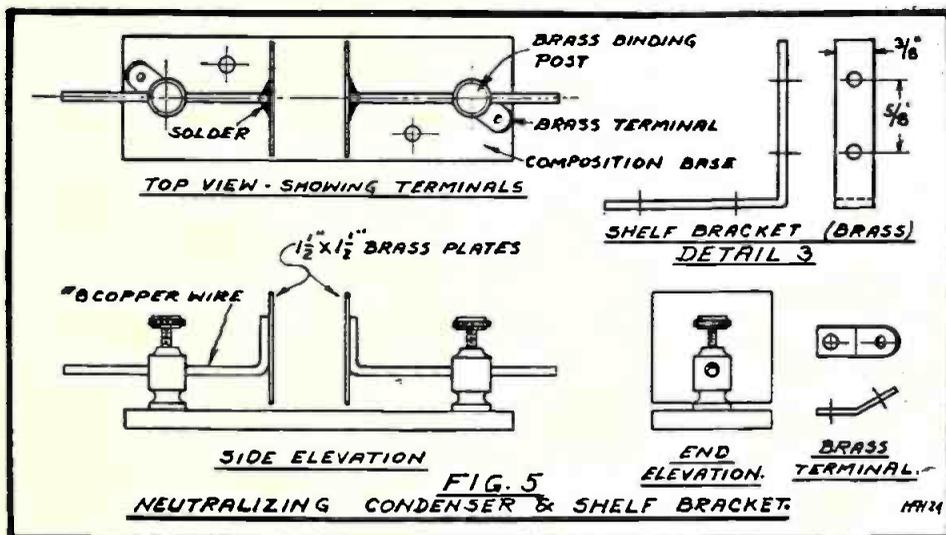
No. 4 brass machine screw, these holes to be one quarter of an inch in from the end of the tube and on opposite sides of the tube. We will call these holes No. 1 and No. 2, as shown in figure 3. They should line up with holes No. 1 and No. 2 on the three-inch tube when this tube is placed inside of the three-inch tube.

The tubes are now ready to be wound. We will start with the secondary coil which is to be wound on the three-inch tube. Two small holes will be drilled one-half of an inch in from the left end of the tube and directly in line with hole No. 1 as shown in figure No. 4, to pass and fasten the No. 26 wire. The end of the wire will be passed down through one hole and up through the other hole, leaving about two inches of free end for connection. Care should be used to see that this wire will lay close to the inside of the tube between the two holes and that it is not pulled too tight, which would damage the insulation or break the wire itself.

Fifty-five turns of the No. 26 wire will now be wound in an even layer on the tube. This should be wound on in a clockwise direction when looking at the right end of the tube. If the tube is held in the left hand and the wire wound so that it goes away from the body over the top of the tube and toward the body on the lower side of the tube, this will be accomplished. Two more holes will then be drilled directly in line with the last turn of the coil and opposite hole No. 3 similar to figure No. 4 and the end made fast as was done at the start, leaving about two inches of free end for connection.

**The Winding**

WHEN the three secondary coils have been wound, they will be laid aside and the two and three-quarter-inch tubes will have the primary coils wound on them; two small holes will be drilled in the right end of the tube opposite hole No. 2 and (Turn to page 70)



A Neutrodon or Neutralizing condenser that can be constructed at a small cost, and which has few equals for efficiency. This type of balancing condenser can be used to advantage on most any type of neutrodyne receiver which requires the use of a balancing element.

Take Good Care of Your

# HEADPHONES

*Receivers are delicate electrical instruments and should be treated as such*

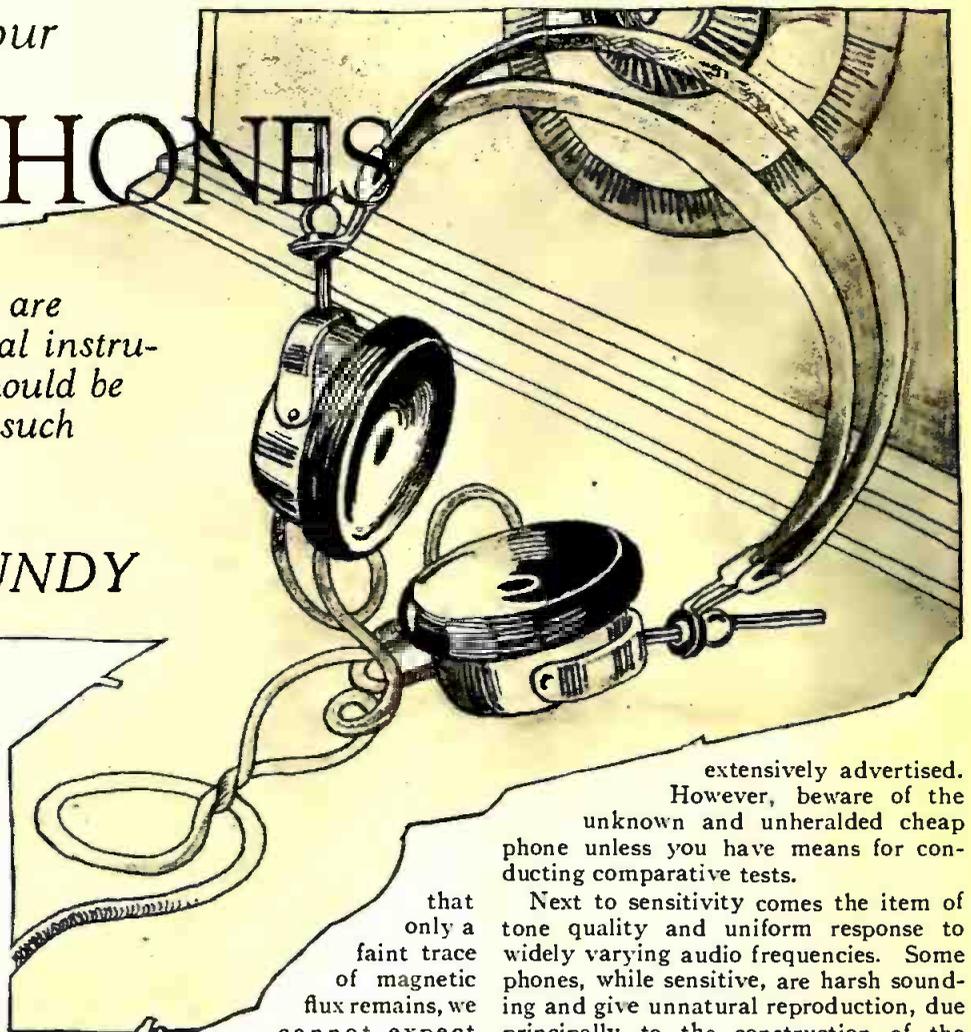
By ROSCOE BUNDY

**A**FTER three years of trouble shooting on amateur-built receiving sets I have come to the conclusion that "Gyp" headsets or phones are as much to blame for failures as any other part of the circuit. It seems to be a common failing for the builder to spend money foolishly on all sorts of pseudo-refinements in the set proper and then to economize or skimp on the phones—the heart of the radio receiver.

After investing a hundred dollars or so on nickel-plated ornaments and foolish coils, he will go and buy his phones from the five and ten cent counter and wonder why he is not getting the expected results from his set.

The importance of the headset is greatly underestimated by the average fan. He does not seem to realize that the entire output of his set is delivered to the phones and that whatever benefit he gets from the set depends on what the phones are capable of delivering to him. If the efficiency of the phones is only 50 per cent, then he will get only 50 per cent of the output in the form of sound waves where he should be getting a great deal more. It can be said without exaggeration that the difference between a good set of phones and the bargain counter type is equal to two stages of audio amplification. That is, the good phones will deliver as much volume from the detector tube alone as the poor phones will deliver from the same tube with two stages of audio amplification added. In fact, there are several makes of phones which will give as much volume on a crystal set as a poor pair will give on a regenerative detector circuit, and the range varies accordingly.

If the radio novice paid as much attention to the selection of his headset as to the selection of a hookup and the tuning units, we would have more consistent DX reception. When the phones have diaphragms with the flexibility of cast iron stove lids, and the magnets are wound with hay wire, it is impossible to make any hookup perform according to Hoyle. When such poor magnet steels are used for the magnets of the phones



extensively advertised. However, beware of the unknown and unheralded cheap phone unless you have means for conducting comparative tests.

Next to sensitivity comes the item of tone quality and uniform response to widely varying audio frequencies. Some phones, while sensitive, are harsh sounding and give unnatural reproduction, due principally to the construction of the diaphragms and the arrangement of the pole pieces. Further, in a double headset both phones should be perfectly matched, so that they give perfectly uniform volume and tone. Headsets, while apparently the most simple device in the receiving outfit, are the most difficult to construct. A good pair of phones will give a smooth, soft reproduction with almost perfectly uniform accent on high and low pitched notes. They are as responsive to the low shuddering notes of the pipe organ as to the high upper notes of the soprano. Poorly constructed phones are generally insensitive to the lower pitched notes and unduly sensitive to high pitches, thus giving an unbalanced reception.

With improper diaphragms and magnets, it is possible to lose half of the orchestra because of the selectivity of the diaphragms. Very sensitive phones with exceedingly thin diaphragms generally have a lower natural period than insensitive phones, and while they record low notes with accuracy, they will buzz and rattle on high notes. By combination of thin diaphragms with proper "damping" we gain a better distribution of sound.

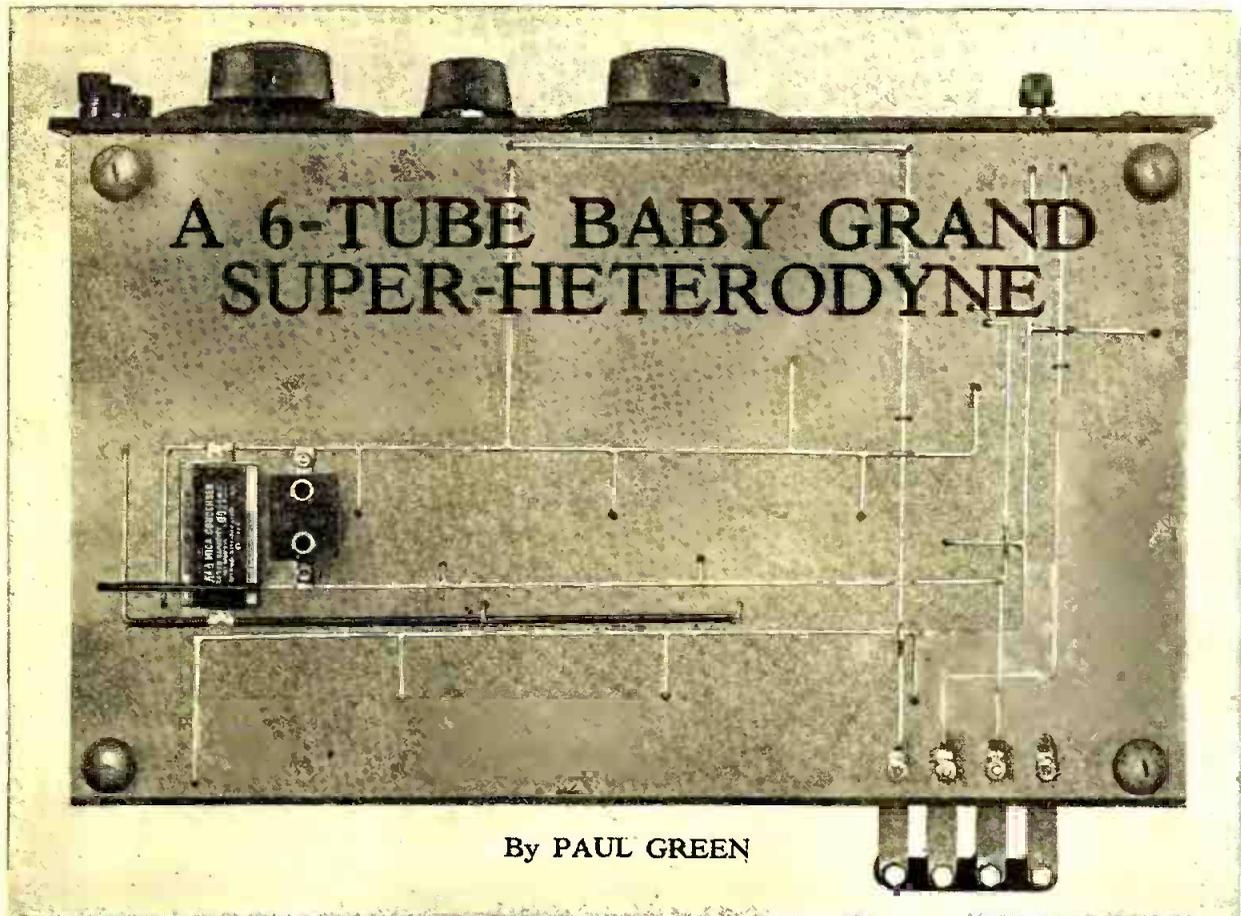
## Wise Buying Advised

**B**Y CHEAP phones I do not necessarily mean phones that retail at a reasonable price. Please do not misunderstand me. There are firms that turn out effective receivers at lists ranging from about \$3.00 to \$4.00 that are comparable to cheaply constructed phones that retail at twice the price. It is easily possible by virtue of improved tooling and minimizing of overhead expenses to turn out a headset that will retail at about \$3.00, but only a few manufacturers have such facilities available. Fortunately, such concerns also have the money to conduct national advertising campaigns so that the purchaser can feel fairly safe in buying a low priced outfit when such sets are

## Elements of the Phones

**E**VERY headset consists of the following elements in some form or other:

- 1) The thin diaphragm which is made of either sheet steel or mica, and which vibrates at voice frequency under the influence of the audio frequency currents. (Turn to page 57)



*A Wonder Circuit That Can Be Built for  
Approximately \$55!—Compares Favorably  
With Larger Supers; Uses Simple Control*

**M**ANY a fan has been waiting for a super-heterodyne that could be built for little, if any, additional cost over what a neutrodyne or other similar set would cost. Here is one that can be built for approximately \$55.00 and that will give you results that will stack up well with larger editions of the same circuit.

In fact, this circuit is practically the same circuit as heretofore described by the writer in RADIO AGE, but with one stage of audio and one stage of intermediate omitted.

In building this set, the purpose that the writer had in mind was to provide something that would be inexpensive and yet would produce results such as the average fan desires. All the parts used are standard, so there will be no difficulty in securing them.

One unique feature of this circuit lies in the fact that it uses only one filament control.

Great pains have been taken in laying out the circuit so as to utilize the baseboard and panel space to very best advantage. There is not one inch of surplus space, so it will be necessary to follow instructions very carefully in building yours. It will be further noted that this arrangement provides for exceptionally short grid and plate leads. An examination of the underside of the

### Pictures by the Author

baseboard will show how the balance of the wiring is disposed of.

#### "Balancing Out the Loop"

**U**NKNOWN probably to most radio enthusiasts, regeneration plays an exceedingly important part in securing selectivity as well as volume and distance. If regeneration is pushed too far, the circuit is said to slop over or become mushy. Resistance is one of the factors which stands in the way of selectivity and volume. Regeneration, if properly used, tends to break down this resistance and thereby gives us the selectivity desired. The use of regeneration in this circuit is unique, and must be fully appreciated to get best results.

An examination of the diagram will show that a midget condenser is so connected that its rotor plates are next to the plate post of the first intermediate transformer and the first detector tube. The stator plates are connected to the one side of the loop in common with the rotor plate of the loop condenser. By adjusting this condenser to the proper value, regeneration of exactly the right degree can be obtained. Too much regeneration, as above stated, will ruin reception. Too little regeneration will prevent the set bringing in its full quota

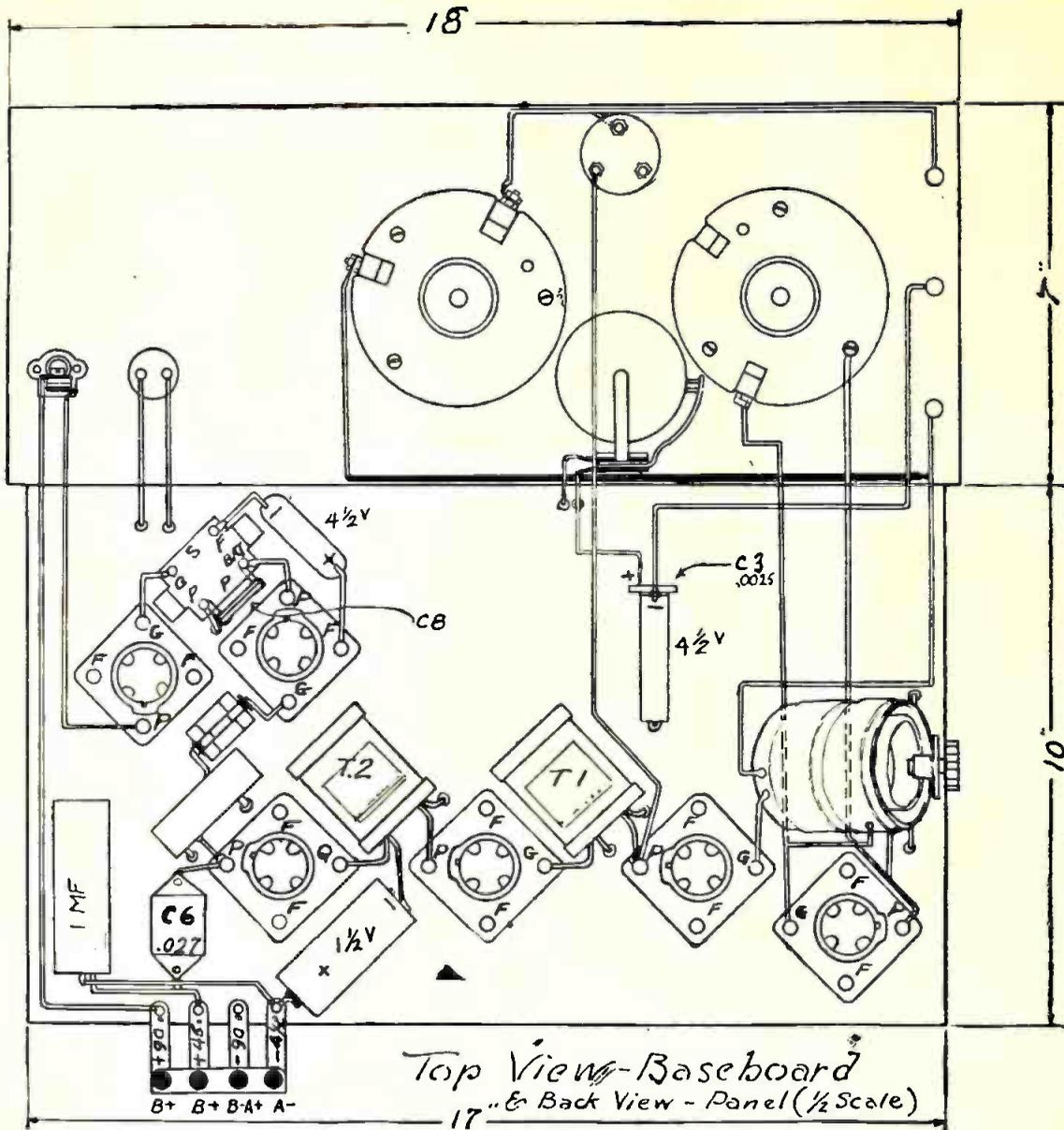
of distant stations. Too much cannot be said regarding this portion of the circuit.

You will find many fans will tell you that this small condenser can be dispensed with. Pay no attention to them. The condenser for this purpose should contain nine plates and should be of a panel mounting variety. If upon testing your set, you find that you cannot place the plates far enough apart to prevent over-regeneration, remove one plate at a time until the proper capacity has been reached.

#### The Variable Condenser

**T**HESE two condensers have been found by experiment to be well adapted to this circuit; however, there are plenty of other good low loss types on the market. The only point to be borne in mind, if you desire to use other low loss condensers, is that it is preferable that they be not only low loss but straight line condensers as well. The importance of this suggestion will be realized when you make your first set of loggings. There will be plenty of separation between the upper and the lower oscillator dial settings on stations around 500 meters, but when you get down to stations of about 250 meters, you will find that the settings come much closer together.

With straight-line condensers the settings are farther apart around 250 meters



A top view of the Baby Grand super-heterodyne receiver described by Mr. Green in the accompanying article. This layout must be religiously adhered to if results are to be expected.

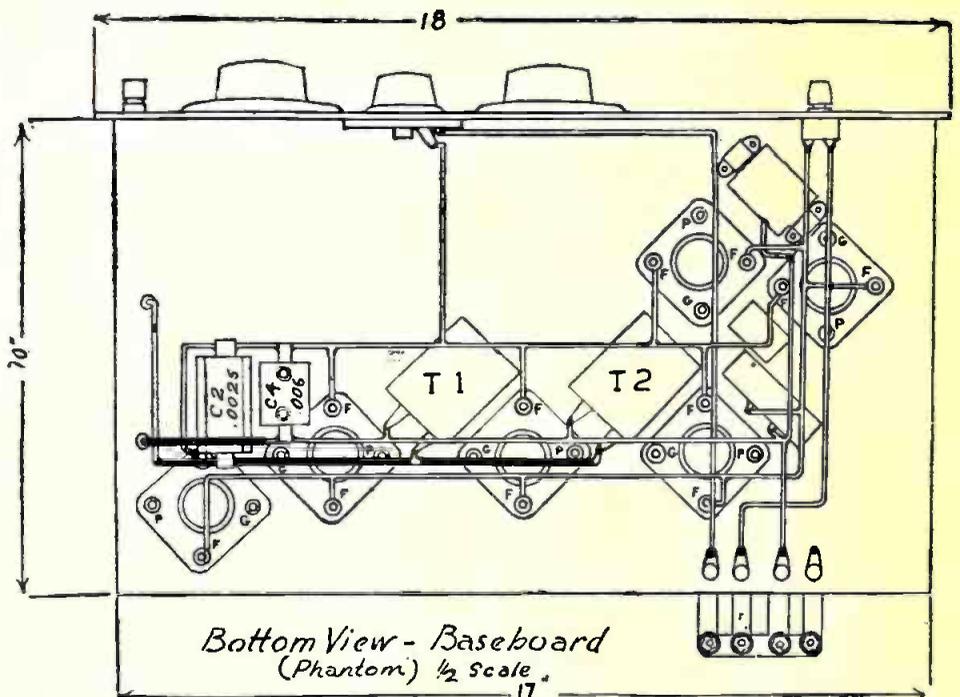
Oscillator Coupling

The oscillator is the device which shows on the extreme right hand end of the baseboard as you look at the illustration. Too tight coupling of these coils will usually result in less selectivity and less volume. For distance reception, avoid too tight a coupling at all times. There are several types of oscillator coupler on the market. The writer would be glad to give anyone interested full constructional details for the making of a very efficient home-made coupler at little expense if you will address him care of RADIO AGE.

While speaking of home-made apparatus, it might be well to mention the output coil. The one shown is wound on a bobbin two inches in diameter with a one inch core. The winding space is 1-2 inch wide. The primary consists of 200 turns of No. 28 single cotton or silk covered wire, over which the secondary is wound with no other separation than the natural insulation of the wire. The secondary consists of 1,500 turns of No. 36 silk or cotton covered wire. The bobbin for this output transformer can be turned out of kiln-dried wood or perhaps more conveniently

than is the case with the ordinary type of condenser. Not only that, but with straight-line condensers, it is much easier for you to lay out your graph and to predict with almost uncanny certainty the dial settings of any station for which you have the wavelength. With the dials properly adjusted, they should tune almost exactly alike, especially on stations around 300 meters. This, of course, refers to the upper oscillator dial setting and the normal loop setting. It will be found that there are two settings for each station on the oscillator dial. This is as it should be, so don't be worried.

It might be added that the two settings are a decided advantage because of the fact that this allows you to utilize the setting which is farthest from the source of interference. You will hear many persons dispute this, but don't let that bother you. The rheostat will usually be found to have one setting at which the circuit functions best. Referring again to the small condenser used for controlling loop feed-back, it should be mentioned that very little coupling is necessary; usually, not more than 1-10 or 1-15 of the way in.



This gives you an idea of what is meant by good design and engineering. The bottom view of the Baby Grand.

made up of two pieces of bakelite 2"x2" x 3-16" for the sides and a 1-2" section of 1 inch diameter bakelite or wood rod for the core. A brass screw of any convenient dimension and approximately two inches in length should be passed through the center of this bobbin. This screw will serve as a convenient means of holding the bobbin core, while at the same time enabling you to chuck the coil in a



*Two controls that require only two hands to tune with. The filament rheostat may be set and left there, and while the regeneration requires an occasional touch when tuning on widely separated wavelengths, it is not troublesome. The filament switch on the right permits one to turn off the set while lashing the phones or loud speaker to the table when strong signals are to be received.*

lathe or hand drill for winding.

If you use your hand drill for winding, merely turn the handle of the drill as many times for the primary and secondary respectively as the ratio of your drill is contained into the number of turns required. Thus, if the ratio of your drill is 5 to 1, you will only need to turn the handle of your drill 40 times when putting on the primary and 300 times when putting on the secondary.

If any of the readers of this article would like to have more detailed description of the construction of this simple output tuner, these details will be supplied in the same manner as those of the oscillator coil.

#### Baseboard

**I**T GOES without saying that inasmuch as a large part of the wiring is done beneath the baseboard, the baseboard should be of bakelite or hard rubber. It can be fastened to the front panel by means of brass brackets or angle pieces not shown in the illustration. If the set is to be handled much before it is put into a cabinet, it will be well to put long, diagonal brackets from the top of the front panel to the back of the baseboard. By doing most of the wiring beneath the baseboard, it is possible to make the grid and plate leads exceptionally short, which, as you know, is a very important feature. The longest leads for the set are "a" battery leads and these are comparatively short. For con-

venience in placing this set in a cabinet the writer extended the binding post back of the baseboard an inch and a quarter. This permits of reaching the binding posts from the outside of the cabinet, without raising the lid. It will merely be necessary to cut a slot in the back of the cabinet long enough and high enough to allow the binding post bracket to slip through, after which the binding posts and their screws can be placed in position.

#### Transformers

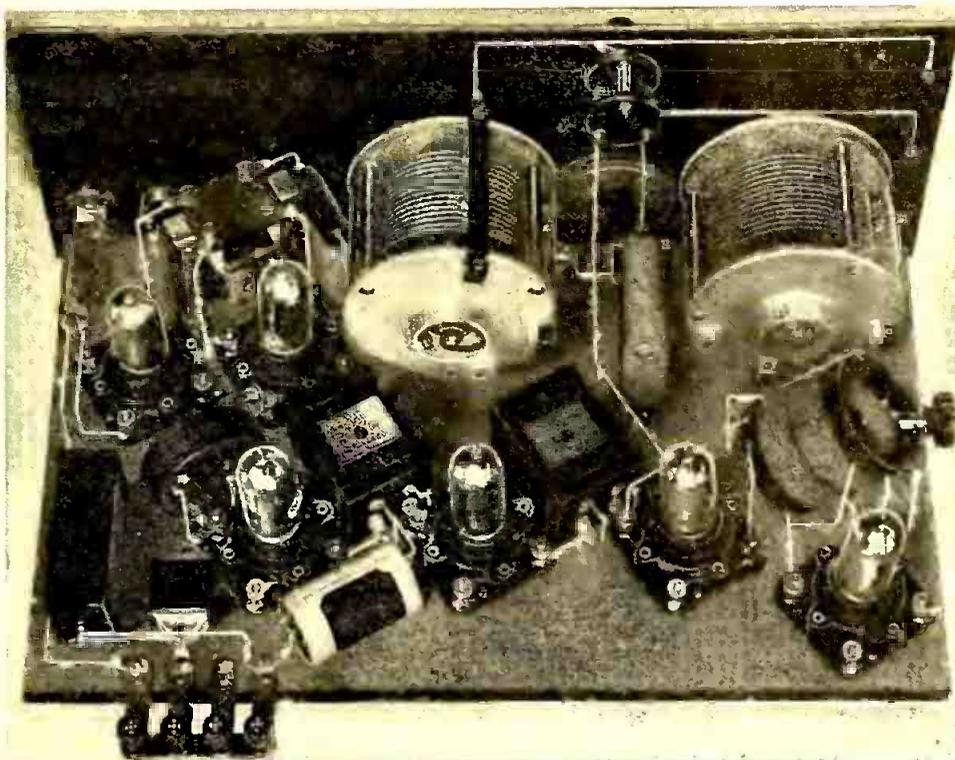
The two transformers shown on the center portion of the baseboard are so-called long wave transformers. Only one step of audio is used in this circuit, so that from the standpoint of expense very little money is spent for transformers. This point alone makes this circuit ideal for the average radio fan. The total

parts to be used. Otherwise, it will be next to impossible to analyze your troubles or to correct them.

This little "Baby Grand" superheterodyne is the outcome of a great deal of experimentation and as it performs just as a super-heterodyne should perform, you will gain nothing by trying to substitute parts. This point can be very well understood when it is explained that the intermediate transformers used are intended to peak at a given frequency. The output coil is tuned to peak at the same frequency. Any changes that might be made in apparatus are almost certain to cause trouble because of the inability of substituted apparatus to function best at the frequency for which this set was designed.

**T**HERE is nothing to fear in the wiring of this circuit. Follow the two baseboard layouts closely and place your apparatus as shown. The distance between the oscillator condenser and the loop condenser has been carefully determined after quite a bit of experimentation. If you change the spacing, it is quite likely that the set will not function as it should and you will find it necessary to make minor adjustments to compensate. This will involve experimentation, which it is the purpose of this article to eliminate.

As stated, practically all of the wiring is done beneath the baseboard. There are a number of advantages to this (Turn to page 66)

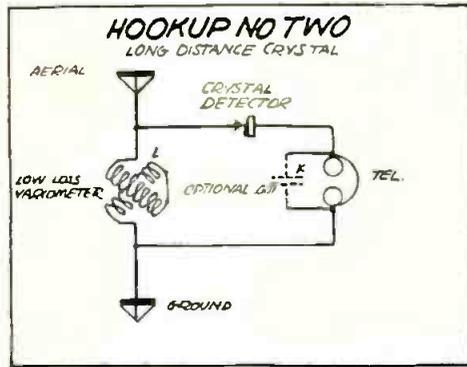


*The business end of the powerful little superheterodyne receiver described by Mr. Green. It gives one an idea of what a compact efficient super-het should look like.*

# An Unusual Account of The Development of A Simple Tube Set

**I**F YOU are interested in the crystal detector, previously described, and want to experiment further with crystals, you will prefer the circuit shown in Hook-up No. 2. This is No. 2, the Long-distance Hook-up.

While we do not recommend it as giving the general satisfaction of Hook-up No. 1, it has often been reported giving phenomenal distance. Try it as you would a grab-bag—you may get a prize!



The feature of this circuit, of course, must be efficiency. A sturdy low-loss variometer (with two stagger-wound coils giving a perfect ratio of inductance) is recommended to insure conserving all the precious signal energy.

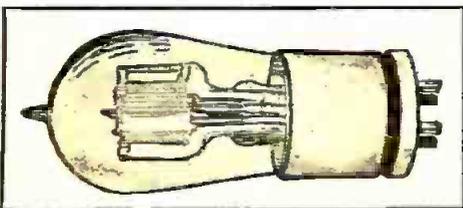
### Vacuum Tube as a Detector

**W**HILE the crystal yields a wonderfully true tone and while your knowledge of it will prove valuable in some interesting combination hook-ups later, you must depend upon the vacuum tube to secure distances of over twenty to fifty miles.

The vacuum tube is simply an electrical "valve." It enables a minute quantity of electricity caught by the antenna to turn on and off a powerful current (the B-battery current). This B-current operates the phones. The action of the tube is like that of a child turning a faucet on and off and controlling a great current of water. Or it is like the delicate fingers of the musician manipulating the key-controls of an organ, releasing the power which produces great sounds.

The accompanying drawing shows the three elements of the vacuum tube.

The filament when heated to incandescence by an "A-battery" (usually of



about 6 volts) throws off small electrical particles or electrons.

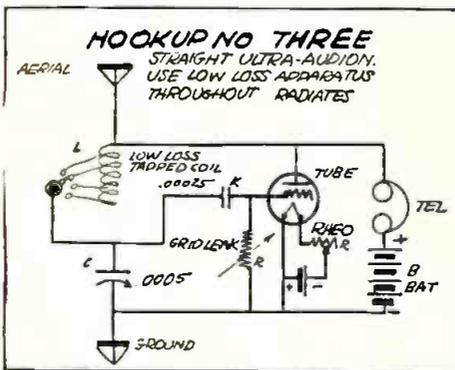
The powerful current (from the B-battery) which operates the phones travels from the filament "on the back" of these electrons to the plate.

The grid, however, is between the filament and plate. It acquires an electrical charge caught by the antenna. These charges on the grid either repel or attract the electrons from the filament and thus weaken or strengthen the value of the B-current.

Also the tube, like the crystal detector, is a rectifier, permitting current to flow in one direction only. This gives pulsating direct current, a necessity for the operation of the 'phones.

### First Tube Hook-up

**Y**OU are now prepared to follow in the footsteps of the masters of radio with one of the first and most famous of all



circuits, the "Ultra-Audion." This circuit is extremely easy to build and operate, and is capable of excellent long distance reception. The parts here listed will not cost much.

1. Ultra-Audion coil. You must use an efficient coil with four taps for this purpose.

2. Switch lever and four switch points.

3. Grid leak and grid condenser. See Vacuum Tube Chart to be published in our February Beginners' Section. We recommend U. V.-199 or C.-299 tubes and dry cells for this circuit. It is important to buy a good accurate grid leak. The two devices may be obtained combined and certified as to accuracy and must be chosen wisely.

4. Socket to fit tube selected.

5. One variable condenser (with dial) capacity .0005 microfarads, vernier and low-loss type preferred.

If a condenser with bakelite end-plates



# The ALLADIN'S

And How

By EDMUND

is used, a shield of aluminum or zinc must be placed between it and the panel.

6. One rheostat to match tube selected.

7. Head-set of good quality.

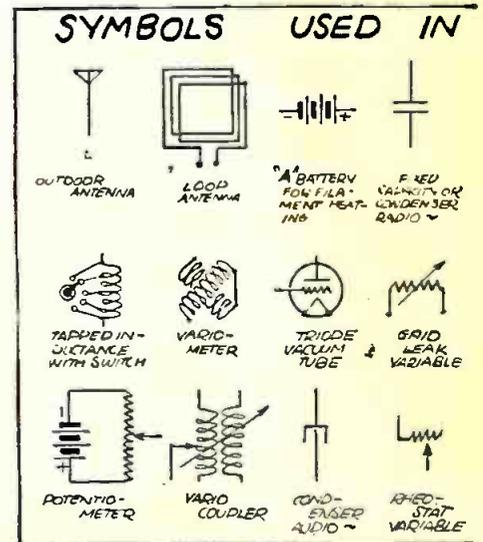
8. One vacuum tube; U. V. 199 or C. 299 recommended.

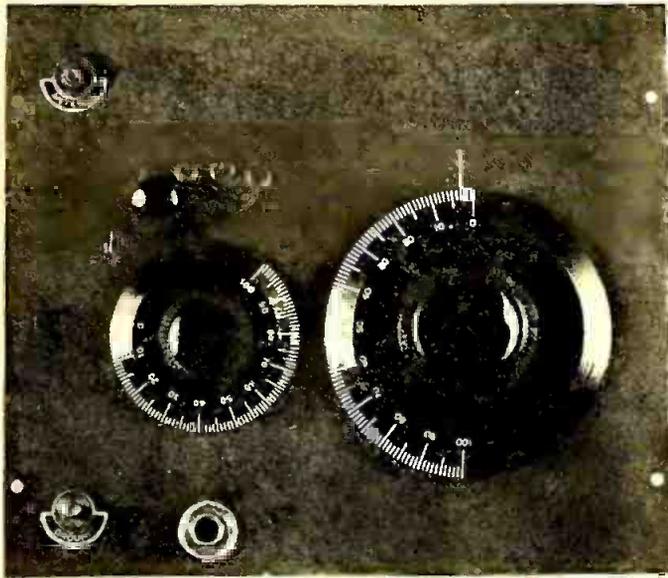
9. "A" battery selected according to type of tube you want to use.

10. One "B" battery of 22 1-2 volts of well known brand. A tapped type should be used with U. V. 200 or C. 300 tubes.

11. Necessary connecting wire, antenna wire, and insulators.

12. No recommendations as to panel or cabinet size, as you may wish to add a two-step amplifier to the set after you see how the set works. The illustration shows a panel 6 by 7 inches. You must secure a drill for drilling iron, and will not find it difficult then to bore holes in the rubber or bakelite panel.





# The Operation of the Vacuum Tube as Detector Explained for Beginners

the filament as shown, and have the Gibbons' Hook-up. This is the last word in the Ultra-Audion. Its success depends upon a supremely fine variable grid leak which is not difficult to find. We recommend that Hook-ups No. 3 and No. 4 be made first, however.

IT might be well to mention that extreme care should be exercised in tuning the receivers illustrated herewith, as they are especially violent squealers when mishandled. This circuit is basically the Colpitts transmitting circuit, and if hard tubes are used with plenty of B battery voltage, you may do terrible things to your next door neighbor's re-

## Lamp of RADIO

to Use It

H. EITEL

TO learn the Ultra-Audion circuit, experiment with it. On these pages is given the "Improved Ultra-Audion;" Hook-up, No. 4. Its chief advantage lies in better control of the feed-back of current from the plate circuit.

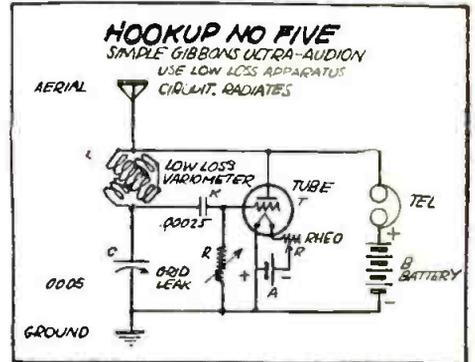
You must observe that one reason for the effectiveness of this circuit is that the signal is amplified in passing through the tube and is returned to the antenna circuit and thus strengthens the original and controlling signal.

By using a variometer instead of a fixed coil, you can control this feed-back and so secure better efficiency or farther distance reception. The only change in your apparatus needed is the addition of the variometer. We advise that a good low-loss type be used.

### Gibbon's Ultra-Audion

The experimenter may now add a variable grid leak between the grid and

In operating any of the circuits illustrated, it is always wise to remember that the filament control is one of the important knobs on the set, and the best results are only obtained with the proper filament current value. Since this feature of the circuit is rather critical, it is advisable, of course, to provide for delicate changes in filament control, and a vernier rheostat of either the carbon pile or metal-dust-carbon should be used.



ceiving if you are not careful. By all means, do not let the set squeal.

### Tuning Simple

The tuning is very simple. For any of the circuits shown, about the same procedure is followed. The filament is turned on till the tube reaches the critical point, which is just immediately below the thump, indicating oscillation and squeals which are heard as the filament is advanced.

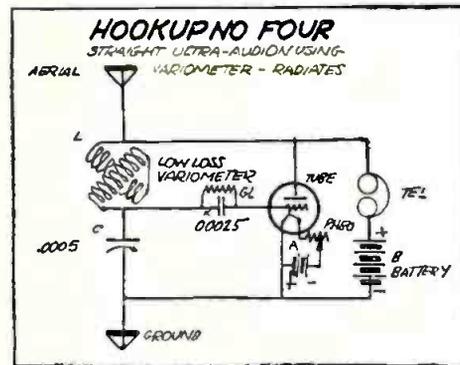
With the filament set at this point, the taps or variometer is varied together with the variable condenser knob until a signal is heard. Adjustments are then made until the signal is clearest and loudest.

In an accompanying illustration, we are printing for the benefit of those uninitiated, the common symbols used in connection with vacuum tube diagrams. Simple comparisons between the diagrams shown elsewhere on the page and with the chart is in itself a little lesson in reading diagrams. Once the reader memorizes the symbols, it becomes quite an easy matter for him to read them and compare circuits.

In reading circuits, always remember that the positions of the symbols on the chart have no bearing mechanically on the layout or assembly of the receiver as a whole. The purpose of the diagram is to furnish a set of electrical connections for the various units of the receiver.

We do find mechanical specifications inferred on diagrams when small, light pointed arrows are drawn across inductances, resistance or capacities to indicate that they are variable, in which case they are usually controlled from the front of the panel.

For the purpose of giving more information on this subject, we would refer you to the RADIO AGE ANNUAL for 1924.

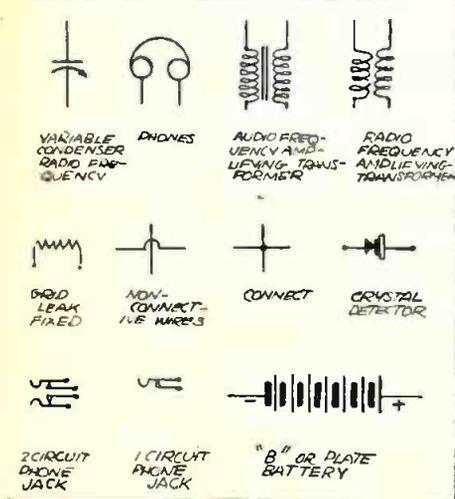


### Have Tubes Tested

When you make a purchase of a tube, remember that the safest way is to cater to a dealer who has a testing device that will give the characteristics for the tube you intend to purchase. Nearly every large dealer in tubes has at his disposal a "testometer" for this purpose, and can give his patrons absolute satisfaction in giving them the proper type of tube for their use.

When buying tubes, the general test is to see if the filament lights; if it does, it is assumed that the tube is satisfactory for all purposes. This, unfortunately, is not the case, since there are tubes that are defective internally or their characteristics may make them better amplifiers than detectors, or they may be "duds." The common term for a tube that refuses to oscillate is "dud." So when buying, specify what your tube is going to be used for, and have your dealer pick one out of stock that which is suited to your needs.

### RADIO DIAGRAMS



# Tuning In with the French Fan

How French Equipment Differs from U. S. Sets and Parts

PARIS:—Radio reception is now very popular in France; there is not one small village which cannot boast itself as having a score of radio listeners.

The programs are very up-to-date and the ears of the countrymen are astonished by the ragtimes and jazz music imported from across the pond.

Great was my surprise when I first listened to a radio concert, in hearing "Gallagher and Shean" and "Dream Daddy."

I thought my friend had succeeded in getting an American station and I was going to congratulate him, when they announced in true Parisian French, "Vous allez maintenant entendre. . . (You will now listen to . . .)"

## How Sets Differ

THE purpose of this article being to show the main differences between the American and French radio equipment, we will start by describing the aerial and ground, the set itself, the radio parts and novelties.

The first thing to consider is what stations may be heard, what kind of program and entertainment they have, and especially what their wavelength is. The aim of the radio fan is to hear as many stations as possible, enabling himself to pick out the best programs and be entertained at any hour of the day.

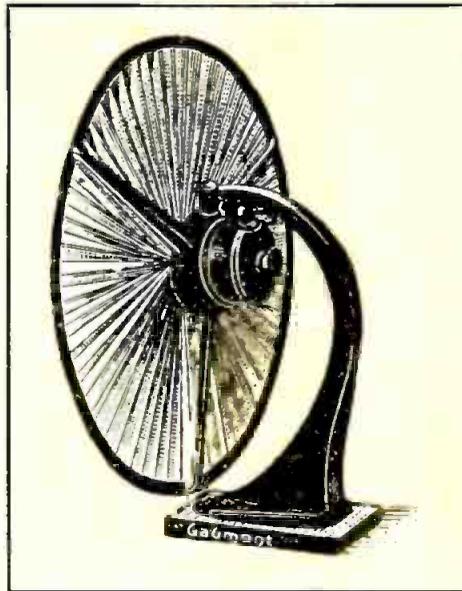
Unfortunately, the number of European broadcasting stations is far from being as considerable as it is in America; a dozen or so in England, five or six in France, a few in Germany, Italy and Spain.

To make matters worse, these stations are far from working in a small range of wavelengths; the English are between 300 and 500 meters; so are some of the French stations; but the Eiffel tower FL works on 2600, Radio-Paris SFR on 1780, Madrid EGC on 2200, Koenigswusterhausen on 6000. There is, of course, no danger of interference but the receiving set has to be designed to cover all the wavelengths.

## The Aerials

The antenna constants must be larger than in America. The aerial may consist of only one wire of 90 to 150 feet; preference is, however, given to a high capacity type such as a three or four wire antenna or a cage antenna strung as high as possible. The inside aerial is being used more and more; the loop con-

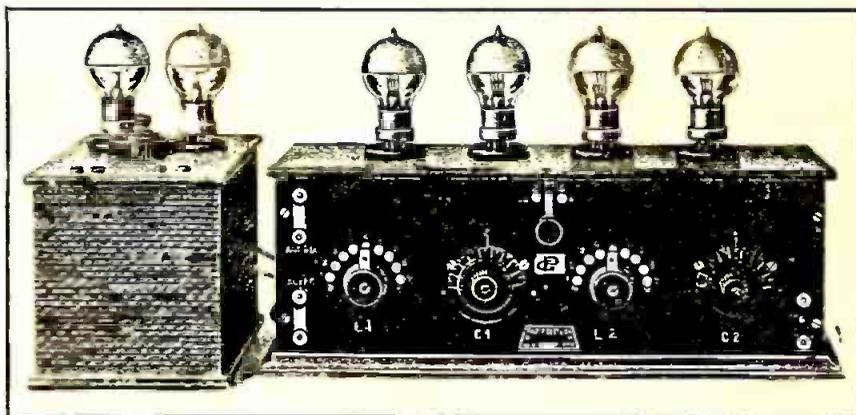
By C. R. Bluzat



Above is a loud speaker of artistic design recently introduced in France. The diaphragm transmits its vibration to a pleated parchment disc, giving pure, unadulterated tone.

sists usually of two units of six turns on a four to six foot square frame, provision being made to use them in series (long waves) or in parallel (short waves).

A new type, just put on the market, consists of a flat copper strip 12 meters long (app. 36 feet). This ribbon is usually strung around a room, so that its wider surface is parallel to the earth. It is claimed that the ribbon acts like a plate of a condenser, the other plate being the earth itself. Far better results have been obtained than with a loop of same length, due to this capacity effect.



A typical French receiving set, with its "micro" lamps, or tubes, on the outside. So objectionable has this type become, with its brilliant glare and unsightly appearance, that the French are slowly adopting the American design of radio set cabinet.

## The Ground

IN THE towns the ground connection is made to the water system; in the country, special galvanized iron rods three feet long are forced into the earth, in a wet place if possible. They also use copper plates or a netting of two to

Frenchman's Set Has to Be Designed to Cover Varied Waves

three square feet laid on or imbedded in the earth at one foot depth.

Receiving set.—Due to the broad range of wavelengths, the maximum inductances of the primary and secondary circuits have to be rather large; they consist of a certain number of units which may be cut in or out through appropriate switches. Condensers of .0005 or .001 microfarad may be put in series or in parallel with the antenna inductances. Use is also made of honeycomb or spiderweb coils, a set being used for short wave, another for long wave reception.

A great number of listeners are still using crystal sets, some built with sliding contact coils of pre-war fame; but the tube set is superseding the crystal, especially since the appearance on the market of the so-called "micro" lamp which is of low current consumption like the American UV-201A or UV 199. Radio frequency amplification as well as audio frequency amplification are a feature of any good set. For the first type of amplification, the manufacturer of transformers had to meet very strict requirements. In America, where the wavelength range is only from 250 to 600 meters, we know it has been a real job to realize a transformer which would keep its amplification factor about the same all over the broadcasting wavelengths.

The French manufacturer had to design a transformer which would amplify satisfactorily from 300 to 4000 meters.

Success has been achieved, and some transformers cover now from 150 to 12000 meters without any tap! Regenerative sets are predominant now; Reinartz finds great favor for the short wave reception. Super-regeneration is tried by a few "dyed-in-the-wool" fans, Flewelling having become a favorite lately. Super-heterodyne sets are the favorites for transoceanic reception.

## Their Parts

Parts differ from the American standard by mechanical construction. The variable condensers come in .00025, .0005,

.001 and .002 microfarad. The vernier attachment consists of a brass rod with a long detachable knob, the back end being shaped like a small grooved pulley. A large bakelite disc fastened to the moving plates shaft engages in this groove and is  
(Turn to page 61)

# "Juggling" Your Circuit for An Efficient PORTABLE SET

**I**T GOES almost without saying that the ambition of every radio fan and experimenter is to possess a complete receiving set which will work in any location, at any time, without the slightest wire connection to aerial, batteries or anything else outside of the outfit. In other words, it's a set that is portable in the strictest sense of the word and which contains every last item necessary to its functioning.

Now, it isn't intended that such a receiver shall weigh so much that it's only portable when tackled by a corps of furniture movers or a traveling crane. It must be light enough to be lifted easily and carried about just like a small suitcase. And above all, it must include a loud speaker, for who cares to use headphones for group entertainment?

These rigid requirements instantly call to mind what type of receiver the portable set must be. It must operate on a small loop antenna, must use dry cell tubes, must have at least three steps of radio frequency amplification, must have at least two steps of audio, preferably three steps of it, and must be selective and sensitive besides. Is there any such thing?

## Triple Reflexing

**T**O embody three radio and three audio, besides a tube detector, seven tubes would ordinarily be necessary, unless we resort to reflexing. This, then, is a most valuable method of reception not only for its economy of expensive tubes, but quite as much on account of its space saving possibilities and the reduction in battery consumption. You may say offhand that to reflex sufficiently would use each of three tubes as both radio and audio amplifiers and a fourth as the detector. This arrangement, you may suppose, will howl and squeal so unmercifully that it would be next to impossible to get it functioning.

Not so, however, for experiments with all sorts of R. F. and A. F. transformer combinations have convinced me that in every case the stunt will work and work well, though not without considerable reversals of audio transformer connections and the judicious use of various sizes of by-pass

By *BRAINARD FOOTE*

*Here's a Receiver  
That Will Function  
At Every Location;  
No Outside Wires*

condensers as individually demanded. Moreover, the size of the loop with which such a circuit will perform local and DX reception is indeed astonishing! Take the set-up illustrated, for instance. The loop is wound on a cigar box of the ordinary proportions, using common No. 20 enamelled magnet wire for the winding, and enough turns to cover the broadcast wavelength band with the 13 plate tuning condenser shown.

Four UV 199 tubes are employed in the outfit, together with three tuned iron core R. F. transformers. The transformer at the extreme right is an audio transformer, not an R. F., its appearance being similar since the same sort of container is used by the manufacturers as for their R. F. transformers. The other two audio transformers may be observed, one at the left, just behind the tuning condenser and the other behind the potentiometer.

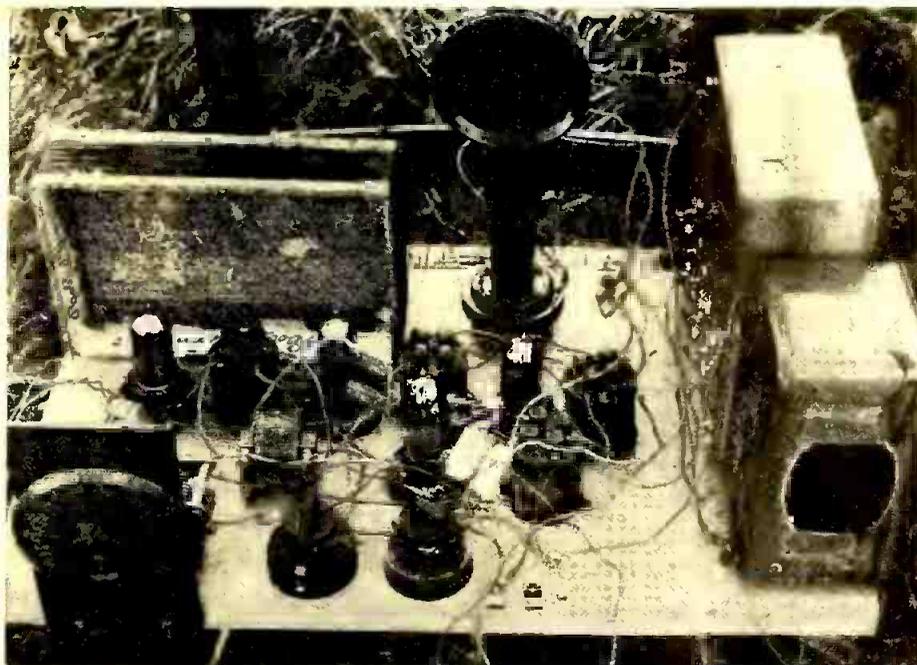
The layout was tried in several different ways, to discover what effect criss-crossing of wires and juxtaposition of R. F. coils would have upon the results. The set functioned as well one way as another,

so long as the R. F. transformers weren't closer than an inch or so. The audio transformers were likewise changed about and interchanged with those of different makes and varying ratios and the only perceptible difference in operation was that transformers of higher ratio (larger secondary windings) required larger by-pass condensers.

## The Hook-up

**T**HE circuit diagram reveals a straight reflex amplifier circuit, reception being accomplished with a loop and one variable condenser. The three tubes 1, 2 and 3 amplify successively at radio frequencies whatever signal is tuned in and passed to the first tube. Next comes the detector, from whose plate circuit the detected and audio frequency impulses are led back to the first tube through an audio frequency transformer, "a." Its secondary is inserted in the grid return lead from the loop tuning circuit to the movable arm of a potentiometer. Tube No. 1 thus amplifies at audio frequency and the amplified audio impulses pass without opposition through the primary winding of the first R. F. transformer to the second audio transformer, "b." Here they are transferred with amplification to the next tube, No. 2, which again amplifies at audio frequencies and passes the energy along to tube No. 3. In the plate circuit of this tube we find the loud speaker "L.S." whereby the impulses are rendered audible.

Now, it is well known that the extent to which a radio frequency amplifying tube will strengthen the weak R. F. impulses is dependent upon the closeness of its approach to the point of oscillation. In other words, there must be a certain degree of tuning in plate and grid circuits of each R. F. amplifier tube and a sufficient negative bias (not too much) to bring about a condition of regeneration, but not of oscillation. Thus, most R. F. iron-core transformers are designed to do and are intended to have the grid return leads go direct the negative of the filament battery. But in the case of the first tube, the grid circuit does not have the high resistance



*Here's an experimental outfit that functions on a cigar-box loop antenna and gets DX in addition to local stations on the speaker. It uses three radio, three audio and tube detector, reflexed in such a way as to require only four tubes. If you'd like to build a really complete portable set in a suit-case, try this with these temporary connections and surprise your friends.*

and iron core which prevents oscillation in the case of the other tubes, but instead has a low resistance loop and a sharply tuned circuit.

Oscillation is therefore present in the first tube unless means be arranged to vary the negative bias, and the potentiometer is therefore installed to effect this sensitivity control. The secondary of the audio transformer must be shunted by a by-pass condenser of sufficient size to pass the R. F. impulses past the high impedance winding. Were the condenser omitted, the tuning would be too broad and oscillation impossible to secure. But condenser C-1 must not be large, for it then exerts a deleterious effect upon the audio frequency side of the amplifier.

### Audio Amplification

**H**AVE you ever shunted a .002 mfd. fixed condenser across the secondary of your audio transformer and observed the alteration in quality of tone? Music becomes more mellow, though at a considerable loss in volume. If the condenser be small enough, the mellowing of tone is obtained to a sufficiently pleasing extent without any great lessening of signal volume and consequently a condenser of about .00025 mfd. is often employed for such a purpose.

The self-same effect is felt here. Too large a capacity at C-1 will greatly cut the volume, but too small a capacity will spoil the sensitivity. The transformer ratio exercises the controlling power over the exact size of fixed condenser needed and therefore the experimenter should have a supply of fixed condensers of .00025 mfd., .0005 mfd. and .001 mfd. on hand; say, about three of each. These three sizes will satisfactorily fill the bill and by a proper distribution of these condensers to the various audio amplifying transformers,

a happy condition of sensitiveness and good volume will be arrived at.

Without by-pass condensers across the audio transformer secondaries of tubes No. 2 and No. 3 or across the loud speaker, local stations can be heard loudly and clearly, but the sensitiveness to DX signals is rather poor. Condenser C-1, however, is a real essential, before any signals will be heard with any sort of strength. Once the set is working on locals, however, it becomes a simple matter to test with the different sizes of condenser at the points recommended. It is not necessary to use by-pass condensers in the primary circuits, however. Condenser C-5 is of utmost importance, it being a .002 mfd. by-pass condenser for the plate circuit of the detector tube.

It is by the use of these by-pass condensers that we obtain a condition of regeneration in each R. F. amplifier, but we must avoid too high a capacity in any of the points where good signals are obtained without the condenser for the sake of maintaining volume and clear tone. Condenser C-2 is usually a .00025 mfd. size, C-3 a .0005 mfd. and C-4, if found necessary, a .001 or .0005. Remember, tone and volume are better without the condensers unless the sensitivity is too low without them, so use only what condensers show themselves to be needed and no others.

Now as to the battery voltages. Two standard dry cells, three volts, can supply the filament current direct without a rheostat. The rheostat illustrated was employed experimentally to determine how much filament current is necessary and the set operates well on slightly under 3 volts. Hence two dry cells furnish sufficient current, as proved also by later trials. For the "B" battery, better results were secured with  $67\frac{1}{2}$  volts than with 90, which is fortunate

because of the space saving feature. Thus, two dry cells and three small size  $22\frac{1}{2}$  volt "B" batteries were found to supply the necessary filament and plate energy.

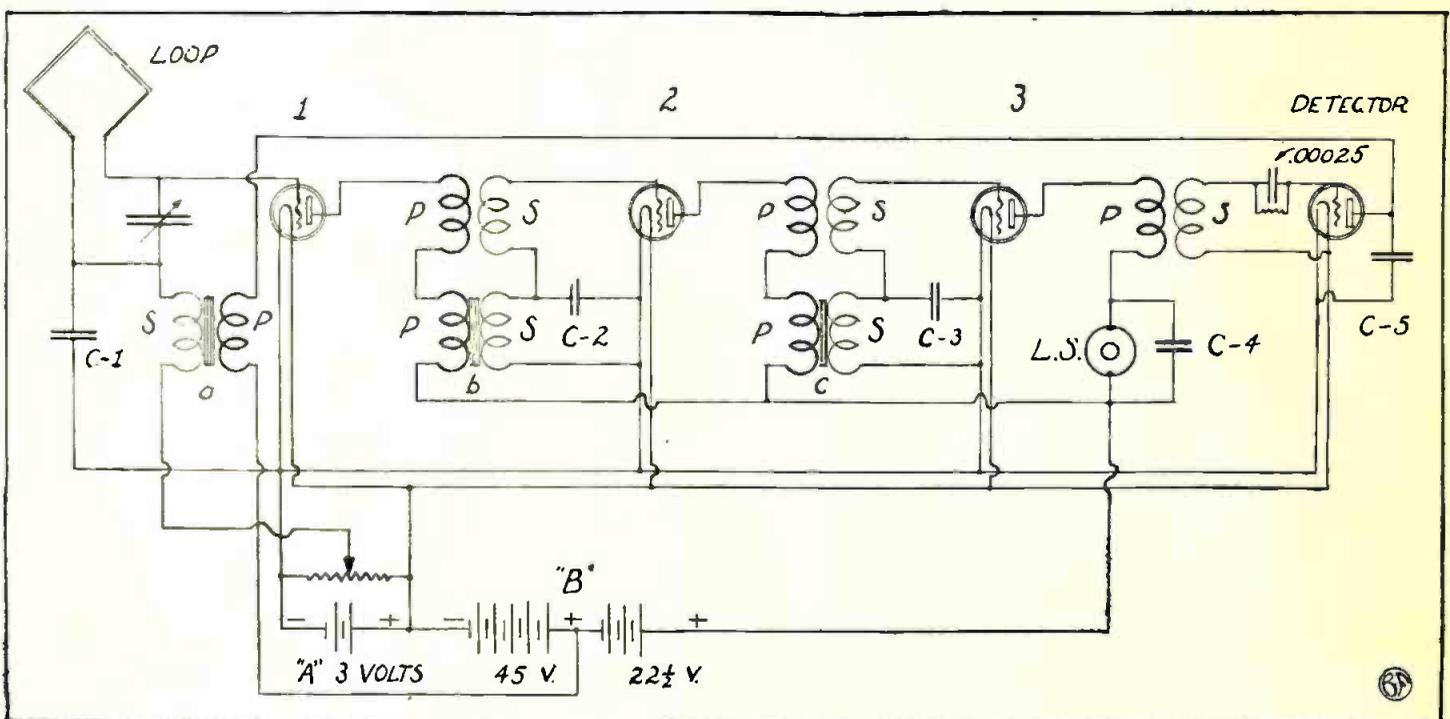
### Transformer Reversals

**A**NYONE who has experimented with a three stage audio amplifier has found a strong tendency to "howl" or oscillate at audio frequency. This is just like a radio frequency oscillation in its nature, except that inasmuch as the tuning which causes such howling is accomplished by very large windings on iron cores, the oscillation is reduced in frequency to a point where it is heard. This howling is not affected by adjustments of the tuning condenser, though it may be changed in pitch or stopped by moving the potentiometer arm.

The audio transformers shouldn't be too close to each other, of course, but with good transformers it isn't necessary to place them at right angles unless they are so close as to nearly touch each other. The heavy iron core prevents the magnetic fields from straying and in that way causing howling by interstage audio coupling. The trouble is due only to oscillation caused by circuits tuned to an audio frequency, and with connections arranged so that the direction of current flow aids the oscillation tendency.

Hence the howling can always be eliminated by reversing the transformer connections in the grid circuit of the tube which causes the trouble. Since you cannot discover except by trial just where the howling commences, it is a question of reversing one or two of the primary binding post connections till the noise stops. This howling, unless caused by the first tube (No. 1) is not stopped when the detector tube is taken out of the socket and the others allowed

(Turn to page 62)



The circuit is quite conventional, though quite a few of the myriad fixed condensers common to the complicated reflex sets are omitted. There's only one tuning control and one sensitivity control; a condenser and a potentiometer. Two dry cells light the tubes and three small "B" batteries can supply the plate voltage.

# How To Construct A Station Finder

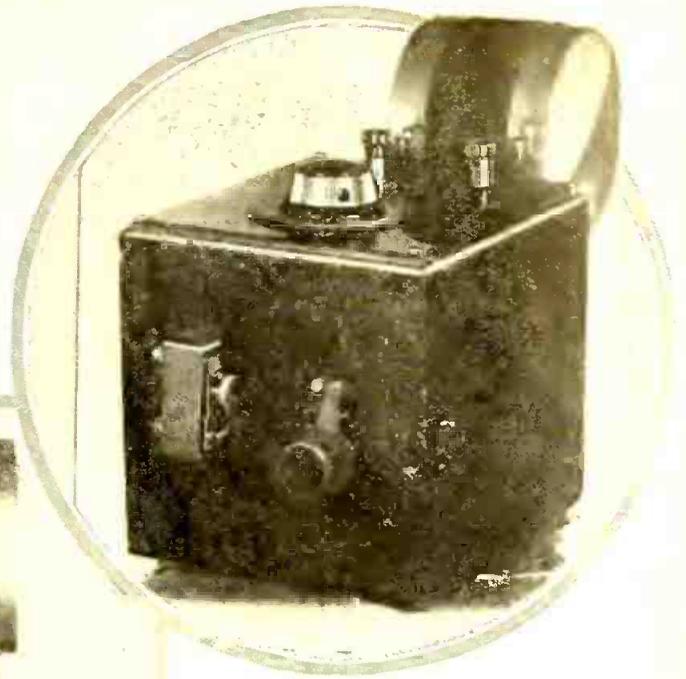
By  
FELIX ANDERSON

**A Novel Unit  
That will Cut  
out Guesswork  
in Tuning and  
Help Reduce  
The Annoying  
Set "Squeals"**

**T**HIS radio pastime is at last getting to a point where enthusiasts no longer are satisfied with the old haphazard methods of tuning, and the out-of-date system of radio "fishing" is resorted to only as a means of entertainment nowadays. The up-to-date listener seeks to go after the long distance stations in a more accurate and sure-fire way; he endeavors to get the results he wants by employing the right methods of tuning.

The recent transatlantic broadcasting tests prove conclusively that there is a pressing need for a unit which will eliminate the guesswork variety of tuning, insure more certain results, and at the same time reduce the nuisance of radiation which broke up more than one reception of the foreign stations. You will no doubt recall the pandemonium of squeals and howls which prevailed in the air during that memorable week. And no doubt you more than once "cussed" some neighbor softly when you found that you had been trying to tune in his radiation. There were times when we gave up in disgust, loudly voicing our disrespect for those bugs who couldn't keep their hands off the controls, and who constantly interfered with the incoming long distance signals with their malicious squeals.

The underlying reason for all the trouble and the real cause for the ceaseless search for the carrier waves or signals of the European stations, can be directly attributed to one main and grand reason. Listeners in general are not so fortunate as to have sets that are calibrated; that is, they do not possess



*In the circle is a three-quarters view of Mr. Anderson's station-finder, giving an unusual angle of the buzzer and the switch. At the left is a top view, showing the dial with its valuable hair-line indicator.*

a receiver that tells them where to set the dials for definite wavelengths. So the logical way to get the much sought receptions was to guess—fish, in other words, until you struck something that sounded promising, and then listen until the announcement was made; or until some other bug spoiled it all by squealing you out.

### The Right Way to Do It.

**I**T WOULD be impossible to set down specified rules for the calibration of every receiver now in use. It is a fact that there are some sets which cannot be calibrated because of their circuit peculiarities. What we can do, fortunately, is make a separate unit and calibrate that instrument, and then tune our receivers to it instead of fishing. The result is that we make only one operation of the job, and then we know that we are accurate and that we are listening on the right wave. Therefore, the purpose of this article is to describe a unit of this type.

For purposes of reference, we will call the unit about to be described and discussed a "Station Finder." Its technical name is wavemeter, or probably more correctly a driver—but that matters only little. What we are after is a unit that is going to tell us where to set our dials

when we want to listen for a certain station, the wave of which we are informed.

The preceding paragraph probably sounds a little imposing, and no doubt you have visions of a mighty piece of apparatus with all the embellishments that usually go with a measuring device; but that is not the case. The station finder is a simple affair, and not in the least bit expensive.

### The Bill of Materials

**I**F YOU have the parts listed below—all well and good; if not, a visit to the local radio store will be necessary.

1 Cabinet 7 inches long, 6 inches wide and 6 inches deep. Get a neat one, and make the job a good looking one.

1 Composition panel 7x6x $\frac{1}{8}$  inches, Bakelite, Celeron, Formica, Spaulding or other.

1 low Loss Straightline condenser. Eleven plate 250 MMF. (0.00025 Mfd). The straightline plates are advised for the purpose of making calibration easier. See text of article.

1 Cardboard tube 3 $\frac{1}{2}$  inches long and 4 $\frac{3}{8}$  inches in diameter.

2 pieces of brass 2 $\frac{3}{4}$  inches long and  $\frac{3}{8}$  inches wide. Any fairly heavy gauge will do.

$\frac{1}{2}$  pound No. 22 Double Green Silk Covered wire.

2 Binding posts.

1 Dial reading 0 to 100°. A metal dial with well etched divisions that are easy to read is suggested, since the readings on it are hair line in cases.

1 High frequency buzzer. One that will operate on flashlight or C batteries, and give a steady clear note.

1 Switch lever.

*(Turn the page)*

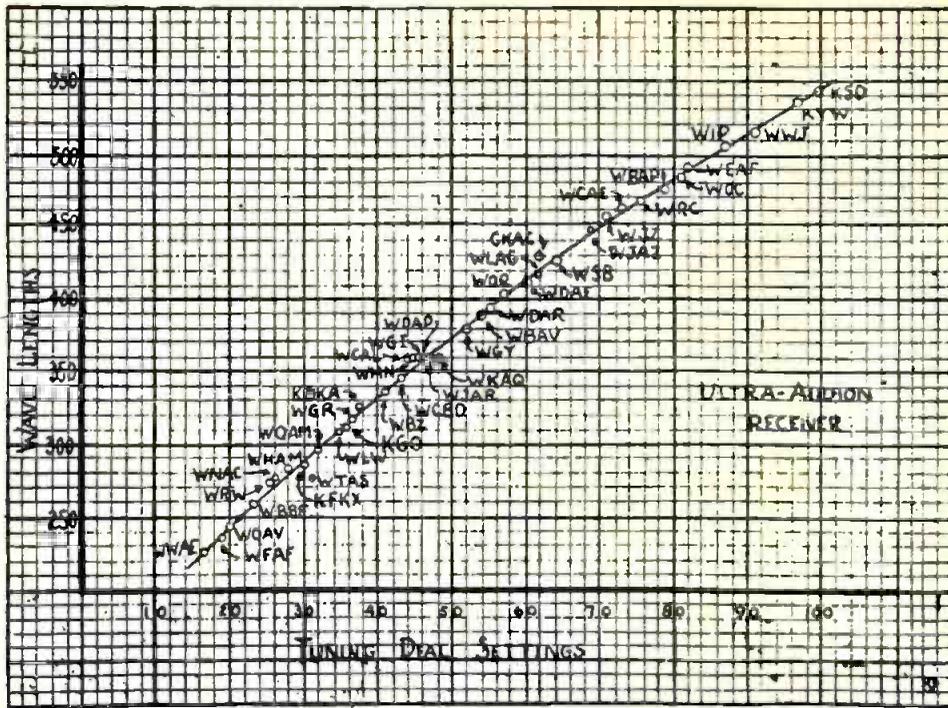


Figure 2.

If your condenser is one that does not have straight-line plates, your calibration chart will look something like the above. In this case numerous readings make the curve especially accurate.

2 Switchtaps.

2 Three volt C batteries or four 1 1/2 volt flashlight batteries. Busbar and stiff rubber covered wire, preferably No. 18 RC, mounting screws, solder, etc.

The above list includes everything you will need. As a word of caution, don't let them sell you anything "just as good" in the condenser line—make it a point to try obtaining one of the straight-line variety.

Building the Station Finder

THE construction is very simple. About the only thing we have to avoid is getting the inductance or coil too close to the rest of the unit, or to get it too close to the hands or dial; bringing any foreign object within the field of the coil changes its wavelength, and as a consequence, the readings of the dial are inaccurate.

Begin by preparing the cardboard tubing which is to be the winding form. Apply a light coating of shellac, spar varnish or better yet a very thin coating of a solution of celluloid dissolved in acetone. If the tube is not dry, it should be thoroughly warmed in an oven before the moisture impregnating compound is applied.

When this has been done, and the coil is still slightly sticky (not wet), two holes should be punched about 3/8 of an inch from the edge. Thread the No. 22 DGSC wire into these holes, and begin winding the coil in a clockwise direction, (face a clock and wind the wire in the direction of the hour hand with the edge of the tube having the holes in it away from you).

If you use a condenser of the type specified and a coil of exactly the same size as is mentioned, wind 59 turns of the wire on the tube. Wind them tightly and neatly. If the varnish or dope you have applied is sticky enough, you should

have little or no trouble with slipping turns. When the winding has been finished punch two additional holes (opposite the beginning ones) and fasten the wire once more. It is understood of course that you leave sufficient ends at both start and finish to allow soldering to terminals.

Now drill two holes in the brass strips, large enough to accommodate an 8-32 bolt. The exact location of the holes is not a matter of great importance; one half inch from either end to their center is satisfactory. The one end of the strip is then bent to form a foot, which is screwed tightly against the cardboard tubing. The ends of the coil are then

soldered to these connection legs. The purpose of these extended legs is to suspend the coil in midair and also to permit its being coupled to the main tuning inductance of the receiver.

Mount the condenser as illustrated in the photograph. A hairline should be deeply scratched in the panel, and filled with either jeweler's wax or some other white compound to make it plain. This line should be drawn carefully and accurately, and should be very thin indeed. (As a matter of information, we filled the line with Bon-Ami, which hardens and makes an excellent filler.)

The binding post for the coil should then be screwed into place.

On the side of the box which is to be opposite the one occupied by the binding posts and the coil, mount the buzzer and switch with the taps. Figure 4 shows the mounting used on the test Station Finder. Holes should be drilled to allow for wiring.

Wiring

YOU are next ready to wire the Station Finder, and again we find simplicity the keynote. Connect the one binding post (it makes no difference which one) to the stationary plate connection of the condenser, and the other binding post to the rotary terminal. Next connect the one terminal of the buzzer to the left hand switchpoint, and connect the switch lever to the cells of the battery. Polarity is not important. The other open terminal of the battery is connected to the remaining terminal of the buzzer. Use busbar in wiring the condenser circuit, and the rubber covered wire for the buzzer circuit.

On the buzzer you will find an adjustment for varying the pitch and some place on the metal support holding the adjusting screw or on some piece of metal connected to this screw, solder another piece of the rubber covered wire. Then solder the other end of that same wire

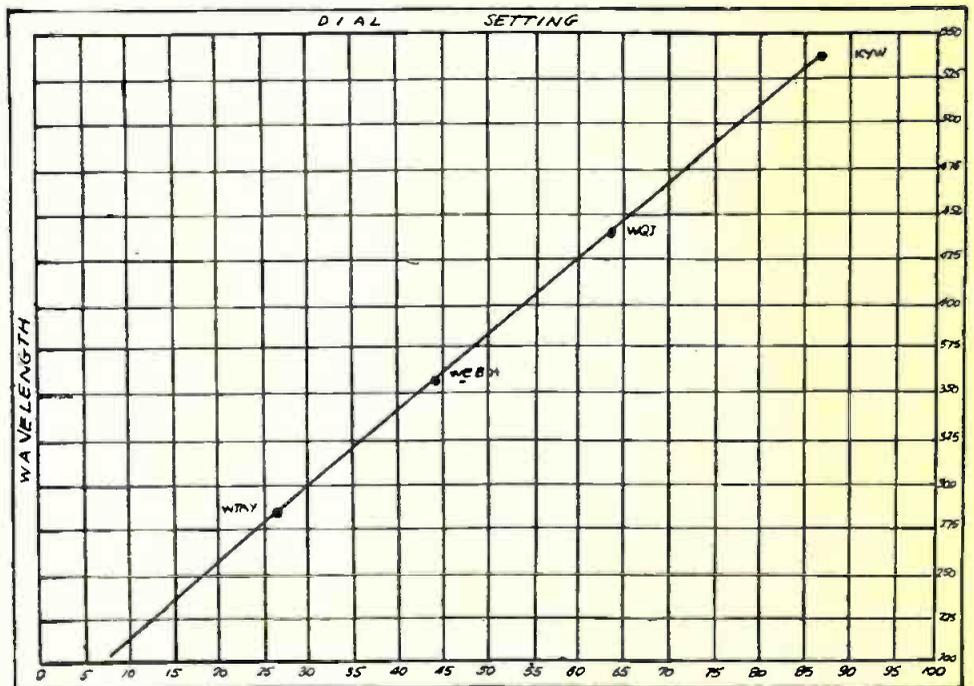


Figure 3.

The graph obtained with the test station-finder is shown above. Straight-line plates were used in this finder, as the curve will show graphically.

to the rotary plate terminal on the condenser. You will then have two wires at that terminal, one for the coil and binding post, and the other to the buzzer or exciter circuit.

The last two mentioned operations are important, especially the matter of getting the right connection to the buzzer. We find in the tests, that any other connection works poorly indeed. Make sure that the one end of that wire goes to the adjustment part of the buzzer, or some metal connected or in direct contact with it. The object is to get the little spark across the buzzer contacts to charge the coil and condenser, and in that way act as a miniature transmitter.

After making sure that the buzzer circuit is properly connected, screw the panel down on the cabinet, and fasten the coil. It might be well to explain the reason for the use of the two switch-points—the object is to provide an open circuit for the buzzer when not in use.

Next put the brass legs of the coil on the binding posts, and tighten them down. Your next job (and probably the most interesting radio experiment you can do as a beginner) is to calibrate the Station Finder.

**Calibrating**

**CALIBRATING** in our case means that we must find out what wavelength the oscillatory circuit composed by the condenser and coil responds to with various settings of the condenser dial, and further it means that we are enabled to read the condenser in terms of wavelengths instead of degrees.

The first step in this procedure is to rule out a sheet of paper as illustrated in Figure 3. This is what is called a calibration graph, and will give us a wavelength curve for the coil and condenser combination we are using.

Make a rectangle 10 inches long and divide it into one-half inch lengths. The other dimension is 7 inches, also divided into half inch divisions. Then proceed to rule up the chart as illustrated. When you have finished, you will have a rectangle having 20 half-inch squares for its base and 14 for its attitude. Number the lines along the base by fives, starting with zero. These numbers correspond with the dial settings of the condenser. The vertical left hand side is numbered off in twenty-fives, starting at 200, and going up to 550. This corresponds to the wavelength range which we are seeking to cover.

Now the calibrating method differs with regenerative and nonregenerative

sets, so we had best take up the methods separately. With a non-regenerative set, it is merely necessary to bring the Station Finder coil within about two or three inches of the main tuning inductance, neutrocoupler, variocoupler, tuning coil or other coil used to tune with. It



A back view of the station finder is shown above. The coil is in the background, while the switch, at the "off" position, is shown at the right. The instrument at the left is a buzzer with its accurate adjustment screw.

will even work on a crystal set, and in the tests, we got readings with four inch coupling. When you have the coil fairly close to the tuning inductance of the set, (which should be tuned to resonance with some stations' wavelength) turn the Station Finder dial until the signal is trapped out. Then move the coil further and further away, wiggling the dial very slightly until the sharpest reading is obtained. At a certain point you will find a setting of the Station Finder dial which will almost entirely if not entirely trap out the signal to which your receiver is tuned. After

of degrees at which the dial is set). Then take your broadcast list and look up the wave of the station. Jot that down too. Now then, take your pencil, and put a dot at the point where the wavelength and dial reading lines intersect. (For instance suppose WEBH is tuned in, and it is found that it can be sharply trapped out with the Station Finder set at 44. The wavelength is 360. Then by drawing a light line vertically from the 44 division on the chart, and another at the 360 division horizontally we will determine a place where the two lines meet. That's where the dot is made).

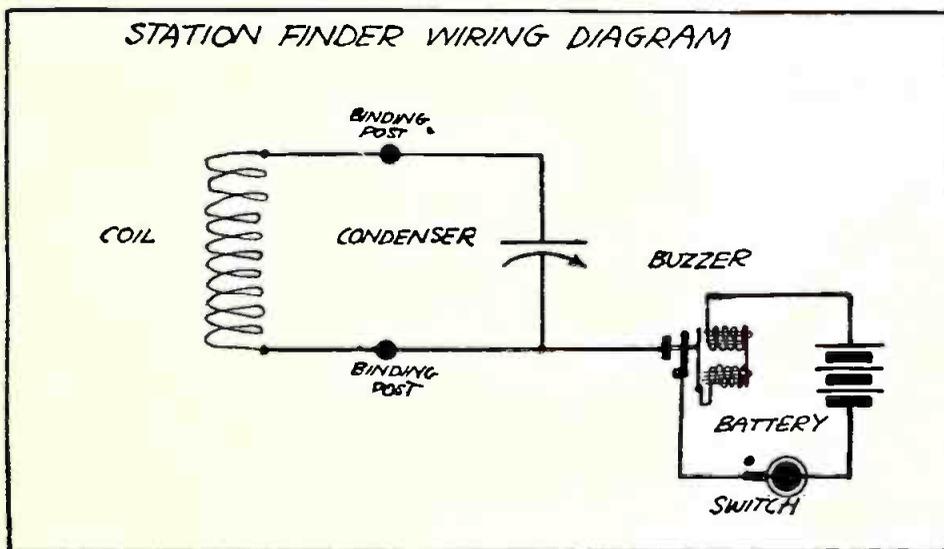
Go up and down the scale of your receiver, getting readings on as many stations as you can possibly get. Make your readings carefully and accurately, and check them once or twice. After you have made about six or eight of these readings well placed over the scale, you can draw a curve or line smoothly connecting these points. If a straightline condenser is used, the condenser graph will read almost in a straight line from the bottom of the scale to the top. If your condenser is not of the straightline plate type, your curve will look like the one shown in Figure 2.

**Regenerative Sets**

**FOR** regenerative sets, we have as an additional indicator, the regenerative feature of the receiver. In this case, as in the case of non-regenerative sets, we bring the Station Finder coil near the tuning inductance of the receiver. The regeneration is then advanced to the point where it just spills over (this is of course with the secondary or tuning circuit tuned to some station or signal the wavelength of which is known). The Station Finder dial is then juggled until the set stops oscillating, and the signal is trapped out. Usually with regenerative sets it is more pronounced with regard to this reading than with non-regenerative receivers. The station is then looked up, the wavelength and dial setting (of the Station Finder) noted, and the dot is made on the chart in the same manner as was described for non-regenerative sets.

**How It Gets Its Name**

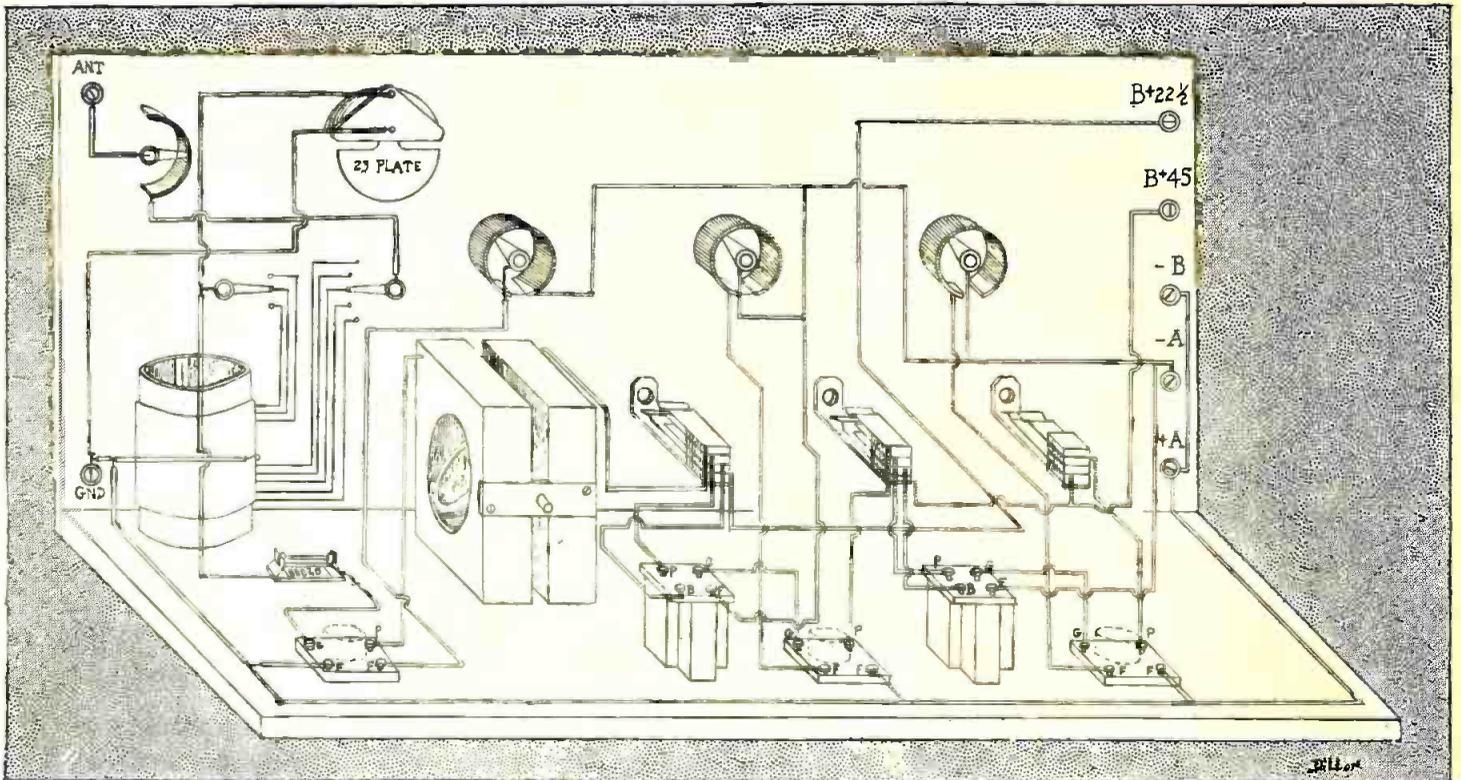
**N**OW you have probably wondered why we need a buzzer on the thing. Simple—. Now suppose we had calibrated the Station Finder dial to the curve shown in Figure 3. Again suppose we were going to listen for Europe with a non-regenerative set, with which we were not acquainted



you have found that point with the Station Finder, be careful not to disturb the reading, and make note of the dial setting (that is, take note of the number

as far as wavelength settings are concerned. It is our wish to listen to a 500 meter station which we know is (Turn to page 54)

# The Latest Edition of One of America's



## Adding TWO STAGES of Audio

TO the readers of RADIO AGE 'way back in the early days, the mention of the name of John L. Reinartz brings back many pleasant recollections. At that time very little was known about receiving sets, and Reinartz gave to the fans one of the best circuits ever published and one which to this day is holding its own against the hundreds of later circuits.

John L. was about two years ahead of the times, and judging from his rapid fire development of new circuits, he is still keeping up this reputation.

When the Reinartz circuit first appeared, practically only one good receiving circuit was then used, this being the Armstrong three circuit tuner, which was hard to make in those days for the reason that it was necessary for one to build his own variometers and couplers, as radio stores were unheard of and the wooden stator blocks and rotors had to be turned out in a lathe. The inductance units used in the Reinartz tuner were simple spider-web coils wound upon a slotted fiber disc, which anyone could make and wind without the use of a lathe or any other machinery.

Thus it attracted the beginner, because it made possible the construction of a three circuit tuner in the ordinary kitchen work shop, and those who were interested enough to build the set as described by Mr. Reinartz were well repaid for their trouble, as it proved to be a good long distance receiver.

### A Popular Circuit

IN fact, it became so popular with our readers that it was necessary for RADIO AGE to publish a special Rein-

artz book to supply the information and take care of the correspondence occasioned by the publication of the article. Since that time several modifications of the circuit have been developed, every one of which has been just as popular, or more so, than the original. The one shown in this issue is considered the best and by popular request it is shown with two stages of audio frequency amplification. It will be noted that the spider web winding has been replaced by a simple coil winding and a variometer. The coil is much easier to wind than the spider web arrangement and variometers are now very easy to procure. The original circuit, being of the regenerative type, naturally caused some radiation. This is now taken care of by using a potentiometer in the aerial circuit, although in this case it is used as an ordinary variable resistance instead of a stabilizer. One of the switches used in the original circuit has also been eliminated, thus making the tuning of the set a simple matter.

Before going into details regarding the construction of this receiver, it might be well to say something about the audio frequency amplification. Three spring jacks are used, making it possible to listen in on the detector only, detector and one stage, or with the detector and both stages. For use with an ordinary phone, the first jack will give ample volume on either local or long distance reception, but when the loud speaker is used, full amplification is obtained by plugging into the last jack. The selection of the transformers will have much to do with the quality of the reception obtained. It is a well known fact that with transformers of high winding ratios, more

By FRANK D. PEARNE

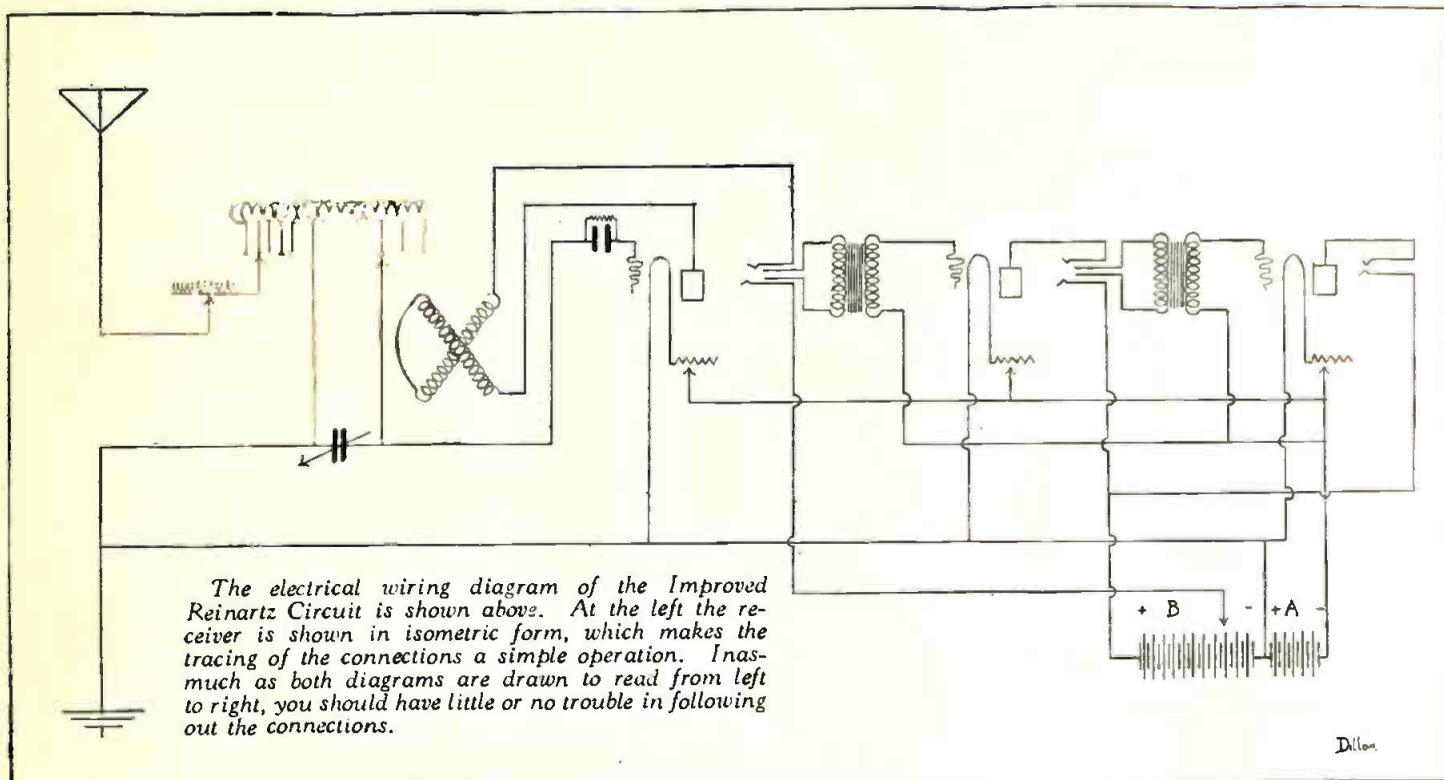
volume may be obtained, but such transformers will also cause considerable distortion in the phones or loud speaker, and as ample volume may be had with low ratio transformers, the builder is advised to be careful in the selection and to choose transformers which do not have a high ratio. If one has a higher ratio than the other, it is suggested that the ordinary practice be reversed and the higher ratio used in the last stage, thus cutting down the distortion in the first stage, which will prevent any amplification of distortion in the second. In either case the ratio should not be more than five to one.

### If You Want Volume

OF course, if one wishes great volume and does not care about distortion, a transformer having a ratio of ten to one may be used in the first stage, and one of five, or six-to-one in the second. The only special apparatus necessary is the inductance, which may be easily wound and constructed in the home workshop. This inductance is wound on a bakelite or cardboard tube 4 inches in diameter and 3 inches long. The winding instructions should be followed to the letter as the only cases of failure so far recorded were caused by variations in the number of turns used and taps being taken off at the wrong place.

The tube is wound with No. 24 cotton or silk insulated wire and in order that no short circuits may occur at the points where the taps are taken off, it is sug-

# Pioneer Receivers: The Popular Reinartz



## Frequency to Modified Reinartz

### TECHNICAL EDITOR

gested that the wire used should have a double silk insulation. The winding is started after two small holes (about the size of the wire) are drilled in the tube about 1-2 inch from the end. These holes should be about 1-4 of an inch apart and in line with the winding. Put the end of the wire down through one of these holes and up through the other, leaving an end about 8 inches long to use in connecting it up after the winding is completed. Wind two turns and take out a tap by making a loop of the wire and twisting it back tight against the tube. Bring out another tap at the next two turns, the next one being taken off at the next turn and two more taps taken off from the next two turns.

The winding is now continued for 35 more turns before another tap is taken off. After this tap, wind seven more turns and bring out the next, then seven more, which will be the end of the winding. Now check up and make sure that this coil is correctly tapped. We have the starting end, two turns and a tap, two more and a tap, one and tap, one and tap, one more and tap, then 35 and tap, seven and tap, then seven more, which is the final end. This will make 56 turns in all, consisting of two ends and seven taps. The final end of the winding is anchored to the tube in the same way as the starting end by drilling two small holes. All of these taps, as well as the ends, should be left long enough to allow for connecting up to the switch contacts on the panel. If they are eight inches in length, they will be sure to reach without splicing.

NOW the balance of the material and parts required may be purchased at any radio store. This will consist of one 200 ohm potentiometer, two switch levers, eight switch contacts, four switch stops, one 23 plate vernier variable condenser, one fixed mica condenser having a capacity of .00025 M.F., one 2 megohm grid leak, one ordinary standard variometer, three standard sockets, one 6 to 8 ohm rheostat, two 25 ohm rheostats, two double circuit spring jacks, one single circuit spring jack, two standard audio frequency transformers having a four, or five to one ratio, two 3-inch dials, seven binding posts, one bakelite panel 18x7x3-16 inches, one baseboard 17 1-2x6x1-2 inches, a cabinet to fit an 18x7 inch panel and about 20 feet of No. 14 tinned copper bus bar wire. This material is only that required for the construction of the set proper.

Aside from this the accessories will be as follows:

#### Materials and Parts

One detector tube (UV-200, or C-300), two amplifier tubes, (UV-201-A, or C-301-A), two 45 volt plate batteries, one 6 volt storage battery, one pair of phones, one loud speaker and two plugs. With these parts on hand, you are ready to start on the wiring. First the panel is laid out and drilled, after which it is fastened to one edge of the baseboard by wood screws, the holes being countersunk so that flat headed screws may be used. All the parts are mounted on the base and panel as shown in the drawing. The aerial binding post on the panel is connected to the movable arm of the potentiometer and one of the ends of the resis-

tance coil of the potentiometer is connected to the switch lever on the five contact switch. The bottom or starting end of the winding of the special inductance coil is connected to the bottom contact on this switch and the next four taps from the coil are connected to the remaining contacts on this switch. This leaves one tap in the bottom group which is connected to the ground binding post to the revolving plates of the 23 plate variable condenser, to one filament binding post on each of the three sockets, to the positive "A" and negative "B" binding posts on the panel.

The two taps and the final end of the winding of the special inductance are connected to the three switch contacts on the other switch, the lever of which is connected to the stationary plates on the condenser and to one terminal of the grid leak and condenser.

#### Watch These Connections

THE other terminal of the grid leak and condenser is connected to the grid binding post on the first socket, which is the detector. The post marked "P" on this socket is connected to one of the variometer terminals and the other variometer terminal is connected to the top spring of the detector jack. The second spring on this jack is connected to the post marked "P" on the first transformer and the third spring from the top is connected to the post marked "B positive" on the same transformer. The last or bottom spring on this jack is connected to the 22 1-2 volt positive "B" binding post on the panel. The post "G" on this first transformer is connected to the post

(Turn to page 56)

# Let the "Happiness Boys" Help You!

*They Won't  
be Happy Till  
They Make  
You Happy  
Too!*

*Millions of  
Fans Cheer  
Peppy Trio  
at Station  
WEAF*



*Above are the "Happiness Boys" of WEAF, New York, who cause the radio waves to ripple with joy every Friday evening at 8:30. From left to right: Ernest Hare, Larry Briers, and Billy Jones.*

**D**OWN EAST in little old New York, people have to work pretty hard or they soon find New York is too big to hold them. Of course, that doesn't include the millionaires, bricklayers and movie producers, but the untold millions who count their pennies every Saturday are the ones who haven't much time to be happy.

Three young Lochinvars who came out of the West a few years ago were astounded at the lack of good cheer in New York City. They saw the bright lights and beautiful buildings and wondered how anyone couldn't *help* being happy. But investigation showed that the average citizen in New York is so busy keeping alive that he just can't afford to chase pleasure to its lair and enjoy it.

### On a Happy Mission

**A**FTER this bit of introspection, the three musketeers mentioned above as Lochinvars went to the owners of WEAF, one of New York's pioneer broadcasting stations—and volunteered to bring happiness to millions of American homes—chiefly in New York.

Radio was struggling for popularity in those days, so the directors of WEAF told the boys to "go to it."

The "boys," Ernest Hare, Larry Briers and Billy Jones, "went to it" with a vim and labeled themselves the "Happiness Boys." With that monicker they proceeded to win the hearts of bored and weary New York.

To find out whether they have been successful, the reader should tune in WEAF some Friday evening at 8:30.

The Happiness Boys are on the air at other times during the week, but they can best be "caught" at their regular hour on Fridays. Their programs consist of everything from good natured banter to beautifully sung popular and semi-classical songs. They don't care what they sing—and neither do their listeners—just as long as it's full of happiness. And, as one old lady said after listening to "the boys" for the *nth* time, "Why, those fellows just *ooze* happiness."

To accomplish such a feat over the radio is indeed something to be proud of.

### A National Reputation

**A**ND although the Happiness Boys started out to bring cheer to the lives of New Yorkers in particular, their cheery songs have reached to the ends of the continent. Instead of merely a local reputation, their fame has spread far and wide. They are known as "The Happiness Team," and so great has their correspondence become that WEAF has had to instal a special office for them.

Letters from spinsters and betrothed flappers; from Middle Aged business men and youthful swains; and scrawls from children asking for undreamed of favors—such is a sample of the day's mail addressed to "The Happiness Boys."

Do you blame them for liking their job? Listen to them at WEAF and be happy, too!

### Happiness Is Costly

**H**APPINESS, although very plentiful at WEAF, is a rather expensive thing.

It is now broadcast regularly by the "Happiness Boys" at the rate of ten dollars per minute. A half hour program by them costs just three hundred dollars. It's worth it—surely. But the radio fan who gets the happiness does not have to pay for it. Instead, the company which hires the boys finds it worth while to spend the sum.

WEAF, probably one of the best known stations in the world, has prospered by its unique and original "pay-as-you-broadcast" system. It sells "microphone time" and not one fan has said nay. In fact, they like it.

Another expensive entertainment is given by "Roxy" Rothafel, conductor of the Capitol Theatre orchestra. This theatre pays about \$600 a night for the privilege of sending its beautiful music through the air.

Although they pay for their time, the "Happiness Boys" trio have become exceedingly popular. Their "Silver Threads Among the Gold" can get tears in the same volume as "I Wonder Who's Kissing Her Now" can get smiles. Every time that they leave the microphone it is a signal for radio fans to sit down and write into the station with their applause cards. The number of these cards and letters that they get has rarely been exceeded by any other entertainers of the air.

On top of all of WEAF'S individual stars, however, stands the famous Graham McNamee, convention announcer, who broadcast the "play by play" story of the Democratic and Republican conventions. His resonant voice has

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# The Hidden Voice

*How Some Radio Ingenuity Rescued a Stolen Baby and Sweetened an Infant Temper Soured by Sore Gums.*

Seated tensely before the microphone, Jimmie sent out the call from the broadcasting station—all programs were stopped and the air was clear for the cry for help. Within a few minutes the whole city was aware of the bold kidnaping.



Chapter I.

Radio Lullaby

SISTER Ella's baby had been crying for more than an hour, and everybody in the house was getting nervous. "Everybody," collectively speaking, included Ella, Ella's mother, and her brother, Jimmie Kinney. They were at their wits' end to know what to do.

These three and the baby constituted a family of stay-at-homes from necessity. Jimmie's mother had just had all her teeth pulled out, and she wouldn't be seen out of the house until her new set was finished; Ella was visiting her parents' home, and her lusty-voiced, nine-month-old Edward Jerome Stansbury, Jr., was so cross from teething that it was folly to allow him to do any broadcasting in the open air. As for Jimmie, he was laid up at home with a sprained ankle, bundled in bandages, and the only way he could move about with any degree of comfort was with the aid of a crutch.

Jimmie was almost a man. Patronizing friends of mature years addressed him as "young man" when desiring a pleasant look in return. But everybody petted him with the diminutive of James, and no doubt his sweetheart, whenever he should select one, would perpetuate the habit. Still Jimmie did not feel diminutive. He usually went at things in a "big way"; that's how he got his sprained ankle. He tackled a half back, half again his weight, on the high school gridiron, and something had to give.

If there's anything that will try the patience of a young fellow like Jimmie, it is to be cooped up at home with a crying baby. And such a fellow will sither fume and fret over undeserved punishment of this sort, or he will exercise his wits for relief.

Some Radio Paregoric

JIMMIE did both. After fuming and fretting for an hour and making his mother and married sister miserable, he got busy with his ingenuity, gave the baby a "dose of radio paregoric," stopped his crying, and nearly caused a tragedy.

However, Jimmie's treatment was in no respect ill-advised. It was really ingenious and highly commendable. He merely unearthed his diminutive super-regenerative receiving outfit from a mass of what a layman would call "junk" in his radio work-shop, tuned it to receive a musical matinee being broadcast for the special benefit of afternoon meetings of women's clubs, sewing circles, and ladies' aids, and deposited it in a sliding drawer under the body of the carriage in which the baby lay.

For some reason, explicable only by a teething pathologist, the ruse was successful. Muffled under the bundle of pillows and quilts, the music proved to be gently soothing. Baby Edward became suddenly very still, then actually laughed, "goo-ed" eagerly, and began to bite his fistful of zwieback with industrious contentment.

Up to this time Jimmie could not induce a member of the family to listen to a radio lecture by him, but now he had no difficulty in interesting his sister in a technical description of his miniature receiving set, which he had constructed himself. It had afforded a very edifying substitute for some of the "rough neck" pranks of high school boys soon after

its completion. It had stimulated some real imagination among some of the usually "slap-stick" fun makers of his acquaintance, and he and a quartet of his friends often indulged their mischievous tendencies by conducting radio serenades under the windows of girl friends in the moonlight.

Once they even entertained half a hundred fellow passengers on a street car with a musical concert and announcement of "the score."

The outfit was a "mite of a thing," contained in a cabinet box about the size of a portable typewriter case. A small loud-speaker, operated by the tremendous amplifying properties of a super-regenerative circuit carefully designed and assembled, held the secret of the marvelous volume of signals which it produced. The circuit, which is so often dubbed a failure, had bowed submissively to Jimmie—for he had mastered it after many painstaking experiments in which he endeavored to remove the squeals customary to this type of circuit. His labors bore fruit, for upon their completion he had a circuit that afforded volume obtained from a circuit that amplified millionfold with but a single tube. Few indeed are the successful sets of this type—so critical are they.

At last the baby went to sleep, and Ella wheeled the carriage out on the front lawn, with the muffled radio music still playing softly. Over the open por-

(Turn the page)

By FRANK HONEYWELL

Joseph Doolin

tion she spread a mosquito net to protect the infant from flies and left him in a shaded spot to the tender mercies of gentle zephyrs of a mild Summer day.

### His Fame Assured

JIMMIE returned to his radio work shop in the basement, proud of his brilliant idea. Both mother and sister complimented him effusively and went about their household much more cheerfully. Once Ella called down to him this blithesome announcement:

"I'm going to write to all the radio editors whose addresses I can find and tell them what you did. It'll make you famous."

"Yes," Jimmie agreed; "they'll run big headlines, reading 'Radio Latest Remedy for Teething Babies. Does the Work where Zwieback Won't.'"

Jimmie had been idling his time away up to the moment when this bright idea came to him. Now, however, he felt much more industrious. With his lame foot resting as comfortably as possible on an empty box, he sat at his workbench and began to wind a set of coils for a new low-loss receiver.

But he had not been thus occupied long when a scream such as he had never heard before caused him to drop his work and hobble upstairs as fast as he could go with safety. As he reached the living room, Ella rushed in, weeping and wringing her hands and crying out that her baby had been stolen. Her mother followed, almost as desperate in words and manner.

"I had him in the carriage out in the front yard, and somebody came along and wheeled him away," wailed Mrs. Stansbury. "Oh, what will I do? Jimmie, can't you do something?"

"You must be mistaken," her brother replied. "Probably some neighbor's child wheeled him down the street."

"No, no," returned the distracted mother.

"None of the children around here would do a thing like that. My Edward has been stolen, I know it, oh, I know it."

"We'll call the police, then," said Jimmie going to the telephone and lifting the receiver.

He got the nearest station without difficulty and delivered his message.

"We'll have a man right over there," promised the desk sergeant. "But all of our motorcycle men are out on special calls and most of the other men are at a big fire that broke out twenty minutes ago. We'll take care of you just as speedily as we can get the men."

Neighbors gathered rapidly at the Kinney home, and in a short time half a dozen boys and two men were hurrying away in different directions in search of the missing babe. The policeman came, made note of a few details, and hastened away more rapidly than he had come. Meanwhile, Jimmie, realizing that he could take no active part in the search, sat down to rest his aching ankle and racked his brain for an idea that might rescue him from the disgrace of utter uselessness.

"I did one smart thing today, they tell me," he mused. "Now, why can't I think of something else to meet this crisis? By Jimminy!" he exclaimed suddenly, as the longed-for "bright idea" actually came. "I do believe it's worth trying. That receiver's still in that carriage, no doubt, and as long as the baby is

sibilities of his plan, Jim hobbled downstairs, hailed a taxi and sped toward the business center of the town, where the studio was located. The antenna towers were situated some ten miles from the town, in keeping with the latest ideas of Frederick Newgard, owner of the station, who believed that radio towers should be free from the interference-causing influences of a city. Arrived at the studio building, Jim dashed upstairs only to be greeted with a muffled "shhh!" as he neared the studio waiting room.

"No noise!" an important individual warned him. "There's a concert going on now. Don't you know any better than to come rushing in here like this?"

Exasperated, Jim told the self-styled guard who he was, with a few added imaginative explanations for good measure.

His words were "open sesame." He was ushered into the studio waiting room and there word was sent to Larry Hornaday, youthful announcer and director of the station, that a young friend was awaiting him in unusual haste. After finishing the announcement of the first number on the afternoon's program, Larry sauntered out, carefully closing the studio door, and greeted Jim.

"What's on your mind, kid?" he queried. "You look upset. Blow out eight tubes or something?"

"Nope. I want you to let me have your station for awhile." Jim was almost too nonchalant to be true, considering the importance of his statement.

Larry was rightfully surprised. He chuckled and asked Jim jokingly if there was anything else he wanted.

Then Jim got down to business. He outlined his plan; how the baby had been kidnapped while in a carriage equipped with a portable radio set which was tuned to the local broadcasting station.

"Can't you see?" Jimmie demanded,

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Suddenly there came a sound, that of a human voice, from the carriage. Julia was nonplused. The cries for help continued at frequent intervals, and finally she broke into a run, while passers-by gaped in amazement.

being wheeled away in it, I may be able to make that set help to arouse suspicion. I'm going to try it."

### A Thought in Time

JIMMIE remembered that the radio set in the carriage had been tuned to the city's only broadcasting station, which was giving its afternoon concert at that hour on a 360 meter wavelength. Jimmie happened to be well in favor with the station, having done several bits of mechanical work for their operating staff in times of need.

His imagination afire with the pos-

# A Pleasing VOICE Isn't Enough!

Says Owen E. McGillicuddy, Who Studies Announcers



(Atwell Photo)

George Hay, "Solemn Old Judge" of Station WLS



(Knight Photo, N. Y.)

Thomas A. Cowan, Jovial Announcer from WJY-WJZ.



(Photo by Lyonde, Toronto)

And Here's E. W. Jackson himself, of CNRT, Toronto

A FAIR young daughter of Eve, while listening recently to the continental broadcast, was heard to remark, "There are all kinds of announcers but, in my opinion, it is not so much the voice that counts as what goes with it."

The young lady was right. Of the many announcers heard nightly, there are not more than a dozen whose enunciation and method show a conscientious desire to tell the public all it wants to hear in a clear, concise and understandable manner.

If an earnest desire to please his public, blended with a pleasant voice and a polite manner, were the sole requirements of a successful announcer, Ernest W. Jackson, director of CNRT, the Canadian National Railways station at Toronto, would be in the front rank. But Jackson possesses more than a good voice and a pleasant manner. He has a keen sense of his responsibility as the vocal representative of Canada's great railway system, and Sir Henry Thornton, the able president of the C. N. R., could not generate more enthusiasm or show more regard for the public than is exhibited when "Jacksy" is giving an oral demonstration.

### An Early Broadcaster

OUR friend Jackson first saw the light of day at Simcoe, Ontario, in October, 1890, where, without the aid of either a transmitting or receiving equipment, his broadcasting was heard at frequent intervals by the neighbors. After enjoying farm life near Courtland, Ontario, for three years the family moved to Tillsonburg in 1901, where he

attended public and high school, and matriculated to Toronto University.

For five years he served the Traders' Bank of Canada and the Royal Bank of Canada in various capacities. In 1916 he took a trip to the Orient, and on his return in 1917 enlisted in the Royal Flying Corps, in which he served in a staff position at Long Branch, Deseronto, Leaside, and Fort Worth, Texas. He was married in 1917, and, in 1919, on being discharged from the Air Force, joined the Treasurer's Branch of the Canadian National Railway.

When the Canadian National Railways decided last Winter to establish broadcasting stations in each province of the Dominion and place receiving sets on their transcontinental trains, Jackson was transferred to the radio department and placed in charge of Station CNRT at Toronto.

The locomotive whistle which always heralds CNRT's coming on the air and the locomotive bells which follow the signing off, are now as well known as Mr. Jackson's voice in Canada and the United States. There are many radio engineers and directors throughout

the continent who hold that Jackson knows how to interpret an announcer's relations with the public to a greater degree than

any other man depending upon his vocal intelligence.

In a recent conversation the popular director of CNRT gave me his opinion concerning an announcer's responsibility to the public and his relations with radio artists and the company he represents.

"An announcer should be intimate without being personal," he declared. "He should be cultured without being too formal, and tactful without being timid. Humor has its place, but there is a type of humor heard sometimes which is violently offensive to all good taste. While an announcer must be honest at all times, there is never any necessity for being brutally blunt. Brutally blunt people never accomplish any good in the world and are always obnoxious.

"An announcer should take extreme care regarding the correct pronunciation of foreign names of places," he continued.

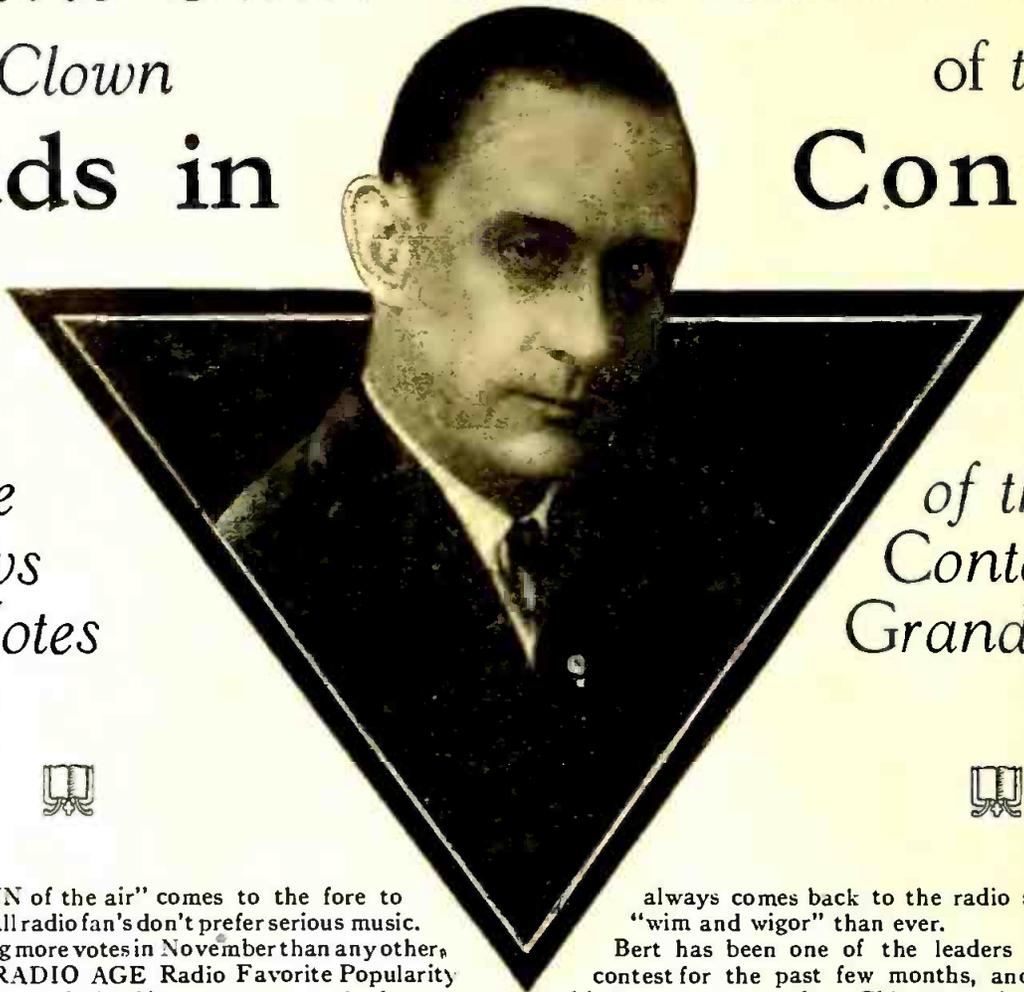
"While he uses his imagination, he should be neither artificial nor superficial in either the tone, inflection, or phrasing of his announcement. There should always be congenial relations between the public and himself, and though he is heard often there is no reason why he should be seen. In other words, he should become and remain an invisible friend to every home in which his voice enters.

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# None Other Than Bert Davis

“The Clown of the Air”

## Leads in Contest



Harry  
Aldyne  
Reviews  
The Votes

Winner  
of the Final  
Contest to Get  
Grand Trophy



**T**HE CLOWN of the air” comes to the fore to prove that all radio fan's don't prefer serious music. By receiving more votes in November than any other entrant in the RADIO AGE Radio Favorite Popularity Contest, the Clown of the Air, more commonly known as Bert Davis, achieves his rightful position as King of Jazz.

Bert has been singing over Middle Western radio stations steadily during the past few months. He has traveled from state to state and “knocked 'em dead” wherever he went, simply because, as one admirer put it, “He can sing more crazy things than you ever heard before.”

He ranks easily with such entertainers as Wendell Hall, Banks Kennedy, Axel Christensen, Art Linick, and others who are acknowledged leaders in their respective lines.

### A Vod-Vil Star, Too

**B**ERT is a vaudeville trouper by profession, having started his stage career in Chicago for various vaudeville circuits. (They weren't short ones, either.) When the radio craze hit the country, Bert was among the first to recognize in radio a vital means of getting before song lovers. So he originated his own repertoire and style and started to “do his stuff.” He succeeded, and today his name is a byword for the liveliest in jazz. He has appeared at every Chicago radio station, being most consistent at WTAS, WGN, and KYW.

He is to appear regularly on RADIO AGE'S broadcast programs, after he completes a recently inaugurated vaudeville tour.

For Bert, like any other true son of the road, gets the “urge” to appear before visible audiences once in a while. But he

always comes back to the radio studios with greater “wim and wigor” than ever.

Bert has been one of the leaders in RADIO AGE'S contest for the past few months, and it was because of his recent programs from Chicago stations that his popularity rose and votes began to trickle in for him with increasing regularity. As a result, Bert swept aside all opposition during the month of November, that contest having closed on October 15.

Bert has a lot of stunts in common with Gene Green, old time vaudeville star. This pair “stunted” together for a few years, and as a result dyed-in-the-wool vaudeville fans of bygone days can hardly tell the two apart—over radio, of course.

**S**O GET busy, folks, and help your favorite win the contest. In the February issue of RADIO AGE, we will announce the prize to be awarded the winner of the Grand Contest. So every vote counts NOW! Clip the coupon on this page and send it in. Urge your friends to do likewise before it's too late.

### THE WINNER FOR NOVEMBER

Bert Davis.....Entertainer.....WTAS      Elgin

### WINNERS OF PRECEDING MONTHS

July.....Duncan Sisters  
August.....Bill Hay  
September.....Karl Bonawitz  
October.....H. W. Arlin

### STANDING TO NOVEMBER 15th

Name	Classification	Where Heard
Karl Bonawitz.....	Organist.....	WIP Philadelphia
H. W. Arlin.....	Announcer.....	KDKA Pittsburgh
Bill Hay.....	Announcer.....	KFKX Hastings
Bert Davis.....	Entertainer.....	WGN Chicago
Duncan Sisters.....	Entertainers.....	KYW Chicago
Lambdin Kay.....	Announcer.....	WSB Atlanta
J. Remington Welsch.....	Organist.....	KYW Chicago
John S. Dagget.....	Announcer.....	KHJ Los Angeles
E. L. Tyson.....	Announcer.....	WWJ Detroit
Jack Nelson.....	Announcer.....	WJJD Mooseheart
Ford & Glenn.....	Entertainers.....	WLS Chicago
Harry M. Snodgrass.....	Entertainer.....	WOS Jefferson City
Fred Smith.....	Announcer.....	WLW Cincinnati
Jerry Sullivan.....	Announcer Entertainer.....	WQJ Chicago
Hired Hand.....	Announcer.....	WBAJ Fort Worth
Edw. H. Smith.....	Director-Player.....	WGY Schenectady
Nick B. Harris.....	Entertainer.....	KFI Los Angeles
Wendell Hall.....	Entertainer.....	WDAF Kansas City

### POPULARITY CONTEST COUPON

Harry Aldyne, Contest Editor,  
RADIO AGE, 500 N. Dearborn St., Chicago.

I wish to cast my vote for:

Name of favorite.....

Classification.....

Station.....Date Heard.....

Name [optional].....

Address [optional].....

The contest is by no means won. Karl Bonawitz leads Wendell Hall by only 52 votes. The scattering of votes over so large a field may ultimately elect a dark horse from among the many strong candidates whose names are not even listed on this page.

# What the Broadcasters are Doing



## KYW Will Have New Station in Chicago

**WESTINGHOUSE** station KYW at Chicago is not to move, but will build a new station to be located on the roof of the Congress Hotel, on the shores of Lake Michigan, it has been announced.

This will be a new KYW. The antenna and tower will embrace science's latest instructions. Likewise, the studio, which will be in the Florentine Annex, Room 1180 on the Parlor Floor of the Congress Hotel, a large and spacious room, will also be constructed in the most modern fashion, with acoustics best adapted for radio uses.

The equipment to be used is of the latest type devised by the Westinghouse Electric and Manufacturing Company, employing water-sealed tubes.

Rectified alternating current will be used, which will change the 60 cycle power service to high voltage direct current.

With the new mechanical equipment to be used at KYW, a vast improvement will be manifest over its present station, which already is one of the best in the country.

## Will Use Special Wire

Programs from the various studios will be broadcast by special wire to the station on the roof of the Congress Hotel.

First comes the Balloon Room of the Congress from which come classical programs, renditions by the most famous artists in the world. It is from here that radio fans hear the famous Coon-Sanders' Night Hawks and Joska Debabary's orchestras.

From the Florentine Room will be broadcast programs of a popular nature, the Midnight Carnivals each Saturday night—always a deluxe program. RADIO AGE broadcasts on these midnight shows the first Saturday in every month.

From the Hearst Studio: KYW will be broadcast the usual afternoon frolics on Tuesday and Wednesday, the "At Home Show," the Revue, and World Crier service. This last goes on the ether every hour and half hour throughout the day and night.

The KYW studio in the Garrick Theatre Building will be used for special programs. Central Church goes on the air each Sunday morning at 11 o'clock, while the Chapel Service goes out at 2:30 p. m., Sunday afternoon. The Sunday Evening Club broadcasts its programs over KYW from the Orchestra Hall.



Old Time Stage Star at WSAI

John Drury is one of the most popular artists appearing from Station WSAI, of the United States Playing Card Company, at Cincinnati.

Mr. Drury is a former well known stage star, and perhaps several of our elderly readers will remember him for his dramatic interpretations in days gone by. In a recent popularity contest in Cincinnati, Mr. Drury came out first.

At present he is a reader of well known pieces from WSAI, and his services are also in demand at other stations and from dramatic societies in the Middle West.

Mr. Drury's photograph is reproduced in the inset above.

Mr. Drury will be glad to communicate with listeners who enjoy his programs, he says.



Have you ever fretted at the "One Moment, Please" from broadcasting studios while the artists were preparing for the next number? The newly developed microphone stands in the WLW studios at Cincinnati do away with waits between numbers. Two signs, labelled "Prepare" and "Broadcast" are illuminated as required and there is no loss of time between selections, as one microphone in the studio is open to "Broadcast" while another in an adjacent studio says "Prepare." Fred Smith, WLW director, is shown before one of the new "Mikes."

## "Ghost" Broadcasts from WEEI

**ONE** of the most unusual broadcasts ever transmitted in this country was sent out from WEEI, the Edison Light Station, at 10 o'clock Hallowe'en night, October 31, when a real live ghost was "interviewed."

This unheard of feature was arranged by the officials of WEEI especially for radio fans who planned to put on Hallowe'en parties. Nothing like this broadcast had ever been attempted before, and great preparations were made to give radio listeners something brand new in radio broadcasts.

A real haunted house, located several miles out of the city was selected for the stunt. Special remote control telephone lines were established between the radio station and this house so that when the ghost walked the entire scene could be described to the radio audience.

The broadcast officials refused to divulge the location of this haunted house because they believed that if they did this, hundreds of sightseers would visit the place and thereby interfere with the broadcast.

At exactly 10 o'clock the telephone line from the studio was transferred to the haunted house and from that time until the ghost appeared and disappeared the microphone was in charge of "Whit," well known radio character. In the spacious dining room of this haunted house a man is said to have murdered his wife and two children.

All fans who heard the broadcast reported they were actually "scared" by the strange, spooky sounds over the radio.

## "Santa Claus Hour" at WLW

Santa Claus has just finished overhauling his airplane and will be ready to read the letters sent to him from all over the country when he arrives at the Crosley WLW broadcasting Studio, this month. Santa Claus hour will begin at 6 o'clock and this jolly patron saint of childhood will be in the studio Monday, Tuesday, Wednesday and Thursday evenings. Who will be the first little boy or girl to write to Santa in care of The Crosley Radio Corporation, Cincinnati?

Do you remember the big party at Music Hall last year, with the funny clowns, fine music and then Santa Claus with his candy and fruit? Well, Powel Crosley, Jr., has engaged the large auditorium again this year and all the children who can possibly attend are invited to the big Christmas Festival to be held Monday night, December 22.

To the little folks who cannot attend, there will be the broadcasting of the entire proceedings.

# A Station that Caters to Friends

By Lera McGinty



*Inspired by "Hired Hand," WBAP is making life cheery in the sunny south*



**F**ORT WORTH:—Upon entering Radio station WBAP, at Fort Worth, Texas, one gets the unusual impression of hard work and contentment as he encounters the announcers on the job. It was my good fortune to find them all present.

W. E. Branch, program director and announcer, simply radiates satisfaction with himself, the studio and the whole world in general, as he tips his swivel chair back to a dangerous angle and begins telling about the virtues of WBAP.

When asked if there was any class of people it wished particularly to please, he said, "Station WBAP caters to its friends—and has no enemies."

This remark incidentally caused C. B. Locke, radio editor, to cease his seemingly never-ending task long enough to slap him on the back and utter a hearty, "Spoken like a man, Bill."

## A Real Old-Timer

**I**F THIS duet smacks a trifle of egotism, it is to be pardoned, considering that Mr. Branch is the only one left now of the original trio, composed of G. C. Arnoux, E. L. Olds and himself.

He built the first set used by WBAP, and when it was later equipped with a Western Electric, he stayed on as radio engineer. Recently he has been made program director and announcer. He not only serves in this capacity, but furnishes entertainment for thousands of enthusiastic fans with his popular noon-day piano concerts. He just naturally feels as proud of the studio as an adoring parent does of a successful son.

Mr. Locke joined forces with WBAP as editor in November and seems to have been promptly submerged under a blanket of requests for WBAP acknowledgment stamps. Various attempts have been made by others to get an interview with him to no avail, and so far the most I have heard him say is: "No money enclosed."

*"The Station with no enemies" is the favorite among the southland's radio fans. In the oval is a view of the studio of WBAP, which has the highest power rating of any station in the Southwest. The right portrait above is W. E. Branch, veteran announcer at WBAP—and with his back unceremoniously facing us, Mr. Reader, is the inimitable and mysterious "Hired Hand."*

Not knowing whether or not he was talking to me and meant, "No money involved," I deliberately reached across his desk and picked up the paper he had flung aside and found it to be a request for a WBAP stamp, and the writer had forgotten to enclose the dime.

That was indeed a happy occasion for me, because I feared that he expected to be paid for an interview.

However, his fellow workers say he is talkative when he isn't so busy, and he is certainly an addition for any studio to be proud of.

(Whisper, he is good looking and personally I believe he is trying the "work cure" on a broken heart and that would be an interesting story if it is so. I am going back again when the rush is over, and if I find out I will let you know).

**E**VERYBODY likes surprises, that is why I have saved the best for the last.

It is the "Hired Hand," comedian and substitute announcer. Of course, it is needless to say that he is the outstanding feature offered by WBAP. To hear him announcing, one would naturally draw the conclusion that he has nothing else to do but think up funny jokes and get

himself into tight corners, but when it comes to having nothing to do, it just doesn't fit that individual at all.

He will have to be given credit for being an extraordinarily clever person when it is considered that he toils daily in the boiler room from early until late, trudges to and from his boarding house, cleverly dodging his landlady when he deems it necessary—and that is one place his good judgment never fails him, he says—and besides attending to his regular studio duties of sweeping, dusting, errand boy and sub-announcer, I think it will be agreed that he is just naturally "clever."

He is never heard to complain and it is only by close discernment that one is ever able to catch a gleam of wistfulness in his eyes for less work and more pay.

These sacrifices are not always without their recompense, however. Almost daily he is rewarded with one or more boxes of cigars or candy, pecans, fruit, ducks, and he has been known to even receive packages of fried chicken and at one time, three live possums and a porcupine, (saying nothing of the mash notes).

So you see he manages a rather well balanced diet in spite of the usual boarding house hash.

# "Why I NEVER SMILE"

—As Told by a SAD but HOPEFUL Musical

Director

By CHARLES H. GABRIEL Jr.

Musical Director, Station WGN.

**T**AKING a receiving set apart to find out what makes it tick has nothing whatever on taking an "artist" apart to find out what's wrong with the picture. Note the quotation marks inclosing the word artist. It's always the sort of musician we describe with "quotes" that makes musical directors tear out the few wisps of hair remaining on the old bean and laugh hysterically.

Real, honest-to-goodness artists are seldom difficult to get along with as long as you remember that they actually are famous or deserve to be. Used as they are to the exigencies of concertizing, they appreciate the efforts made in their behalf and know of the vexatious "little things" that may almost wreck a recital at the last moment.

But the "artists"!

## Why a Musical Director?

Everybody knows what an announcer does—everybody hears him doing it. A pianist's place in the scheme of a radiocast is pretty well defined. The title of "publicity director" is self-explanatory. But what on earth is a musical director and why?

Well, he arranges the programs and provides the "talent." Simple, is it not? It is not, even if we do say it.

Boiled down (!) the musical director's job is to provide some 300-odd programs a year, each requiring the services, co-operation and good will of from four to twenty musicians; to see that everybody arrives in time to "appear" on the dot; to placate the wrath of the small-timers; to use diplomacy in the case of performers of fame; to accept the mean cracks of those who have no idea of the machinery of radio programs; to get up instantaneously the soft answers promulgated to turn away the anger of simple, unofficial critics; to give hearings to those who would like to sing or play for the public; to announce all kinds of "numbers" in all kinds of languages; to perform himself when somebody doesn't arrive for the show; to play accompaniments for those who failed to provide their own pianists.

... The rest of the time he has to himself.

## His Crown of Thorns

**F**OR ways that are hard and tricks that are vain—to jumble a metaphor or two—the impresario of musicians wins the mothproof medal. The average "manager" of talent finds his path

bestrewn with temperaments of great variety and curious design.

The late F. Wight Neumann and the present Louis Eckstein of Ravinia fame confirmed that rumor to us in person. But whereas men of their profession are concerned with but what amounts to a handful of concerts or opera performances yearly, the radio director must scare up hundreds of musicians and arrange hundreds of programs. Not only that, but his audience is multitudinous and supercritical, whereas the concert manager's patrons are fewer and not so apt to be rabidly critical, since only those who understand and enjoy this type of program pay him for seats. They wouldn't go if they didn't like the kind of music the recital or concert assured.

The radio audience, on the other hand, is a cross section of the population of the United States. Some like jazz; some despise it; some dislike sopranos, some revile contraltos; some root for piano solos, other say "bah," not to say "blah"; some want old time favorites, younger hearers cry for popular songs of today. And so it goes. Yet all these "critics" of each other's tastes are listening to the musical director's daily programs at the same time and each type thinks the program is terrible if it does not consist of just what it likes best.

Starting out in the early morn intent on catching the early artist and "booking" him, the pale young man with the high forehead and fallen arches finds two classes of musicians awaiting him—the kind that begs to be put on a program and the kind he has to ask to do their stuff for this radio age. The former keep the telephone wires sizzling throughout the day and wear out the anteroom carpet during "tryout" hours. Here begins woe. Most of them know they are good. Honestly, most of them are good and dating them up is merely a question of "how soon can you come?"



Charles H. Gabriel Jr., of WGN

(Drake Photo)

But the others. Knowing they are good, nine times out of ten they are insulted when the inevitable request to hear them is made.

"Why," said a young near-soprano to us the other day, "Mme. Screech says I am really too good for the radio. She says, everybody says, I have a wonderful voice. I only want to sing because so many of my friends who live out of town are anxious to hear me. When can I come? I prefer your Master Artist recitals on Sunday and could do a whole hour for you."

What to do? What to do? What to do?

When she finally consents to sing a little test song, the voice, what there is of it, is very good—only for talking, not singing. To plainly say so would not be quite what they are doing this year in the best circles. To book her for an appearance would be a pitiful thing to do, not only for the reputation of the station but as an unnecessary torture to the future hearers. What would you say? What we say is a secret of musical directors.

Too recently a gentlewoman was booked by error of confusing her with another of the same name, and immedi-

(Turn to page 67)

## The Real Story of Harry Snodgrass, Who Won Radio Fame in Prison



Above is Harry Snodgrass, during one of his "at home" programs from the Missouri State Penitentiary, where he has been confined for three years. His piano renditions are broadcast regularly through Station WOS, at Jefferson City.

a feeling of gratitude. For were it not for that chance arrest back in 1921, he might still be an unknown wanderer.

Not long after his advent into the prison, radio began to win popularity. Broadcasting stations sprung up, and among them was WOS, at Jefferson City, Missouri. While visiting the penitentiary one day, a representative from WOS happened to hear Snodgrass playing the piano casually and disinterestedly for a group of prisoners.

The radio man was astounded. He marveled at Snodgrass' natural ability as a pianist, his easy skill and expert technique. The radio man brought visiting pianists of note and several musical instructors to hear Snodgrass play. All were of the same opinion; Snodgrass was a "genius of the ivories," wasting his talents behind the bleak walls of a penitentiary.

J. M. Witten, chief announcer and a director at WOS, arranged to have Snodgrass broadcast regularly from the Jefferson City broadcasting station. Witten dubbed him "King of the Ivories" and advertised him on WOS programs, neglecting, however, to mention that Snodgrass' studio was a trusty's parlor in the state penitentiary.

During the year or so Snodgrass has been performing over radio, his whole attitude of life has changed. As he faces the microphone in his gray "studio," he visions the untold millions who are listening to his varied concerts—jazz, classical music, and old time favorites. He sees the men, women and little children who sit open-mouthed on hearing his lightning-like speed and his tender, impassioned handling of the Old Masters.

### A Purpose in Life

SNODGRASS admits that now he has a purpose in life. The piano is his life, and now he knows it will guide him to greater fame once he leaves the confines of the prison walls.

"Love laughs at locksmiths," he told his warden. "I love my work. When I play I am not in prison. I am surrounded by millions of admirers instead of four gloomy walls. If I get so much pleasure from playing now, can you imagine what will happen when I get out of here?"

If Snodgrass contemplates fame now, he does not realize he has already gained it. Few persons know he is a convict, but those who know who he is admire him all the more for the change radio broadcasting has wrought over him; the spiritual transformation that radio has caused over this once indifferent "floaters."

(Turn to page 69)

# 'Stone Walls do not a Prison Make'

By RUSSELL H. HOPKINS

"Stone walls do not a prison make, nor iron bars a cage."

—Old Saying.

"Love laughs at locksmiths."

—Another Saying.

NO ONE knows the truth of the foregoing sayings better than Harry Snodgrass, who is known throughout the United States and Canada as the inimitable "King of the Ivories" from Radio Station WOS, at Jefferson City, Mo.

Three years ago this January, Snodgrass was an Unknown—a mere cog in the world's everyday life. And he wasn't very successful at that.

Harry was somewhat shiftless back

in 1921. He couldn't hold a job for more than a month. He had a wonderful gift of piano playing, but he had no one to inspire him. So he drifted along—not even a pebble on Life's beach.

### The Turning Point

HE GOT into bad company. One night the police made a raid and Harry was "among those present" when charges of robbery were made. Harry was tried and convicted on a charge of attempted burglary. He was sentenced to serve three years in the Missouri State Penitentiary.

Most people regard a prison as the last place to achieve fame, but Snodgrass looks upon his jail sentence with

# Can Beauty Be Sent Over Radio ?



By  
"Buddy  
Snaps"

Who, After an  
Interview with  
Miss Byrdetta  
Evans, Feels  
Convinced that  
Radio Listeners  
Can Determine  
Whether Beautiful  
Singers Are  
Beautiful!

**D**O YOU THINK it possible to transmit part of your physical being as well as your voice by radio?

Byrdetta Evans, nationally known radio singer and a prominent society beauty as well, was the person who asked that question at the opening of an informal interview over the teacups the other afternoon.

The question proved to be the first and the last to be asked in said interview. In fact, it was enough for a whole interview.

Assuming a very thoughtful air, the writer started to quote several well known radio engineers to disprove her point, but Miss Evans assured him that she was interested in the psychological and not the technical side of radio.

"Why?" we asked, coming to life.

"As you probably know," Miss Evans began, "I have sung from a large number of broadcasting stations recently, including such well known ones as WGN, WLS, WJAZ and WEBH. Of course, I have received my share of letters, phone calls and telegrams, commenting on and praising my voice, as well as requesting favorite numbers.

### Those Forward Fans!

**B**UT the reason I asked you that question is because nearly all the messages from masculine fans not only praise my vocal ability, but request my telephone number or home address and express a desire to meet me.

"I have heard from many sources that many movie stars receive proposals from persons who have never seen anything but their image and who have no idea of their personality or speech. But here it is the reverse, for the radio fans who write me have only heard my voice and have no idea how I look.

"Naturally, I am considerably intrigued by these incidents, and I wonder if by any chance my listeners could have received an impression of my physical self along with my voice."

In other words, Miss Evans wants to know if the average radio listener can tell, by paying rapt attention to a girl's voice

over the radio, whether she is as sweet and pretty as her voice would have you believe.

### Look at Byrdetta!

**M**AYBE there is something in her theory. The reader will be able to solve this riddle by glancing at the portrait of Miss Evans accompanying this article.

In a moment of confidence Miss Evans showed us a typical letter she received after singing an unusually sentimental song; one which undoubtedly stirred several listeners to romantic ravings—particularly the writer of this *billet doux*:

"Dearest Radio Songbird:

"I must express my deep appreciation of your wonderful voice which came to me so marvelously from WGN last night. You do not know the solace and comfort your song inspired in me. Why, I can scarcely wait until your voice comes again stealing out of the night, bringing comfort for a lonely heart. I feel that such a lovely voice could only have its origin in an equally lovely body.

"Please answer this message so I may have the privilege of personally thanking you for your artistry.

"Anxiously,

"George ....."

Before taking up her song career, Miss Evans was the town belle of Fargo, N. D., where she won the annual beauty contest for several seasons. While attending the University of Minnesota she was asked to enter a bathing girl contest, and although her nearest approach to bathing exhibitions during past years had been in a railroad water tank near Fargo, she entered the contest and was selected winner.

"I love radio for its romance," Miss Evans assured us. "No one ever knows where her voice is going or to whom she is singing. Wouldn't it be marvelous to have the Prince of Wales listening!" she sighed, just like any other American girl would at such a supposition.

But the question still remains unsolved—Can beauty be transmitted by radio? Try it and see.

Miss Byrdetta Evans  
(Drake Studio Photo)

# How a Touch of Radio Finesse Makes Broadcasting a Pleasure at WEBH

By WILLIS ARNOLD



(Chicago Aerial Survey Photo.)

A bird's-eye view of the Edgewater Beach Hotel, home of WEBH.

## FINESSE! Art! Color!

Those are three things that the Radio broadcasting field is destined to possess some day, but which it lacks to a noticeable degree at present.

Eight out of ten of our broadcasting stations are the most uninteresting things in the world. Artists "dated" to appear for the first time before the microphone go to the studios with hearts aflame, dreaming wild dreams of the romance and thrill they will get from their first broadcast.

Instead of the romance they had supposed was behind the microphone and the broadcast studio, they usually find a dull and overheated room; a few disinterested persons in charge; and a mechanical way about doing things that breeds "stage fright" and many times causes a promising artist to fail completely.

Mind you, not all stations are like that. But the majority of them are. They feel that because a broadcast studio cannot be seen, it need not cater to the artistic, the colorful and the romance that is in radio as a science. In other words, the *finesse*—the finishing touch—is lacking.

### A Step Forward

THE Edgewater Beach Hotel, one of Chicago's most pretentious show-places, purchased Radio Station WEBH with the avowed intention of forming a studio that would inspire radio artists instead of terrify them; that would make them feel at home and arouse all that was artistic in them. The Hotel management wanted *class* to pervade throughout every inch of its studio.

The Hotel already had something to build from. It had a crystal radio studio situated in a cozy corner of the hotel building; a studio enclosed entirely in glass and built along the latest lines of studio development.

The mechanical side of the station was acknowledged one of the best in the country; the operating staff was the most efficient that could be found. The original apparatus had communicated daily with Capt. McMillan during his explorations in Arctic regions. These experiments were carried on when the station was under another management.

Everything was ready, then, for the final step; the introduction of the elusive bit of *finesse*.

Robert D. Boniel, a veteran at the gentle art of studio management, was chosen to take charge of the newly created Station WEBH. That was four months ago. And today WEBH is the last word in "artistry" in radio broadcasting. Just as the Hotel itself strives

to cater to the best tastes of Chicago's *elite*, so has "Bob" Boniel injected a colorful atmosphere in the studio he manages.

### Unique Crystal Studio

THE studio consists of two glass compartments. One, a very small room, houses the announcer—Mr. Boniel—and his operator. The other room, also glass enclosed and adjacent to the operating and announcing room, houses the artists in charge of Dean Remick, musical director. To avoid timidity on the part of the entertainers who view the microphone for the first time, the microphone is concealed in a piano lamp, and singers and other performers sing "at" the lamp, thus making it unnecessary for them to concoct any weird illusions about the powers of the more or less harmless microphone.

Velvet drapes further enhance the beauty of "the crystal studio" and add to its sound values. The broadcasting antennae are located nearly a block away from the studio itself, free from interference of steel girders. The Hotel is situated in Chicago's fashionable North Side.

One of the most renowned features of WEBH and a typical example of its *finesse* is the Sunday afternoon twilight musicale. Operatic selections by Dan Russo and Ted Fiorito's Oriole Orchestra attract a gathering of socially-elect every Sunday at 5 p. m.; and a famed singer, sometimes a soprano, and at others a tenor or baritone, also appear on these musicales, as an added feature. The best in opera music and classical selections is broadcast on this special program.

But that is not all. Mr. Boniel's *forte* is variety; and he can arrange jazz programs with the same success that greets his handling of classical arrangements. But Mr. Boniel has the gift of making jazz presentations *seem* ethereal; he is like Paul Whiteman in that respect.

RADIO AGE broadcasts from the crystal studio once a month, the next program being scheduled for Tuesday, December 23, between 9 and 10 p. m. Tune in! Wavelength, 370 meters.

WEBH is continually hanging up distance records. It is one of the two strongest stations in the Chicago territory, but in spite of the force behind its broadcasts, the modulation is practically perfect. This is accomplished only by close observation by an expert corps of operators.

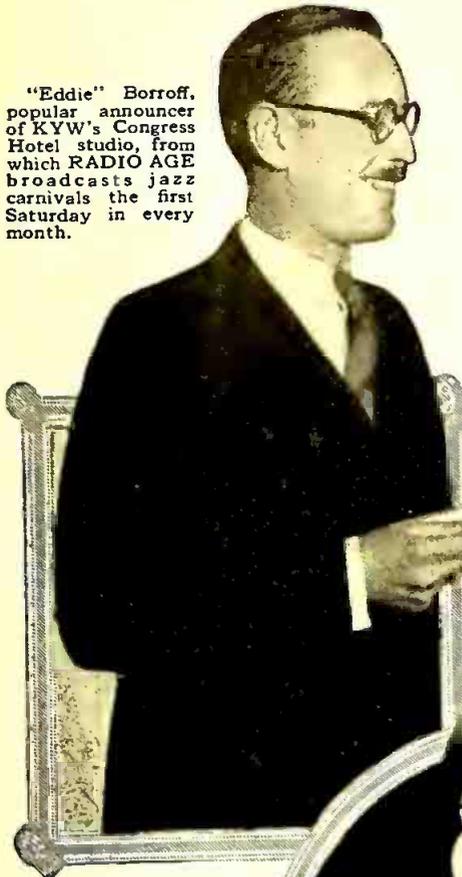


The famous Langdon Brothers, Hawaiian guitar artists who appear exclusively on WEBH programs. They are known from Coast to Coast for their unique presentations.

# Radio Age to Try for Distance from KYW

## All-Star Program to Be on the Air at Midnight, January 3, 1925

"Eddie" Borroff, popular announcer of KYW's Congress Hotel studio, from which RADIO AGE broadcasts jazz carnivals the first Saturday in every month.



And here's Wanda Goll, jazz artist de luxe on RADIO AGE'S midnight show. What she doesn't know about syncopation isn't worth knowing.

(Celebrity Photo)



**F**ROM coast to coast! From Gulf to Canadian Frontier! That was the record set by Station KYW Saturday evening, November 8, when RADIO AGE broadcast its first Congress Hotel Jazz Carnival from KYW, between the witching hours of midnight and 2:30 a. m.

Although the hour was late, it was surprising how many fans managed to stay up throughout the land. The program was as varied as it was excellent, and a corps of telephone and telegraph operators was kept busy for two hours during the program and for three days later checking up on the requests and inquiries at RADIO AGE'S initial effort at jazz broadcasting.

### They're Off!

Managed by the able hand of Edwin Borroff, announcer of the Congress Hotel Studio of KYW, the program started at midnight on the dot, with Coon Sanders' Original Night-Hawks' orchestra from Kansas City. Then Banks Kennedy, RADIO AGE's original song man, started to tickle the keys, and from then on there was no surcease from jazz. From the first strains of Kennedy's latest composition, "Harold Teen," to the dying

strains of "How do you do?" at 2:30 a. m., there was something doing every minute.

Encouraged by this success, RADIO AGE presented another of its monthly popular programs from KYW on Saturday, December 6, from the same studio. This time the star performers were Banks Kennedy, with an entirely new repertoire; Art Linick, the famous "Mrs. Schlagenhauer" of K Y W fame; Axel

planning a long distance test of its program from KYW on Saturday, January 3, from midnight to 2 a. m. Prizes to be announced over the radio will be awarded the first ten listeners who report (by telegram, telephone or letter) the greatest distance reception.

This will be the first time KYW has attempted long-distance tests for some time, and because of the fact that an unusual effort will be made to cross two oceans, the program will be unusually attractive.

Of course, there will be Art Linick, with his inimitable renditions of quaint songs; Axel Christensen will pound the keys in his airy style; and Banks Kennedy and Wanda Goll will introduce the latest in popular melodies.

In addition there will be other headlines. Tune in on Saturday, January 3, at midnight, and hear what Announcer Borroff has to say!

And if you live at a distance from KYW, send in your report of the program for confirmation and win one of the prizes!

By the way, if you really like RADIO AGE'S broadcast entertainers, drop us a line telling your appreciation. And if you have any suggestions, we'll be glad to comply with them.

Here's "Mrs. Schlagenhauer," without the skirts. Art Linick is one of radio's most popular characters. His interpretations are known from Coast to Coast.

(Celebrity Photo)



The demure young lady below is Claiborne Foster, winsome heroine of "Applesauce." She will soon appear on a RADIO AGE radio playlet from KYW with Alan Dinehart, her leading man.

(Wide World Photo)



Christensen, president of the Christensen School of Popular Music and the "Czar of Rag-time"; Wanda Goll, the popular vaudeville artist and radio jazz entertainer; and Rose Marie Meyers, who can sing classical and popular selections with equal dexterity and allure.

### Distance Test Planned

Armed with this group of infallible radio artists, RADIO AGE is now

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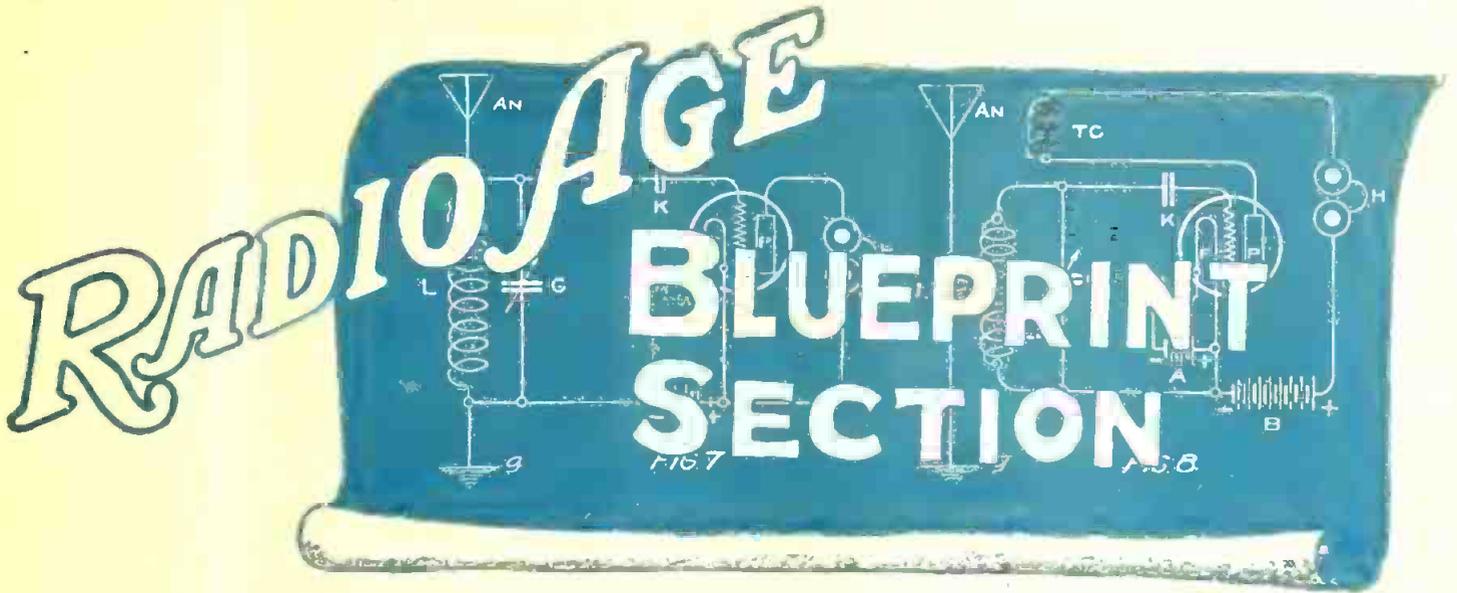


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SAN FRANCISCO



## *Improving a Popular Circuit* The "99" Reflex with Two Stages

By JOHN B. RATHBUN

ACCORDING to the reports sent in by many of our readers, the "99" Tuned Impedance Reflex has proved to be one of the most stable of the reflex circuits yet published by RADIO AGE.

It seems to be less critical in regard to the varying inductance values of the different makes of audio transformers and therefore there is correspondingly less trouble in adjusting the bypass condensers than with other reflex types. We have had a great many complimentary letters on the single tube "99" Tuned Impedance Reflex described in our April issue, and for this reason the writer resolved to expand this set into a three tube affair having a still better range and much greater volume.

At first, the idea was to reflex all three tubes, thus attaining three stages of radio frequency amplification and two audio amplification stages, but on actual trial the circuit became so complicated that I became rather doubtful about suggesting such a hook-up for beginners. With all three tubes reflexed, we attain wonderful volume and range but at the expense of several rather critical adjustments which would probably keep the technical department of RADIO AGE in hot water for several months to come.

As a result of many trial hook-ups, it was finally decided to place one stage of tuned radio frequency ahead of the single tube "99" circuit for distance, and then to add one stage of audio for increased volume. This combination works out very nicely and is only slightly inferior to the circuit in which all three tubes are reflexed. It is equivalent to two stages of radio and two stages of audio amplification and compares very favorably with a five tube neutrodyne, when properly built.

One more desirable feature in addition to the greater range and volume is the selectivity. We can get through almost

### *How 3 Tubes Will Give Better Range*

any local jam and bring in distance by virtue of the three controls, and in this respect it is one of the sharpest tuning sets I have yet worked with. In addition to the original two controls we have the tuned radio frequency unit which sharpens up the set to a point where we bring them in and out on a feather edge. Vernier condensers must be used for this reason on all of the stages.

As with all ordinary reflex circuits, a crystal can be used successfully as a detector and its use brings that clear, clean tone that is an impossibility with sets using oscillating type tube detec-

tors. However, to avoid the several drawbacks for which the crystal detector is responsible and at the same time to avoid the tube noises inherent in the three element tube detector, I have shown the two element tube in this role, which is non-oscillating and which gives the same pure tone as the crystal. These "Fleming Diode and the Tu Valves" eliminate the necessity of frequent crystal adjustment and at the same time give slightly increased volume. These tubes are simple and cost hardly more than a good crystal detector. Three element tubes should not be used for the detector unless range is to be attained at the expense of tone.

#### Circuit in Detail

FIGS. 1-2 show the circuit of the three tube "99" Reflex, Fig 1 being a picture diagram while Fig. 2 is a conventional diagram with the various parts denoted by symbols, the latter being of use to the more experienced builder who wishes to trace out the functioning of the circuit. Fig 3 is an isometric view showing the appearance from the back of the panel and the general arrangement of the apparatus, but should not be used exclusively for hooking up the set as several of the wires are concealed behind the various units.

On examining Fig. 1 or Fig. 2 we see that two common air core radio transformers or "neutroformers" (RFT-1) and (RFT-2) are used for coupling the R. F. stages. They are preferably tuned by the 17 plate (0.00035 mf) condensers (C1) and (C2) of the vernier type.

Right here I see a deluge of mail coming in with the question "Can I use 23 plate condensers?" You can use the larger condensers but you will find that the range of wavelengths is covered over a shorter arc of the dials, and hence the tuning is made more difficult and critical. This is the only objection to the

*(Turn to page 48)*

#### KEEPING UP WITH THE LATEST IN RADIO

The RADIO AGE blueprints are the latest in radio development. They describe graphically and clearly every step to be taken in the construction of the season's most popular circuits. The careful radio fan cannot afford to be without them.

The RADIO AGE ANNUAL for 1925 contains a 32-page blueprint section that will be treasured by every home radio builder. Sixteen pages of this unusual section will consist of real blueprints—the kind that have made the RADIO AGE blueprint section the talk of the radio world.

Order your RADIO AGE ANNUAL for 1925 NOW to insure your getting one of the first copies. \$1 a copy.

Blueprints of The Tuned Impedance Reflex with Two Stages on Pages 42 and 47.

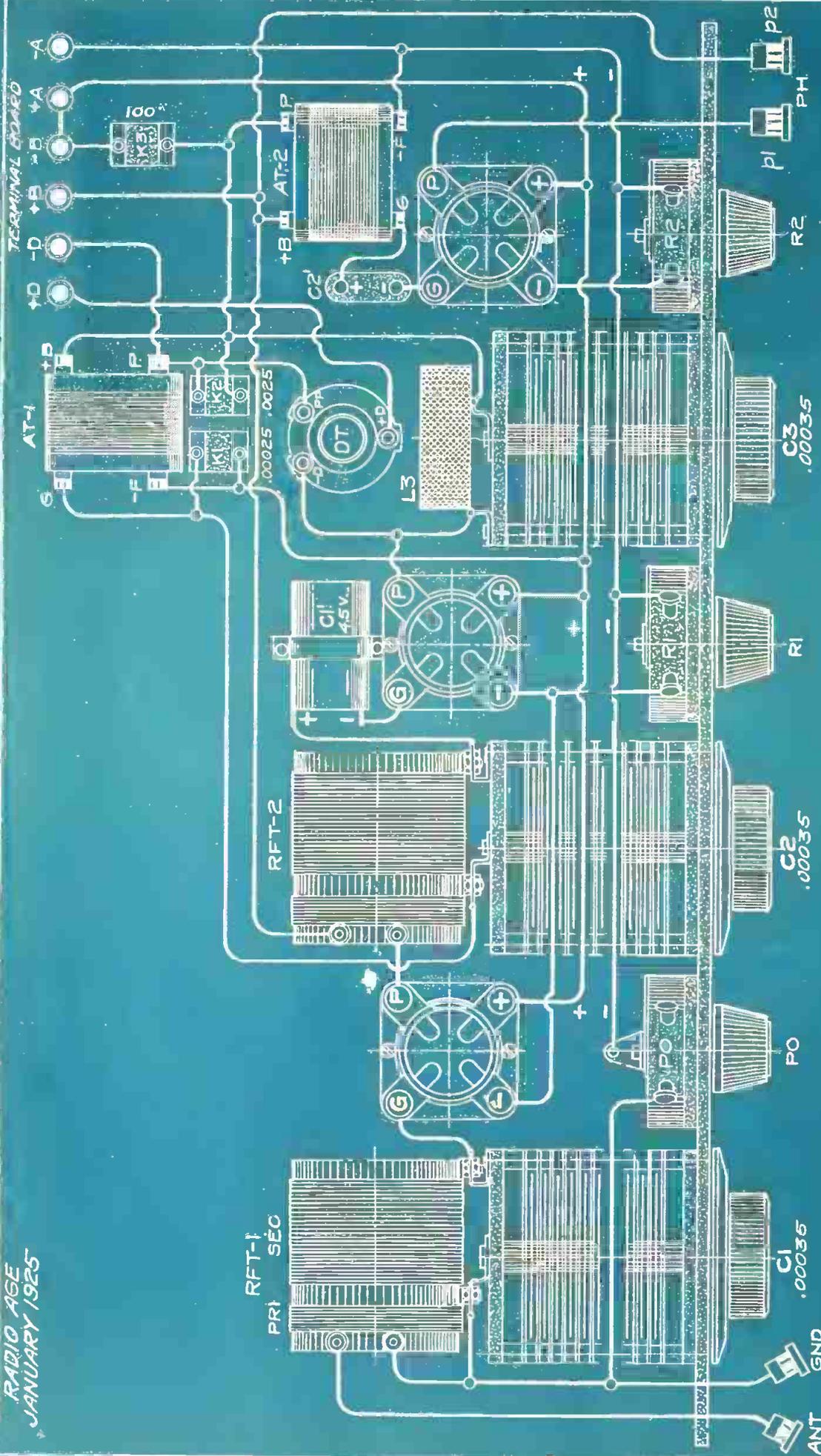


Fig. 1

TWO STAGE "99" REFLEX

TWO STAGES OF RADIO, DETECTOR, TWO STAGES OF AUDIO FREQUENCY AMPLIFICATION. A TWO ELEMENT "DIODE" TUBE IS USED AS A DETECTOR AT DT ABOVE, BUT A CRYSTAL CAN BE INSERTED INSTEAD OF THIS TUBE IF DESIRED. TUBES T1, T2, AND T3 ARE OF THE "HARD" AMPLIFYING TYPE, UV-199, C-299, UV-201A, C-301A.

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RADIO AGE, INC.  
CHICAGO, ILL.

PAT. PENDING.

J. B. RATHBUN  
RFX-550

# No Frills, But Real Service With A Tuned Plate Regenerative Set

By JOHN B. RATHBUN

**P**ROBABLY one of the most effective types of straight regenerative circuits and the simplest to build is the "tuned plate" type in which the plate circuit is tuned to resonance with the grid circuit by means of a variable inductance such as a variometer.

While I do not present this well known circuit as anything new in its entirety, yet by the use of an aperiodic coupler I am sure it is far more selective than the older arrangement with a variocoupler and that it is far easier to tune. With a single stage of audio amplification as shown in the following blueprints, it is an exceedingly good DX set and gives good volume on distant stations. The same tuner coil and the same variometer can be used as was specified with the Baby Heterodyne II.

Fig. 1 is a "picture diagram" of the circuit arranged for the use of the beginner. In Fig. 2 is a schematic diagram by which the action of the circuit can be more easily traced out by those experienced in handling symbolic diagrams. In the following description we will refer, therefore, particularly to Fig. 2, although all three views bear the same reference numbers and figures. By this system of lettering, the novice can trace back and forth between the two diagrams and thus become acquainted with the conventional symbols which mean so much to the experienced radio man.

## How to Increase Range

**T**O BEGIN with, in every type of straight regenerative circuit, some of the amplified plate energy is fed back into grid or input circuit of the tubes, thus increasing the potential acting on the grid of the tube and increasing the range and signal strength of the circuit. For example, the feeble little impulse induced by a distant station in the aerial enters the antenna binding post (ANX), passes through the primary coil (L1) and thence to ground through the ground post (GND) and the dotted ground wire. That is, the antenna current of the station to which the set is tuned passes to earth in this manner, the remaining waves from other stations being "choked back" by the self-inductance of the system.

While passing through the primary coil (L1), the current sets up a slight magnetic field which threads its way through the turns of the adjacent secondary coil (L2) of the tuner and "induces" or creates a current in (L2). The induced current, known as the "secondary current" acts on the grid of the tube through the grid condenser (CG) and leak (GL), thus causing the relatively powerful local battery current to flow in step with the pulsations in the aerial. In effect, the tube is now simply a form of current relay or valve by which a feeble pulsating current controls a rela-

## Attaining Selectivity With An Aperiodic Coupler Added To a Well Known Circuit

tively much more powerful battery current in the same way that a slight movement of the hand on the throttle regulates a powerful steam engine or heavy stream of water.

### Inductance is Varied

By means of the variable condenser (C1) the inductance of the coil (L2) is varied so that the circuit can be tuned or brought into step with the frequency of the desired station. Coil (L2) by acting inductively on (L1) allows only the current of the desired frequency to pass to earth. The number of turns of wire on (L2) and the capacity of the condenser (C1) determine the frequency of the circuit or the wavelength to which it may respond. Increasing the number of turns on (L2) or increasing the capacity of (C1) increases the wavelength of the circuit. In the same way, cutting down the number of turns or the capacity of condenser (C1) lowers the wavelength of the system. As it is far easier to vary the capacity of (C1) than to alter the number of effective turns, the number of turns on (L2) is fixed at some value so that the operation of (C1) will cover the complete band of broadcasting wavelengths. The number of turns on (L1) is not of so much importance in this respect, but in any case the turns on (L1) are only a small fraction of those on (L2).

### Tubes or Crystal?

**I**F WE were to depend completely upon the signals produced in this way, the vacuum tube would not be so very much more effective than a crystal detector for the reason that the potentials acting on the grid of the tube are very feeble and the amount of battery current controlled would be correspondingly small. The "amplification" or "multiplication" of the tube would not be sufficient to give us the tremendous distance and signal strength attained by the tube when used in a "regenerative" circuit. As matters stand at this point, the relayed battery current from the "B" battery (B) passes through the plate circuit (12-13) from the positive side of the battery (+), through the phones (PH) and back to the tube plate at (P). Inside the tube this current flows through the vacuous space between the plate (P) and the filament (F) and returns to the negative side (-) of the battery

through the wires (9-15). Each change in the rate of flow in this circuit moves the diaphragms of the phones (PH) and thus produces a sound.

As the grid (G) of the tube is between the plate (P) and filament (F), it acts like a valve on the current flow. When the aerial current induces a negative charge on (G), the current flow is instantly checked. When the incoming signal imparts a positive charge to (G) then the rate of flow is increased. Each one of these changes in the rate of flow causes movements of the head-set diaphragms in proportion to the intensity of the incoming waves. During this process of amplification, the incoming waves are "rectified" or checked so that only waves of like polarity pass through the tube. This rectification makes it possible to develop the "modulation" or voice frequency waves upon the phones, as the frequency of the radio frequency waves is far too high to cause diaphragm movement.

Thus the tube acts in two roles. In the first place it amplifies the incoming signal waves, and (2) the tube rectifies these waves so that the voice frequency impulses are developed in the phones. We are not directly concerned with the rectification factor at present in describing the regenerative circuit; hence we will let this matter drop and consider only the means of amplification.

Named according to the tube elements with which they are connected, we have the grid circuit at (6-4-L2-7-8) and the plate circuit at (11-VA-12-13-14-9-15-F). The grid circuit is the "input" of the tube while the plate circuit is the amplified "output." As the current in the plate circuit is very much heavier than that in the grid circuit, it is evident that the output could be further increased if we could feed some of the plate current back into the grid circuit for re-amplification in the tubes.

Thus, the plate current could be amplified a second time with corresponding increase in the output, and this is exactly what is done with the "feedback" type of regenerative circuit. In one type, the conductively coupled regenerative, the plate (P) is directly connected to the grid circuit as at (4) or to the aerial circuit wire, (2). In another type, the plate current is led through a "tickler" coil which acts inductively on the secondary coil (L2).

In the present "tuned plate" regenerative, the feedback is "capacitive"; that is, the plate current is fed into the grid circuit through the internal capacity of the tube, control being had by means of the variable inductance or variometer (VA.) It will be seen from Fig. 2 that the grid (G) and the plate (P) are like the plates of a condenser in regard to

(Turn to Page 46)

Blueprints of the Tuned Plate Regenerative on Pages 44 and 45.





## A New Twist to the Tuned Plate Regenerator

(Continued from page 43)

each other, and therefore grid current can be fed into the plate circuit or plate current can be fed into the grid circuit through the capacity of this condenser, providing that the two circuits are brought nearly into step or "resonance" with each other.

The inductance of the variometer (VA) is varied until the grid and plate circuits are nearly in resonance, and when this is attained, plate current feeds across (P) and (G) into the grid circuit, producing "regeneration." This causes a tremendous increase in the output of the circuit with corresponding increases in range. Without regeneration the ordinary range of the tube would probably be between 50 and 100 miles. Adopting the regenerative principle makes 1,000 miles an ordinary range on voice transmission and even 2,000 miles is not unheard of.

### Units and Dimensions

NOW we will get down to the practical description and give specific instructions for the building of this receiver. We can now include the picture diagram, Fig. 1, and the isometric view of Fig. 3, which shows the general arrangement of the apparatus behind the panel. With the exception of the aperiodic coupler (L1-L2) all of the apparatus is standard. There is nothing at all critical about the set and even the inexperienced need not hesitate. For those experimenters who have built the Baby Heterodyne II, I will say that the same tuner, variometer and condenser can be used for building this circuit, and several of our readers have already done this successfully. The aperiodic coupler has been described many times in these columns, but for the benefit of the newcomers, I will repeat these specifications.

Both the primary (L1) and the secondary coil (L2) are wound on the same cardboard or bakelite tube. This tube is about three inches in diameter and four inches long. Coil (L1) consists of 15 turns of No. 26 double silk covered wire, wound 1-2 inch from one end of the tube. The secondary coil (L2) contains about 60 turns of the same size wire and is started about 1-2 inch from the end of coil (L2). In other words, there is 1-2 inch space between (L1) and (L2). Under certain conditions, particularly with long aeriels, it may be necessary to reduce slightly the number of turns on (L2), say by five to eight turns, in order to bring in stations on short wavelengths around the 200-meter mark. This is best determined experimentally at the time the set is built, owing to the great variation in the constants of commercial condensers and variometers.

To avoid long wires, it is generally best to support the coil on the back of the condenser by means of short brass brackets which also serve as the connections (4-7) between the coil (L2) and condenser (C1). The jumper wire connection (3) may or may not be necessary, depending upon local conditions, but as

a rule this is desirable, as it greatly reduces body capacity. The extreme outer turn (c) of coil (L2), the end farthest away from the primary (L1) should be connected to the grid line (4-5), and it should be particularly noted that the "stator" or stationary plates of (C1) should be connected to (c), and also (4-5). If this is not done, then there is likely to be trouble with body capacity.

Any standard variometer will work well in this circuit, but if possible, obtain a "plate variometer" especially designed to work in the plate circuit. This variometer has fewer turns of heavier wire than the "grid" type variometer. However, both will give results if it is impossible to obtain these distinctive windings. It will be well to keep the variometer well away from the tuning coil (L1-L2) so that there will be no coupling between the two units, and for the best results it is better to incline the coupler at a considerable angle so that the axis of the coupler does not coincide with the axis of the variometer stator.

Condenser (C1) should be of the vernier type, capacity 0.0005 m. f. (23 plates). This form of coupler is very sharp and a vernier arrangement of some kind is therefore highly desirable. For the tubes ordinarily used, the grid condenser (CG) should be of the mica type with a capacity of 0.00025 mf. While a variable grid leak is the best, a 1.0 megohm fixed leak will generally be very satisfactory. The bypass condenser (K1) has a capacity of 0.002 mf. and is effective in reducing the impedance of the plate circuit, for the phones (PH) and the "B" battery both introduce a high resistance to the radio frequency currents in this circuit. The "B" battery voltage may range from 16 to 45 volts, but with the average tube it is likely that 22.5 volts will be perfectly satisfactory.

### Picking the Tubes

ANY type of standard tube will give satisfactory results, ranging from the WD-12 to the UV-201A or the UV-200. The latter is somewhat more sensitive as a detector and will give good results on voltages not much exceeding 22.5 volts. This tube is sharper and more critical than the hard tubes. The battery "A" depends upon the tube used. For the WD-12, a single 1.5 volt cell of dry battery is used. For the UV-199 we use three dry cells in series, giving a total of 4.5 volts, while for the UV-200 and UV-201-A a six volt storage battery is best.

It is best to leave the aerial and ground wires (1) and (2) connected temporarily until the set is completed and can be tuned in. Now connect the aerial (AN) and the ground connection (GND) to (a) and (b) alternately, until the best results are obtained. When this is determined, the connection of the primary (L1) can be soldered in permanently. There is one connection that is best and experiments alone can determine this.

As with all regenerative circuits, this circuit will re-radiate from the aerial if not carefully handled, but owing to the small ratio between the turns on coils

(L1) and (L2) this effect is not as bad as with the majority of circuits of this nature. It is nowhere near as bad as a single circuit tuner and is better than the majority of vario-coupler types having a greater number of turns on the primary. The looser the coupling between (L1) and (L2) the less trouble there will be from local "razzing" and interference.

Do not let your tube whistle or howl in tuning, and when you tune into a wave, tune in sharply. Don't get in on the fuzzy edge of a wave. Don't keep your tubes heated up to bright incandescence. If you obey these instructions, you will not cause much disturbance in the neighborhood.

From those of our readers who have tried out this circuit from sketches mailed to them before this article was written, we have had remarkable reports on its selectivity and range. It is a simple, stable circuit without any gew-gaws, and should appeal to the beginner in radio.

## Making Everybody Happy from WEAF

(Continued from page 28)

become familiar to millions of radio listeners in all parts of the country. It has covered the country quite thoroughly, for no less than eighteen stations were linked together with WEAF when he announced the conventions' proceedings.

McNamee's abilities are not limited to handling political events. He is a baritone of no little distinction, having won the encomium of such renowned critics as Richard Aldrich, W. J. Henderson, Henry T. Fink and others. In spite of the demands of WEAF's microphone, McNamee still appears as soloist in some of New York's famous churches.

### Expanding Old New York

OLD Broadway and Fifth Avenue have been much spoiled by celebrities, for Father Knickerbocker breeds 'em big. Before the advent of radio, New York had sole claim to these favorite sons and daughters, and Main Street and the rolling prairies and mountains beyond caught a glimpse of their greatness only through the Sunday newspapers or when they made a rare tour into the wilderness of the Great West.

However, to WEAF is due the credit of pioneering in the field of radio and giving, in tones of sound, the privileges of becoming acquainted with the great. Thus, the Bowery of New York and the stockyards of Chicago were put on an equal plane. The greatest individuals of all time, including stars of the stage and lights of the political world, have been in the studio of WEAF.

The privilege of announcing these celebrities has fallen in a large degree to A. V. Lufrio, accompanist and announcer. As announcer his voice has become familiar to millions, and as accompanist he has broken records, for he has accompanied more entertainers than any other individual in the country.

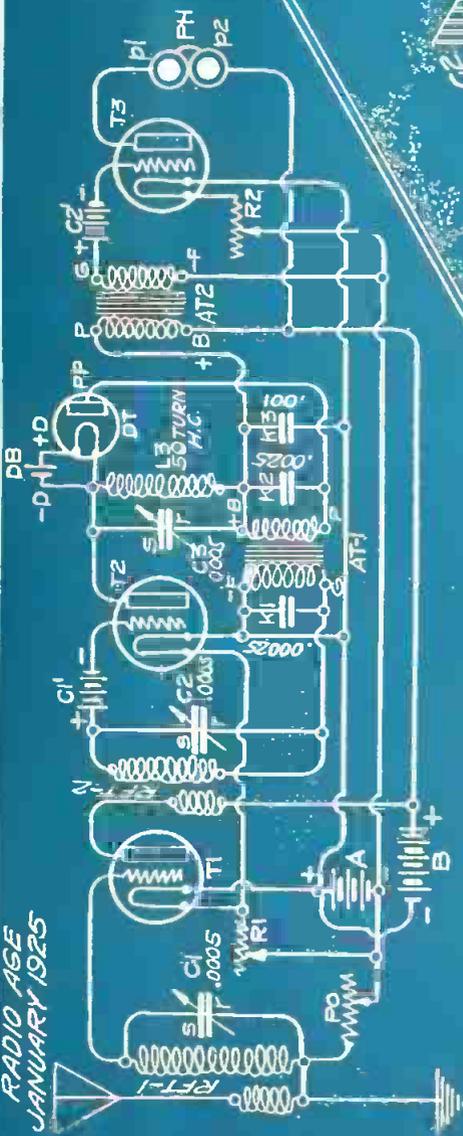


FIG. 2  
SCHEMATIC WIRING DIAGRAM

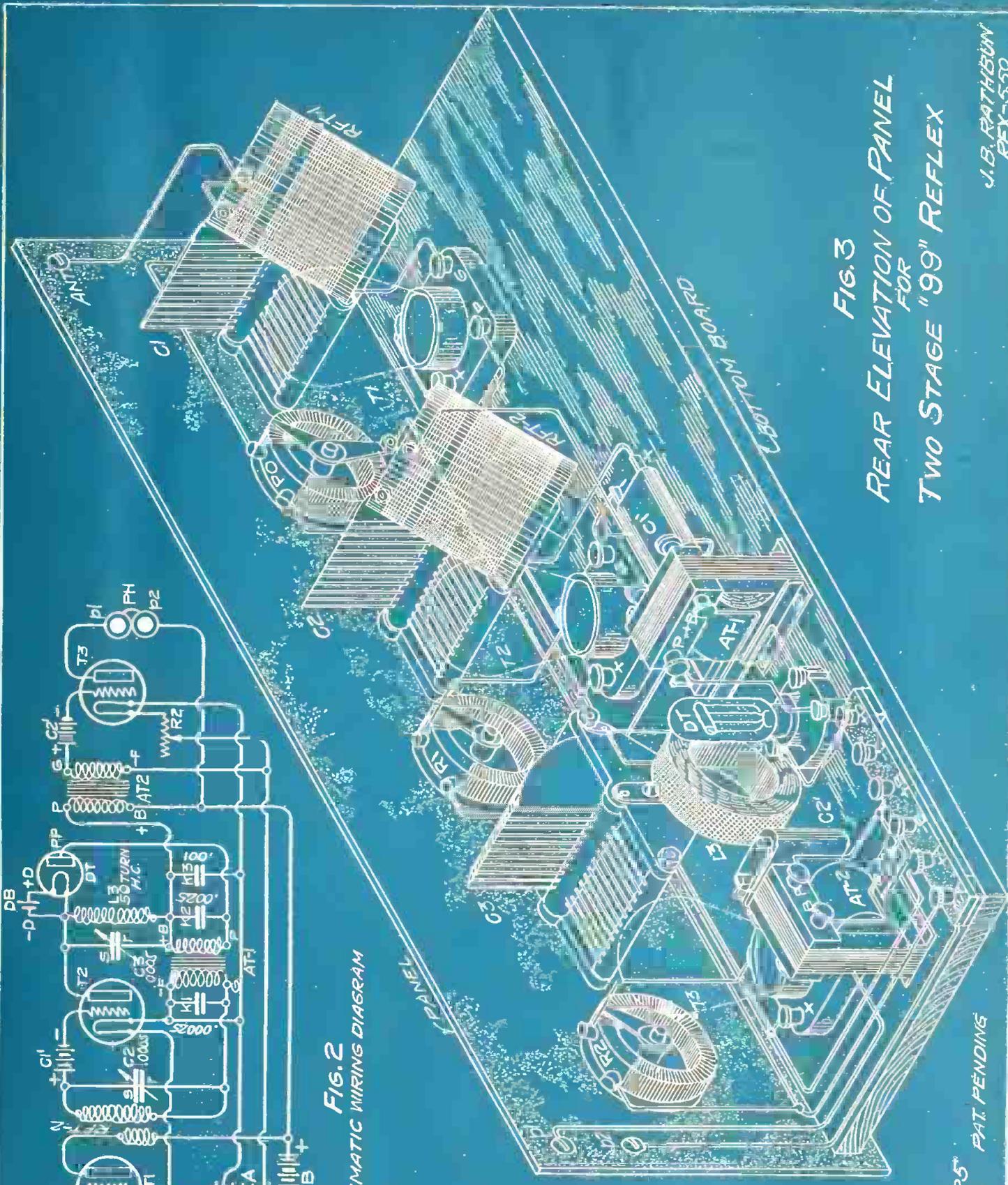


FIG. 3  
REAR ELEVATION OF PANEL  
FOR  
TWO STAGE "99" REFLEX

## The "99" Reflex Receiver with Two Stages

(Continued from page 41)

23 plate (0.0005 mf) size. It is far the best to buy the transformers (RFT-1) and (RFT-2) as the home made coils are seldom entirely satisfactory, and in the end they often prove even more expensive than the home wound units.

For those who are determined to wind their own coils, however, I will say that they are wound on two tubes, an outer tube 3" diameter and an inner tube 2.5" diameter, either of cardboard or bakelite. The secondary coil consists of 60 turns of No. 26 D. S. C. wound over the outer tube while the primary contains 12 turns of the same size wire wound at one end of the inner tube. The primary coil is so located that it lies just beyond the end of the secondary and so that there can be no capacity coupling between the two. For convenience, the transformers are attached to the backs of the variable condensers by brass brackets and are tilted up so that they are not magnetically coupled, say at an angle of about 60 degrees with the horizontal. Please note that the outer turn of the secondary coil on the end farthest from the primary goes to the grid of the tubes. Also note that the rotor (movable part of the condensers) go to the (-A) line while the stators (stationary blades) are connected to the grid (G) circuits.

At (L3) we have the tuned plate inductance which consists of a 50 turn honeycomb or 50 turn stagger wound coil, this being tuned by the 0.00035 mf vernier condenser (C3) which is of the same capacity as the other variable condensers. This comprises the tuning controls. All of the amplifying tubes (T1-T2-T3) are either of the 199 or 201A type operating on a "B" battery voltage of 67.5 to 90 volts. The two element detector tube (DT) is shown in place of the crystal detector as it is more difficult to show this than the crystal.

The negative (-D) is connected to one side of the circuit while the plate is connected at (PP). The positive (+D) goes straight to the detector battery (DB) without further connection to the circuit or rheostat.

As the diode tubes are 1.5 volt tubes, it is best to use a single separate dry cell for this tube as shown at (DB). As this tube is not critical no rheostat need ordinarily be used although it is sometimes desirable to cut down the flow of current with a fresh battery. When a crystal detector is used, connect it between (+D) and (-D), of course omitting the battery (DB). Either one or the other detector may be used with perfect success.

### The Audio Circuits

**T**UBE (T3) is the audio amplifying tube connected to the first part of the circuit by the audio transformers (AT-2). This forms a simple single stage of audio amplification, and to insure maximum volume, clarity, and minimum "B" battery current a 4.5 volt "C" battery marked (C2) is used. The (-) pole of the battery goes to the grid post (G) of the tube socket. The first audio

frequency transformer (AT-1) is the reflex transformer used in the single tube "99" circuit and is connected in just as before.

It will be well to examine the four markings shown at the ends of the primary and secondary coils of these audio transformers so that no mistake will be made in connecting them up. The "C" battery (C1) is also a 4.5 volt battery used for biasing the radio frequency stages. A potentiometer (PO) of 200 ohms is connected like a rheostat in the grid return to suppress oscillations.

As all of the bypass fixed condensers (K1, K2, K3, etc.) are marked with their capacity on the blueprints, it seems hardly necessary to describe them further, except to state that they should all be of the mica dielectric type. Various makes of transformers have different inductive values, but in general these fixed bypass condensers will work well with almost any type or make of audio transformer. The ratio of the audio transformers is not critical but two 5/1 ratio transformers are probably the best. At least do not use a ratio higher than 6/1 for transformer (AT-1). A higher ratio can be used at (AT-2) with some increase in distortion.

So sharp is the tuning of this circuit that some practice will be required before distant stations can be brought in. If the dials are not moved very slowly, point by point, you will surely skip over a "hot spot." Dial whirling will bring you nothing and in this respect the tuning greatly resembles that of a neutrodyne. First, set all of the variable condenser dials at (O), where the plates are fully out of engagement, and then move (C1) by one dial division. Next move (C2) by one division and then (C3). Now start at (C1) again and move this one more division, following by corresponding movements of (C2) and (C3). Keep this up until you strike a wave. After the stations are found they should be logged in a memorandum book with their wavelength and the dial settings that brought them in. With such a record it is then a simple matter to find any station in the list at any time.

Crystal detectors should be carefully inspected and tested before installing them to be assured of their sensitivity. Carefully observe the polarity of the various connections. Polarity is of the greatest importance.

Do not use WD-12 tubes for they are poor R. F. amplifiers. Keep the "B" battery voltage above 45 volts. The ordinary 22.5 volts used with regenerative outfits will not work.

Tubes (T1) and (T2) both being radio frequency amplifiers can be controlled by the single rheostat (R1) as shown. In this respect it should be noted that this rheostat should only have half the resistance required for a single tube of the same type. Thus, if 199 tubes are used, which require a 40 ohm rheostat for a single tube, the resistance for two tubes should be 15 to 20 ohms. Two 201A's can be handled on a 7.5 ohm rheostat. The single rheostat (R2) controls only the audio stage tube (T3), hence this should be of higher resistance than (R2). Probably 40 ohms for a 199 and 15 ohms for a 201A would be proper for (R2).

## Midget Reflex Notes

**A** GREAT number of letters have been received by RADIO AGE from those who have built or attempted to build the Midget Reflex published in the blueprint section of the November issue. For the benefit of those who have experienced difficulties I will give a little additional information which I trust will set them right. With a little care and attention to minor details, the Midget will perform very well, and in fact is now in production by a Chicago radio set manufacturer as one of the leaders in his line. It has been thoroughly tested out in every particular, and for so simple a rig it has given very good all around results.

Like all reflex circuits, the performance of the Midget is largely dependent upon the characteristics of the audio transformer and particularly on the impedance values of the windings. (See Figs. 1-2 of October issue.) The variations among the different makes of transformers call for different values of the bypass condenser (K2), and in some cases the distributed capacity of the primary winding is so great that the condenser must be completely removed from its present position across the primary winding and then connected across the phones and "B" battery. The adjustment must be made for each different make and ratio of audio transformer. This adjustment does not apply only to the Midget transformer—it applies to all reflex sets. Again, some good makes of audio transformers give excellent results on straight audio amplification but are entirely unsuited for reflexing.

Out of a number of local Midget sets which I have serviced directly, I have found many errors in the connections; in fact this seems to be the major trouble. There is a decided tendency toward short circuiting the transformer primary by making connections to the wrong side of the fixed condenser (K2), the current in this case going straight through the crystal to the ground without affecting the audio transformer at all. This mistake occurred in five cases examined; hence I am of the opinion that it has happened in many sets that I have not been able to inspect. In shooting trouble for the local fans I have found five instances where the crystal detector (CD) was connected to post (PI) instead of to post (B1) as it should have been, and with this error the transformer is of course perfectly useless. If your set functions best when the catwhisker is removed from the crystal, this may be one of the reasons. One side of the crystal detector must be connected to post (B1) and not to post (P1). Look at your set and see that this connection is made properly.

Two cases of error were corrected for readers who misunderstood the purpose of showing a part of the circuit in dotted lines (Fig. 2), they assuming that the dotted lines indicated that these wires could be used or omitted at pleasure. All lines whether solid or dotted must be used in the circuit. I showed certain

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# Pick-ups and Hook-ups by our Readers



THE material appearing under the title "Pickups and Hookups by Our Readers" in RADIO AGE, is contributed by our readers. It is a department wherein our readers exchange views on various circuits and the construction and operation thereof. Many times our readers disagree on technical points, and it should be understood that RADIO AGE is not responsible for the views presented herein by contributors, but publishes the letters and drawings merely as a means of permitting the fans to know what the other fellow is doing and thinking.

WE have noticed in the past few weeks a growing number of letters requesting information as to how one may become a Dial Twister, and what the requirements are in submitting contributions to the Pickups and Hook-ups pages. So insofar as this is the January number, and the proper time to make resolutions, we are going to set down a few rules for those uninitiated, with regard to membership and contributions to these pages.

First of all, anyone can be a member—makes no difference if you're twelve or forty, you are just as welcome to write in. When you write to this department, please make your communications as neat as possible (they really stand a much better chance of being published), write them in ink or on the typewriter, and do it neatly on a piece of honest-to-goodness correspondence paper. In the past year we've had contributions that were written on the back of shoe boxes, billheads, calling cards and what not—with the result that they went into the bloody rettytsnitch under our desk because they were not even worthy of consideration because they were not neat. Reading the mail of the Pickups Section is no little job, and if it is made harder by poor contributions, it is easy to see that your contribution won't stand half a chance against another that is more neatly prepared. So much for that.

Now then what you write about. Whatever you do, make your subject an interesting one. A good humorous letter telling of a funny radio incident is always welcome, and quite a rarity. We are always partial to a good description of a circuit that has been giving especially good results. In describing circuits, make the description short, interesting and meaty—don't waste a single sentence. Diagrams and specifications should accompany. If they are neatly drawn in black ink, we'll publish them as you draw them—if not, we redraw them as best we see fit.

Good lists of stations heard are of course always welcome. We experience no little satisfaction when one of our number has done a creditable piece of DX (the set you use does not count). What we seek to compare is results—and we doubt if you can find a better place than the Pickups Section to do it. Station lists should be typewritten if possible, or else neatly and carefully printed. Hereafter, do not list stations under five hundred miles distant. Of course if you use a crystal set, and hear 300 or 400 miles, by all means tell us about it—but

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tube sets are not working right if they don't do at least 500 mile work with the present sending powers used—if you can't do any better, the Technical Information service is the proper place for you to write. And remember in listing stations, it's quality that counts—not especially quantity.

There has been a terrible lack of good photographs for these pages—and we are herewith dropping the hint that they are always viewed with special favor. Let's have a few. Gloss prints are necessary—any photographer will make them, and good clear photos are almost a necessity. Of course we can retouch them, but if you save us the trouble in the first place so much the more chance of your contribution being available.

Now then, if your contribution is really worth while, we'll print it. You'll have to leave that up to our judgment, since our experience in this line tells us just what one fan will like, and what another will rave about. However, if your contrib. does not make the "line" don't feel bad about it—it's appreciated just the same, and your name will be listed for reference when another fan wants to be QSO (in communication) with another fan who has had something to say on a certain subject.

So as evidence of the fact that a fellow has done something along the lines mentioned that was especially meritorious, and of constructive nature to the radio game, we have been giving out a little button. It signifies that the fellow wearing it is a real radio man—that he knows the game from a human angle—that he has experienced the taste in his mouth like unto a blacksmith's apron or the inside of a motorman's glove after listening or experimenting for hours, or that he has had some experience with the game that was worth while mentioning. And believe us, we've seen fellows wearing that little button on their chests as one fan put it "With my chest sticking out two feet, I was so proud."

The only real requirement that exists, is that you have to be a reader of RADIO AGE (not necessarily a subscriber), so now that we've got that off our hook, let's hear from you all—

Don't be a Dead Spot!

—THE PICKUPS EDITOR.

We've got a peach of a starter this month for you. A fellow by the name of Mr. A. E. Irelan, living at Sharon Hill, Pa., has turned out a circuit that he has found gives wonderful results. What makes us to call it wonderful is that he encloses a notation that on December 19 (Tuesday); 1923, he tuned on SPE Rio de Janerio, Brazil. The notation further says that while the programme was entirely foreign to him the call letters were very plain, and there was no doubt about their identity.

Since that time, Mr. Irelan has tuned in two stations in England, one in Brazil, and several in Canada, Cuba, Hawaii, California, and Washington. We are printing his circuit in Figure 1, with the hope that it may be of interest to some of the other fans. In his letter to this department he says:

## IMPORTANT NOTICE Regarding Technical Information Service

**A**FTER January 1, 1925, the Technical Office of RADIO AGE will operate under the following rules:

(1) Before writing, search your files of RADIO AGE, and you will without question find answers to your inquiries there.

(2) Do not ask us to compare advertised products. Information of this nature should be obtained from the Buyers' Service Department of RADIO AGE.

(3) Don't expect the Technical Office to devote its entire efforts to your questions by asking a great number of them—stick to the subject you are puzzled about, and don't put down everything you think of. Do not request information that requires a large amount of work; give the other fellow a chance.

(4) Put questions in the following form:  
A—A standard business size stamped, self addressed envelope must be enclosed.

B—Write with typewriter or ink, and on one side of the paper only. Number questions so we can refer you to them.

C—Make diagrams on separate sheets, and fasten all correspondence together. Label your diagrams carefully. Failure to fasten your correspondence usually results in losing some part of your letter when the mail is sorted. Put your name and address on each sheet.

D—Write orders for back numbers, subscriptions and the ANNUAL on separate sheets. You'll get an answer sooner if you take the time to write your questions on sheets separate from the orders.

E—Keep a copy of your letter and diagrams so that we can refer you to them.

F—Address all requests for information to RADIO AGE, Inc., Technical Office, 500 North Dearborn Street, Chicago, Ill.

RADIO AGE.  
Gentlemen:

As I am a great reader of your magazine, and take great interest in the new circuits you publish from time to time, I couldn't but help noticing that hookup of Mr. Chapman's in the November issue. I have a criticism to make of his circuit since he failed to indicate the use of .002 condensers in the grid circuits of the audio tubes. I use only three tubes, and have wonderful results.

Last week I had the pleasure to hear KDPT, KPO, and KGO on the loud speaker with good volume. At present I'm listening to KFPM as I am writing to you.

I am at present working on the design of a new coil of the low loss type, and I have hopes that it will be still better than the first one.

I hope that the enclosed matter will be of some value to readers of your unusual magazine, for which I wish the greatest success.

Yours truly,

A. E. IRELAN,

Sharon Hill, Pa.

STAND BY

Mr. Irelan's contrib is one of the reasons why we started this Dial Twister business. We can't but admire a fellow who is generous enough to pass out information of the type he does. Only too many of the fellows in this game are "dead spots" when it comes to helping out the other fellow. We hope that if any of the readers of the Pickups construct Mr. Irelan's set, they will let him hear from them. And the funny part of it is that Mr. Irelan isn't satisfied. Here

he has to go and wind another coil—he thinks he can make it better. Judging from his list of stations heard, and the results he jots down, that is entirely unnecessary. Fine business, DT.

STAND BY

Mr. Rathbun, one of the members of our technical staff, probably better known as the "blueprint editor" asks me to correct an omission for him with regard to his super heterodyne receiver in the December number. Hence the following:

### Heterodyne Oscillator Coil

By some error we omitted the detail sketch of the oscillator coil, Fig. 4, in our December blueprint series and for the information of many of our readers who have written to us on this subject we attach the following sketch. As will be seen from the cut, this oscillator is very small and compact and requires no adjustment after installation.

The windings are placed on two tubes which are held in a concentric position by means of small machine screws and washers. The outer tube carrying the plate and grid coils is 2.5 inches in diameter while the inner tube is 1.5 inches diameter and carries the pickup coil by which the oscillations are impressed upon the grid circuit. All coils are wound with No. 26 D. S. C. wire.

At the bottom on the outer tube is the plate coil which consists of 28 turns of wire. This coil is separated by 1-4 inch from the grid coil above it, the grid coil containing 35 turns of the same size wire. Inside this tube is the pickup coil which is wound at a level with the space between the outer coils or midway between them. The pickup coil has only four turns. For those who wish to avoid the trouble of making this coil, it can be purchased ready made at many radio stores.

We are printing a sketch of the coil in question in Figure 2, and hope to clear up some of the difficulty attached to its omission from the last issue of RADIO AGE.

STAND BY

And now to get back to the Windy City again—Mr. H. F. Graebke of 4148 N. Ashland Ave., Chicago, Illinois, submits the circuit shown in Figure 3. His results are very unusual as his letter tells:

RADIO AGE:

Gentlemen:

First of all, let me put in a good word for your blueprint section; with instructions like the ones you are printing, any dumbbell could make a radio set and not go wrong.

I have tried the Baby Het (shown in the September issue), and have had very good results. However, I did not use the C (bias) battery, substituting a grid leak and grid condenser in its place. After I made these changes, I got excellent results.

I am submitting my list of DX stations heard (through the summer up to the present time) on a single circuit set with the addition of a variometer in the plate circuit. I find that a variometer connected in this way makes tuning much sharper, and gives a much better control of regeneration. I advise this circuit be used with a rather short antenna, and if my advice is followed, I am sure listeners who build the circuit will find interference at a minimum as compared to the average single circuit set.

By using a bedspring as an antenna, I have been able to get stations in the 1000 mile range on a loudspeaker pretty fair, many of them while local stations were doing their darndest. Have heard KGO

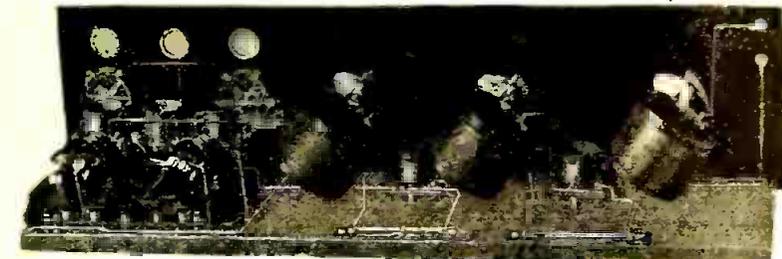


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 1 .001 Condenser  
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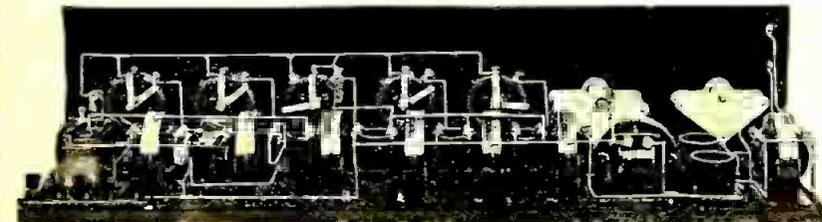
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 2 Bakelite 6-ohm Rheostats  
 2 Bakelite 30-ohm  
 1 Bakelite Potentiometer, 400 ohms  
 1 Carter Double Circuit Jack  
 1 Dubilier 1 mfd. Condenser  
 1 .005 Mica Condenser  
 1 .0005 Mica Condenser and 2 megohm Grid Leak  
 3 .0025 Mica Condensers  
 10 Binding Posts  
 1 .00025 Mica Condenser  
 1 Bakelite Terminal Strip for Binding Posts  
 1 Multicord cable for connecting batteries  
 1 7x30 1/2" Drilled Bakelite Panel  
 1 Baseboard  
 35 ft. Hook-up Wire  
 24 in. Bakelite Dials  
 2 4 1/2 volt C Batteries  
**\$59.75**  
 Complete wiring diagrams, base board layout, blue-prints and instructions.

### COMPLETE PARTS FOR Two Stage Amplifier

with Thordarson or Columbia Transformers; with drilled panel & wiring diagram **\$10.90**

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1000 Mile 1-Tube Set... **\$8.95**  
 with drilled panel and wiring diagram.

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1-Tube Reinartz Set... **\$10.45**  
 3-Tube Reinartz Set... **17.55**

### Randolph Special Headphones

2200 Ohm ..... **\$2.45**  
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containing a thousand bargains of everything on radio—parts, supplies, complete parts for sets, complete sets, etc., also a mine of very latest information on all different circuits, complete list of broadcasting stations, and other valuable, up-to-the-minute radio data. Send your name and address on a card or letter. We will send catalog free.

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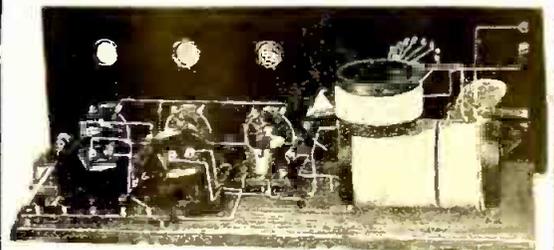
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 3 Bakelite Sockets  
 1 high ratio Columbia or Thordarson Transformer  
 1 Single Circuit Jack  
 1 low ratio Columbia or Thordarson Transformer  
 2 Double Circuit Jacks  
 2 3 in. Bakelite Dials,  
 1 Grid Leak and Mica Cond.  
 1 Bakelite Binding Post Strip  
 7 Binding Posts  
 1 7x21 1/4 in. Drilled Bakelite Panel  
 3 Bezels  
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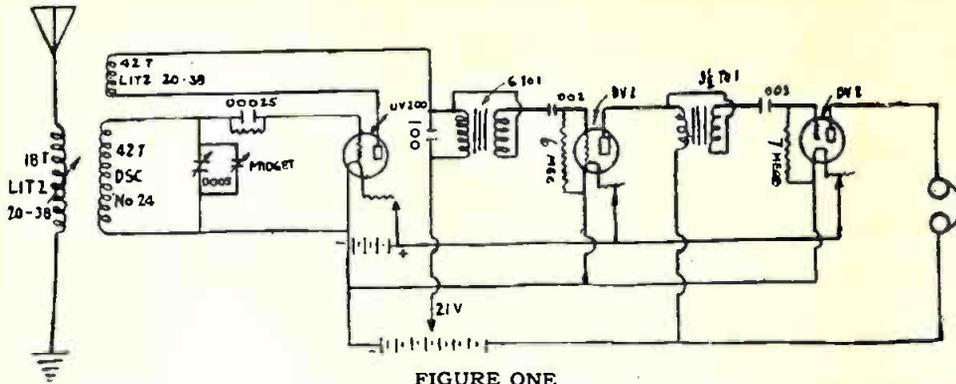


FIGURE ONE

This is the hook-up used in the long distance radio receiver constructed by A. E. Irelan, of Sharon Hill. It makes use of a unique tuning coil, which consists of a primary, secondary and tickler. The primary is "untuned," but its position in relation with the secondary can be varied by sliding it along the tube on which the secondary is wound. This feature, the designer states, adds greatly to the selectivity of the receiver. Attention is drawn to the unusual arrangement of the parts in the two stages of amplification. Fixed condensers are used in the grid circuits of each of the amplifying tubes, while the primary and secondary coils of the transformers are connected in parallel. The use of high resistance leaks on each tube also should be of interest.

Oakland, California, on horn 4 times out of 6 during the month of September. (Editor's Note: Mr. Graebke sent in a list of DX stations heard which certainly entitles him to a DT pin, but due to the length of the list we are not printing it. Excuse, please.)

Maybe my list isn't as long as a lot of others you have printed, but local interference in Chicago is one thing, and receiving DX through it is another. And considering that most of these stations were heard while locals were going, I don't think it's half bad.

Very truly yours,  
**HOWARD F. GRAEBKE.**  
 4148 N. Ashland Ave.,  
 Chicago, Illinois.

STAND BY

Inasmuch as we are well acquainted (probably only too well) with Chicago interference we are in a position to admire Mr. Graebke's heavy hitting. We'll bet he's got his arm in a sling from twisting dials.

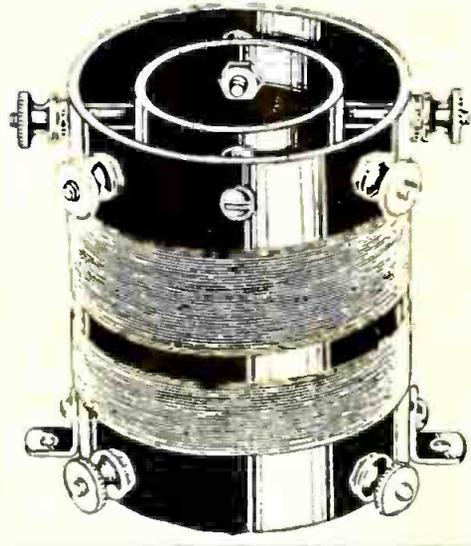
STAND BY

With this issue we are going to start a little "Strays" department. If the fellows like it we will keep it up each month. What we want to try to do is give every fellow who at least deserves acknowledgment a little comment publicly: SO

STAND BY  
**STRAYS**

Mr. Henry E. Wendleborn of 521 S. Gunnison St., Burlington, Ia., submits

FIGURE TWO



a very interesting list of stations heard. It's so long and has so many stations listed on it that we'll bet he's got radio rash on the ears, calloused fingers, and a stare on him (from lack of sleep) like a china doll. He knows a lot about single circuits. Some of you fellows drop him a line.

STAND BY

Mr. W. J. Potter, 15 Auriol Rd., W 14, London, England, sends in an interesting contribution with regard to a comparison of our and English broadcasting systems. We regret we don't have space enough to print it—but hope that we may find an opening for it later. Thank you, Mr. Potter. It was very interesting.

STAND BY

John T. Marshall, Jr. of 286 Indiana Ave., Providence, R. I., submits a circuit (very much like the One Control Go-Getter) which he says he will be glad to give to anyone writing him. We are sorry we can't print it—but would advise any of the bugs looking for improvements on the Go-Getter to write him. Come again, Johnny.

STAND BY

Gilbert A. Slater of 88 Linwood Ave., Pawtucket, R. I., says he did some interesting work with the 1 Tube Reflex and 1 Tube Loop circuits printed in recent blueprints in the RADIO AGE, and is willing to pass the dope on if you'll write him. Wot say?

STAND BY

Felix Fredrickson or Route 2, Delmar, Ia., has a circuit for those long wave British stations, and says he'll hand it out for the writing.

STAND BY

George S. Richardson of 145 St. Julien St., London, Ontario, Can., and C. N. Olson of Saunders, Alta., Canada, are two Canadian bugs who sent in lists that would make you green with envy.

STAND BY

John Tomlin of 303 Madison Ave., Atlantic City, N. J., a sixteen year old boy, sends in a list of stations which is certainly one of the best we have as yet ever seen. On November 28th, 1924, he tuned in fifty three stations in one stretch at the set. The list he submits comprises receptions all the way from KFI at California to 6FL, Sheffield, England, and then back to California with KHJ. In addition, he has heard (at other times) eleven stations on the Pacific coast, 6FL England, 2BD Scotland, PTT Madrid, Spain, VOX HAUS, Berlin, Germany, and Lyons, France. He uses a manufactured set.

STAND BY

Warren F. Bowles of 808 Buckingham Place, Chi—Kago, Banton Cantonian of 1419 Sherman Ave., Evanston, Ill., Ray Elzey 2582 Sullivan Ave., Columbus, Ohio, and Henry C. Reece of Apt. 17, 1419 Clifton N. W., Washington, D. C. all send in exceptionally long DX lists. Our printer gets the heebie-jeebys when we give him long lists like that to set up, so we'll let him off easy this time.

STAND BY

Mr. R. H. Craig of 221 Brown Street, Sault Ste. Marie, Ont., Canada, wants us to tell him what we think about his list of 102 stations heard in 19 days. The verdict is that we're only too glad to make you a DT, and what's more, not only admire your list of stations but the careful way in which you kept check on your listening time.

STAND BY

If Julian Lopez will send in his address, we'll send him a button. His list makes him a Dial Twister, and there's a button waiting here for him.

STAND BY

Harold R. Bigelow of 118 East 26th St., Chicago, Ill., got an English station three times at different times with a three tube neurodyne built after plans (of Mr. Rathbun) in a recent issue of RADIO AGE.

STAND BY

Joseph A. Sumner of 18 Morton Ct., New Bedford, Mass., says the circuit of the November issue (the Low Loss Regenerator) is a peach. He sends in a list of DX stations to substantiate his claim.

STAND BY

Jas S. Heyser of 1005 Swissvale Ave., Wilkinsburg, Pa., George R. Milges of 6200 Dorchester Ave., Chi—Kago, Ill., Billie Broker, 509 Lecka Ave., Ft. Smith, Ark., A. J. Kralovec of 411 Somerville Ave., Menominee, Mich., W. Worwood, Jr., 1 Montcalm Street, Bienville, Levis, P. Q., Canada, and Robert S. Shull, 136 East Queen St., Chambersburg, Pa., all get DT buttons for long lists sent in.

STAND BY

Mr. H. G. Brown, 1106 North St., Peoria, Ill., challenges all one tube operators with a list of stations that includes England, Porto Rico, Cuba, Canada, and 38 states, with a topnotcher of 58 stations heard in one night. Verifications on all receptions. Sicc'em, Mr. Brown.

STAND BY

Oscar Orneas of 3314 Montrose Ave., Chicago, Ill., bemoans a tube gone west, and wants to caution us against letting the high voltage B battery lead slip against the A battery circuit wires. S'tu Bad. We know that four dollar feeling too.

STAND BY

F. F. Feiner, of 3673 Lafayette Ave., St. Louis, Mo., says that you can use a stick of Dennison's Black Sealing Wax to fill holes in panels that are battle scarred. (Continued on page 54)

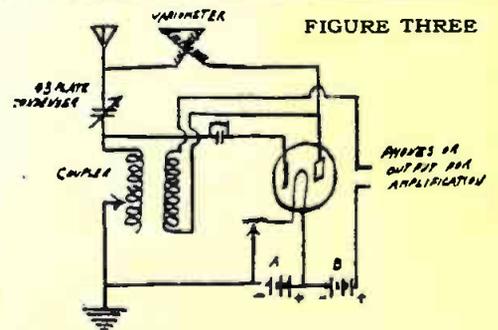
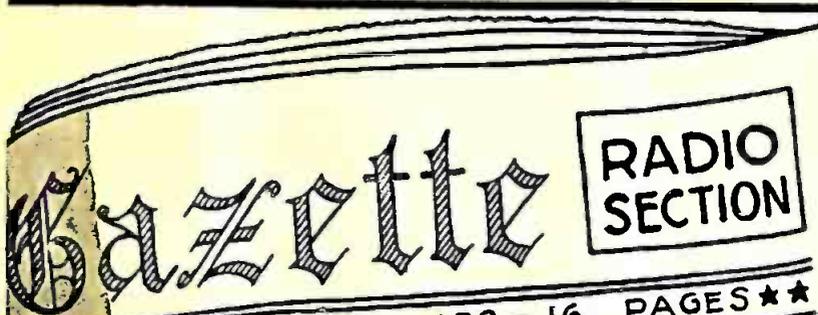


FIGURE THREE

# Modulation plus Regeneration



## MODULATION PLUS REGENERATION IN NEW MODEL L-2 ULTRADYNE

20 DX Stations logged on August 25th on Loud Speaker using loop aerial at Covington. Ky

Modulation plus regeneration is the keynote of the new Model L-2 Ultradyne Receiver. Regeneration as applied to this new method of radio reception produces greater rectification than ordinary methods of detection—a vital step in radio engineering. This combination produces tremendous amplification when receiving weak signals. Allows the Ultradyne to respond to a very small amount of energy. Signals are amplified thousands of times before they are detected and made audible.

Mr. R. H. Thomas, 509 Coppin Building, Covington, Ky., writes: "The Ultradyne far surpasses any idea that I previously had as to what a radio receiver could be. On the night of August 25th, 1924, I tuned in on my Ultradyne, the following stations:

- WBZ Springfield, Mass.
- WOR Newark, N. J.
- WGY Schenectady, N. Y.
- WHN New York, N. Y.
- WCAP Washington, D. C.
- WEAF New York, N. Y.
- WOO Philadelphia, Pa.
- KDKA Pittsburgh, Pa.
- WCBD Zion, Ill.
- WJAR Providence, R. I.
- WGR Buffalo, N. Y.
- WTAS Elgin, Ill.
- WAAM Newark, N. J.
- WABM Saginaw, Mich.
- WNAC Boston, Mass.
- WEAN Providence, R. I.
- WLW Cincinnati, O.
- KSD St. Louis, Mo.
- WWJ Detroit, Mich.
- WHO Des Moines, Ia.
- WTAM Cleveland, O.
- WHAZ Troy, N. Y.
- WOS Jefferson City, Mo.

- WSB Atlanta, Ga.
- WMC Memphis, Tenn.
- WOC Davenport, Ia.
- WBAP Ft. Worth, Tex.
- WNYC New York, N. Y.
- WOAW Omaha, Nebr.
- WFAA Dallas, Tex.
- WSAI Cincinnati, O.
- KFKX Hastings, Nebr.
- WCK St. Louis, Mo.
- WBT Charlotte, N. C.
- KFKB Milford, Kan.
- WCAQ Shreveport, La.
- KGO Oakland, Calif.
- KFJM Grand Forks, N. D.
- KFI Los Angeles, Calif.
- WDAF Kansas City, Mo.

"I consider the above reception remarkable as it stands, but considering it was all accomplished on a 24-inch loop, and all but WCAQ, KFJM and KFI, were heard on the loud speaker, it far surpasses anything that I have heretofore experienced.

"As regards selectivity, will say that I am only four or five miles from the powerful WLW station at Cincinnati, operating on 423 meters, and his wave is so powerful that I can receive him on the loud speaker, with one stage of audio; loud enough to be heard a block away, without using antenna, ground or loop. When WLW is on the air, I can tune him out completely, and receive WSB on 429 meters, WHB and WDAF on 411 meters, and PWX, nominally on 400 meters, but usually somewhat above that wave.

"I know of no other receiver that will even approach this performance for extreme selectivity, volume and distance."

## ULTRADYNE MODEL L-2

This application of regeneration is the most recent development of R. E. Lacault, E. E., A. M. I. R. E. since his perfection of the "Modulation System" used exclusively in the Ultradyne and which has so revolutionized all conception of selectivity, sensitivity, volume and range.

This Model L-2 Ultradyne, without a doubt, represents the peak of present day super-radio engineering skill.



## Ultradyne Kit

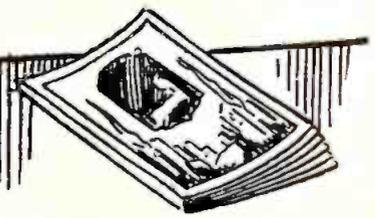
Consists of one low loss Tuning Coil, one low loss Oscillator Coil, one special low loss Coupler, one type "A" Ultraformer, three type "B" Ultraformers, four matched fixed Condensers. The Ultraformers are new improved long wave Radio frequency transformers, especially designed by R. E. Lacault, Consulting Engineer of this Company and inventor of the Ultradyne.

To protect the public, Mr. Lacault's personal monogram seal (R. E. L.) is placed on all genuine Ultraformers. Ultraformers are guaranteed so long as this seal remains unbroken.

**\$30.00**

Send for the 32 page illustrated book giving latest authentic information on drilling, wiring, assembling and tuning the Model L-2 Ultradyne Receiver.

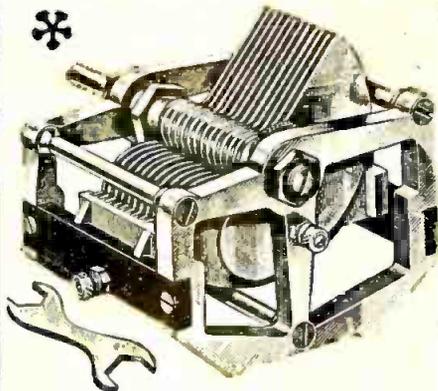
**50c**



PHENIX RADIO CORPORATION  
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Bremer-Tully Low Loss "Lifetime" Condenser



- Type L- 7-125 m. m. f. .... \$4.25
- Type L-11-250 m. m. f. .... 4.50
- Type L-23-500 m. m. f. .... 5.00
- Type L-35-750 m. m. f. .... 6.50

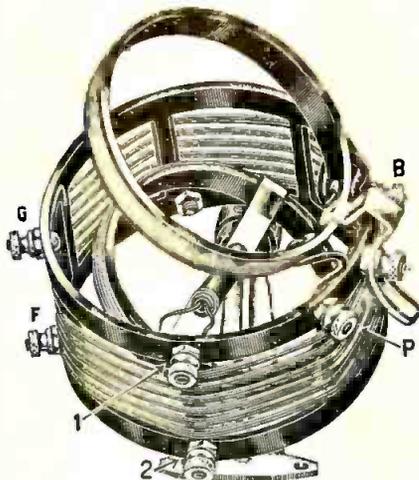
We guarantee it has more points of superiority, more advanced features, more vital improvements, more essential advantages than any other.

Write for "20-point" folder telling you why.

## BREMER-TULLY

Leads again with a new, real

### LOW LOSS TUNER



Gives results heretofore impossible. New and improved method of inductance winding. New adjustable untuned primary successfully meets the great problem of the past—that of adapting a tuner to the various types of antenna, circuit requirements and local receiving conditions. Adjustments permit greater selectivity or increased signal strength as desired.

Two types: for broadcasting 200-565 meters; for short wave work 50-150 meter ranges covered with a Type L-11 B. T. Condenser.

Price \$5.00

Better tuning (now in sixth edition) tells you why and shows you how. Complete instructions and diagram for progressive construction from Crystal to Radio Frequency circuits. Sent on receipt of ten cents.

**Bremer-Tully Mfg. Co.**  
531 S. Canal St., Chicago

# Pickups and Hookups

(Continued from page 52.)

Try it. Shave the excess wax off with a razor blade.

STAND BY

One of our California Twisters gives an interesting account of some super-heterodyne experiences. He also tells us about that "grand and glorious feeling" upon getting his DT button:

Box 363, National City, Calif.

Dear Editor:

You can imagine my surprise when the mail man handed me a letter from "Radio Age." I was more surprised when upon opening the letter a Dial Twisters pin dropped out. This little pin has caused much comment among the fellows and I thank you very much for it.

Another reason for writing this letter is to report upon the Super-Heterodyne receiver which I became the owner of last spring. I find that the best results are those obtained by the use of a wire twenty to thirty feet long. By the use of this small indoor aerial, I can tune in stations that are at right angles to the small internal loop. I have also tried the use of a larger loop and of a ground, separately; these increase the volume above that obtained when using the small loop, but they are not as good as the small indoor aerial for the set has to be turned in tuning when they are used.

Besides being inexpensive in upkeep, this receiver is one of the easiest sets to tune as there are only two main controls, besides easy to control the set tunes very sharp as I have received the following stations one after another with absolutely no interference: KLZ, Denver, 283 M., KFRC, San Francisco, 280 M., and KFSG, Los Angeles, 278 M.

I will close in saying that of all of the radio magazines on the market today I will take *RADIO AGE* every time.

Respectfully yours,  
Lloyd Stove.

STAND BY

We think that gives us some kind of an idea as to what a super-heterodyne can do under adverse conditions, and believe us, a lot of credit goes to Mr. Stove for breaking the ice. Honestly, we thought that owners of super-het were all "dead spots" when it came to giving information.

STAND BY

We would like to suggest the following as the official greeting song of all Dial Twisters, giving of course all credit due Harry Giess of WQJ, Chi-Kago. The tune is quite familiar to all those of you who have heard the Howdedo song Heh Heh.

How Do you Do, Dial Twister  
How Do you Do?  
How Do You Do, Dial Twister  
How are you?  
Every morn' you're nearly dead,  
With the receivers on your head,  
Why don't you go to bed?  
How Do you Do?

STAND BY

And thats all—there is no more. Wishing you a very Merry Radio New Year we'll sign off until February when you'll find us back of the blueprint pages jus' like ever before. Goo bye!

End.

\* Tested and Approved by RADIO AGE \*

## How to Make a Station Finder

(Continued from page 25)

operating, but we are at a loss where to set the dials. Bring the Station Finder over, set it on top of the cabinet of the set, and start the buzzer going. Referring to our chart we find that 500 meters would be at 77 on the Station Finder dial, and so we set the dial to that reading. Then we tune the receiver to the tune of the buzzer, until we hear it loudest. When that has been done, the buzzer may be turned off, and the final details of vernier touches can be put on the signal which should be there if there is any to be heard. And it will if your Station Finder is accurate and you have made your readings correctly.

The same goes for regenerative sets—tune the set to the wavelength of the Station Finder which is set at the dial reading corresponding to the wavelength shown by the chart, and then turn your regeneration up slowly and carefully until it is just under the spillover point—and not over it.

Other interesting experiments can be performed with the Station Finder—it can be used as a tuning circuit for a crystal receiver, it may be used as a wave trap, it may be used as a filter, to balance neutrodynes, as a check on coils to tell whether they are wound large enough or whether they are too small. In fact it is probably one of the most useful and desirable things you can have around the place.

But probably best of all, it is almost a sure fire preventer of regenerative squeals, because it teaches you how to tune correctly and do some real accurate and practical radio experimental work.

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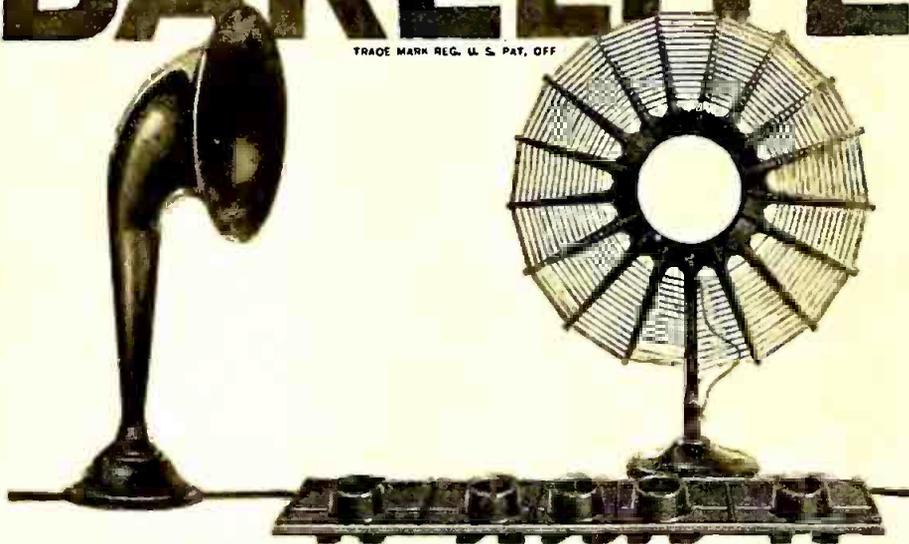
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Of all insulating materials Bakelite alone combines the many characteristics vital to efficient radio reception.

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The Bakelite Radio Map lists the call letters, wave length and location of every broadcasting station in the world. Enclose 10 cents to cover the cost and we will send you this map. Address Map Department.

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**MAIN RADIO BATTERIES, Inc.**  
7016 Euclid Ave., Cleveland, O.

## The Modified Reinartz with Two Stages

(Continued from page 27)

"G" on the second socket and the post marked "F" on the transformer is connected to the negative side of the filament battery circuit. Binding post "P" on the second or first stage socket is connected to the top spring on the second jack. The second spring from the top on this jack is connected to the post "P" on the second transformer, and the third spring from the top on this second jack is connected to the post marked "B positive" on this second transformer, and the bottom spring as well as the bottom spring on the third jack is connected to the 90 volt positive plate battery binding post on the panel.

Post "G" on this second transformer is connected to post "G" on the third socket and the post marked "F" on this transformer is connected, like that of the first, to the negative side of the filament battery. The top spring on the third jack is connected to the post marked "P" on the third socket. The filament circuit is wired in the usual way, from the negative filament battery post on the panel, to one side of each of the rheostats, the other rheostat terminals being connected to the filament binding posts on their respective sockets. The other filament binding posts on the sockets, according to the directions, have already been connected to the ground and to the positive binding post of the filament battery.

There are several things to which the builder's attention should be called. One of these is to make sure that the grid leak and condenser are mounted as close to the "G" binding post on the first socket as possible, as this shortens the grid leak and gives less chance for interference, such as howls and squeals.

#### Some Final Cautions

The next thing to be carefully watched is to be absolutely sure that the binding posts marked "F" on both of the transformers are actually connected to the negative side of the filament battery. If by any chance they are connected to the positive side, then the amplifier will refuse to work and louder signals will be obtained in the detector jack than in either of the amplifier jacks. Care should also be used in replacing the storage battery after charging to make sure that the wires are not reversed, as this will throw the negative on the wrong side and will give the grids of the amplifier tubes the wrong polarity.

RADIO AGE will be on the air again with a brand new Jazz Carnival from KYW's Congress Hotel Studio, at Midnight Saturday, January 3. An all-star program!

#### MARVELOUS NEW AUDIO TRANSFORMER

adds a musical quality to any set far beyond anything you ever heard before.

#### KARAS HARMONIK

Amplifies low, middle and high tones—all to the same big volume, thus eliminating distortion. Brings out the vital harmonics and over-tones of music. Price \$7.00. Write

Karas Electric Co., Dept. 58-99 4042 N. Rockwell St., Chicago



## Take Good Care of Your Head-phones

(Continued from page 14)

2) The electromagnets and coils which are energized by the audio frequency currents and which actuate the diaphragm.

3) The permanent magnet of constant polarity which exerts a pull on the diaphragm at all times and which places it under a constant stress or tension.

Current from the radio set is connected directly to the coils of the electromagnets (2), and in passing through these magnets, the current causes a varying pull on the diaphragm which sets it into a state of vibration exactly proportional to the momentary strengths of the varying current. As the current is exceedingly small, it is necessary to wind these coils with hundreds of turns of very fine wire so that the "ampereturns" will be sufficient to produce the desired degree of magnetization of the poles pieces. Owing to the great length of the wire and its small diameter, the resistance is quite high when compared with the resistance of the phones used with the ordinary wired telephone. A pair of phones in a double headset will have a resistance ranging from 2,000 to 6,000 ohms, but it should be remembered that resistance alone is no index of the sensitivity. It is the number of turns that counts, not the resistance in ohms, although in exactly similar phones the resistance indicates the number of turns to some extent.

The magnet coils are wound on iron cores which also form the poles of a powerful permanent magnet (3). The stronger the permanent magnet, the more sensitive will be the phones, but the "gyp" phone makers gracefully shy off when questioned on this point, as effective permanent magnets are difficult and expensive to make. The permanent magnets exert a heavy continuous pull on the diaphragm, and in a manner of speaking, take out the "slack" and control the vibration of the diaphragm. Current impulses which act in the same direction as the permanent magnets add to the deflection of the diaphragm, while impulses acting in the opposite direction partly neutralize the effect of the permanent magnet and cause the diaphragm to relax in proportion to the flow of current.

At this point I wish to call attention to the necessity of the magnet holding its charge indefinitely without weakening, even when the phones are subjected to severe blows and falls which would quickly demagnetize a permanent magnet of poor construction. The steel used must be glass hard to properly retain the charge, must be of the proper grade of alloy steel or equivalent, and above all must be properly heat treated and hardened.



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THERE'S a lot of satisfaction and enjoyment in perfect reception. Yet it does not come merely with having a good loud speaker.

It's the work of Jefferson Transformers to provide full, smooth amplification—furnish the loud speaker with the proper energy so as to assure the greatest volume consistent with purity of tone.

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Even amplification over the entire musical range, perfect reproduction of the voice or instrument—these are some of the reasons why radio authorities and music lovers the world over are recognizing the superiority of Jefferson Transformers.

Designed by a concern with over 20 years experience in the manufacture of high grade transformers of all descriptions. Jefferson Transformers meet matched construction specifications.

Ask for our latest Jefferson circuits including full details for building the Jefferson Baby Grand Superheterodyne (6tubes). Write today

**JEFFERSON ELECTRIC MFG. CO.**  
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*Manufacturers of*

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| Bell Ringing Transformers                    | Gas, Furnace and Oil          |
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Chas. A. Branton, Inc.  
Dept. 13,  
815 Main St., Buffalo, N. Y.

# Jefferson Transformers

### A Pleasing Voice Isn't Enough!

(Continued from page 31.)

“THE announcer, more than any other entertainer of the public, must have an innate character, a very positive intelligence, and a friendly, understanding voice, which informs his large audience as easily and frankly as one close personal friend would inform another. There was a time when a good speaking voice was considered the only requisite for announcement purposes, but in my opinion, that time is passing, and passing very rapidly. The executives of the big broadcasting companies today realize that imagination, character, and mental equipment are just as essential, if not more so, than good vocal equipment.”

Apart from radio, “Jacksy” has many hobbies, which include chemistry, physics, electricity, music, photography, philosophy, psychology, and theosophy. In April, 1924, he was asked to prepare his first program for the Canadian National Railways and at the last moment discovered there was no announcer. He took charge himself and made good.

“How do you know you made good?” I asked him.

“Because no one recognized my voice,” he replied, with a sly smile.

Jackson's success can be attributed to the same thing that brought fame to George Hay, the “Solemn Old Judge” of WLS, and formerly with WMC, Memphis; to the same intangible something to be found in the ethereal personality of Thomas A. Cowan, studio manager of Radio Broadcast Central, WJZ-WJY, New York City, and countless others whose voices are eagerly awaited nightly.

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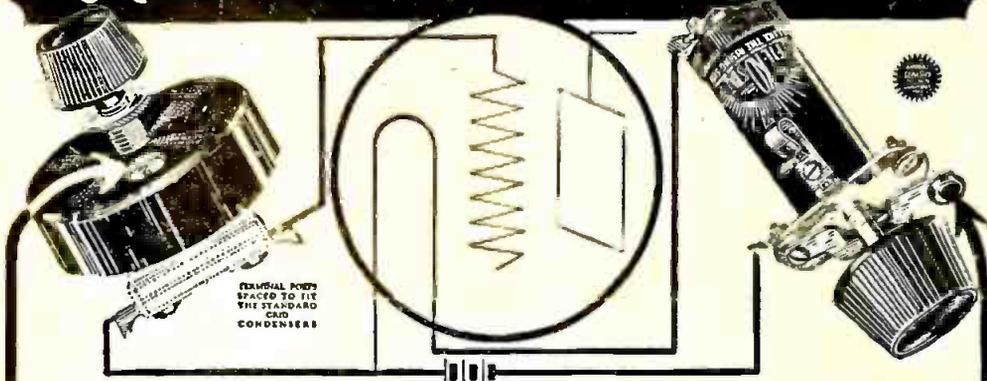
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 Only \$21.95 for 1-tube outfit, receiver parts unassembled; often receives over 1,000 miles. Only \$33.78 for 2-tube outfit, receiver assembled; often receives over 1,000 miles on loud speaker. Only \$55.09 for 5-tube Neutrodyne outfit, receiver parts unassembled; has received England. These prices include all accessories, aerial, etc.—everything needed for receiving on head phones. Also, Crosley receivers, 10% off. 26 other popular sets away down.  
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## -thru scientific tube tuning

The most important (and most neglected) tuning unit on your set is the tube. It is the one thing you can adjust to bring weak stations to audibility—to eliminate distortion on local programs. Coils and condensers are easily tuned to incoming waves, but wave-length isn't everything. The antenna gets distant broadcasters but their signals never reach the phones unless you tune the tube to the different characteristics of the weak, distant stations. Here are two instruments distinctly designed to improve reception through their ability to control tube action—FIL-KO-LEAK to tune the grid by securing correct grid bias—FIL-KO-STAT to tune the plate-filament circuit by its control of electronic flow. Together they assure you maximum audibility, clearer signals and freedom from oscillations and other tube noises. They bring in stations you never heard before.

**FIL-KO-LEAK** \$2  
 SCIENTIFICALLY CORRECT VARIABLE GRID LEAK  
 Individually Calibrated  
 In Canada \$2.90

**FIL-KO-STAT** \$2  
 SCIENTIFICALLY CORRECT RADIO RHEOSTAT with Battery Switch  
 In Canada \$2.90

You will get stations you never heard before with Fil-KO-Leak. Clear up distortion and increase volume. You can “log” your Fil-KO-Leak as you do your other tuning units. Each Fil-KO-Leak is individually hand calibrated over the operating range of all tubes 1/4 to 5 megohms. Set it for specified resistance and adjust it for best results. Resistance read in megohms through panel peep-hole. (Base-board mounting furnished.) Resistance element constant, accurate, not affected by atmospheric conditions, wear or jarring. Assures smooth, gradual control of resistance and correct grid bias. *Unconditionally guaranteed.*

Tune your tube filament with Fil-KO-Stat and receive stations you never heard before, get greater distance, louder signals, sharper tuning, freedom from tube noises. Fil-KO-Stat is the only rheostat that permits adjustment over the entire operating range of all tubes and enables you to get maximum audibility in phones or loud speaker. And now the improved model is fitted with battery switch that attaches to the regular mounting screws. Distinctly signals “on” and “off” and enables you to break circuit without changing Fil-KO-Stat adjustment. Fil-KO-Stat fits any type tube in any hook up. *Unconditionally guaranteed.*

**FIL-KO-SWITCH**  
 SCIENTIFICALLY CORRECT “A” BATTERY SWITCH  
 Simple Study Sure  
 50¢  
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 SCIENTIFICALLY CORRECT INDIVIDUALLY CALIBRATED IN OHMS 5,000 to 250,000 ohms. For use in resistance coupled amplification or across secondary of transformer.  
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 with the \$100 Guarantee  
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Radio fans who heard RADIO AGE's jazz carnival from Station KYW Chicago, on Saturday, December 6, reported it was one of the “best programs ever heard from that station.”

Axel Christensen, Banks Kennedy, Art (“Goofy”) Linick, Elizabeth Berry, Wanda Goll, George Jatho and the Banjo Boys, Meyers and Sokol, comprised the “all star” cast which started things at midnight and kept it up till nearly five o'clock Sunday morning. California's receiving the program unusually clear caused Announcer Borroff to extend the broadcasting hours considerably.

Another program by the same popular artists will be on the air again Saturday, January 3. So don't go away! If you want something special, write your request to RADIO AGE.

\* Tested and Approved by RADIO AGE \*

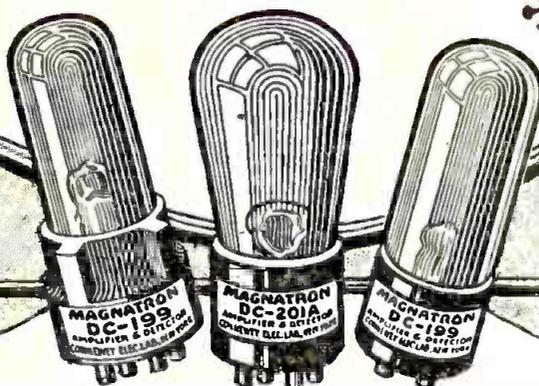
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**M**AGNATRON Radio Vacuum Tubes have been improved to that degree of excellence where you can no longer afford to be without them. It will take but one trial to prove to you that MAGNATRONS can put real "pep" in your set.

Recent improvements in manufacture have made the MAGNATRON a superior radio frequency amplifier, a clearer detector, and a louder audio frequency amplifier. Ask your dealer today! He will recommend MAGNATRONS.

Any Type  
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### Howard Rheostat With Dial Control

Carrying capacity 1-5 amperes; beautiful 2 1/8 in. dial with 100 point markings covering full sweep of contact arm. Made in resistances of 6 1/2, 25, 40 and 60 ohms. Each **\$1.10**

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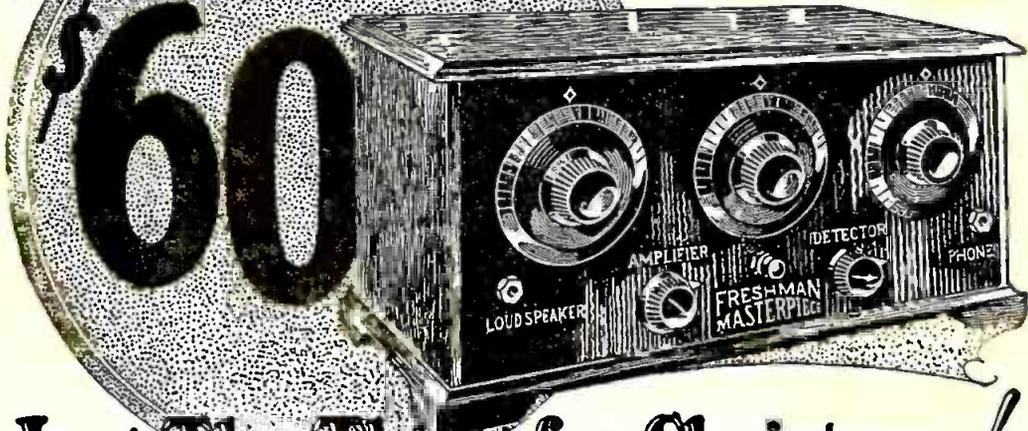
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**Just The Thing for Christmas!**

## A 5 Tube Tuned Radio Frequency Receiver

made of the finest low loss materials and in a beautiful genuine solid mahogany cabinet, that is attractive enough for the most pretentious room, and at sixty dollars, economical enough for the most modest. Users claim it is

**\* The Greatest Value Ever Offered in a Radio Receiving Set**

Combines all points essential to the perfect receiver. Real distance reception without that squealing and howling. So selective that once a station is picked up—it can be brought in again on the same points on the dials, whenever you want it. And what's more,

All genuine Freshman Masterpiece Sets have a serial number and trademark riveted on the sub-panel. The Receiver is not guaranteed if number has been removed or tampered with.

**It is Mighty Easy to Operate**

Ask your dealer to install one in your home

**Chas. Freshman Co. Inc.**  
Radio & Condenser Products

Beware of Imitations and Counterfeits.

106 Seventh Ave. New York, U.S.A.

## Some Notes on the Midget Reflex

(Continued from page 48)

of the wires dotted for the assistance of those who wished to simplify matters by grounding part of the circuit to a metal panel. It seems almost impossible that such mistakes could occur, but they have—and repeatedly.

Now we come to the subject of free tube oscillations, the inherent difficulty with reflex circuits. With the tube in free oscillation, radio frequency amplification is impossible. In this set, corrections can be made by adding a few turns to the primary coil (L1) thus reducing the radio frequency transformation ratio and the oscillations at the same time. This ratio varies somewhat with different makes and ratios of the audio transformer (AT) and individual adjustment must be made in each case by adding turns to (L1). In extreme cases I have been forced to use as high as 25 turns on (L1) when highly inductive transformers were used.

It must be understood that the negative pole (—) of the "C" battery must be connected to the grid connection (G) of the tube socket. If the polarity is reversed the set will not operate at all. This is known as giving a "negative bias to the grid." Two cases of reversed polarity were discovered, two defective crystals, and a short circuited condenser (K1) which was damaged by heat while the condenser was being soldered into circuit. When soldering, be very careful not to overheat the condensers.

Of course we had our old soldering difficulties in evidence. In one set examined by the writer, there were only three wires actually soldered, the remainder simply being stuck together with the rosin soldering flux. The conductivity of such joints is zero. Use a hot soldering copper which has a clean and shining point well "tinned" with solder. A cool soldering iron will melt out the rosin flux but will not melt the metal solder, thus giving an impression that the joint is soldered when it is not. After soldering a joint shake it roughly by hand. If it is stuck only by the flux it will break off. If properly soldered it will withstand considerable abuse.

When the set is in proper working order it will howl and shriek violently whenever the catwhisker is lifted from the crystal. As a rule, continued howling is due to an imperfect crystal or to improper adjustment of the catwhisker. If the reception improves when the catwhisker is lifted from the crystal then the detector is probably connected to the wrong side of (K2) as already described, the condenser (K2) may be short circuited by soldering, or the detector may be defective. Free oscillations in the tube will also cause similar effects.

## LATEST RADIO MARVEL

Try the Spider-Wound

**Paramount Loop** With Genuine Bakelite Frame



List Price \$12

(Patent Pending)  
Develops Greater Volume, Clarity, Directional Effect and Receptivity  
(Dealers and Jobbers Write To-day)

A master product that, by virtue of its unique, scientific construction gathers and sends to the receiver, without customary absorption, every electron of current.

"A Loop Eventually, Why Not the Best?"

Send order to

**PARAMOUNT RADIO CORPORATION**

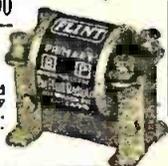
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## MORE VOLUME—NO DISTORTION

Correct spacing of first grade silk on steel leaves in core carries away high flux densities which causes other transformers to distort reception. Ratio 4.25 to 1. Equally efficient in all stages. Windings absolutely accurate.

The FLINT A. F. T. Better looking than any A. F. T. made and the finest built A. F. T. in the world. Only \$3.00 each. If your dealer can't supply you, order direct. Money back guarantee. Dealers, write for particulars. **FLINT RADIO CO.** 1824 Wilson Av., Chicago, Ill.



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\* Tested and Approved by RADIO AGE \*

### Keeping up With the French Radio Fan

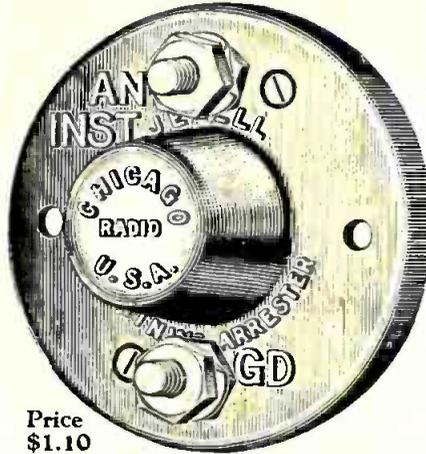
(Continued from page 20)

made to turn slowly when the knob is rotated. The purpose of the spring is to maintain a constant pressure of the grooved pulley on the bakelite disc.

The vacuum tubes are of the three-electrode type. The prongs are slotted and are engaged into female parts. No error is possible in placing them as prongs and other parts are disposed in a special manner. This type of prongs is superior, electrically, to the American type. The contact is made on a large surface and practically no trouble is experienced from this mode of connection.

A combined variable grid leak and variable condenser has just been introduced on the market. Such a combination is valuable in getting the best out of any given tube. Special mention must also be made of a very good loud speaker of an artistic design. The diaphragm of the loud-speaking unit transmits its vibration to a pleated parchment disc, giving very pure reproduction free from any metallic noise.

The first radio sets were equipped with the lamps on top of the set; they were thus unprotected, resulting in breakage; and the glare was objectionable. The new models are of the "piano" type, a hinged cover protecting the lamps. The latest invention is a set which may be switched on 110 volts D. C. or A. C., eliminating storage battery or dry cells.



Price \$1.10

### The Fire Underwriters'

Code requires that—

Each lead-in wire shall be provided with an approved protected device properly connected and located (inside or outside the building) as near as practicable to the point where the wire enters the building. The protector shall not be placed in the immediate vicinity of easily ignitable stuff, or where exposed to inflammable gases or dust or flyings of combustible materials. The protective device shall be an approved lightning arrester which will operate at a potential of five hundred (500) volts or less.

Buy a Jewell Arrester. (In brown porcelain case.) It has been passed or approved by Underwriters.

Send for Jewell Radio Instrument Catalog No. 15-A.

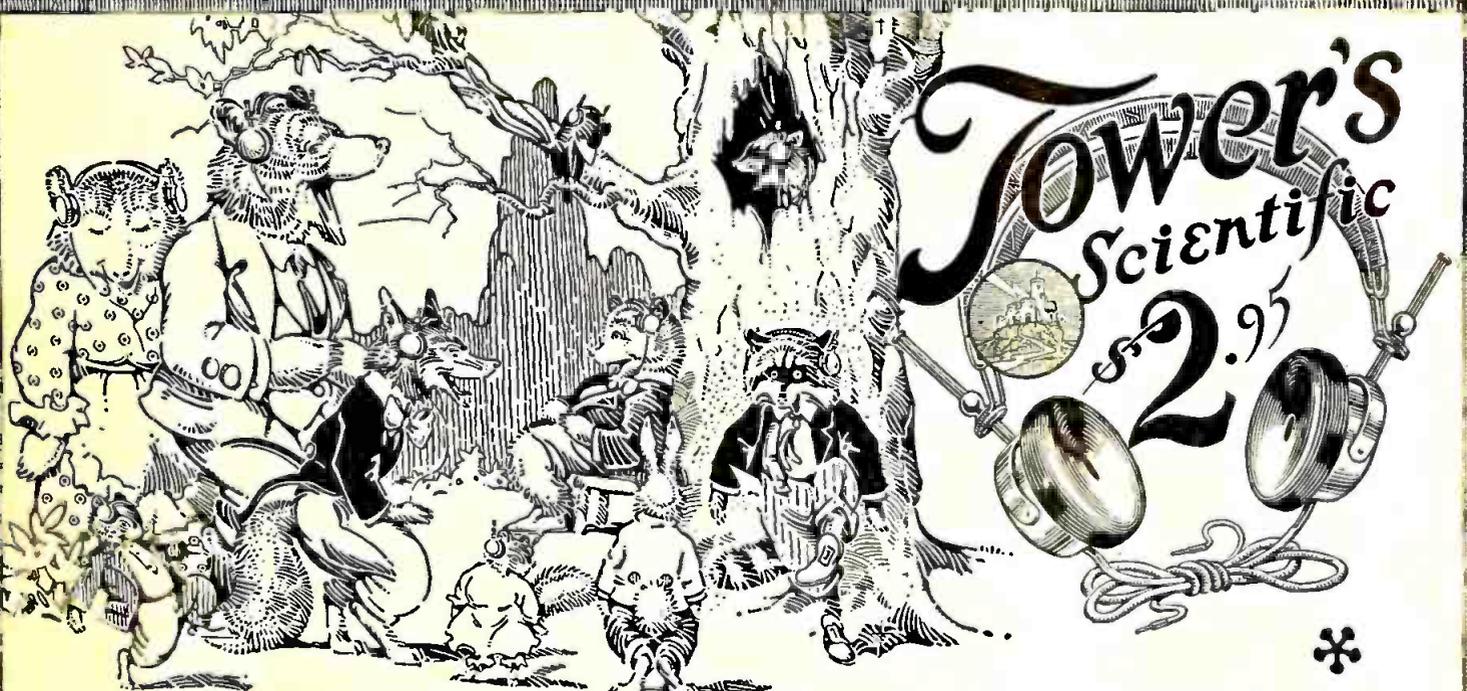
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To bring happiness into the lives of millions is to have accomplished a worthy purpose in this progressive era of Radio achievement.

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# Telmaco Acme Receiver

## The Ideal Receiver for all Seasons



The Telmaco Acme Receiver is truly portable. May be instantly removed from handsome carrying case and inserted into beautiful two-tone mahogany case. No outside loop, no aerial, no ground required.

Size of Case 8" x 10" x 18". Weighs only 27 pounds complete. Easily Carried.



### Acme 4-Tube Reflex Circuit Used

securing selectivity, distance and volume with minimum battery consumption.

Complete in itself. Easily carried from room to room in your home or to office, neighbors, etc. Take it along and have music, entertainment, speeches, news, market reports wherever you happen to be.

Instantly ready for use as it is. You can use external antenna and ground, loop and loud speaker if desired. 4 tubes (fully protected by shock absorber sockets)—equal to 7 tubes, due to reflexing and use of crystal detector.

**Reasonably Priced** Write for Free illustrated circular fully describing Telmaco Acme Receiver.

Complete Telmaco 64 page catalog containing 20 circuits in blue and describing the best in radio sent postpaid for 10c.

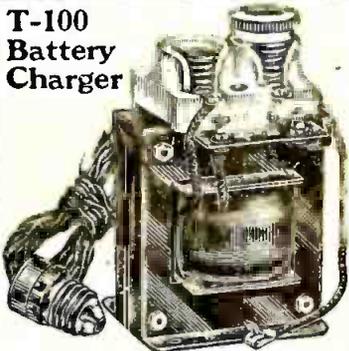
**Dealers!** Catalog and Price List furnished to all bona fide dealers making request on their business stationery.

Radio Division

Quality Radio Exclusively Established 1918

**TELEPHONE MAINTENANCE CO.**  
20 South Wells Street Dept. C Chicago, Illinois

### T-100 Battery Charger



### The Best and Lowest Priced on the Market

This battery charger operates on 110 volt, 60 cycle, A. C. circuit, charging a 6 volt battery at a 2 ampere rate. Standard 2 ampere charging tube is used. The T-100 is the lowest priced first-class charger on the market. Large numbers now in use have proved entirely satisfactory. No vibrating parts to get out of order. Absolutely noiseless in operation. Furnished with plug and cord for lamp socket. Battery leads marked. Fuse protects charger from accidental short circuit of 110 volt leads. Fully guaranteed.

Price complete, with 2 ampere tube, \$12.00

Radio Division

Quality Radio Exclusively

**TELEPHONE MAINTENANCE CO.**  
20 So. Wells St., Dept. C Chicago, Ill.

### L. A. COCKADAY RECOMMENDS IT

Because it's more than a transformer.

## IT'S A PRECISE

A Laboratory Instrument at a Commercial Price  
**THE LITTLE GIANT OF AMPLIFICATION**

Don't Accept a Substitute

Distributed by HUDSON-ROSS CO., and S. B. HARRIS CO., CHICAGO



Type 285A Price \$5

**Precise Manufacturing Corporation**  
53 W. JACKSON BLVD. CHICAGO, ILL.

## A Really Efficient Portable Receiving Set

(Continued from page 22)

to remain. Then it's a case of reversing the primary connections of transformer "B" or "C". As a rule, the best way is to wire up the audio transformers according to the manufacturers' markings. This usually places the outside end of the secondary on the grid, its inside or "beginning" on the negative filament; the outside or "end" of the primary winding to the plate and its inside or "beginning" to the "B" battery positive. Ordinary bell or annunciator wire is most conveniently used to make the connections and it is then very easy to "swap" the primary connections. The difference in operation is due to the opposition of the primary coils when they are properly reversed and audio oscillation is thereby stopped. There is also a difference in the radio frequency results, which should not be treated till the audio howling has been eliminated. The change in R. F. amplification is due to a difference in capacity between the primary or secondary winding of the R. F. transformer and the filament side of the audio transformers, this difference being caused by the reversal of the primary connections. If a certain primary reversal stops the howling but decreases signal volume, especially on a DX station, it is merely necessary to use a larger size by-pass condenser at C-2 or C-3.

### R. F. Transformers

The radio frequency transformers are to be connected exactly as their makers recommend, except, of course, that instead of a connection directly to the positive "B" battery, this is made through the audio transformer's primary and similarly the negative filament connection is through the secondary of the audio transformer.

Inverse duplexing was tried also, but inasmuch as more difficulty was met in quieting the howling at audio frequencies, the straight reflex was finally selected.

If the speaker is placed in front or turned aside, such trouble usually ceases and it is not encountered at all when the portable set is made up with the horn exposed and tubes concealed or shielded from air vibration by the panel. The lay-out illustrated operates very well on the cigar box loop, distant stations in Canada, Chicago, and other points being heard with good volume on the loud speaker in the writer's New Jersey location. The builder of the portable set would doubtless employ a larger loop than this and results with a larger loop are very much better. The sharp directional effect of the cigar box loop is surprising in its effective elimination of a loud local station and the interception of some faint DX fellow when their directions are at right angles to each other.

The final installation of the portable is in a suit-case measuring about 10 by 16 inches, including speaker, batteries, set and a spiral loop wound on hard rubber rods and mounted in the cover of the suit-case.

Order Your RADIO AGE ANNUAL for 1925 Now!

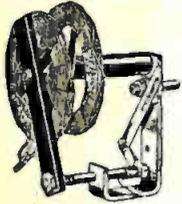
\$1.00 a Copy.

\* Tested and Approved by RADIO AGE \*



## Pure Inductances for Low Loss Receivers

MUCH is being said about the necessity of good parts, especially of condensers. Inductances are likewise of extreme importance for efficiency. Pfanstiehl Pure-Inductances are good because:



Pfanstiehl Variometer, P-301

1. Air-cored means no absorption of signal strength;
2. Stagger wound means no appreciable distributed capacity.
3. Vernier control of adjustment means distance getting.

THE Pfanstiehl Variometer with two 50 turn untapped coils as a variometer with PERFECT RATIO OF INDUCTANCE. \$4.75 at your dealer's.

THE Pfanstiehl Variocoupler P-300 is another efficient unit.



Pfanstiehl Variocoupler, P-300

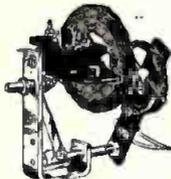
Using this unit in our "efficiency hookup" furnished with unit a Wisconsin radio fan picked up Hawaii! Let us suggest that you improve your favorite circuit with this variocoupler. \$5.00 at your dealer's.

THE new Pfanstiehl "Three-Circuit" Tuning Unit, P-302, solves the problems of radiation and selectivity in the regenerative circuit. \$5.00 at your dealer's.

Other Pfanstiehl Pure Inductances are:

	Turns	List Price	Wave Length
P-201.....	25	\$0.55	100-340
P-202.....	35	.59	125-470
P-203.....	50	.65	170-650
P-204.....	75	.74	220-960
P-205.....	100	.90	300-1300
P-206.....	150	1.10	470-1980
Pfanstiehl Ultra-Audion.....			\$0.95
Pfanstiehl Reinjectors.....			\$1.75

THE P-600 Pfanstiehl Oscillator for super-heterodynes oscillates sharply and steadily and improves the hookup. For any intermediate transformers (2,000—10,000 meters.) \$6.00 at your dealer's.



Pfanstiehl Oscillator, P-600

## The PFANSTIEHL RADIO CO.

Highland Park - Illinois  
Chicago Office  
1001 W. Washington Boulevard  
Tel. Haymarket 8010

## "The Hidden Voice:" An Unusual Radio Story

(Continued from page 30)

impatiently. "The concert is probably coming out of the carriage now. If I can get on the air right away, before the kidnapper gets wind of the radio set in the baby carriage, we can scare the man or woman who's abducted the kid and maybe upset his plans. Is that clear?"

### A Dramatic Moment

HORNADAY had a sense of humor and he appreciated the possibilities of Jim's plan. He wanted to know if Jim was sure the set was tuned to Station W---; and he was in turn reassured that the tubes were turned on full volume for W--- and nobody else.

Larry ran into the operating room.

"Stop everything!" he whispered hoarsely. The operator, amazed but sensible enough to obey orders, cut off the switch as a local prima donna was about to begin the first verse of her latest "masterpiece."

Then Larry ran into the studio, explained matters hurriedly, and motioned to Jimmie to seat himself before the microphone and "do his stuff." The surprised artists reluctantly took seats in the corners of the studio, wondering what was about to happen.

"Go to it, Jim," Larry finally said. "If this will help, it'll be a tremendous boost to the station. Ready? All right. Shoot!"

Tense, and, only slightly nervous, Jim faced the "vied lady." Gathering his wits and assembling his practiced speech coherently, he began speaking in a steady though imperative tone:

"Help, help, help! I'm being kidnapped. The person who is pushing this carriage kidnapped me. Help! The police are looking for me. Help!! Take me back to my mamma! I want my mamma!"

### Chapter II

#### "The Baby's 'Stomach'"

PEOPLE did wonder very much at the sounds they heard coming from baby Edward's carriage as they passed it on the street. They gazed with astonishment, first at the sweet face of the infant, then at the plainly dressed, hard-featured woman behind.

The latter, Julia Murray, was not a professional baby snatcher. She had a record of shop-lifting and other forms of petty theft, which had not proved as lucrative as her growing greed demanded, and this crime was a new venture on her part. She had a friend who would help her, and together they might make a considerable "haul." So on she walked, shaping her plans as she went, when suddenly there came a sound, that of a human voice, from the carriage that sent violent chills through her frame.

"Help, help, help! I'm being kidnapped. The person who is pushing this carriage kidnapped me. Help! The police are looking for me. Help! Take me back to my mamma! I want my mamma!"

(Continued on page 65)

## Biggest dollar's worth in RADIO



Compiled by HARRY F. DART, E.E.  
Formerly with the Western Electric Co., and  
U. S. Army Instructor of Radio  
Technically edited by F. H. DOANE

### 514 PAGES

THE most complete book of its kind ever published. Written, compiled and edited by practical radio experts of national reputation. Packed with concise, sound information useful to every radio fan—from beginner to veteran hard-boiled owl. Hundreds of illustrations and diagrams to make every point clear. Note this partial list of contents:

Electrical terms and circuits, antennas, batteries, generators and motors, electron (vacuum) tubes, every receiving hook-up, radio and audio frequency amplification, broadcast and commercial transmitters and receivers, wave meters, super-regeneration, codes, license rules. Many other features.

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I enclose One Dollar. Please send me—post-paid—the 514-page I.C.S. Radio Handbook. It is understood that if I am not entirely satisfied I may return this book within five days and you will refund my money.

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Check here  and enclose \$1.50 if you wish the deluxe edition, bound in Leatheroid.

## REDUCE STATIC

Pat. Pending 690459



\$10.00

Prepaid in U. S.

by using our super-sensitive  
**Omni-Directional Aerial**  
Collapsible, Ornamental,  
Mechanically Perfect

Can be used either as a loop or antennae inside or outside.

A wonderful value featured at a price within the range of all. Ask your dealer or send order direct

The Portable Globe Aerial Co.  
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## To Each Purchaser of a World Battery

A 24-Volt "B" Storage Battery positively given FREE with each purchase of a WORLD "A" Storage Battery. The WORLD Battery is famous for its guaranteed quality and service. Backed by years of Successful Manufacture and Thousands of Satisfied Users. You save 60%.

**Prices That Save and Satisfy**

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6-Volt, 11 Plate	\$12.25	6-Volt, 100 Amps.	12.50
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Shipment Express C. O. D. subject to examination. 5 per cent discount for cash in full with order.

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proves satisfactory World performance. Mail this ad with your name and address—we will ship battery day order is received; and give you your choice of "B" Storage Battery or a handsome nickel finish Auto Spotlite, FREE. Write TODAY.

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1219 So. Wabash Ave. Dept. 36, CHICAGO, ILL.

This FREE "B" Storage Battery takes the place of dry cell "B" batteries. Can be recharged and will last indefinitely. To be sold retail for \$6.00. It is the only battery of its kind equipped with solid rubber case—and insurance against acid and leakage. Take advantage of this remarkable introductory offer NOW. (To those who prefer it, we will send FREE a handsome nickel finish Auto Spotlite, instead of the "B" Battery. Be sure to specify which is wanted.)

**GIVEN FREE**

To introduce this new, superior World "B" Storage Battery to the Public.




### Stewart C. Whitman Has New Invention

Radio fans everywhere will be interested in the latest creation of the Paramount Radio Corporation, 23 Central Ave., Newark, N. J.—the Paramount loop—a radically new type of antenna that gives promise of gaining great popularity among radio enthusiasts generally.

The Paramount loop is spider-web wound with silk over phosphor-bronze wire and mounted on a bakelite frame, extremely low in dielectric losses. And, standing but fifteen inches in height, this unique loop affords exceptional directional effect, a qualification with no mean advantages.

By virtue of its scientific construction, a greater volume, receivability and clarity of tone is assured for this new indoor antenna by its manufacturers.

Mr. Whitman, inventor of the Paramount loop, is both President and Engineer of the Paramount Radio Corporation. This is by no means his first creation in the electrical field, as he is also the originator of a "B" Battery Eliminator soon to be placed on the market, and of other radio and high frequency apparatus.

### No Fishing with Ultra-Vernier

A notable stride forward in the simplification of tuning in, which will be welcomed by fans who prefer a concert to fishing for stations, is announced in the Ultra-Vernier, a vernier tuning control with hair-splitting adjustment, which practically allows you to forget there is such a thing as wavelength. Once you have located a station with the Ultra-Vernier, you can forever after get it instantly.

The Ultra-Vernier, which fits all standard condenser shafts and may easily be made to replace old dials, has a beautifully silvered disk. On this you pencil-record a station you have found and like. Thereafter, whenever you wish to hear it again, you simply turn the station finder, with its gauge for your pencil markings, to that particular pencil-mark. Without having had to fumble, you instantly hear the station you want, and you may be sure it is that station without waiting for the announcer to tell you so. This ingenious tuning control was de-

signed by R. E. Lacault, E. E., A. M. I. R. E., inventor of the famous Ultradyne Receiver. It is manufactured by the Hammarlung Mfg. Co. and produced only for the Phenix Radio Corporation, who will furnish any information concerning it, upon request.

### Timmons Talker Wins Fans

If you haven't heard the Timmons Talker, made by the Timmons Radio Products Corporation, Philadelphia, you you don't know how pure radio reception can be.

The Timmons Talkers are made in two

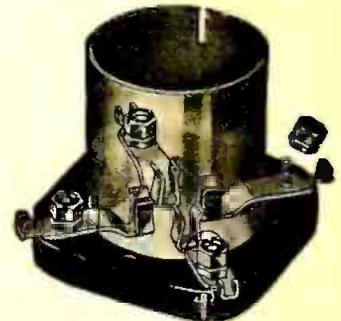


types; the Type "A" adjustable loud-speaker, for \$35, and the Type "N" Non-adjustable speaker, for \$18. The reflecting horn on the Timmons Talkers embodies the latest theory of acoustics, and the adjusting knob has threads finer than those on watch-cases, permitting unusually delicate adjustment. The diaphragm is 3 1-8 inches in diameter and will handle the volume of any set. The back is removable for the placing of A or B batteries around the reflecting horn.

The Timmons Corporation is also marketing a B-Battery Eliminator, which gives accurate control of the plate voltages of all tubes. They are constantly gaining favor with the country's radio fans, as are other Timmons products.

### New "Perfect Contact" Socket

Announcement is made by The Cutler-Hammer Mfg. Company of Milwaukee, Wisconsin, that they have recently put on the market a new and distinctly de-



signed socket which provides a perfect contact for radio reception. It is the result of many months of experiment and research and contains features not found in any other type.

The tube is simply pushed down—not twisted—into the socket, thereby preventing any chance of severing the bond between glass and base of tube.

# Here's the Newest!

## 95% AIR DIELECTRIC



### NO DOPE USED ON WINDINGS

## The Henninger AERO-COIL

PAT. PENDING

### PREVENTS R. F. LOSSES

Here is the greatest, most important advancement in Tuner and tuned R. F. Transformer construction ever made. Think of it! A rigid self-supporting Tuner and tuned R. F. Transformer having 95% air dielectric, and with no dope on the windings. The Aero-Coil actually uses and amplifies hundreds of times, the energy lost by "doped" coils or coils wound on tubing.

Replace your old coils with Aero-Coils. You will get enormous volume on distant stations! Reception will be crystal clear—your set will tune "needle" sharp. You will be amazed at the difference. Primary 6 1-4 turns; secondary 60 turns; beautifully made. Go to your dealer now and get a set of Aero-Coils. If he hasn't them yet, send us the purchase price with your dealer's name and we will send the coils and brackets postpaid at once. \$3.50 each or \$10.50 set of three. Also write for bulletin H-3 "Radio Frequency Losses and their Prevention"—It's FREE!

**THE HENNINGER RADIO MFG. CO.**  
1772 Wilson Ave., Dept. 13, Chicago  
DEALERS and SET MANUFACTURERS: Write for Attractive Proposition.

5000 RADIO DEALERS buy from

# HUDSON-ROSS

123 W. Madison St. Chicago  
Send for dealers discount.

(Continued from page 63)

"Help, help, help!" called the voice. "I'm being kidnapped. The person who is pushing this carriage kidnapped me. Help! Take me back to mamma. I want my mamma."

It was awesome enough to make many women unstrung. But Julia was not of that nature. Nevertheless, she was non-plused. She stopped and looked at the baby, who ceased to bite at his zwieback long enough to utter a string of self-satisfied "coos."

What could it mean? Had her ears deceived her? With nervous hope that she was the victim of an illusion, or that the cry, whatever it was, would not be repeated, she stepped back to the push-handle again.

But her hope was vain. Half a minute later the cry for help came once more from the pillows and quilts, this time more vigorously.

"Help, help, murder! I'm being kidnapped. My kidnapper is going to kill me. Rescue me. Take me back to mamma."

**What Can It Mean?**

This time a well dressed, middle aged woman approached near enough to hear most, if not all, of "the infant's" plea. She looked as if she was going to faint or scream as she passed, but she did neither.

The cries for help continued at frequent intervals from the carriage, and the woman pushed along as rapidly as she could without breaking into a run. If she had dared, she would have abandoned the child on the street and thus escaped the ever increasing embarrassment and danger, but there were too many persons passing for her to resort to such move. She turned several corners in the hope of finding less frequented avenues, but with poor success.

"Help!" "Murder!" "Police!" "Kidnappers." "Thieves," were some of the cries and words that seemed to pour almost continuously from the infant's lungs, while passers-by stared and shied at her and the babe as if in doubt whether to flee as from a ghost or put in a call for psychopathic ambulance. Finally Julia broke into a run and virtually flew down the sidewalk, pushing the carriage.

(To be concluded in February RADIO AGE)

Arthur B. McCullah, who created a sensation at the Chicago radio show, and who has been a keen student of the latest in super-heterodynes, will present a new article giving all the latest developments of the popular "super" in the February RADIO AGE. Watch the next issue for this up-to-the-minute article.

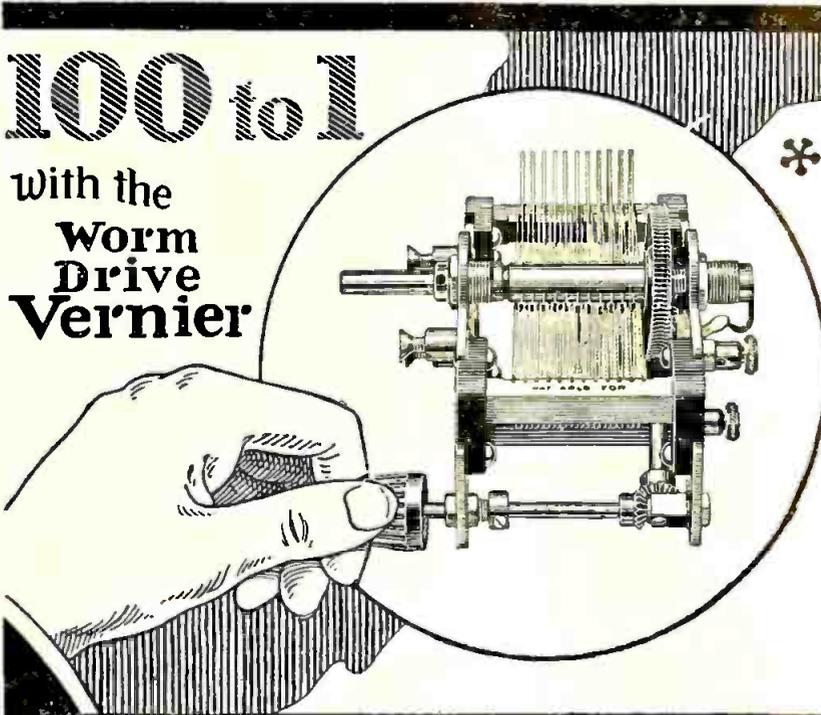
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Embodying a marvelous New Non-Oscillating Principle  
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 Dept. 58-91 Marshall Blvd. & 19th St., Chicago

**AMERICAN BRAND CONDENSER \$5.00**  
 IN CANADA \$7.00

**100 to 1**

With the **Worm Drive Vernier**



In justice to yourself you should examine the American Brand Condenser with the 100 to 1 Worm Drive Vernier before you finally decide which condenser you will put into your set.

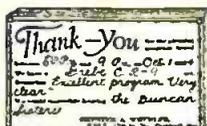
You will be agreeably surprised by its sturdy build—by its wonderful fine tuning possibilities—by its remarkable electrical qualities. Here is a real low loss condenser that we guarantee to improve any set. Let your dealer show it to you.

Note to Dealers: Your jobber is now able to furnish you with American Brand Condensers.

**American Brand Corporation**  
 8 West Park St., Newark, N. J.

**MAKE YOUR NEUT REACH OUT**—Same panel, same layout, fewer parts. Our \$5.00 Kit includes the one different part, 22 feet real gold sheathed wire, lithographed print of Kladag Coast to Coast Circuit, and Complete, simple instructions. Nothing else to buy. Gives selectivity with deep, resonant volume. Not obtainable elsewhere. We originated this and can name scores of buyers it has delighted. Satisfaction guaranteed. Details, 10c. Kit prepaid anywhere, \$5.00. New 48-page catalog, thousands of items, many exclusive, for stamp. We accept postage stamps same as cash. **KLADAG RADIO LABORATORIES, KENT, OHIO**

**SEND NO MONEY!**



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 Hear what YOU like. Stations are glad to put on numbers at your request. We print Special cards that get ATTENTION. All the RAGE Cards (Printing FREE) 100—only \$1.35; 200—\$1.85; 300—\$2.35, plus few cents postage. Order TODAY.  
**MONEY REFUNDED If Not Delighted**  
 Quality cards. High grade printing.  
 Send no money—just pay postman when you get cards. Order NOW!  
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 THAT BURNT OUT  
**AUDIO TRANSFORMER**

Satisfaction Guaranteed  
 \$5.00 Transformers - \$1.50  
 More than \$5.00 - \$2.50

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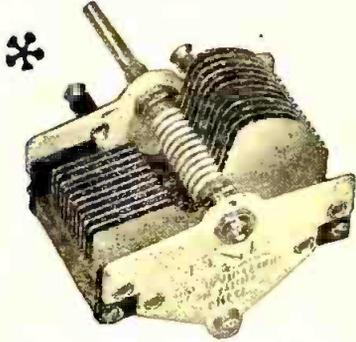


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**Amplitron Tubes \$4**  
 Bonded to Give Service, List Price  
 Send in your old and burnt out Tubes—We will send you new AMPLITRON—any model at \$2.50.  
 Dealers and Jobbers—Write for Discounts  
**Pennant Radio Laboratories**  
 Dept. RA, 23 Central Ave., Newark, N. J.

# A 6-Tube Baby Grand "Super"

(Continued from page 17)

TRADE **DXL** MARK  
Variable Condenser



## LOW LOSS

(Practically no Loss) A FACT

New distances—new thrills are yours with D. X. L. Straight-line Low Loss Condensers. For Low Loss is a definite fact.

Your set will give its absolute maximum. D. X. L. Condensers are manufactured with infinite precision upon the exclusive D. X. L. design.

With the D. X. L. Condenser, radio reception approaches perfection. Designed for all supersensitive sets. Fully guaranteed. Buy from your dealer or from factory direct.

List Prices	
11 Plate.....	\$1.00
17 Plate.....	4.25
23 Plate.....	4.50
43 Plate.....	5.00

### Set Manufacturers

Our special manufacturers' proposition will interest you. D. X. L. Condensers will increase the merit of your product.

Interesting description sent on request.

D. X. L. RADIO CORPORATION  
5765 Stanton Ave. Detroit, Michigan

Distributors  
Sales agencies wanted to develop distribution in certain territories. D. X. L. offers an unusual merchandising proposition. Write or wire.

## Where Radiophans Buy Parts of Recognized Merit

1—6-inch Radion Tube—3-inch dia.....	\$ .60
1/2 lb. No. 24 D.C.C. Magnet Wire.....	.60
3—Precision Audio Transformers, each \$5.00.....	15.00
2—Duplex Variable Vernier Condensers .0005, each \$6.50.....	13.00
1—50 Turn Honeycomb Coil, unmounted.....	.60
3—Batteries No. 771-C, each 60c.....	1.80
3—Benjamin Cle-ra-tone Sockets, each \$1.....	3.00
1—R.U.F. Crystal (semifixed).....	1.35
2—N. Y. Mica Fixed Condenser .00025, each 35c.....	.70
3—30 ohm Ameco Rheostats, each \$1.25.....	3.75
10—lengths Bus Bar, each 2c.....	.20
	\$40.60

COMPLETE SET OF ABOVE PARTS. \$35.90

Brandes Superior Matched Headphones.....	\$ 5.00
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mail order will be  
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Try us on any radio  
parts you have been  
unable to secure.

**MORISON**  
Electrical Supply Co. Inc.

Wholesale

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15 East 40th Street New York City

RADIO AGE ANNUAL FOR 1925!  
Will be on sale early in January! Bigger and better than ever with new hookups and a big blueprint section! Price \$1.00, postpaid, or at your dealer's. Send in your order now to insure delivery of your copy.

method of wiring other than merely the appearance of the set. At first glance it may seem to introduce complications for the average fan. This is not the case, however, for after you have run the first two or three base wires, you will have little or no difficulty. It should be remembered that contrary to most wiring plans, you have no grid or plate leads to contend with, besides those appearing above the baseboard; and in no case will it be possible to run grid and plate leads parallel to each other or to any other leads in the set. The oft repeated injunction of keeping grid and plate leads as far separated as possible and not parallel can thus be forgotten when wiring underneath the baseboard.

All that you have to contend with are the filament leads and "b" battery leads. The arrangement of the baseboard precludes the possibility of interaction between any of these leads. By studying the baseboard photograph, it will be seen that the filament leads are carried directly through the baseboard in every case and that the plate and grid leads remain above the baseboard and go directly to the transformers, or, as the case may be, to the oscillator coil.

As soon as you have placed the apparatus on a baseboard, using brass machine screws and nuts for the purpose, drill your holes for the filament leads as close to the binding posts as possible. This also applies to all other leads which go from transformers to other portions of the circuit. Be sure to stagger the apparatus as shown. The baseboard arrangement has in mind condensing to a minimum amount of space and at the same time insuring the shortest possible grid and plate leads. The intermediate frequency transformers used are shielded and are of the iron core type and can be worked very close together without interstage coupling. However, the baseboard arrangement has, among other advantages, that of keeping any possible interstage reaction to the smallest possible minimum.

While this set as originally built was planned so that holes were to be drilled through the baseboard for the various leads, yet in practice it will be found that a rather simpler method can be used; at least in the case of the filament leads going to the sockets. Remove the two filament binding posts from each of the sockets, and after placing the sockets in their respective positions on the baseboard, mark the baseboard with small center punch for holes through the baseboard, directly underneath the filament post holes. As most binding post screws extend considerably above the binding post, you will probably find that the binding post screws will be plenty long enough to pass through the baseboard, as well as the tube socket, and still leave enough threads extending above the socket for the binding post. Of course, the screw holes on the under side of the panel should be counter-sunk so that the heads of these screws will not extend beyond the bottom face of the baseboard.

You now have a very convenient method of attaching your filament leads directly in the binding posts without the necessity of drilling separate holes. The sockets used by the writer are the Benjamin type, having spring bases. Other leads not going to sockets will, of course, require separate holes through the baseboard. Great pains have been taken in laying out the two baseboard drawings shown with this article, so if you follow them carefully, very little comment need be made along this line except to repeat that only those wires that appear above and below the baseboard are shown in the respective drawings for each of these

### Securing Leads

THERE are two or three leads which are rather too long to support themselves; these should be held in place by a loop of copper wire passed through holes on either side of the lead. Make sure that these loops do not occur underneath any of the transformers or other apparatus, so as to cause short circuits or other complications. Usually you will find that the long leads can be run underneath the shorter leads by bending "U" shaped loop in the short lead directly over the intersection of the two leads and place a short piece of "spaghetti" on the longer lead so as to insulate the leads from each other. The "spaghetti" can be anchored in place by using a little shellac.

By consulting the photographic and baseboard views of this set, it will be seen that the upper loop binding post is connected directly to the stator plates of the right hand (loop condenser). This lead lays flat against the panel and is connected at its mid-point to the rotor plates of the small 9 plate Chelton condenser. The other lead from this condenser goes direct to the plate of the second tube (detector) and the plate terminal of the first intermediate transformer, which, as you will note, are in common. The rotor plates of the loop condenser are connected to the bottom binding post on the left end of the panel as well as to the input side of the oscillator coil. The 4½ volt bias battery shown between the two variable condensers is by-passed by means of a .0025 fixed condenser and has its negative side connected to the middle binding side post on the left hand end of the panel. The positive side of this bias battery is connected to the negative side of the filament circuit. The oscillator condenser shown at the extreme end of the panel bridges the plate and grid of the first (oscillator) tube as well as the oscillator coil.

### "B" Voltage Is 90

The battery shown in the photograph of the set between the loop condenser and the audio transformer places a negative bias on the (last) audio tube. The voltage is correct for 90 volts of "B" battery; the other bias battery shown on the back of the baseboard lying on its side furnishes negative bias to the first four tubes. A grid leak and grid condenser are used on

(Turn to page 75)

\* Tested and Approved by RADIO AGE \*

### Why a Musical Director Never SMILES

(Continued from page 35.)

ately planned a lengthy recital, due notice of which was forwarded to us. She appeared per schedule and sang one song.

It looked like something was due to happen to an otherwise good program.

With regret, she failed to appear again that evening. As we signed off for that particular hour, a veritable avalanche of wailing smote the ear. We were no gentlemen, we were the "short and uglies," we failed in believing that any one who sang with teeth tightly clenched in a wee, squealing manner was going to stand for such treatment, and much more.

### Then the Artist Type

HAVING up to this time said nothing, made no comment on the singing, offered no excuse save that the program was so full we hadn't had time for more than one number from the incipient Galli-Curci, we bowed the head to the blast and tried to appear meek and lamblike. The tirade continued for more than an hour. In fact, it continued until one of the engineers, annoyed by the threat of the lady's brother to do bodily injury to him, picked up a broom and industriously began to raise a cloud of dust from the concrete floor.

A typical example, that, of the "artist" type. Had the soprano in question really been good the episode would not have happened. If the program had been filled the real artist would have understood—as they often do—and would have been booked for a later, more propitious occasion.

Woe No. 3, as we see it, is the continual worry for fear those of the real artists booked may not appear in time for the opening of the concert or decide at the last moment not to appear at all.

(Turn to next page)

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  - 1 Genuine Brunswick Low Loss Condenser.
  - 1 Brunswick Tripliod Mounting Socket and Binding Post Strip.
  - 2 Brunswick Cast Foundation Brackets.
  - 2 Brunswick Jacks with Gold-Plated Fronts; 1 for phones, 1 for Loud Speaker.
  - 1 Freshman Mica Grid Condenser.
  - 1 Standard Glass-Enclosed Grid Leak.
  - 2 30-Ohm Shacton Bakelite Rheostats with Gold-Plated Indicators.
  - 2 Molded Mahogany Dials grained to match Panel.
  - 5 Lengths Professional Bus-Bar.
  - 1 Special Blue Print for this circuit. Not an ordinary hook-up but a clear picture form that a child can understand and make. 3 Premier Hegebot Transformers.
- ALL ASSEMBLED READY TO WIRE

THE RADIO SHACK  
55 Vesey Street, New York City  
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The  
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PRICE  
\$29<sup>39</sup>

### ACCESSORIES

- Everything needed to operate after building is listed here—
- 3 Type 201A Tested Tubes .....\$10.35
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  - 2 45-Volt Extra Large Enco "B" Batteries..... 6.50
  - 1 Pr. 3000-Ohm HeadPhones and Cord 3.75
  - 1 Antenna Equipment..... 1.50
  - 1 Phone Plug, Double..... .70
- COMPLETE OUTFIT.....\$34.05

Parts also sold separately

### CABINET FREE

Order Set and Accessory Outfit both together, and we will send Fine Mahogany Finish Cabinet FREE!

### MAIL COUPON TODAY

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Please send me the "Shacton" outfit I have marked. When it arrives I will pay the postman the amount. If I am not satisfied I will return it in 5 days, and you agree to refund my money instantly. Mark choice in square.

- (A) Complete Building Kit...\$29.39
- (B) Operating Outfit.....\$34.05

Name.....  
Address.....  
City.....State.....

### KHJ Los Angeles, Cal.

We are glad to confirm your report of reception of our program.

John S. Daggett,  
"Uncle John,"  
Mgr., Times Radio Staff.



### General Electric Company

Pacific Coast Broadcasting Station  
KGO  
5555 E. 14th St.  
Oakland, Cal.  
Sept. 11, 1924.

Mr. T. J. Kennedy,  
1360 University Ave., New York, N. Y.

We are glad to confirm your reception of KGO on the evening of Sept. 6 as we were broadcasting the opera "Carmen."

We always appreciate hearing from our radio listeners and hope that you will be able to pick up KGO regularly.

Yours very truly,

Jennings Pierce,  
Radio Broadcasting Pub. Dept.

## DX Fans! Confirmations Stop All "Doubting Thomases"

Confirmations of Stations Received from  
New York, N. Y., with

## KENNEDY TUNER

DX Fans! If you want real results, get a  
KENNEDY TUNER AND HAVE THE  
WHOLE U. S. A. AT YOUR FINGER TIPS.

Only one dial to get stations and the other to increase or decrease volume. Kennedy Tuner is used in place of variocoupler, variometer and honeycomb coils, saving the cost of over \$9.00 worth of unnecessary junk that is in most receiving sets, and no dead end losses.

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Including Globe  
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If not satisfied  
after 30 days, we  
will cheerfully  
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money.

Send for Free Diagram

## T. J. KENNEDY

RADIO GLOBE TROTTER

1360 University Ave., New York, N. Y.

### KFI Los Angeles, Cal.

Thanks for your letter received. Yes, "The Minuet," by Louis Parker, was broadcast from the Anthony station during the late program.

Yours, Radio KFI.

### General Electric Company

Pacific Coast Broadcasting Station  
KGO  
5555 E. 14th St.  
Oakland, Cal.  
Sept. 4, 1924.

Mr. Vincent T. Kenney,  
124 W. 96th St., New York, N. Y.

We are glad to confirm your reception of our late program from the Hotel St. Francis on the morning of August 27th.

We are always glad to answer any questions of our radio friends and hope you write in often with your comments.

Yours very truly,

Jennings Pierce,  
Radio Broadcasting Pub. Dept.

### KLZ Denver, Colo.

We are pleased to acknowledge receipt of your report of reception of our phone station. We have placed a tack in our map for you.

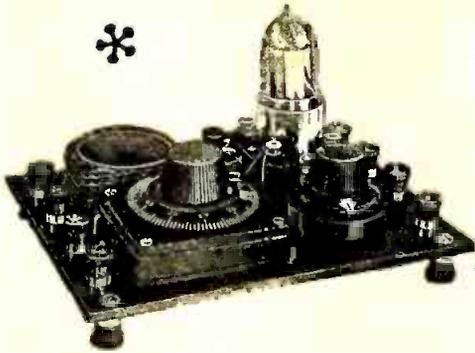
Reynolds Radio, Inc.

### 2-LO, London, Eng.

We beg to acknowledge your reception of our program.

Yours faithfully for the  
British Broadcasting Co., Ltd.,  
Jr. Director, London Station, C. C. H. King

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Beside its appearance and sturdy construction, three factors place the Babydyne above the average one tube set, i.e., compactness, a scientifically well-balanced hook-up, and greater ability to perform.

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Write today for descriptive literature and low prices of our guaranteed tubes.

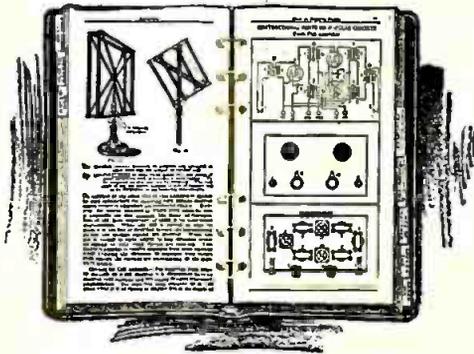
# INTERNATIONAL BABYDYNE RADIO RECEIVER

TRADE MARK

Manufactured by

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Dept. B, DANVERS, MASS.

## Lefax Radio Handbook



Radiofax

# THE PERPETUAL RADIO HANDBOOK

The Lefax Radio Handbook with flexible black binder..... \$2.00  
RADIOFAX, the monthly service that makes the hand-book perpetual, per year..... \$3.00

LEFAX, INC.

Ninth and Samson Sts., Philadelphia, Penna.

(Continued from preceding page)

The concert is announced, the program is arranged to the musical director's satisfaction, the time is set for five minutes from now—and no talent! Worra, worra!

"Ah, here they are. Three minutes to go. Please hurry. What're you going to do first? What's that first name again? There goes the 'on the air' signal. The red light'll be on in a minute. What's your next number? What's the name of your accompanist? Here we go. . . ."

Some time since a certain manager-clerk in a school of music kindly promised us seven persons for a program. Five hours before they were to arrive—it was on a holiday—we learned we must be "off the air" for a matter of two hours just at the time the manager-clerk's seven were to appear. The concert had started and the seven were supposed to "go on the air" a half hour later.

### A Terrible Outrage

They arrived seven minutes late, save for one soprano who ought to make a name for herself because she had so much common sense.

When we broke the news the manager-clerk, feeling important before his charges, no doubt, burst into a tempest of rage. He snarled. He growled. He sneered. He ended up by saying that his seven could wait the two hours if they wished, but he, for one, strongly urged them to leave the musical director flat on his back, gasping for success. He overlooked the fact that it had been impossible for us to notify his seven charges, since we had not known their address or phone numbers and, it being a holiday, he had not been in his office, where we might have reached him.

Meanwhile the musical director has one eye on the clock, thinking of the waiting thousands who will not wait long, another on the dilatory performer. Between trying to straighten out his crossed eyes, hurry the proceedings without recording strong language in the "mike," and calm himself, he is lucky if he doesn't begin saying "da da" and ask for a rattle.

### Happy [Sometimes]

But if the woes of a musical director are many and sore—we have mentioned but a few—his joys far offset them. Most artists are fine people, willing to help amuse, instruct and charm the millions of the radio theater and concert hall, happy to do their bit toward making broadcasting the eighth wonder of the world, quite conscious of the personal element and of the need for whole hearted co-operation between the station management and themselves and altogether a mighty good set of folk with which to be connected. (Turn to next page.)

## Your Crystal Set

will work 100 to 1000 miles if made by my plans. No tubes or batteries. Copyrighted plans \$1.00; or furnished FREE with complete parts for building set, including special coil and panel correctly drilled for only \$5.00. Satisfaction guaranteed or money refunded. Satisfied customers everywhere. Particulars free. LEON LAMBERT  
642 Kaufman Bldg. Wichita, Kansas

You listeners-in perhaps do not realize the effort those who sing and play for you are forced to make. It is not comparable to ordinary "visual" concertizing. Then, the artist may rest between "numbers" or groups. In the radio studio he cannot do so, but must play or sing continuously without either the encouragement of applause he can hear or the stimulus of an audience he can see.

Such co-operation as this makes the musical director of any station glad he is permitted to take part in the program.

Remember this the next time you hear something you particularly like and then set down a few lines of appreciation for the artist, send it to the station which gave you the pleasant experience, recalling the old saying that "a word of praise never hurt nobody, nohow, and it might do a pile of good."

The "old saying" is probably quoted wrong but you get the idea.

Signing off until—we see about that program—great grief, he's sick and can't come!!!—[Copyright, 1924, by the Chicago Tribune]

**"Stone Walls Do Not a Prison Make"**

(Continued from page 36.)

Harry is but 29 years old. On January 16, 1925, he will be a free man, able to pursue his talent to its rightful place. Every day WOS receives hundreds of letters addressed to Snodgrass, requesting favorite numbers and thanking him for his wonderful playing. These letters come from other lands and from people in all walks of life in America.

Snodgrass cannot see these letters, but he is told about them. He is told about the scores of offers from broadcasting stations, vaudeville theaters and concert halls that come in every mail. He knows that going to prison was the best thing that ever happened in his life and that he can pick any one of countless lucrative offers the minute he leaves the penitentiary.

Stone walls do not a prison make. Rather, they spelled a Castle of the Future for Harry Snodgrass, "King of the Ivories," of Station WOS.

**The Traffic Cop of the Air** \* **FERBEND Wave Trap**

Add a Ferbend Wave Trap to your Radio Set and "Police" your reception. Regulate traffic. Guaranteed to tune out any interfering station. Widely imitated but never equalled. The original and only successful WAVE TRAP. Now in its third year. Sent Postpaid upon receipt of \$8.50 or C. O. D. plus postage. Send for Free Booklet

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Largest exclusive Radio Jobbers in middle West.  
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**P**UTS you in touch with stations and programs never reached before—gives you better service and wider distance with far greater volume and wonderful clarity.

Get the utmost from your radio set by equipping it with Jiffy Ribbon Antenna. Jiffy is absolutely non-corrosive, immune to kinks or curls and of great tensile strength. The average ribbon soon collects black oxide, retarding reception and cutting down the efficiency of your set. Jiffy remains bright, clean and efficient indefinitely. Jiffy is easily and quickly installed and once up, is up to stay.

100 feet with 2 insulators..... **\$1.50**



*If Your Dealer Cannot Supply You—Mail The Coupon Below TODAY!*

**COUPON**

Apex Stamping Company,  
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Send me.....Jiffy Ribbon Antenna. I agree to pay postman \$1.50 each, plus few pennies postage.

Name.....

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**IF** YOU are genuinely interested in building a record-breaking radio set, write to Danziger-Jones, Inc. 25 Waverly Place, New York, Dept. C, for a copy of "Telos, the KIT of a Thousand Possibilities", to-day!

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20 Ft. Mast \$10 or 60 Ft. Mast \$45. All steel construction. Each mast complete with guy wires and mast head pulley. Write for literature and free blueprints.

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Get more stations—greater range—bigger volume—finer selectivity—less interference. Lasts forever. The one big advance yet made in tuning. Ratio 12 to 1. Quickly applied to any shaft. For sale by all good Radio Dealers. If unable to obtain from dealer, enclose \$2.50 for nickel-silver finish, or \$3.50 for De Luxe satin finished gold.

**7-Tube Super-Heterodyne for \$97.50**

Receive the parts complete to assemble your own set. Coat to coat on an 18-inch Loop. Assemble this 7-tube Microdyne Super-heterodyne on a 7x18 in. panel in three hours. Parts complete, including drilled and engraved panels, condensers, sockets, transformers, dials, connecting plugs, cables, etc., with drawings, diagrams and instructions. Price of cabinet to fit—on application. If your radio dealer cannot supply parts for complete Microdyne Radio Set, send check or money order for \$97.50 and name of your dealer.

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**TO CONSUMERS ONLY**

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Quality Not Sacrificed

Here is real battery quality, guaranteed to you, at prices that will astound the entire battery-buying public. Order direct from factory. Put the Dealer's Profit in your own pocket. You actually save much more than half, and so that you can be convinced of true quality and performance, we give a

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- 6-Volt, 140 Amp. Radio Storage Battery, 13.00

We ask for no deposit. Simply send name and address and style wanted. Battery will be shipped the day we receive your order Express C. O. D., subject to your examination on arrival. Our guarantee accompanies each battery. We allow 5% discount for cash in full with order. You cannot lose! Act quick. Send your order today—NOW.

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"If He Can Arrange It"  
The True Story of  
**BANKS KENNEDY**  
in February RADIO AGE

## A Four-Tube NEUTRO-REFLEX Set That Gets Results

(Continued from page 13)

three quarters of an inch in from the end as was done on the large tubes (see Figure No. 4). The end of the No. 26 wire will then be made fast by passing it down through one hole, up through the other and back down through the first hole, leaving about two inches of free end on the inside of the tube for connection.

Fifteen turns of the wire will then be wound on the tubes in an even layer in the same direction as the secondary coils and two more small holes will be drilled directly in line with the last turn, and in line with the first two holes on the other end of the tube and the wire fastened as was done at the start, leaving two inches of free end on the inside of the tube for connection.

The coils are now ready to be assembled into the completed radio frequency transformers. The primary coil will be inserted into the secondary coil so that holes No. 1 and No. 2 will line up. One of the No. 4 brass machine screws will be passed through hole No. 1, a brass nut having been placed between the coils as shown in the "left end elevation," figure No. 3. The free end of the secondary coil opposite hole No. 1 will then have the insulation removed and will be made fast under the second nut and a third nut placed on the screw, forming the terminal No. 1 of the secondary coil.

The same procedure should be followed with the screw and nuts for hole No. 3 except that the free end of the primary coil will be made fast under the head of the screw on the inside of the tubes, forming primary lead No. 2.

The free end of the secondary coil on the right end should then be made fast under a nut on the screw passed through hole No. 3 making the secondary terminal No. 3. The free end of the primary coil will be made fast under the head of the screw passed through hole No. 4, which will form primary terminal No. 4.

The mounting brackets for the coils will be made from a strip of brass about three-eighths of an inch wide and about two and one-half inches long; two of the brackets will be bent in the form of an "L" as shown in detail No. 2, figure No. 4, and one to form a step as shown in detail No. 1, figure No. 4. The upright leg of detail No. 2 will be one and one-half inches long and have a hole drilled to pass a No. 4 brass machine screw, one quarter inch down from the top. The foot of the "L" will have a hole drilled for the mounting screw.

The foot of detail No. 1 will be one-half inch long and have the hole for the mounting screw drilled. The rise will be one inch and the top projection will be three-quarters of an inch long. The hole for the mounting screw will then be drilled one-quarter of an inch in from the end and the brackets will be finished.

The next step will be to mount the brackets to the coils. The bracket known as detail No. 1 will be made fast to the transformer "R2" by a No. 4 brass machine screw through hole No. 5 on the

right end of the tube; one detail No. 2 will be fastened to each of the transformers "R1" and "R3" in a like manner and the transformers will then be ready to mount into the set.

**T**HE neutralizing condensers or neutrons, as they are usually called, are small variable condensers having a capacity, when properly adjusted, equal to that of the tube which it is to neutralize or balance.

The one described herein can be made at a cost of about fifteen cents. Four pieces of thin sheet brass or aluminum about fourteen thousandths of an inch in thickness and one and one half inches square; four pieces of number ten bare copper wire; four brass binding posts and two pieces of composition one and one-half inches wide and four inches long will be required, as well as four small terminals, as shown in Figure No. 5.

The construction of this instrument is so simple that little need be said outside of what is shown in Figure No. 5.

### Connecting the Set

The antenna lead will be made fast to the binding post "A"; the ground will be connected to the binding post "G". If a loop antenna is used, the leads from the loop will be made fast to the binding posts "A" and "G" in place of the leads mentioned. If the set is arranged as shown in the diagram and both aerials arranged for, the connections will be made to the outside antenna and to the ground as covered above. The loop terminals are made fast to a phone plug. This phone plug will be inserted into the cutoff jack "X" when it is desired to use the loop. The other connections can remain in place as the cutoff jack automatically cuts off the radio frequency transformer R1 and connects the loop to the set.

The terminals of the "A" or filament battery will be connected to the binding post "A1" and "A2", the positive lead or lead "+" will go to the post marked "A2" and the negative lead or lead marked "-" to the post marked "A1."

The "B" or plate battery will be connected to the binding posts marked "B" "B1" and "B2". The negative side of the battery will be connected to the post marked "B2", a tap will be taken at 22 1-2 volts and will be connected to post marked "B"; the positive terminal of the battery will then be connected to the post marked "B1". The correct "B" or plate battery for this set will be from 90 to 120 volts.

When the batteries have all been connected, test the two springs in the tube sockets to see that the "A" battery is not shorted with the "B" battery. This will be done by temporarily removing one of the leads to terminals "A1" or "A2" and shorting the springs in the tube socket marked "F—" and "F+", (these designations will appear on the sockets). If no spark is made, the battery lead will be then made fast again, the tube control rheostat "D"

\* Tested and Approved by RADIO AGE \*



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Dear Sir: Send me your FREE Radio Book and your limited plan without cost or obligation.



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Address: ..... City: .....



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No. 205B-Black Pyralin Bell.....\$22.50  
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# EBY

QUALITY BINDING POSTS

Twenty-five Different Engraved Tops

They Don't Lose Their Heads

**H. H. EBY MFG. CO.**  
Philadelphia

# Regeneration Plus Modulation

By Hogart S. Sweet

**R**EGENERATION plus modulation is the keystone of a new model ultradyne receiver designed by Robert E. Lacault, formerly Radio Research Engineer with the French Signal Corps. This combination is going to prove as valuable to the level minded radio fan as four wheel brakes and balloon tires have to the level minded autoist.

around with one or a couple of rheostats every time you shift. If you are using both stages of audio and wish to shift to the detector, out comes the plug with your own hands and out go the two audio frequency amplifier tubes. Likewise, on one or both go when the plug is inserted in one or the other jack.

All binding posts have been moved to



A horizontal rear view of the new Ultradyne L-2 as designed by Mr. Lacault. Note the neat arrangement of apparatus.

There is a strong comparison here; for both the autoist and radio fan seek the same things, namely: smooth operation and reliable and instant control.

Regeneration plus modulation! You can theorize until you are blue in the face, you can draw conclusions on such a combination from experience with regeneration in conjunction with the usual form of super-heterodyne, but until you experience the performance of the new ultradyne, you don't know the half of it!

But think it over from the theoretical standpoint anyway; we know the advantages of the super-heterodyne; maximum amplification for each radio frequency stage for one thing and ease of control for another. Add to this the modulation system and we make the first detector or frequency changer perform a real service by modulating the oscillations produced by the oscillator tube and thus enormously boost the amplitude of the

the rear, where they rightfully belong, for there should be no wires in front or on the side of the receiver, but behind, where they are out of sight and out of the way. The two variable condensers, of the low loss type, are both of the same capacity, whereas before one was twice the capacity of the other. Making them both of a capacity of .0005 M. F. provides a more even adjustment than was possible with the original type of ultradyne.

Naturally, the old type single layer cylindrical coils have been replaced by coils of the low loss type. These are the basket weave form and are more compact than the single layer type.

It will be noted from the photo that there is a radical change in the position of the controls. Both the tuning dials are situated in the center of the panel, really the most convenient positions for them—right where your hands normally rest. The regeneration control and the



A view of the ultradyne receiver showing the layout of the parts. Unusual results are reported by builders of this hookup.

incoming signal before it ever reaches the long wave radio frequency amplifiers. Now, suppose we add the most sensitive and efficient system of amplification known to the radio art; regeneration. To be more exact, suppose we include regeneration in the modulator tube circuit. What is the result?

### The Specifications

**B**UT listen to the specifications of Mr. Lacault's Model L-2 Ultradyne, before we cover the constructional details: There are no rheostats! The filaments of all the vacuum tubes are controlled by automatic filament regulating devices. Filament control jacks are employed for the two stages of audio frequency amplification so that it is not necessary to play

potentiometer control are out to either side, being the less important adjusting mediums.

The panel layout is shown in the photo. The loop aerial jack is at the extreme left followed by the regeneration control knob, the tuner dial, the oscillator dial and the potentiometer control. The three phone jacks and the "A" battery switch are lined up on the extreme right of the panel.

A view of the layout from the rear of the panel is also shown. From left to right are: the phone jacks and "A" battery switch, the potentiometer, the 23 plate oscillator condenser, the 23 plate tuning condenser, the regeneration coupler and its copper shield, and the loop aerial jack. (Turn to next page)

Another photo shows a view of the instruments mounted on the baseboard. The devices similar in appearance to grid leaks are the automatic filament regulators. The oscillator coupler is seen just to the right of the second rear tube socket. The tuning coil is situated to the extreme right of the baseboard. The ultraformers are seen lined along the front portion of the baseboard, in the photo, though this is actually the rear. The "A," "B" and "C" battery binding posts are all mounted on a single strip of bakelite which is supported by two brass columns, and are at the extreme left of the baseboard, in the photo. The aerial and ground binding posts are mounted in the same manner and are seen to the extreme right.

**The Parts Required**

- 1—7" x 30" cabinet with baseboard.
- 1—7" x 30" panel.
- 2—.0005 M. F. low loss variable condensers.
- 2—vacuum tube knobs and dials.
- 1—low loss tuning coil.
- 1—low loss oscillator coil.
- 1—ultraformer—type A.
- 3—ultraformers—type B.
- 1—low loss 180° coupler with shield.
- 1—dial for coupler.
- 8—vacuum tube sockets.
- 1—300 to 400 ohm potentiometer.
- 8—amperites—type A.
- 2—double circuit jacks.
- 1—double circuit filament control jack.
- 1—single circuit filament control jack.
- 1—"A" battery switch.
- 2—audio frequency transformers.
- 7—variable grid leak.
- 7—binding posts.
- 2—bakelite binding post mounting strips.
- 1—.0005 M. F. condenser with grid leak mounting.
- 4—.00025 M. F. fixed condensers.
- 2—.001 M. F. fixed condensers.
- 1—.005 M. F. fixed condenser.
- No. 14 tinned copper bus bar wire.
- Assortment of screws and nuts.

The first job to be done is the panel drilling and the mounting of the phone jacks, "A" battery switch, the two 23-plate variable condensers, the potentiometer and the coupler and shield. Lay out the baseboard next, placing each instrument in its proper position as shown in the photo. Wire the instruments mounted on the panel first, then the instruments on the baseboard. Be sure to solder all connections and take your time about it to insure a good job. Be sparing with the soldering flux and use a hot iron. After both the panel and baseboard instruments have been wired, attach the baseboard to the panel and complete the wiring between the instruments on each.

Be sure to check all the connections when you have completed the wiring, and as a final check up, test each soldered joint with a battery and headphones to insure perfect electrical contact.

After all instruments and connections have been tested, insert the tubes in the sockets, connect up the "A," "B" and "C" batteries to the proper binding posts, plug in the loop aerial or attach the aerial and ground, and with the phones or loud speaker plugged in, pull the filament switch.

**Tuning the Set**

THE following is the correct procedure for tuning the set: turn the oscillator dial one degree at a time and for each setting of this dial turn the tuning dial slowly through its whole range. If nothing is heard at any setting, move the oscillator dial one more degree and repeat the process with the tuning dial. At some point, one should hear a station, and it will be noticed that a slight hissing

noise is heard when the station is transmitting, but no one speaking or singing into the microphone. This slight hissing noise indicates the presence of a carrier wave and will help materially in tuning in the various broadcast stations.

All this tuning should be done with the potentiometer adjusted to a point where no whistles are heard. If whistling noises are present, the potentiometer should be turned towards the positive side until the whistling stops, at which point the amplifier operates at its maximum sensitiveness. When tuning in distant stations, it may be necessary to readjust the potentiometer slightly. This should be done only after the station is heard faintly, but clearly enough to increase the amplification.

When tuning in very weak signals, the feed-back or regenerative coupler should be turned slowly until a point is reached where a whistle is heard, then moved back just below this point. A slight readjustment of the two condensers will then bring the signal to maximum audibility. When tuning in another station, turn the feed-back coupler to zero (coils at right angle) and tune first with the two condensers, as explained above, then adjust the coupler when the station is tuned in.

It should be pointed out that the regeneration feature incorporated in the new ultradyne is a form of radio frequency amplification and consequently plays its most important part when you are receiving a long distance station. Its use does not increase the volume of the signals received from local stations to any appreciable extent, this not being the object. Greater volume can always be obtained by the addition of audio frequency amplification; but it does increase the volume of stations at a distance for the reason that the weak signals are boosted in amplitude before they pass through the long wave radio frequency amplifier. Since the object of the regeneration feature is to make the Ultradyne more sensitive to weak signals, it should be evident that it will not only increase the volume of signals from distant stations and insure consistent reception, but will also pick up the signals from stations that could not be heard on an Ultradyne without regeneration.

With the addition of regeneration, it will be found that the second stage of audio frequency amplification is of real use only when receiving from very distant stations. All the volume desired is had with one stage of audio frequency amplification when receiving local or semi-local stations. The second stage of audio frequency amplification, however, is quite desirable for long distance work and may be likened to a high powered car in which, under normal conditions, the surplus power is not used, but is there for use in case of emergency.

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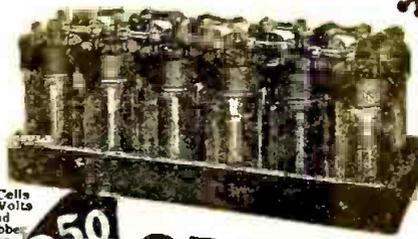
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# Corrected List of Broadcasting Stations

KDKA	Westinghouse Electric & Mfg. Co.	East Pittsburgh	326	KFOA	The Principia	St. Louis, Mo.	261
KDPM	Westinghouse Electric & Mfg. Co.	Cleveland, Ohio	270	KFOB	The Searchlight Publishing Co.	Fort Worth, Tex.	254
KDPT	Southern Electrical Co.	San Diego, Calif.	244	KFOC	Kidd Brothers Radio Shop	Astoria, Ore.	283
KDYL	Newhouse Hotel	Salt Lake City, Utah	360	KFOD	Chovin Supply Co.	Anchorage, Alaska	280
KDYM	Savoy Theatre	San Diego, Calif.	280	KFOE	Dickenson-Henry Radio Laboratories	Colorado Springs, Colo.	224
KDYO	Oregon Institute of Technology	Portland, Oreg.	360	KFOF	D. A. Boul.	Minneapolis, Minn.	224
KDZE	Frank E. Siefert	Bakersfield, Calif.	240	KFOG	Southern Calif. Radio Ass'n.	Los Angeles, Calif.	226
KDZJ	Rhodes Department Store	Seattle, Wash.	270	KFOH	Radio Service Co.	Burlingame, Calif.	231
KDZK	Electric Supply Co.	Wenatchee, Wash.	360	KFOI	The Thos. H. Ince Corp.	Culver City, Calif.	234
KDZR	Bellingham Publishing Co.	Bellingham, Wash.	261	KFOJ	Harbour-Longmire Company	Oklahoma City, Okla.	226
KDZS	McArthur Bros. Mercantile Co.	Phoenix, Ariz.	360	KFOK	Democrat Leader	Fayette, Mo.	236
KFAE	State College of Washington	Fullman, Wash.	330	KFOQ	Oklahoma Free State Fair Assn.	Muskogee, Okla.	252
KFAF	Western Radio Corporation	Denver, Colo.	278	KFOO	Texas Highway Bulletin	Austin, Tex.	283
KFAJ	University of Colorado	Boulder, Colo.	360	KFOQ	Third Baptist Church	Portland, Ore.	260
KFAR	Studio Lighting Service Co. (O. K. Olsen)	Hollywood, Calif.	280	KFOQ	Meier Radio Shop	Russell, Kans.	261
KFAU	Boise High School	Boise, Idaho	270	KFOR	G. S. Carson, Jr.	Iowa City, Ia.	224
KFAW	The Radio Den (W. B. Ashford)	Santa Ana, Calif.	280	KFOR	Walter LaFayette Ellis	Oklahoma City, Okla.	250
KFAY	Virgin's Radio Service	Medford, Oreg.	283	KFOT	Texas National Guard	Denison, Texas	252
KFBB	F. A. Buttrey & Co.	Hayre, Mont.	360	KFOU	W. Riker	Holy City, Calif.	234
KFBC	W. K. Azbill	San Diego, Calif.	278	KFOV	Omaha Grain Exchange (Portable)	Omaha, Nebr.	231
KFBE	Reuben H. Horn	San Luis Obispo, Calif.	242	KFOV	C. F. Knierim	North Bend, Wash.	248
KFBG	First Presbyterian Church	Boise, Idaho	360	KFOX	Alfred M. Hubbard	Seattle, Wash.	233
KFBK	Kimball-Upson Co.	Sacramento, Calif.	283	KFOZ	Farmers State Bank	Belden, Neb.	273
KFBL	Leese Bros.	Everett, Wash.	224	KFRJ	The Reynolds Radio Co. Inc. Portable Station	Hollywood, Calif.	240
KFBM	Trinidad Gas & Electric Supply Co. and the Chronicle News	Trinidad, Colo.	280	KFRJ	Guy Simmons, Jr.	Conway, Ark.	250
KFBU	The Cathedral	Laramie, Wyo.	283	KFRW	United Church of Olympia	Olympia, Wash.	220
KFCB	Nielson Radio Supply Co.	Phoenix, Ariz.	238	KFRW	Angelus Temple	Los Angeles, Calif.	278
KFCF	Frank A. Moore	Walla Walla, Wash.	360	KFSY	The Van Blaricon Co.	Helena, Mont.	261
KFCL	Leslie E. Rice	Los Angeles, Cal.	236	KGG	Tacoma Daily Ledger	Tacoma, Wash.	252
KFCP	Ralph W. Flygare	Ogden, Utah	360	KGG	Hallock & Watson Radio Service	Portland, Oreg.	360
KFCY	Fred Mahaffey, Jr.	Houston, Texas	360	KGO	General Electric Co.	Oakland, Calif.	312
KFDZ	Omaha Central High School	Omaha, Neb.	258	KGU	Marion A. Mulrony	Honolulu, Hawaii	Waikiki Beach 360
KFDH	St. Michael's Cathedral	Boise, Idaho	252	KGW	Portland Morning Ozeonian	Portland, Oreg.	282
KFDJ	University of Arizona	Tucson, Ariz.	368	KGY	St. Martin College (Rev. Sebastian Ruth)	Los Angeles, Calif.	395
KFDK	Oregon Agricultural College	Corvallis, Oreg.	360	KHO	Times-Mirror Co.	Seattle, Wash.	360
KFDX	First Baptist Church	Shreveport, La.	360	KJQ	Louis Wasmser	Stockton, Calif.	273
KFDY	South Dakota State College	Brookings, S. Dak.	360	KJR	C. O. Gould	Seattle, Wash.	283
KFDZ	Harry O. Iverson	Minneapolis, Minn.	231	KJS	Northwest Radio Service Co.	Los Angeles, Calif.	360
KFEC	Meier & Frank Co.	Portland, Oreg.	248	KLS	Bible Institute of Los Angeles	Los Angeles, Calif.	360
KFEK	Augsbury Seminary	Minneapolis, Minn.	261	KLX	Warner Brothers Radio Supplies Co.	Oakland, Calif.	360
KFEL	Winner Radio Corp.	Denver, Colo.	254	KLZ	Tribune Publishing Co.	Oakland, Calif.	509
KFEO	J. L. Stropstein	Fort Oak, Neb.	268	KMO	Reynolds Radio Co.	Denver, Colo.	283
KFEB	Auto Electric Service Co.	Fort Dodge, Iowa	231	KNO	San Joaquin Light & Power Corp.	Fresno, Calif.	248
KFEY	Bunker Hill & Sullivan Mining and Concentrating Co.	Kellogg, Idaho	360	KNT	Leve Electric Co.	Tacoma, Wash.	263
KFFB	Jenkins Furniture Co.	Boise, Idaho	240	KOB	Walter Henrich	Kukah Bay, Alaska	263
KFFE	E. H. Smith	Hillsboro, Oreg.	229	KOP	Los Angeles Evening Express	Los Angeles, Calif.	337
KFFP	First Baptist Church	Moberly, Mo.	266	KPO	New Mexico College of Agriculture & Mechanic Arts	State College, N. Mex.	360
KFFR	Nevada State Journal (Jim Kirk)	Sparks, Nev.	226	KQD	Detroit Police Department	Detroit, Mich.	286
KFFV	Grace Land College	Lanoni, Iowa	280	KQV	Hale Bros.	San Francisco, Calif.	423
KFFY	Pineus & Murphy Music House	Alexandria, La.	275	KQW	Apple City Radio Club	Hood River, Oreg.	360
KFGB	Heidreder Radio Supply Co.	Utica, Neb.	224	KQX	Doubleday-Hill Electric Co.	Pittsburgh, Pa.	270
KFGC	Louisiana State University	Baton Rouge, La.	254	KRE	Charles D. Herrold	San Jose, Calif.	360
KFGD	Chickasha Radio Electric Co.	Chickasha, Okla.	248	KSD	V. C. Battery & Electric Co.	Berkeley, Calif.	275
KFGH	Leland Stanford University	Stanford University, Calif.	273	KST	Post Dispatch (Pulitzer Pub. Co.)	St. Louis, Mo.	446
KFGL	Snell & Irbly	Arlington, Oreg.	234	KTV	First Presbyterian Church	Seattle, Wash.	360
KFGO	Crary Hardware Co.	Boone, Iowa	226	KUO	Examiner Printing Co.	San Francisco, Calif.	360
KFGX	First Presbyterian Church	Orange, Tex.	250	KWG	Portable Wireless Telephone Co.	Stockton, Calif.	360
KFGZ	Emmanuel Missionary College	Berrien Springs, Mich.	286	KWH	Los Angeles Examiner	Los Angeles, Calif.	360
KFHA	Western State College of Colorado	Gunnison, Colo.	252	KYQ	Electric Shop	Honolulu, Hawaii	270
KFHJ	Ambrose A. McCue	Neah Bay, Wash.	261	KYW	Westinghouse Electric & Mfg. Co.	Chicago, Ill.	536
KFHK	Fallon & Co.	Santa Barbara, Calif.	360	KZM	Preston D. Allen	Oakland, Calif.	360
KFHR	Star Electric & Radio Co.	Seattle, Wash.	283	WAAB	Valdemar Jensen	New Orleans, La.	268
KFI	E. C. Anthony, Inc.	Los Angeles, Calif.	468	WAAC	Tulane University	New Orleans, La.	360
KFIF	Benson Polytechnic Institute	Portland, Oreg.	360	WAAD	Ohio Mechanics Institute	Cincinnati, Ohio	360
KFIO	North Central High School	Spokane, Wash.	252	WAAG	Chicago Daily Drivers Journal	Chicago, Ill.	263
KFIP	First Methodist Church	Yakima, Wash.	242	WAAM	H. R. Nelson Co.	Chicago, Ill.	263
KFIQ	Alaska Electric Light & Power Co.	Juneau, Alaska	226	WAAN	University of Missouri	Columbia, Mo.	254
KFIR	Reorganized Church of Jesus Christ of Latter Day Saints	Independence, Mo.	240	WAAP	Omaha Grain Exchange	Omaha, Neb.	286
KFIS	Daily Commonwealth and Oscar A. Huelsman	Fon Du Lac, Wis.	273	WAAB	Harrisburg Sporting Goods Co.	Harrisburg, Pa.	268
KFJB	Marshall Electrical Co.	Marshalltown, Iowa	248	WABD	Parker High School	Dayton, Ohio	283
KFJC	Seattle Post Intelligencer	Seattle, Wash.	270	WABH	Lake Shore Tire Co.	Sandusky, Ohio	240
KFJD	National Radio Manufacturing Co.	Oklahoma City, Okla.	252	WABI	Bangor Railway & Electric Co.	Bangor, Me.	240
KFJE	Liberty Theatre (F. E. Marsh)	Astoria, Oreg.	252	WABL	Connecticut Agricultural College	Storrs, Conn.	268
KFJK	Delano Radio and Electric Co.	Bristow, Okla.	233	WABM	O. A. Doherty Automotive and Radio Equipment Co.	Saginaw, Mich.	254
KFJL	Hardware Manufacturing Co.	Ottumwa, Iowa	242	WABN	Chicago Daily Drivers Journal	Chicago, Ill.	263
KFJM	University of North Dakota	Grand Forks, N. Dak.	280	WABP	H. R. Nelson Co.	Chicago, Ill.	263
KFJQ	Valley Radio, Div. of Elec. Constr. Co.	Grand Forks, N. D.	280	WABQ	University of Missouri	Columbia, Mo.	254
KFJR	Ashley C. Dixon & Son	Stevensville, Mont. (near)	258	WABR	Omaha Grain Exchange	Omaha, Neb.	286
KFJX	Iowa State Teacher's College	Cedar Falls, Iowa	280	WABU	Harrisburg Sporting Goods Co.	Harrisburg, Pa.	268
KFJY	Tunwall Radio Co.	Fort Dodge, Iowa	246	WABV	Parker High School	Dayton, Ohio	283
KFJZ	Texas National Guard, One hundred and twelfth Cavalry	Fort Worth Texas	254	WABW	Lake Shore Tire Co.	Sandusky, Ohio	240
KFKA	Colorado State Teachers College	Greeley, Colo.	273	WABX	Bangor Railway & Electric Co.	Bangor, Me.	240
KFKB	Brinkley-Jones Hospital Association	Midford, Kans.	286	WABY	Connecticut Agricultural College	Storrs, Conn.	268
KFKC	F. F. Gray	Butte, Mont.	283	WABZ	O. A. Doherty Automotive and Radio Equipment Co.	Saginaw, Mich.	254
KFKD	Conway Radio Laboratories (Ben H. Woodruff)	Conway, Ark.	250	WAHC	Chicago Daily Drivers Journal	Chicago, Ill.	263
KFKX	Westinghouse Electric & Manufacturing Co.	Hastings, Nebr.	341	WABH	H. R. Nelson Co.	Chicago, Ill.	263
KFKZ	Nassour Bros. Radio Co.	Colorado Springs, Colo.	234	WBAN	University of Missouri	Columbia, Mo.	254
KFLA	Abner R. Willson	Butte, Mont.	283	WBAO	Omaha Grain Exchange	Omaha, Neb.	286
KFLB	Signal Electric Manufacturing Co.	Menominee, Mich.	248	WBAP	Harrisburg Sporting Goods Co.	Harrisburg, Pa.	268
KFLD	Paul E. Greenlaw	Franklinton, La.	234	WBAV	Parker High School	Dayton, Ohio	283
KFLE	National Educational Service	Denver, Colo.	268	WBAX	Lake Shore Tire Co.	Sandusky, Ohio	240
KFLQ	Bizzell Radio Shop	Little Rock, Ark.	251	WBAY	Bangor Railway & Electric Co.	Bangor, Me.	240
KFLR	University of New Mexico	Albuquerque, New Mexico	254	WBBD	Connecticut Agricultural College	Storrs, Conn.	268
KFLU	Rio Grande Radio Supply House	San Benito, Texas	236	WBBG	O. A. Doherty Automotive and Radio Equipment Co.	Saginaw, Mich.	254
KFLV	Rev. A. T. Williams	Rockford, Ill.	229	WBBI	Chicago Daily Drivers Journal	Chicago, Ill.	263
KFLW	Missoula Electric Supply Co.	Missoula, Mont.	234	WBBL	H. R. Nelson Co.	Chicago, Ill.	263
KFLX	George Roy Clough	Galveston, Tex.	240	WBMM	University of Missouri	Columbia, Mo.	254
KFLZ	Atlantic Automobile Co.	Atlantic, Ia.	273	WBNN	Omaha Grain Exchange	Omaha, Neb.	286
KFMB	Christian Churches	Little Rock, Ark.	254	WBPP	Harrisburg Sporting Goods Co.	Harrisburg, Pa.	268
KFMO	University of Arkansas	Fayetteville, Ark.	263	WBRR	Parker High School	Dayton, Ohio	283
KFMR	Morningside College	Sioux City, Iowa	261	WBBS	Lake Shore Tire Co.	Sandusky, Ohio	240
KFMT	Dr. George W. Young	Minneapolis, Minn.	231	WBBT	Bangor Railway & Electric Co.	Bangor, Me.	240
KFMW	M. G. Sateren	Houghton, Mich.	266	WBBU	Connecticut Agricultural College	Storrs, Conn.	268
KFMX	Carleton College	Northfield, Minn.	283	WBVA	O. A. Doherty Automotive and Radio Equipment Co.	Saginaw, Mich.	254
KFNF	Henry Field Seed Co.	Shenandoah Iowa	266	WBWB	Chicago Daily Drivers Journal	Chicago, Ill.	263
KFNG	Wooten's Radio Shop	Coldwater, Miss.	254	WBWC	H. R. Nelson Co.	Chicago, Ill.	263
KFNL	Radio Broadcast Ass'n.	Paso Robles, Calif.	240	WBWD	University of Missouri	Columbia, Mo.	254
KFNV	L. A. Drake Battery and Radio Supply Shop	Santa Rosa, Calif.	234	WBWE	Omaha Grain Exchange	Omaha, Neb.	286
KFNY	Montana Phonograph Co.	Helena, Montana	261	WBWF	Harrisburg Sporting Goods Co.	Harrisburg, Pa.	268
KFNZ	Royal Radio Company	Burlingame, Calif.	231	WBWG	Parker High School	Dayton, Ohio	283
KFOA	Rhodes Department Store	Seattle, Wash.	455	WBWH	Lake Shore Tire Co.	Sandusky, Ohio	240
KFOC	First Christian Church	Whittier, Calif.	236	WBWI	Bangor Railway & Electric Co.	Bangor, Me.	240
KFOD	Radio Shop	Wallace, Idaho	224	WBWM	Connecticut Agricultural College	Storrs, Conn.	268
KFOE	Moberly High School Radio Club	Moberly, Mo.	246	WBWN	O. A. Doherty Automotive and Radio Equipment Co.	Saginaw, Mich.	254
KFOF	Leslie M. Schifano	Marengo, Iowa	234	WBWP	Chicago Daily Drivers Journal	Chicago, Ill.	263
KFON	Echophone Radio Shop	Long Beach, Calif.	234	WBWQ	H. R. Nelson Co.	Chicago, Ill.	263
KFOP	Latier Day Saints University	Salt Lake City, Utah	261	WBWR	University of Missouri	Columbia, Mo.	254
KFOR	Rohrer Elec. Co.	Marshfield Oreg.	226	WBWS	Omaha Grain Exchange	Omaha, Neb.	286
KFOT	David City Tire & Electric Co.	David City, Nebraska	240	WBWT	Harrisburg Sporting Goods Co.	Harrisburg, Pa.	268
KFOU	College Hill Radio Club	Wichita, Kansas	231	WBWZ	Parker High School	Dayton, Ohio	283
KFOV	Hommel Mfg. Co.	Richmond, Calif.	254	WCAD	Lake Shore Tire Co.	Sandusky, Ohio	240
KFOY	Board of Education, Technical High School	Omaha, Nebraska	248	WCAG	Bangor Railway & Electric Co.	Bangor, Me.	240
KFOZ	Beacon Radio Service	St. Paul, Minn.	226	WCAL	Connecticut Agricultural College	Storrs, Conn.	268
KFOA	Leon Hudson Real Estate Co.	Fort Smith, Ark.	233	WCAM	O. A. Doherty Automotive and Radio Equipment Co.	Saginaw, Mich.	254
KFB	Edwin J. Brown	Seattle, Wash.	224	WCAN	Chicago Daily Drivers Journal	Chicago, Ill.	263
KFBG	Garretson and Dennis	Los Angeles, Calif.	238	WCAP	H. R. Nelson Co.	Chicago, Ill.	263
KFBH	Harold Chas. Mailander	Salt Lake City, Utah	242	WCAR	University of Missouri	Columbia, Mo.	254
KFBK	C. C. Baxter	Dublin, Texas	242	WCAS	Omaha Grain Exchange	Omaha, Neb.	286
KFBM	The New Furniture Co.	Greenville, Texas	242	WCAT	Harrisburg Sporting Goods Co.	Harrisburg, Pa.	268
KFBN	Missouri National Guard	Jefferson City, Mo.	242	WCAY	Parker High School	Dayton, Ohio	283
KFBP	Colorado National Guard	Denver, Colo.	231	WCAX	Lake Shore Tire Co.	Sandusky, Ohio	240
KFBQ	G. & G. Radio & Electric Shop	Olympia, Washington	236	WCAY	Bangor Railway & Electric Co.	Bangor, Me.	240
KFBR	Los Angeles Co. Forestry Dept.	Los Angeles, Calif.	231	WCBA	Connecticut Agricultural College	Storrs, Conn.	268
KFBT	Cape Johnson	Salt Lake City, Utah	268	WCBB	O. A. Doherty Automotive and Radio Equipment Co.	Saginaw, Mich.	254
KFBV	Heintz & Kohlmann, Inc.	San Francisco, Calif.	236	WCBC	Chicago Daily Drivers Journal	Chicago, Ill.	263
KFBW	St. Johns M. E. Church	Cartersville, Mo.	268	WCBD	H. R. Nelson Co.	Chicago, Ill.	263
KFBX	First Presbyterian Church	Fine Bluff, Ark.	242	WCBE	University of Missouri	Columbia, Mo.	254
KFBY	Symons Investment Co.	Spokane, Wash.	283	WCBF	Omaha Grain Exchange	Omaha, Neb.	286
				WCBG	Harrisburg Sporting Goods Co.	Harrisburg, Pa.	268

### A 6-Tube Baby Grand Super Het

(Continued from page 66)

the fifth (detector) tube.

It will be necessary to try several capacities of fixed condensers across the primary of the audio transformer. The value to use may run as high as .0075 or as low as .0025. The .0275 condenser across the primary of the output transformer is rather critical, as is also the one across the primary of the audio transformer. The condensers C-4 and C-2 are rather critical, and unless they are nearly the right capacity, the oscillator circuit will have a tendency to be erratic in its operation or possibly slip over into the adjacent circuit causing peculiar symptoms. The same thing that has been said a number of times before should be repeated; namely: that fixed condensers, while given rated capacity markings, vary as a usual thing from the rated capacity by as much as 15 to 20 per cent. The writer has frequently run across fixed condensers which had such high conductance as to be useless as condensers.

A 1 MF condenser of 1 MF capacity is placed between the negative "B" and plus "B" 45 volt posts. This condenser is shown at the extreme left end of the baseboard at the back. No capacity less than 1 MF should be used, and usually it could be increased to 2 MF without actually causing any ill effects.

#### Tuning The Set

By using good straight line condensers, it will be possible to lay out a chart whereby you can predict, with almost startling certainty, the dial setting for any station that you may wish to reach.

It is to be understood, of course, that the oscillator dial has two settings for every station. Usually it will be found that one of these settings gives results superior to the other. It may be necessary to make a slight adjustment of the loop condenser when changing the oscillator settings so as to secure the greatest efficiency in tuning.

## AMBASSADOR Low Loss Products



Master Tuning Coil  
Perfectly Balanced  
Head Phone  
Low Loss Condenser

High grade, standard radio products that will increase the efficiency of any set and add to the satisfaction of the user. Ambassador Low Loss Products have long been the choice of particular fans. See them—compare them, and you will choose them too.



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Write for interesting literature  
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### RADIO BARGAINS

Radio Set Complete, with R. C. A. Tubes, Batteries, and Antenna Equipment, ready to tune in.....\$19.85  
Journal Low-Loss Coils, set..... 3.95  
Engraved Binding Posts, Complete set..... 1.00  
Guaranteed Crystals..... .59  
Famous Chapin Transformers, 6- or 8-1..... 3.85  
All mail orders filled promptly C. O. D. Parcel Post.  
FREE—Write now, Big Bargain Sheet  
RADIO-ELECTRIC MFG. CO.  
Dept. S. 442 Clinton Ave., Newark, N. J.

## CLASSIFIED ADVERTISEMENTS

Don't overlook the value of RADIO AGE'S classified advertisements. Many such messages have paved the way to independent incomes.

The classified advertising rates are but ten cents per word for a single insertion. Liberal discounts are allowed on three, six and

twelve -time insertions, of five, fifteen and thirty per cent, respectively. Unless placed through an accredited advertising agency, cash should accompany all orders. Name and address must be included at foregoing rates and no advertisement of less than ten words will be accepted.

#### AGENTS

90c an hour to advertise and distribute samples to consumer. Write quick for territory and particulars. American Products Co., 2130 American Building, Cincinnati, Ohio.

Man wanted for this territory to sell wonderful value men's, women's. Children's shoes direct, saving consumer over 40%. Experience unnecessary. Samples supplied. Big weekly permanent income. Write today Tanners Mfg. Co., 1334 C. St., Boston, Mass.

#### BUSINESS OPPORTUNITIES

DEALERS—Write for our illustrated catalog of reliable Radio Merchandise. Rosier-Manning Corporation, Dept. D, 1830 Wilson Ave., Chicago, Ill.

AN OLD AND WELL ESTABLISHED MANUFACTURING COMPANY IN THE MIDDLE WEST WITH LARGE WELL EQUIPPED PLANTS AND UNUSUAL FINANCIAL RESOURCES, DESIRING TO ENTER THE RADIO FIELD WILL CONSIDER THE MANUFACTURE AND SALE OF RADIO SETS OR DEVICES OF OUTSTANDING AND UNUSUAL MERIT ON A ROYALTY BASIS. ADDRESS BOX 1A, RADIO AGE.

#### FOR SALE

BLUEPRINTS—Make your own set from proven original and up-to-the minute blueprints. The following are merely three of a choice of almost one hundred different types:

11T-1-3—Five tube neutrodyne—50c.  
FB-6—Three-honeycomb regenerative—35c.  
D10-4—Diode single circuit—25c.

All three of above, for \$1.00.  
These tested blueprints are all made up in easily read circuit drawings. MIDLAND PRODUCTS COMPANY, 1413 Hood Ave., Chicago, Ill. Ask for our complete list, No. R11.

100 VOLT EDISON TYPE "B" BATTERY, knocked down. Parts and plans—complete, \$12.50. Lane Mfg., 2937 W. Lake, Chicago.

#### RADIO CIRCUITS

##### SPECIAL FOR JANUARY

The Reinartz Radio Booklet, by Frank D. Pearce, fully illustrated, and RADIO AGE, for \$2.50. Price of booklet alone is 50c. Send check, currency or money order to RADIO AGE, 500 N. Dearborn Street, Chicago.

#### MISCELLANEOUS

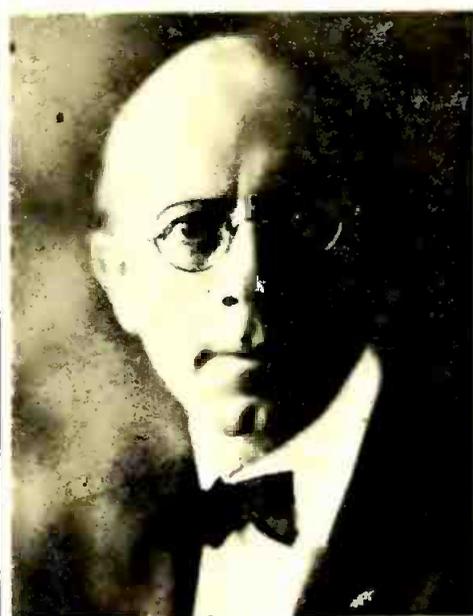
158 Genuine Foreign Stamps. Mexico War Issues. Venezuela, Salvador and India Service. Guatemala, China, etc., only 5c. Finest approval sheets, 50 to 60 percent. Agents Wanted. Big 72-p. Lists Free. We Buy Stamps. Established 20 Years. Hussman Stamp Co., Dept. 152, St. Louis, Mo.

Three Cosmopolitan Phusiformers, each \$5.50, book of instructions included. F. A. Mall, Tripoli, Iowa.

Standard solderless radio Jacks. Binding post attachments. Double circuit. One dollar bill. Postpaid. Clinton Seward, Jr., New Paltz, New York, N. Y.

Make Big Money. Safe and Lock Expert. Wayne Strong, 3800 Lan Franco, St. Los Angeles, Calif.

Classified ad copy for the February issue must reach RADIO AGE not later than December 25.



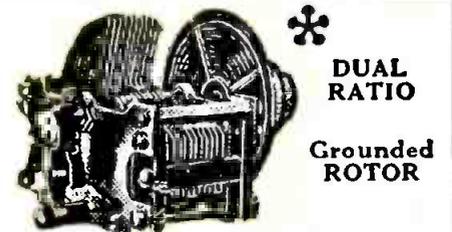
"THE RAGTIME KING."

Above is Axel Christensen, president of the Christensen School of Popular Music and a popular artist on RADIO AGE's Jazz Carnivals from KYW, beginning at Midnight the first Saturday in every month. The next program is on January 3, 1925.

## RADIO Buyers' GUIDE

For Consumers  
Get it now—before you buy any set or parts to build one.  
FREE 100 Pages Just send your name.  
Bargains in all kinds of complete sets, parts and accessories (Will you be so kind as to add the name of one of your friends you believe will soon want radio goods? Thank you!)  
Liberty M. O. House, Dept. A. 693 106 Liberty St., N.Y.

\* Tested and Approved by RADIO AGE \*



DUAL RATIO  
Grounded ROTOR

## LOW-LOSS CONDENSER

PLAIN & VERNIER TYPE  
PRECISION MOVEMENT ABSENCE  
OF GEARS OR COMPLICATED PARTS



Improved Type Rheostats and Potentiometers

All Sizes

GENUINE SUPERIOR BAKELITE CONSTRUCTION



United Scientific Laboratories, Inc.  
92-94 E. 10th St. NEW YORK CITY

RADIO AGE FROM WEBB!  
Tune in on WEBB, 370 meters, Tuesday, December 23, from 9 to 10 p. m., and hear one of RADIO AGE's popular and semi-classical programs.

WCBH	University of Miss.	Oxford, Miss.	242	WKAP	Dutree W. Flint.	Cranston, R. I.	360
WCBJ	Nicoll, Duncan & Rush.	Bemis, Tennessee	240	WKAQ	Radio Corp. of Porto Rico.	San Juan, P. R.	360
WCBK	J. C. Maus.	Jennings, Louisiana	244	WKAR	Michigan Agriculture College.	East Lansing, Mich.	280
WCBL	E. Richard Hall.	St. Petersburg, Fla.	266	WKAJ	Laconia Radio Club	Laconia, N. H.	254
WCBM	Northern Radio Mfg. Co.	Houlton, Me.	280	WKBK	Dutree Wilcox Flint	Cranston, Rhode Island	286
WCBN	Charles Swartz.	Baltimore, Md.	229	WKBY	Wky Radio shop	Orlando, Fla.	360
WCBP	James P. Boland	Ft. Benji Harrison, Ind.	266	WLAG	Cutting & Washington Radio Corp.	Minneapolis, Minn.	417
WCBQ	The Radio Shop, Inc.	Memphis, Tenn.	250	WLAL	Naylor Electrical Co.	Tulsa, Okla.	360
WCBR	First Baptist Church.	Nashville, Tenn.	236	WLAP	Wm. V. Jordan	Louisville, Ky.	286
WCBT	G. H. Masten.	Providence, R. I.	246	WLAQ	Arthur E. Shilling	Kalamazoo, Mich.	289
WCBU	Clark University, Collegiate Dept.	Worcester, Mass.	238	WLAW	Police Dept., City of New York	New York, N. Y.	360
WCBV	Arnold Wireless Supply Co.	Arnold, Pa.	254	WLAX	Putnam Electric Co.	Greencastle, Ind.	231
WCBW	Tullahoma Radio Club.	Tullahoma, Tenn.	252	WLB	University of Minnesota.	Minneapolis, Minn.	278
WCBX	George P. Rankin, Jr., and Maitland Solomon	Macon, Ga.	226	WLBL	Wisconsin State Dept. of Markets	Stevenspoint, Wis.	278
WCBY	Radio Shop of Newark (Herman Lubinsky)	Newark, N. J.	233	WLS	Sears Roebuck & Co.	Chicago, Ill.	345
WCBZ	The Forks Electrical Shop	Buck Hill Falls, Pa.	268	WLW	Crosley Mfg. Co.	Cincinnati, Ohio	423
WCCO	Coppotelli Bros. Music House.	Chicago Heights, Ill.	248	WMAA	J. Edw. Page (Olive B. Meredith)	Cazenovia, N. Y.	261
WCCP	Washburn-Crosby Co.	Twin Cities, Minn.	360	WMAF	Round Hills Radio Corp.	Dartmouth, Mass.	360
WCCQ	St. Bar Fuller D. G. Co.	St. Louis, Mo.	350	WMAH	General Supply Co.	Lincoln, Neb.	254
WCCX	Fres. Press.	Detroit, Mich.	517	WMAK	Norton Laboratories	Logan, N. Y.	273
WDAE	Tampa Daily Times	Tampa, Fla.	360	WMAL	Trenton Hardware Co.	Trenton, N. J.	256
WDAF	Kansas City Star	Kansas City, Mo.	411	WMAN	First Baptist Church	Columbus, Ohio	286
WDAH	J. Laurence Martin	Amarillo, Tex.	263	WMAQ	Chicago Daily News	Chicago, Ill.	448
WDAI	Trinity Methodist Church (South)	El Paso, Tex.	268	WMAV	Alabama Polytechnic Institute.	Auburn, Ala.	250
WDAJ	Lit. Brothers.	Philadelphia, Pa.	395	WMAW	Kingshighway Presbyterian Church.	St. Louis, Mo.	280
WDAK	Samuel A. Walte.	Worcester, Mass.	360	WMAZ	Mercer University	Macon, Ga.	261
WDAU	Slocum Kilburn.	New Bedford, Mass.	360	WMC	Commercial Appeal.	Memphis, Tenn.	500
WDAV	Radio Equipment Corp.	Fargo, N. Dak.	244	WMU	Doubleday-Hill Elec. Co.	Washington, D. C.	261
WDBA	Fred Kay.	Columbus, Ga.	236	WNAC	Shepard Stores	Boston, Mass.	278
WDBB	A. H. Waite & Co., Inc.	Taunton, Mass.	229	WNAD	University of Oklahoma	Norman, Okla.	254
WDBD	Kirk, Johns & Co., Inc.	Lancaster, Pa.	250	WNAL	Apollio Theater (Blindlers Amusement Co.)	Omaha, Neb.	289
WDBE	Herman Edwin Burns.	Martinsburg, W. Va.	268	WNAP	Wittenberg College.	Springfield, Ohio	275
WDBF	Robert G. Phillips.	Youngstown, Ohio	246	WNAR	First Christian Church	Butler, Mo.	231
WDBG	C. T. Scherer Co.	Worcester, Mass.	268	WNAT	Lennix Brothers Co. (Frederick Lennix)	Philadelphia, Pa.	250
WDBI	Radio Specialty Co.	St. Petersburg, Fla.	226	WNAW	Peninsular Radio Club (Henry Kunzmann)	Fort Monroe, Va.	240
WDBJ	Richardson Wayland Electric Corp.	Roanoke, Va.	229	WNAZ	Dakota Radio Apparatus Co.	Yankton, S. Dak.	244
WDBL	Wisc. Dept. of Markets.	Stevens Point, Wis.	278	WNYC	Dept. of Plant and Structures	New York, N. Y.	528
WDBN	Electric Light & Power Co.	Baunor, Me.	252	WQAC	Pape Organ Co.	Lima, Ohio	268
WDBO	Rollins College Inc.	Winter Park, Fla.	240	WQAE	Midland College.	Fremont, Neb.	280
WDBP	Superior State Normal School	Superior, Wis.	261	WQAF	Tyler Commercial College.	Tyler, Texas	360
WDBQ	Morton Radio Supply Co.	St. Louis, N. J.	234	WQAG	Apollio Theater (Blindlers Amusement Co.)	Belvidere, Ill.	273
WDBR	Treatment Temple Baptist Church	Boston, Mass.	256	WQAI	Southern Equipment Co.	Sao Antonio, Texas	388
WDBS	S. M. K. Radio Corp.	Dayton, Ohio	283	WQAN	Vaughn Conservatory of Music (James D. Vaughn)	Lawrenceburg, Tenn.	360
WDBT	Taylor's Book Store.	Hattiesburg, Miss.	236	WQAO	Lyradon Mfg. Co.	Mishawaka, Ind.	360
WDBU	The Strand Theatre.	Fort Wayne, Ind.	258	WQAP	Lundskow, Henry P.	Kenosha, Wis.	229
WDBV	The Radio Den.	Columbia, Tenn.	268	WQAT	Boyd M. Hamp.	Wilmington, Del.	360
WDBW	Otto Baur.	New York, N. Y.	233	WQAU	Pennsylvania National Guard, 2d Battalion, 112th Infantry.	Erle, Pa.	242
WDBX	North Shore Congregational Church	Chicago, Ill.	258	WQAW	Woodmen of the World.	Omaha, Neb.	528
WDBY	Boy Scouts, City Hall	Kingsrown, N. Y.	233	WQAX	Franklyn J. Wolff	Trenton, N. J.	240
WDBZ	Church of the Covenant.	Washington, D. C.	234	WQAZ	Palmer School of Chiropractic	Davenport, Ia.	484
WDM	J. L. Bush.	Tuscola, Ill.	278	WOC	Iowa State College.	Ames, Ia.	360
WDMZ	F. D. Fallin.	Flint, Mich.	250	WOD	Western Radio Co.	Philadelphia, Pa.	360
WEAA	American Telephone & Telegraph Co.	New York, N. Y.	492	WOO	L. Bamberger and Co.	Kansas City, Mo.	360
WEAB	Wichita Board of Trade.	Wichita, Kans.	280	WOR	State Marketing Bureau	Newark, N. J.	405
WEAC	Cornell University.	Ithaca, N. Y.	286	WOS	Pennsylvania State College.	Jefferson City, Mo.	441
WEAD	University of South Dakota.	Vermillion, S. Dak.	283	WPAB	Donaldson Radio Co.	State College, Pa.	283
WEAE	Borough of North Plainfield (W. Gibson Buttfield)	North Plainfield, N. J.	286	WPAC	Doolittle Radio Corp.	Okmulgee, Okla.	360
WEAF	Shepard Co.	Providence, R. I.	273	WPAD	North Dakota Agricultural College	New Haven, Conn.	268
WEAG	Ohio State University.	Columbus, Ohio	360	WPAK	Superior Radio & Telephone Equipment Co.	Agricultural College, N. D.	283
WEAH	Mobile Radio Co.	Mobile, Ala.	263	WPAL	Ward Battery and Radio Co.	Columbus, Ohio	286
WEAJ	Davidson Bros. Co.	Sioux City, Iowa	275	WPAN	Concordia College.	Beloit, Kans.	236
WEAK	Iris Theatre (Will Horowitz, Jr.)	Houston, Texas	360	WPAQ	John R. Koch (Dr.)	Moorhead, Minn.	286
WEAL	Bentley Co.	St. Louis, Mo.	273	WPAZ	Horace B. Beale, Jr.	Charleston, W. Va.	270
WEAM	Electric Shop.	Highland Park, N. J.	233	WQAA	E. B. Gish.	Amarillo, Texas	234
WEAN	Walter Cecil Bridges.	Superior, Wis.	242	WQAB	Moore Radio News Station (Edmund B. Moore)	Springfield, Vt.	275
WEAO	Electrical Equipment and Service Co.	Anderson, Ind.	246	WQAC	Sandusky Register.	Sandusky, Ohio	240
WEAP	Roy W. Walker.	Cambridge, Ohio	248	WQAD	Electrical Equipment Co.	Miami, Fla.	283
WEAQ	Edgewater Beach Broadcasting Station.	Chicago, Ill.	370	WQAE	Scranton Times.	Scranton, Pa.	280
WEAR	Walter H. Gibbons.	Salisbury, Md.	242	WQAF	Calvary Baptist Church	New York, N. Y.	360
WEAS	Third Avenue Railway Co.	New York, N. Y.	273	WQAG	Ahliene Daily Reporter (West Texas Radio Co.)	Abilene, Texas	360
WEAT	E. B. Peilcord.	New Orleans, La.	280	WQAH	Prince-Walter Co.	Lowell, Mass.	266
WEAU	The Dayton Coop. Industrial High School.	Dayton, Ohio	270	WQAI	Radio Equipment Company	Florida, Ill.	248
WEAV	DeLand Piano & Music Co., 139 Boulevard St.	DeLand, Fla.	258	WQAJ	Colmet Radio Broadcasting Co.	Chicago, Ill.	448
WEAW	Beloit College.	Beloit, Wis.	283	WQAK	The Radio Club (Inc.)	Laporte, Ind.	224
WEAX	John E. Cain, Jr.	Nashville, Tenn.	263	WQAL	Northern States Power Co.	St. Croix Falls, Wis.	248
WEAY	Hobart Radio Co.	Rosindale, Mass.	226	WQAM	Lomhard College.	Oskaloosa, Ill.	244
WEAZ	The Edison Electric Illuminator Co.	Boston, Mass.	303	WQAN	Black Hawk Electrical Co.	Waterloo, Iowa	236
WEBA	Hulbert-Still Elec. Co.	Houston, Tex.	263	WQAO	St. Louis Radio Service Co.	St. Louis, Mo.	263
WEBC	St. Louis University.	St. Louis, Mo.	280	WQAP	Antioch College.	Yellow Springs, Ohio	242
WEBD	Dallas News & Dallas Journal.	Dallas, Texas	476	WQAR	Avenue Radio Shop (Horace D. Good)	Reading, Pa.	238
WEBE	Times Publishing Co.	St. Cloud, Minn.	273	WQAS	Flaxon's Garage.	Glouster City, N. J.	268
WEBF	Hutchinson Electric Service Co.	Hutchinson, Minn.	286	WQAT	Immanuel Luther in Church	Valparaiso, Ind.	278
WEBG	University of Nebraska, Department of Electrical Engineering.	Lincoln, Neb.	275	WQAU	Radio Corp. of Am.	Washington, D. C.	459
WEBH	Eureka College.	Eureka, Ill.	240	WQAV	Rice Motor Car Co.	Flint, Mich.	288
WEBI	The Wm. E. Cahle Co.	Chicago, Ill.	316	WQAW	Doron Bros.	Hamilton, Ohio	360
WEBJ	Concourse Radio Corporation.	New York, N. Y.	283	WQAX	Union College.	Schenectady, N. Y.	270
WEBK	St. John's University.	Collegeville, Minn.	236	WQAY	University of Illinois	Urbana, Ill.	273
WEBL	Ainsworth-Gates Radio Co.	Cincinnati, Ohio	309	WQAZ	Police and Fire Signal Department.	Dallas, Tex.	360
WEBM	Strawbridge and Clothier	Philadelphia, Pa.	395	WQBA	Tarrytown Radio Res. Lab.	Tarrytown, N. Y.	273
WEBN	Langester Electric Supply & Construction Co.	Lancaster, Pa.	248	WQBB	Southeast Missouri State Teachers College.	Cape Girardeau, Mo.	360
WEBO	Cecil E. Lloyd.	Pensacola, Fla.	360	WQBC	Clemson Agricultural College.	Clemson College, S. C.	360
WEBP	Youree Hotel	Shreveport, La.	252	WQBD	J. A. Foster Co.	Providence, R. I.	261
WEBQ	South Bend Tribune.	South Bend, Ind.	360	WQBE	United States Playing Cards Co.	Cincinnati, Ohio	309
WEBS	First Baptist Church	Memphis, Tenn.	266	WQBF	Grove City College.	Grove City, Pa.	283
WEBT	Gimbel Bros.	Chicago, Ill.	316	WQBG	Seventh Day Adventist Church	New York, N. Y.	283
WEBU	American R. & R. Co.	Medford Hillside, Mass.	360	WQBH	Doughty & Welch Electrical Co.	Fall River, Mass.	254
WEBV	Thos. F. J. Howlett.	Philadelphia, Pa.	360	WQBI	Camp Marionfield.	Chesham, N. H.	289
WEBW	The Tribune Co.	Chicago, Ill.	370	WQBJ	C. W. Vick Radio Construction Co.	Houston, Tex.	360
WEBX	Federal T. and T. Co.	Buffalo, N. Y.	319	WQBK	Irving Austin (Port Chester Chamber of Commerce)	Port Chester, N. Y.	238
WEBY	General Elec. Co.	Schenectady, N. Y.	380	WQBL	Chas. Electric Shop	Pomeroy, Ohio	253
WEBS	University of Wisconsin.	Madison, Wis.	275	WQBM	Atlanta Journal	Atlanta, Ga.	429
WEBT	State University of Iowa.	Iowa City, Iowa	484	WQBN	J. and M. Elec. Co.	Utica, N. Y.	273
WEBU	Marquette University	Milwaukee, Wis.	280	WQBO	School of Engine'ing.	Milwaukee, Wis.	246
WEBV	University of Cincinnati.	Cincinnati, Ohio	222	WQBP	Alabama Power Co.	Birmingham, Ala.	248
WEBW	Hafner Supply Co.	Joplin, Mo.	283	WQBQ	Ball River Daily Herald Publishing Co.	Fall River, Mass.	260
WEBW	University of Rochester (Eastman School of Music)	Rochester, N. Y.	283	WQBR	Penn Traffic Co.	Johnstown, Pa.	360
WEBW	Seaside House.	Atlantic City, N. J.	275	WQBS	Louis J. Gallo.	New Orleans, La.	242
WEBW	Courier-Journal & Louisville Times.	Louisville, Ky.	400	WQBT	Toledo Radin & Electric Co.	Toledo, Ohio	252
WEBW	Wilmingon Electrical Specialty Co.	Wilmingon, Del.	360	WQBU	Willard Storage Battery Co.	Cleveland, Ohio	390
WEBW	Rensselaer Polytechnic Institute.	Troy, N. Y.	380	WQBV	Cambridge Radio & Electric Co.	Cambridge, Ill.	242
WEBW	Sweeney School Co.	Kansas City, Mo.	411	WQBW	S. H. Van Gordon & Son.	Osseo, Wis.	220
WEBW	Radiovox Company.	Cleveland, Ohio	283	WQBX	Reliance Electric Co.	Norfolk, Va.	286
WEBW	George Schubel.	New York, N. Y.	360	WQBY	Charles E. Erbstein.	Elkin, Ill.	286
WEBW	Bankers Life Co.	Des Moines, Ia.	526	WQBC	Edison Electric Illuminating Co.	Boston, Mass. (portable)	244
WEBW	Joslyn Automobile Co.	Rockford, Ill.	252	WQBD	Russell Radio & Electric Co.	Tecumseh, Neb.	242
WEBW	Galveston Tribune.	Galveston, Texas	360	WQBD	Agricultural & Mechanical College of Texas.	College Station, Tex.	280
WEBW	Howard R. Miller.	Philadelphia, Pa.	254	WQBE	Williams Hardware Co.	Streator, Ill.	283
WEBW	Journal-Stockman Co.	Omaha, Neb.	278	WQBF	Oak Leaves Broadcasting Station	Oak Park, Ill.	231
WEBW	Chronicle Publishing Co.	Marion, Ind.	226	WQBG	Thomas J. McGuire.	Lambertville, N. J.	283
WEBW	Home Electric Co.	Burlington, Iowa	283	WQBF	Kansas State Agricultural College.	Manhattan, Kans.	273
WEBW	K. & L. Co.	McKeesport, Pa.	234	WQBG	H. G. Saal Co.	Chicago, Ill.	268
WEBW	Continental Electric Supply Co.	Washington, D. C.	360	WQBF	Wright & Wright (Inc.)	Philadelphia, Pa.	360
WEBW	Gimbel Bros.	Philadelphia, Pa.	509	WQBG	The Alamo Bell Room	Joliet, Ill.	242
WEBW	American Electric Co.	Lincoln, Neb.	229	WQBG	Ford Motor Co.	Dearborn, Mich.	242
WEBW	Jackson's Radio Engineering Laboratories.	Waco, Texas	360	WQBG	Detroit News (Evening News Assn.)	Detroit, Mich.	517
WEBW	Norfolk Daily News.	Norfolk, Neb.	283	WQBG	Loyola University.	New Orleans, La.	260
WEBW	Clifford L. White.	Greentown, Ia.	254	WQBG	Michigan College of Mines.	Houghton, Mich.	244
WEBW	D. M. Perham.	Cedar Rapids, Iowa	268	WQBG	Charles E. Erbstein, Villa Olivia.	near Elgin, Ill.	536
WEBW	Peoria Star.	Peoria, Ill.	280	WQBG	First Baptist Church.	Knoxville, Tenn.	250
WEBW	The Outs. Co. (J. Samuels & Bro.)	Providence, R. I.	360	WQBG	Fifth Inf. Md. Nat'l Guard, 5th Reg. Army.	Baltimore, Md.	254
WEBW	Pittsburgh Radio Supply House.	Pittsburgh, Pa.	286	WQBG	Gloucester Co. Civic League.	Pitman, N. J.	231
WEBW	Union Trust Co.	Cleveland, Ohio	390	WQBG	Jones Elec. & Radio Mfg. Co.	Baltimore, Md.	254
WEBW	Chicago Radio Laboratory.	Chicago, Ill.	268	WQBG	Penn College.	Oskaloosa, Iowa	240
WEBW	Denison University	Grantville, Ohio	229	WQBG	Central Mo. State Teachers College.	Warrensburg, Mo.	234
WEBW	Supreme Lodge of Loyal Order of Moose.	Mooseshart, Ill.	278	WQBG	General W. H. Gordon.	Falmouth, W. Va.	217
WEBW	Radio Corp. of Am.	New York, N. Y.	455	WQBG	James F. Boland.	Fort Sill, Okla.	263
WEBW	H. F. Paar.	Cedar Rapids, Iowa	278	WQBG	M. Laurence Short.	Hanford, Calif.	224
WEBW	Chas. Looff (Crescent Park)	East Providence, R. I.	240	WQBG	Curtis Printing Co.	Ft. Worth, Tex.	246
WEBW	W. S. Radio Supply Co.	Wichita Falls, Texas	360	WQBG	Wynne Radio Co.	Raleigh, N. C.	252
WEBW	United Battery Service Co.	Montgomery, Ala.	226	WQBG	Southeast Mo. State Teachers College.	Cape Girardeau, Mo.	275



Premier  
**"Lo Loss"**  
 TUBE  
 SOCKET  
 90 Cents  
 All Types

### Strengthen Your Speaker Volume

Conserve the current at full strength and strengthen your speaker volume with this radically different socket. Has the lowest insulation leakage to radio frequency current. Bakelite between terminals is purposely thin and all metallic parts are placed so as to reduce capacity between them and the terminals to the very minimum. Contact springs in the "LO LOSS" are in one piece from binding post to tip of tube. The skeleton tube barrel permits inspection of contact at prong tips while tube is in the socket. The contact springs automatically clean the tube prongs as the tube is inserted, insuring good contact always. The new tube lock with the cam action makes the proper insertion of the tube easy. A twist of the wrist does it. The terminals are curved and will stand unusual deflection without setting.

Write for Free Bulletin No. 94 showing complete line of Premier Quality Radio Parts. Ask your dealer if he has Premier free hook-ups. If not, send his name and receive a set free.

**Premier Electric Co.**

3803 Ravenswood Ave., Chicago

**PREMIER**  
 Quality Radio Parts

## What to Expect from Your Set

By Kenneth C. Smith

A MAN in the Middle West once heard 2LO, London, England, on an ordinary 3-tube set. It was an accident—one of those unusual, inexplicable accidents that happen so often in Radio. He never got out of the U. S. A. again, but for ever after he bragged that his set would bring in London, England.

I don't know why it is, but there is something about radio that seems to encourage extravagant statements, not only by set owners but by manufacturers and dealers. Wonderful as radio is, there are many things that no receiver can be guaranteed to accomplish.

From my home in Chicago, I may tune in KGO, San Francisco, with loud speaker volume, every night during a certain week. But I cannot guarantee to do the same thing the next week. Neither can I guarantee that you will do the same thing with the same kind of a set, even though your home may be nearer San Francisco than Chicago is. This will not be because of any difference between your set and mine; rather, there are several factors responsible for variation in performance. Here are three of the principal ones:

#### Practice Helps

First: There is the difference between you and me. I am not bragging about my skill as a tuner, but I am familiar with my own set, having used it for some time. You will become just as skilful

in tuning your set after you have used it a while.

Second: There is the difference in atmospheric conditions—sometimes a very great difference between two successive nights. No one can ever be certain of getting a particular distant station at any definite time, even though that station is known to be broadcasting.

Third: There is the difference of locations. Much study is being given to this perplexing problem. "Dead Spots" are known to exist—and between "dead spots" and the ideal location is found every degree of conditions. During experiments made in Chicago, a set brought in a certain distant station when tuned on one side of the street, but when moved to the other side of the street, that station could not be heard at all.

When one considers these facts, it is plain that no set manufacturer can possibly guarantee the distance a purchaser can expect from the set he buys.

I don't want you to get the idea that there is any probability that you live in a "dead spot" where the pleasure of a radio set is denied you. The chances are a million to one that you are not. Although receiving conditions may not be perfect in your location, you can still get as much with a good set as the average radio fan is getting. Plainly, the matter of atmospheric conditions and the adaptability of your location to radio reception is entirely beyond your

(Turn to page 79)

### DEVICES

displaying this seal have been tested and approved by the RADIO AGE INSTITUTE.

The apparatus illustrated and described below have successfully passed our tests for January, 1925.



## Radio Age Institute Manufacturers' Testing Service

MEMBERS of the staff of RADIO AGE will be pleased to test devices and materials for radio manufacturers with the object of determining their efficiency and worth. All apparatus which meets with the approval of various tests imposed by members of the technical staff of RADIO AGE will be awarded our endorsement, and the seal shown to the left will be furnished free of charge. Materials for testing should be sent to

**RADIO AGE INSTITUTE**  
 504 N. Dearborn Street, Chicago, Ill.



Test No. 26. MIDGET LOUDSPEAKER, known as the "Reflector." Made by Rice and Hochster, of 130 Washington Place, N. Y. C. It is claimed that this speaker is the smallest loudspeaker on the market today. Notwithstanding its small size, the little unit gives tremendous signals with surprising faithfulness as to reproduction. Arrived in good condition, and satisfactorily passed the tests and requirements of the RADIO AGE Institute.



Test No. 27. LOUDSPEAKER and LAMP COMBINED. Better known as the Radialamp. Manufactured by the Radialamp Co., Dept. 810, 334 Fifth Ave., N. Y. C. The lamp is a beautiful piece of decorative furniture as well as it is exceptionally fine loudspeaker for radio use. The horn, concealed in the stem of the lamp, throws out its mellow sound to be reflected by the new sound mirror, a new idea in acoustics. The lamp was received in good condition. Tested and approved by RADIO AGE Institute.



Test No. 28. STORAGE FILAMENT BATTERY. Made by the Philadelphia Battery Company, Philadelphia, Pa. These batteries are well known to motorists and other electrical people as "Philco" Diamond Grid batteries. The battery has a high ampere hour rating, good, sturdy and wear-resisting plates and separators. The battery makes use of the famous principle of using the Diamond grid formation which it is claimed is superior to other types. Arrived in excellent condition, shipped dry, with the electrolyte in a separate container. Tested and approved by the RADIO AGE Institute.



Test No. 29. SEMI-FIXED CONDENSER. Better known as the Build-Up condenser, made by Chas. Schindler of 1404 W. Delaware Ave., Toledo, Ohio. A useful instrument in determining proper capacities for fixed condensers. The unit is so designed that plates may be added or removed to give any capacity from .00025 to .006 mfd. This stepping of capacities is accomplished with .0002 mfd. capacities added to the total every time a plate is added. The mica is high grade, and the case is fairly low in losses. Tested and approved by the RADIO AGE Institute.

While every piece of apparatus advertised in RADIO AGE must be tested and approved by the RADIO AGE Institute before being accepted, both advertised and non-advertised apparatus are described in the RADIO AGE Institute department on this page. Any manufacturer or designer of radio sets or apparatus, whether advertising in RADIO AGE or not, may send his products to the Institute to be tested.

# End your Radio Troubles for 30c in Stamps

We have laid aside a limited number of back issues of RADIO AGE for your use. Below are listed hookups to be found in these issues. Select the ones you want and enclose 30c in stamps for each desired. The supply is getting low, so enrich your store of radio knowledge by laying in an ample stock of copies NOW!

**May, 1922**

—How to make a simple Crystal Set for \$6.

**September, 1922**

—How to make a Regenerative Set at a low cost

**October, 1922**

—How to make a Tube Unit for \$23 to \$37.  
—How to make an Audio Frequency Amplifying Transformer.

**November, 1922**

—Design of a portable short-wave radio wavemeter.

**May, 1923**

—How to make a portable Reioartz set for summer use.

**June, 1923**

—How to build the new Kaufman receiver.  
—What about your antenna?

**December, 1923**

—Building the Haynes Receiver.  
—Combined Amplifier and Loud Speaker  
—A selective Crystal Receiver.

**January, 1924**

—Tuning Out Interference—Wave Traps—Eliminators  
—Filters.  
—A Junior Super-Heterodyne.  
—Push-Pull Amplifier.  
—Rosebloom Circuit.

**March, 1924**

—An Eight-Tube Super-Heterodyne.  
—A simple, low loss tuner.  
—A Tuned Radio Frequency Amplifier.  
—Simple Reflex Set.

**April, 1924**

—An Efficient Super-Heterodyne (fully illustrated).  
—A Ten-Dollar Receiver.  
—Anti-Body Capacity Hookups.  
—Reflexing the Three-Circuit Tuner.  
—Index and first two installments of Radio Age Data Sheets.

**May, 1924**

—Construction of a Simple Portable Set.  
—Radio Panels.  
—Third Installment of Radio Age Data Sheets.

**June, 1924**

—Important Factors in Constructing a Super-Heterodyne.  
—A Universal Amplifier.  
—A Sure Fire Reflex Set.  
—Adding Radio and Audio to Baby Heterodyne.  
—Radio Age Data Sheets.

**July, 1924**

—A Portable Tuned Impedance Reflex.  
—Operating Detector Tube by Grid Bias.  
—A Three-Tube Wizard Circuit.  
—Data Sheets.

**August, 1924**

—Breaking Into Radio Without a Diagram.  
—The English 4-Element Tube.  
—Filtered Heterodyne Audio Stages.  
—An Audio Amplifier Without an "A" Battery.  
—Data Sheets.

**September, 1924**

—How Careful Mounting Will Improve Reception.  
—Osc Tuning Control for Hair's Breadth Selectivity.  
—Four Pages of Real Blueprints of a New Baby Heterodyne and an Aperiodic Variometer Set.  
—Data Sheets.

**October, 1924**

—An Easily Made Super-Het.  
—Two Radio and Two Audio for Clear Tones.  
—A Simple Regenerative Set.  
—The Ultradyne for Real DX.  
—Real Blueprints of a 3-Tube Neutrodyne and a Mid-Get Reflex Set.

**November, 1924**

—Blueprints of a Single Tube Loop Set and a capacity Feedback Receiver.  
—A 3-Tube Low Loss Regenerator.  
—Mastering the 3-Circuit Tuner.

**December, 1924**

—Blueprints of a New 8-Tube Super-Heterodyne.  
—How to Make a Receiver that Minimizes Static.  
—A Trans-Atlantic DX Receiver.  
—How to Make a Home Made Battery Charger and a Loud Speaker at a Small Cost.

## RADIO AGE, Inc. 500 N. Dearborn St., Chicago

# THE RADIO AGE BUYERS' SERVICE

What do you want to purchase in the radio line? Let the staff of RADIO AGE save you time and money by sending in the coupon below. Enter the number of the article you would like to know more about in the spaces provided in the coupon.

- |  |                               |                                    |  |                                       |
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| 1 "A" Batteries                              | 57 Couplers, loose            | 114 Indicators, polarity           | 168 Patent attorneys                   | 221 Solder salts                      |
| 2 Aerial protectors                          | 58 Couplers, molded           | 115 Inductances, C. W.             | 169 Phone connectors, multiple         | 222 Solder solution                   |
| 3 Aerial insulators                          | 59 Couplers, vario            | 116 Insulation, molded             | 170 Phonograph adapters                | 223 Spaghetti tubing                  |
| 4 Aerials                                    | 60 Crystal alloy              | 117 Insulation material            | 171 Plates, condenser                  | 224 Spark coils                       |
| 5 Aerials, loop                              | 61 Crystal holders            | 118 Insulators, aerial             | 172 Plugs, coil                        | 225 Spark caps                        |
| 6 Amplifiers                                 | 62 Crystals, rough            | 119 Insulators, composition        | 173 Plugs, telephone                   | 226 Stampings                         |
| 7 Amplifying units                           | 63 Crystals, mineral          | 120 Insulators, fibre              | 174 Pointers, dial and knob            | 227 Stators                           |
| 8 Ammeters                                   | 64 Crystals, synthetic        | 121 Insulators, high voltage       | 175 Poles, aerial                      | 228 Stop points                       |
| 9 "B" batteries                              | 65 Crystals, unmounted        | 122 Insulators, cloth              | 176 Potentiometers                     | 229 Switch arms                       |
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| 12 Batteries, storage                        | 68 Detector units             | 125 Insulators, porcelain          | 179 Regenerative set parts             | 232 Switch stops                      |
| 13 Battery chargers                          | 69 Detectors, crystal         | 126 Irons, soldering               | 180 Receiver caps                      | 233 Switches, aerial                  |
| 14 Battery clips                             | 70 Detectors, fixed crystal   | 127 Jacks                          | 181 Rectifiers, battery                | 234 Switches, battery                 |
| 15 Battery plates                            | 71 Dial, adjusters            | 128 Filament control               | 182 Resistance leaks                   | 235 Switches, filament                |
| 16 Battery substitutes                       | 72 Dials, composition         | 129 Jars, battery                  | 183 Resistance units                   | 236 Switches, ground                  |
| 17 Bezels                                    | 73 Dials, hard rubber         | 130 Keys, transmitting             | 184 Rheostat bases                     | 237 Switches, inductance              |
| 18 Binding posts                             | 74 Dials, rheostat            | 131 Knobs                          | 185 Rheostat strips                    | 238 Switches, panel                   |
| 19 Binding posts, insulated                  | 75 Dials, metal               | 132 Knock-down panel units         | 186 Rheostats, automatic               | 239 Switches, single and double throw |
| 20 Books                                     | 76 Dials, vernier             | 133 Laboratories, testing          | 187 Rheostats, battery                 | 240 Tone wheels                       |
| 21 Boxes, battery                            | 77 Dials with knobs           | 134 Lever, switch                  | 188 Rheostats, dial                    | 241 Towers, aerial                    |
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| 23 Bridges, wheatstone                       | 80 Dry cells                  | 136 Loosecouplers                  | 190 Rheostats, potentiometer           | 243 Transformers, filament            |
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| 26 Buzzers                                   | 83 Enamels, battery           | 139 Lugs, battery                  | 193 Rods, ground                       | 246 Transformers, push-pull           |
| 27 Cabinets                                  | 84 Enamels, metal             | 140 Lugs, terminal                 | 194 Rotors                             | 247 Transformers, radio frequency     |
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| 31 Cat whiskers                              | 88 Fibre sheet, vulcanized    | 144 Meters, D. C.                  | 198 Schools, radio                     | 251 Tubes, vacuum—two element         |
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| 35 Coils, couplings                          | 92 Fuses, tube                | 148 Minerals                       | 202 Sets, receiving—Neutrodyne         | 255 Variocouplers, molded             |
| 36 Coils, filter                             | 93 Generators, high frequency | 149 Molded insulation              | 203 Sets, receiving—portable           | 256 Variocouplers, wooden             |
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| 40 Coils, Reinartz                           | 97 Grid leaks, tube           | 153 Mountings, end                 | 207 Sets, receiving—Reinartz           | 260 Varnish, insulating               |
| 41 Coils, stabilizer                         | 98 Grid leaks, variable       | 154 Mountings, grid leak           | 208 Sets, receiving—sectional          | 261 Voltmeters                        |
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| 43 Condenser parts                           | 100 Ground clamps             | 156 Mountings, inductance switch   | 210 Sets, receiving—super-regenerative | 263 Wave meters                       |
| 44 Condenser plates                          | 101 Ground rods               | 157 Name plates                    | 211 Sets, transmitting                 | 264 Wave traps                        |
| 45 Condensers, antenna couplings             | 102 Handles, switch           | 158 Neutrodyne set parts           | 212 Slate                              | 265 Wire, aerial                      |
| 46 Condensers, by-pass                       | 103 Head bands                | 159 Nuts                           | 213 Shellac                            | 266 Wire, braided and stranded        |
| 47 Condensers, coupling                      | 104 Head phones               | 160 Ohmmeters                      | 214 Sliders                            | 267 Wire, copper                      |
| 48 Condensers, filter                        | 105 Head sets                 | 161 Oscillators                    | 215 Socket adapters                    | 268 Wire, insulated                   |
| 49 Condensers, fixed (paper, grid, or phone) | 106 Honeycomb coil adapters   | 162 Panel cutting and drilling     | 216 Sockets.                           | 269 Wire, Litz                        |
| 50 Condensers, variable grid                 | 107 Hook ups                  | 163 Panels, drilled and un-drilled | 217 Solder                             | 270 Wire, magnet                      |
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| 53 Contact points                            | 110 Horns, mache              | 166 Parts                          | 220 Solder flux                        |                                       |
| 54 Contacts, switch                          | 111 Horns, metal              | 167 Paste, soldering               |  |                                       |
| 55 Cord tips                                 | 112 Horns, wooden             |                                    |  |                                       |
| 56 Cords, for head sets                      | 113 Hydrometers               |                                    |  |                                       |

RADIO AGE BUYERS' SERVICE, 500 N. Dearborn St., Chicago, Ill.

Please see that I am supplied with buying specifications and prices on the articles numbered herewith:

\_\_\_\_\_

I am a—  Dealer  Jobber  Mfgs.' Rep.  Manufacturer

Firm [If identified with Radio industry] \_\_\_\_\_

My Occupation \_\_\_\_\_ My Name \_\_\_\_\_

Address \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_

(Continued from page 77)

control. But there is the first point mentioned above—individual skill in tuning, that you can control.

**How Much Skill?**

The question is "How much does skill in tuning have to do with the results you will get from your set?" Let me relate a few of my experiences:

I have had several people come to my house, some of whom have never operated a radio set, and others who have used regenerative sets of various types. I explained to them briefly how to tune my set, and watched them work. Of course, they had no trouble in tuning local stations. Even Pittsburgh, Schenectady and Springfield came in pretty strong, and they got them without much trouble. Then I asked them to fish around for other distant stations and watched them very closely. Invariably they would pass by several stations without bringing them in at all. I then tuned in four or five of these stations which they had missed. I showed them how the difference of one-half a division on the dials would often make the difference in bringing in the station on the loud speaker or missing it altogether.

I have visited a number of people in my neighborhood who have been using sets like mine—some for several weeks and others for only a few days. One very intelligent man, who had discarded a well-known regenerative receiver three weeks before, told me that it took him two weeks to realize how sharp his new set tuned. He said, "I can now get most anything I want, but I couldn't get much more than local stations the first week." The thing that fooled him at first was the absolute quietness of the new set, unless all three dials were tuned exactly to the same wavelength.

Here is another thought I want to leave with you. In tuning for distant stations, except the very powerful ones, I generally use the head set. Because of the extreme selectivity of some sets, even the most skilled tuner will often pass by a distant station if tuning with a loud speaker. This naturally brings up another question: "When I have tuned in a distant station on a head set, can I always put it on the loud speaker with satisfactory volume?"

Not by any means. Often the signal is so weak, due to causes entirely outside of the receiver, that head-phone volume is all I can get. Particularly, this is true during the day time and in seasons except cold, snappy Winter weather.

Some day these things may be overcome, but I prophesy that the change will come through improvement in broadcasting stations rather than receiving sets. Until that time comes, I am going to continue getting a lot of fun out of what I can do and not fret about what I can't

do. Here is the way I size up the matter:

**What to Look For**

There are four qualifications to look for in a radio set:

1. Quality of Reception.
2. Selectivity.
3. Volume.
4. Distance.

The first is absolutely essential. If your set fails to give clear, undistorted music, then it doesn't make any difference how selective it may be or what volume and distance it will give you; without good music it is worthless.

Greater progress has been made this year in improving quality of reception than in the four or five years previous. Radio can now give a quality of music superior to anything that the phonograph has ever done.

The matter of selectivity is of greater or less importance, depending entirely upon where you live. If you are located in or near a big city where there are several powerful local broadcast stations, you must have a selective set if you expect to get through local stations and bring in distant ones.

It is no great feat to separate two stations 5 to 10 meters apart in wavelength, when both stations are several hundred miles distant. But it does take a very selective receiver to bring in a distant station if it is within 10 to 20 meters of a local station.

Volume is important only to the degree that it enables you to put the stations you want to hear on the loud speaker. By loud speaker volume, I have in mind music that will fill the room and prove enjoyable to the listeners. Sometimes when conditions are just right, I can bring in a station 1500 miles away so strong it can be heard all over the house. But I don't do it. Music so loud as that is anything but agreeable to persons in the same room with the loud speaker.

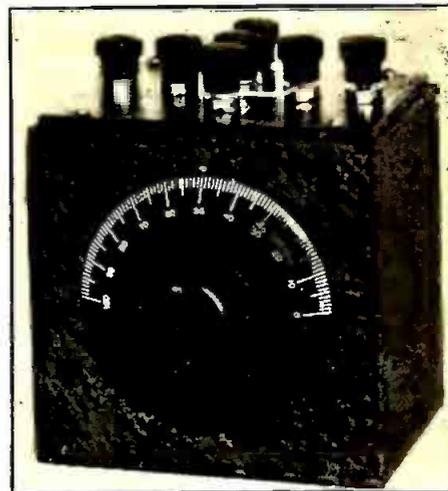
Distance I consider the least important of all.

I know that my set will get distance enough to bring in the powerful stations from one coast to another. I hear men brag of getting little one-horse stations in Canada or California, but that doesn't mean anything to me. I look upon radio as a source of music and pleasure in my home. I don't consider it a game of seeing how many stations you can log.

I know that the best programs come from the powerful stations. It doesn't worry me at all if I don't get little stations I never even heard of, because I know they are not putting out programs I would care to hear.

There is no doubt in my mind that some day radio is going to be improved far beyond the comparative perfection of today, but I have very little patience with a man who says, "I am going to wait to buy my radio set until radio is perfected." It is perfected right now.

**MAKE YOUR RECEIVING SET SELECTIVE**



The Benson Wave Filter eliminates annoying interferences. It is of the inductive coupled type.

Mounted in a beautiful leather covered cabinet with an engraved bakelite panel.

**PRICE \$8.75**



1225 No. Halsted St.

CHICAGO, ILL.

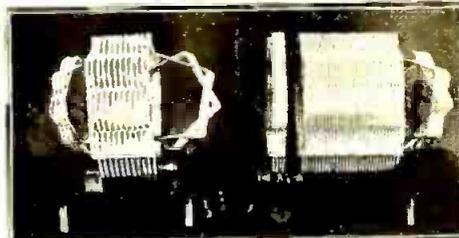
**NEXT TIME INSIST ON**

**"COMET" "B" BATTERIES**

At all good radio stores or write

**ELECTRICAL MFG. AGENCY**  
25 N. Dearborn St., Chicago, Ill.

**Low Loss Tuners That Give Results**



Made in amateur, and broadcast types. Price \$7.00. A post card will bring it to you. We pay postage and insurance. Descriptive literature and hookup sent free on request.

**DAVENPORT RADIO LABORATORIES**

Davenport, - - - Iowa

**Save 25% to 50% On Everything in Radio**

Standard Sets, all types, \$5.00 to \$79.00. Knocked down, sealed kits. All accessories. 150,000 customers. Money back guarantee. Immediate delivery. Illus. catalog on request. Special prop. to community agents to get into radio business. Radio Dept. 115, IMPERIAL LABORATORIES, Coca Cola Bldg., Kansas City, Mo.

\* Tested and Approved by RADIO AGE \*

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Erla—Acme—Harkness  
Dealers: Send for Discounts  
**HUDSON-ROSS**  
123 W. Madison St. Chicago

# 12 Stages of Amplification

JANUARY
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APRIL
MAY
JUNE
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AUGUST
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OCTOBER
NOVEMBER



## A Year-Round Gift

A radio magazine brimful of hook-ups and good construction articles.

An eight-page section in each issue containing actual blueprints showing how to make the best and latest circuits at home.

Many pages of pictures and interesting stories about the world's favorite broadcast entertainers and about the stations and studios.

A department for radio beginners.

A department for readers who want to tell other radio fans about the sets they have made, how they're made and what results they have had with them.

All the best news of the radio world and its magic progress.

A magazine your friend would treasure as a gift.

# 30

## Days More!

You can multiply your holiday gift by twelve in a very simple and inexpensive manner.

You probably know of one or more friends to whom you wish to make a present. We want to make it easy for you to select the gift, and we want to take care of all the work connected with delivering it safely, twelve times.

Of course, your friend, relation or whoever is to be remembered is a radio lover. RADIO AGE is a quality publication for the entire family; for experimenters and broadcast listeners.

Its blueprint section in each issue is a delight to the home constructor of radio sets and its illustrated features on what is going on in the broadcast studios have a large following. A perfect gift, particularly for men and boys.

For a special thirty day rate of \$2.00, (regular rate is \$2.50) we will have the mail carrier deliver a copy of RADIO AGE each month for twelve months. Fill in the coupon on this page with the name and address to which you wish the magazine mailed; we will do the rest.

If you wish to order subscriptions for more than one person, you may do so by writing the additional names and addresses on a slip of paper attached to the coupon. Start it with any issue you desire, but send the coupon now!

# Radio Age,

INC.

500 N. Dearborn St.,  
CHICAGO, ILL.

### Gift Subscription Coupon

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Please send RADIO AGE, the Magazine of the Hour, to the following for one year, at your special holiday rate, beginning with the..... issue.

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Address.....

City.....

I enclose \$2.00 (in currency, check or money order). With the first magazine delivered send one of your notices informing the recipient that RADIO AGE is sent to him by the undersigned with Christmas greetings and Best Wishes for the New Year.

Sender's Name.....

Street.....

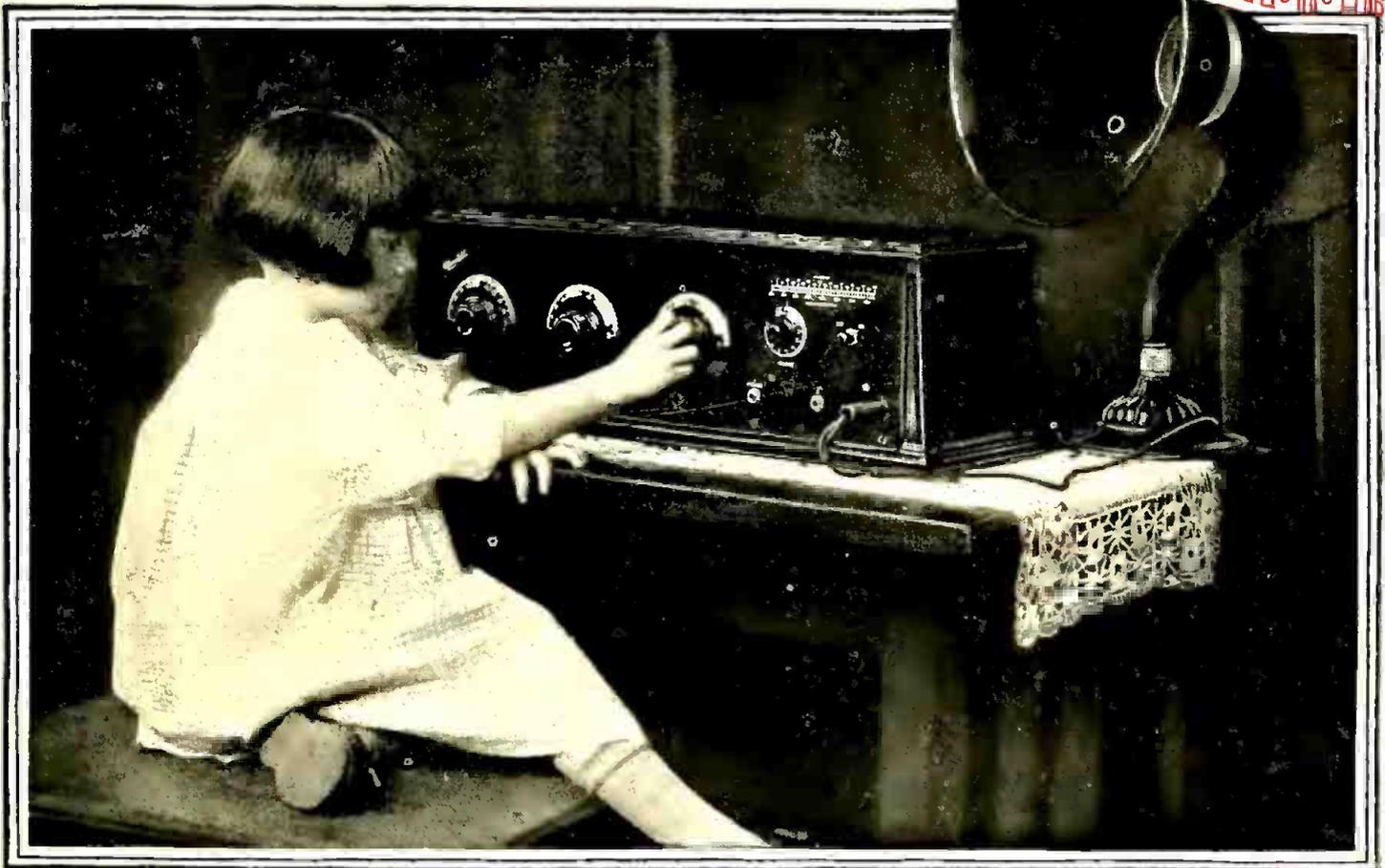
City.....

1-25

This Offer Not Good After January 20, 1925

# So Easy to Tune

— Comes in like Velvet



## \* —the Pfanstiehl Model 7 Receiver

*A 5-tube Receiver using the new system of tuned radio frequency*

RADIO is no longer a scientific toy, something to play with. Like the telephone, the piano, and the phonograph, it has become a modern home convenience. The chief use of radio today is that of an instrument of communication and entertainment. Hence, what people want in a receiver is trouble-proof service. That means a simple instrument—a receiver a child can tune. And, they want distance *plus* a tone that is clear, sweet, pure and natural.

### *A Non-Oscillating System*

What Pfanstiehl has done has been to design the simplest and least complicated receiver known in radio. He has developed a non-oscillating system that gets rid of all stray oscillations, that keeps them out. There is no

need of choking or neutralizing devices. The absence of all such devices greatly improves tone purity and tone-sweetness. Speech and music are naturally received, naturally reproduced. Distance makes no difference. There is no distortion however great the amplification. And tuning is so sharp that wave lengths can be received distinctly and separately less than 8 meters apart.

See and hear this new system that is revolutionizing radio—the Pfanstiehl Model 7—at your dealers. Or let us send you free descriptive booklet.

*Dealers:* Write for the special Pfanstiehl proposition.

**PFANSTIEHL RADIO COMPANY**  
Highland Park 22 S. Second Street Illinois

# Pfanstiehl

\* Tested and Approved by RADIO AGE \*



*Of Course It's*  
**a CROSLLEY**  
 Better - Costs Less  
 Radio

**O**H, boy! There's the West Coast! Last night I had the East Coast, and the night before that, Havana. I bet I get London soon. This Crosley sure does bring 'em in. I can tune out local stations any old time and get what I want. There's nothing like a Crosley!"

That's what thousands of men, women and boys are finding out every evening in all parts of the United States. So enthusiastic are they that hundreds of voluntary letters tell us daily of the really remarkable performances of Crosley Radios and the complete satisfaction that they give. Here is what a few of them say:

Parkersburg, W. Va. September 30, 1924.  
 "Wish to congratulate you on the one-tube Crosley 50. Have listened to Havana, Cuba, and as far west as Oakland, Los Angeles and San Francisco. This is what I call a wonderful set."

Rockville, Maryland. October 1, 1924.  
 "I thought it would interest you to know that on September 15th, I received Oakland, California, on my two-tube Crosley 51. That station is 2,434 miles from here. I had a hard time making my friends believe it until I wrote to California and had them verify what I heard. As soon as I can afford it, I expect to get a Trirdyn."

Olney, Illinois. October 15, 1924.  
 "I'm getting stations from New York to Seattle, Wash., on my Trirdyn. Monday night, October 13th, I received clearly and plainly the announcer and music from Honolulu, Hawaiian Islands, 7,000 miles away. My machine is not for sale."

(Names upon request)

**BEFORE YOU BUY—COMPARE  
 YOUR CHOICE WILL BE A CROSLLEY**  
 For Sale By Good Dealers Everywhere

*Crosley Regenerative Receivers are Licensed under Armstrong U. S. Patent 1,113,149  
 Prices West of the Rockies add 10%*

*Write for Complete Catalog*

**THE CROSLLEY RADIO CORPORATION**

Powel Crosley, Jr., President

163 Alfred Street

Crosley Owns and Operates Broadcasting Station WLW

Cincinnati, Ohio



Crosley Trirdyn Special, \$75.00  
 With tubes and Crosley Phones \$90.75



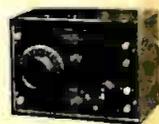
Crosley Trirdyn Regular, \$65.00  
 With tubes and Crosley Phones \$80.75



Crosley Three Tube Model 52, \$30.00  
 With tubes and Crosley Phones \$45.75



Crosley Two Tube Model 51, \$18.50  
 With tubes and Crosley Phones \$30.25



Crosley One Tube Model 50, \$14.50  
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Crosley  
 Head Phones  
 Better—Cost Less  
 \$3.75



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 of Crosley receivers  
 and parts.

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